DICOMA: DIsaster **CO**ntrol **MA**nagement

Deliverable D1.2

Personas, Contexts of Use, Scenarios and Use Cases

Project Identifier	DICOMA
Project Title	**DIsaster COntrol MAnagement**
Document Version	0.1
Planned Delivery Date	30.10.2012
Actual Delivery Date	30.11.2012 (final draft)
Document Title	Personas and context of Use for Scenarios documentation
Work Package	WP1
Document Type	Word

Abstract

The main results of the T1.2 - *Analysis of the context of use, users and tasks* and T1.3 - *Definition of scenarios, use cases and requirements* are reported in this combined D1.2 – *Personas, Contexts of Use, Scenarios and Use Cases*. The issues presented in the deliverable are related to context of use, user roles and tasks, usage scenarios and use cases that are based on them.

Keywords Context of use, User roles and tasks, Usage scenarios, Use Cases.

Function	*Name*	*Entity*
Editor	Pekka Eloranta	Mobisoft
Authors	Pekka Eloranta Tomi Korhonen	Mobisoft Mattersoft

List of DiCoMa participants:

Partner	Country	Type
Answare	Spain	SME
Athena GS3	Israel	I
CVC-UAB	Spain	RES
Deusto Tech	Spain	RES
Finnish Meteorological Institute/Arctic Research and Meteorological Research Group	Finland	RES
Indra Software Labs	Spain	I
Infotripa	Finland	SME
Mantis	Turkey	SME
Mattersoft	Finland	SME
Mobisoft	Finland	SME
Oulu University of Applied Sciences OUAS	Finland	RES
Savox	Finland	SME
UDG	Spain	UNI
UPC	Spain	UNI
University of Seville	Spain	UNI
VTT	Finland	RES

Terminology

The following terminology is used in this document:

- **Personas** are fictional characters with all the characteristics of the end-user.
- **Scenarios** are fictional stories about the normal day as well as challenges and goals that user has with personas as the main characters.
- **Use cases** are more in detail description how end-users are system to be developed interact with each other**.**
- **Data Abstraction tools** are comprehensive set of tools designed to process and correlate information from a large variety of public and private sources, allowing the creation of a unified data set, which can be easily explored and understood by decision makers.
- **Simulation and Modelling Tools** are tool that DiCoMa proposes to create, They are a suite of simulation tools that model both human behavior and natural phenomena (i.e. fires, earthquakes, weather patterns).
- **Decision Support and Training tools** are application to be created by DiCoMa and used by decision makers during both real and simulated disasters that presents information to the decision maker in a manner that is easily and quickly understood, proposes alternative actions, indicating the implication of each alternative.

Contents

1 Executive Summary

This deliverable presents the main results of the *T1.2 - Analysis of the context of use, users and tasks* and *T1.3 - Definition of scenarios, use cases and requirements*. These results will be used to define the DiCoMa user requirements, business model framework, high level design and the needed DiCoMa architecture. Thus the issues presented in this deliverable are related to context of use, user roles and tasks, usage scenarios and use cases. It is important to notice that this deliverable will also be used, when planning the evaluation of use of the DiCoMa achievements.

The countries involved in DiCoMa, Finland, Israel, Spain and Turkey have all presented their contexts of use, user involved, their roles and tasks. The contexts of use and users' roles, tasks and objectives have been used to define the DiCoMa usage scenarios that are: chemical disaster (Finland), storm disaster (Finland), forest fire (Spain, Israel, Turkey), earthquake (Spain, Israel, Turkey), and aircraft crash (Spain, Turkey). Based on these scenarios the user stories and use cases have been presented. The use cases include system users and their roles, user interfaces and use case diagrams. The actual use cases are presented in table format where for each use case name, description, actors, user interfaces, initial situation, main activity flow, exceptions, end situation and related use cases are defined. Both general use cases and scenario related use cases are presented. Additionally also simulation and training use cases and administrative use cases are presented.

The process used in tasks T1.2 and T1.3 has followed the User Centered Design (UCD) process that has been defined in the deliverable *D1.1 - Specification of the User Centred Design (UCD) process.*

2 Introduction

As the project name implies (DiCoMa = Disaster Control Management), the main goal for DiCoMa project is to provide better tools for disaster control management. Disasters like earthquakes, forest fires, massive storms and floods are far beyond the ability of a single agency to deal with, and require cooperation between multiple agencies.

Moreover, decision makers dealing with such disasters are frequently swamped with massive amounts of often-conflicting information, on which decisions need to be made in real-time. Adding this to the need to take into account, social, political and economic factors, it is no wonder that many incorrect decisions are made, worsening an already difficult situation. On the other hand effective training of such situations, especially in a multinational setting, requires an enormous effort and thus cannot be used very often.

The DiCoMa project aims to provide a set of tools to improve the effectiveness of decision makers in dealing with disasters by better training and in situ support in the field. This toolset will include:

- **Data Abstraction tools** – A Comprehensive set of tools designed to process and correlate information from a large variety of public and private sources, allowing the creation of a unified data set, which can be easily explored and understood by decision makers.
- **Simulation and Modelling Tools** - DiCoMa proposes to create a suite of simulation tools that model both human behaviour and natural phenomena (i.e. fires, earthquakes, weather patterns).
- **Decision Support and Training tools** – DiCoMa intends to create applications to be used by decision makers during both real and simulated disasters, that presents information to the decision maker in a manner that is easily and quickly understood, proposes alternative actions, indicating the implication of each alternative.

2.1 Purpose for this document

The DiCoMa toolset is planned to be designed using the User Centered Design (UCD) process. The UCD process is a method in which the needs, wants, and limitations of end users of a product are given extensive attention at each stage of the design process.

The main tools for UCD Analysis (and DiCoMa WP1) phase are:

- **Personas** - fictional characters with all the characteristics of the end-user.
- **Scenarios** - fictional stories about the normal day as well as challenges and goals that user has with personas as the main characters.
- **Use cases** – more in detail description how end-users are system to be developed interact with each other.

This document will describe all these three.

3 DiCoMa overview

In recent years, the world has seen some dramatic disasters, both natural and manmade. Some spectacular examples include the Indian Ocean Tsunami in 2004, Hurricane Katrina in the same year, the terrorist attacks in Madrid (2004), London (2005), and Mumbai (2007), most recently, the earthquakes in Haiti and Chile (2010).

Disasters such as these are far beyond the ability of a single agency (even one funded by a large, wealthy government) to deal with, and require cooperation between multiple agencies, frequently from multiple countries. Moreover, decision makers dealing with such disasters are frequently swamped with massive amounts of often-conflicting information, on which decisions need to be made in real-time. Adding this to the need to take into account, social, political and economic factors, it is no wonder that many incorrect decisions are made, worsening an already difficult situation. On the other hand effective training of such situations, especially in a multinational setting, requires an enormous effort and thus cannot be used very often.

- The goal of the DiCoMa project is to ensure effective management of large disasters and complex emergencies by providing a set of tools that aim to improve the effectiveness of decision makers in dealing with disasters by better training and in situ support in the field. This toolset will include:
- Data Abstraction tools – A Comprehensive set of tools designed to process and correlate information from a large variety of public and private sources, allowing the creation of a unified data set, which can be easily explored and understood by decision makers.
- Simulation and Modelling Tools: - DiCoMa proposes to create a suite of simulation tools that model both human behaviour and natural phenomena (i.e. fires, earthquakes, weather patterns.). The models will be based upon extensive theoretical work and field experience
- Decision Support and Training tools – DiCoMa intends to create applications to be used by decision makers during both real and simulated disasters, that presents information to the decision maker in a manner that is easily and quickly understood, proposes alternative actions, indicating the implication of each alternative Using simulation modelling, and disseminates decisions to all personnel, equipment, and agencies involved in the disaster response process.

  In order to achieve these objectives, the DiCoMa consortium intends to follow three main principles:

  1. People – The DiCoMa consortium believes that effective disaster management requires taking into account people, and the way they react to emergencies. This results in an intense usage of User Centered Design, involving many application partners (as potential users), as well as studying behavior patterns in emergencies and taking these patterns into account, in the design and implementation of DiCoMa.
  2. Interoperability – DiCoMa intends to focus on the ability of agencies to cooperate, sharing information and resources, regardless of internal procedures and

regardless of language. Furthermore DiCoMa will aim at defining a standardized Process Framework, which will allow the different parties in a disaster scenario to work collaboratively together, but still comply with their own country specific set of processes, rule and regulation.

3. Validation – The DiCoMa consortium intends to prove the feasibility of the developed concepts und prototypes by executing a validation phase, allowing actual users to work with the system, managing simulated multi-national disaster scenarios.

The DiCoMa consortium includes 17 partners from 4 different countries – sharing their expertise and experiences. The Consortium is purposely large: This was done Intentionally, as the project is intended as a “Reference Model”, incorporating many up-and-coming technologies in the field of crisis management.

DiCoMa UCD from the beginning until the end of the project, using the close collaboration with end users to establish requirements, to examine new functional concepts in data analysis and presentation and to validate the newly developed user interfaces. Definition, implementation and instrumentation of user centred design methodology has been carried out in Taks 1.1.

4 WP1 Summary

Work Package 1 User Centred Design defines the overall user centred design (UCD) process for the DiCoMa project in order to ensure the usability and economic perspective of the future solution. Thus WP1 is related to and affects all the other of DiCoMa. The objective of WP1 is to keep the work focused on the users and business stakeholders, their needs and the environment.

Task T1.2 - Analysis of the context of use, users and tasks will analyse the context(s) of use is for each country, including identification of users and their roles and tasks. Based on this work the scenarios, use cases and requirements will be defined. The table 1 below describes the WP1 deliverables. It shows how the revised dead-line for D1.2 is October 2012 instead of the originally planned June 21012.

06/12	07/12	08/12	09/12	10/12	11/12	12/12	01/13	02/13	03/13	04/13	05/13
D1.1 (VTT) – spec.			D1.1 (VTT) – final report								
D1.2 (Mobisoft)											
D1.3 (Mattersoft)											
D1.4 (Mattersoft)											
D1.5 (Infotripla)											

Table 1. The Revised summary of WP1 deliverables.

As described in the DiCoMa FPP Task 1.2 will define the context of use for the DiCoMa system to be developed. This definition work will be based upon detailed analysis of real world disaster/crisis situations in the participating countries. The work will involve the experience and knowledge of problem owners, evaluators and subject matter experts responsible for disaster control management, A central challenge of this task is defined by determination of the set of potential DiCoMa user-roles with their specific tasks and authorities. In order to get the picture of the context(s) of use the table below will be used.

D1.2 includes now also the original D1.3 and has been re-named as *"Personas, Contexts of Use, Scenarios and Use Cases"* so that it better reflects the contents of the report and objectives presented in the DiCoMa Work Programme. The table 2 on the following page summarizes for each DiCoMa country their contexts of use, users, their related tasks and provides possible comments

Country	Context of Use	Users (names/roles)	Tasks of the users	Target level	Remarks	Other comments
Spain	Forest Fires	Police , COC (Operation, Center Complex) Civil Guard, Service of attention to the citizen 112, Telephone 085, Firefighters, Security and police forces (FCS), Forest rangers.	Police – Collaborates with the emergency Services to rescue and evacuation of victims. COC (Operation, Center Complex) Civil Guard – It researches the possible responsible of the fire forest. Service of attention to the citizen 112 – Is responsible for transmission of the request for assistance, the establishing a prioritization of response in telephone communications, the collection of research data. Telephone 085, Security and police forces (FCS) – Are responsible of assist and protect to people, and receive the report of the incidence and analyze it for further investigation. Forest rangers – Are responsible of the control and authorization of burning, the preventive monitoring, the fire detection, damage assessment and data collection about each forest fire.	Conceptual planning, proof of concept and development	This scenario has been selected as the one to be implemented in the project. All partners will contribute on the development of this scenario in the different areas of DiCoMa	
	Crisis orientation	Police, firebrigade, emergency response unit, Seprona	Police – Police – leading police units, communication with other Users Firebrigade – Are responsibles of the coordination and implement prevention of forest fire, and preparing an incident report. Emergency response unit – Seprona – Are responsible of the protecting the nature, the preventing pollution, encourage behavior respect for nature and the environment, give assistance to patrols.	Conceptual planning		
	Others.	Press, Aemet	Press – Collects and spreads the information. Aemet – It development of a weather index, where they develop fields of analysis and forecasts of operating models	Conceptual planning		
Turkey	Earthquake	City of Ankara, Governor, Military, Police, Fire brigade, Red crescent, provincial medical emergency organization	Governor – leading disaster management efforts Police – Traffic management, security, communication Army – Coordinated with the police, rescue efforts Red crescent – distribution of food and shelter Medical emergency – leading rescue efforts	Conceptual planning		
	Airport ground services plane crash	Airport critical situation management center, Head of the center, coordinator, personnel management, action unit, transport unit, operator, Police, military	Critical situation management center head – starting the action plan Coordinator – assigning people to roles Action unit – carrying out processes to fight the consequences of the crash Police, army – security of the airport and the passengers, possible terrorism investigations	Conceptual planning		
Israel	Forest Fires	Relief stations : a conglomeration of the conventional relief forces (police, fire, ambulance, army,	Relief stations command center – leading both static and mobile relief units to assist minimizing the damage caused by the disaster.	Conceptual planning		

		national guard, etc.).				
	Earthquakes	Relief stations : a conglomeration of the conventional relief forces (police, fire, ambulance, army, national guard, etc.).	Relief stations command center – leading both static and mobile relief units to assist minimizing the damage caused by the disaster.	Conceptual planning		
Finland	Local/regional crisis situation (chemical disaster) caused by an accident in rail transport of hazardous goods.	Police, fire rescue, medical emergency response unit, army, traffic control centre	Police – leading police units, communication with other Users Fire rescue – leading fire rescue units, communication with other Users Medical emenrgency response unit – leading medical response units, communication with other Users Army – Leading military units, communication with other Users Traffic control centre – provision of real-time traffic related information, communication with other Users	Conceptual planning	Especially communication systems between authorities will be studied. Situation awareness need to be improved	Advisory Committee consisting of policy level, strategic level & organisational level stakeholders is being established. Discussions and meetings going on national and regional levels.
	Crisis situaton caused by a storm in Northern Finland	Police, firebrigade, emergency response unit, army, traffic control centre	Police – leading police units, communication with other Users Fire rescue – leading fire rescue units, communication with other Users Medical emenrgency response unit – leading medical response units, communication with other Users Army – Leading military units, communication with other Users Traffic control centre – provision of real-time traffic related information, communication with other Users	Conceptual planning	Especially communication systems between authorities will be studied. Situation awareness need to be improved.	Advisory Committee consisting of policy level, strategic level & organisational level stakeholders is being established. Discussions and meetings going on national and regional levels.page

Table 2. Contexts of use.

The contents of the table 2 is used D1.2 to be the corner-stone of the use cases and scenarios and it provides the documentation of the created “Personas” that are used as users and user groups for whom the DiCoMa system is designed for in later phases of the project. Persona descriptions should contain the following background information:

- Persona’s/user’s goals
- Persona’s/user’s motivation and drivers
- Background information about the Persona/user
- Context of use for DiCoMa system

All this requires information gathering from targeted user groups via methods defined in deliverable D1.1 Specification of the UCD-Process.

The results of Task 1.2 will be used especially in Task 1.3 Definition of scenarios, use cases and requirements. Thus when filling the table above the user stories describing the scenarios and related requirements need to be kept in mind. The requirements and user stories will be created in the Requirement and Testing Hub. Thus also the context of use definitions should be based on WHAT, not on HOW.

On the other hand all the user requirements and scenarios will be based on the results of T1.2. Thus they need to be related to the identified and defined contexts of use and include the identified users.

5 Context of use

The primary goal of this chapter is to identify the contexts of use for each DiCoMa country.

5.1 Context of use, Finland

In Finland there are two main contexts of use in DiCoMa. The first is a local or regional crisis situation caused by an accident in rail transport of hazardous goods. In this kinfd of a situation a train with wagons filled with hazardous goods or material (for instance gas) has fallen in the rail yard in a medium sized city. When a a gas wagon for instance falls and breaks down, there is a therath of a dangerous gas leakage in the city.

The other context is a crisis situaton caused by a storm in Northern Finland. In this case there may be a lot of obstacles, for instances fallen trees blocking the roads. Additionally the wired and wireless connections may be out of order or working only partially. This kind of situations have become rather common in Finland lately.

5.1.1 Present challenges

In both cases there are challenges to overcome today. The Finnihs user contexts and requirements were studied in DiCoMa. The focus was on transmission of important information of the operative higher officers from different authorities (police, fire and resque, medical emergency) in disaster and crisis situations. Situation of today, the future visions, needs and wishes were studied.

The results show that it is hard to get enough information of the situation. Normally the only means and source in use is the VIRVE authority line (State security network). When several users online, this authority line often falls down or gets stuck.

There are different authorities trying to work together. They have different map and management systems, which are synchronized poorly. The information available is fragmented and defective. Very often same things have to repeated several times trough the authority line. There are also many different persons in emergency exchange who are involved in one didaster case. At the moment different authorities have no uniformal action models nor management systems.

Fire and rescue normally arrives first to the destination, the crisis area. Their channel of the authority line can be different from the line of the medical emergency or police. The other authorities have problems to get connection to the general manager of the fire and rescue, because all his time goes to leading his own crew.

In the becinning of the disaster or emergency situation there is lack of information. Building the overall view is hard, because information is fragmented and comes quite slowely. Field management systems of the different aurhorities are mot synchronzed and there is no secure of the load of the systems.

5.1.2 The targeted future

Based on the responses of the survey there are some visions and targets for the future. The targed year is 2030.

The role of Emergency exchange will be to give only the first stage alarm. Communication after the alarm will take place trough the coherent management system where police, fire and resque and medical emergency can communicate and lead the units together

Trough the management system it will possible to see in real-time all units, crews and available tools. In the manament system there should be a blog that can be updated trough speech and by writing. Fotos and videos from the scene of an accident comes across the helmet cameras of the first units or across the camera helicopter.

Triage of the patients and their position info will be marked and registered straight into the management system. The units/rescuers can thus be guided to the right places

New information channels like tablets or smart phone will be used to give streight orders to the rescuers. Who will also have real-time view of the disaster/accident from air trough camera helicopter or airplane. All the leaders will be in the same physical or virtual place and act trough the same management system. All the leaders will have real-time information of the resource and needs what are available

5.2 Context of use, Israel

The proposed platform/solution will be applied to natural disasters that Israel is faced with. We will initially focus on forest fires and earthquakes. The reasoning for the aforementioned focus is as follows:

- Forest Fires: Due to the current drought situation in Israel we have been plagued by a series of devastating forest fires. Most notably, the 'Carmel' forest fire from 2010 (Dec. 2 – Dec. 6). In this fire, 40 people were killed, among them commanders and responders.
- Earthquakes: We know that we are way overdue for a big one. Much money and effort is being expended in order to 'prepare' for this pending disaster. Infrastructures are being improved and emergency forces are being trained. The public is being prepared for the eventuality of 60,000 casualties.

In the case of the Carmel forest fire, we know that had a proper DSS system been in place, most, if not all, of the casualties could have been avoided. We are confident, that by applying the learned methodologies to earthquakes will yield similar benefits.

A full description of the proposed DSS methodology can be found in separate Appendix 'A'.

5.3 Context of use, Spain

In Spain there are three main contexts of use in DiCoMa project; earthquakes, which the last years are very frequently in the Southeast of the country, forest fires, which are common during the hot months of the year and aircraft accidents, the most important recently in Madrid.

In recent years some major earthquakes have occurred in the southeastern Spanish. The most important of these occurred in Lorca (Murcia), with a magnitude 5.1 on Richter scale, and killed nine people and very important in many buildings damaged. Earthquakes need an infrastructure to coordinate all emergency forces involves. In this kind of emergency is very important to know the best resources, escape, interesting buildings (schools, nursing homes, hospitals, etc.) to act as quickly as possible.

In the other context, in Spain, although there is a wide range of forest fire causes, the long drought periods are usually the main cause. Because of these periods, the forest and the wind become a chemical combustible. When a fire forest occurs, different actions will carried out depending on the fire intensity and other meteorological factors.

Also depending on the received information from sensors and with help of web services, the platform will be able to control the fire most efficiently.

Although in Spain the number of aircraft accidents since the 60’s is less than twenty, in recent years has been one of the largest in its history.

20 August 2008, Spanair Flight JK 5022 from Madrid-Barajas Airport to Gran Canaria Airport crashed just after take-off from runway 36L of Barajas Airport at 14:24. The aircraft was a McDonnell Douglas MD-82. It was the first fatal accident for Spanair in the 20-year history of the company, and the 14th fatal accident and 24th hull loss involving MD-80 series aircraft. It was the world's deadliest aviation accident in 2008 and Spain's deadliest in 25 years. 154 people died; six died en route to the hospital, one died overnight and one died in the hospital three days later. Only 18 people survived.

For this reason, a platform has been incorporated for the management of events from sensors of the affected area. This platform will be responsible for the register of the first emergency call, the obtaining of affected area coordinates, acquisition of the received data from sensors present in the affected area, organization of an action plan, monitoring of personal position, planning of safe routes in order to provide to personal with access until the assessment of damages, to provide information about possible aftershocks, information about Point of Interest (POIs), etc.

5.4 Context of use, Turkey

In Turkey there are two major uses for the outcomes from the DiCoMa project. Earthquakes, which are more frequent than the other European countries, and crisis management in the cased of a plane crash in a major airport.

Earthquakes are the most complex form of disasters which require a tremendous amount of effort for managing and auctioning correctly. The recent earthquakes in Turkey showed that even if you have a very good action plan to deal with, management of the situation is a challenging task. The most challenging issue in the 1999 Golcuk earthquake was communication. The earthquake affected a populatıon of approxımately 15 million people and the public communication infrastructure was quickly saturated after just 2 minutes from the time of earthquake not only because of the destruction of infrastructure but also because of heavy use. GSM operators and telephone exchange routers were not designed to deal with such a situation.

Airplane crash may not be so frequent but it is still a clanging situation because usually the airports in Turkey have separate crisis management centers and coordination with provincial crisis management centers becomes very important. DiCoMa project will provide a common framework which will improve effective communication between different units.

Currently, in Turkey, every province and airport have their own action plan for disaster management. In the case of disasters that require interventions from more than one province, coordination may be difficult as the plans may not use the same concepts, same personas and scenario definitions. By providing common use case definitions, DiCoMa project outcomes will provide quick and effective management of such situations when dealing with earthquakes and airport crisis situations.

6 Users

The primary goal of this chapter is to identify the relevant users, their roles and tasks related to the context of use.

6.1 Personas/users, their roles and tasks, Finland

As described earlier the main personas/users in both of the Finnish contexts, scenarios and use cases will be:

- Fire and rescue authorities - responsibility of the needed fire and rescue activities during the crisis. Co-operation with other related stakeholllders. Fire and rescue chief – leading the fire and rescue units, communicatiing with other Personas/Users. In the future new tools are needed such as:
- Police - responsibility of the needed police activities during the crisis. Co-operastion with other related stakeholllders. Police chief – leading police units, communicatiing with other personas/users
- Medical emergency authorities - responsibility of the needed medical emegency activities during the crisis. Co-operation with other related stakeholllders. Medical emenrgency response unit chief – leading medical response units, communicatiing with other personas/users
- Army – military help and support provision. Army officer(s) – Leading military units, communication with other personas/users. Co-operation with other related stakeholllders. Medical emenrgency response unit chief – leading medical response units, communicatiing with other personas/users
- Traffic control centre – provision of real-time traffic related information, communication with other Personas/Users. Co-operation with other related stakeholllders. Medical emenrgency response unit chief – leading medical response units, communicatiing with other personas/users
- FMI – provision of needed weather forecasts, alarms, etc. Co-operation with other related stakeholllders. Medical emenrgency response unit chief – leading medical response units, communicatiing with other personas/users

All these users are aiming to take into use the following new technologies in the future:

- The real-time picture /video will be in use and available from helmet camera or air
- All the resource information will be in use and available automatically by GPS
- Common information to the leaders will be in the same system: terrain, street map, city map, weather report, rescue units, rfid of the patient, other resources
- All rescuers will have tablets or smar phones in use to get orders

- All patients will be marked with RFID code and position info
- Virtual video conference systems will be in use

6.2 Personas/users, their roles and tasks, Israel

The main objective is introducing, the concept of Relief stations (both static and mobile). These Relief stations are a conglomeration of the conventional relief forces (police, fire, ambulance, army, national guard, etc.) and form the main personas/users in DiCoMa. Creating 'bundles' of these assorted forces, training them to work together as a unit, has proven most effective in reducing disaster damages.

The goal/purpose of a relief station is to minimize the losses/damages that are incurred during a disaster. Through proper deployment of these relief stations at the right time and in the right place the potential relief can be maximized. The users of the DiCoMa platform will be the body that is responsible for the deployment, placement and maintenance of these relief stations. The DiCoMa DSS will assist the users in optimizing the relief station placements.

6.3 Personas/users, their roles and tasks, Spain

Following personas/users in Spain can be identified.

The National Police

- Establish a system of prevention and policing of the areas assigned to the National Police, coordinating actions with the other Security Forces.
- Collaboration and coordination with the emergency Services, rescue and evacuation of victims.
- Control and identification of possible perpetrators of forest fires.
- Checking the contents of calls to complex operation centers (COC) and other Civil Guard units in order to identify possible witnesses at the start of the fire or any other circumstance that relates the fire.
- Interview with witnesses of affected areas.
- Interviewing staff of the brigades of forest fire.
- Study the degree of intent of the fire.
- Study of the physical evidence found at the point of beginning and establish connection with the fire.
- Identification of people suspected in the zone that could be the cause of the fire. Surveillance of suspects.

Regional Police

- Has jurisdiction over a particular area. Organizes, regulates and designates its authorities.

Municipality

- Making investments to provide safety measures and fire fighting
- Set plan and coordinates of actions in case of forest fires.

Press

- Collects and spreads the information.
- Delivery the information of latest news all people.
- Informs the latest developments of the forest fires.
- Transmits information by television, radio, magazines, newspapers, etc.

The Civil Guard

- Performs analysis of the fact happened.
- Obtains the reasons that individuals realized the fire forest.
- Request Test of alcohol.

COC (Operation Center Complex) Civil Guard

- Determines the source of the fire forest.
- Helps extinguish the flames of a forest fire.
- Conducts research to find the culprit of the fire forest

Service of attention to the citizen 112

- Establishes a prioritization of response in telephone communications and the collection of research data.
- Treatment and evaluation of incoming calls.
- Responsible for transmission of the request for assistance to relevant departments, indicating the exact location of incident

Telephone 085 (phone for forest fires)

- Responsible for reception and care of calls because forest fire.
- Identification and classification of emergency.
- The transmission of the request for assistance.

Resident

- Call the firefighters, 085.112, police, firefighters, etc..
- Provide data on the location of fire.
- Provide details about suspicious of fires.
- If you are at home, disconnect LP gas, natural gas, diesel, etc.
- Remove objects that are around the house that can burn.
- Close doors and windows of the house to keep out sparks that are transported by wind.

Firefighters

- Coordinate and implement prevention, control and extinguishing forest fires, as well as developing and updating the national strategy of management and fire management.
- Establish prevention and early detection to prevent forest fires and / or lessen their impact.
- Be constantly alert in case of fire.
- Receive information about the incident.
- Make a report of the incident.
- Review the tools available and the units.
- Receive information about the fire.

Security and police forces (FCS)

- Assist and protect people
- Receive the report of the incidence and analyze it for further investigation.
- Maintain order and public safety
- Collaborate with other entities for research for joint action

The civil guard Trafico

- Receive the report of the suspects who violated a traffic law to receive its appropriate sanction

Seprona (Protection Service of the Civil Guard's Nature)

- Protects the nature: soil, water and environment.
- Protects the living species in the nature.
- Prevents pollution of the environment through monitoring and control of activities.
- Encourages behavior respect for nature and the environment.
- Give Assistance to patrols.
- Makes the necessary inquiries for detecting causes of forest fires.

Forest rangers

- Control and authorization of burning.
- Preventive monitoring and fire detection.
- Damage assessment and data collection about each forest fires.

Aemet

- Develop a weather index, where they develop fields of analysis and forecasts of operating models. The system takes into account the dead fuel moisture in the soil and subsoil, estimated from their starting values and the analyzed and forecast meteorological fields (temperature, relative humidity, wind, precipitation). The wind is taken into account to estimate the intensity about propagation of a fire.

6.4 Personas/users, their roles and tasks, Turkey

As summarized in the table above, in Turkey there are different personas, roles and users for the context of airport crisis and earthquake.

When it comes to **earthquake the personas/users** are (in the City of Ankara), governor, army, police, mayor, provincial disaster action unit, city planning unit, agriculture and food unit, fire brigade, red crescent, provincial medical emergency organizations and other institutions designated by the governor. The heads of all these units forms the "Provincial Emergency Response Team". This team is led by the governor and performs the following tasks when there is a disaster:

- Preparation and execution of emergency response plan
- Supervision of county emergency plans
- Formation of emergency response team and assigning roles
- Initiating the emergency response activities performed by different units
- Coordination of different units involved
- Decision about the type of help needed and the needs of the affected people
- Requesting government funds when needed
- Analyzing emergency response efforts
- Coordination of transportation of personnel and utilities
- Supervision of the following activities (ordered by priority):
    - Provide communication between different action units
    - Transportation activities and traffic management
    - Search and rescue
    - Medical emergency services
    - Transport of patients to the hospitals
    - Fire fighting
    - Establishing security
    - Provision of food, cloths, heating and lighting
    - Providing provisional shelters
    - Burying the dead
    - Cleaning the wreckages
    - Fixing water, electricity and sewage systems
    - Application of quarantine when needed

    The order of activities can be adapted to the type of disaster but usually the order above needs to be followed.
- Government disaster management unit is responsible for providing the funds needed.

Governor is responsible for leading the disaster management efforts. Police is responsible for traffic management, security and communication. Army is coordinated with the police and carries out the rescue efforts. Red crescent distributes food and shelter and the medical emergency – leading rescue efforts

In the case of the **airport ground services plane crash the personas/users** are “the airport disaster and emergency management center”, head of the center, coordinator, personnel management, action unit, transport unit, operator, police and army. The head of the critical situation management center head is responsible for starting the action plan. The coordinator the takes care of assigning people to roles. The action unit carries out the needed processes to fight the consequences of the crash. Police and army are responsible for security of the airport and the passengers, possible terrorism investigations. The Airport Disaster and Emergency Management Center has the following tasks/roles:

- Creating an action plan in accordance with the regulations from Ministry of Transportation and Communications.
- Coordination with the Government Disaster Management Control Center in the case of disaster.
- Airport Management is responsible for the following actions:
    - Provide an environment for air transportation requirements by the organizations designated by the Ministry of Transportation and Communication for helping the disaster control actions.
    - Making sure that parts of the airport are in good usable state for rescue and disaster control efforts.
    - Provide reports to the Ministry about capacity of regional airports to be used for rescue and disaster management efforts.
    - Management of transportation fee policies for rescue efforts
    - Management of voluntary contributions to the rescue efforts
    - Rapid reparations of damaged airports
    - Planning of all these efforts

7 Users and Usage Scenarios

The primary goal of this chapter is to present the usage needs and scenarios and to gather the resulting user requirements. The context of use, usage scenarios and user profiles are defined in deliverable 1.2. These definitions are based on user interviews and research work. The user interviews were conducted in Finland.

7.1 Usage Scenarios and User Stories, Finland

There will be two scenarios in Finland based on the use contexts. The first scenatio is related to crisis situation caused by an accident in rail transport of hazardous goods (chemical disaster) and the other to a crisis situaton caused by a storm.

Concept level probabilistic estimates of hazardous wind gusts, highly slippery road surfaces, or dissemination of toxic gases as pre-emptive warning will be on the focus in Finland.

The same goes with concept level producing of local high-resolution satellite data from the area of (natural) disaster area for management of rescue operations, locating most critical spots and rescue paths.

7.1.1 Chemical disaster

Thus crisis management scenario focuses on a chemical disaster occurring in a railway close to city area. The management of such a large disaster requires many authority groups to work together and making decisions coherently. Effective response, decision making and relief to large-scale disasters requires that a common operational picture (COP) is formed and all participants can rapidly assess the available information.

To achieve these goals, different emergency authorities use different types of sensors suitable for monitoring and collecting information about people, objects and the environment. They can react to the sensor information automatically utilizing the actuators that act on devices – to turn them of, adjust them or maneuver them.

The main information sources in this scenario are: viable already deployed sensors and actuators, and around the disaster area ad hoc built WSANs (wireless sensor actuator network). Sensors will monitor the environment and provide measurement data related to:

- Quantitative sensors (measure physical and chemical properties)
    - weather conditions relating to chemical gas spreading and effects
        - air pressure
        - humidity
        - flow
        - temperature
    - chemical compositions and percentages

- biological aspects
- radiological components

- Qualitative sensors (report the presence or absence of objects and activities))
    - real-time and non real-time monitoring (video and pictures from the crisis area)
    - radar
    - human identification
        - biometrics
        - positioning (GPS)
        - equipment
        - suitable communication methods

Actuators regulate the sensors and monitoring events. Control commands to actuators can be the result of automated logic observing that the measurement data from the sensors has drifted outside of preset nominal values, or some event has taken a place (motion sensor is activated etc.) and some action needs to be taken.

All measurements are collected to a central command, control and communications centre (Local Gateway C4) which provides either fixed or wireless connectivity to application server maintained by authorised users. The sensors and actuators can be linked to the Local Gateway via LAN or local wireless connection. The Local Gateway can be placed to a leading vehicle of a certain authority group (police, emergency response, fire brigade) that will act as an incident commander. The connection between Gateway and application server can be either fixed or wireless.

Crisis management scenario with communication and information sharing capabilities is presented in the picture below. This platform is an architecture framework for building solutions to prevent, respond and recover from large scale crisis. The framework comprises of Local Gateway (C4), mission critical networks, sensing and actuation, authority groups with application servers and incident collaboration (COP).

Some of the sensor devices can be very constrained utilizing WSN radio technologies whereas other equipment might also have cellular networking capabilities and more CPU and memory.The devices are assumed to have IP connectivity provided by 6LoWPAN.

The Local (CoAP) Gateway provides a request/response interaction model between application endpoints, supports built-in resource discovery with unreliable datagram-oriented transport (i.e., UDP). CoAP meets the specialized requirements of constrained environments such as low overhead, simplicity, and ability to deal with sleeping nodes.

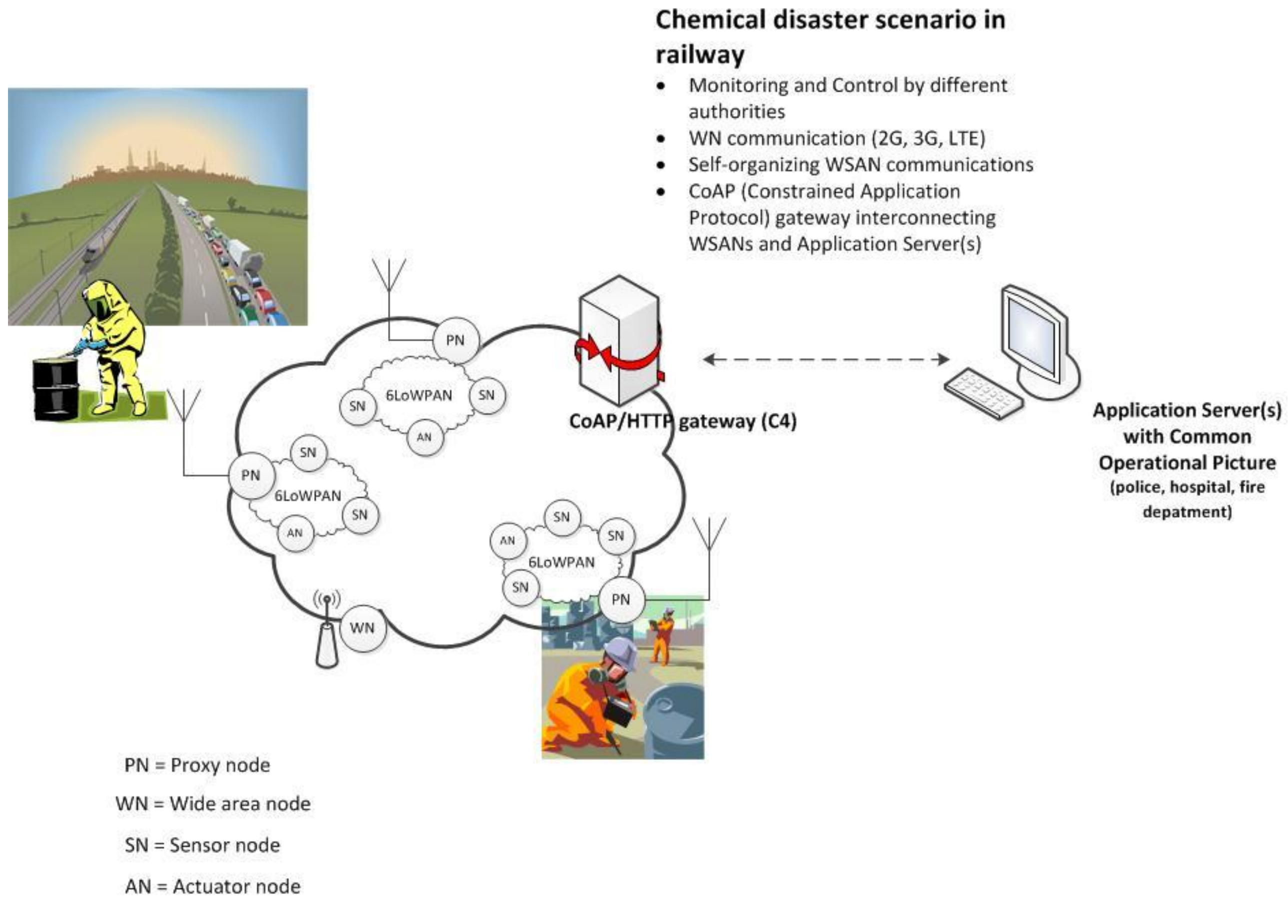

Figure 1. Chemical disaster scenario.

The operational environment in the scenario requires:

1) suitable sensor, wireless and wired technologies
2) monitoring gateway and interfaces
3) information and data base services
4) application server(s)
5) authorized access and security
6) co-operation and COP between authorities

From system logic viewpoint the following actors can be recognised:

- Sensors take measurements and send the measurement information to Local Gateway (C4)
- Actuators receive control commands from Local Gateway
- Local Gateway communicates with multiple sensors to receive measurement information and pass it to Application Server(s) of different authorities

- Application Server(s) accumulates measurement information from many Local Gateways

Preconditions/Assumptions form the scenario are that the sensors have performed Local Gateway discovery and secure communication in Sensor network as well as in the connectivity from Local Gateway to Application Server has been initiated.

Several possible sequences can exist.

- Passive sensor request sequence by polling
- Control loop via polling
- Control loop triggered by sensor alert

7.1.2 Storm disaster

Storm disaster management scenario focuses on a storm disaster occurring in Northern Finland, where the road and telecommunications network are not very dense and thus rather vulnerable. The management of storm disaster requires many authority groups to work together and making decisions coherently as in chemical disaster. Effective response, decision making and relief to large-scale disasters requires that a common operational picture (COP) is formed and all participants can rapidly assess the available information.

To achieve these goals, different emergency authorities use different types of sensors suitable for monitoring and collecting information about people, objects and the environment. They can react to the sensor information automatically utilizing the actuators that act on devices – to turn them off, adjust them or maneuver them. In storm situations also observations by both authorities and citizens are important.

Traffic and transportation is many times one of the parties that suffer the most of bad weather conditions. Therefore, monitoring the road conditions and managing the incident warnings is a critical part of the disaster management related to stormy weather. Communication entity consists of Road Side Unit(s) (RSU), Linking Point(s) and Service Core(s). Vehicles receive real-time service data from the vehicle sensors and systems, and also by exchanging observation data with other vehicles. Roadside units deliver this data to the linking point using alternative available connections (IEEE 802.11p, 3G, GPRS) to update the service core's data bases and disseminate the critical data among authorities. By combining different information sources, it is expected to reach the most effective response for decision makers of severe incidents.

The main information sources in this scenario are: viable already deployed sensors and actuators, and around the disaster area ad hoc built WSANs (wireless sensor actuator network). Sensors will monitor the environment and provide measurement data related to:

- Quantitative sensors (measure physical environment and properties)
  - weather conditions relating to expansion of storm damages and effects
    - air pressure
    - humidity
    - flow
    - temperature
  - weather forecasts

    - geographical environment
    - road weather monitoring and warnings
- Qualitative sensors (report the presence or absence of objects and activities))
    - real-time and non real-time monitoring (video and pictures from the crisis area)
    - radar
    - human identification
        - biometrics
        - positioning (GPS)
        - equipment
        - suitable communication methods

Actuators regulate the sensors and monitoring events. Control commands to actuators can be the result of automated logic observing that the measurement data from the sensors has drifted outside of preset nominal values, or some event has taken a place (motion sensor is activated etc.) and some action needs to be taken.

All measurements are collected to a central command, control and communications centre (Local Gateway C4) which provides either fixed or wireless connectivity to application server maintained by authorised users. The sensors and actuators can be linked to the Local Gateway via LAN or local wireless connection. The Local Gateway can be placed to a leading vehicle of a certain authority group (police, emergency response, fire brigade) that will act as an incident commander. The connection between Gateway and application server can be either fixed or wireless.

The storm crisis management scenario with communication and information sharing capabilities is in practice very much like in the chemical disaster scenario. The platform is an architecture framework for building solutions to prevent, respond and recover from large scale storm crisis. The framework comprises of Local Gateway (C4), mission critical networks, sensing and actuation, authority groups with application servers and incident collaboration (COP).

Some of the sensor devices can be very constrained utilizing WSN radio technologies whereas other equipment might also have cellular networking capabilities and more CPU and memory. The devices are assumed to have IP connectivity provided by 6LoWPAN.

The Local (CoAP) Gateway provides a request/response interaction model between application endpoints, supports built-in resource discovery with unreliable datagram-oriented transport (i.e., UDP). CoAP meets the specialized requirements of constrained environments such as low overhead, simplicity, and ability to deal with sleeping nodes.

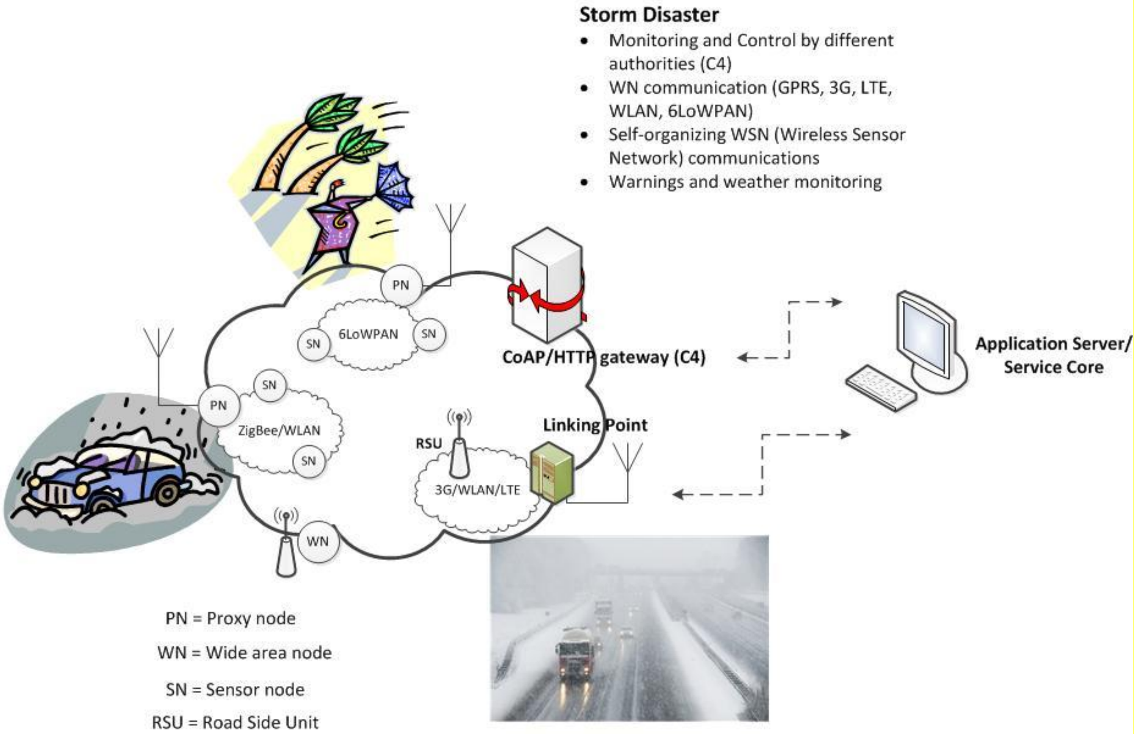

Figure 2. Storm disaster scenario

The operational environment in the scenario requires:

1) suitable sensor, wireless and wired technologies
2) monitoring gateway and interfaces
3) information and data base services
4) application server(s)
5) authorized access and security
6) co-operation and COP between authorities
7) vehicle communications

From system logic viewpoint the following actors can be recognized:

- Sensors take measurements and send the measurement information to Local Gateway (C4)
- Road side units receive control commands and data from linking points/gateways
- Local Gateway/linking point communicates with multiple sensors to receive measurement information and pass it to Application Server(s) of different authorities
- Application Server(s) accumulates measurement information from many Local Gateways and linking points

Preconditions/Assumptions form the scenario are that the sensors have performed Local Gateway discovery and secure communication in Sensor network as well as in the connectivity from Local Gateway to Application Server has been initiated.

Several possible sequences can exist.

- Passive sensor request sequence by polling
- Control loop via polling
- Control loop triggered by sensor alert

7.2 Usage Scenarios and User Stories, Israel

As a disaster begins, DSS modeling inputs must be provided. When possible, these inputs will be automatic (via sensors and other services). The required inputs will applied to the disaster model in order that the system can determine the location, conditions, magnitude, spread rate and direction of the disaster. The DSS will provide all the necessary visualizations (COP) for the decision makers. The DSS will provide relief station availability, capability and strength. The DSS will provide a 'what if' view of the potential effects of relief stations as they are deployed/positioned.

7.3 Usage Scenarios and User Stories, Spain

7.3.1 Forest Fires

The forest fire is a crisis event that is being frequently caused in the last years. A wildfire is any uncontrolled fire in combustible vegetation that occurs in the countryside or a wilderness area. Other names such as brush fire, bushfire, forest fire, desert fire, grass fire, hill fire, peat fire, vegetation fire, and veldfire may be used to describe the same phenomenon depending on the type of vegetation being burned. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and fire breaks. Wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible material present, and the effect of weather on the fire. Although there is a wide range of forest fire causes, the long drought periods are usually the main cause. Because of these drought periods, plants and air become a chemical combustible.

Figure 3. Example of the cause of forest fire.

Once an alarm arrives to telephone exchange, it is verified in order to verify that the information is real. After, the agents nearest to affected area are alerted to evaluate the area.

Series of Events	DiCoMa System Usage
1. The fire fighter emergency room receives phone calls from civilians that report a fire ignition. The central of the fire fighter emergency room inserts the information in the notification system. 2. The telephone agents send a signal alerts the nearest available means. 3. Depending on the received data from sensors, depending on the fire magnitude some precautions will be carried out, in order to control the fire in the best possible way. 4. Once fire was checked, its level of severity is established. There are several severity levels, these are: • Level 0: Can be controlled by the basic resources and the people aren't in danger. • Level 1: More than 12 hours are needed to control the forest fire. It causes danger over more of 30 hectares of forest and ambient impact temporary or permanent. • Level 2: Causes situations in which people and assets are in damage, roads, railways, electric lines are blocked or there are simultaneous fires of level 1. • Level 3: Emergency situations declared of national interest. 5. The emergency coordinator develops an action plan according to the fire severity. • The agents will perform their work in a safe distance of the fire calculated according to the time required to perform their work. Therefore, the time and the area of the fire will be measured.	• Reception of emergency call event. • Call verification. • Obtaining of the affected area coordinates. • Acquisition of the received data from sensors present in the affected area. • Smart analysis of the collected data from sensors. • Organize an action plan. • Register the times of propagation.

Table 3. Forest fire - Alarm/reception and Processing.

The rescue vehicles leave the fire station and get around towards the fire location. These agents are reported by phone or radio. During the transportation until the fire location, the agents check their equipment and each chief explains the defined action plan and the assigned area of each agent.

Series of Events	DiCoMa System Usage
1. The emergency agents units arrive on the	• Deployment personal.

Series of Events	DiCoMa System Usage
incident location. 2. The emergency unit coordinator gives indications to all agents that has under his command. 3. Pumps and fire fighting vehicles are used in order to place hoses from the vehicles and pumps, until a suitable place to extinguish the fire. 4. Terrestrial agents are organized in brigades of about twelve fire fighters. These fire fighters receive all the information of the area which has to be protected by them.	• Monitoring of personal positions • Planning of safe routes in order to provide to personal with access until affected area.

Table 4. Forest fire - Transportation

The intervention phase is composed of a series of actions carried out in the field by the rescue teams, firemen, policemen, paramedics, etc.

Once the agents receive the alert and detects the location of the fire, the responsible of the emergency unit establishes the most appropriate actions depending on the data received in order to achieve the mission. The agents regularly report the successes and difficulties of his mission by radio or using other means.

Figure 4. Forest in fire.

Series of Events	DiCoMa System Usage
1. The agents start their work on the field. They install fire hoses but, despite their actions, the fire front increases. The fire is not under control, many spot fire occur, leading to multiple ignition points. The agents are contacting by radio to report about the situation. 2. The agents reported to the Civil Guard that for the moment not is register no injured. Also report the direction about and velocity of the fire. 3. The civil guard with help of the regional police reported to all near neighbours, the measures that should take to evacuation of the place. 4. The ambulances are situated, near of the rescue areas.	• Monitoring of forest fire behaviour and its trajectory. • Evacuation of areas near the fire trajectory. • Obtaining the position of hospitals and rescue areas near affected area. • Organization of evacuation of injured persons. • Return personal.

Table 5. Forest fire - Intervention

The status report is used for updating the command centre of the ongoing work and to allow the operator to update and prepare the arriving units.

Series of Events	DiCoMa System Usage
1. Firelighters staff decides which the incident was by natural cause. 2. A report is performed which contains the caused damage by fire and the number of injured person (including members of emergency units). 3. A report is performed which contains the measures and the action plan carried out to extinguish the fire. 4. A report is performed which contains the time, means and resources that were needed to extinguish the fire.	• Assessment of damages. • Generation of aerial maps of the affected area. • Estimation of time and money needed in order to regenerate the affected area.

Table 6. Forest fire - Incident completion

7.3.2 The Aftermath of an Earthquake [1234]

Crisis event

---

[1] http://en.wikipedia.org/wiki/2011_Lorca_earthquake
[2] http://earthquake-report.com/2011/05/13/moderate-earthquake-near-lorca-and-murcia-spain/
[3] http://earthquake-report.com/2011/05/12/understanding-the-lorca-spain-may-11-2011-earthquake/

[4] http://earthquake-report.com/2011/05/13/earthquake-lorca-earthquake-preparedness-may-have-saved-some-lives/

11/05/2011

The 2011 Lorca earthquake was a moderate magnitude 5.1 on Richter scale earthquake that caused significant localized damage in the Region of Murcia, Spain. Centred at a very shallow depth of 1 km (0.6 mi) near the town of Lorca, it occurred at 18:47 CEST (16:47 UTC) on 11 May 2011, causing panic among locals and displacing many from their homes. The quake was preceded by a magnitude 4.4 on Richter scale foreshock at 17:05 (15:05 UTC), that inflicted substantial damage to many older structures in the area, including the historical Espolón Tower of Lorca Castle, the Hermitage of San Clemente and the Convent of Virgen de Las Huertas. Three people were killed by a falling cornice. A total of nine deaths have been confirmed, while dozens are reported injured.

.

Figure 5. Lorca earthquake site

The 112 emergency room response work is triggered by a lot of calls. The operational room which centralized alerts receives an important number of calls, over 245. Indeed many civilians report the tremor and witness the collapse of many buildings.

As soon as the area is identified by the centralist, the nearest available means are sent by the Emergency Coordinator on the scene accompanied by an Incident Commander (IC). (TO-DO)

Series of Events	DiCoMa System Usage
17h05 An earthquake of magnitude 4.4 on Richter scale hit Lorca (Murcia)	17h05 The emergency room opens DiCoMa System to check the status (using sensors and

Series of Events	DiCoMa System Usage
17h06 The emergency room (112) receives phone calls from civilians that report tremors. Over 245 calls. 17h08 Centralist sends the nearest available means (2 Policemen teams + IC): IC is in charge of 2 Policemen teams and gives the instructions.	information gathered from the civilians) of the whole emergency. Based on this, DiCoMa ranks the different alerts that may have happened in the emergency. Then, it searches the most suitable units (based on expertise, distance, and so on). Finally, DiCoMa assigns the most suitable units to each emergency to recognition/response tasks. DiCoMa optimizes route planning in order to minimize the required time in order to arrive to the scenario. 17h06 DiCoMa systems runs alternative simulations using data in order to generate new states that may happen in the earthquake and schedule new actuations with the former or new units. TO-DO→ Add new information.

Table 7. Earthquake - Alarm/reception and processing

The rescue vehicles leave the fire station and dispatch towards the area. IC contacts the emergency room by phone and confirms that they are on their way.

Series of Events	DiCoMa System Usage
17h10 IC and policemen contact the DiCoMa system (using their GPS signal). 17h11 IC and FC teams arrive on the incident location. 17h12 IC contact with the Director of the IES Ros Giner and with the Director of the Nursing Home. 17h15 IC contacts with the center coordinator and tell how is the actual situation. 17h17 The Emergency Coordinator order to evacuate the IES Ros Giner and Nursing Home	17h10 DiCoMa tracks the route of IC and FC and communicates them if there are some changes in the events. 17h40 DiCoMa receives the signal the teams have arrived to the incident area. TO-DO→ The system will take different decisions based on what the leader communicates the incident • Identified nearby safe areas (for shelters) • Identified risk areasSimulación de flujos de salida de personas. • Plans those actions taken by the FC.

Table 8. Earthquake - Transportation

The intervention phase is a series of actions undertaken in the field by the rescue teams, firemen, policemen, paramedics, etc.

Once the fire crew commander receives his orders from the IC and the location of the truck he is responsible for, the responder team chief positions his truck and dictates the most appropriate actions to his responder teams in order to achieve the mission. Responder teams execute their FCC orders, and communicate only with their FCC.

A responder team's mission is always linked to a fighting, saving, or rescuing action. The actions carried out by the responder team will lead the responder team chief to initiate. The FCC regularly reports to the IC the successes and difficulties of his mission by radio or other medium.

Series of Events	DiCoMa System Usage
17h17 Policemen dislodge the IES Ros Giner and Nursing Home. 17h18 The Emergency Coordinator notifies the Red Cross to assist the police in the work of eviction. 17h25 The Red Cross notify its situation via radio. 17h28 The Red Cross arrives to the incident location. 17h30 The Red Cross and the firefighter teams start the relocation of the elders of the Nursing Home. 18h45 Other earthquake of magnitude 5.2 on Richter scale hit Lorca (Murcia) 18h47 The emergency room (112) receives phone calls from civilians that report a building collapse in the Barrio de La Viña 18h48 There are 3 deaths in the Barrio de La Viña cornices detachment 18h49 The Emergency Coordinator sends 3 policemen teams, 3 firefighter's teams and 4 ambulances to the incident location: IC is in charge of all teams and gives the instructions. 18h53 Policemen arrive to the location incident in Barrio de La Viña 18h54 Firefighters arrive to the Barrio de La Viña 18h55 Police chief call to the fireman chief. Together they made a joint inspection of the area. 18h56 The Red Cross arrive to the Barrio de la Viña. 18h57 The teams start their work on the field. - One firefighter hears some cries behind a wall - Firefigthers are shoring, drilling and cutting, they evacuate 2 persons wounded and asphyxiated by the collapse of the building - The Red Cross chief set up an emergency medical post. Also is asked to transport the victims to the ambulance. 19h00 Collapse of the Belfry of the Church of San Diego, the roof of the asylum, and part of the Tower of Lorca Castle Spur. A journalist shows this in live. 19h01 The Emergency Coordinator contact with the	18h00 DiCoMa receives the information and generates a sequence of actions to perform by the FC unit, recalculated from the previous simulations.

Series of Events	DiCoMa System Usage
firefighter teams to send at the Church of San Diego 19h05 1 firefighter team arrive to the Church of San Diego 19h07 The head of the fire patrol has come call to the Emergency Coordinator to requesting the presence of the police. 19h08 The Emergency Coordinator contacts with the policemen and send 2 units to the Church of San Diego. 19h12 Policemen established a security perimeter 19h15 The Emergency Coordinator decide to closed the motorway A-7 at the height of the tunnel of Lorca 19h35 The Red Cross and the Emergency Coordinator decide to install some field hospital. Coordinator shows the best places to install it. 19h45 The Emergency Coordinator orders to the Firefighter chief to revise the most important buildings in the city. 20h19 The Emergency Coordinator increases Level 2 alert Emergency Plan to the Seismic Risk of the Autonomous Community of Murcia (Sismimur). 20h20 Firefighters revised the Hospital Rafael Mendez and decide to dislodge. 20h21 Firefighters chief contact with the Emergency Coordinator and tell the situation. So, the coordinator calls to Red Cross. 20h25 4 units of Red Cross (4 ambulances) arrive to the Hospital Rafael Mendez. 20h26 The Red Cross chief of the 4 units call to the coordinator and tell that they're moving their 270 patients to other hospitals. 20h30 The Prime Minister decides to send the UME (Unidad Militar de Emergencias). 21h30 Replica of 3.1 degrees on the Richter scale 21h33 150 members of the UME arrive the city 21h35 The Emergency Coordinator contact with the UME leader and send the units to the different location 21h40 UME units arrives to its location and begin to build a camp for people affected 22h00 The Red Cross has activated its Emergency Agreement with Carrefour Foundation to provide food and water for 10,000 people 22h32 The Red Cross has mobilized to 130 members to participate through health care, food distribution, water, blankets and kits maternal and child	

Series of Events	DiCoMa System Usage
22h36 200 members of the UME arrive the city 22h37 Replica of 4.0 degrees on the Richter scale 22h38 The last members of the UME deploy two news camps for people affected 23h35 The Emergency Coordinator decides it can start lifting restrictions in the city 23h36 Policemen open to traffic motorway A-7 00h00 The police patrol the city to prevent theft and looting 02h37 Firefighters stop looking for victims among the rubble.	

Table 9. Earthquake – Intervention

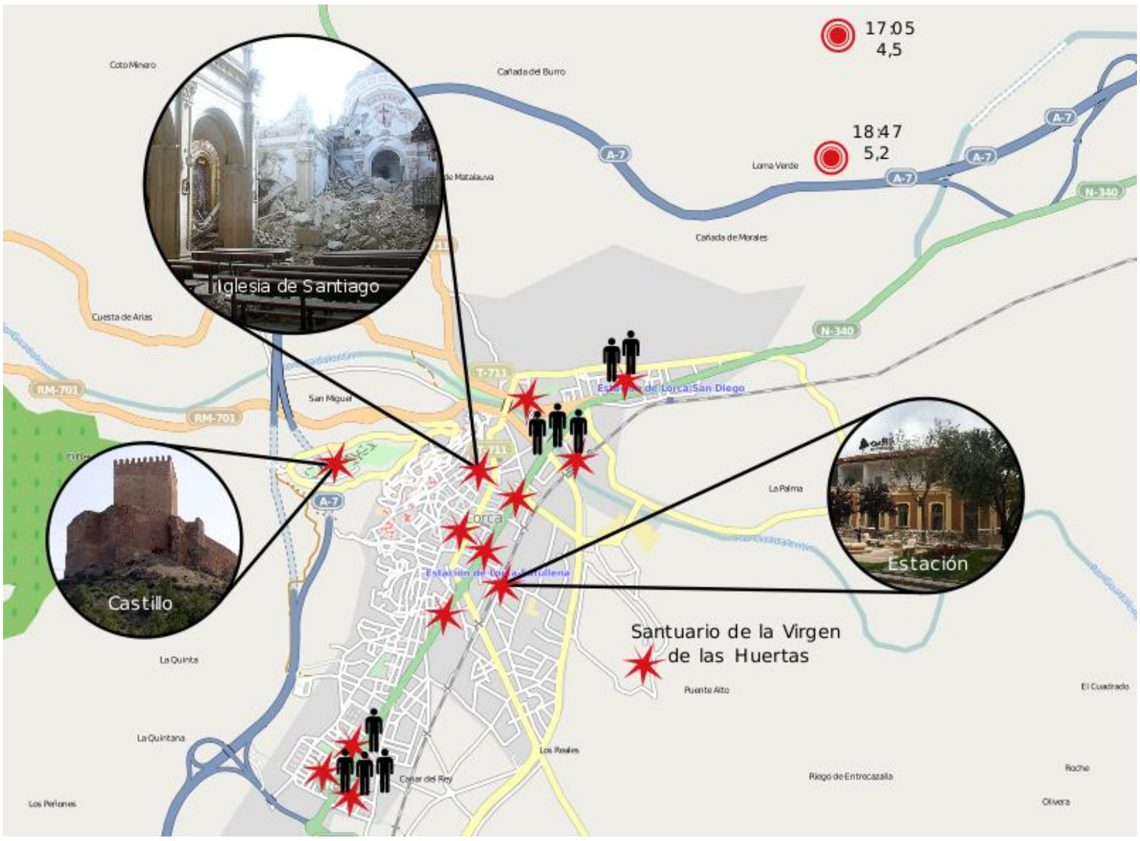

Figure 6. Lorca earthquake site

The situation assessment is communicated in what is called a status report which is a verbal report with a specific structure. The status report is used for updating the command centre of the ongoing work and to allow the operator to update and prepare the arriving units.

Series of Events	DiCoMa System Usage

Series of Events	DiCoMa System Usage
06h00 The Emergency Coordinator decides to close the first actuation in the earthquake crisis. 06h15 Firefighters staff decides that the building collapse should be released for forensic investigation. 11h35 Authorities have released the names of seven of the eight died in the earthquake.	CLOSING TIME DiCoMa receives the information and a shouting down plan is computed in order to retrieve all the important information. TO-DO→ DiCoMa manages the closure of the incident..

Table 10. Earthquake – Incident completion

7.3.3 Aircraft Landing Crash Incident

On 20th August 2008 the Spanair Flight JK 5022, from Madrid-Barajas Airport to Gran Canaria Airport in Gran Canaria, Spain, crashed just after take-off from runway 36L of Barajas Airport at 14:24 CEST(12:24 UTC) on 20 August 2008. The aircraft was a McDonnell Douglas MD-82, registration EC-HFP. It was the first fatal accident for Spanair (part of the SAS Group) in the 20-year history of the company, and the 14th fatal accident and 24th hull loss involving MD-80 series aircraft. The accident was the first fatal accident of any aeroplane featuring a full airline alliance special aircraft livery. It was the world's deadliest aviation accident in 2008 and Spain's deadliest in 25 years. 154 people died; six died en route to the hospital, one died overnight and one died in the hospital three days later. Only 18 people survived. The accident had weakened Spanair's image, which at the time was already negative among the public. The crash augmented financial difficulties at Spanair, which ceased operations on 27th January 2012.

The emergency response work is triggered by an alarm. This alarm sets in motion two major temporal structures; awakening and transportation. It suddenly interrupts ongoing activities and switches attention to the preparations for the emergency response work that in short time will be accomplished. In this case, the alarm is a lot of smoke near the airport, so some people that was working near to the zone, went to the incident location as soon as they could.

As soon as the smoke location is identified by the centralist, the nearest available means (Fire Crew, aka FC) are sent on the scene accompanied by an Incident Commander (aka IC).

Series of Events	DiCoMa System Usage
1. Emergency room (112) receives phone calls from civilians that report a plane crash close to the airport. Centralist of the unified regional emergency room inserts the information in the notification system. 2. Centralist reports location of the airplane (near the airport). It collects all possible information of the accident: the exact location of the event, number of aircraft, aircraft type, is there smoke?, Fire still alive?, The aircraft has been fragmented?,	• Reception of emergency call event. • Call verification. • Obtaining of the affected area coordinates. • Organization of an action plan. • Nomination of the Coordinator of the emergency & Coordinating Board.

Series of Events	DiCoMa System Usage
No victims? , Do we see living people?, emergency services already going there? 3. Official state of emergency declaration PLANE CRASH WITH VICTIMS. Use of the protocol established for this purpose. 4. Nomination of the Coordinator of the emergency situation and establishment of the Coordinating Board. 5. Communication the incident to entities involved: Health, fire, police, civil protection. Bringing all the details collected so far.	

Table 11. Aircraft Landing Crash – Alarm/reception and Processing

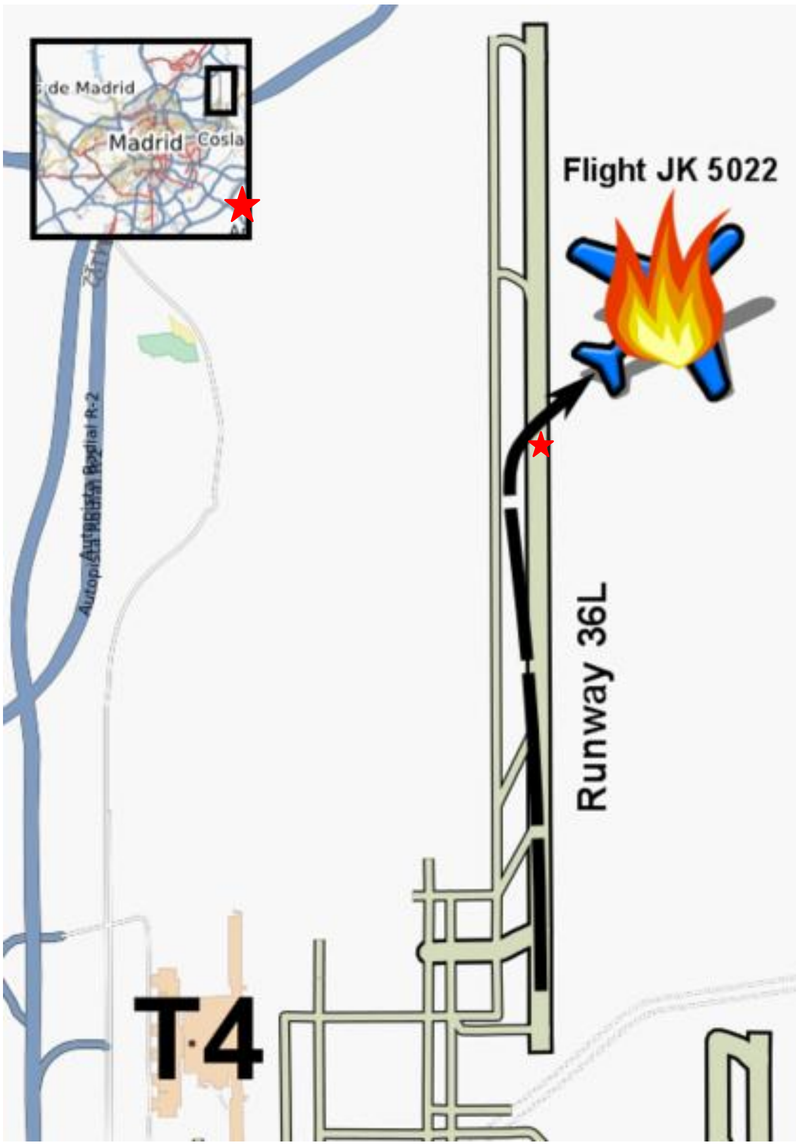

Figure 7. Madrid-Bajaras accident

The rescue vehicles leave their stations and dispatch towards the accident location. The rescue team chief contacts the command centre (emergency room) and confirms that they are on their way. The command centre operator informs the incident commander about what is known about the accident and what additional resources at this point in time have been dispatched.

Series of Events	DiCoMa System Usage
1. First rescue teams drive fast to the incident and start working immediately after arrival. 2. Moving to the scene of the means help (based on the information collected so far): fire trucks, ambulances, police vehicles, civil protection vehicles, cranes, debris removal tools, etc ... 3. Establishment in the scene of the Outpost coordination board (comprising the heads of police, fire, health and civil protection and in constant contact with the Coordinating Board). 4. First evaluation on the ground: aircraft situation, aircraft fragmented?, number of action areas, existence of fire: entity and characteristics, approximated number of victims. 5. Communications to the Coordinating Board for all this data. And by this establishment of the first orders of coordination.	• Moving to the scene Monitoring • Establishment in the scene of the Outpost coordination board • First evaluation on the ground

Table 12. Aircraft Landing Crash – Transportation

When the rescue teams arrive to the accident location, they begin to work. They deploy their equipment, contact with other teams, they make a quick reconnaissance of the area, etc.Visual signs of emergency, such as thick black smoke-clouds, wounded victims or a severely crashed vehicle are triggering factors can make that the teams work nervousness.

Series of Events	DiCoMa System Usage
1. First response units (of all disciplines) start their work in the field. 2. Establishment of hospitals, operations center, communications center on the ground. 3. Cast Communication Equipment, Geolocation equipment, Environment Monitoring Probes, debris removal tools,	• Establishment of hospitals, operations center, communications center on the ground. • Cast Communication Equipment, Geolocation equipment, Environment Monitoring Probes, debris removal tools. • Fire equipment deployment. • Deployment of medical teams.

Series of Events	DiCoMa System Usage
etc. 4. Fire equipment deployment: Priority One: smother fire, eliminate imminent risk. Priority Two: expanding information (location of injuries and fatalities, approximate number, means necessary for relief), priority three: start relief efforts for victims: clearance and helps wounded geolocation rescuers and victims, etc.. 5. Deployment of medical teams: Determination of levels of care to victims: Priority One: Victims critical, Priority Two: victims medium level, Priority Three: victims mild level, Priority Four: victims of extreme gravity, zero priority: deaths. Victim assistance in situ, moving to emergency field hospitals and general hospitals. List of victims and first identifications. 6. Civil Protection: Operations Liaison and support to Fire and Health. 7. Police: cordoning off the area and protecting it from intrusion.	• Civil Protection operations • Police intervention.

Table 13. Aircraft Landing Crash – Intervention

When the incident is nearing completion, all the units back to their stations and inform to the coordinator. Only a small number of teams stay at the location. With this information, the coordinator center can document all that it happens during the crisis. This is important for the remote command center and emergency room. From the moment of the first fire crew's demobilization, capacity to handle the next incident increases. It is therefore important to gradually demobilize fire crews that are considered unnecessary at the location.

.

Series of Events	DiCoMa System Usage
1. CLOSING TIME-Policy staff decide That incident location Should be released for forensic investigation at XX: YY. 2. Retracting staggered units. 3. Removing Field Hospitals. 4. Closure determination area. 5. Start of work and identification of corpses. 6. Development of the site Expert Report: sketches, photographs, video, measurements, etc... 7. Closure of place and protecting it for future research.	• Assessment of damages. • Start of work and identification of corpses • Development of the site Expert Report. • Closure of place and protecting it for future research.

Series of Events	DiCoMa System Usage
8. Elevation Performance Report in detail of all transactions, steps taken, teams involved and results. Preparation of the final list of victims.	

Table 14. Aircraft Landing Crash – Incident completion

7.4 Usage Scenarios and User Stories, Turkey

Earthquake in Ankara

In the case of earthquake, the provincial Emergency Response Team is engaged following the orders from the governor. Coordination of different units is the first thing to do. Following actions are the main activities.

- Communication infrastructure needs to be assured in order the collect the data from the earthquake scene
- Rescue efforts need to be coordinated and engaged. An assessment of the situation is initiated immediately after the earthquake.
- Security needs to be assured by the police and if needed by the army
- Traffic management needs to be performed in order to evacuate the people affected and also easy movement of the rescue teams
- Medical emergency teams are engaged after the first assessment of the situation and dispersed around the disaster zone.
- Fire control need to be engaged in case of fire. If required neighboring fire fighting teams are engaged.
- Food and shelter supply is provided by red crescent in coordination with the emergency response team.

Airplane crash at Esenboga airport

In the case of a plane crash the Disaster and Emergency Control Center take control of the situation. The center immediately engages the pre-determined personnel to the defined roles. All the actions are registered in “event flow charts”. The following units are involved.

- Air traffic control, diverts the flights to alternative regional airports
- Fire control, engages in fire fighting
- Security unit, secures the airport in order to prevent a chaotic situation and evacuates the airport
- Traffic management unit manages the traffic around the airport for easy transportation of possible victims
- Medical emergency team and the rescue team help the injured passengers after the fire is controlled.

8 User stories

8.1 General User Stories

This section contains user stories that do not belong to any specific scenario and therefore are part of core system of DiCoMa.

8.1.1 General User Stories

USER STORY: Management of information of the disaster location from web services

- **ID**: US_ GE_F_DS_MANAG_TRAIN_GIS_ Management of information of the disaster location
- **Title**: Management of information of the disaster location from web services
- **Description**: As an emergency unit member I want to obtain geographical information of the disaster location in order to control the area affected by fire.
- **Priority:**
- **Conversation**: The system is connected to several web services which provide to the system with useful information of affected areas by fire.

  On one hand, the system accesses and manages the geographical data from different sources using OGC standards and open source solutions.

  Using GIS information, the forest agents and firefighter are able to attack easily forest fires. Thanks to the GPS and its integration with Geographic Information Systems, it is possible to create maps of large fire. This allows, among other advantages, to determine surfaces as vegetation type, surface type of ownership and types of vegetation affected area of protected natural areas and affected species and wood volumes.

  Moreover, the system will receive the meteorological data in order to forecast the spread direction of fire and can control it more quickly.

  On the other hand, there are Web Map Services (WMS) that are a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database. The system uses maps with the different vegetation types or fuel kinds that are present in each area. These maps according to its abstraction level can show different types of elements. Thanks to the information of these maps, the spread direction of fire can be estimated by the system.

  On the other hand, it is possible to obtain the geographical coordinates of rescue areas nearest area affected by fire.
- **Acceptance criteria**:
  - ✓ Using of web services that provide precise information.
  - ✓ Using of updated maps.

Table 15. Management of information of the disaster location from web services

8.1.2 Integration and presentation of the collected information

USER STORY: Integration and presentation of the collected information and visual-interactive analysis at the user-interface level

- **ID**: US_ GE_I_DS_MANAG_TRAIN_GIS_ Integration and presentation of the collected information
- **Title**: Presentation and visual-interactive analysis at the user-interface level
- **Description**: As an emergency unit member I want to obtain geographical information of the disaster location in order to control the area affected by fire.
- **Priority:**
- **Conversation**:

  Once the sensor data is received by the system, this should be integrate and treated to manage it. This information should be available on all the processes of the system.

  On one hand, Geographical Information system is responsible for integration of the spatial data of the disaster situation. It uses technologies to integrate and unify spatial data from different sources (including existing spatial data sets, earth-observation data, simulation data and sensor data that are acquired during an actual situation accessing it or directly from the simulation and external geo-data sources in OGC standard formats).

  On the other hand, the system is responsible for presentation and visual-interactive analysis at the user-interface level. For that purpose, it will have a geo-visualization widget for the crisis management application. Moreover, the geo-visualization functionality of the system will be adapted to a range of interaction platforms from control rooms to mobile devices.

  Moreover, the system will be responsible for the definition and implementation of algorithms for the integration of all spatial data at the syntactic level.
- **Acceptance criteria**:
  - ✓ All the integrated data should be coherent.

Table 16. Integration and presentation of the collected information

8.1.3 Recognition and the exploitation of sensors (OGC-SWE standard)

USER STORY: Implementation of the OGC-SWE standard, for the recognition and the exploitation of sensors.

- **ID:** US_GE_F_DS_INTEG_PLATF_DATA_FRAME_Implementation of the OGC-SWE standard.
- **Title:** Implementation of the OGC-SWE standard, for the recognition and the exploitation of sensors.
- **Description**: As administrator I want to implement the OGC-SWE standard, for the recognition and the exploitation of sensors and also he wants to specify data formats. Also he wants to generate of integrated data models, both syntactic and semantic, for crisis management situation, develop the storage elements, define data and domains and build of an ontology that describes the used domain.
- **Priority**:
- **Conversation**:

  To specify data formats for simulation data, sensor data, including sensor networks, sensors, high bandwidth (optical, SAR, LIDAR) and others in real time, relevant data providers with a view to interoperability with geographic data in OGC formats, will be used the OGC-SWE standards, with purpose is to define open standards and interoperable within the GIS and the World Wide Web.

  This enables the interoperability of the systems geoprocessing and facility the exchange of geographic information.

  These are some of the most important specifications of the OGC:

  GML - Geography Markup Language (do not confuse with Generalized Markup Language, GML also)

  KML - Keyhole Markup Language is a markup language based on XML to represent geographic data in three dimensions.

  WFS - Web Feature Service or vector entities that provide information on the entity stored in a vector layer (coverage) having the characteristics set out in the consultation.

  WMS - Web Map Service or maps on the web that produces image maps on demand for viewing by a web browser or a simple client.

  WCS - Web Coverage Service

  CSW - Web Catalogue Service

  Syntactic data model: is defined to denote detailed semantic model. Represents procedures that when they are run, causes the occurrence of any effect semantically prescribed. These models are specified procedurally, ie as a series of orderly steps.

  Semantic data model: It is a conceptual data model that includes the capability to express information that enables parties to the information exchange to interpret meaning (semantics) from the instances, without the need to know the meta-model. Such semantic models are fact oriented (as opposed to object oriented). Facts are typically expressed by binary relations between data elements, whereas higher order relations are expressed as collections of binary relations.
- **Acceptance criteria**
  - ✓ Using of GPS that provides precise information
  - ✓ Using of updated maps
  - ✓ Acquisition of information from sensors in real time

Table 17. Implementation of the OGC-SWE standard

8.1.4 Definition, development and testing of CEP engines

USER STORY: Definition, development and testing of CEP engines.

- **ID:** US_ GE_F_DS_INTEG_PLATF_DATA_FRAME_Definition, development and testing of CEP engines.
- **Title:** Definition, development and testing of CEP engines.

- **Description**: As administrator I want to develop and define of CEP engines for correlating, aggregating and computing real time event data generated on the Crisis Management domain.
- **Priority**:
- **Conversation**:

  To correlating, aggregating and computing real time event data generated on the Crisis Management domain will be used the CEP engines.

  Event processing is a method of tracking and analyzing (processing) streams of information (data) about things that happen (events), and deriving a conclusion from them. Complex event processing, or CEP, is event processing that combines data from multiple sources to infer events or patterns that suggest more complicated circumstances. The goal of complex event processing is to identify meaningful events (such as opportunities or threats) and respond to them as quickly as possible.
- **Acceptance criteria**
  - ✓ Acquisition of information from sensors in real time.

Table 18. Implementation of the OGC-SWE standard

8.1.5 Acquisition of relevant information

USER STORY: Acquisition of relevant information in order to act correctly when a crisis situation is produced.

- **ID:** US_GE_F _DS_INTEG_PLATF_INF_SERV_Acquisition of relevant information.
- **Title:** Acquisition of relevant information in order to act correctly when a crisis situation is produced.
- **Description:** As member of the unit emergency, I want to obtain all relevant information in real time of the sensors and the systems show me a possible form of starring before a crisis situation.
- **Priority:**
- **Conversation:**

  Is will obtain all the necessary information to define rules to the correlation of events and the development of tools to order to act properly in a crisis, to this case is will show the information obtain of the monitoring device in real time of each the sensors and is will analyze the received data for development of measures adopted as:

  - Development of tools: To the development of the tool need known and establish some parameters, as know when a data is out or into of a rank and display data on screen.

  - Capacity of define the rules to the correlation of event: Depending a set of received data, it will define some rules.

  - Data storage: The data can either be stored individually on the hard disk or in a database, to able to generate reports and statistics.
- **Acceptance criteria:**
  - ✓ Acquisition of information from sensors in real time.
  - ✓ Communication between the sensors and computers in real time.
  - ✓ The rank of the parameters should have the relevant measures.

Table 19. Acquisition of relevant information

8.1.6 Evaluation of the most suitable alternative to implement the communication middleware

USER STORY: Evaluation of the most suitable alternative to implement the communication middleware

- **ID**: US_GE_R_DS_INTEG_PLATF_MIDDLE_TEC_Evaluation of the most suitable alternative communication middleware
- **Title**: Evaluation of the most suitable alternative to implement the communication middleware.
- **Description**: As a system user I want the most suitable alternative in order to support the communication middleware.
- **Priority:**
- **Conversation**: Project members will have to identify the most suitable alternative (DDS, CORBA, Java RMI, Jini, ICE, etc.) to support the communication middleware at the different levels of integration required by the Crisis Management domain. This middleware will be a critical asset and its development will be divided into subtasks:
  - Evaluation and customization of a free or commercial middleware solution, taking into consideration the suitability and compatibility to other middlewares with higher levels of abstraction, such as ESBs. This will require the assessment of existing middleware alternatives based on the distributed objects model (CORBA, EJB, ZeroC Ice, etc.) and the DDS standard. The customization of the middleware solution will include the development of intelligent agent-based middleware services for the data management.
  - Evaluation and specification of a scalable service architecture that meets the needs of the Crisis Management domain. In particular, techniques based on replication and migration of services will be developed in order to achieve the fault tolerance of the platform.

  On one hand, the system should have scalable service architecture. For that purpose, the project members will carry out a research in order to evaluate and select the most suitable architecture to build the system.

  The **System Architecture** will be elaborated focusing on the ability to **dynamically discover** equipment through the use of **DPWS** and **IEC 61850 standards**. A system design will be created with the capability of integrating both **NEMO devices** and **non-NEMO devices.** The Architecture will be further extended to accommodate the integration of these devices into a **real-time platform** for data acquisition and processing (**XTPP**).

  In order to perform an efficient access to decentralized and distributed information sources, there is a need for low-latency middleware integrated with ESBs, capable of deploying a wide range of capabilities for managing information in scenarios that have diverse requirements for real-time data processing.

  The complexity of decision making in crisis situations has prompted the development and study of many decision support systems (DSS). DSS have evolved from two main areas of research—theoretical studies of organizational decision making and technical.
- **Acceptance criteria**:
  - ✓ Selection of the most suitable alternative that fulfils the communication middleware needs.

Table 20. Evaluation of the most suitable alternative to implement the communication middleware

8.1.7 Evaluation of the current middleware solutions and development of the necessary interfaces for connecting with the middleware solution for legacy systems and third-party applications

USER STORY: Evaluation of the current middleware solutions and development of the necessary interfaces for connecting with the middleware solution for legacy systems and third-party applications.

- **ID**: US_GE_P_DS_INTEG_PLATF_MIDDLE_TEC_Evaluation of the current middleware solutions and development of the necessary interfaces for connecting with the middleware solution.
- **Title**: Evaluation of the current middleware solutions and development of the necessary interfaces for connecting with the middleware solution for legacy systems and third-party applications.
- **Description**: As a system user I want to develop the necessary interfaces for connecting with the middleware solution for legacy systems and third-party applications.
- **Priority:**
- **Conversation**: Project members should evaluate the current free or commercial middleware solutions and develop the necessary interfaces for connecting with the middleware solution for legacy systems and third-party applications.

  The SPEED real time data platform will work with two different technologies, Data Distribution Service (**DDS**) and Internet Communications Engine (**ICE**), in order to offer as many options as possible to facilitate the integration with every system and agents that want to use the information that flow over the platform. Depending of the technology, the SPEED platform is able to use the best characteristics of each middleware, for example, the use of the Quality of Service, and the fragmentation and structure that allows the publish/subscribe architecture.

  A property of the DDS data-centric publish-subscribe architecture is that component interfaces are decoupled in space (providers and consumers can be anywhere), time (delivery may be immediately after publication or later), flow (delivery Quality of Service can be precisely controlled), platform (providers and consumers can be on different implementation platforms, and written in different languages), and multiplicity (there can be multiple providers and consumers of a topic).

  Ice is an object-oriented middleware platform. Fundamentally, this means that Ice provides tools, APIs, and library support for building object-oriented client-server applications. Ice applications are suitable for use in heterogeneous environments: client and server can be written in different programming languages, can run on different operating systems and machine architectures, and can communicate using a variety of networking technologies. The source code for these applications is portable regardless of the deployment environment.
- **Acceptance criteria**:
  - ✓ Evaluation of the all current middleware solutions.
  - ✓ Development of necessary interfaces for connecting with the middleware solution for legacy systems and third-party applications.

Table 21. Evaluation of the current middleware solutions

8.1.8 Development of data domains and structures

USER STORY: Development of data domains and structures according to the defined data model.

- **ID**: US_ GE_I_DS_INTEG_PLATF_MIDDLE_TEC_ Development of data domains and structures according to the defined data model.

- **Title**: Development of data domains according to the defined data model
- **Description**: As a system user I want to develop data domains and structures according to the defined data model in order to divide the domain in which the messages will be published/subscribed.
- **Priority:**
- **Conversation:**

  DDS is an API specification and an interoperability wire-protocol that defines a data-centric publish-subscribe architecture for connecting anonymous information providers with information consumers. Like SOA, DDS promotes loose coupling between system components. A distributed application is composed of data providers and consumers, each potentially running in a separate address space, possibly on different computers. On one hand, a data provider publishes typed data-flows, identified by names called “topics,” to which consumers can subscribe. An application may simultaneously fulfil the roles of data provider and consumer. The DDS APIs allow data providers and consumers to present type-safe programming interfaces. A typical DDS application architecture can be represented as a software “data-bus”.

  The DDS Structure should have the following features:

  - All DDS communications are confined within a Domain
  - A domain can be organized into Partitions
  - Partitions can be used as subjects organizing the flow of data
  - Publishers/Subscribers can connect to a Partitions’ List which might also contain wildcards.
  - Topics are published and subscribed across one or more Partitions

  The domain can be real or simulated. A real domain is a Space for messages for “Real World”. The real message must come from SCADA systems, Field hardware, etc. The simulated domain is a space for messages for “Simulated World”.

  On one hand, the topics of the simulated and real domain are similar. Some of the available topics in real domains are, among others:

  - ACTIVE_POWER: Publish/subscribe messages for power active measures.
  - REACTIVE_POWER: Publish/subscribe messages for power reactive measures.
  - VOLTAGE: Publish/subscribe messages for voltage measures.
  - INTENSITY: Publish/subscribe messages for intensity measures.
  - OIL_TEMPERATURE: Publish/subscribe messages for oil temperature measures.
  - EVENT: Publish/subscribe message for control event.

  On the other hand, the partition division is used by DDS to indentified sub-topics or filters that can be concatenated and used with “wildcards” as “*” in order to enable a greater granularity in the published/subscribed messages. The available partitions are hourly, quarterhour, instant, real, verified and simulated.

  For the DDS message structure transmitted through the platform in real time, a file of interface definition language (IDL) is used.

  For the ICE message structure, a file of interface definition language is used (ICE).

- **Acceptance criteria**:
  - ✓ The DDS Structure should have the defined features.

Table 22. Development of data domains and structures

8.1.9 Integration with CEP engines and algorithm development

USER STORY: Integration with CEP engines and algorithm development.

- **ID**: US_GE_I_DS_INTEG_PLATF_MIDDLE_TEC_ Integration with CEP engines and algorithm development.
- **Title**: Integration with CEP engines and algorithm development.
- **Description**: As a system user, I want to integrate the platform with CEP engines and develop algorithms in order to provide to the platform with the advantages of these engines (detect events with information that has not any value, avoid frauds, etc).
- **Priority:**
- **Conversation**: The main objective of a CEP engine is the event processing, this is, interprets what is happening in the implemented scenario.

  The possibility of analyze the message received from DDS middleware using CEP engines, provides the capability of detect patrons into messages to inject the information needed by subscribers.

  The CP engines use the EPL language (Even Pattern Language) in order to define patrons and conditions that permit to filter events according to the temporal windows or its arrival sequence.

  The CEP engine will receives DDS messages from data bus without any modification by the associated subscriber. The message information will be analyzed by the CEP engine in order to detect and correlate the events and find the defined patrons.
- **Acceptance criteria**:
  - ✓ Development of the needed algorithms in order to integrate with CEP engines.

Table 23. Development of data domains and structures

8.1.10 Analysis of CEP technologies

USER STORY: Analysis of CEP technologies.

- **ID**: US_ GE _I_DS_INTEG_PLATF_MIDDLE_TEC_ Analysis of CEP technologies.
- **Title**: Analysis of CEP technologies.
- **Description**: As a system user I want to obtain analysis results of the current CEP technologies in order to know the advantages and disadvantages of each one.
- **Priority:**
- **Conversation**: Project members should analyse the current CEP technologies in order to select the most suitable to environment to be developed.

  Complex Event Processing (CEP) is a technology for correlating, aggregating, and computing on real-world event data. Complex Event Processing (CEP) enables the real-time discovery and situational understanding of business opportunities and threats – as indicated by the events flowing through all layers of an enterprise IT. However, complete situational understanding cannot be fully automated. It requires a human element to make sense of the raw data generated by a CEP engine.

  CEP has several operation facets, such as StreamSQL (integrate database functionality by integrating streaming operations with the SQL programming language), Relationships CEP, and Pattern matching (these patterns allow the detection of relationships between events that are based on temporal ordering). There are several commercial systems: TIBCO BusinessEvents™, RTView of SL, Sy Base, Forrester Wave, etc. The most popular remains RTView for its capacity on graphical representations. Open source tools must be considered, like DROOLS Fusion (http://jboss.org/drools) from JBOSS Community. It is concerned with the Business Logic integration Platform which provides a unified and integrated platform for

Rules, Workflow and Event Processing.

IBM Operational Decision Management software is another alternative CEP implementation that provides a CEP engine with a well-designed rule authoring framework for IT users and a web based rule authoring framework for domain experts (http://pic.dhe.ibm.com/infocenter/dmanager/v8r0/index.jsp).

CEP rules engine are being experimented in several national and European research projects in the areas of critical infrastructure protection and crisis management (e.g.: Projects ITEA SERKET, FP6 IST E-SENSE, French Cluster System@tic SIC). DiCoMa will benefit from the experience of some partners in the SERKET project focused on security purposes.

Moreover, the traceability will build with CEP rules in including the CEP rules into the DiCoMa ontology.

- **Acceptance criteria**:
  - ✓ Find the CEP technology most suitable.

Table 24. Analysis of CEP technologies

8.1.11 Analysis of operating systems

USER STORY: Analysis of operating systems to select the most suitable according to real time needs.

- **ID**: US_ GE _E_DS_INTEG_PLATF_MIDDLE_TEC_Analysis of operating systems.
- **Title**: Analysis of operating systems to select the most suitable according to the real time needs.
- **Description**: As a system user I want to analyse current operating systems in order to select the most suitable according to real time needs.
- **Priority:**
- **Conversation**: The system will have to be based on an operating system that supports the execution of data exchange processes in real time. Moreover, it should be reliable and have a high performance to run multitude of processes.

  An analysis of art state at operating systems and network in real time will be performed by project members. As analysis result, an architecture model will be designed focused on avoiding the communication knots.
- **Acceptance criteria**:
  - ✓ Analysis of all the operating systems that support a lot of process in real time.
  - ✓ Obtain an operating system that avoids the communication knots.

Table 25. Analysis of operating systems

8.1.12 Definition of service quality and integration with storage repositories

USER STORY: Definition of service quality and integration with storage repositories

- **ID**: US_GE_F_DS_INTEG_PLATF_MIDDLE_TEC_ Definition of service quality and integration with storage repositories.
- **Title**: Definition of service quality and integration with storage repositories.
- **Description**: As a system user I want to define the service quality and integrate the platform with storage repositories.

- **Priority:**
- **Conversation**:

  As well as the security, the service quality is a point very important that requires be investigated in order to provide solutions that adapt to the different applications and communication infrastructures.

  Because of the publisher and subscriber identity are unknown between themselves, the DDS middleware is responsible for resolve if the service quality policies offered by the publisher are compatible with the required by the subscribers.

  There are different service qualities, some of these are:

  - QoS:Durability
  - QoS:Presentation
  - QoS:Deadline
  - QoS:Latency_Budget
  - QoS:Ownership
  - QoS:Liveliness
  - QoS:Reliability

  On one hand, there are energy data messages that will use the same format of the input data. Only, the data of "measurementValueQuality" field will be modified according to the classification of quality message values.

  On the other hand, there are control messages that will use the same format of the input data. It can only generate messages with eventType = 7 (messages of reenlistment start/end).

- **Acceptance criteria**:
  - ✓ Definition of the most suitable service quality for each message.

Table 26. Definition of service quality and integration with storage repositories

8.2 User Stories related to scenario: Forest Fire

The following user stories are closely related (but not restricted to) disasters dealing with Forest Fire.

8.2.1 Management information of the location of the disaster from sensors

USER STORY: Management information of the location of the disaster from sensors

- **ID**: US_FF_F_DS_MANAG_TRAIN_GIS_ Management information of the location of the disaster from sensors.
- **Title**: Management information of the location of the disaster from sensors.
- **Description**: As an Emergency unit member I want to manage all the information collected from the location of the disaster in order to be able to control the fire quickly and efficiently.
- **Priority:**
- **Conversation**: The system receives useful information of the affected area that arrives from sensors installed at affected areas. This information is sent by the Data and Services Integration platform and the

system analyzes it in order to study the best way to control the fire. Moreover, the system is able to estimate the magnitude of affected area by fire using information from sensors of the affected area. For example, it is possible to obtain the temperature received from several sensors and so know the sensors that are included in the affected area. Some data that will be received from sensors are: o Temperature. o Dampness. o Sensor geographical location. o Smoke level. o Wind direction and velocity. ▪ **Acceptance criteria**: ✓ Acquisition of information from sensors in real time.

Table 27. Management information of the location of the disaster from sensors

USER STORY: Management information of the location of members of the emergency unit

▪ **ID**: US_FF_F_DS_MANAG_TRAIN_GIS_ Management information of the location of members of the emergency unit ▪ **Title**: Management information of the location of members of the emergency unit • **Description**: Emergency unit members location and warning of life risk • **Priority:** • **Conversation**: The system receives information about safety and location of the members of the emergency unit. This information comes from a portable device that each member of the unit will carry and the system will use the information received to warn about life risk of any member of the unit and its position and will allow to make decisions about the procedure to follow. Additionally the developed device will offer information of location and safety among the members of the unit. Some data that will be received from sensors are: o Temperature. o Sensor geographical location. o Free fall alarm o Acceleration of gravity. ▪ **Acceptance criteria**: ✓ Acquisition of information from sensors every defined time period.

Table 28. Management information of the location of members of the emergency unit

8.2.2 Management of Head End of data acquisition

USER STORY: Management of Head End of data acquisition.

- **ID:** US_FF_F_DS_INTEG_PLATF_DATA_FRAME_ Management of Head End of data acquisition.
- **Title:** Management of Head End of data acquisition.
- **Description**: As administrator I want to manage of Head End of data acquisition and convert the input data to the defined format.
- **Priority**:
- **Conversation**:

  The platform receives useful information that arrives from sensors installed at forests. This information is integrated by the Data and Services Integration platform. This platform communicates with Head End to obtain the data from sensors.

  Each Head End monitors several sensors.

  All this information is analyzed it in order to study the best way to control the forest fire.

  The information that is sent will be: moisture, temperature, wind direction ...From this information will know the spread of fire.
- **Acceptance criteria**
  - ✓ Acquisition of information from sensors in real time
  - ✓ Using of sensors that provides precise information

Table 29. Management of Head End of data acquisition

8.2.3 Management of information storage system based on Distributed caches or NoSQL databases

USER STORY: Management of information storage system based on Distributed caches or NoSQL databases

- **ID:** US_FF_F_DS_INTEG_PLATF_DATA_FRAME_Management of the Distributed caches or NoSQL databases.
- **Title:** Management of the information storage system based on Distributed caches or NoSQL databases.
- **Description**: As administrator I want to store all information using distributed caches and NoSQL databases.
- **Priority**:
- **Conversation**:

  To store all this information will be used to span multiple caches distributed servers and allow therefore increase in size and transactional capabilities. Also be used NoSQL databases, which are more flexible and can store large amounts of information very quickly. The information will be stored moisture, wind, temperature, position coordinates, events …etc.
- **Acceptance criteria**
  - ✓ Acquisition of information from sensors in real time

Table 30. Management of Head End of data acquisition

8.2.4 Processing of stored data (NoSQL repositories)

USER STORY: Processing of stored data (NoSQL repositories).

- **ID:** US_FF_F_DS_INTEG_PLATF_DATA_FRAME_Processing of stored data (no SQL repositories).
- **Title:** Processing of stored data (no SQL repositories).
- **Description**: As administrator I want to process all information using NoSQL databases.
- **Priority**:
- **Conversation**:

  All information that is received from sensors is stored in NoSQL database then this information will be processed depending on the objectives to be achieved.

  On the other hand, with this processing be wanted to realize the necessary operations or algorithms to obtain the useful information to alert of forest fires.
- **Acceptance criteria**
  - ✓ Acquisition of information from sensors in real time

Table 31. Processing of stored data

8.2.5 Detection of significant state changes

USER STORY: Detection of significant state changes

- **ID:** US_FF_ F_DS_INTEG_PLATF_INF_SERV_Detection of significant state changes.
- **Title:** Detection of significant state changes
- **Description:** As member of the unit emergency, I want to obtain all the information from sensor in real time in order to know if a significant state change has occurred.
- **Priority:**
- **Conversation:**

  The system shows the information concerning the temperature, the speed and wind direction, moisture, control of presence smoke, atmospheric pressure, land moisture and CO2 that are important factors to determine and identify a significant change of state in the environment.

  - Control temperature: Setting up parameters of temperatures minimum and maximum and if the sensor detect that temperature is out of rank, a signal of alert is sent to the platform.
  - Moisture control: if the system detects that the moisture of a certain area is decreasing exceeding the limit of the rank, an alert signal is sent to the platform.
  - Land moisture: The system receives information of the actual water contained in the substrate and will establish ranks of acceptance.
  - Control of smoke presence: The system should sends a signal of alert and display all the information, if detect high-density of smoke.
  - Control C02: The system receives data and sends a signal of alert if the established minimum value range is being exceeded.
  - The speed and wind direction: The system will receive the data in real time and send a signal of alert and will display the wind direction, if the data received of the wind speed are exceeding to the prescribed as minimum value range.
  - Atmospheric pressure: The system will receive data and send a signal of alert if the data received

containing the atmospheric pressure is exceeding to the established minimum value range.

- **Acceptance criteria:**
  - ✓ The sensors should indicate real data in real time.
  - ✓ Remote communication equipment: Communication between the sensors and computers in real time.

Table 32. Detection of significant state changes

8.2.6 Design and implementation of different action plan to handle crisis situations

USER STORY: Design and implementation of different action plan to handle crisis situations

- **ID:** US_FF_ F_DS_INTEG_PLATF_INF_SERV_Design and implementation of different action plan to handle crisis situations
- **Title:** Design and implementation of different action plan to handle crisis situations

  Description: As member of the unit emergency, I want to design and implement different action plan that will be carried out when a crisis situation occurs.
- **Priority:**
- **Conversation:**

  The system should be able to handle crisis situation. For that, several action plans will be implemented in order to be executed when these are needed. Some actions that will be carried out are:

  - To give priority to the data received from the sensors localized in the affected area.
  - Obtain all the information of the affected area in real time.
  - Sending of an order to evacuate of the nearest areas.

  The system should have a schedule to each crisis situation in which all the actions that must be carried out will be defined. Several of these actions will be executed automatically by the platform.
- **Acceptance criteria:**
  - ✓ Communication between the sensors and computers in real time.
  - ✓ The sensors should indicate data in real time.
  - ✓ The rank of the parameters should have the relevant measures.

Table 33. Design and implementation of different action plan to handle crisis situations

8.2.7 Generation and implementation of CEP rules

USER STORY: Generation and implementation of CEP rules

- **ID:** US_FF_ F_DS_INTEG_PLATF_INF_SERV_Generation and implementation of CEP rules
- **Title:** Generation and implementation of CEP rules
- **Description:** As administrator, I want to design and deploy CEP rules in order to be able to act in an automatic way when an event occurs.
- **Priority:**
- **Conversation:**

The system will be integrated with CEP engines which will use several defined CEP rules. These CEP rules will be able to reply facing certain events. Some defined CEP rules could be:

- Calculation of the affected area magnitude when the system has received three positions from sensors localized in the affected area.
- The system will only send an alarm when it has received several alerts from sensors localized in the same area.
- Sending an alarm when the system receives two temperature data with a high difference of the same sensor.

- **Acceptance criteria:**
  - ✓ All need CEP rules must be defined and deployed.
  - ✓ All the behavior of the system that must be automatic will be implemented using CEP rules.

Table 34. Generation and implementation of CEP rules

8.2.8 Workflow editor

USER STORY: Workflow editor including facilities to edit:

- ✓ Tasks
- ✓ Order links (arcs/arrows) between tasks
- ✓ Associate variables to every task

- **ID**: US_FF_F_DS_MANAG_TRAIN_EVENT_MANAGE_Graphical Workflow Editor
- **Title**: Workflow editor
- **Description**: As a crisis manager, a tool to edit crisis management workflows is required. Tasks ordering and sequencing within the workflow containing information related to critical or significant variables (attribute-value) in every task will be included in the definition of tasks.
- **Priority:**
- **Conversation**:

  The system will work as a stand alone application, with a graphical editing tool. Task template, in the workflow, will be generic enough to facilitate their ordination inside the workflow. Editor will generate a XML output file containing the whole workflow information. The use of XML is proposed to facilitate interoperability and integration with other tools.
- **Acceptance criteria**:
  - ✓ Easy and graphic UI.
  - ✓ Existence of a user manual.
  - ✓ Output: Workflow representation as XML file

Table 35. Workflow editor

8.2.9 Workflow monitoring

USER STORY: Workflow monitor allows focusing on specific tasks of the workflow based on the identification of associate variables to every task

- **ID**: US_FF_F_DS_MANAG_TRAIN_EVENT_MANAGE_Workflow Monitoring System
- **Title**: Workflow monitor
- **Description**: As a crisis manager, a workflow monitoring tool is necessary objectively to focus attention on specific tasks and implicated variables.
- **Priority:**
- **Conversation**:

  The WF monitoring tool will focus attention of decision makers on current tasks and will integrate decision support capabilities based on the retrieval and reuse of similar previous cases. The system will use as input the XML description of workflow and a case base containing previous experiences. The monitoring tool can include decision support facilities based on case based reasoning (CBR) when available information related to past similar cases was available.
- **Acceptance criteria**:
  - ✓ Existence of User interface
  - ✓ User manual.
  - ✓ Interactivity to search information related to previous cases following the same workflow.

Table 36. Workflow monitoring

8.3 User Stories related to scenario: Aircraft Landing Crash

The following use case is closely related (but not restricted to) disasters dealing with Aircraft Landing Crash.

8.3.1 Management information of the location of the disaster from sensors

USER STORY: Development of a list of victims and their severity.

- **ID**:
- **Title**: **:** Development of a list of victims and their severity.
- **Description**: After a first survey of the site may be determined a list of the approximate number of victims, the location and severity of the same.
- **Priority:**
- **Conversation**:
- Early intervention teams which run the place, shared extension thereof and will be responsible for each area to inspect the field.
- Each team develope a list of the number of victims who have located in its area, based on a level table determine their health status and priority of rescue, in addition they geolocalize each victim:
    - Priority One: Victims critical.
    - Priority Two: victims medium level.
    - Priority Three: victims mild level.
    - Priority Four: victims of extreme gravity.
    - Zero priority: deaths.
- **Acceptance criteria**:

Table 37. Aircraft Landing Crash

9 Use cases

This section contains all the use cases that will form the DiCoMa system. The use cases are formed based on research work and user interviews and they act as a basis for further requirement specification and user interface design.

9.1 System users and their roles

Based on the user and scenario modeling in chapters 5 to 7, the DiCoMa system will use following system user roles to manage authorization for functionalities defined in this document as use cases.

- **DiCoMa Officer:** Officers in DiCoMa user role domain are persons responsible for managing the disaster control process. Officers have access rights to view all information related to the disaster and its control actions.
- **DiCoMa Clerk:** The Clerk role is aimed for personnel that is not charge of the disaster control process nor hasn't got rights to view all sensitive information (such as locations of police units).
- **DiCoMa Administrator:** DiCoMa Administrators are experts in DiCoMa system domain. They are responsible for system and integration configuration, user management and predefined procedures and scripts.

9.2 User interfaces

The actual DiCoMa user interfaces will be designed later phases of the project in Work Package 2. Therefore, this document describes a set of naive concept level user interfaces that are only meant to help readers to construct a mental model of the DiCoMa system and make it easier to follow the use cases. The actual user interfaces will be something completely else than described below:

- **DiCoMa GIS UI (DGUI):** DGUI is typical geographical information system that displays information from multiple sources on a map based UI. Main function for this UI is to combine and display location based information for decision makers during disaster scenarios.

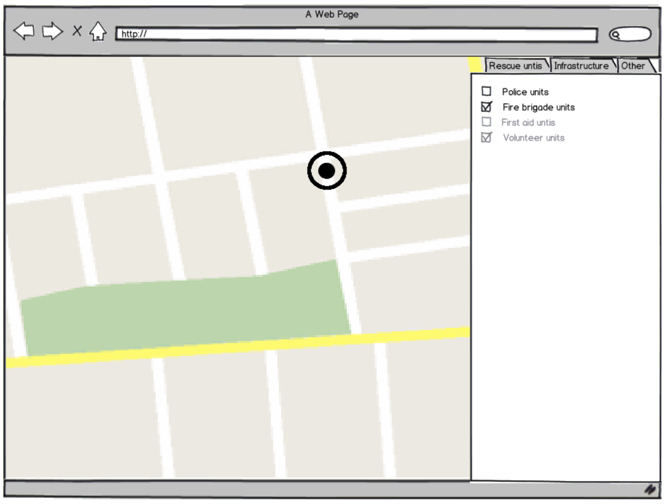

Figure 8. Sketch of DGUI.

- **DiCoMa Decision Support System (DDSS):** DDSS is a system that combines information from current disaster, information gathered from other disasters via data mining and predefined rescue procedures. DDSS allows the decision makers quickly and accurately assess the present situation (e.g. event type and location of resources available) – allowing him to make an intelligent decision.

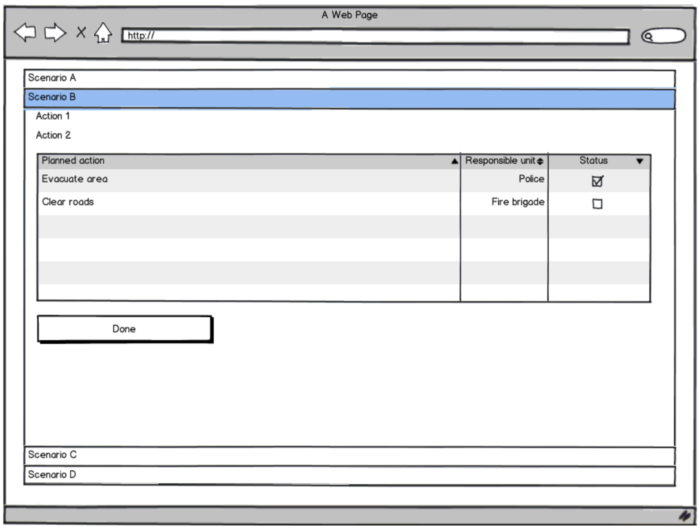

Figure 9. Sketch of DDSS.

- **DiCoMa Administration UI (DAUI):** DAUI is directed to DiCoMa system admistrators especially used in non-disaster situations. Main functionalities of DAUI are system configurations as well as defining scripts and procedures that are used during disaster situations.

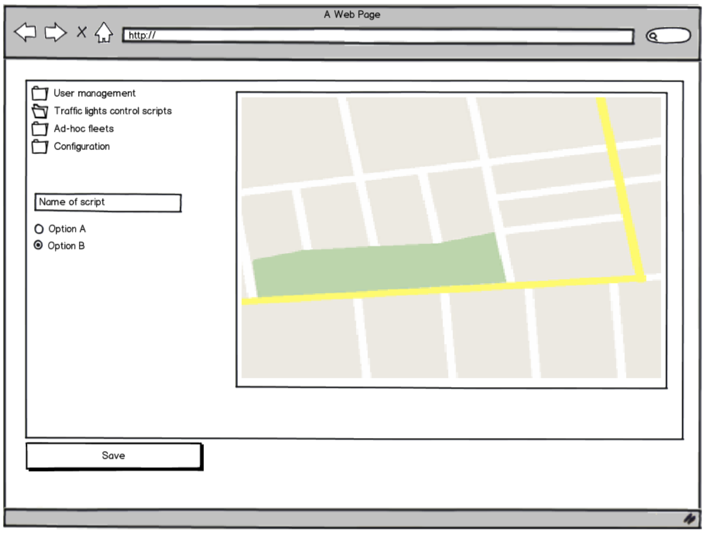

Figure 10. Sketch of DAUI.

9.3 Use case diagrams

Figure 11. Common use cases for all users using DGUI.

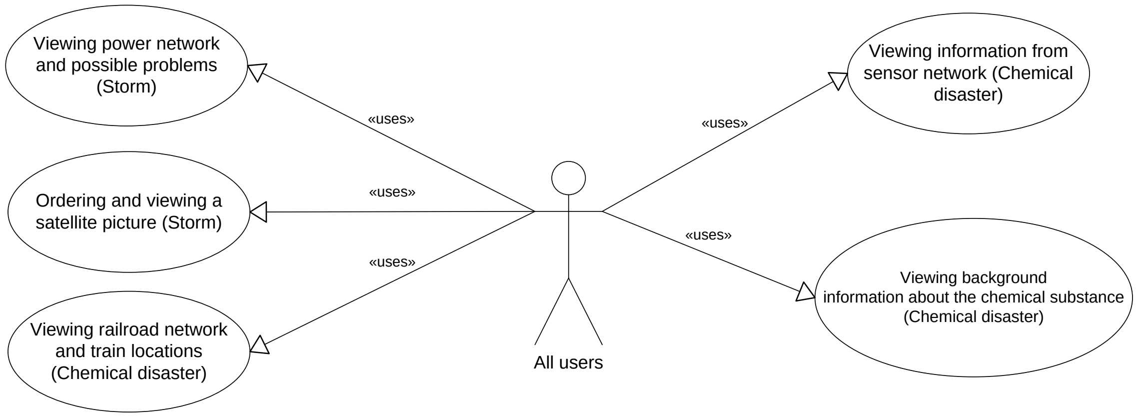

Figure 12. Finnish scenario specific use cases.

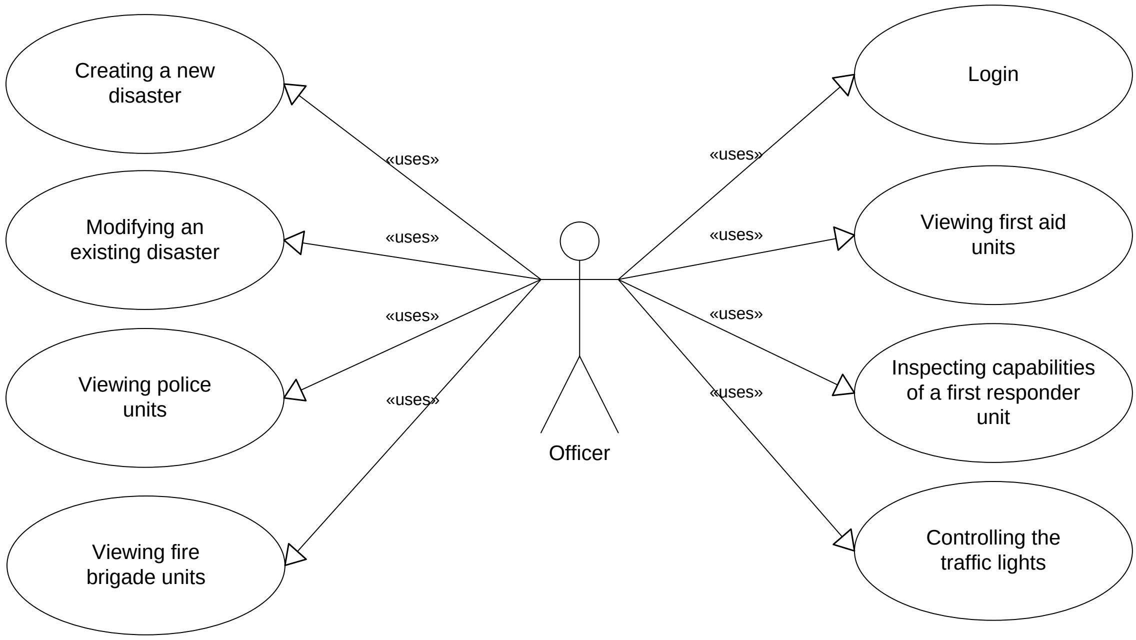

Figure 13. Use cases for Officers using DGUI.

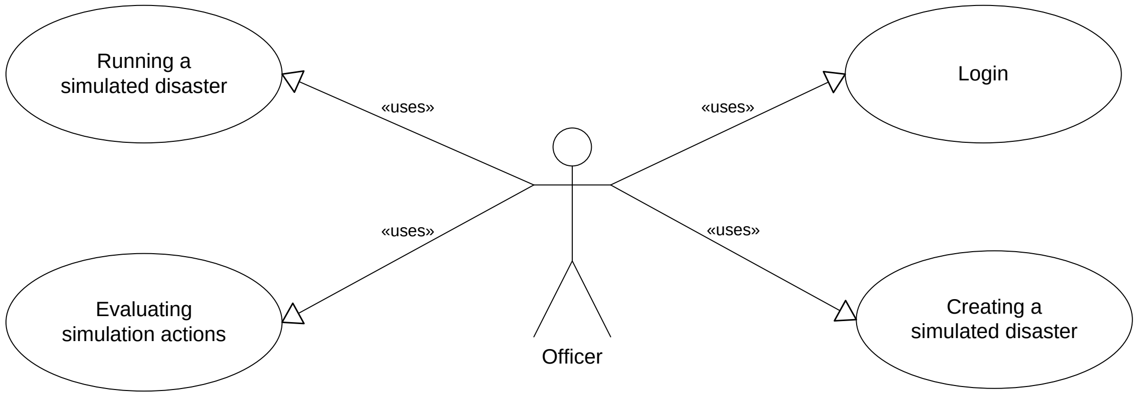

Figure 14. Use cases for Officers using DGUI (Simulation and training).

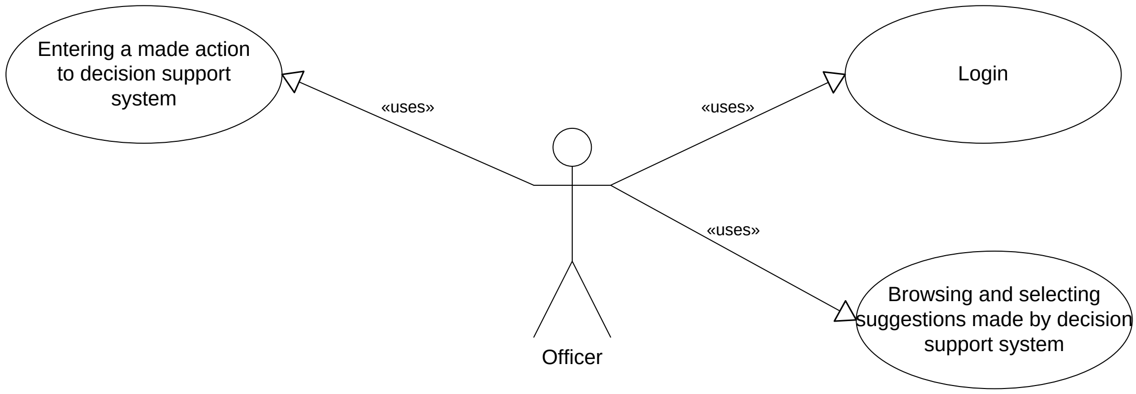

Figure 15. Use cases for Officers using DDSS.

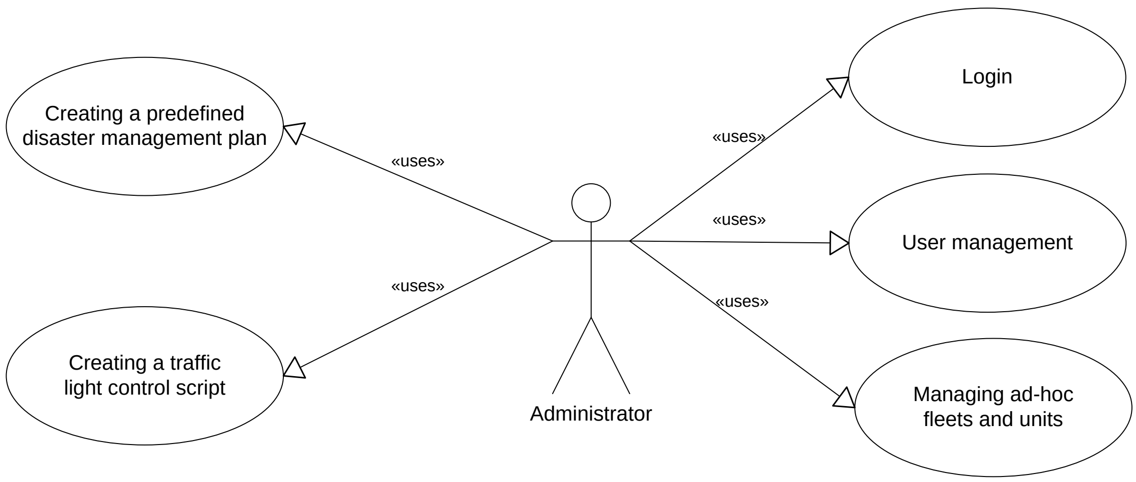

Figure 15. Use cases for Administrators using DAUI.

9.4 General use cases

This section contains use cases that do not belong to any specific scenario and therefore are part of core system of DiCoMa.

9.4.1 Login to DiCoMa

Name	**Login to DiCoMa**
Description	User is authenticated and authorized for using predefined set of DiCoMa tools.
Actors	All roles
User interface(s)	All user interfaces
Initial situation	User opens any of the DiCoMa tools.
Main Flow	1. User navigates to DiCoMa system
	2. If DiCoMa system does not recognize user (existing session), user is prompted to provide user credentials.
	3. User authenticates himself by ways defined later in WP2
	4. If user is authenticated successfully, user is redirected to main page of DiCoMa system.
Exceptions	User is not recognized or user has no access rights to use DiCoMa.
End situation from the user's point of view	User can now use all the DiCoMa tools that user is authorized to use.
Related use cases	This use case is precondition to all other use cases.

Table 38. Login to DiCoMa

9.4.2 Viewing current disaster situation

Name	**Viewing current disaster situation**
Description	User views current disaster situation (ongoing disasters). The DiCoMa system displays ongoing disasters and all related information such as affected area, planned and already performed actions on map.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Some disaster has occurred and user needs to start following the situation.

Main Flow	1. User opens the DiCoMa GIS UI and selects to view current disaster situation
	2. DiCoMa system displays all ongoing disasters based on user's area selection.
	3. User can view detailed description and related information by selecting the desired disaster.
Exceptions	
End situation from the user's point of view	User has up-to-date information about current disaster situation.
Related use cases	Login to DiCoMa

Table 39. Viewing current disaster situation

9.4.3 Creating a new disaster

Name	**Creating a new disaster**
Description	User receives information about a newly occurred disaster and based on that information decides to add the disaster information to DiCoMa system.
Actors	Officer
User interface(s)	DiCoMa GIS UI
Initial situation	A disaster has occurred but it has not been automatically added from other systems that are integrated to DiCoMa.
Main Flow	1. User opens the DiCoMa GIS UI and selects to add new disaster.
	2. User fills all the information that is currently available.
	3. User saves information to DiCoMa system and information about the disaster comes available to all DiCoMa users.
Exceptions	
End situation from the user's point of view	Information about the disaster is added to DiCoMa.
Related use cases	Login to DiCoMa

Table 40. Creating new disaster

9.4.4 Modifying an existing disaster

Name	**Modifying an existing disaster**
Description	User has received new or corrected information about an existing disaster and decides to update the disaster in DiCoMa system.
Actors	Officer
User interface(s)	DiCoMa GIS UI
Initial situation	Something has changed in disaster information and that information needs to be added to DiCoMa system so that the information can be used for future decisions.
Main Flow	1. User opens the DiCoMa GIS UI and selects the disaster to be updated.
	2. User fills new information.
	3. User saves information to DiCoMa system and information about the disaster comes available to all DiCoMa users.
Exceptions	
End situation from the user's point of view	Information about the disaster is updated to DiCoMa.
Related use cases	Login to DiCoMa Creating a new disaster

Table 41. Modifying an existing disaster

9.4.5 Viewing police units

Name	**Viewing police units**
Description	User views locations and information about police units (mobile units and headquarters). The DiCoMa system displays all tracked police units and related information such capabilities and assigned tasks on map.
Actors	Officer
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know where the police units are located at the moment.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view police units.
	2. All police units are displayed on the map.

	3. User can view detailed information about a unit by selecting it from the map. (See Inspecting capabilities of a first responder unit)
Exceptions	
End situation from the user's point of view	User has clear understanding about locations of police units that are tracked to DiCoMa.
Related use cases	Login to DiCoMa Inspecting capabilities of a first responder unit

Table 42. Viewing police units

9.4.6 Viewing fire brigade units

Name	**Viewing fire brigade units**
Description	User views locations and information about fire brigade units (mobile units and headquarters). The DiCoMa system displays all tracked fire brigade units and related information such capabilities and assigned tasks on map.
Actors	Officer
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know where the fire brigade units are located at the moment.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view fire brigade units.
	2. All fire brigade units are displayed on the map.
	3. User can view detailed information about a unit by selecting it from the map. (See Inspecting capabilities of a first responder unit)
Exceptions	
End situation from the user's point of view	User has clear understanding about locations of fire brigade units that are tracked to DiCoMa.
Related use cases	Login to DiCoMa Inspecting capabilities of a first responder unit

Table 43. Viewing firebrigade units

9.4.7 Viewing first aid units

Name	**Viewing first aid units**
Description	User views locations and information about first aid units (mobile units and headquarters). The DiCoMa system displays all tracked first aid units and related information such capabilities and assigned tasks on map.
Actors	Officer
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know where the first aid units are located at the moment.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view first aid units.
	2. All first aid units are displayed on the map.
	3. User can view detailed information about a unit by selecting it from the map. (See Inspecting capabilities of a first responder unit)
Exceptions	
End situation from the user's point of view	User has clear understanding about locations of first aid units that are tracked to DiCoMa.
Related use cases	Login to DiCoMa Inspecting capabilities of a first responder unit

Table 44. Viewing first aid units

9.4.8 Inspecting capabilities of a first responder unit

Name	**Inspecting capabilities of a first responder unit**
Description	Before making a decision about which unit should be assigned to a specific task, user can inspect what capabilities a certain first responder unit (police, fire brigade or first aid) has. Information contains at least unit capabilities and equipment information as well as information about work shift and overall condition.
Actors	Officer
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know what capabilities a certain first responder unit has.
Main Flow	1. User selects a unit from the map. (See use cases 9.4.5, 9.4.6 and 9.4.7)

	2. A list of unit's capabilities and other related information is displayed to user.
Exceptions	
End situation from the user's point of view	User has clear picture about the capabilities of a certain unit and in what condition it is in.
Related use cases	Login to DiCoMa Viewing police units Viewing fire brigade units Viewing first aid units

Table 45. Inspecting capabilities of a first responder unit

9.4.9 Viewing problems in transport network

Name	**Viewing problems in transport network**
Description	Situations in transport network can affect heavily on decision making in disaster scenarios. Therefore, user can view problems and abnormalities in transport networks that may cause or already have caused congestion before making a final decision.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know if there are any problems in transport network.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view problems in transport network.
	2. All transport network problems such as road or bridge constructions are displayed on the map.
Exceptions	
End situation from the user's point of view	User has clear picture about the condition of the transport network.
Related use cases	Login to DiCoMa

Table 46. Viewing problems in transport network

9.4.10 Viewing ad-hoc fleets and units

Name	**Viewing ad-hoc fleets and units**
Description	User views locations of ad-hoc fleets and units. The DiCoMa system displays all tracked ad-hoc fleets and units on map. Ad-hoc units are created in use case 9.11.2 and they usually represent disaster type specific units such as rescue dog patrols in earthquake scenarios.
Actors	Role that was set during creation of ad-hoc fleet.
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know where the ad-hoc fleets are located at the moment.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view ad-hoc fleet units.
	2. Ad-hoc fleets and units that user has rights to view are displayed on the map.
Exceptions	
End situation from the user's point of view	User has clear understanding about locations of ad-hoc fleets and units that are tracked to DiCoMa.
Related use cases	Login to DiCoMa Managing ad-hoc fleets and units

Table 47. Viewing ad-hoc fleets and units

9.4.11 Viewing traffic camera information

Name	**Viewing traffic camera information**
Description	User views the images or videos provided by traffic cameras in road network.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	A decision that user needs to make, requires actual picture information from some location.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view traffic cameras.
	2. Traffic cameras are displayed on the map.
	3. User can select to view one or more traffic camera images by selecting them from the map.

Exceptions	
End situation from the user's point of view	User has a better understanding about the situation at specific point in road network.
Related use cases	Login to DiCoMa

Table 48. Viewing traffic camera information

9.4.12 Viewing weather information and forecasts

Name	**Viewing weather information and forecasts**
Description	User views current weather conditions and forecasts on disaster area.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Weather conditions can ease or make situation even more difficult than it was to begin with. Therefore, it is essential for all users to understand the reigning and upcoming weather conditions.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view weather information.
	2. Current weather conditions (temperatures, wind and rain) are displayed on the map.
	3. User can also select to view weather forecast on specific time in future or view simulation how weather conditions will change.
Exceptions	
End situation from the user's point of view	User knows what weather conditions prevail in the disaster area now and in future.
Related use cases	Login to DiCoMa

Table 49. Viewing weather information and forecasts

9.4.13 Viewing problems in communication networks

Name	**Viewing problems in communication networks**
Description	User views problems in communication networks (E.g. 2G/3G/4G and phone line).
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User suspects or knows that there are problem in communication network and some areas cannot be contacted.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view problems in communication networks.
	2. Communication network problems and the affected areas are displayed on the map.
Exceptions	
End situation from the user's point of view	User knows what areas cannot access communication networks and perform e.g. emergency calls.
Related use cases	Login to DiCoMa

Table 50. Viewing problems in communication networks

9.4.14 Creating a dynamic GIS overlay

Name	**Creating a dynamic GIS overlay**
Description	User can combine information from multiple sources as one map view. (See related use cases).
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs the form an overall picture containing information from multiple sources.
Main Flow	1. User opens the DiCoMa GIS UI and selects the information sources that should be shown as an overlay view.
	2. Items from the selected sources are displayed on the map.
	3. User can modify the overlay view by selecting and deselecting other information sources.

Exceptions	
End situation from the user's point of view	User can form an overall picture of the current disaster scenario.
Related use cases	Login to DiCoMa Viewing current disaster situation Viewing police units Viewing fire brigade units Viewing first aid units Viewing problems in transport network Viewing ad-hoc fleets and units Viewing traffic camera information Viewing weather information and forecastsTable *49. Viewing weather information and forecasts* Viewing problems in communication networks

Table 51. Creating a dynamic GIS overlay

9.4.15 Sharing a GIS view with other users

Name	**Sharing a GIS view with other users**
Description	User can share a view in GIS UI with other DiCoMa users. Shared view is a copy of all the UI parameters (area selection, selected information and possible overlays). This function makes it possible to quickly share information to other users handling the disaster.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User has found out information that needs to be shared with other users.
Main Flow	1. User opens the DiCoMa GIS UI and selects different information sources and makes other UI selections. Use cases 9.4.2 to 9.4.14.
	2. User notices a something in the UI that should shared with other users handling the disaster.

	3. Instead of gathering behind one monitor, user can send the UI view to other users via DiCoMa system by selecting the "Share view" functionality and specifying recipients.
	4. Users selected as recipients will receive a notification that shared view is available. If they select to view the shared view, DiCoMa system will store their current work and they can return to it once shared view is closed.
Exceptions	
End situation from the user's point of view	User can quickly share situation information with other users.
Related use cases	Login to DiCoMa Viewing current disaster situation Viewing police units Viewing fire brigade units Viewing first aid units Viewing problems in transport network Viewing ad-hoc fleets and units Viewing traffic camera information Viewing weather information and forecastsTable *49. Viewing weather information and forecasts* Viewing problems in communication networks Creating a dynamic GIS overlay

Table 52. Sharing a GIS view with other users

9.4.16 Controlling the traffic lights

Name	**Controlling the traffic lights**
Description	User can control a single traffic light group (one crossroads) or run a script that contains control actions for multiple traffic light groups. This is effective mean when evacuating urban areas.
Actors	Officer
User interface(s)	DiCoMa GIS UI

Initial situation	A decision has been made to evacuate some area. This evacuation can be carried out with higher velocity if traffic lights form a green wave to exit routes.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view traffic light groups that can be controlled by DiCoMa system.
	2. User can select a single traffic light group to control or select a script to be run.
	3. If user selects a control script to be run, he can check the affects that script has before running it.
	4. Traffic light groups that are controlled via DiCoMa are highlighted in GIS UI until user cancels the control or stops the script from running.
Exceptions	
End situation from the user's point of view	User can increase the velocity of evacuation by setting a so called green wave to traffic lights for exit routes.
Related use cases	Login to DiCoMa Creating a traffic light control script

Table 53. Controlling the traffic lights

9.4.17 Creating a live video feed from disaster area

Name	**Creating a live video feed from disaster area**
Description	User can share a video feed from the disaster area to other DiCoMa system users. This is achieved by DiCoMa Mobile Application that is run in a standard smart phone. The Mobile Application captures video feed and sends it to DiCoMa system to be viewed by other DiCoMa users.
Actors	All roles
User interface(s)	DiCoMa Mobile Application
Initial situation	User has arrived to disaster area and starts to send video feed to DiCoMa System.
Main Flow	1. User opens the DiCoMa Mobile Application and authenticates himself.
	2. User selects to send video feed.
	3. The DiCoMa Mobile Applications opens a video capturing view and starts to send video feed to DiCoMa system.
	4. User records the video feed and the Mobile Application streams the feed automatically to DiCoMa system.

Exceptions	If communication network is not available or some network problems occur during the video stream, the Mobile Application stores the video feed locally and sends it to DiCoMa system once proper network connection is available.
End situation from the user's point of view	User can quickly and easily share live video stream from disaster area to other users.
Related use cases	Login to DiCoMa Viewing a live/recorded video feed from disaster area

Table 54. Creating a live video feed from disaster area

9.4.18 Viewing a live/recorded video feed from disaster area

Name	**Viewing a live/recorded video feed from disaster area**
Description	Users can view a video feed from the disaster area. Video feed can be live or it can be recorded earlier by DiCoMa system.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User has selected that he wishes to be informed whenever video feed is available.
Main Flow	1. Once DiCoMa system receives a new video feed from disaster area, it informs all the interested users about new the feed. The available video feed is presented on the map on top of the location of the video feed's source. DiCoMa system also automatically records the video feed, so that users can view the feed in any given time.
	2. User sees the available video feed on the map and opens it for viewing.
	3. User can pause, rewind, fast forward and replay the recorded video feed and jump back and forth between recorded and live feed.
Exceptions	
End situation from the user's point of view	User can form an overall picture of the current disaster scenario based on video imaginary.
Related use cases	Login to DiCoMa Creating a live video feed from disaster area

Table 55. Viewing a live/recorded video feed from disaster area

9.4.19 Participating in conversations at disaster management discussion forum

Name	Participating in conversations at disaster management discussion forum
Description	Users can participate in discussion forum conversations about the disaster management and other related issues. All DiCoMa users can participate and view the conversations. The main idea behind the forum is that no information is lost nor not shared due to the system limitations. In the forums, users can also rely on identity of other posters and that only a limited group of the users have access to the information posted on the forum.
Actors	All roles
User interface(s)	DiCoMa Forum
Initial situation	-
Main Flow	1. User opens the DiCoMa Forum
	2. User selects to view or participate in conversations like in any discussion forum available online.
Exceptions	
End situation from the user's point of view	User can quickly and easily share information and experiences in a secure and social way.
Related use cases	Login to DiCoMa

Table 56. Participating in conversations at disaster management discussion forum

9.4.20 Browsing and selecting suggestions made by decision support system

Name	Browsing and selecting suggestions made by decision support system
Description	User can browse and select action suggestions that DiCoMa Decision Support System (DDSS) makes. DDSS makes suggestions for actions based on currently available information about the disaster and pre-modeled scenarios. User can check what possible implications a certain action or series of actions might have.
Actors	Officer
User interface(s)	DiCoMa Decision Support System (DDSS)
Initial situation	User needs decision support or wants to double-check his own decisions about how to handle current disaster situation.
Main Flow	1. User opens the DDSS UI and selects to browse action suggestions.

	2. Based on currently available information about the disaster and pre-modeled scenarios, the DDSS makes action suggestions to user.
	3. User can review the possible implications that a action might have
	4. When user is sure about committing to a certain action, he can mark a suggested action as performed and DDSS uses that information based on future suggestions.
Exceptions	
End situation from the user's point of view	
Related use cases	Login to DiCoMa

Table 57. Browsing and selecting suggestions made by decision support system

9.4.21 Entering a made action to decision support system

Name	**Entering a made action to decision support system**
Description	In some cases the suggestions made by DDSS are not the ones that decision makers want to make. Or in some cases actions have already been done by different authorities. In both cases these actions should be added DDSS so that they will be used in future decision suggestions.
Actors	Officer
User interface(s)	DiCoMa Decision Support System (DDSS)
Initial situation	The DiCoMa system is not up-to-date about decisions that have been made related to the ongoing disaster control management.
Main Flow	1. User opens the DDSS UI and selects to enter a made action.
	2. User enters the required information about the action and saves information.
	3. The entered information will be taken into account when making future suggestions.
Exceptions	
End situation from the user's point of view	Actions made in real world are entered to DiCoMa system.
Related use cases	Login to DiCoMa

Table 58. Entering a made action to decision support system

9.4.22 Reception and display of data from web services of the nearest hospitals to the affected area

Name	**Reception and display of data from web services of the nearest hospitals to the affected area.**
Description	User views locations and information about hospitals. The Dicoma system displays all hospitals and show the capacity of the hospital to house the wounded
Actors	All roles
User interface(s)	Dicoma GIS UI
Initial situation	User needs to know where the hospital that has capacity to house the wounded.
Main Flow	1. User opens the Dicoma GIS UI and selects to view the nearest hospitals.
	2. All hospitals are displayed on the map.
	3. User can view detailed information about a hospital by selecting it from the map, as capacity, distance, clinics services needed…etc
Exceptions	
End situation from the user's point of view	User has clear understanding about locations of hospitals that are tracked to Dicoma.
Related use cases	- Login to DiCoMa - Viewing all nearest hospitals in map.

Table 59. Reception & display of data from web services of the nearest hospitals to the affected area

9.4.23 Management of nodes needed for platform in real time

Name	**Management of nodes needed for platform in real time.**
Description	The management of nodes is necessary for the real-time platform. The goal is to manage nodes to avoid traffic that occurs when sensors have begun to send messages from different sensors.
Actors	
User interface(s)	Dicoma Data Framework UI

Initial situation	The nodes of the platform are configured.
Exceptions	
End situation from the user's point of view	Sending of the all information without having problems volume of messages, achieving in this way a send faster.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO_2 control, speed and wind direction, atmospheric pressure from sensors. - Design an action plan for specific crisis situation.

Table 60. Management of nodes needed for platform in real time

9.4.24 Analysis of the crisis situation to select the most suitable action plan

Name	**Analysis of the crisis situation to select the most suitable action plan**
Description	The system will have a specific action plan designed to each crisis situation. These action plans are composed of several tasks and actions that will be executed automatically by the system when a certain crisis situation occurs.
Actors	Administrator system, emergency unit
User interface(s)	Dicoma platform UI
Initial situation	A series of events is registered by the system and it analyzes it to know if he must carry out any action plan or not.
Main Flow	1. The system analyzes all the events that occur.
	2. If the occurred events are associated a crisis situation, the system will look for the suitable action plan to be carried out.
	3. The tasks and actions belongs to the selected action plan are executed. If an error occurs, the system will send an alert to the administrator system.
Exceptions	
End situation from the user's point of view	The use case finishes when all the planned tasks and actions have been executed.

Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors. - Design an action plan for specific crisis situation.

Table 61. Analysis of the crisis situation to select the most suitable action plan

9.4.25 Definition of data model of DDS for the reception of data in real time

Name	**Definition of data model of DDS for the reception of data in real time**
Description	The data model of DDS will be defined for reception of sensor messages in real time. This requires the defining of the messages structure, in these messages. Detailed information will store of each sensor as temperature, dampness, smoke level, CO2,etc.
Actors	
User interface(s)	Dicoma Data Framework UI
Initial situation	The system needs a defined data model of DDS to be able to integrate all the functionalities of DDS.
Exceptions	
End situation from the user's point of view	Definition of data model of DSS for the reception of data in real time. To implement it later.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors. - Design an action plan for specific crisis situation.

Table 62. Definition of data model of DDS for the reception of data in real time

9.4.26 Definition of a CEP rule to send alarms

Name	**Definition of a CEP rule to send alarms**
Description	The system will be able to analyze the input events and send a specific alarm in case of any anomaly.
Actors	Members of the emergency unit
User interface(s)	Decision Support System (DDSS)
Initial situation	The system monitors all the input events and analyzes them.
Main Flow	4. A combination of input events are collected by the system
	5. The system has stored predefined event series and an alarm associated to each one that will be sent if that event series occurs.
	6. It inspects the input event series to know if it is a predefined input event series. In that case, the system sends its associated alarm.
Exceptions	
End situation from the user's point of view	An alarm is sent in case of an anomaly.
Related use cases	

Table 63. Definition of a CEP rule to send alarms

9.4.27 Definition of a CEP rule to activate a sensor

Name	**Definition of a CEP rule to activate a sensor**
Description	The system will be able to analyze the input events in order to order the activation of a sensor.
Actors	Members of the emergency unit
User interface(s)	Decision Support System (DDSS)
Initial situation	The system monitors all the input events and analyzes them.
Main Flow	1. A combination of input events are collected by the system
	2. The system has stored predefined event series and an action associated to each one that will be carried out if that event series occurs.

	3. It inspects the input event series to know if it is a predefined input event series. In that case, the system orders to start its associated action. This action can be the activation or disabling of a specific sensor.
Exceptions	
End situation from the user's point of view	A sensor is enabled or disabled when it is necessary.
Related use cases	

Table 64. Definition of a CEP rule to activate a sensor

9.4.28 Design an action plan for specific crisis situation.

Name	**Design an action plan for specific crisis situation.**
Description	The system will have a specific action plan designed to each crisis situation. These action plans are composed of several tasks and actions that will be automatically executed by the system when a certain crisis situation occurs.
Actors	Members of the emergency and firefighter unit
User interface(s)	DiCoMa Administration UI (DAUI)
Initial situation	The system will be able to automatically act when a certain crisis situation occurs. For that, it is necessary to load in the system an action plan associated to each crisis situation.
Main Flow	1. A series of tasks is defined to be executed when a specific crisis situation occurs.
	2. Each task will be a state of an automaton. It will be necessary to give logic to this automaton.
	3. This automaton will be associated to a new action plan and stored in the system.
Exceptions	
End situation from the user's point of view	The user will be able to manage the created action plan.
Related use cases	Analysis of the crisis situation to select the most suitable action plan

Table 65. Design an action plan for specific crisis situation

9.4.29 Detection of significant changes using the received information form sensors.

Name	Detection of significant changes using the received information form sensors.
Description	The system is able to detect any significant change using the received information form sensors.
Actors	Members of the emergency and firefighter unit
User interface(s)	Decision Support System (DDSS)
Initial situation	A series of events are collected by the system and an anomaly appears.
Main Flow	1. The system collects all the received data from sensors
	2. The system manages historical data in order to compare the collected data of each sensor in a short time interval.
	3. If there is a large difference between the last data of a sensor, the system sends an alarm.
Exceptions	
End situation from the user's point of view	The user can display all the stored data of sensors in a specific period time and the sent alarms because of any anomalies.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors. - Performing of operations or algorithms to obtain the useful information to alert of forest fires.

Table 66. Detection of significant changes using the received information form sensors.

9.4.30 Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.

Name	Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.
Description	The system manages all the data collected from several sensors of temperature, control, land, smoke presence control, CO2 control, speed and wind direction and atmospheric pressure, among others.
Actors	Members of the emergency unit
User interface(s)	Decision Support System (DDSS)
Initial situation	All the retrieved data from sensors is stored in the system database.
Main Flow	1. Sensors are configured in order to send data to the system in real time. The sensors can be of temperature, control, land, smoke presence control, CO2 control, speed and wind direction and atmospheric pressure, among others.
	2. The system is associated to different sensors and the communication configuration between both is configured.
	3. The system stores all the received data from sensors
Exceptions	
End situation from the user's point of view	The user can display all the sensors associated to the system and the last data collected of these.
Related use cases	- Detection of significant changes using the received information form sensors.

Table 67. Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.

9.4.31 Reception and storing of all information in NoSQL database.

Name	**Reception and storing of all information in NoSQL database.**
Description	The system will use NoSQL databases in order to store all the information from sensors and any static data which needs to be consulted very quickly.
Actors	Members of the emergency unit
User interface(s)	Decision Support System (DDSS)

Initial situation	Any data that needs to be often consulted will be going to store in NoSQL database.
Main Flow	1. An event is retrieved by the system
	2. The system decides if this data will often be acceded. In that case, the system will select a NoSQL database.
	3. The system stores the data in the selected database.
Exceptions	
End situation from the user's point of view	The data is stored in the correct database.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.

Table 68. Reception and storing of all information in NoSQL database.

9.4.32 Definition of data model of Distributed caches or NoSQL database.

Name	**Definition of data model of Distributed caches or NoSQL database.**
Description	The data model of Distributed caches of NoSQL database will be defined for store of sensor. Detailed information will be stored of each sensor as temperature, dampness, smoke level, CO2,etc.
Actors	
User interface(s)	Dicoma Data Framework UI
Initial situation	The system needs a defined data model of Distributed caches or NoSQL database to store all information about moisture, wind, temperature, position coordinates, events...
Exceptions	
End situation from the user's point of view	Definition of data model of Distributed caches of NoSQL database for the stored of data. To implement it later.

Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors. - Design an action plan for specific crisis situation.

Table 69. Definition of data model of Distributed caches or NoSQL database
Management of static information of sensors

Name	**Management of static information of sensors**
Description	The platform receives useful information that arrives from sensors installed at forests. This information is integrated by the Data and Services Integration platform. This platform communicates with Head End to obtain the data from sensors. (*UC: Management of the associations of Head End to sensors*)
Actors	
User interface(s)	DiCoMa Data Framework UI
Initial situation	
Main Flow	1. Sensors have created and configured. Head End have created and configured. Each sensor is associated to a Head End.
	2. All information from installed sensors is sent to the DiCoMa System.
	3. DiCoMa System displays the integrated information from sensors installed at forest.
Exceptions	
End situation from the user's point of view	User can use the platform DiCoMa System to know all information about actual situation from sensors at forest.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors. - Management of the associations of Head End to sensors

Table 70. Management of static information of sensors

9.4.33 Storing and retrieval of information based on Distributed caches or NoSQL database.

Name	**Storing and retrieval of information based on Distributed caches or NoSQL database.**
Description	The data model using the OGC-SWE standard will be defined for recognition and exploitation of sensors.
Actors	
User interface(s)	Dicoma Data Framework UI
Initial situation	The system needs to store all this information that will be used to span multiple caches distributed servers and allow therefore increase in size and transactional capabilities. Also be used NoSQL databases, which are more flexible and can store large amounts of information very quickly. The information will be stored moisture, wind, temperature, position coordinates, events …etc. And thereafter, all this information will be queried.
Exceptions	
End situation from the user's point of view	Storing and retrieval of information that is received from sensors and stored in NoSQL database.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.

Table 71. Storing and retrieval of information based on Distributed caches or NoSQL database.

9.4.34 Definition of data model using the OGC-SWE standard for recognition and exploitation of sensors.

Name	**Definition of data model using the OGC-SWE standard for recognition and exploitation of sensors.**
Description	The data model using the OGC-SWE standard will be defined for recognition and exploitation of sensors.
Actors	
User interface(s)	Dicoma Data Framework UI
Initial situation	The system needs a defined data model using the OGC-SWE standard, to specify data formats for simulation data, sensor data, including sensor networks, sensors, high bandwidth (optical, SAR, LIDAR) and others in real time, relevant data providers with a view to interoperability with geographic data in OGC formats, will be used the OGC-SWE standards, with purpose is to define open standards and interoperable within the GIS and the World Wide Web.
Exceptions	
End situation from the user's point of view	Definition of data model using the OGC-SWE standard for recognition and exploitation of sensors. To implement it later.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.

Table 72. Definition of data model using the OGC-SWE standard for recognition and exploitation of sensors.

9.5 Use cases related to scenario: Storm

The following use cases are closely related (but not restricted to) disasters dealing with Storms.

9.5.1 Viewing power network and possible problems

Name	**Viewing power network and possible problems**
Description	User views power lines and problems in power network.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Storm or some other natural phenomenon has cut down power in some areas and user needs to know what areas and how many people are affect be this problem.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view power line grid and problems in power network.
	2. Power network grid and its problems are displayed on the map. Also number of affected households or persons is shown in problem details.
Exceptions	
End situation from the user's point of view	User knows the scope of the power failure.
Related use cases	Login to DiCoMa

Table 73 Viewing power network and possible problems

9.5.2 Ordering and viewing a satellite picture

Name	**Ordering and viewing a satellite picture**
Description	Especially in stormy conditions, when strong wind has cut down trees on top of power lines and roads, it is essential to have a better understanding about the magnitude of the problem before making any decisions. Satellite pictures give an accurate view over large areas but they require satellites to be in the right orbit. Users of DiCoMa system can order a satellite picture from any desired area. The DiCoMa system sends the order to preconfigured satellite picture provider and user is notified that order has been sent and estimation of the delivery time is shown.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs picture information about the magnitude of damage in some area.
Main Flow	4. User opens the DiCoMa GIS UI and selects to order a satellite picture from the area that is currently selected on the GIS UI.

	5. The DiCoMa system sends the order to satellite picture provider(s) and displays an estimate when the picture should be ready.
	6. As soon as the satellite picture is ready to be used, all DiCoMa GIS UI users can select to view it. The satellite picture can also be used in dynamic map overlay views (See Creating a dynamic GIS overlay)
Exceptions	
End situation from the user's point of view	
Related use cases	Login to DiCoMa

Table 74. Ordering and viewing a satellite picture

9.6 Use cases related to scenario: Chemical disaster

The following use cases are closely related (but not restricted to) disasters dealing with chemical disasters on a railroad network.

9.6.1 Viewing railroad network and train locations

Name	**Viewing railroad network and train locations**
Description	User views railroad network and train locations.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know locations of trains in railroad network.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view railroad network and train locations.
	2. Railroad network and trains are displayed on the map.
Exceptions	User must be notified if no data is available or location for a certain train cannot be determined.
End situation from the user's point of view	User knows where trains are located.
Related use cases	

Table 75. Viewing railroad network and train locations

9.6.2 Viewing information from sensor network

Name	Viewing information from sensor network
Description	The DiCoMa system can be connected to all kinds of data sensor networks that provide accurate real-time data and can easily cover large areas. This information is viewable for all DiCoMa system users in the DiCoMa GIS UI. Data sensors can provide information about characteristics of air such as: • chemical compositions and percentages • biological aspects • radiological components
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to check values from a certain sensor network or Some preconfigured sensor level has been exceeded and GIS UI users are notified about this issue
Main Flow	1. User opens the DiCoMa GIS UI and selects view sensor networks. If any threshold values are exceeded, those sensor networks are highlighted.
	2. User selects a sensor network from the map and GIS UI shows detailed information in the selected sensor network area.
Exceptions	User must be notified if no data is available or connection for a certain sensor network is broken.
End situation from the user's point of view	User has received information about air quality in a selected area.
Related use cases	Login to DiCoMa

Table 76. Viewing information from sensor network

9.6.3 Viewing background information about the chemical substance

Name	**Viewing background information about the chemical substance**
Description	DiCoMa system contains up-to-date information about all possible chemical substances that may be affected by disasters. This information contains at least following details: • Basic information and characteristics: Color and odor • Consequences of exposure • Possible symptoms of exposure • Protection measurements
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Some preconfigured sensor level has been exceeded and GIS UI users are notified about this issue. User needs to check what kind of dangers the substance does have.
Main Flow	1. User has opened a sensor network that has informed about an exceeded threshold value (See Viewing information from sensor network).
	2. User selects the substances whose values are over the threshold value.
	3. The DiCoMa GIS UI displays detailed information about the selected substances.
Exceptions	
End situation from the user's point of view	User has received information what kind affects the chemical substance has.
Related use cases	Login to DiCoMa Viewing information from sensor network

Table 77. Viewing background information about the chemical substance

9.7 Use cases related to scenario: Forest fire

The following use cases are closely related (but not restricted to) disasters dealing with forest fire.

Next, a list of all use cases that are part of forest fire scenario have defined. Moreover, some use cases have been more detailed.

9.7.1 Use case list

DISASTER SUPPORT MANAGEMENT AND TRAINING

Geographical Information System

- **USER STORY:** Management information of the location of the disaster from sensors of temperature, dampness, wind, smoke level...etc.
  - Reception and storing of the sensor localization in map.
  - Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time.
  - Display of the affected area by fire and his evolution in real time.
  - Display statistics of possible causes of forest fire.
  - Reception and viewing in the map of alerts in real time.
  - Viewing of the historical fire and statistics of latest fires.

- **USER STORY:** Management of information of the disaster location from web services.
  - Reception and storing of the received data from needed web services.
  - Viewing and analysis of the receive data (temperature, wind direction and velocity...etc) from web services of the meteorological center.
  - Reception and display of data from web services of the nearest hospitals to forest fire.
  - Reception of the alerts from a forest ranger.

- **USER STORY:** Integration and presentation of the collected information and visual-interactive analysis at the user-interface level.
  - Viewing of integration of the collected information from all sensors in real time (temperature, dampness, wind, smoke level...etc) and from web services (meteorological center, hospitals...etc) in map.

DATA AND SERVICES INTEGRATION PLATFORM

Data Framework

- **USER STORY:** Development of data domains and structures according to the defined data model.
  - Definition of data model of DDS for the reception of data in real time.
  - Definition of data model of Distributed caches or NoSQL database.

- **USER STORY:** Management of Head End of data acquisition.
    - Management of static information of sensors
    - Management of the associations of Head End to sensors

- **USER STORY:** Management of information storage system based on Distributed caches or NoSQL databases.
    - Storing and retrieval of information based on Distributed caches or NoSQL database.
    - Management of nodes needed for platform in real time.

- **USER STORY:** Implementation of the OGC-SWE standard, for the recognition and the exploitation of sensors.
    - Definition of data model using the OGC-SWE standard for recognition and exploitation of sensors.

Information Services

- **USER STORY:** Processing of stored data (NoSQL repositories).
    - Reception and storing all information in NoSQL database.
    - Performing of operations or algorithms to obtain the useful information to alert of forest fires.

- **USER STORY:** Detection of significant state changes
    - Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO_2 control, speed and wind direction, atmospheric pressure from sensors.
    - Detection significant changes using the received information form sensors.

- **USER STORY:** Design and implementation of different action plan to handle crisis situations.
    - Design an action plan for specific crisis situation.
    - Analysis of the crisis situation to select the most suitable action plan

- **USER STORY:** Acquisition of relevant information in order to act correctly when a crisis situation is produced.
    - Calculation of the safe area from where the firefighters will act.
    - Forecasting of the fire behavior using all the collected data.
    - Viewing estimation of propagation time and possible focus of fire.

- **USER STORY:** Generation and implementation of CEP rules.
    - Definition of a CEP rule to calculate the affected area.
    - Definition of a CEP rule to send alarms
    - Definition of a CEP rule to activate a sensor

9.7.2 Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time

Name	**Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time.**
Description	To viewing all the specific information each sensors in real time (temperature, dampness, wind, smoke level…etc) for the user to be aware of that is happening at all time, and foresee the situation if data are anomalous.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know all information about all sensors of a zone selected, such as state of sensor (active, inactive, stopped), alerts, temperature of zone, dampness, CO2 in air, smoke level,... to be informed of that is happening at all times.
Main Flow	7. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the sensor.
	8. DiCoMa system displays all information () of selected sensor based on user's area selection. This information is state of sensor (active, inactive, stopped), alerts, temperature of zone, dampness, CO2 in air, smoke level...
	9. User can view detailed information from sensors by selecting the desired sensor in the selected zone of map.
Exceptions	
End situation from the user's point of view	User has clear understanding about all information that has sent the sensor and he can foresee.
Related use cases	- Login to DiCoMa - Display of sensors of temperature, dampness, wind direction, smoke level…in map.

Table 78. Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time

9.7.3 Display of the affected area by fire and his evolution in real time

Name	**Display of the affected area by fire and his evolution in real time**
Description	User views current forest fire. The DiCoMa system displays ongoing disasters; in this case forest fire, and all related information such as affected area, planned and already performed actions on map.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Some forest fire has occurred and user needs to start following the situation through the information that shows the application and map.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view forest fire.
	2. DiCoMa system displays all forest fire, alerts, or any information, based on user's area selection.
	3. User can view detailed description and related information with fire, mainly affected area in map
Exceptions	
End situation from the user's point of view	User has up-to-date information about current forest fire. (Historical of forest fires)
Related use cases	- Login to DiCoMa - Obtaining information from sensors to know that area has been affected by fire. - Calculation of affected area by fire

Table 79. Display of the affected area by fire and his evolution in real time

9.7.4 Management of the associations of Head End to sensors

Name	**Management of the associations of Head End to sensors**
Description	End Head is responsible for receiving the information from different sensors, and sending this information to different destinations for processing.
Actors	---
User interface(s)	DiCoMa Data Framework UI

Initial situation	
Main Flow	4. Sensors have created and configured.
	5. Head End have created and configured
	6. Each sensor is associated to a Head End.
Exceptions	
End situation from the user's point of view	The user can monitor each Head End and its associated sensors
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors.

Table 80. Management of the associations of Head End to sensors

9.7.5 Forecasting of the fire behavior using all the collected data

Name	**Forecasting of the fire behavior using all the collected data**
Description	The system will be able to analyze the behavior of the fire in order to estimate the possible affected areas when the fire expands and to act accordingly.
Actors	Members of the emergency unit
User interface(s)	DiCoMa platform UI
Initial situation	An action plan is being carried out and it is needed to know the areas that might be affected by the fire.
Main Flow	1. The system collects the wind, humidity and smoke data from sensors localized in the affected area.
	2. The system analyzes all the collected information and using several algorithms obtains the spread time and direction of the fire.
	3. The system displays a graphic showing the result data on a map of the affected area.
Exceptions	

End situation from the user's point of view	The system displays a graphic showing the result data on a map of the affected area.
Related use cases	- Obtaining of control temperature, moisture control, land moisture, smoke presence control, CO2 control, speed and wind direction, atmospheric pressure from sensors. - Display of the affected area by fire and his evolution in real time.

Table 81. Forecasting of the fire behavior using all the collected data

9.7.6 Definition of a CEP rule to calculate the affected area magnitude

Name	**Definition of a CEP rule to calculate the affected area magnitude**
Description	The system will be able to calculate the magnitude of the affected area using a CEP rule.
Actors	Members of the emergency unit
User interface(s)	DiCoMa platform UI
Initial situation	An action plan is being carried out and it is needed to know the magnitude of the affected area in time real.
Main Flow	1. The system, using the defined CEP rules, analyzes all signals that receives from different sensors.
	2. It receives three position signals from sensors localized in the affected area.
	3. It calculates the affected area using the three coordinates.
Exceptions	
End situation from the user's point of view	The system displays a map indicating the affected area.
Related use cases	- Display of the affected area by fire and his evolution in real time.

Table 82. Definition of a CEP rule to calculate the affected area magnitude

9.7.7 Viewing estimation of propagation time and possible focus of fire.

Name	**Viewing estimation of propagation time and possible focus of fire.**
Description	The system is able to display an estimation of propagation time and possible focus of fire. This estimation will change according to the input data that is collected by the system in real time.
Actors	Members of the emergency unit
User interface(s)	Decision Support System (DDSS)
Initial situation	When an action plan is being carried out, it is necessary to estimate the propagation times and direction of fire in order to get ahead of the future damaged areas.
Main Flow	1. The system collects all the data of the sensors from the affected area.
	2. It analyzes all the data using several estimation algorithms to obtain the most precise data of the estimated propagation time and direction of fire.
	3. The system displays a map indicating the future affected areas and the direction of fire to different times. Moreover, the possible focus of fire will be shown.
Exceptions	
End situation from the user's point of view	The user will display a map indicating the future affected areas and the direction of fire to different times.
Related use cases	

Table 83. Viewing estimation of propagation time and possible focus of fire.

9.7.8 Calculation of the safe area from where the firefighters will act.

Name	**Calculation of the safe area from where the firefighters will act**
Description	A safe area from where the firefighters can act to put out the fire without being in damage has to be calculated.
Actors	Members of the firefighter unit
User interface(s)	Decision Support System (DDSS)

Initial situation	When an action plan is being carried out, it is necessary to estimate a safe area from where the firefighters can act to put out the fire without being in damage.
Main Flow	1. The system estimates the propagation time and direction of fire. *Use case: Viewing estimation of propagation time and possible focus of fire.*
	2. Using several algorithms and the output data of the use case "*Viewing estimation of propagation time and possible focus of fire*", the system will obtain the safest areas from which the firefighters can be without damage.
	3. The safest areas will be recalculated according to the received data in time real.
Exceptions	
End situation from the user's point of view	The firefighter unit will obtain the safest areas from which to put out the fire.
Related use cases	Viewing estimation of propagation time and possible focus of fire.

Table 84. Calculation of the safe area from where the firefighters will act

9.7.9 Performing of operations or algorithms to obtain the useful information to alert of forest fires.

Name	**Performing of operations or algorithms to obtain the useful information to alert of forest fires.**
Description	It is necessary to design and perform several operations or algorithms to obtain the useful information to alert of forest fires.
Actors	Members of the emergency unit
User interface(s)	DiCoMa Administration UI (DAUI)
Initial situation	A significant change is detected by the system in one or more sensors.
Main Flow	1. The system detects a significant change in one or more sensors. Use case <Detection of significant changes using the received information form sensors>

	2. It executes several algorithms and operations using the output of the previous step. These algorithms search any relation between the produced significant changes and the crisis situations.
	3. If the results of the algorithms and operations have relation with a forest fire situation, the system sends an alert.
Exceptions	
End situation from the user's point of view	The user can display all the designed algorithms and create others.
Related use cases	- Detection significant changes using the received information form sensors.

Table 85. Performing of operations or algorithms to obtain the useful information to alert of forest fires.

9.7.10 Reception and storing of the sensor localization in map

Name	***Reception and storing of the sensor localization in map.***
Description	Reception and storing of the localization of sensors in map (temperature, dampness, wind, smoke level sensors…etc), to viewing all the specific information each sensors in real time (temperature, dampness, wind, smoke level…etc).
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to view sensor (temperature, dampness, wind, smoke level…etc) localization in map of selected zone, and know all information about this sensors (UC: *9.7.2. Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time*).
Main Flow	1. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the zone.
	2. DiCoMa system displays all sensors in map based on user's area selection also displays the sensor coordinates.
	3. User can view all sensors in map of selected zone and the information each sensor (UC: *9.7.2. Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time*).
Exceptions	

End situation from the user's point of view	User has clear understanding about all sensors installed in selected zone and he can view this sensor in map of DiCoMa system.
Related use cases	- Login to DiCoMa - Viewing of sensors of temperature, dampness, wind direction, smoke level… and sensors states in real time.

Table 86. Reception and storing of the sensor localization in map

9.7.11 Display statistics of possible causes of forest fire.

Name	**Display statistics of possible causes of forest fire.**
Description	To know statistics of causes of previous forest fire. So that user has clear understanding about possible cause of actual forest fire from statistics stored.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know all statistics of possible causes of forest fire (statistics historical) to the forecasting actual forest fire. This statistics show all needed information for each previous forest fire (date, zone, affected area, time, cause, temperature, dampness, wind direction, smoke level…)
Main Flow	1. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the zone.
	2. DiCoMa system shows all statistics historical of possible causes of forest fire. The user selected dates interval.
	3. User can view all statistics historical for this interval and he can select concrete crisis situation, to know all information (date, zone, affected area, time, cause, temperature, dampness, wind direction, smoke level…).
Exceptions	
End situation from the user's point of view	User has clear understanding about possible causes of forest fire and he can forecast futures or actual forest fire.
Related use cases	- Login to DiCoMa

Table 87. Display statistics of possible causes of forest fire

9.7.12 Reception and viewing in the map of alerts in real time.

Name	**Reception and viewing in the map of alerts in real time.**
Description	Reception and viewing in the map of alerts in real time. User Have to know in real time if an event has occurred, to react faster. For example, an alert or event can be the excessive temperature increase.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User needs to know in real time if an event has occurred. DiCoMa system has to notify if exist alerts or events at every moment.
	1. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the zone.
Main Flow	2. The system analyzes all the events that occur and displays these alerts in real time.
	3. If the occurred events are associated a crisis situation, the system will send an alarm/alert/event to inform user.
Exceptions	
End situation from the user's point of view	User has clear understanding about situation state at every moment.
Related use cases	- Login to DiCoMa

Table 88. Reception and viewing in the map of alerts in real time

9.7.13 Viewing of the historical fire and statistics of latest fires

Name	**Viewing of the historical fire and statistics of latest fires**
Description	Viewing of the historical fire and statistics of latest fires
Actors	Members of the emergency unit
User interface(s)	DiCoMa platform UI
Initial situation	A user wants to display the historical fire and statistics of latest fires. It will be able to select a specific time interval, country, city or continent to only display the data of the selected place and time interval.
Main Flow	1. The user selects a certain place an time interval
	2. The system searches all the data that belongs to the selected place and time interval.
	3. The system shows the results using statistics graphics.
Exceptions	
End situation from the user's point of view	The user is able to display the historical fire and statistics of latest fires
Related use cases	

Table 89. Viewing of the historical fire and statistics of latest fires

9.7.14 Viewing and analysis of the receive data (temperature, wind direction and velocity...etc) from web services of the meteorological center.

Name	**Viewing and analysis of the receive data (temperature, wind direction and velocity...etc) from web services of the meteorological center.**
Description	User views and analyzes the receive data as temperature, direction and velocity wind…etc. All this information is received from web services of the meteorological center.
Actors	All roles
User interface(s)	Dicoma GIS UI

Initial situation	User needs to know all information about the meteorological at every moment.
Main Flow	4. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the zone.
	5. User selects meteorological option and the system displays information about meteorology.
	6. User can view detailed information about a selected zone.
Exceptions	
End situation from the user's point of view	User has clear understanding about the meteorological at every moment to analyze the situation.
Related use cases	- Login to DiCoMa

Table 90. Viewing and analysis of the receive data (temperature, wind direction and velocity...etc) from web services of the meteorological center.

9.7.15 Reception of the alerts from a forest ranger

Name	**Reception of the alerts from a forest ranger**
Description	User receives of alerts from a forest ranger in case of forest fire or anomalous situation.
Actors	All roles
User interface(s)	Dicoma GIS UI
Initial situation	User needs to know what is occurring in the forest at every moment, to anticipate possible crisis situations.
Main Flow	7. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the zone.
	8. User selects meteorological option and the system displays information about meteorology.
	9. User can view detailed information about a selected zone.
Exceptions	

End situation from the user's point of view	User has clear understanding about the situation in the forest at every moment. In case of anomalous situation, user is alerted for the forest ranger and user receives an alert from the system.
Related use cases	- Login to DiCoMa

Table 91. Reception of the alerts from a forest ranger

9.7.16 Viewing of integration of the collected information from all sensors in real time in map

Name	**Viewing of integration of the collected information from all sensors in real time in map**
Description	User views situation in real time (ongoing disasters). The DiCoMa system displays the collected information from all sensors in real time (temperature, dampness, wind, smoke level,…etc) and information received from web services (meteorological center, hospital,…etc) and all this information is displayed in map.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	User need know the collected information from sensors and from web services in map.
Main Flow	1. User opens the DiCoMa GIS UI and selects to view of forest fire map and selects the zone.
	2. DiCoMa system displays all collected information from all sensors in real time and from web services. User selects option that he wants know more information.
	3. User can view detailed description and related information by selecting the desired zone.
Exceptions	
End situation from the user's point of view	User has all information about actual situation.
Related use cases	Login to DiCoMa

Table 92. Viewing of integration of the collected information from all sensors in real time in map

9.8 Use cases related to scenario: Earthquake

9.8.1 Environmental conditions conductive to the earthquake and the measures taken to help the victims and prevent further damage

Name	**Environmental conditions conducive to the earthquake and the measures taken to help the victims and prevent further damage**
Description	As member of the unit emergency, I want to system send a signal of alert, when is produced an important earthquake and that can to display the environmental conditions in real time in the affected area to help possible victims and prevent further damage. To generate early alert is should display all information. The same way depending of the received data be will establish a set of emergency levels of the area. Also be will control by sensors (information of the sensors) the rank of the earthquake power, the temperature and levels CO2. Also the systems should to locate the places where exist more signals emitted by the alert sensors and indicate if this sensors are into of the same county and display the rescue team that is more near to area of the earthquake.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Some preconfigured sensor level has been exceeded and GIS UI users are notified about this issue.
Main Flow	1. User has opened a sensor network that has informed about an earthquake
	2. User review the location of the crisis
	3. The DiCoMa GIS UI displays detailed information about the selected area.
Exceptions	
End situation from the user's point of view	User has received information about the intensity of an earthquake.
Related use cases	Login to DiCoMa Viewing information from sensor network

Table 93. Environmental conditions conducive to the earthquake and the measures taken to help the victims and prevent further damage

9.8.2 Behavior and classification of earthquake

Name	**Behavior and classification of earthquake**
Description	As member of the unit emergency, I want that the systems is able to generate an algorithm, that depending on the data received, this can be defined the type of earthquake and their behavior, as the estimate of consequence and possible collapse buildings. To realize this systems is will obtain all the necessary information of the sensors as the power of the earthquake, movement of buildings, the presence CO2, temperature, etc. with this data and with the information of the relief of the city (POIs) that obtainable of a web service, is will create different predictor models, indicating evacuation routes for example.
Actors	All roles
User interface(s)	DiCoMa GIS UI
Initial situation	Some preconfigured sensor level has been exceeded and GIS UI users are notified about this issue.
Main Flow	4. User has opened a sensor network that has informed about an earthquake
	5. The DiCoMa GIS UI displays detailed information about the earthquake.
Exceptions	
End situation from the user's point of view	User has received information about the intensity of an earthquake.
Related use cases	Login to DiCoMa Viewing information from sensor network

Table 94. Behavior and classification of earthquake

9.9 Use cases related to scenario: Aircraft Landing Crash

Name	**Development of a list of victims and their severity**
Description	After a first survey of the site may be determined a list of the approximate number of victims, the location and severity of the same.
Actors	All roles
User interface(s)	Dicoma victims location UI
Initial situation	
Main Flow	1. Early intervention teams which run the place, shared extension thereof and will be responsible for each area to inspect the field.
	2. Each team develope a list of the number of victims who have located in its area, based on a level table determine their health status and priority of rescue, in addition they geolocalize each victim.
	3. Table of severities of the victims: • Priority One: Victims critical. • Priority Two: victims medium level. • Priority Three: victims mild level • Priority Four: victims of extreme gravity
Exceptions	
End situation from the user's point of view	Victims location listed. Viewing information from sensor network
Related use cases	

Table 95. Aircraft Landing Crash

9.10 Simulation and training use cases

9.10.1 Creating a simulated disaster

Name	**Creating a simulated disaster**
Description	Authorities can construct a simulated disaster that is used as a training exercise for persons handling disasters. A simulation can contain all the elements that may occur in a real disaster scenario. At least the following set of items can be added to simulation: • Locations and movement of police, fire brigade and first aid units. Information can be manually made or it can be recorded from actual data. • Weather conditions and forecasts. Information can be manually made or it can be recorded from actual data. • Disaster information and its progression in a timeline.
Actors	Officer
User interface(s)	DiCoMa Simulation Tool
Initial situation	User prepares a training or simulation in order to educate the personnel handling disasters.
Main Flow	1. User opens the DiCoMa Simulation Tool and selects the functionality “creating a new disaster simulation”.
	2. User manually adds elements to simulation timeline. Elements or series of elements can also be added from recorded live data.
	3. User can playback the simulation to make sure that disaster sequence is as planned.
	4. Once the simulation is ready, it can be saved and used for training (See use case 9.10.2).
Exceptions	
End situation from the user's point of view	A simulation is created and stored to DiCoMa system.
Related use cases	Login to DiCoMa Running a simulated disaster

Table 96. Creating a simulated disaster

9.10.2 Running a simulated disaster

Name	**Running a simulated disaster**
Description	DiCoMa users can be trained to handle disaster situations by running simulations in DiCoMa system. A simulation is usually managed by high officer or teacher of rescue organizations. The manager starts the simulation from DiCoMa Simulation Tool and after that all the other tools and user interfaces act as in real situations.
Actors	Multiple roles depending on used user interface
User interface(s)	DiCoMa Simulation Tool DiCoMa Decision Support System (DDSS) DiCoMa GIS UI
Initial situation	
Main Flow	1. The simulation manager opens the DiCoMa Simulation Tool and selects the simulation to be run.
	2. Once the simulation is started, the Decision Support System and GIS UI appear as there was an actual disaster going on.
	3. The users of DDSS and GIS UI will as they would in real disaster situation.
	4. The simulation manager may pause, stop, alter or rerun the simulation in any given time.
Exceptions	
End situation from the user's point of view	A simulation was run successfully.
Related use cases	Login to DiCoMa Creating a simulated disaster Evaluating simulation actions

Table 97. Running a simulated disaster

9.10.3 Evaluating simulation actions

Name	Evaluating simulation actions
Description	Once the simulated disaster has been run, the simulation manager can examine what actions users made during the simulation. This information can used as a feedback purposes.
Actors	Simulation manager
User interface(s)	DiCoMa Simulation Tool
Initial situation	
Main Flow	1. The simulation manager opens the DiCoMa Simulation Tool and selects the right simulation from simulation history.
	2. All predefined events and users' actions are visualized as a graph so that manager can get a good overall view how simulation went from start to finish.
	3. The manager can drill down to a single user to see how he acted and what information did he receive and examine during the simulation.
Exceptions	
End situation from the user's point of view	The simulation manager has the information how simulation went and what areas need better attention and preparation.
Related use cases	Login to DiCoMa Running a simulated disaster

Table 98. Evaluating simulation actions

9.11 Administrative use cases

9.11.1 User management

Name	User management
Description	User management functionality contains all CRUD-operations needed to manage user accounts and roles for DiCoMa system.
Actors	Administrator
User interface(s)	DiCoMa Administration UI
Initial situation	

Main Flow	1. User opens the section in DiCoMa Administrator UI where user accounts and roles are managed and selects the desired action.
	2. User can one of the following modifications: • Add new user account • Modify existing user account • Reset a password for an user account • Delete/Inactivate an user account • Assign roles for user account
	3. Modifications become active in real-time and effect all DiCoMa user interface immediately.
Exceptions	
End situation from the user's point of view	Administrator has made desired modifications to DiCoMa systems user accounts.
Related use cases	Login to DiCoMa

Table 99. User management

9.11.2 Managing ad-hoc fleets and units

Name	**Managing ad-hoc fleets and units**
Description	Ad-hoc fleets are formed from mobile devices that are configured to transmit location information to DiCoMa system. When creating an ad-hoc fleet, user needs to configure what devices belong to what fleet and how is that fleet shown in the GIS UI. Depending on the selected mobile device, the configuration process may also require software installation to the mobile devices.
Actors	Administrator
User interface(s)	DiCoMa Administration UI
Initial situation	
Main Flow	1. User opens the section in DiCoMa Administrator UI where ad-hoc fleets are managed and selects to add new ad-hoc fleet.
	2. User enters required information such as fleet identification, roles required to view fleet locations and identification of mobile devices that belong to the fleet.

	3. If needed, user installs the tracking and identification software to mobile devices (locally if devices are present or as a OTA update, if devices are already on the field)
	4. When all is set, the fleet is visible in the GIS UI for appropriate roles.
Exceptions	
End situation from the user's point of view	Ad-hoc fleet is created or edited.
Related use cases	Login to DiCoMa

Table 100. Managing ad-hoc fleets and units

9.11.3 Creating a predefined disaster management plan

Name	**Creating a predefined disaster management plan**
Description	DiCoMa system supports predefined plans for handling disasters that have a relative high probability or are common to a certain area. The predefined management plan is a decision tree that holds action suggestions and other guidance information. The purpose for these plans is to give guidelines and support when disaster management might be handled by inexperienced person.
Actors	Administrator
User interface(s)	DiCoMa Administration UI DiCoMa Decision Support System
Initial situation	
Main Flow	1. User opens the section in DiCoMa Administrator UI where disaster management plans are managed and selects to add new plan.
	2. User creates a plan and configures the preconditions that should be met before this plan is suggested by DDSS.
Exceptions	
End situation from the user's point of view	
Related use cases	Login to DiCoMa

Table 101. Creating a predefined disaster management plan

9.11.4 Creating a traffic light control script

Name	**Creating a traffic light control script**
Description	Large urban areas usually contain a huge amount of traffic lights. Therefore, creating a green wave for evacuation can be very time consuming effort. These controls can be automated by creating a script that automatically controls the traffic lights in desired crossroads.
Actors	Administrator
User interface(s)	DiCoMa Administration UI DiCoMa GIS UI
Initial situation	
Main Flow	1. User opens the section in DiCoMa Administrator UI where traffic light control scripts are managed and selects to add a new script.
	2. User selects the traffic light groups from the map and set control parameters and timing.
	3. User enters a description about the script and saves it.
Exceptions	
End situation from the user's point of view	Traffic light control script is saved to DiCoMa system and can be used from the GIS UI.
Related use cases	Login to DiCoMa

Table 102. Creating a traffic light control script

10 Conclusions

This deliverable has presented the summary of the work related to context of use, users and tasks, scenarios and use cases. The presented results will offer the starting point for the DiCoMa activities related to user requirements, business model framework, high level design and DiCoMa architecture. The work has been carried out through discussions in teleconferences and physical meetings. The workshop held in Antalya Turkey in the beginning of September 2012 proved to be very useful and productive and it offered a lot of material for this D1.2.

The deliverable has covered issues related to context of use, user roles and tasks, usage scenarios and use cases and the countries involved in DiCoMa (Finland, Israel, Spain and Turkey) have all been able to present their own views and objectives related to them.

The main use cases in DiCoMa will be related to chemical disaster, winter storm disaster, forest fire, earthquake and aircraft crash and they have been described in this deliverable. Thus D1.2 will offer starting point for the next steps of the DiCoMa planning work.