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The DRIVER+ project

Current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
 - Develop a common guidance methodology and tool (supporting Trials and the gathering of lessons learned).
 - Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
 - Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
 - Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
 - Facilitate the usage of the Portfolio of Solutions.
 - Ensure the sustainability of the Portfolio of Tools.
3. Facilitate a shared understanding of Crisis Management across Europe:
 - Establish a common background.
 - Cooperate with external partners in joint Trials.
 - Disseminate project results.

In order to achieve these objectives, five sub-projects (SPs) have been established. **SP91 Project Management** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on crisis management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment (from the former SP8 and SP9) are part of SP91 as well. **SP92 Test-bed** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93 Solutions** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in SP93. **SP94 Trials** will organize four series of Trials as well as the final demo. **SP95 Impact, Engagement and Sustainability**, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardization.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities, whose most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange on lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

The former DRIVER sub-project 4 (SP4) was aimed for implementing an experimentation process focused on solutions that could strengthen professional responders in Crisis Management (CM). The experimentation methodology addressing the activities and key aspects of the experiment design, execution and evaluation of results was developed in SP2 and enriched SP4's experiments by including a multi-dimensional scope, which considered not only the solutions' perspective of the experiment but also the end users and CM perspectives of it:

- The **end users dimension** can be understood as the perspective of the experiment (or platform) owner on the basis of the corresponding end users' needs.
- The **CM dimension** can be understood as the operational perspective, related to the CM performance and procedures with a special consideration of the identified CM capability gaps.
- The **solutions dimension** can be understood as the perspective of the solution providers, and is mainly related to the capability of certain solution to improve or drive innovation in CM.

The purpose of this document is to provide a report on the design and execution of Experiment 43b, as well as on the main results gathered from it.

Each experiment during the former DRIVER period was aimed to address a specific subset of the gaps identified in the gap assessment activities. In the case of Experiment 43b, these gaps were mainly related to the need for tasking and resource management capabilities within and across agencies (at several levels of command), and the need for an improved information sharing which enabled common situational awareness and a better understanding of the relief effort as a whole. The addressed gaps were intended to guide the experiment design, including the selection of the particular crisis scenario which contextualized the experiment as well as the corresponding participants from the relevant communities of end users and practitioners. These gaps were also crucial for identifying the solutions (from those in the DRIVER catalogue) that were suitable for being included in the experiment.

Considering the CM capability gaps and other relevant aspects for the experimentation process, a set of clear objectives were established. These objectives revolved around the three experiment dimensions mentioned above.

From a pure end users' perspective, the main objective was validating the scenario and the performance on the activities carried out by practitioners during the experiment execution.

From the CM perspective, the objectives were focused on being able of executing a multi-site activity taking advantage of the solutions available at the corresponding stage of the project, as well as exercising and evaluating the methodological approach put in place.

Finally, from a solutions perspective, the objectives were oriented towards evaluating the added value provided by the solutions used during the experiment (not only for real operations but also for future experimentation and trialling) and evaluating the DRIVER approach to solutions interoperability, based on the CIS concept.

The design phase included the fundamental step of selecting and developing a scenario that gave an appropriate context for the execution of the experiment. As the experiment counted on two different platforms sited at Sweden and Poland (MSB and the Eastern European Platform, respectively), the only realistic alternative for a cross-border cooperation scenario was an incident in the Baltic Sea. The final scenario consisted of a massive rescue operation for the evacuation, due to a fire incident, taking place on a ship with passengers from different countries. In order to manage the crisis, Polish and Swedish CM bodies operating on local and regional areas would cooperate using the solutions selected from the DRIVER catalogue.

The selected operational solutions were those linked to the gaps being addressed by Experiment 43b, resulting in a set of solutions mainly providing Common Operational Picture (COP) functionality and tasking and resource management support. These solutions were expected to be integrated into a System of

Systems (SoS) by putting them into a Common Information Space (CIS). The CIS was one of the leading concepts developed in SP4 and was intended to be used in all former DRIVER experiments; it can be seen as a collaborative network that allows the structured exchange of information between the different solutions integrating the SoS.

In order to enable this information exchange, the CIS was expected to use a predefined set of standards (data formats, protocols), which solutions connected to the CIS should be adapted to (by developing adaptors that perform the required protocol and data format transformations and the mappings between data models). In the particular case of Experiment 43b, the ISO's Emergency Management Shared Information (EMSI) standard, based on the former Tactical Situation Object (TSO) specification, was used as the basis of data exchange through the CIS. EMSI was selected as it provided a robust data model addressing key CM concepts (such as events, missions and resources) as well as an extensive code dictionary for semantic interoperability, while still being simple enough to let solution providers getting familiarized with it spending a reasonable amount of effort.

Previous operational infrastructure (understood as the operational solutions connected through the CIS implementation) was supported by the former DRIVER's Test-bed. The Test-bed functionalities allowed executing the coordinated experiment between the Polish and Swedish platforms providing scenario orchestration as well as ground truth and on-scene simulation support. This support was a key driver for an experiment like this, which was expected to involve a high amount of on-field resources (such as helicopters, ambulances, etc.) that for practical reasons could not be effectively deployed on field (at least, at that stage of the former DRIVER experimentation process).

The experiment preparation included four design and progress meetings incrementally including experiment organizers, such as the experiment leader and the platform owners, end users, practitioners and solution providers. This preparation ended with an experiment rehearsal that took place two weeks before the experiment execution itself. The experiment execution was held from the 24-29/04/2016 at MSB Revinge (Sweden) and Gdynia Naval Academy (Poland) premises. It directly involved more than 60 members of the former DRIVER consortium and around 40 end users and practitioners. Contrary to exercises, breaks were allowed during experimentation, which allowed controlling the experiment to do adjustments if needed and also accelerating the course of action between relevant phases, in order to focus on the aspects under experimentation. The real time action was nine hours of scenario, distributed into four phases executed in three days.

It was proven that the Experiment 43b was able to set up a CM scenario where two different platforms, which included the participation of representatives from different Polish and Swedish CM bodies, cooperated by means of a set of operational tools put together into a CIS, being all this supported by the former DRIVER's Test-bed. In general, end users and practitioners found the experiment itself quite productive and the overall experimentation approach promising. They got highly involved with the scenario and the activities performed during the experiment execution and were able to provide relevant feedback to both the methodology and the solutions put in place. This feedback was provided by means of notes during the experiment, hot-wash observations, filling of questionnaires and personal interviews, as foreseen by the evaluation approach. Due to this feedback and the work of integrating solutions into a system of systems, solution providers were also able to identify both the main strengths and weak spots of their tools with regard to the end users' needs and also from the perspective of solutions interoperability (ranging from the technical to the semantic and operational interoperability). In summary, Experiment 43b was considered satisfactory as a first approach towards a pan-European CM Test-bed and a Portfolio of Solutions (PoS) aimed to bridge existing CM gaps.

As a final note, a series of lessons learned concerning the CM and the solutions perspectives were extracted and documented, in order to make up a main source of input for subsequent experiments in CM. The process needs to be improved and refined in successive Trials considering these lessons learned (as it was the first approach), but, according to end users and practitioners' feedback and also to the impressions of the other experiment participants, it seems to be a firm step in the right direction.

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List of Acronyms

Acronym	Definition
AIS	Automatic Identification System
C3	Command, Control and Coordination
CIS	Common Information Space
CM	Crisis Management
COP	Common Operational Picture
CoPCM	Community of Practice in Crisis Management
DOM	Document Object Model
DOW	Description Of Work
DRIVER	Driving Innovation in Crisis Management for European Resilience
EMSI	Emergency Management Shared Information
FOM	Federation Object Model
GIS	Geographic Information System
GUI	Graphical User Interface
HLA	High Level Architecture
ICT	Information and Communications Technologies
IT	Information Technology
LAN	Local Area Network
LS	Landing Site
LSOC	Landing Site Operations Centre
JRCC	Joint Rescue Coordination Centre (Sweden)
MIRG	Maritime Incident Response Group (Sweden)
MRCC	Maritime Rescue Coordination Centre (Poland)
MV	Motor Vessel
NGO	Non-governmental organization
OSC	On-Scene Commander
PoS	Portfolio of Solutions
REST	Representational State Transfer
RQ	Research Question
SAR	Search And Rescue
SDEM	Simulation Data Exchange Model
SOA	Service Oriented Architecture

Acronym	Definition
SOAP	Simple Object Access Protocol
SOP	Standard Operating Procedures
SoS	System of Systems
SP	Subproject
TRL	Technology Readiness Level
TSO	Tactical Situation Object
VPN	Virtual Public Networks
WP	Work Package

1. Introduction

This document provides the “Experiment Design & Report” for the Experiment 43b of the former DRIVER project, set up as part of the DRIVER SP4’s 2nd round of experiments. It is intended to use the outcomes of the experiments in the context of the DRIVER+ project.

DRIVER+ has three main objectives:

- 1) Develop a pan-European Test-bed for crisis management capability development.
- 2) Develop a well-balanced comprehensive portfolio of crisis management solutions.
- 3) Facilitate a shared understanding of crisis management across Europe.

In this context, SP4 of the former DRIVER project pointed to IT solutions for strengthening CM responders, being experiments framed in SP4 oriented to:

- Bridging some of the detected gaps in Crisis Management (CM) using Information Technology (IT) solutions.
- Taking a first step to deploy a sustainable Test-bed distributed in different EU locations.

Experiment 43b “Coordinated Tasking and Resource Management” addressed those gaps related to tasking and resource management as well as to the need for an improved information sharing between agencies involved in the management of crisis events. This way, the operational solutions participating in the experiment as well as the Test-bed functionalities should be providing features supporting those gaps.

Experiment 43b took advantage of the developments made in the former WP42 (Architecture for strengthened response), where an architecture for the system of systems was defined. This architecture relies on the concept of Common Information Space (CIS), through which all systems being part of the SoS are expected to exchange information, according to the corresponding communication standards.

The results extracted from the experiment design, preparation and execution were expected to provide a series of lessons learned and a set of identified areas of improvement regarding all aspects associated to the experimentation process. This included the operational solutions and the Test-bed, but also the methodological approach, i.e. the processes of designing and preparing experiments as well as the process followed for the evaluation of results.

Due to the fact that two different platforms sited in Sweden and Poland (MSB and the Eastern European Platform, respectively) raised their interest about hosting the experiment, Experiment 43b took also the opportunity to define a crisis scenario which required the cross-border cooperation of CM bodies at different levels of command, setting up a multinational experiment which offered an attractive environment to engage end users and practitioners from both countries.

The present document is structured as follows:

- Section 2 provides an overall description of the experiment design and its main activities. This includes the establishment of concrete objectives, the definition of a scenario that served as context for the experiment execution, the specification of the technical set-up (including operational solutions and Test-bed) for the experiment and the corresponding evaluation approach.
- Section 3 gives a description of the experiment execution and includes a summary of the analysis and evaluation of the gathered results. It also provides a list of lessons learned that are aimed to be the main input from Experiment 43b to the DRIVER experimentation process and thus to the definition of later experiments.
- Section 4 outlines the main conclusions resulting from the process described in previous sections.

Finally, a set of annexes are provided with the description, in the form of information cards, of the operational solutions which participated in the experiment, as well as the templates of the questionnaires filled by the practitioners after the experiment execution.

2. Experiment design

This section presents the main design aspects of Experiment 43b; including the main goals that guided this design and the concrete experiment set-up, which encompasses the scenario developed for contextualizing the experiment, the hosting platforms, the participants and roles and the general technical infrastructure.

2.1 Goals and expected outcomes

2.1.1 Gaps and research questions

Experiments conducted in the frame of the former DRIVER project were aimed to address specific subsets of the gaps identified in the former DRIVER gaps assessment activities.

In particular, Experiment 43b had to focus on the gaps summarized here below (the codes of these gaps correspond to those assigned in (1) and (2)):

G02: Lack of Command, Control and Coordination (C3) tools for tasking and resource management, which entails:

- A lack of insight into the availability of resources within and across agencies.
- A lack of insight into the current and planned tasks within and across agencies.

G06: Not enough understanding the relief effort as a whole.

G08: Lack of proper inter-agency information sharing, which entails:

- An insufficient alignment of information between agencies.
- A lack of an accessible common operational network to share information.

Based on previous gaps, two main research questions were defined for the experiment. The first one was set out from a pure operational perspective:

RQ01: Provided a crisis event whose management requires cross-agency and multinational cooperation, can the current deviation between the “perceived reality” in different Coordination Centres, and also between this “perceived reality” and the “actual reality”, be reduced?

Considering the current and planned missions and the availability of existing resources as part of the reality being perceived, it becomes clear that a positive answer to previous question would imply a good level of insight into the availability of resources as well as into the current and planned tasks (see G02). It would also imply a better alignment of the information between agencies (see G08) and would contribute to a common and better understanding of the relief effort as a whole (see G06).

The second research question is directly related with the first one but is approached from the technical (or solutions) perspective:

RQ02: Is it possible to reduce previous deviation by integrating a set of solutions into a Common Information Space such as the one defined in DRIVER?

A positive answer would imply having an accessible common operational network to share information (see G08). The reduction of the deviation between “perceived realities” in the different command posts and between these “perceived realities” and the “actual reality” would be the operational benefit brought by the solutions and their integration into the CIS.

With the aim of addressing these questions, the following aspects were considered:

- The perception of the crisis event and emerging needs and problems that would be improved through information sharing.

- The management of resources that can be used to deal with the crisis event.
- The monitoring of those resources and the missions they are assigned to.

The solutions selected to participate in Experiment 43b were specifically aimed at addressing previous gaps by improving the aspects listed here above. As it is well known that existing legacy systems are diverse and that potential additional solutions would be heterogeneous, there was a clear need of achieving interoperability between different implementations of each type of solution. Taking this into consideration, an implementation of the CIS concept developed in WP42 needed to be put in place, using Emergency Management Shared Information (EMSI) as the standard for exchanged messages. This enabled to also evaluate:

- The ability of the CIS concept to support the required exchange of information between heterogeneous IT solutions.
- The utility of EMSI to provide the syntax and semantics required for such exchange.
- The adaptations that EMSI would require to be fully operational.

2.1.2 Objectives and criteria of success

The Experiment 43b design and execution was approached from a three-dimensional scope, formed by:

- The **end users dimension**, understood as the perspective of the experiment (or platform) owner on the basis of the corresponding end users' needs.
- The **CM dimension**, understood as the operational perspective, related to the CM performance and procedures with a special consideration of the identified gaps (including but not limited to crisis response, but also to the test and evaluation procedures).
- The **solutions dimension**, understood as the perspective of the solution providers and mainly related to the capability of certain solution to drive innovation (contributing to bridging the gaps) or improve CM performance.

The concrete objectives of the experiment were therefore established according to this three-dimensional approach.

Regarding the end users dimension, the Polish platform owner (concretely, the Eastern European Platform supporting the execution of Experiment 43b in Gdynia) established the following objective, according to the end users' needs and their main interests:

OBJ01: Validation and test of the:

- a. Evacuation from the vessel to the Landing Sites (LS). These are special places with dedicated infrastructure for handling the evacuated people and providing medical assistance.
- b. Survivor assistance plans (handling the evacuated people on land) by the regional crisis management centres, which may cooperate with other services like Fire Service, Police, Non-Governmental Organisations, etc.
- c. Information exchange and cooperation between the Landing Sites, Regional Crisis Management Centre and Governmental Centre for Security.

Regarding the CM dimension (prevailing in the Swedish platform, i.e. MSB Revinge), it was agreed that the two main objectives of the experiment were:

OBJ02: Execute a multi-site (and multinational) activity taking advantage of the Test-bed's functionalities and the operational solutions already in place at the corresponding stage of the project, and exercise and evaluate the methodological approach followed to perform the experiment and collect observations by players, evaluators and observers.

OBJ03: Evaluate to which extent (if any) the deviation between “perceived reality” in the different Coordination Centres and between this “perceived reality” and the “actual reality” can be reduced with the DRIVER approach (objective linked to research question RQ01).

From the solutions dimension, three main technical objectives were identified:

OBJ04: Assessment of the usage and the added value provided by a distributed Test-bed (deployed in three different locations: Revinge, Gdynia and Sandö) including simulation (both ground truth and constructive).

OBJ05: Assessment of the capability of the solutions participating in the experiment execution (both operational and Test-bed) to achieve technical interoperability through the usage of a CIS based on the exchange of EMSI (Emergency Management Shared Information) messages.

OBJ06: Evaluate whether these solutions and the integration of them into a System of Systems actually contribute to gain an operational benefit and fill the relevant gaps associated to Experiment 43b (objective linked to research question RQ02).

The execution of the experiment was expected to provide enough elements of judgement to be able to evaluate to which extent these objectives were accomplished. An overall success of the activity should be seen as the proper execution of the experiment; therefore, a simulation of crisis information flow was expected to be made in a realistic approach. It must however be taken into account that it was not an objective of the experiment evaluating Standard Operating Procedures (SOPs) or operational and crisis management plans; but to validate the usefulness of tools and techniques supporting decision-making.

The organizer of the experiment was expected to create a possibility for the participants to work in an environment close to reality, but with a staff model tailored to the needs of the end users and solutions available within DRIVER catalogue. Legal and organizational solutions arising from domestic legal and institutional system were implemented in a form and scope necessary to reach the main objectives of this activity; other assumptions of the scenario had been tailored to the needs of experiment’s participants.

During the experiment, the organizer planned to use evaluation questionnaires in order to validate the solutions which were used in the experiment. The organizer did not however evaluate the used methods, manners or the quality of the participants’ work.

Considering this, the criteria of success, from an operational perspective, included:

- Fulfilling a scenario which includes handling people in the Landing Sites.
- Fulfilling a scenario which involves the cooperation between various levels of Crisis Management Services (Local – LS, Regional and Country-wide).
- Establishing cooperation rules between countries.
- Collection of the guidelines and lessons learnt material for future use.
- Networking between people taking part in the experiment.

An initial summary in a form of hot wash expressed by participants was carried out on the last day of exercise.

From a technical perspective, the criteria of success can be divided into multiple interdependent levels. The first level is technical infrastructure and communication, which provide the means to run the experiment involving actors and tools (which in turn enables collection of data and observations in a realistic scenario). The second level is connected to technical aspects of the tools that were used in the experiment, such as the capability to send and receive messages using the CIS. The final level is about gathering relevant feedback from end users that would influence further research and development.

The concrete criteria can be summarized as follows:

- Technical infrastructure and communications related criteria of success.
 - The solutions are able to receive and send EMSI messages using the CIS.

- EMSI standard is suitable (at least as a first approach or step) to exchange operational information through the CIS, being able to represent the reality in a meaningful way during a crisis situation.
- EMSI is easy to use and has advantages over other existing protocols.
- Solution related criteria of success.
 - The solutions are capable of supporting the actors in terms of being able to create tasks, monitor task progress and share information in an adequate way in the four phases of the experiment.
 - The solutions are able to correctly interpret and display information received from other actors.
- Feedback related criteria of success.
 - Insights and lessons learned related to the capability to assist the actor are collected and documented during the experiment.
 - A questionnaire is answered by the actors using the tool after the experiment.

2.2 Scenario

This section provides a description of the scenario that served as the context for Experiment 43b.

At an early stage of the former DRIVER experimentation process, two different platforms raised their interest on this experiment: MSB (Sweden) and the Eastern European Platform (sited in Poland). It was decided to incorporate both platforms to the experiment and include a cross-border cooperation facet. In order to set up a realistic scenario, the incident was placed at sea (which was the only realistic alternative for cross-border cooperation between Sweden and Poland).

Finally, the chosen scenario was a Massive Rescue Operation for the evacuation of a ship having a fire incident on the Baltic Sea, which involved of citizens from different countries. Because of that, the activity was international; and involved members from Polish and Swedish crisis management institutions which operate on local and regional areas as well as members of rescue units operating on sea. Actions would be taken in a realistic information environment, based on currently available means, crisis management plans, rescue procedures and good practices developed by particular members.

The crisis situation was declared when the Polish Maritime Rescue Coordination Centre (MRCC) in Gdynia and the Swedish Joint Rescue Coordination Centre (JRCC) in Gothenburg received an “SOS” signal from the MV Fire Sparrow, a passenger ship with 1780 people aboard. The large scale of the incident required the cooperation between the corresponding Swedish and Polish CM bodies.

2.2.1 Scenario description

The initial situation was as follows:

MV Fire Sparrow leaves the port in St. Petersburg and starts the journey to Luebeck harbour. The vessel has 1780 passengers, 580 cars and 150 trucks on board. Captain receives early warning about severe weather conditions - near gale wind 7 B scale (14 m/s), sea state 6 B scale, sea wave 4-5 m, visibility less than 3 miles in precipitation. Ten hours after departure of the vessel, one of its cooling systems has failed, which leads to engine overheating and a fire in the engine room. The crew of the ship inform her owner about the emergency situation. However, due to the fact that fire starts to spread to the compartments with flammable resources, the crew needs to call for external help.

Polish Maritime Rescue Coordination Centre (MRCC) in Gdynia and Swedish Joint Rescue Coordination Centre (JRCC) receive then an “SOS” signal from MV Fire Sparrow. Most of the available resources are dispatched on the scene of the possible maritime disaster. Polish and Swedish crisis management centres at regional and central level are immediately alerted. SAR starts contingency planning for the first time ever Mass Rescue Operation at the Baltic Sea (Figure 2.1).



Figure 2.1: Event place and SAR responsibility division

The incident entailed the need to evacuate passengers from ship and moving them, using the available evacuation means, to the corresponding Landing Sites (where they can be triaged and treated if necessary) and then carrying them, using the required transportation means, to the corresponding rest centres or hospitals, depending on the assessment.

Thus, there was a crisis situation which could be characterized by the following needs (Figure 2.2):

- The evacuation of all the passengers to the corresponding Landing Sites in Poland and Sweden.
- The assessment of evacuated people, provision of medical assistance to those requiring it and their transportation to rest centres or hospitals, as required.
- The final accommodation of the people not requiring medical assistance in rest centres.

In a deeper detail, the CM activities to be performed consisted of:

- Activities on sea: fire extinguishing, evacuation of people from the ship, taking care of wounded, providing information about sea actions to subjects that coordinate rescue action on land.
- Activities on land: assignation of admission site to evacuated people, headquarters organisation, helping the wounded, giving information to public administration subjects about the incident, giving information to media, giving information to wounded families, communication with teams that are conducting rescue operations on sea, transportation of evacuated people to their final accommodation places.

The situation would be considered overcome (or solved) only once all passengers had been accommodated. In order to deal with this situation, the Polish and Swedish CM bodies counted on a series of resources:

- Sea evacuation means (helicopters and vessels, with and without medical capability).
- Land transportation means (ambulances and buses).
- Accommodation means (hospitals and rest centres such as hotels or sport complexes).



Figure 2.2: General overview of the crisis situation

The CM activities and the management of previous resources were coordinated by the following command posts (mobile or fixed):

- The Joint Rescue Coordination Centre (JRCC) in Sweden.
- The Maritime Rescue Coordination Centre (MRCC) and the corresponding Regional and National Operations Centres (ROC and NOC) in Poland.
- The On-Scene Commander (OSC), which is a mobile command post set up at the incident place (the MV Fire Sparrow passenger ship). The role of OSC can be performed by an on-field asset moved to the ship or even by the ship's captain.
- The Landing Site Operation Centres (LSOC), which are specifically deployed for the occasion both in Poland and Sweden. A LSOC is an on-field command post, which controls the activities performed in the corresponding Landing Site (e.g. reception and registration of evacuated people who are not directly brought to hospitals and later distribution of these people to the corresponding accommodation places).

In each and every moment it is required to monitor the crisis situation, in order to account for:

- The number of people in each location (aboard the ship, being evacuated, in Landing Sites, being carried to their final accommodations, or already accommodated) and their assessment (needing medical assistance or not).
- The available capacity (understood as the room for carrying or accommodating people) of the evacuation, transportation and accommodation means.
- The status of the missions being performed and the status and position of previous resources.

Figure 2.3, Figure 2.4 and Figure 2.5 describe the command posts, their location (in real life) and their functions.



Figure 2.3: Real geographical locations of the command posts



Figure 2.4: Command posts – Sweden



Figure 2.5: Command posts – Poland

2.2.2 Hosting platform

The experiment involved international cooperation and was hosted by two platforms, one in Sweden and the other in Poland. In Sweden, the experiment was hosted by MSB in Revinge, while in Poland it was the Eastern European Platform, hosted for the experiment by the Gdynia Naval Academy (Poland). MSB in Sandö (Sweden) was also providing support for the ground truth simulation.

In Poland, the main place dedicated for the experiment execution was a large assembly hall, which had sites devoted to four groups of end users, representing the different command posts specified in previous section. In Sweden, a number of specific rooms (booths) were also prepared for this purpose:

- Command posts in Sweden – MSB Revinge:
 - Joint Rescue Coordination Centre (JRCC).
 - On-Scene Commander (OSC).
 - Landing Site Operations Centre (LSOC).
- Command posts in Poland – Gdynia Naval Academy:
 - National Operations Centre (NOC).
 - Maritime Rescue Coordination Centre (MRCC).
 - Regional Operations Centre (ROC).
 - Landing Site Operations Centre (LSOC).

The control rooms were equipped with the solutions provided by the project partners, and included a wide-band Internet connection with the appropriate technical infrastructure, including wired and wireless connection capabilities. Furthermore, the assemble halls were equipped with microphones, speakers, a projector, screens and audio mixing consoles.

On each command post, a subset of resources was deployed: the actors, tools and additional material. It has to be remarked that not all the on-field elements that would be involved in the real crisis situation were considered, and that the ones considered were simulated. This avoided some complexity that was unnecessary to be addressed for the specific experiment purposes; the subset of on-field resources being

simulated was considered representative enough. It has to be also remarked that the simulation was interactive; i.e. simulated assets were able to respond to mission assignments issued by the actors using the operational solutions and provide reports on their status and the status of the assigned missions.

All the existing IT solutions in Revinge were included in a Local Area Network (LAN MSB Revinge); in the same way, all the existing IT solutions in Gdynia were included in a Local Area Network (LAN Gdynia Maritime University). These two LANs were connected to each other through a Virtual Public Networks (VPN) (Figure 2.6).

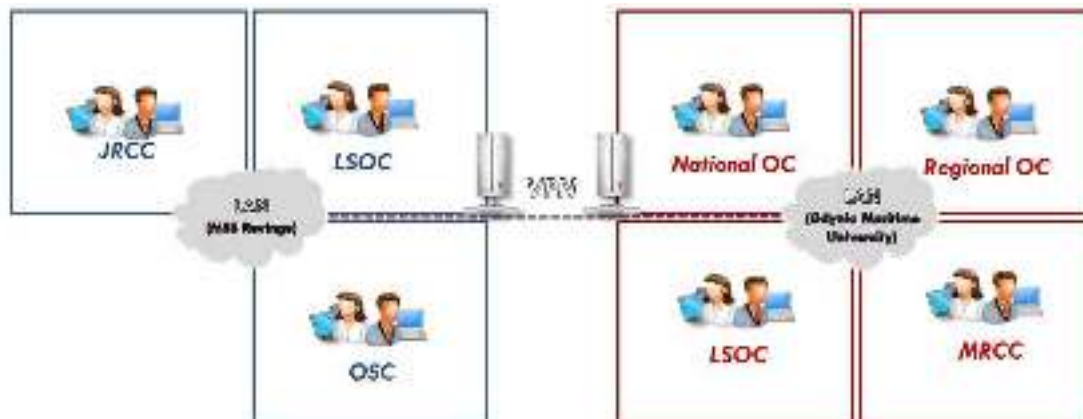


Figure 2.6: Organisation in the Hosting Platforms

All those IT solutions (both in Poland and Sweden) were able to exchange information based on the CIS concept put in place as part of the WP42, using the ISO's EMSI standard. With this aim, one CIS server (instantiated by the Socrates CSS tool) providing the backbone network was deployed in each one of those LANs (CIS Server Revinge and CIS Server Gdynia). Those servers were responsible of the communication between the solutions in their network and also of the communications with the other location.

From a game conduction perspective, two additional booths (one in Gdynia and the other in Revinge) were located for the Game Control, exchanging information with the simulation, providing injections to the other booths and keeping the coordination with the Game Control booth in the other location.

2.2.3 Participants and roles

In Poland there were a group of 36 stakeholders from the following organizations:

- National level.
 - Government Centre for Security.
 - Crisis Information Centre (division of Space Research Centre).
- Regional level.
 - Sea Rescue Service.
 - Sea Search and Rescue Service from Gdynia.
 - Regional administration.
 - Warmińsko-Mazurskie Voivodship Office in Olsztyn.
 - Police.
 - Voivodship Police Headquarters Post in Olsztyn.
 - Police Headquarters in Olsztyn.
 - State Fire Service.
 - Voivodship Fire Service Headquarters Post in Olsztyn.
 - Poviāt Fire Service Headquarters Post in Elbląg.
 - Municipal Fire Service Post in Gdańsk.
 - Municipal Fire Service Post in Olsztyn.

- Medical Service.
 - Voivodship Emergency Medical Services Post in Olsztyn.
 - Helicopter Emergency Medical Service.
- Military.
 - Military Police Elbląg Division.
- Non-governmental Organisations.
 - Polish Red Cross.
 - Great Orchestra of Christmas Charity.
 - Polish Scouting and Guiding Association.
- Observers.
 - National Defence University.
 - Polish Naval Academy.

They were subsequently grouped into three groups representing National Operational Centre, Regional Operational Centre and Landing Site Operational Centre. The NOC has been represented by the Government Centre for Security. The ROC was represented by the Regional administration (Voivodship office) and representatives from Police and Firefighters. The biggest team was the LSOC which involved people from Regional level (Medical Services, Firefighters, Police, Military and administration) and NGOs. There was also a group responsible for contacts with the Swedish side and which has involved people from SAR, Administration, DRIVER partners and platform members (ITTI and Crisis Information Centre).

2.3 Technical set-up

The technical set-up of Experiment 43b consisted of two main components: the integration of operational solutions into a System of Systems and the implementation of a Test-bed including supporting solutions, which provided, for instance, the ground truth and the required simulation capability.

Additionally, a whole technical infrastructure was deployed in order to set up an efficient exchange of information between the different sites of the experiment, including: Virtual Public Networks (VPNs), video display matrix, videoconferencing solutions, video streaming, etc.

This entire framework allowed raising conclusions related to the following aspects:

- The efficient exchange of information between the different sites.
- The implementation of a shared evaluation methodology between different sites.
- The game (experiment) conduction involving different sites.
- The performance of the simulation environment aimed to avoid the deployment of real actors and means on the field for this type of experiment.

2.3.1 System of Systems architecture (integration of solutions)

Experiment 43b's SoS architecture is based on the CIS concept developed in WP42; its use (more exactly, the use of a concrete implementation of it) was a "must-do" in all DRIVER experiments. The CIS as well as its corresponding implementation in Experiment 43b are described in what follows.

2.3.1.1 CIS concept

The CIS (Figure 2.7) can be seen as a collaborative network that allows the structured exchange of information between the different solutions integrating the SoS. It provides services that allow the transmission of the data associated to the corresponding domain according to the publish/subscribe pattern.

CIS's services use a concrete data format based on a particular data model. If a system to be connected to the CIS uses a different data model or transmits the data using formats or communication protocols not supported by the CIS, these have to be translated or converted by the corresponding adaptor.

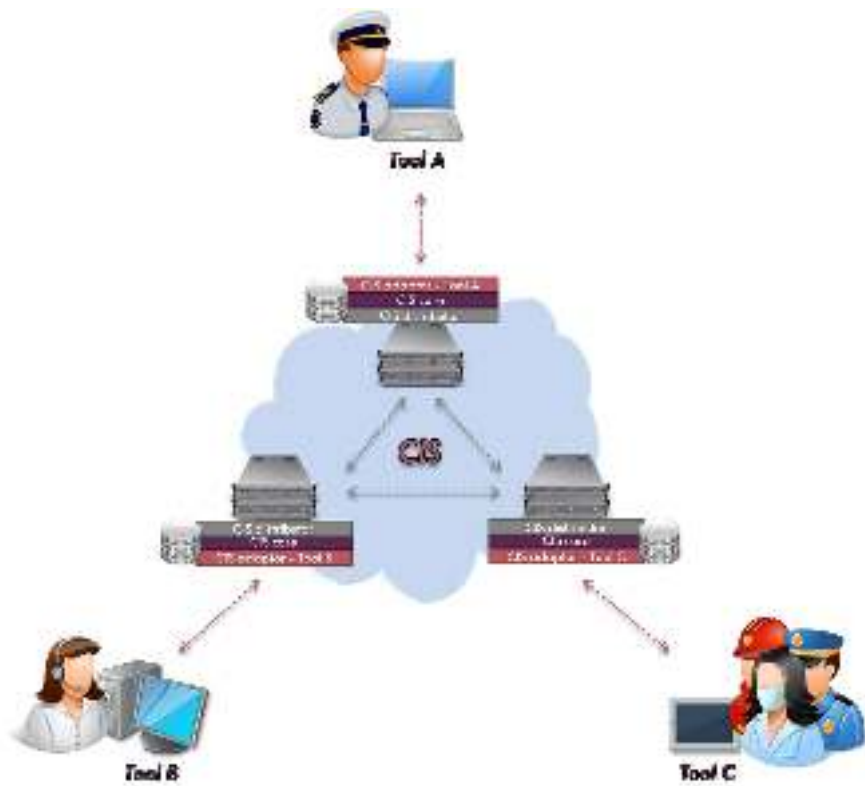


Figure 2.7: Common Information Space

As shown in Figure 2.7, the CIS is built up by a series of nodes which the systems accessing the network are connected to. The inner architecture of each node can be divided into three main components: the tool adaptor, the core and the distributor. The adaptor is aimed at translating the tool's native data model into the one used by the CIS, as well as performing the corresponding data formats and/or communication protocols conversion. The core and the distributor are in charge of providing the CIS interface, services and distribution mechanisms used to transmit and receive the corresponding data. This way, while the adaptor is only required when the system to be connected does not “speak” the same language than the CIS, the core and the distributor are tool independent and the key components of it.

It is important to remark that, beyond the physical connection (technical interoperability), data models and formats (syntactical interoperability), the interpretation of the content (semantic interoperability) is crucial for automated information exchange. Due to this, the EMSI standard was selected as the reference model for the data to be exchanged in Experiment 43b, as it provides a robust data model that addresses key CM concepts (such as event, mission and resource) as well as an extensive data dictionary with the definition of the values that the different data fields may be assigned.

2.3.1.2 CIS in Experiment 43b

In the context of Experiment 43b, the CIS was implemented by means of the *Socrates CSS* tool. Particularly, this tool provided an implementation of the core and distributor components of the CIS. Thus, the collaborative network was composed by two instances of the *Socrates CSS* tool (one at each of the experiment's sites) acting as the network nodes (Figure 2.8).

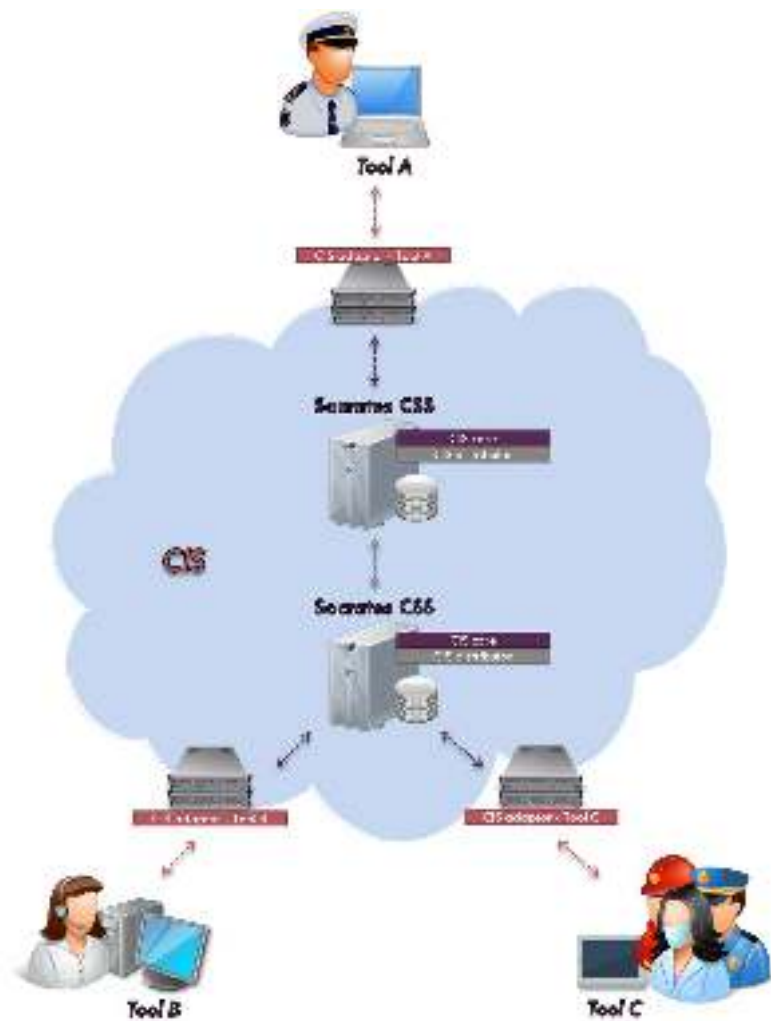


Figure 2.8: (Two node) CIS-based architecture using Socrates CSS

Socrates CSS follows a Service Oriented Architecture (SOA) approach based on the publish/subscribe paradigm. On top the Socrates CSS infrastructure a new service (namely, the EMSI service) was deployed in order to enable connected systems exchanging XML-formatted EMSI messages through the CIS. Those systems that wanted to be notified when a new message was published additionally needed to implement the Notify service on their side (either in the corresponding tool adaptor or the tool itself if no adaptor was being used). A high-level sketch of CIS communications is illustrated by Figure 2.9.



Figure 2.9: CIS communications using Socrates CSS

Both SOAP and RESTful interfaces were developed for the EMSI service. This service provided operations for publishing EMSI messages and retrieving them from the CIS. The SOAP implementation additionally allowed clients to subscribe and unsubscribe to EMSI messages and be notified about the publication of them by means of the Notify service.

EMSI messages were generated by the tools connected to the CIS according to a set of rules and constraints in order to support the SoS capabilities required for the Experiment 43b, namely:

- Sharing operational/tactical information on crisis event, missions and resources.
- Tasking available resources.
- Requesting for additional resources.

In order to support these capabilities, two main kinds of messages were identified:

- **Report:** Aimed to inform about the overall operational situation, including the corresponding event and the related missions and resources. This kind of message may contain the whole picture as it is seen by the message sender or only part of it, in case it was just an update of the information previously provided by the same or a different sender.
- **Request:** Aimed to make a request to the message receivers regarding the management of the corresponding crisis events. The information inside this message was not intended to provide a picture about the actual/current situation but to indicate what was needed (according to the sender's view) to properly manage it. Examples of requests can be requests for resources or requests to perform a given mission.

Table 2.1 illustrates the link between the required capabilities and the messages here above.

Table 2.1: Experiment 43b types of messages

Required capability	Type of message exchanged	
	Name	Function
Share operational/tactical information on crisis event, missions and resources.	Report	To report information about the operational situation. This may include information about the crisis event itself or about the status of the associated resources and missions. It may provide a complete or partial picture of the sender's view of the situation.
Task available resources.	Request	To request receivers to perform the corresponding missions or to contribute with additional resources to the crisis management.
Request for additional resources.		

Previous types of messages were considered enough to cover Experiment 43b's information exchange needs. Both of them consisted of an EMSI message to be exchanged using the EMSI service as stated above. EMSI's data model is fully based on the Tactical Situation Object (TSO) Document Object Model (DOM), shown in Figure 2.10. A detailed description of EMSI contents can be found in (3). TSO specification can be found in (4) and (5).

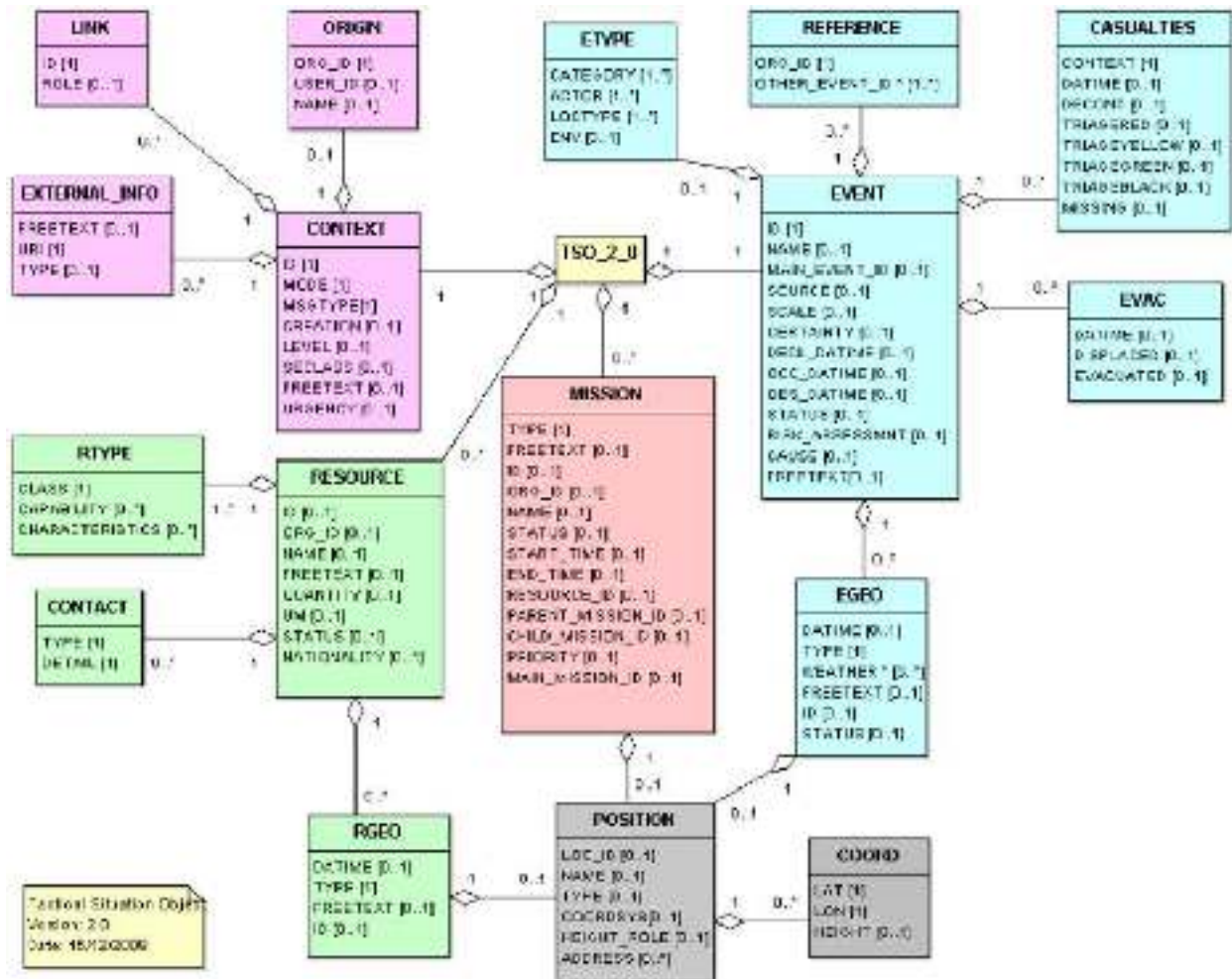


Figure 2.10: TSO Document Object Model

2.3.1.3 Tools involved

It is clear that, due to the nature of the situation (as described in section 2.2), the task of aligning the information held by the different command posts distributed among Sweden and Poland was of a great complexity. This is the reason why most of operational tools being used in Experiment 43b were devoted to improve the situational awareness and contribute to the COP. Some of them also included tasking and resource management capabilities, as required by the activities foreseen in the experiment scenario.

The main features provided by these tools were:

- **Common Operational Picture** solutions:
 - Provide snapshots of the situation.
 - Exchange situation data with other COP tools and assets on the field.
 - Hold information about crisis events.
 - Allow users to access event-related information.
 - Provide command posts (operational centres, coordination centres, control rooms...) a “window” to the external world.
- **Tasking and Resource Management** solutions:
 - Enable to monitor the status and position of resources.
 - Allow to create and monitor missions.
 - Allow to assign resources to missions.
 - Allow users to access to mission-related information.

The concrete list of operational tools taking part in Experiment 43b was:

- **LUPP** (MSB): Operative logging, command and control and mission situation awareness tool for local rescue services organisations.
- **SITRA** (FOI): Research prototype for a COP in the context of crisis management. On top of traditional functionality (e.g. COP map view with icons, database, web services, etc.) it includes semantic techniques, reasoning and decision support to leverage the existing information. Its main purpose is to build Situation Assessment and decision support for a command central based on available information, supporting also management of resources and tasks.
- **PROTECT** (EDI): Allows the management of emergencies, involved resources, requests for assistance, documents involved and lessons learned registry in a crisis situation, as well as monitoring its development.
- **ESS** (GMV Sistemas): The ESS Portal aims to offer a common interface for crisis management by integrating in real time information from multiple organizations and offering additional capacities for simulation, prediction and information sharing, simplifying cooperation among different forces and providing actionable, up-to-date information of the current situation.
- **Socrates suite** (GMV), composed by:
 - **Socrates CSS**: Collaborative tool aimed at enabling the information sharing between heterogeneous systems in a multi-organizational environment by building up a SOA based on the publish/subscribe mechanism. Its core infrastructure allows the usage of the tool in different domains just by adding new services that allow the transmission of the data associated to the new domain. In Experiment 43b, this tool was the one implementing the CIS (see section 2.3.1.2).
 - **Socrates OC**: Enables analysis and decision-making based on shared situational awareness by providing a COP including a Geographic Information System (GIS) and visualization of data (based on graphics and symbols) about the corresponding operational situation.
 - **Socrates TSK**: Enables the definition of contingency plans, the monitoring of organic resources and the assignment of tasks to relevant resources to execute the contingency plan or to define ad-hoc tasks. Besides, it improves the coordination of multi-national and multi-agency missions through assets and tasking requests.
 - **Socrates FR**: Enables the reception of tasks assignments from the corresponding control centre and enables analysis and decision-making based on shared situational awareness by providing a COP including a GIS and visualization of data (based on graphics and symbols) about the corresponding operational situation.

Annex 2 provides a more in depth general description (in the form of information cards) of these solutions, including the expectations the corresponding solution providers had with regard to Experiment 43b.

2.3.2 Test-bed

This section describes the DRIVER's Test-bed solution developed for DRIVER Experiment 43b. The Test-bed functionalities allowed executing the coordinated experiment between the two different platforms and the three different locations mentioned in previous section: MSB located for this experiment in Revinge and Sandö (Sweden), and the Eastern European Platform located for this experiment in Gdynia Naval Academy (Poland).

Additionally, it has to be noted that the DRIVER's Test-bed, and especially, the simulation support, was a key driver for an experiment which was expected to involve a high amount of on-field resources, such as helicopters, ambulances, etc. (see section 2.2), that for practical reasons could not be effectively deployed as part of the experiment (at least, at that stage of the DRIVER experimentation process). It also allowed the ground truth simulation (simulation of personal actors) of the Swedish Maritime Incident Response

Group (MIRG) team in the ship and the constructive simulation (simulation of each individual resource) of the helicopters, ships, ambulances and buses doing the evacuation of the passengers.

2.3.2.1 Test-bed requirements

As a brief summary, the high-level requirements for the Experiment 43b's Test-bed solution were as follows:

1. The Test-bed shall simulate the following resources:
 - 1.1. Sea evacuation assets: SAR helicopters and SAR vessels.
 - 1.2. Land transport assets: Ambulances, buses and taxis.
 - 1.3. Hospital beds.
 - 1.4. Accommodation places (beds in rest centres).
 - 1.5. Number and location of evacuated people per resource over time.
2. The Test-bed shall incorporate a Resource Manager that:
 - 2.1. Handles mission requests for previous resources coming from the operational solutions (i.e. process instructions from these solutions and send the corresponding orders to the simulation).
 - 2.2. Provides status information about these resources (on availability and about their positions, when applicable) to the operational solutions.

This Resource Manager will act as an interface between the simulation and the CIS, which the operational solutions are connected to.
3. The Test-bed shall simulate the MV Fire Sparrow, the Marie X and the Tug Boat.
4. The Test-bed shall simulate general vessel traffic as background noise.
5. The Test-bed shall provide a GUI for the SAR team to operate a SAR Helicopter on the incident scene.
6. The Test-bed shall provide a GUI that visualizes the area, resources and vessel traffic.
7. The Test-bed shall provide the means to coordinate the whole simulation scenario.

A conceptual representation of the problem space to be modelled by the Test-bed is provided in Figure 2.11. Figure 2.11 shows in the blue box the entities that must be represented in the Test-bed. The green box represents the operational environment and tools, interconnected via the CIS. This box is not in the scope of the Test-bed and was already addressed in previous section; nevertheless the Test-bed uses the CIS to exchange the required data with the operational solutions (as specified in previous requirements).

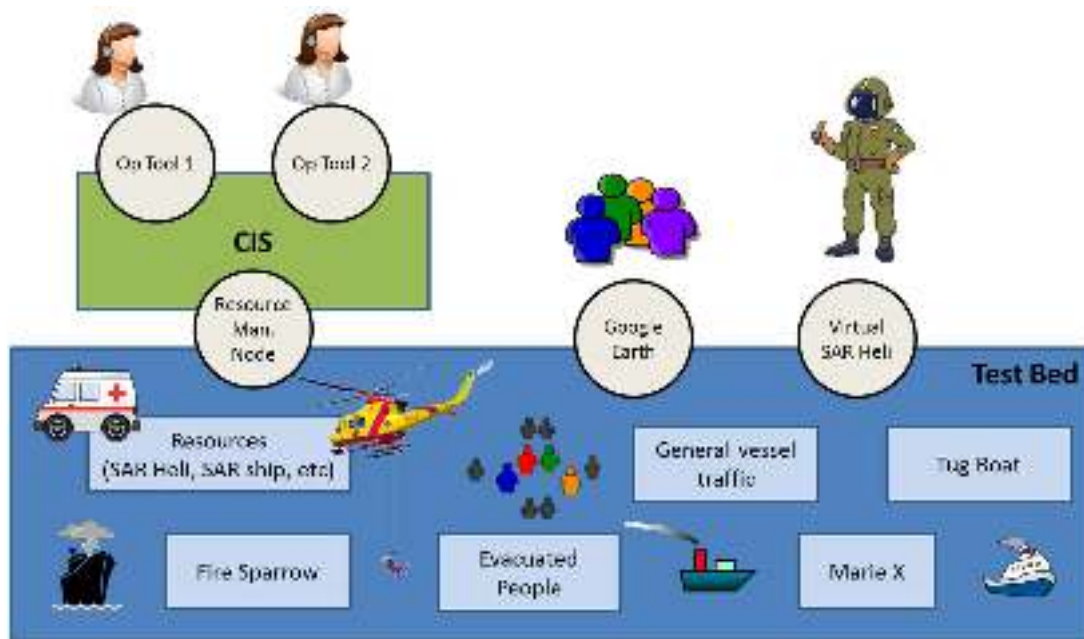


Figure 2.11: Conceptual representation of the problem space for the Test-bed

2.3.2.2 Test-bed solution architecture

This chapter describes the solution architecture of the DRIVER Test-bed for Experiment 43b and identifies the simulation tools that perform a role in the Test-bed. The selection of suitable simulation tools was made in a dialog between the SP2 Technical Point of Contact, the experiment leader and the tool providers. Various building blocks of the Test-bed Reference Architecture were incorporated in the Test-bed solution architecture for Experiment 43b in the form of a simulation or an orchestration tool:

- Crisis Management actor/system model, scenario presentation model and environment model building blocks (simulation tools).
- Infrastructure, integration, and monitoring and control building blocks (orchestration tools).
- Simulation data exchange models that specify the ground truth and non-ground truth information that is exchanged at run time between Test-bed tools.

The component view of the Test-bed solution architecture is shown in Figure 2.12.

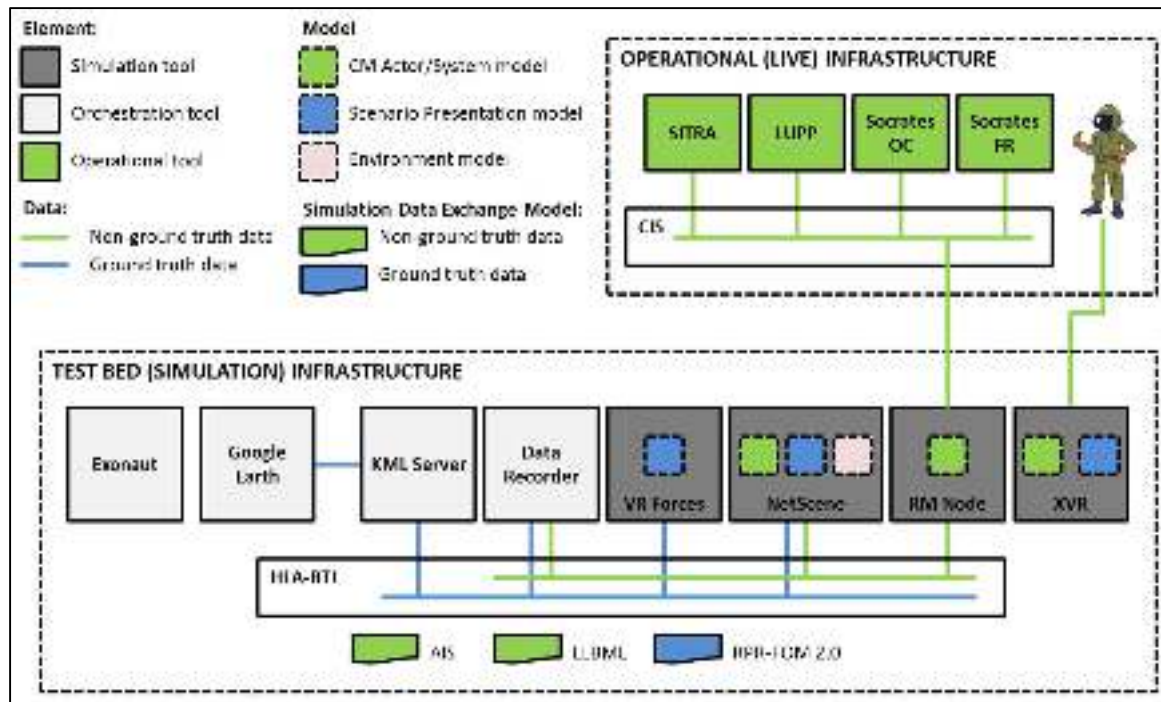


Figure 2.12: Test-bed solution architecture: component view

Here below are described the Test-bed components outlined in Figure 2.12:

- **Exonaut** (orchestration tool): orchestrates the overall scenario by keeping track of story line, collecting observations for qualitative evaluation and providing injects for live actors in the experiment. Exonaut is not integrated with the other Test-bed tools; it was provided by MSB (the supplier of Exonaut was not a DRIVER partner).
- **RMNode** (simulation tool): represents a management node for simulated resources that accepts and provides EMSI messages from/to other nodes. RMNode is connected to the CIS for the exchange of EMSI messages with other nodes, and connected with the simulation infrastructure for the exchange of simulation commands and reports with other simulation tools. RMNode breaks down EMSI messages in lower level simulation commands for simulation tools and aggregates simulation reports to EMSI messages for exchange with other nodes. The simulation commands and reports are general and are defined in a so called "Low Level BML" FOM module.
- **NetScene** (simulation/orchestration tool): represents the spatial scenario (scenario presentation model), simulating CM actors in form of resources that perform tasks originating from the CIS (CM Actor models), and controlling the progression of simulation time. The ground truth status of resources is described in the RPR-FOM module and is exchanged with other simulation tools via the HLA Run Time Infrastructure.
- **XVR On Scene** (simulation tool): simulates the on-scene action with the MIRG team fighting the fire on MV Fire Sparrow. XVR is not technically integrated with the other Test-bed tools.
- **VR Forces / Vessel Traffic Generator** (simulation tool): generates simulated vessel traffic as background traffic in the area of interest. The ground truth status of the vessels is described in the RPR-FOM module and the corresponding Automatic Identification System (AIS) data in the AIS FOM module. All data is exchanged with other simulation tools via the HLA Run Time Infrastructure.
- **KMLServer** and **Google Earth** (orchestration tools): KMLServer provides a KML feed for showing the ground truth in Google Earth, as communicated via the HLA Run Time Infrastructure.
- **Data Recorder** (orchestration tool): records simulation data.
- **HLA-RTI** (orchestration tool): The HLA Run Time Infrastructure is used for the exchange of simulation data between simulation tools and orchestration tools.

2.3.2.3 Allocation of modelling responsibilities

This chapter summarizes the modelling responsibilities of each simulation tool. Some of the modelling responsibilities were simulation state dependent, according to the transition diagram shown in Figure 2.13.

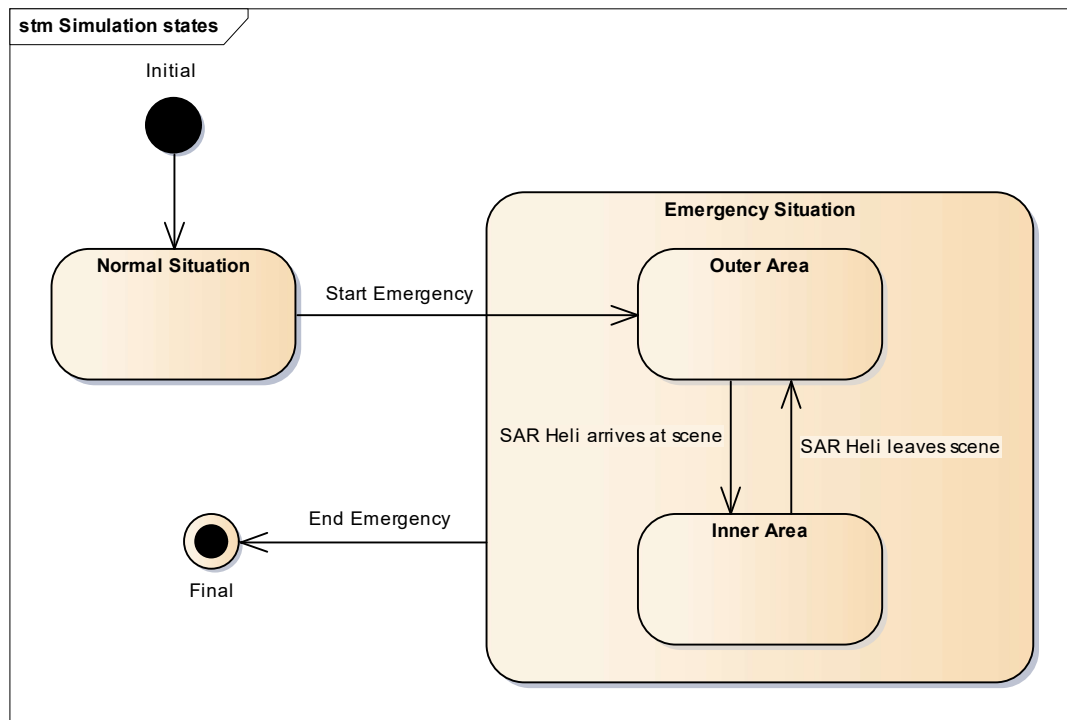


Figure 2.13: Test-bed simulation states

The area of the Baltic Sea which was simulated was divided into an inner and an outer area:

- Inner area: the scene of the incident (a few square kilometres) around the MV Fire Sparrow.
- Outer area: the remainder of the area.

The initial state corresponds to the Normal Situation. In this state there is the usual vessel traffic in the Baltic Sea. The trigger to the Emergency state is the “SOS” call from the MV Fire Sparrow. In the Emergency Situation the sea and land evacuation and transportation resources are mobilized and activated. This state has four phases in which people are evacuated and transported. The Emergency Situation is subdivided in two sub states, called Inner Area and Outer Area (according to the division of the simulated Baltic Sea area described above). In the Inner Area state one of the SAR Helicopters is simulated by XVR and operated by the SAR team to perform a SAR mission aboard the MV Fire Sparrow. In both the Inner and Outer Area states resources and entities are simulated by NetScene and VR Forces.

The Simulation Data Exchange Model (SDEM) is a specification of the information that is exchanged at run-time between the Test-bed tools. For the High Level Architecture (HLA) the SDEM corresponds to the HLA Federation Object Model (HLA FOM). The HLA FOM describes amongst others the object classes, object class attributes, object class hierarchy, interaction classes and interaction class parameters for a simulation environment.

The DRIVER Test-bed solution for Experiment 43b uses the following FOM modules (see (6)):

- RPR-FOM 2.0: defines the ground truth information (e.g. resource position information, vessel position information).
- AIS FOM: defines the non-ground truth AIS information (i.e. the standard AIS information).
- LLBML FOM: defines the lower level simulation commands and reports used for resource tasking and reporting.

Although the SDEM represents an agreement among tools as to how runtime interaction will take place, there are other operating agreements that must be reached and that are not documented in the SDEM, such as progression of simulation time, synchronization points between tools, and attribute update policies.

The DRIVER's Test-bed solution for Experiment 43b conforms to the agreements compiled in (7).

2.3.2.4 Main functions of the Test-bed

The main functions performed by the Test-bed, and the specific tools in charge of realizing these functions, are briefly described here below:

- **Resource tasking and reporting.** Resource tasking and reporting is performed by RMNode (Resource Management Node). RMNode was connected to the CIS to participate in the EMSI message exchange with the operational tools, which are also connected. RMNode supports a subset of the data exchange model (based on EMSI) developed for Experiment 43b. RMNode can represent different organisations (those being simulated) and task different kinds of resources within the organisation. For example, a medical organisation with ambulances and hospitals or a SAR organisation with SAR assets.
- **Scenario creation.** NetScene tool use a flexible structure to create building blocks for scenario creation (the scenario model). These building blocks are defined in an object-oriented fashion that is similar to HLA FOM structure. The scenario model used for Experiment 43b is a reflection of the RRP FOM 2.0; several entity classes were added to simulate resources and keep track of passengers.
- **Simulation control.** NetScene can control a simulation enabling the gaming organisation to manage, inject and change entities within the simulation.
 - NetScene use HLA time management to be able to pause, continue, speed up and slow down the simulation for other simulators also using time management. In the experiment this was used in order to fast forward simulation between phases (during a given phase, the action was in real-time).
 - NetScene can inject new entities into the simulation on the fly. In the experiment this was used when participants wanted for example to transport people to a hospital which did not exist in the simulation from the beginning.
 - NetScene can modify entities in the simulation. This was used to adjust for demands from the gaming organisation such as changing capacity for resources or changing the routes and velocity for resources.
- **Integration into the Test-bed.** NetScene can be configured to publish and subscribe entities and interactions from an HLA simulation. For Experiment 43b the LLBML FOM was added to NetScene, enabling NetScene to interact with the RMNode (e.g. if a MoveToLocation command was received from the latter, a motion model was created for the tasked resource). RPR-FOM 2.0 was used to share ground truth data between NetScene, KLMServer and the Vessel Traffic Generator.
- **Simulation scenario.** The simulation scenario includes several types of resources (Figure 2.14): facilities (e.g. landing site, hospital, rest centres) and assets (helicopters, ambulances, buses, vessels). They all have certain capacity to keep or move people. Assets can generally perform tasks (or missions) and transport people between facilities and locations. Assets cannot be filled over their capacity, while facilities can; it was up to the corresponding operator and operational tool to keep track of overwhelmed landing sites, hospitals and other accommodations.



Figure 2.14: Test-bed simulation showing tasked resources and vessel traffic (*NetScene UI*)

- **Vessel traffic and AIS data generation.** Background vessel traffic in the Baltic Sea along with the production of vessel AIS data is provided by VR Forces and the VR Forces Vessel Traffic Generator (VTG) plug-in (Figure 2.15). The Vessel Traffic Generator is an agent based maritime traffic generator. A vessel traffic scenario is initially created in a KML editor like Google Earth and includes the definition of harbours, sea-lanes, ferry routes, fishing areas, and densities per vessel type. The vessel traffic scenario can subsequently be loaded and executed in VR-Forces (using the VTG plugin).



Figure 2.15: Vessel traffic generated by VR-Forces

VR-Forces tool creates the ground truth simulation entities (modelled as surface ships in the RPR FOM). The international traffic is spawned regularly at the area of interest edges to maintain the desired densities. Each ship has an alibi (origin, destination, etc.) which is generated only when

needed. The VTG maintains an extensive set of characteristics for each generated vessel and also includes an AIS generator for non-ground truth AIS data.

- **On-scene search and rescue.** On-scene search and rescue is supported by XVR On Scene simulation tool. XVR On Scene was used in Experiment 43b to create an on-scene search and rescue scenario, involving the MV Fire Sparrow, a SAR Helicopter and the MIRC team fighting the fire on MV Fire Sparrow.
- **Data visualization.** The KML server creates a connection between Google Earth and the Test-bed simulation, enabling the user to view the status and positions of simulation entities on top of graphical data from Google Earth (Figure 2.16). The KML Server can simultaneously serve multiple Google Earth clients that can run anywhere in the network. For Experiment 43b, it supported the experimentation team in gaining situational awareness by providing up to date information on the location of resources. The KML Server currently supports RPR FOM data.



Figure 2.16: The mission area and the MV Fire Sparrow

- **Scenario orchestration and collection of observations.** One important feature of the Test-bed was the ability to control the orchestration and to enable data collection. For the Experiment 43b execution in Sweden, three different modules from the Exonaut™ SW suite were used:
 - **Scenario orchestration – Exonaut Training and Exercise Management (TEM) system.** Exonaut™ TEM is a training and exercise management system, delivering a comprehensive exercise management tool to support structure, cohesion and visibility in everything from smaller exercises to two-day distributed simulations. In Experiment 43b, it was used to design the scenario, create dynamic events, which reflected “live” participant decision-making and to assess performance against defined objectives.
 - **Capturing observations – Exonaut™ Compliance and Performance Manager (CPM).** Exonaut™ CPM is a platform through which to capture organization-wide evaluations on compliance and capability levels. It enhances reporting by providing a management dashboard view on risk levels and capability gaps. This supports decision-making on prioritization of mitigation efforts, resource and investment. Exonaut™ CPM was used in Experiment 43b:
 - To plan, conduct and monitor activities to assess performance against selected objectives as well as for regulatory and compliance demands.
 - As an integrated survey tool to distribute self-assessments across the organization and external observers.
 - To support real time field reporting activities through Exonaut™ Observer.

- For real-time tracking, dashboard views and reports to support the gaming organization in decision-making.
- To support the immediate experiment hot wash-up using dashboard reporting and aggregation of data.
- **Field reporting – Exonaut™ Observer (OBS).** Exonaut™ OBS is a tool through which to gather timely and accurate data, whether in the form of audits, inspections, incidents or exercises. It was used for input and capture real-time findings, observations and evaluations. This data was synchronized with Exonaut™ TDE and CPM to support reporting and management dashboard views on performance vs. objectives and compliance status. The main features which were used in Experiment 43b were:
 - To collect and share accurate field data using text, sound, images, video and geographical position.
 - To connect observations directly to observer perspectives divided into Information and Communications Technologies (ICT), Crisis management, Research or Actors interacting with operational tools in the experiment.

About 2000 observations were collected by 20 external observers from the categories above during the execution of the Experiment 43b in MSB Revinge. They had the options to use tablets provided by the platform, their own smartphone (Figure 2.17) or a laptop computer.



Figure 2.17: Exonaut Observer

2.4 Evaluation approach

For the evaluation framework, the same three-dimensional scope used for the establishment of the objectives was applied (as a reminder: the end users, the CM and the solutions dimensions or perspectives; see section 2.1.2). Three different evaluator profiles were indeed defined: crisis managers, researchers and IT specialists.

Regarding the end users dimension, prevailing in the Polish site, the experiment was just set out as an exercise where some breaks were allowed. This way, the evaluation approach was to a great extent aligned to the way practitioners were used to assess and evaluate results in their common exercise scheme. According to this, the evaluation was based on two sources of data, one being the data gathered during experiment and the other coming from debriefing of participants after it. The base methodology was concerning how the whole exercise was seen by its participants in terms of applicability to their work and whether they had gained some skills from it or not. As it is usual in end users' common exercises, the experiment included a "hot-wash" session the last day of the activity. This was an opportunity for all participants to share their individual and joint observations and for the experiment organizers in particular to gather a relatively "fresh information" on how the scenario was played from the end users perspective (in terms of advantages, disadvantages and neutral observations, such as remarks on some issues). Later, a "first impression session" is conducted preferably from three to seven days after the exercise. CM stakeholders use this opportunity to deepen their findings (collected during "hot-wash" session), and develop and co-build the most crucial elements. The time between formal finalization of the exercise and this session allows participants re-thinking their observations, requests and comments and raising other research findings. Usually it is run as a few-hours or even two or three days plenary meeting divided into individual and joint sessions. Observations collected during discussions are used as an input to the report.

On the one hand, in terms of applicability, the evaluation should concern how the outcomes from the experiment could be used in real situations (or further experiments) as guidelines or lessons learned. On the other hand, it should be also assessed whether the participants have gained some knowledge. In the case of Experiment 43b, the scenario proposed was quite close to real conditions; additionally, crisis services involved in such events were participating in the experiment.

From the CM and the solutions dimensions, a coordinated evaluation methodology to collect observations by players, evaluators and observers was defined. It included interviews, discussion sessions (involving facilitators to make sure that the collected feedback was in the right direction) and questionnaires (customized for each evaluator profile). The main objective was to figure out whether the DRIVER approach had the capability to drive innovation in CM, e.g. by contributing to bridging existing gaps and improving the current test and evaluation practices.

A complementary approach for evaluation was also considered interesting in this case (and directly applicable to the research questions established in section 2.1.1); it was based on a quantitative measuring of the difference between the "perceived realities" in Sweden and Poland and between these "perceived realities" and the "actual reality" accounted by the Game Conduction. The information about "reality" would consist on the existing knowledge about the crisis situation, based on:

- The number of people still on ship.
- The number of people already evacuated:
 - How many are being carried by sea evacuation means.
 - How many are on the Landing Sites.
 - How many are being transported to their destinations on land.
 - How many are already accommodated.
- The available (evacuation, transportation, accommodation) capacity of the resources at every moment:
 - The number of people that can be evacuated at a given time.
 - The number of people that can be temporarily hosted on Landing Sites.
 - The number of people that can be transported to their final destinations at a given time.
 - The number of people that can be accommodated at a given time.
- The status of the (evacuation, transportation, accommodation) resources. For each of them, several kinds of information (depending on the resource type) can be provided, such as their position, total (evacuation, transportation, accommodation) capacity in number of people, capacity in use (i.e. number of people allocated) and/or assigned tasks or missions.

3. Experiment report

This section addresses the execution of Experiment 43b, held on the 26th, 27th and 28th of April 2017 at MSB Revinge (Sweden; with the participation also of MSB Sandö) and the Gdynia Naval Academy (Poland) premises. The schedule that led to the final experiment execution from the DRIVER project's Initial Inventory of Tools and through the experiment preparation phases is provided in section 3.1.

Section 3.2 provides a general overview of how the experiment was structured and the activities performed. It must be noted that this report only includes a very brief summary of the experiment execution itself; the whole event was documented by video footage which was gathered by CCTV cameras, especially set up to give an insight how experiment was prepared and conducted from the observers' point of view (furthermore, there were also people on both locations who were taking pictures for future dissemination, some of which were also uploaded to the DRIVER project's Twitter account).

Section 0 includes a narrative about the gathered results as well as an analysis of them and how they link to the corresponding experiment's objectives specified in section 2.1.2.

Finally, section 3.4 provides a summary of the lessons learned according to the analysis and evaluation of results from previous sections.

3.1 Experiment schedule

The 1st Inventory of Tools in Aix-en-Provence on November 2014 was the first step on the preparation of Experiment 43b. Starting with the gained knowledge of the functionalities provided by the candidate IT solutions, and being Experiment 43b the one corresponding to WP44 (Tasking and Resource Management Tools), it was decided that the addressed gaps should be focused on tasking and resource management. It was also determined that Experiment 43b should incorporate simulation support as part of the Test-bed functionalities as a key driver for an experiment that should consider the involvement of on-field resources that will not be effectively deployed (i.e. no real assets were going to be used).

Two different platforms raised their interest on this experiment: MSB (Sweden) and the Eastern European Platform (sited in Poland), so it was decided to include a cross-border cooperation facet. During the initial months of 2015, there was a coordination at SP4 level to define a complete set of experimentation activities corresponding to the tasks defined in the Description of Work (DOW) and covering the interest that were expressed by previous platforms. In parallel, these platforms were coordinating themselves with the aim of collecting the objectives and scenarios that could be of interest for "their" end users.

On June 2015, Experiment 43b First Design Meeting was held in Warsaw involving platform owners (ITTI and MSB) and the experiment leader (GMV) for the definition of the objectives and the scenario of the experiment.

The Experiment 43b Second Design Meeting was held in Madrid on September 2015; it also included tool providers for the definition of the experiment approach and the technical set-up. The CIS infrastructure that should support the data exchange was deployed on GMV premises in Madrid by December 2015 in a way that it could be remotely accessed by all tool providers from their premises and so remote testing could be started.

On February 2016, Experiment 43b Progress Meeting and Workshop was held in Revinge with the aim of defining the evaluation framework and to have a first direct contact with end users and practitioners for the validation of the scenario. On March 2016, Experiment 43b Second Progress Meeting and Workshop was held in Gdynia for the validation of the last taken steps and to have a second direct contact with end users.

The Experiment 43b rehearsal was held on MSB Revinge from the 11th to the 14th of April, and it included:

- Deployment of the technical equipment (11th -12th April).

- Technical testing of the tools (12th -14th April).
- End users rehearsal (14th April).
- Wrap-up (14th April).

Trouble shooting of the issues found during previous rehearsal was performed by solution providers from the 18th to the 22nd of April, being the final Experiment 43b Execution held on MSB Revinge (with the participation of MSB Sandö) and the Gdynia Marine Academia from the 24th to the 29th of April 2016. The experiment execution included:

- Final tool Deployment and Testing and dry-run (24th -25th April).
- Experiment Execution – Phase 1: Alert Reception & Preliminary Assessment (26th April).
- Experiment Execution – Phase 2: Evacuation & Planning of the land operation (27th April).
- Experiment Execution – Phase 3: On-shore assistance (27th April).
- Experiment Execution – Phase 4: Transportation and accommodation (28th April).
- End users Wrap-up (28th April).

A detailed schedule of the experiment execution is provided by the following table:

Table 3.1: Experiment execution detailed schedule

Time	26 th April Tuesday	27 th April Wednesday	28 th April Thursday
8:00		Registration	DISTAFF PL briefing
9:00		Play phase 2 “Evacuation & Planning of the land operation”	Play phase 4 “Transportation & Accommodation”
9:30			
11:30		Recap Telco Poland-Sweden	Recap Telco Poland-Sweden
12:00	Readiness confirmation	Hot wash up	Hot wash up
12:30	Lunch	Lunch	Lunch
13:00			
13:30	Play phase 1 “Alert Reception & Preliminary Assessment”	Play phase 3 “On-Shore Assistance”	End users’ evaluation (questionnaires)
14:00			Wrap-up
14:30			
15:00			
15:30			
16:00	Recap Telco Poland-Sweden	Recap Telco Poland-Sweden	
16:30	Debriefing	Debriefing	
17:00			
17:30			
18:00		Cultural programme in Poland.	
18:30		Visiting MRCC in Gdynia.	
19:00			

During the four phases indicated above, a set of injections were provided by the Game Conduction group to the different booths representing the command posts. Each of those injections was a piece of relevant information for the crisis that should raise some actions on the different command posts (e.g. medical needs of the passengers being evacuated in a particular ship at a specific moment, change on the medical conditions of some of the evacuated passengers on the LSOC, unexpected finding of fifty refugees on the ship car deck that were unregistered, etc.). After each one of those phases, information about the crisis situation was compiled by Sweden and Poland. Additionally, teleconferences between them were held with the following aims:

- Confirmation and analysis of the existing information on both sides about the number of passengers in each one of the locations, available capacity, resource status and on-going tasks.
- Decision about the steps to be taken by each party in the following phase.

As a final note, it is worth noting the great amount of effort required for organizing such an event. A key indicator of this is that more than 60 members of the DRIVER team and around 40 end users and practitioners were directly involved in Experiment 43b. A description of the experiment execution is provided in the following section.

3.2 Experiment execution

The whole experiment was executed at the same time in two countries: Sweden (Figure 3.1) and Poland (Figure 3.2). The information about situation on both sides was exchanged using DRIVER tools providing reports about involved assets and later summarized on dedicated teleconferences between the corresponding coordination groups.

On both sides there were teams representing particular levels of CM coordination (local, regional and national). Local level served as LSOC dealing within synchronisation of relief efforts for evacuees and their families or relatives. Regional component was responsible for gathering and provision of information related to assessment and tasking for CM stakeholders capacity. National CM level was responsible for provision of strategic overview on the situation and crosschecking for additional civilian and military capabilities.



Figure 3.1: Experiment 43b execution at MSB Revinge



Figure 3.2: Experiment 43b execution at Gdynia Naval Academy

All of them were linked by ICT technologies provided from the DRIVER catalogue, whose aim was to build-up a joint and shareable COP (enabled by the exchange of data through the CIS) in a dynamic flow of crisis information during the response phase of the CM process.

Each group had its own responsibilities and assets, which were contributed to the mass rescue operation described in the crisis scenario (see section 2.2). The exchange of information between groups was made using two set of tools:

- The aim of the first set was to create a context and simulate the real environment. For that purpose, tasking and management cards with resources (emergency staff and equipment) were used in order to communicate to each team what they would be supposed to do at each stage, according to the scenario development. These experimental mechanics were supported by e-mail and telephone communication across exercising sections. Occasionally (only when it was critically needed), voice commands were transmitted by the Game Control.
- The second set of tools consisted of DRIVER's solutions, including the operational ones (those contributing to the COP and providing tasking and resource management capabilities), and those corresponding to the Test-bed (providing the "simulated reality").

The aim of this approach was to create an operational context which enabled to compare how tools brought by DRIVER contributed to improving the operational performance.

The management of the crisis event developed as indicated by Table 3.2, which includes the main activities and the corresponding timeline related to the scenario.

Table 3.2: General scenario of Experiment 43b

No.	Time	Action
1	H	MV FIRE SPARROW captain reports to MRCC Gdynia that he has fire on board
2	H + 5m	MRCC confirms that he obtained MAYDAY report
3	H + 5m	Initiation of SAR procedure: alarming, gathering additional information, planning, tasking rescue units
4	H + 10m	Referral for SAR units support from Sweden, Denmark, Germany
5	H + 10m	In agreement with JRCC Sweden all action coordination are conducted by MRCC Gdynia
6	H + 15m	Captain of nearest container vessel "Marie X" sends his coordinates to MRCC and MV Fire Sparrow captain and declares his readiness for action. By SMCs decision he remains in assistance until release
7	H + 15m	Creating communication channel with MV Fire Sparrow owner
8	H + 15m	MRCC Gdynia informs Voivodship Crisis Management Centre, Maritime Office, Ministry of Foreign Affairs and Ministry of Maritime Economy
9	H + 15m	9 polish rescue ships are getting into action
10	H + 20m	Start of first polish rescue helicopter
11	H + 20m	Evacuation of passengers and part of the crew from the ship with/by MES and FRB
12	H + 30m	Start of first Swedish rescue helicopter
13	H + 30m	Providing MRCC MV Fire Sparrow's crew and passenger list
14	H + 30m	Providing the list to Voivodship Crisis Management Centre
15	H + 30m	SAR informs media about the incident
16	H + 30m	MRO announcement
17	H + 35m	Convening Voivodship Crisis Management Team session
18	H + 35m	MRCC Gdynia informs VCMT about status and number of casualties
19	H + 35m	First Danish SAR ships are getting into action
20	H + 50m	Start of taking wounded on the board of newly arrived on rescue site helicopter
21	H + 1h	Start of Danish rescue helicopter
22	H + 1h	Start of Polish Aircraft Co-ordinator (ACO)
23	H + 1h	SAR Crisis Management Team starts its work
24	H + 1h30m	Taking 9 people on board of SAR helicopter
25	H + 1h 30m	In agreement with Director of Maritime Office, Voivodship Crisis Management Centre, SAR Maritime Coordinator; ODOR and Maritime Border Guard, LS is designated

No.	Time	Action
26	H + 1h 30m	LS Organization: assignation of LS operation centre potholders, separation of action zones, LS infrastructure organization
27	H + 1h 30m	Establishing that Swedish and Danish helicopters will return with rescued to Sweden, the same for Swedish rescue ships
28	H +1h 35m	Press conference
29	H +1h 40m	Query to Swedish and Danish embassy about status and number of casualties from their countries
30	H + 2h 00m	Start of first German helicopter
31	H + 2h 00m	First situational report in CAR reporting system
32	H + 2h 00m	Sending first representatives from embassies to the LS
33	H + 2h 10m	First SAR helicopter forwards wounded on LS (9)
34	H + 2h 10m	Start of registration/identification and medical assistance process on LS
35	H + 2h 20m	Border Control initiates UE, non-UE identification/verification procedures on LS
36	H + 3h 10m	Net group of wounded are delivered on LS by helicopter
37	H + 3h 30m	Start of German air coordinator plane
38	H + 3h 35m	Wounded families arrive on LS
39	H + 4h 30m	Danish and Swedish embassy representatives arrive on LS
40	H + 4h 40m	Forwarding casualties from German helicopter to LS (8)
41	H + 4h 50m	First ship is forwarding wounded to LS (70)
42	H + 5h 00m	Additional rescue helicopters start from Poland
43	H + 5h 00m	Another rescue ships forwards wounded to LS (70+50)
44	H + 5h 30m	Ships after disembarking and forwarding wounded to LS, are returning to action
45	H + 5h 30m	More wounded are delivered on LS by helicopter and by ship (140+8)
46	H + 5h 50m	Application for teleconference with Swedish side in order to coordinate MRO
47	H + 6h	Start of Danish ACO plane
48	H + 6h - 7h	More ships are forwarding wounded to LS (70+150)
49	H + 7h	Convening the meeting of Crisis Management Team of ministry of internal Affairs and Administration
50	H + 7h 30m	Videoconference with Swedish side concerning MRO coordination
51	H + 10h	End of aerial activities
52	H + 11h	Information from OSC - end of evacuation, there are 50 crew members left alongside with MIRG team, fire is extinguished, vessel is unable to swim on its own, three SALVAGE company tugboats, contracted by ship-owner, arrive on site, they will tow the ship to the harbour and deal with empty rafts and rescue boats

No.	Time	Action
53	H + 11h 20m - 14 h	SAR ships and helicopters forwards wounded to LS (586+90)
54	H + 14h	End of martial activities for MRO

It has to be noted that previous table presents the “simulated” timing of the experiment (i.e. the simulation of how the management of the crisis event would be expected to develop in a real situation). The real time action was nine hours of scenario, distributed into four phases executed in three days:

- Phase 1: Alert Reception & Preliminary Assessment (Figure 3.3).
- Phase 2: Evacuation & Planning of the land operation (Figure 3.4).
- Phase 3: On-Shore Assistance (Figure 3.5).
- Phase 4: Transportation & Accommodation (Figure 3.6).

Contrary to common exercises, breaks are allowed during experimentation, which allowed accelerating the course of action between phases and focusing on the aspects under experimentation.

It must be noted that, while in the experiment the four phases were executed sequentially, they would have been actually occurring in parallel during a real crisis event. For instance, the activities corresponding to phases 1, 2 and 3 would be performed simultaneously, as it is obvious that while some evacuated people were already being carried to their destinations (either hospitals or rest centres), others could be at that moment being attended in the Landing Sites and others being still rescued from the ship.

The phases executed during the experiment actually identified which activities the participants were focusing their attention on, and not representing a real timeline. For instance, during Phase 2 the focus was put on the evacuation activities; e.g. the assignment of rescue missions to helicopters and vessels and the retrieval from them of reports about the status of their missions. This way, on-shore activities were ignored during the two first phases: once a vessel left the evacuated people on land, it was assigned a new mission to go to the ship for more passengers; however, the land operations did not start at that moment. It was during Phase 3 that the focus was put on land operations, being the staggered arrival of evacuated people simulated by the Test-bed, according to the activities and the development of the scenario during Phase 2.

The activities associated to each phase are briefly described in what follows.

3.2.1 Phase 1: Alert Reception & Preliminary Assessment

In this phase, the Polish Maritime Rescue Coordination Centre (MRCC) in Gdynia and Swedish Joint Rescue Coordination Centre (JRCC) received the “SOS” signal from MV Fire Sparrow. Polish and Swedish crisis management centres at different levels of command are immediately alerted and a preliminary assessment of the situation is produced. This assessment included, on the one hand, the number of people to be evacuated as well as how many of them needed medical attention and/or accommodation, and on the other one the number of available hospital beds, accommodation places and sea evacuation and land transportation assets.



Figure 3.3: Experiment execution Phase 1

3.2.2 Phase 2: Evacuation & Planning of the land operation

In the second phase, the evacuation of people from the ship is led by the On-scene Commander in close cooperation with the LSOCs at Sweden and Poland. Sea evacuation vessels and helicopters carry evacuated people to the Landing Sites where they can be registered.

The evacuation assets, the on-scene commander and the LSOCs provide reports about the current situation (number of people being evacuated, number of people already at the landing sites, status of assigned missions, etc.).



Figure 3.4: Experiment execution Phase 2

3.2.3 Phase 3: On-Shore Assistance

In the third phase, evacuated people are attended in the Landing Sites and the needs are reassessed according to their status: the number of already evacuated people is updated, as well as the number of them needing medical attention. The information about available resources (those which have finished their evacuation missions and those which are available to transport people to their final destinations) is also updated.

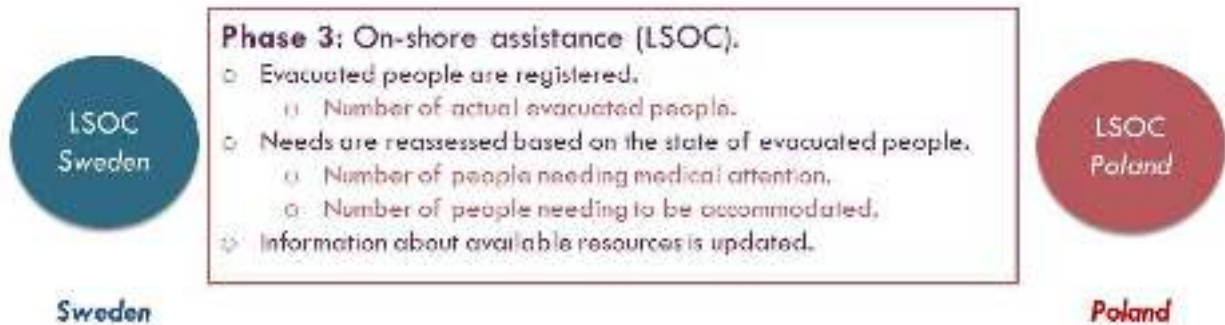


Figure 3.5: Experiment execution Phase 3

3.2.4 Phase 4: Transportation & Accommodation

In this phase, the evacuated people are carried from the corresponding Landing Sites to their final destinations (hospitals or rest centres). For it, the corresponding LSOCs are responsible of tasking the available transportation assets (ambulances or buses) to transport people and come back when they have finished their missions. The status of these tasks and the number of people successfully accommodated will be reported by the assets.

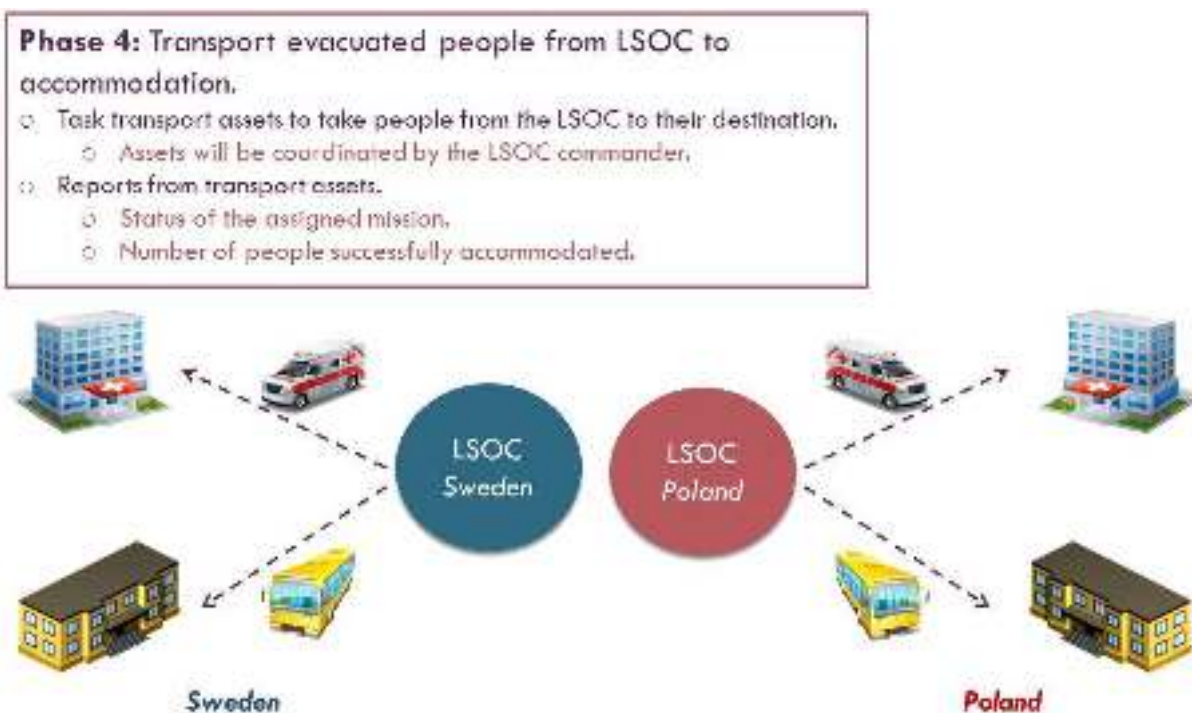


Figure 3.6: Experiment execution Phase 4

3.3 Analysis and evaluation of results

As described in the evaluation approach in section 2.4, the evaluation was based on:

- Notes made by observers during the experiment.
- Hot-wash observations gathered during discussions in the last day of experiment.
- Questionnaires filled by the participants in the experiment.
- Personal interviews with participants, documented using camera.

Note: The questionnaires addressed several aspects related to the experiment (e.g. capability to drive innovation, performance of solutions, etc.) and were customized according to the evaluators' profiles (CM operational background, CM research background and technical background). These questionnaires were all in English. When needed, participants were supported by the consortium partners who provided translation to their corresponding native languages (Polish or Swedish).

This section summarizes, in narrative form, the results gathered from the notes, observations and responses to the questionnaires and interviews mentioned above. These results have been classified and evaluated according to the objectives established in section 2.1.2 and the three-dimensional (end users, CM and solutions perspectives) scope applied to DRIVER's Experiment 43b.

3.3.1 End users dimension

The main objective regarding the *end users dimension* of Experiment 43b was the following:

OBJ01: Validation and test of the:

- a. Evacuation from the vessel to the Landing Sites (special places with dedicated infrastructure for handling the evacuated people and providing medical assistance).
- b. Survivor assistance plans (handling the evacuated people on land) by the regional crisis management centres, which may cooperate with other services like Fire Service, Police, Non-Governmental Organisations, etc.
- c. Information exchange and cooperation between the Landing Sites, Regional Crisis Management Centre and Governmental Centre for Security.

While in Sweden (MSB Revinge and Sandö) the experiment execution was mainly focused on the CM dimension of the Experiment 43b, in Poland (Gdynia Naval Academy) prevailed the end users dimension. Due to this, the objective above was mainly set out by the Polish platform owner (based on end users and practitioners' interests and needs), and thus results traceable to this objective came mainly from the experiment execution in Gdynia.

The scenario was reported as quite realistic for the end users, even though it included the topic of *Mass Evacuation*, which was quite new for them. The mechanics of running the experiment generally worked well facing CM stakeholders with the need for action during the play of the crisis scenario.

It is worth noting that in Poland there was not yet an established detailed procedure on how *Landing Sites* for such maritime evacuation should be made. Moreover, Experiment 43b was the first table-top exercise organized by and for CM stakeholders in Poland. Thus, the experiment was recognized as very profitable for its participants. It allowed crosschecking new areas of CM operations, as for instance using non-regular medical service resources or psychosocial aid capabilities. The selection of such approach also attracted the interest of end users from organisations which are involved in such activities (which in turn created a good opportunity for DRIVER solution providers to test the tools by practitioners within a context interesting for them).

It was also reported that the experiment allowed CM stakeholders to better understand the importance of the various layers of information involved in the management of the crisis event from an IT perspective and

the need for database access to better manage a crisis situation. Although not every baseline LSOC function was chaired by actors during the experiment, it did not impact on their perception of the technical infrastructure being validated (it was however remarked that it is highly foreseen to consider a better description of casualties when dealing with large efforts on medical assistance than that put in practice during the execution of Experiment 43b).

The stakeholders confirmed during debriefing that the experimentation approach promoted in DRIVER was interesting for them and they discovered many issues, which could be valid during a real situation. *Mass Rescue Operation* involving sea and land-based assets was notified by CM stakeholders as an interesting issue to be considered for an exercises baseline. Indeed, in Poland a follow-up was planned at national level involving stakeholders who participated in the experiment. The strategy consisted of two steps: the first one is an additional surveying of representatives from regional and national level about their impressions and observations during the experiment. This would be followed by a second step mainly consisting of reviewing contingency planning checklists in case of large-scale operations, and preparation of subject-related semi-formal “guidance on good practice in case of mass evacuation event”. It was estimated that it would enhance situational awareness perspective of CM stakeholders acting directly and partially within complex issues related to *Massive Rescue Operations*.

3.3.2 CM dimension

The objectives associated to the *CM dimension* of the Experiment 43b were the following ones:

- OBJ01:** Execute a multi-site (and multinational) activity taking advantage of the Test-bed’s functionalities (including simulation support) and the operational solutions already in place at the corresponding stage of the project, and exercise and evaluate the methodological approach put in place to perform the experiment and collect observations by players, evaluators and observers (including interviews, discussion sessions and questionnaires).
- OBJ02:** Evaluate to which extent (if any) the deviation between “perceived reality” in the different Coordination Centres and between this “perceived reality” and the “actual reality” itself can be reduced with the DRIVER approach (objective linked to research question RQ01).

Regarding OBJ02, the first important remark is that practitioners are not used at all to the kind of experimentation proposed in DRIVER project; they are however accustomed to exercises and demonstrations. It has been said before that it was tried to align the execution and evaluation approach of the experiment, keeping some of their essential aspects (e.g. allowing breaks in between), to the end users’ exercises scheme, so practitioners would feel more comfortable with the activity. This however led to the perception by some participants of some fuzziness or missing definition in the experimentation methodology. In order to overcome this difficulty, it became clear that boundaries between “exercise” and “experiment” need to be clearly identified (and understood by all actors involved in the experiment) before the experiment itself. It is also needed to specify when and how exercises can be integrated into experiments. For instance, certain phase of an experiment may be seen as an exercise on its own, having then breaks between phases. This, which fits the approach adopted for Experiment 43b quite well, was however not explicitly stated at any time before the experiment, and thus this aspect was not sufficiently clear to the experiment’s participants.

Due to this, it took some time to reset end users’ minds from normal exercises to this type of experiment. In the beginning of the experiment a lot of energy was put on this type of issues, but as the experiment developed end users focused on the matter at hand: keeping track on resources, tasking them, requesting new ones if needed and monitor how they were used. This improvement was in part attributed to the division of the experiment in four phases with breaks between them.

A second remark regarding OBJ02 is that practitioners are not used to work with the kind of IT solutions and data communications that were used in the experiment. They do work on a daily basis with telephone/radio communications and give voice commands, so a more intensive training of end users and

practitioners on the solutions being used in the experiment would have been required. The experiment preparation and design however lacked this training phase (at most, some of the end users had a preliminary contact with solutions in a demo given by solution providers during the experiment rehearsal). Due to this, during the experiment it was technical staff from solution providers, who actually operated the tools. In these conditions, the practitioners were told by these technical operators about new data (e.g. new event on the COP) in the tool and they (practitioners) decided the actions to be taken from a CM perspective. These actions were then converted again into input data to the COP tools by the technical operators. Even this approach showed to be a good decision provided the mentioned lack of a training phase; it still took some time to have practitioners getting involved with the tools. Moreover, it has to be also considered that in some of the command posts the practitioners and the technical operators did not share a common language and so translation by a third person was required, making the process even more difficult.

It has to be noted that this second remark did not affect the evaluation of the performance of the operational and Test-bed solutions in relation to the objectives set out from a solutions perspective (which were to be directly evaluated by solution providers and observers with a technical background), but somehow hindered the capability of end users and practitioners to evaluate how an experiment like this could take advantage from those solutions.

There is a third remark, more related to the methodological and organisational approach, on the fact that countries (and even organizations from the same country) had different planning traditions. In order to mitigate the impact of this, it was agreed that for subsequent experiments the planning process had to be made more explicit, so uniformity between participants could be better controlled. It should also include all actors in the process, who should in turn have a shared understanding of the basic terminology (e.g. “Test-bed”). To make this feasible, some proposals were made by experiment’s organizers, such as preparing a manual with agile steps and terms and guidelines to early identify constraints among actors, or putting money aside for end users’ expenses.

In line with this, it was remarked that a deeper reflection should be also carried out (during the experiment design) on who are the relevant end users or stakeholders for each solution, method, or whatever other aspect being put in place or evaluated in the experiment. For instance, regarding the Test-bed, it is the platform provider (MSB in Sweden; the Eastern European Platform in Poland) which is the actual end user.

It was also noted that the different focuses or interests in Swedish and Polish sites (more oriented to the experiment’s end users dimension in Poland; more oriented to the CM and solution dimensions in Sweden) made sometimes the experiment drift apart in those sites. In order to compensate it to the maximum possible extent, audio and video communications between both sites were done after each phase of the experiment. In any case, it was clear that the focus and objectives between locations involved in a multi-site experiment should be agreed between all participants and be aligned to the maximum extent in all experiment sites.

The fourth main remark, connected as well to the methodological approach, is about the need of reaching a reasonable trade-off between the complexity of the experiment and its utility or relevance; i.e. the experiment should have a more limited scope to avoid that its inherent complexity hindered focusing on the concrete aspects under experimentation, but it should not be so simple that it did not provide a real added value (or, more exactly, did not allow to evaluate the potential added value provided by the DRIVER approach). Depending on the end users and their roles during the experiment, there were however opposing views about the experiment’s complexity.

On the one hand, it was raised by some practitioners that the scenario itself was quite demanding and there was too much information to keep track on (although it was recognized that solutions were helping on that). They proposed some improvements in order to make it more assumable: for instance, in order to have a clearer understanding of the situation, it would have been appreciated to have additional support from the Game Conduction perspective, such as some sort of visual timeline notifying and displaying when key information was being provided and decisions needed to be taken. Moreover, since it is an experiment and not an exercise, and so it can be stopped and resumed later, they remarked it would have been useful

to make some additional breaks during the execution. According to them, this would have provided more opportunities to explain and demonstrate what the input provided by end users had resulted in, and would have given even more meaning to why their participation in the experiment was really important.

On the other hand, it was found that in some other cases, in order to create a situation where the end users could clearly see the added value of using new solutions, the task at hand had to be quite challenging. Challenging in this context mainly refers to the workload that the actor is facing in terms of information that needs to be processed. By way of example, according to Swedish JRCC perspective, the task was not especially challenging; being one of the main reasons for this that JRCC already knew what was going to happen. A more complex and flexible scenario, where some temporary unfamiliar resources are needed and added to the pool of available resources, and where the scenario development is not so “fixed” and enables some kind of branching and unexpected cascading effects, would create an environment in which the added value gained by using the solutions infrastructure could be more easily demonstrated.

Moreover, the lack of a better training on Experiment 43b’s solutions (due to different difficulties commented below), made solution providers to take some decisions towards reducing the complexity of their solutions and easing the understanding of them by end users and practitioners. These decisions, which in fact simplified the solutions’ business logic and enabled an easier understanding of them, sometimes prevented practitioners from doing some actions that they would have liked to do (as for instance, commanding a mission which was not within the predefined set of missions supported by the tools). This could have been avoided with a better training on solutions during which users might have highlighted those basic features tools were lacking. For instance, missing types of missions could have been easily included by solutions. Being familiarized in advance with tools could have also facilitated finding alternative ways of doing certain things not directly supported by the tools’ functionality.

Also related to this is the fact that the operational tools had the set of resources used in scenario built in; while during the execution of the experiment its participants needed a more flexible set of resources to handle the crisis. Especially they needed more detailed information like the capacity of a particular hospital regarding some specialization instead of the overall capacity of all hospitals (this is another clear example of issue that would have been detected and easily solved with the corresponding training and rehearsal with end users). Due to that, the COP tools which were used to report general status were not fully useful for some of the participants, who needed more details to plan their actions. Their proposed way of sharing the information on current capacity was generally considered useful, but needs to be extended with more detailed data.

Another aspect to be carefully taken into account is that of the tool’s language. In general, end users showed their preference for tools displaying information and menus in their native language. By way of example, the LUPP tool by MSB gathered the largest user group among all the tools being used on the Swedish site. This was partly because the tool was known to the actors before, but also because the tool was in Swedish. In the case of the Polish site, the issue with language not only affected solutions but extended to the experiment as a whole. Although real-time translation to English was provided by Polish DRIVER partners, the development of the activities was not easy to follow by non-Polish speakers.

Putting difficulties aside, it is worth mentioning some of the very positive comments by practitioners, once the experiment execution gave full understanding of the experimentation approach.

It was recognized that the scenario helped end users to get a scene-setter and get involved; the field of experimentation was also found relevant (for instance, it was agreed that registration of individuals during large scale crisis could be of interest as a potential focus area for future experiments). The experiment was also able to adapt on its definition process even during the experiment execution, and succeeded to achieve a good level of satisfaction for practitioners, evaluators and observers.

It was stated that this type of experiment and development activities give a lot of new possibilities for CM organisations to explore and develop new capabilities and procedures and identifying what is needed to handle future complex crisis scenarios.

It was also raised that the experiment enhances understanding on how future distributed (multinational and cross-agency) exercises could be organised, in order to carry out a variety of different activities ranging from experiments, training, exercises, technical integration, etc.

The scenario, which contextualized the experiment, was reported as immersive and interesting by end users, who seemed motivated therein. This was in part also enabled by the good coordination between the two sites. End users also recognized that using the visualisation and simulation tools gave an excellent possibility to display new ways of conducting distributed trainings. Moreover, the simulation of the deployment of the Swedish MIRC team to the accident ship MV Fire Sparrow helped to create a great feeling of reality for participants. In line with this, it has to be remarked that being Experiment 43b the first multisite experiment using simulation, the infrastructure in Gdynia was not intended to have the whole simulation capability. As end users in Gdynia found however this part as very interesting, some simulated assets were incorporated after Phase 1: Alert Reception and Preliminary Assessment as a technical proof of concept about this being possible to be done for future experiments. Anyhow, it was also stressed that virtual simulation only fully works when complemented with real simulation and have clear strategic and tactical objectives.

And finally regarding OBJ02, it was also clear that this type of activity also contributes to one of DRIVER's main aims, i.e. to get a "better understanding of Crisis Management in Europe", since participating organisations have the opportunity to gain some knowledge about how each other works and reasons around different matters (and this applies both to national and cross-border levels).

Regarding the objective OBJ03 and, by extension, research question RQ01, two main difficulties were found.

The first one was that, due to the extraordinary number of participants it would have required and the high cost associated to it, an experiment where real assets were deployed on field was unfeasible to be carried out at that stage of the DRIVER's experimentation process (perhaps it would have been an option for the subsequent Joint Experiments).

In such an experiment, real assets would have been the ones feeding the COP tools with the corresponding information about "reality", and, provided that the context scenario had certain complexity, a measurable deviation between "reality" and "perceived reality" (the one shown by COP tools) would be expected. Moreover, this deviation could be compared to that resulting from the execution of the same scenario according to current end users' practices (i.e. without DRIVER solutions), in order to identify how this deviation varies and whether it can be actually reduced using the DRIVER approach.

However, due to the mentioned constraints, instead of real action on the field, the experiment counted on a simulation (supported by the Test-bed's tools) of on-field assets. This simulation was in charge of directly providing COP tools with the required information (what can be seen as these tools having "direct access" to reality, without human intermediary), which led to a perfect alignment between "reality" (provided by the simulation tools) and "perceived reality" (represented by COP tools in the command posts).

This way, there was no deviation between measuring of "reality" and "perceived reality", and thus there was no actual way to meet the corresponding objective.

The second difficulty regarding OBJ03 was that in this first contact with the DRIVER experimentation framework, practitioners showed in general their interest on not focusing too much on tools. This made it complex to have a solid feedback on how the solutions (not only the operational ones, but also those composing the Test-bed) might contribute to driving innovation in current CM practices. As the evaluation framework showed nevertheless its efficiency and effectiveness, it was agreed to postpone this quantitative measurement or evaluation for the next iterations of the DRIVER experimentation process (i.e. Joint Experiments).

3.3.3 Solutions dimension

The concrete objectives associated to the solutions dimension of the Experiment 43b were:

- OBJ02:** Assessment of the usage and the added value provided by a distributed Test-bed (deployed in three different locations: Revinge, Gdynia and Sandö) including simulation (both ground truth and constructive).
- OBJ03:** Assessment of the capability of the solutions participating in the experiment execution (both operational and Test-bed) to achieve technical interoperability through the usage of a CIS based on the exchange of EMSI (Emergency Management Shared Information) messages.
- OBJ04:** Evaluate whether these solutions and the integration of them into a System of Systems actually contribute to gain an operational benefit and fill the relevant gaps associated to Experiment 43b (objective linked to research question RQ02).

Regarding OBJ04, it has been already mentioned that end users at both sites found it quite satisfying to have simulation means in order to both contextualize the crisis scenario (e.g. simulation of Swedish MIRG team arriving the ship to fight the fire) and to provide realistic ground truth (e.g. simulation of vessel traffic and assets going to the ship or the Landing Sites). Solution providers and platform owners also found it of the highest value to have a simulation infrastructure that enable providing input to solutions and practitioners in contexts where having actual resources (such as helicopters or vessels) deployed on field results unaffordable. This is especially relevant for experimentation activities focusing on very concrete aspects.

In the particular case of Experiment 43b, it was found that the total number of resources to be accounted was relatively small; for instance, JRCC at Sweden was commanding a total of seven assets. This way, the location of each resource as well as the capacity in use of each of them was relatively easy to keep track of without support from any IT tool. Hence, the added value of providing tables showing aggregated figures on available capacity as well as on the number of passengers being evacuated was not proven to a full extent. Nevertheless, it was generally accepted that aggregations of this kind should provide added value when the number of resources was high enough (in a real scenario, the expected number of vessels involved in the rescue operation would be at least twenty).

With regard to OBJ05, tools participating in Experiment 43b showed their capacity to send, receive and correctly process messages coming from different solutions connected to the CIS.

However, it was also clear that in general the EMSI standard could not be implemented inside the tools without sacrificing usability. It turned out to be quite complicated to have a set of heterogeneous legacy tools in their current shapes communicating through a CIS based on certain message types and data formats. Mapping between data models also demonstrated to be not enough: it was a really complex task which at most enabled to exchange a small subset of the information which the tools were able to manage (this of course depend on the similarity between the data models supported by the solutions, and the one being used within the CIS; but in general, quite a lot of information was lost in the process of doing the model-to-model mappings). Due to this, some of the tools even needed to build a separate editor in order to succeed, which was no more than a relatively straightforward compromise solution given the impossibility of adapting the tool to a different data model before the experiment execution. Solution providers agreed that in order to set up an efficient and effective exchange of information, tools should support “natively” the data models in which data exchange are based, and also implement a minimum set of shared business rules; this would obviously take considerable time and effort to be done.

Bluntly speaking, the concept of the CIS and a common shared information standard (such as EMSI) makes it easier to communicate between systems but, in order not to compromise usability of tools and the completeness of information, a significant adaptation effort must be done over the tools connecting to the CIS.

Another proof of the complexity to exchange information between legacy tools not sharing a common data model was that it was required to make changes in the Experiment 43b technical specifications until a late stage of the experiment preparation. This led to some bugs that hindered the correct processing of some messages by some of the tools. This was aggravated by some design decisions on the use of the EMSI standard which proved to be inefficient, such as using some fields with a different meaning from that established by the standard or introducing some counterintuitive conventions going beyond it, with the aim of supporting features which were not straightforwardly provided by the standard itself. A better approach would have been to develop extensions to the standard which could be later formulated as improvements for a particular domain.

It is also worth noting that, from a solution provider perspective, the experiment was fruitful in the sense that feedback from end users (which was in many cases quite concrete and precise) allowed to identify several areas of improvement for the solutions used at both sites. Solution providers considered comments in general very relevant and helpful; either they were regarding the functionality strictly addressed by the experiment (tasking, resource management, COP) or to some other aspects (such as data presentation or operational procedures). This was in part attributed to the fact that end users were not only offered the possibility to evaluate solutions, but to do it in conditions which are close to their operational activity and in a context (scenario) that attracted their interest. Such kind of approach benefits both the solution providers and the participants.

More related to the status of EMSI as a potential candidate for data exchange within an operational CIS, there were also some findings by solution providers. During the experiment, both free text and structured data elements of EMSI messages were used. Free text was required to distribute some information about the operational situation, which is not directly supported in a structured way by the EMSI specification (for instance, summaries about the current situation or questions to the actors involved). This was not optimal for two main reasons:

- 1) The free text fields in the standard were limited to 500 characters, which did not leave much room to providing information.
- 2) Without any guidelines or conventions on how to use the free text fields (i.e. without additional business rules), it was in some cases hard to interpret the information correctly (for example, relative expressions such as “now” and “within two hours” were used).

Another example is that the free text was updated with questions without explicitly specifying who the question was for and without specifying the questioner. Even though the date and publisher of the message was known on a message level, it was not explicitly provided in the free text. For increased clarity, each entry added to the free text field should start with a specification of who made the entry and when. Even though information and questions could be communicated using the free text field, it would be better to have a dedicated log associated with the event so that it is easier to follow conversations related to the incident.

Another finding was the fact that it was not suitable at all to use EMSI messages through the CIS to update resources' geographical positions in real time. This was the initial approach taken during the experiment rehearsal and the CIS turned out to be fully overwhelmed with messages with the only purpose of updating the position of a single resource. The approach agreed for the experiment execution was to provide updates on resources positions only every fifth minute, which empirically proved to be good enough to maintain the performance of the CIS network. This however led to a lack of feeling (on end users side) about resources actually moving, as COP operational tools only displayed changes in resources positions every five minutes. Furthermore, it was not clear by only looking at the maps if the vessels were heading towards the incident location or if they were heading towards the drop-off location (which on the other hand might have been solved using some kind of “direction arrow” attached to the symbol representing the resource).

Regarding OBJ06, the same analysis that was carried out for OBJ03 is applicable. Quantitative measurement about operational benefit as exposed by RQ02 was postponed for the later iterations of the DRIVER experimentation process (i.e. Joint Experiments).

Putting again difficulties aside, from a solutions perspective, the objectives were in general successfully met. Interoperability was achieved between 16 instances of 10 different IT solutions distributed among Gdynia, Revinge and Sandö. The CIS concept put in place as part of WP42 was used to connect those systems with the additional challenge that they were deployed in seven different command posts distributed among Gdynia (Poland) and Revinge (Sweden). The EMSI standard used for the technical information exchange showed its utility for the purposes under study as a first approach to be successively refined. Some required adaptations were also identified.

The entire technical infrastructure allowed exchanging around 4000 messages that were broadcasted to the seven different command posts. This is, on the one hand, showing the engagement of the end users in the experiment, but also showing the utility of the solutions. Considering that a minimum of 25% of all messages were relevant for each command post, there would be an exchange of 1000 messages between any two posts in the twelve hours the experiment went on. This is an update rate which is clearly unachievable by more conventional communication mechanisms, such as radio or phone calls.

3.4 Lessons learned

This section presents a series of lessons learned based on the analysis and evaluation of results documented in previous section. These lessons learned can be summarized as follows:

- End users and practitioners' training on solutions being used in experiments is fundamental. This does not only enable an interaction between end users and solution providers which permits identifying gaps in tools functionality and elucidating user needs at an early stage of the process, but also enables end users getting really involved with solutions and thus provide a more valuable and relevant feedback on them.
- The experiment's trade-off between complexity and utility (or relevance) should be more carefully analysed during the design and preparation phase and should be customized for (and supervised by) the corresponding end users. It turned out that, depending on the concrete end users, as well as on their roles and activities during the experiment, there were opposing views about the experiment's complexity. A deeper analysis of the aspects of interest for each kind of practitioner and the level of complexity (and also, flexibility) which is suitable for them should be performed during the experiment's design and preparation phase.
- Practitioners are used to exercises and demonstrations and so it takes time to reset their minds to the types of experiments proposed by the former DRIVER experimentation process. The less trained they are for this kind of experiments, the less advantage they take from the opportunities experiments may bring. It was also the case that some external players, even after information on several occasions, had expectations that this was an exercise rather than an experiment. This reveals a very strong need of simplified and very clear information being provided to end users from the very beginning.
- The experiments' preparation and planning process needs to be made more explicit to end users and practitioners and should include all actors involved in the experiment. For it, developing manuals describing the preparation and planning process and common terminology would be of help; putting some money aside for end users' expenses would also help to improve this process. This would mitigate the impact of having participants with different planning traditions and would improve uniformity between them.
- Clear boundaries between "experiment" and "exercise" must be defined as part of the experimentation methodology, and be communicated beforehand to all actors involved in experiments. This definition might also include when and how exercises can be integrated into

experiments (for instance, certain phase of an experiment may be seen as an exercise on its own). This step was not achieved during the preparation and design of Experiment 43b, which led to the perception by some of its participants of missing definition or fuzziness in the DRIVER experimentation methodology.

- The different focuses and interests in Swedish and Polish sites (more oriented to the experiment's end users dimension in Poland; more oriented to the CM and solution dimensions in Sweden) produced sometimes they drifted apart during the experiment. It is thus convenient to align to the maximum extent the focus and objectives between locations participating in a multi-site experiment, unless otherwise explicitly stated during the experiment design.
- As exposed by previous notes, there is a need for involving end users and practitioners in the design and preparation of the experiment since the very beginning. A concrete metric on this was given by stakeholders: there is a need to identify which actors to engage in training and/or development at least one year ahead of the experiment. However, this is not easy to set up at all, mainly because the end users and practitioners have already very loaded schedules. A potential compromise solution could consist of organizing short workshops to make them more familiar with the tools and make them more aware of how these tools might support them in their communication and decision-making processes.
- A deeper reflection should be also carried out (during the experiment design) on who are the relevant end users or stakeholders for each solution, method, or whatever other aspect being put in place or evaluated in the experiment. For instance, regarding the Test-bed, it is the platform provider (MSB in Sweden; the Eastern European Platform in Poland) which is the actual end user. Moreover, end users have different competences and organizational levels, so it would be very useful to also define in advance which is the wanted or expected competence and organizational level for each of them.

As a general note related to this: experiment organizers must be careful with the way of approaching end users and the words used for instance when elaborating manuals or describing the experiment design process. By way of example: end users are not "selected" to participate in an experiment, but "gratefully accepted".

- The final experiment's objectives and research questions should not be established until the concrete experiment set-up (or at least, the existing limitations about it) has been determined. This avoids setting out unrealistic objectives that turn out to be unachievable during the experiment execution (see issues outlined in previous section, about the research questions on differences between "reality" and "perceived reality").
- This kind of experiment gives new possibilities for CM organisations to explore and develop new capabilities and procedures and identifying what is needed to handle future complex crisis scenarios. It also provides clues on how future distributed (multinational and cross-agency) exercises could be organised to carry out a variety of different activities ranging from experiments, training, exercises, technical integration, etc. Moreover, participating organisations have the opportunity to gain some knowledge about how each other works and reasons around different matters at both national and cross-border levels.
- In case that end users or practitioners do not feel comfortable with an experiment which is not being developed in their mother tongue, simultaneous translation or other alternative approaches (such as having a kind of dashboard on a big screen with an English sum up at regular times; e.g. every 30 minutes) should be planned and organized in advance.
- It is worth considering providing tools menus and information in the native language of the end users who are expected to operate them. As remarked in previous section, practitioners demonstrated a clear inclination for solutions and activities developed in their native language.
- It is not a good idea to use the entities, features or similar of a communications standard with a different meaning from that it establishes. A better approach is to develop (when needed) extensions to the standard which can be later formulated as improvements for a particular domain.

- (On-scene and ground truth) simulation capabilities clearly help to create a great feeling of reality for participants and make them getting really involved with the scenario.
- It has to be taken into account that some practitioners may be reluctant to focusing too much on solutions, being their interest more oriented towards solving the crisis itself (especially in the case of the Polish site, which was more focused on the end users dimension). This is why, although in these cases the feedback obtained on the presented solutions may be quantitatively below the initial expectations, the multi-dimensional approach to experimentation proved to be successful and worthy to be kept for future experiments.
- Experiment rehearsals should be scheduled at least two or three months before the experiment execution. In the case of Experiment 43b, the rehearsal week was planned to tight in time before the experiment execution week (only one week in between). Late changes had to be implemented and tested with only one week margin before the experiment. Moreover, the need for a more exhaustive solution pre-test before the experiment rehearsal was identified. It would have revealed the need for changes and would have allowed the solutions to enter the rehearsal fully ready.
- Organizing (designing, planning and executing) an event such as Experiment 43b, which still did not include real assets on field, requires a huge effort. It took more than a year and involved directly more than 60 members of the DRIVER team and around 40 end users between Sweden and Poland.
- In order to optimize the quality and relevance of the feedback on solutions received from end users, it demonstrated to be fundamental not only offering end users and practitioners the possibility to evaluate solutions, but doing it in conditions close to their operational activity and in a context (scenario) that attracted their interest.
- The concept of the CIS and a shared information standard such as EMSI enables communication between heterogeneous systems. However, in order not to compromise the usability and friendliness of tools and do not lose relevant information due to the mappings between data models, a significant adaptation effort must be done over the tools which connect to the CIS.
- When real-time data is going to be sent at a high rate (as for instance, the updates of the positions of resources which are in motion), it would be better to have independent communication channels for it. Otherwise, the CIS used to exchange operational information might get overwhelmed, with the corresponding reduction on performance.
- There is a need for having specific technical meetings in advance and formalize the process of adaption and testing the solutions (and integrating this process into the overall DRIVER experimentation process). For instance, technical interfaces should be agreed in a specific meeting where all solution providers connecting to the CIS were present. Moreover, a test and integration plan and the associated test cases (preferably organized into three levels: application testing, integration testing, and interoperability testing) ought to be developed based on these interface agreements. Whenever possible, test automation should be also applied.

Although previous lessons learned were established from the perspective of the first phase of the DRIVER project, they can be anyhow fully applicable to any further activity in DRIVER+. Apart from them, there are some basic aspects which the project relied on, that have been developed towards DRIVER+.

For instance, in the first phase of the project, solutions were mostly understood as “technical” solutions, while in the context of DRIVER+ they are understood as “socio-technical” solutions. This kind of solutions allows for instance to incorporate concepts such as an operator as intermediary between the CM staff and the corresponding “technical” tool. This was indeed an approach already adopted in Experiment 43b (by necessity, as it was not possible to train end users on solutions before the experiment; see section 0).

Another example is the switch from experiment to Trial. While in the first phase of DRIVER,

- an experiment was expected to involve the testing of new ideas or technologies in a carefully crafted environment, with a clear goal of demonstrating particular properties of the idea/technology and gathering evidence for expected outcomes in a systematic way;

in DRIVER+,

- a Trial takes place in an exercise or serious game-like setting performed in an as much as possible realistic environment, being its main aim assessing the impact of one or several solutions on CM performance (e.g. on processes), and thus their potential to drive innovation.

The concept of Trial is better aligned with end users' practices (e.g. exercises), and is more suitable for the aim of DRIVER+ of testing innovative solutions and their impact on CM.

During its first phase DRIVER faced certain issues with research questions, mainly related to their formulation and structure: what is a research question, which kind of research questions are applicable, how they should be stated, etc. For instance, in DRIVER+ the implementation of innovation is in the forefront, and so research questions regarding innovation are mandatory in Trials; research questions must additionally function in parallel, in order to avoid that they compete in Trials, etc.

In general, DRIVER+ includes a more careful treatment of its basic concepts and terminology, providing guidelines and concrete definitions on each aspect under consideration.

These modifications or adaptations towards DRIVER+ produced a change in the course of action; i.e. new activities (Trials) were scheduled discarding those planned in the first phase of DRIVER (such as the Joint Experiments). These new activities are being planned in a more systematic way, according to more clearly defined processes, and taking advantage of lessons learned from previous DRIVER.

4. Conclusion

The Experiment 43b was able to set up a crisis management scenario where two different platforms, which included the participation of representatives from different Polish and Swedish CM bodies, cooperated by means of a set of operational tools (included in the DRIVER catalogue) put together into a CIS. This all was supported by the DRIVER's Test-bed.

End users and practitioners had the feeling that in general the experiments were quite productive and the overall DRIVER experimentation approach is promising. They got highly involved with the scenario and the activities performed during the experiment execution and were able to provide relevant feedback to both the methodology and the solutions put in place. Thank to this feedback and to the work of integrating solutions into a System of Systems, the solution providers were also able to identify both the main strengths and weak spots of their tools with regard to the end users' needs and also from the perspective of solutions interoperability (ranging from the technical to the semantic and operational interoperability). They were also able to identify areas of improvement with regard to the interoperability standards and the way of exchanging information through the CIS, as well as some aspects that would enrich the Test-bed platform for later experiments.

With regard to the objectives set out prior during the experiment design, most of them could be considered to a great extent satisfied. In particular, OBJ01 about the validation of CM activities in a Massive Rescue Operation (in which Polish actors were especially interested) was considered fully met by practitioners, who extracted relevant conclusions and organized for future exercises on the same topic. OBJ02 (about the capability to execute the experiment according to the expectations) was fully met, as proven by the fact that the experiment was set up and executed according to the scenario developed and applying the methodology and solutions as planned. OBJ04 and OBJ05, about the capability of achieving technical interoperability and assessing the added value of solutions and communications standards, were also fully satisfied. Only objectives OBJ03 and OBJ06, about quantitative measurement of the difference between "reality" and "perceived reality" and the reduction of this deviation by the use of the solutions, turned out to be more problematic, as they seemed not to be fully suitable according to the characteristics of the experiment. As explained in the corresponding analysis and evaluation of results, this deviation from the original expectations was considered acceptable as the evaluation framework showed nevertheless its efficiency and effectiveness, and the quantitative measurement could be addressed in subsequent experiments. Not for nothing, this situation anyhow led to extracting an important lesson learned to be taken into account for the next activities in DRIVER+.

In summary, Experiment 43b was considered satisfactory as a first approach towards a pan-European CM Test-bed and a PoS aiming to bridge existing CM capability gaps. This first approach needs of course to be improved and refined in successive activities, taking advantage of the lessons learned during these preliminary experiences. But, according to end users and practitioners feedback, and also to the impressions of the other experiment's participants (organizers, platform owners, solution providers), it seems to be a firm step in the right direction.

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Annexes

Annex 1 – DRIVER+ Terminology

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated¹. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

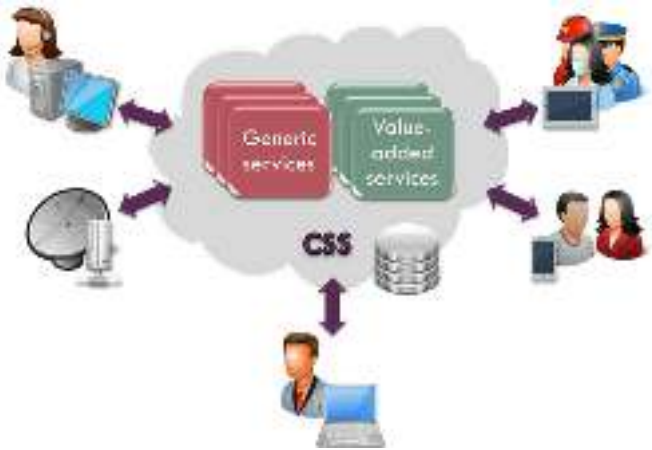
Terminology	Definition	Comment
Crisis	Situation with high level of uncertainty that disrupts the core activities and/or credibility of an organization and requires urgent action.	
Crisis management	Holistic management process that identifies potential impacts that threaten an organization and provides a framework for building resilience, with the capability for an effective response that safeguards the interests of the organization's key interested parties, reputation, brand and value-creating activities, as well as effectively restoring operational capabilities.	
Emergency	Sudden, urgent, usually unexpected occurrence or event requiring immediate action. Note 1 to entry: An emergency is usually a disruption or condition that can often be anticipated or prepared for, but seldom exactly foreseen.	
Emergency management	The organization and management of resources and responsibilities for addressing all aspects of emergencies and effectively respond to a hazardous event or a disaster.	
End users	Individual person who ultimately benefits from the outcomes of the system.	
Exercise	Process to train for, assess, practise and improve performance in an organization. Note 1 to entry: Exercises can be used for validating policies, plans, procedures, training (3.265), equipment, and inter-organizational agreements; clarifying and training personnel (3.169) in roles and responsibilities; improving inter-organizational coordination (3.52) and communications; identifying gaps in resources (3.193); improving individual performance and identifying opportunities for improvement; and a controlled opportunity to practise improvisation.	
Experiment	Purposive investigation of a system through selective adjustment of controllable conditions and allocation of resources.	

¹ Until the Portfolio of Solutions is operational, the terminology is presented in the DRIVER+ Project Handbook and access can be requested by third parties by contacting coordination@projectdriver.eu.

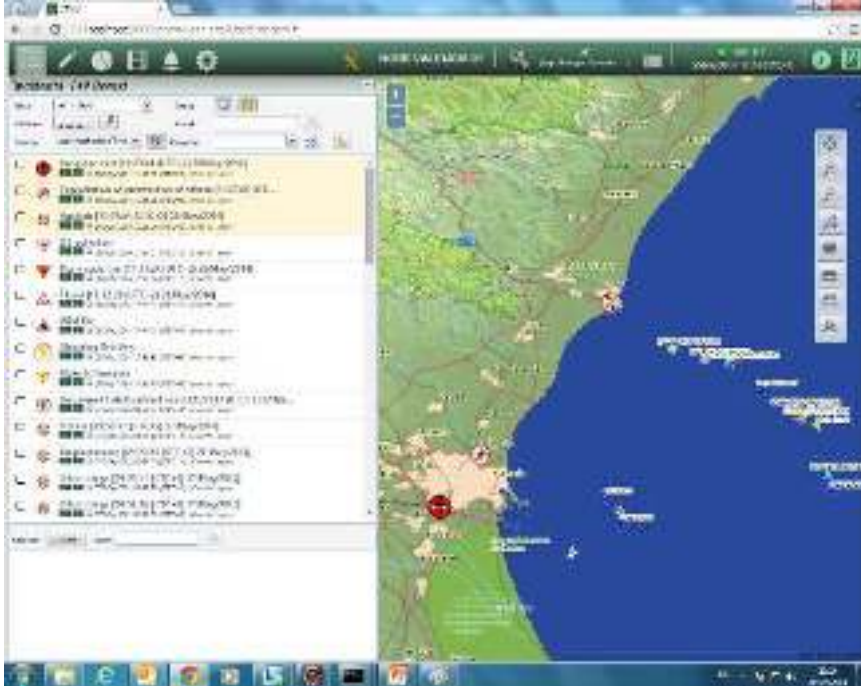
Terminology	Definition	Comment
Gap	Gap between the existing capabilities of responders and what was actually needed for effective and timely response.	
Operator	Person engaged in task performance, considered as a monitoring, controlling or directing element in a system or process capable of a dynamic response to system inputs and disturbances.	
Scenario	Pre-planned storyline that drives an exercise as well as the stimuli used to achieve exercise objectives.	

Annex 2 – Operational solutions

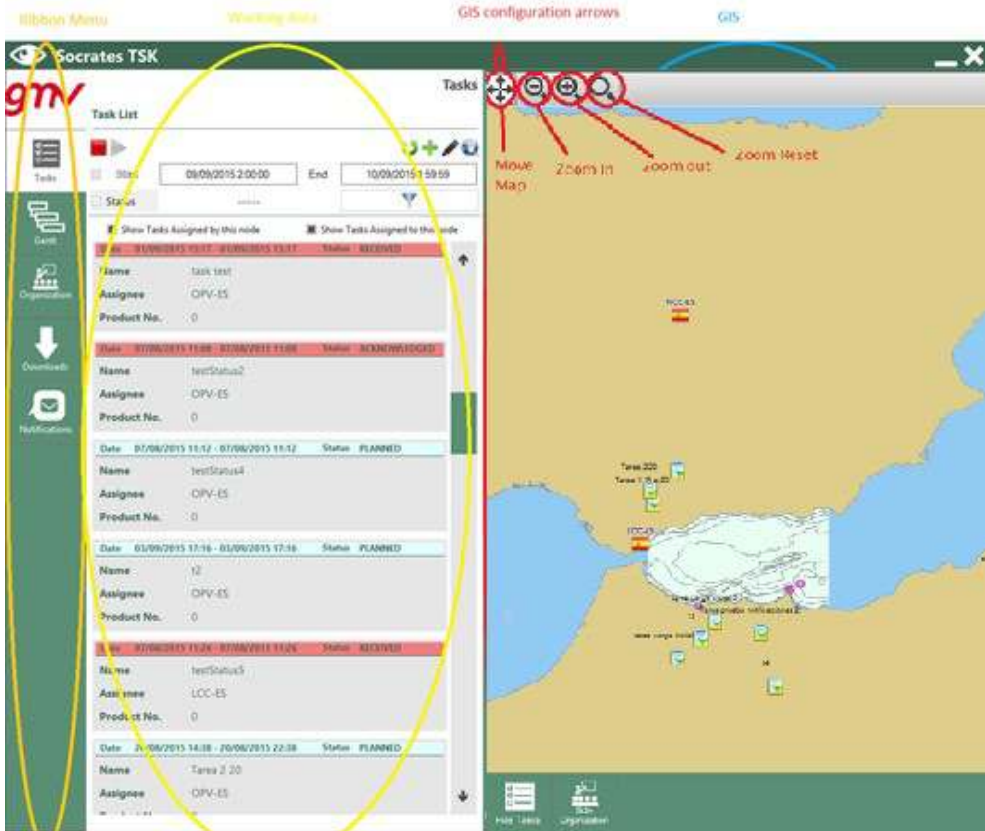
This annex includes a set of information cards about the operational tools which were involved in Experiment 43b. These cards were filled by tool providers prior to the experiment execution, and give a snapshot of the tools status (current features, *Technology Readiness Level* – TRL –, etc.) at the moment of the execution of the experiment. They also include the (mainly technical) feedback that tool providers expected from Experiment 43b with regard to each tool.

Socrates CSS		GMV
<p>Collaborative tool aimed at enabling the information sharing between heterogeneous systems in a multi-organizational environment by building up a SOA based on web services and a publish/subscribe mechanism. Its core infrastructure allows the usage of the tool in different domains just by adding new services that allow the transmission of the data associated to the new domain. It also allows the addition of value-added services that integrate the new domain's business logic in order to improve the cooperation of the parties integrating the collaborative environment.</p> 		
General characteristics		
Usage in CM domain	The tool covers mainly the Information management CM function, enabling the collaboration and information sharing between the entities involved in the CM at any level of command and during any crisis phase.	
Main capabilities	<ul style="list-style-type: none"> - Publish, update, request and subscribe to structured and unstructured data. - Validation of data in accordance to a specific taxonomy of metadata. - Notifications to interested parties (subscribers) about the availability of new data. - Persistence and redundancy: <ul style="list-style-type: none"> ○ Data may be stored for later delivery. ○ Several synchronized instances of the tool may be deployed on the network. 	

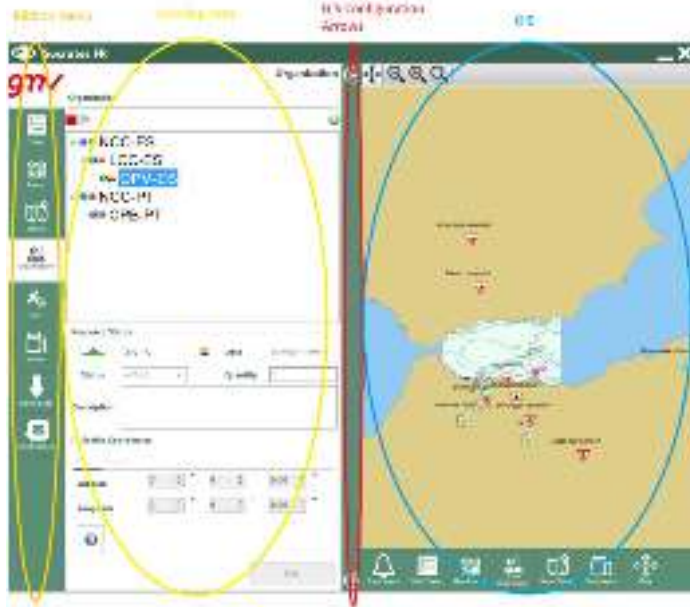
Socrates CSS		GMV
Maturity	TRL 7: Prototype demonstrations have been carried out in operational environments during several projects such as FP7 CLOSEYE (Collaborative evaluation Of border Surveillance technologies in maritime Environment bY pre-operational validation of innovative Solutions) and the NATO’S MAJIIC (Multi-sensor Aerospace-ground Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) and MAJIIC 2 (Multi-intelligence All-source Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) programmes.	
Role in EXPE 43		
Role description	<p>Socrates CSS will be used as the implementation of the CIS in EXPE 43. This way, it will be the backbone of the experiment’s SoS, enabling the interoperability of the different systems that integrate it.</p> <p>A new domain-specific service (namely, the <i>EMSI service</i>) has been added to the Socrates CSS core infrastructure in order to enable the structured exchange of EMSI (Emergency Management Shared Information) messages between the systems connected to the CIS. This service will not process or merge messages nor include any further business logic; the way in which messages are used, processed or interpreted will be transparent to the Socrates CSS tool. Thus, CM business processes associated to EXPE 43 will be fully supported by the systems that are connected to Socrates CSS.</p>	
Actors using the tool	Socrates CSS tool will be somehow used by all the actors that use the systems connected to the CIS, as this is implemented by Socrates CSS.	
Expected feedback	<p>Feedback on functionality, usability and efficiency is expected from the end-users/actors participating in EXPE 43. In particular, their impression on the following aspects would be appreciated:</p> <ul style="list-style-type: none">- Suitability, understood as the capability of the tool to provide an appropriate set of functions for the corresponding tasks.- Interoperability, understood as the capability of the tool to interact with other systems.- Attractiveness, understood as the capability of the tool to be attractive to the user.- Time behaviour, understood as the capability of the tool to provide appropriate response and processing times and throughput rates when performing its function under the stated conditions.	

Socrates OC	GMV
<p>Enables analysis and decision making based on shared situational awareness by providing a Common Operational Picture including a GIS and visualization of data (based on graphics and symbols) about the corresponding operational situation.</p> 	
General characteristics	
Usage in CM domain	<p>The tool may support situation assessment activities at the strategic and tactical levels. It is expected to be deployed at the corresponding Operations Centres (either international, national, regional or local) of the different levels of command.</p>
Main capabilities	<ul style="list-style-type: none"> - Data exchange among systems using Web Services. - Management of events or incidents, created by the operator or coming from external sources. - Reception of tracks data (AIS, AVL, Radar, GMTI...) in different formats (ASTERIX, SIVICC) and visualization on the situation map. - Suspicious items database. - Dynamic creation of types of events and their associated information (expandable and customizable). - Interoperable with FRONTEX EUROSUR through a EUROSUR Gateway.
Maturity	<p>TRL 8: The development of the tool has been completed after successful prototype demonstrations in operational environments. These demonstrations were carried out in several projects such as FP7 CLOSEYE (Collaborative evaluation Of border Surveillance technologies in maritime Environment bY pre-operational validation of innovativE Solutions) and the NATO'S MAJIC (Multi-sensor Aerospace-ground Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) and MAJIC 2 (Multi-intelligence All-source Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) programmes.</p>

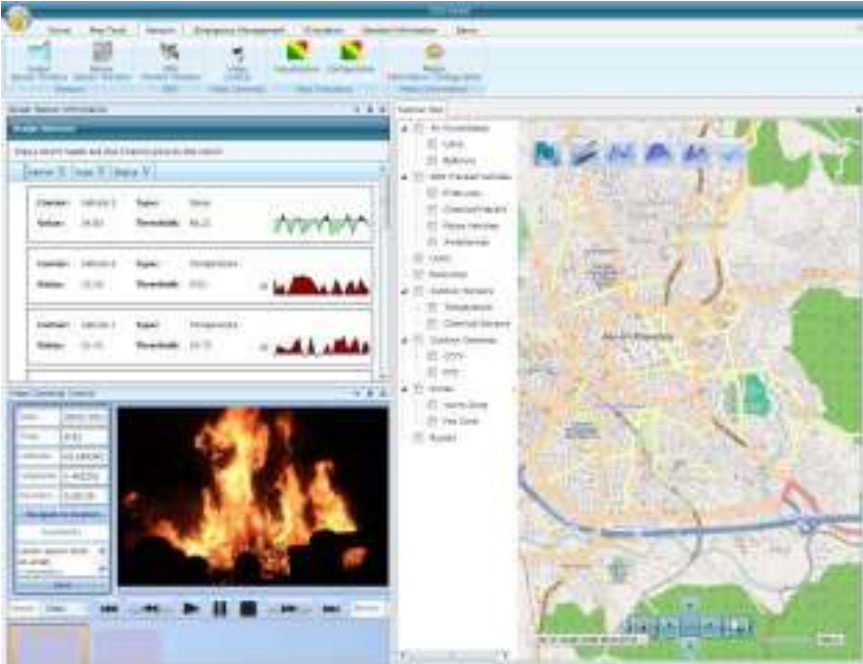
Socrates OC		GMV
Role in EXPE 43		
Role description	The tool will support the management of the information on crisis events, allowing the users to visualize these events on a map and share the information with other systems connected to the CIS. These systems are mostly expected to be also situation awareness tools, so that a COP can be shared by all the organizations involved in the management of the corresponding crisis event.	
Actors using the tool	The tool will be used by the personnel in the Operations Centres (National and/or Regional) of the organizations involved in the Crisis Management (either in Poland or Sweden).	
Expected feedback	<p>Feedback on functionality, usability and efficiency is expected from end-users/actors using the tool during the execution of EXPE 43. In particular, their impression on the following aspects would be appreciated:</p> <ul style="list-style-type: none"> - Suitability, understood as the capability of the tool to provide an appropriate set of functions for the corresponding tasks. - Interoperability, understood as the capability of the tool to interact with other systems. - Learnability, understood as the capability of the tool to enable the user to learn its application. - Operability, understood as the capability of the tool to enable the user to operate and control it. - Attractiveness, understood as the capability of the tool to be attractive to the user. - Time behaviour, understood as the capability of the tool to provide appropriate response and processing times and throughput rates when performing its function under the stated conditions. 	

Socrates TSK	GMV
<p>Enables the definition of contingency plans, the monitoring of organic resources and the assignment of tasks to relevant resources to execute the contingency plan or to define ad-hoc tasks. Besides, it improves the coordination of multi-national and multi-agency missions through assets and tasking requests.</p> 	
General characteristics	
Usage in CM domain	<p>The tool may support activities of preparation and planning and control and coordination at the strategic and tactical levels. It is expected to be deployed at the corresponding Operations Centres (either international, national, regional or local) of the different levels of command.</p>
Main capabilities	<ul style="list-style-type: none"> - Data exchange among systems using Web Services. - Management of tasks, created by the operator or coming from external sources: assignment, control and monitoring the progress of tasks. - Resource Management: monitoring the status and availability of the organic resources.

Socrates TSK		GMV
Maturity	TRL 8: The development of the tool has been completed after successful prototype demonstrations in operational environments. These demonstrations were carried out in several projects such as FP7 CLOSEYE (Collaborative evaluation Of border Surveillance technologies in maritime Environment bY pre-operational validation of innovative Solutions) and the NATO’S MAJIIC (Multi-sensor Aerospace-ground Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) and MAJIIC 2 (Multi-intelligence All-source Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) programmes.	
Role in EXPE 43		
Role description	The tool will support the management of resources and tasks, allowing the users to visualize these tasks and resources on a map. It receives information about the status and availability of the resources connected to the CIS. In addition, it can assign tasks to the organic resources, and monitor and control their progress. It can also collaborate with other control centres for pooling and sharing of resources.	
Actors using the tool	The tool will be used by the personnel in the Operations Centres (National and/or Regional) of the organizations involved in the Crisis Management (either in Poland or Sweden).	
Expected feedback	<p>Feedback on functionality, usability and efficiency is expected from end-users/actors using the tool during the execution of EXPE 43. In particular, their impression on the following aspects would be appreciated:</p> <ul style="list-style-type: none">- Suitability, understood as the capability of the tool to provide an appropriate set of functions for the corresponding tasks.- Interoperability, understood as the capability of the tool to interact with other systems.- Learnability, understood as the capability of the tool to enable the user to learn its application.- Operability, understood as the capability of the tool to enable the user to operate and control it.- Attractiveness, understood as the capability of the tool to be attractive to the user.- Time behaviour, understood as the capability of the tool to provide appropriate response and processing times and throughput rates when performing its function under the stated conditions.	

Socrates FR	GMV
<p>Enables analysis and decision making based on shared situational awareness by providing a Common Operational Picture including a GIS and visualization of data (based on graphics and symbols) about the corresponding operational situation.</p> <p>Also enables the reception of tasks assignments from the control centre.</p> 	
General characteristics	
Usage in CM domain	The tool may support activities of situation assessment and control and coordination at the operational level. It is expected to be used by the responders on field.
Main capabilities	<ul style="list-style-type: none"> - Data exchange among systems using Web Services. - Management of events or incidents, created by the operator or coming from external sources. - Management of tasks assigned by the control centre: assignment, control and monitoring the progress of tasks. - Resource Management: monitoring the status and availability of the organic resources. - Reception of tracks data (AIS, AVL, Radar, GMTI...) in different formats (ASTERIX, SIVICC) and visualization on the situation map. - Suspicious items database. - Dynamic creation of types of events and their associated information (expandable and customizable). - Interoperable with FRONTEX EUROSUR through a EUROSUR Gateway.
Maturity	TRL 8: The development of the tool has been completed after successful prototype demonstrations in operational environments. These demonstrations were carried out in several projects such as FP7 CLOSEYE (Collaborative evaluation Of border Surveillance technologies in maritime Environment bY pre-operational validation of innovativE Solutions) and the NATO'S MAJIC (Multi-sensor Aerospace-ground Joint Intelligence,

Socrates FR		GMV
	Surveillance and Reconnaissance Interoperability Coalition) and MAJIC 2 (Multi-intelligence All-source Joint Intelligence, Surveillance and Reconnaissance Interoperability Coalition) programmes.	
Role in EXPE 43		
Role description	<p>The tool will support the management of the information on crisis events, allowing the users to visualize these events on a map and share the information with other systems connected to the CIS. These systems are mostly expected to be also situation awareness tools, so that a COP can be shared by all the organizations involved in the management of the corresponding crisis event.</p> <p>It will support the management of resources and tasks, allowing the users to visualize these tasks on a map. It transmits information about the status and availability of the responder to the control centres connected to the CIS. In addition, it can be assigned tasks, and update their progress.</p>	
Actors using the tool	The tool will be used by the on-field responders of the organizations involved in the Crisis Management (either in Poland or Sweden).	
Expected feedback	<p>Feedback on functionality, usability and efficiency is expected from end-users/actors using the tool during the execution of EXPE 43. In particular, their impression on the following aspects would be appreciated:</p> <ul style="list-style-type: none">- Suitability, understood as the capability of the tool to provide an appropriate set of functions for the corresponding tasks.- Interoperability, understood as the capability of the tool to interact with other systems.- Learnability, understood as the capability of the tool to enable the user to learn its application.- Operability, understood as the capability of the tool to enable the user to operate and control it.- Attractiveness, understood as the capability of the tool to be attractive to the user.- Time behaviour, understood as the capability of the tool to provide appropriate response and processing times and throughput rates when performing its function under the stated conditions.	

ESS	GMV Sistemas
<p>The ESS Portal aims to offer a common interface for crisis management:</p> <ul style="list-style-type: none"> - Integrating in real time the information of multiple organizations & Offering additional capacities for simulation, prediction and information sharing. - Simplifying cooperation among different forces - Providing actionable, up-to-date information of the current situation 	
General characteristics	
Usage in CM domain	<p>The tool may support situation assessment activities at the strategic and tactical levels. It is portable as long as it is possible to deploy satellite communications in the area, and it is meant to be deployed at the local operations centre set-up in the incident scenario, but it can also be accessed remotely through the internet for authorized users.</p> <p>It is expected to be deployed at the corresponding Operations Centres (either international, national, regional or local) of the different levels of command.</p> <p>It can also support preparedness by replaying previous incidents in order to support training exercises at the exercise site or at the user premises.</p>
Main capabilities	<p>The portal has been designed with a Service-Oriented Mentality, where each piece of functionality is seen as a suite of interoperable services that bridge together disparate systems, simulators and data sources.</p> <ul style="list-style-type: none"> - Data exchange among systems using Web Services. - Management of events or incidents, created by the operator or coming from external sources. - Monitoring of resources (location and multiple sensors, such as temperature, water level pressure, and chemical sensors). - Integration of video images and cameras field of view information on the tactical map

ESS		GMV Sistemas
	<ul style="list-style-type: none">- Integration of simulation tools (ALOHA, G-FMIS) for chemical spread and fire spread prediction- Simple commanding of ESS – enabled resources- Sketching tools on the tactical map and sharing of the COP among operators.- Integration of images and video from mobile terminals equipped with the ESS client.- Integration of status, location and images from external resources (E.G. SOGRO Triage information)	
Maturity	TRL 8: The development of the tool has been completed after successful prototype demonstrations in operational environments. These demonstrations were carried out in several projects such as FP7 ESS (Emergency Support System) and SOGRO, funded by the Federal Ministry of Education and Research of Germany.	
Role in EXPE 43		
Role description	<p>The tool will support the management of the information on crisis events, allowing the users to visualize these events on a map and share the information with other systems connected to the CIS. These systems are mostly expected to be also situation awareness tools, so that a COP can be shared by all the organizations involved in the management of the corresponding crisis event.</p> <p>Please, do note that the system is more suited to display information and allow sharing the COP between organizations than to the tasking of assets and the exchange of capabilities information. However, we are working on adapting these functionalities with the current CSS interface to provide a richer experience for the experiment.</p>	
Actors using the tool	We are not 100% sure at this stage, but probably at one of the regional OCs would be the most suitable actors. It could be used at the national OC level too, although there are multiple tools that can operate in the same levels and roles, although it should be decided whether we are going to be using multiple tools at the same level or they would be distributed among the different actors.	
Expected feedback	<p>The main hypothesis of the experiment for the ESS platform is whether the platform is suitable for the cooperation scenario and if it can be integrated with the rest of the systems and/or if the CSS coordination system is the appropriate coordination tool to manage a crisis incident.</p> <p>Additionally, the platform has never been used for a maritime rescue scenario, so the suitability of the ESS platform for the coordination in such a scenario can also be tested.</p> <p>Given that the ESS resources communicate via Satellite and wireless communications, which will not be available at sea, the latency and the throughput of satellite for all communications can also be measured.</p> <p>Video imaging, which was one of the key strengths of the ESS platform, might not be available depending on the distance to the cruiser incident, so the relative weight of the functionality can also be measured against other scenarios</p>	

ESS		GMV Sistemas
	demonstrated already with the tool.	

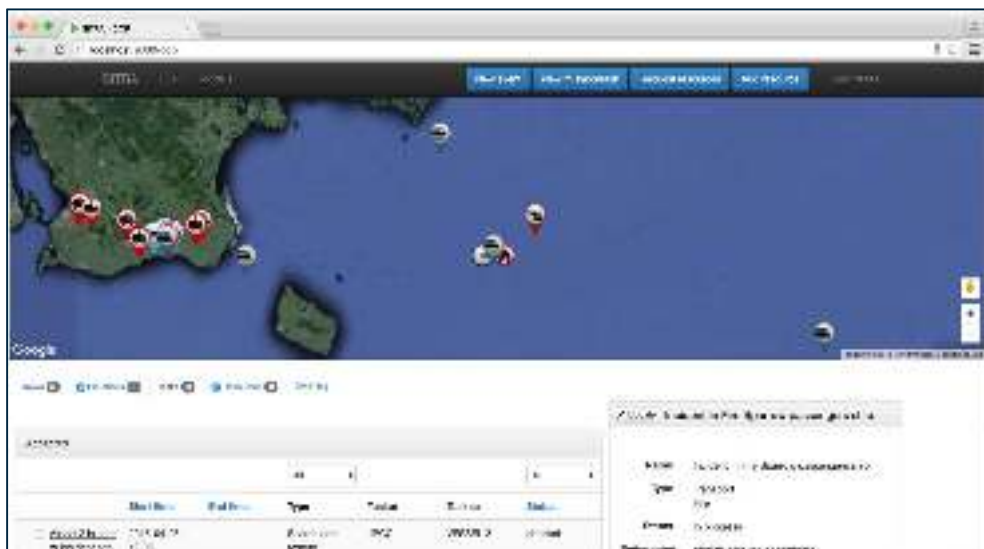
LUPP		MSB
LUPP is an operative logging, command and control tool for local rescue services organisations.		
General characteristics		
Usage in CM domain	The tool used in the response phase for logging operational decisions command & control and situation awareness in missions by local rescue services organisations.	
Main capabilities	<ul style="list-style-type: none">- Automated import of alarms and unit dispatch instructions- Keep track of the local organisations resources.- Automated logging of vehicle positions- Manual logging of operational decisions, assessments etc.- Provide map based operational picture with resources, incident location for the incidents etc.- Use the map component to visualise data from other tools such as aerial gas dispersion “plume” calculation.- All the tools features are available for users in the field command post with off-line capabilities by synchronisation. This enables officers to manage the missions equally well from the field command post or remotely from the station.	
Maturity	The tool is in operational use, TRL 9.	
Role in EXPE 43		
Role description	Used by local rescue services to manage their role in the experiment and to exchange information regarding missions with other local organisations and/or regional organisations.	
Actors using the tool	Swedish municipal rescue services; local command post and/or field command post.	

LUPP	MSB
Expected feedback	<p>There are two distinctive parts of the objectives for this experiment. The first part of objectives covers details about Test-bed development and set-up. The second part covers details about the use of a mature operational management system as a tool for providing a common operational picture superimposed on the operational management picture.</p> <ul style="list-style-type: none"> - Can LUPP receive EMSI messages and interpret them and show them to the users in a clear way? Hypotheses: Yes. - Can LUPP without interfering with the operational management picture present information from the common operational picture? Hypotheses: Yes. - Can LUPP send data from the operational management picture to the participating bodies using EMSI messages? Hypotheses: Yes. <p>Other goals for LUPP were:</p> <ul style="list-style-type: none"> - Gather feedback on functions lacking regarding functionalities related to COP. - Collect data points for further analysis for product stabilization.

Protect / Alert4All	EDISOFT
<p>Protect allows the management of: emergencies; involved resources; requests for assistances; documents involved, and lessons learned registry in a crisis situation, as well as monitoring its development.</p>	
General characteristics	
Usage in CM domain	<p>The tool will allow the management of: emergencies; involved resources; requests for assistances; and lessons learned registry in a crisis situation, as well as monitoring its development.</p> <p>It will be (cross)xLevel implementation (Operational; tactical and strategical),</p>

	xBorder (used in both countries) documents involved and will be available to national and regional authorities.
Main capabilities	<ul style="list-style-type: none"> - Emergencies management - Involved resources - Requests for assistances - Documents involved - Lessons learned registry in a crisis situation - Data exchange among systems using Web Services. - Exchange TSO information files in XML format.
Maturity	The development of some features of the tool is ongoing and involves EDISOFT skills gathered in several different projects like: CECIS; A4All; and OASIS. Thus we can assume that the tool is in a high maturity level.
Role in EXPE 43	
Role description	<p>The tool will support the management of: emergencies; involved resources; requests for assistances; and lessons learned registry in a crisis situation, as well as monitoring its development.</p> <p>The tool will exchange TSO information in a XML format with the other tools using the CIS (Common Information Space).</p>
Actors using the tool	The tool will be used by the personnel in the Operations Centers (National and/or Regional) of the organizations involved in the Crisis Management (either in Poland or in Sweden).
Expected feedback on EXP43	<p>Feedback on:</p> <ul style="list-style-type: none"> - The Requests for Assistance processed between National and Regional entities in different countries. - Protect Notification sent between the several authorities and main actors. - Emergency status management. - Data exchange among systems using Web Services. - Exchange TSO information files in XML format. <p>The main research goal is to test the Protect tool with the EMSI messages using a CSI system, in order to support the information exchange between several entities and different Emergency Management tools in Crises Management area.</p> <p>Protect as already an internal communication support system that allows the emergencies Request for Assistance management in a Cross Border; Cross Level and Cross Phases approach. Edisoft was responsible for the TSO (Tactical Situation Object) in OASYS FP6 project. The use of TSO supported data model and XML files type was also used in Alert4All FP7 project, where EDISOFT was the responsible for the “Information Management Portal”. However, the information exchange with Command and Control and other Emergency Management systems was mainly supported by proprietary and specific type of files. Thus, Edisoft implemented with success the SOA approach, using the web services defined by the CIS platform provider and available in the SoS, in order to use the necessary EMSI messages that should support the data exchange between the several tools in EXP 43. The</p>

	specification and implementation of the necessary Protect interfaces that enable data exchange between Protect and the CIS Common Information Space (which has been defined as an architectural framework for SP4 in WP48 Architecture) and consequently the other tools involved, was also developed and tested in lab.
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SITRA – COP (Common Operational Picture)		FOI
<p>SITRA-COP is a research prototype for a COP in the context of crisis management. On top of traditional functionality (e.g. COP map view with icons, database, web services, etc.) it includes semantic techniques, reasoning and decision support to leverage the existing information. Its main purpose is to build Situation Assessment (SA) and decision support for a command central based on available information. SITRA-COP also supports management of resources and tasks. The users can visualize tasks and resources on a map as well as assigning tasks and monitor progress.</p>		
		
General characteristics		
Usage in CM domain	SITRA-COP supports situation assessment activities at the strategic and tactical levels. It is expected to be deployed at the corresponding Operations Centres (either international, national, regional or local) of the different levels of command.	
Main capabilities	<ul style="list-style-type: none">- Data exchange via Web Services- Interactive map (COP)- Management of events or incidents which can be created by the operator or coming from external sources.- Management of tasks assigned by the control centre: assignment, control and monitoring the progress of tasks.- Creation/reporting of events and their associated information.- Resource Management: monitoring the status and availability of the resources.- Information aggregation for decision making purposes	
Maturity	TRL 4-6. System demonstration in laboratory/relevant environment	
Role in EXPE 43		

SITRA – COP (Common Operational Picture)		FOI
Role description	SITRA will give the user an overview of the situation including missions and resources by visualizing information on a map and aggregating information in the form of tables. Furthermore, the tool can be used to share information about the incident at hand. The tool can also be used to assign tasks and monitor progress.	
Actors using the tool	The tool will be used by the Swedish Joint Rescue Coordination Centre (JRCC). The JRCC will use the tool to monitor the situation, share information and assign tasks to available resources (4 helicopters and 3 rescue boats).	
Expected feedback	<p>The main objective is connected to technical aspects such as testing the technical infrastructure and the proposed information exchange format (EMSI). The most important question related to the standard is if it can be used, as is or with modifications, to exchange relevant information between the actors involved in an efficient way. In this context, relevant information is the kind of information that the actors need and want to communicate to each other in order to coordinate and carry out a large scale maritime evacuation. FOI will, as complementary objective, explore to what extent the standard can be used for information aggregation and decision making purposes such as capacity and mission progress monitoring.</p> <p>Based on the information available related to the incident, we will also evaluate a tool (SITRA-COP) both from a technical and user perspective. Since the EMSI standard puts limitations on what information that can be shared and how it is shared, the evaluation of the tool itself will be of secondary interest but will however give valuable indicators for further research and development. The user perspective focuses on evaluating how well the tool is performing in terms of helping the actor to carry out his/her task. Feedback related to the user perspective will be collected by discussing the current situation as presented by the tool during the experiment. The discussion will be complemented by a questionnaire after the experiment. The technical evaluation will cover aspects such as the tools ability to correctly handle received messages and response times.</p> <p>The research questions in order of relevance are:</p> <ol style="list-style-type: none"> 1. How can the EMSI standard be used to exchange the information that the actors want to share with each other to successfully handle the crisis situation 2. How can information, shared by the use of the EMSI standard, be used to create aggregated views of the information which gives the operator a summary of <ol style="list-style-type: none"> a. Resources and available capacity b. Resources and capacity in use <p>How can automatic aggregation, fusion and inference rules be used to help the user to understand the current situation faster and with higher accuracy.</p>	

Annex 3 – Questionnaire template for participants in the Polish site

This annex includes the template of the questionnaires which were provided to participants in the Polish site. Most of the questionnaires were manually filled and given back to Experiment 43b's organizer the last day of the experiment, while others were taken and sent filled by mail some weeks after.

In the case of the Swedish site, the filling of questionnaires was supported by the Exonaut tool (see section 2.3.2), which directly provided summary reports according to all the answers gathered. The templates for these summary reports are included in Annex 4.

Experimentation 43 Use Case 2. Tools
Feedback Questionnaire

To be returned to Hector Naranjo Soben (hnaranjo@ams.com) by the 16th of May 2016 (EOM)

Experimentation 43 Use Case 2. Tools Feedback Questionnaire

EXPERIMENTATION 43	
Name	
Email Address	
Organisation	
Country	
Are you familiar with Command and Control Systems (from 1-not at all to 5-expert)	

1 Operational benefits

- A Resource Management System of Systems (SoS) is a way to assign missions to different resources, and monitor the resource status and the mission fulfilment. In your opinion are the experimented solutions implementing such an approach?

- ☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

- A Common Operational Picture (COP) is a way to share information vertically (between different levels in a single agency or country) and horizontally (with other agencies and countries). In your opinion are the experimented solutions implementing a COP approach?

- ☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

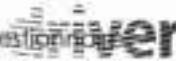
2 Shared information

2.1 Type of Information

- Do you think that the dissemination of available capacity information is useful?

- ☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Experimentation 43 Use Case 2. Tools Feedback Questionnaire



Comment:

- Do you think that the dissemination of crisis situation information is useful?
 - ☐ Not at all
 - ☐ A little bit
 - ☐ Somewhat
 - ☐ Quite a bit
 - ☐ Completely

Comment:

- Do you think that the dissemination of information about resources status and their missions is useful?
 - ☐ Not at all
 - ☐ A little bit
 - ☐ Somewhat
 - ☐ Quite a bit
 - ☐ Completely

Comment:

- What other kind of information do you think that should be shared?

Comment:

2.2 Sharing Actors

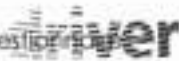
- Do you think that sharing information between different levels in a single agency is useful?
 - ☐ Not at all
 - ☐ A little bit
 - ☐ Somewhat
 - ☐ Quite a bit
 - ☐ Completely

Comment:

- What kind of information do you think that should be shared (select as many options as you want)?
 - ☐ Available capacity
 - ☐ Crisis situation
 - ☐ Resource status and their missions' fulfillment
 - ☐ Other

Comment:

- Do you think that sharing information between different agencies in a single country is useful?
 - ☐ Not at all
 - ☐ A little bit
 - ☐ Somewhat

Experimentation 43 Use Case 2. Tools Feedback Questionnaire 

☐ Quite a bit
☐ Completely

Comment:

- What kind of information do you think that should be shared (select as many options as you want)?

☐ Available capacity
☐ Crisis situation
☐ Resource status and their missions' fulfillment
☐ Other

Comment:

- Do you think that sharing information between different countries is useful?

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

- What kind of information do you think that should be shared (select as many options as you want)?

☐ Available capacity
☐ Crisis situation
☐ Resource status and their missions' fulfillment
☐ Other

Comment:

3 Technical performance (usability)

- Do you think that the information on the SOCRATES suite is useful?

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

- Do you think that the SOCRATES suite is easy to use?

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

Experimentation 43 Use Case 2: Tools Feedback Questionnaire

- What would improve the SOCRATES Suite?

Comment:

- What do you like in the SOCRATES Suite?

Comment:

- Do you think that the information on SITRA tool is useful?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- Do you think that SITRA tool is easy to use?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- What would improve the SITRA tool?

Comment:

- What do you like in the SITRA tool?

Comment:

- Do you think that the information on LUPP tool is useful?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- Do you think that LUPP tool is easy to use?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- What would improve the LUPP tool?

Comment:

Experimentation 43 Use Case 2. Tools Feedback Questionnaire

- What do you like in the LUPP tool?

Comment:

- Do you think that the information on the Simulation Tools is useful?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- Do you think that the Simulation Tools are easy to understand?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- What would improve the Simulation Tools?

Comment:

- What do you like in the Simulation Tools?

Comment:

4 Set up of the experimentation

The objective of the tool experimentation is to assess the potential enhancement on coordinated tasking and resource management including cross border cooperation taking advantage of a Resource Management System of Systems (SoS) and a Common Operational Picture (COP):

- Do you think that the set-up of this experimentation is well adapted to the objective?

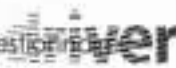
- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- What improvement in the set-up would you suggest?

Comment:

- Do you think that the simulation plays an interesting role in the experimentation?

Experimentation 43 Use Case 2. Tools Feedback Questionnaire 

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

- Do you think that having professional players is important for such experimentation?

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

5 Experimentation results

- Did you learn/discover something during this experimentation?

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

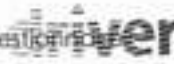
Comment:

- Do you think that this experimentation will benefit the crisis management community?

☐ Not at all
☐ A little bit
☐ Somewhat
☐ Quite a bit
☐ Completely

Comment:

Experimentation 43 Use Case 2. Tools Feedback Questionnaire



6 Way forward

This experimentation will be followed by two other events incorporating feedback from this experimentation and trying to make the scenario closer to reality increasing the involvement of end users and avoiding some simplifications that were required at this stage:

- Do you find this an interesting way forward?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- What other perspectives would you recommend?

Comment:

- Would you be interested in being involved in these future experimentations?

- ☐ Not at all
- ☐ A little bit
- ☐ Somewhat
- ☐ Quite a bit
- ☐ Completely

Comment:

- Who else would you recommend as a participant?

Comment:

Annex 4 – Questionnaire template for participants in the Swedish site

The filling of questionnaires in the Swedish site was supported by the Exonaut tool (see section 2.3.2), which directly provided summary reports according to all the answers gathered. These reports were classified into the following areas, the first two being related to the CM dimension of the experiment and the last two to the solutions dimension:

- CM evaluation.
- Research evaluation.
- Feedback on tools.
- IT evaluation.

The templates for the corresponding summary reports are included here below in the form of tables.

CM Evaluation

Objective Name, Assessor	Objective Assessment Field	Assessment
Driver Crossborder exercise from preparedness to response		
Infrastructure and platforms Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Optimal Operational Technologies		<div> <div></div> <div></div> <div></div> </div> <div>0</div>
To what extent do you, considering the limitations of this experiment, think that the use of background simulation enhances the experience of the experiment? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
To what extent do you, considering the limitations of this experiment, think that the use of VR (XVR) enhances the experience of the experiment? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Optimal Supporting Technologies Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
To what extent do you think the matrix supports your understanding of participant's activities? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>

<p>To what extent do you think the matrix supports your understanding of participants' decisions?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>To what extent do you think the matrix supports your understanding of the gaming organisation's activities?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>What are the opportunities and benefits for MSB and Swedish emergency services from virtual training?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>What threats and issues are associated with the development towards virtual training.</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>To what extent is there a benefit or risk of using virtual simulated footage in an exercise? Please argue this point.</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>To what extent are virtual images or footage realistic enough? Please argue.</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>What efficiency criteria can be identified as critical in the use of virtual simulation for training and exercise purposes?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>What efficiency criteria can be identified, and should these efficiency criteria have been clearer in the scenarios?</p>		<p>0000</p> <p>0</p>
<p>To what extent are these criteria important for learning? Please</p>		<p>0000</p> <p>0</p>

describe how and why.		
<p>Are there criteria that may not be important for learning, but that are important to keep the scenario developing and maintain the enthusiasm of the participants? Please describe what, if any, such criteria that you have identified in this experiment</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>Are there aspects that are especially important to keep the training audience focused and motivate more training? Please argue.</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>In a scenario-driven exercise, what aspects could be improved or what could be added to ensure increased involvement of the training audience?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>In a scenario-driven exercise, what aspects could be improved or what could be added to ensure increased enthusiasm in the training audience?</p>		<p>0000</p> <p>0</p>
<p>In a scenario-driven exercise, what aspects could be improved or what could be added to ensure a more authentic experience for the training audience?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>Flexible and Adaptive Platforms</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
<p>To what extent do you think it would be valuable to follow activities from another location?</p> <p>Eval team</p>		<p>0000</p> <p>0</p>
Methods and processes		<p>0000</p> <p>0</p>

Eval team		
Collaboration Methods		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Did you have enough options to exchange knowledge with other actors Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Did you have enough options to share your expertise with other actors? Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
People and organisation Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Collaborative Community of Users		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
To what extent did you understand the terminology used in the experiment? Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
To what extent do you think the setting was helpful to learn about collaboration? Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
To what extent were you able to share your knowledge with other participants? 		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Effective Governance and Ownership		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
How inclined would you be to participate in a similar activity as actor/observer again? Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Did you receive enough support in your role as actor/observer? Eval team		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Adaptive and Inclusive Culture		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>

To what extent do you think the setting was helpful to learn about collaboration?		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
How would you assess your own learning possibilities from this session? Eval team		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
Experimentation in CM Eval team		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
Serving the crisis management community		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
To what extent were you able to explore your personal capability (förmåga) as a crisis manager? Eval team		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
To what extent were you able to explore your organisation's capability (förmåga) in crisis management? Eval team		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
To what extent did you experience a transfer of knowledge between research and crisis management? Eval team		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
To what extent did you experience a transfer of knowledge between industry and crisis management? Eval team		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
To what extent did you experience a transfer of knowledge between civil society and crisis management?		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>
To what extent did you experience a transfer of knowledge between different actors within crisis management?		<div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> </div>

Research evaluation

Objective Name, Assessor	Objective Assessment Field	Assessment
DRIVER Cross-border exercise from preparedness to response		
Infrastructure and platforms		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Optimal Operational Technologies		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
To what extent do you, considering the limitations of this experiment, think that the use of background simulation enhances the experience of the experiment?		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
To what extent do you, considering the limitations of this experiment, think that the use of VR (XVR) enhances the experience of the experiment?		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
Optimal Supporting Technologies		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
To what extent do you think the matrix supports your understanding of participant's activities?		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
To what extent do you think the matrix supports your understanding of participants' decisions?		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
To what extent do you think the matrix supports your understanding of the gaming organisation's activities?		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
What are the opportunities and benefits for MSB and Swedish emergency services from virtual training?		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>
Eval team		
What threats and issues are associated with the development towards virtual		<div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div>







training?		
Eval team		
To what extent is there a benefit or risk of using virtual simulated footage in an exercise? Please argue this point.		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
To what extent are virtual images or footage realistic enough? Please argue.		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
What efficiency criteria can be identified as critical in the use of virtual simulation for training and exercise purposes?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
What efficiency criteria can be identified, and should these efficiency criteria have been clearer in the scenarios?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
To what extent are these criteria important for learning? Please describe how and why.		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
Are there criteria that may not be important for learning, but that are important to keep the scenario developing and maintain the enthusiasm of the participants? Please describe what, if any, such criteria that you have identified in this experiment		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
Are there aspects that are especially important to keep the training audience focused and motivate more training? Please argue.		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
In a scenario-driven exercise, what aspects could be improved or what could be added to ensure increased involvement of the training audience?		<div> <div>●●●●</div> <div>0</div> </div>

Eval team		
In a scenario-driven exercise, what aspects could be improved or what could be added to ensure increased enthusiasm in the training audience?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
In a scenario-driven exercise, what aspects could be improved or what could be added to ensure a more authentic experience for the training audience?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
Flexible and Adaptive Platforms		<div> <div>●●●●</div> <div>0</div> </div>
To what extent do you think the set-up of the experiment in terms of participating type of actors can contribute to innovation?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
To what extent do you think the set-up of the experiment in terms of participating crisis management organizations can contribute to innovation?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
To what extent do you think the set-up of the experiment in terms of the hosting organization (MSB) can contribute to innovation?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
To what extent do you think it would be valuable to follow activities from another location?		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		
Methods and processes		<div> <div>●●●●</div> <div>0</div> </div>
Collaboration Methods		<div> <div>●●●●</div> <div>0</div> </div>
Did you have enough options to exchange knowledge with other actors		<div> <div>●●●●</div> <div>0</div> </div>
Eval team		

Did you have enough options to share your expertise with other actors?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
To what extent was the opportunity to give feedback during the exercise and the chosen mode for this (a tablet based application) helpful?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
People and organisation		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Collaborative Community of Users		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
To what extent did you understand the terminology used in the experiment?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
To what extent do you think the setting was helpful to learn about collaboration?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
To what extent were you able to share your knowledge with other participants?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
Effective Governance and Ownership		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
How inclined would you be to participate in a similar activity as actor/observer again?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
Did you receive enough support in your role as actor/observer?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
Adaptive and Inclusive Culture		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
To what extent do you think the setting was helpful to learn about collaboration?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Eval team		
How would you assess your own learning possibilities from this session?		<div> <div> <div></div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>

Eval team		
Experimentation in CM		<div> <div>●●●●</div> <div>0</div> </div>
Serving the crisis management community		<div> <div>●●●●</div> <div>0</div> </div>
To what extent did you experience a transfer of knowledge between research and crisis management? Eval team		<div> <div>●●●●</div> <div>0</div> </div>
To what extent did you experience a transfer of knowledge between industry and crisis management? Eval team		<div> <div>●●●●</div> <div>0</div> </div>
To what extent did you experience a transfer of knowledge between civil society and crisis management? Eval team		<div> <div>●●●●</div> <div>0</div> </div>
To what extent did you experience a transfer of knowledge between different actors within crisis management? Eval team		<div> <div>●●●●</div> <div>0</div> </div>

Feedback on tools

Feedback question	Qualitative feedback	Assessment (1-5, where 1 = not at all, 5 = completely)
Operational benefits		
Resource Management System of Systems A Resource Management System of Systems (SoS) is a way to assign missions to different resources, and monitor the resource status and the mission fulfilment. In your opinion are the experimented solutions implementing such an approach? Experiment 43 Eval team		
Common Operational Picture A Common Operational Picture (COP) is a way to share information vertically (between different levels in a single agency or country) and horizontally (with other agencies and countries). In your opinion are the experimented solutions implementing a COP approach? Experiment 43 Eval team		
Dissemination of available capacity information Do you think that the dissemination of available capacity information is useful? Experiment 43 Eval team		
Dissemination of crisis situation information Do you think that the dissemination of crisis situation information is useful? Experiment 43 Eval team		
Dissemination of Status Do you think that the dissemination of information about resources status and their missions is useful? Experiment 43 Eval team		
Other information? What other kind of information do you think that should be shared? Experiment 43 Eval team		

Sharing between nations Do you think that sharing information between different countries is useful?		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Sharing information between different agencies Do you think that sharing information between different agencies in a single country is useful?		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Sharing information within one agency Do you think that sharing information between different levels in a single agency is useful?		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Sharing within one nation Do you think that sharing information between different agencies in a single country is useful?		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Do you think that the information on the SOCRATES suite is useful? Experiment 43 Eval team		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Do you think that the SOCRATES suite is easy to use? Experiment 43 Eval team		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
What would improve the SOCRATES Suite? Write in free text Experiment 43 Eval team		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
What do you like in the SOCRATES Suite? Write in free text Experiment 43 Eval team		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Do you think that the information on SITRA tool is useful? Experiment 43 Eval team		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>
Do you think that SITRA tool is easy to use? Experiment 43 Eval team		<div> <div> <div></div> <div></div> <div></div> </div> <div>0</div> </div>

What would improve the SITRA tool? Write in free text Experiment 43 Eval team		000 0
What do you like in the SITRA tool? Experiment 43 Eval team		000 0
Do you think that the information on LUPP tool is useful? Experiment 43 Eval team		000 0
Do you think that LUPP tool is easy to use? Experiment 43 Eval team		000 0
What would improve the LUPP tool? Experiment 43 Eval team		000 0
What do you like in the LUPP tool? Experiment 43 Eval team		000 0
Do you think that the information on the Simulation Tools is useful? Experiment 43 Eval team		000 0
Do you think that the Simulation Tools are easy to understand? Experiment 43 Eval team		000 0
What would improve the Simulation Tools? Experiment 43 Eval team		000 0
What do you like in the Simulation Tools? Experiment 43 Eval team		000 0
Set Up The objective of the tool experimentation is to assess the potential enhancement on coordinated tasking and resource management including cross border cooperation taking advantage of a Resource Management System of Systems (SoS) and a Common Operational Picture (COP)		
Do you think that the set-up of this experimentation is well adapted to the objective? What improvement in the set-up would you		000 0

suggest?		
Experiment 43 Eval team		
Do you think that the simulation plays an interesting role in the experimentation?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		
Do you think that having professional players is important for such experimentation?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		
Experimentation results		
Did you learn/discover something during this experimentation?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		
Do you think that this experimentation will benefit the crisis management community?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		
Do you find this an interesting way forward?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		
Would you be interested in being involved in these future experimentations?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		
Who else would you recommend as a participant?		<div> <div>0</div> <div>100%</div> </div>
Experiment 43 Eval team		

IT evaluation

Objective Name, Assessor	Objective Assessment Field	Assessment
Driver Crossborder exercise from preparedness to response		
Infrastructure and platforms		<div> <div></div> <div></div> <div></div> <div></div> </div>
Optimal Operational Technologies		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent do you, considering the limitations of this experiment, think that the use of background simulation enhances the experience of the experiment? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent do you, considering the limitations of this experiment, think that the use of VR (XVR) enhances the experience of the experiment? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div>
Optimal Supporting Technologies		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent do you think the matrix supports your understanding of participant's activities? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent do you think the matrix supports your understanding of participants' decisions? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent do you think the matrix supports your understanding of the gaming organisation's activities? Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div>
What are the opportunities and benefits for MSB and Swedish emergency services from virtual training?		<div> <div></div> <div></div> <div></div> <div></div> </div>
What threats and issues are associated with the development towards virtual training.		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent is there a benefit or risk of using virtual simulated footage in an exercise? Please argue this point. Eval team		<div> <div></div> <div></div> <div></div> <div></div> </div>
To what extent are virtual images or footage realistic enough? Please argue.		<div> <div></div> <div></div> <div></div> <div></div> </div>
What efficiency criteria can be identified as critical in the use of virtual simulation for training and		<div> <div></div> <div></div> <div></div> <div></div> </div>

exercise purposes?		
What efficiency criteria can be identified, and should these efficiency criteria have been clearer in the scenarios?		*** 0
To what extent are these criteria important for learning. Please describe how and why.		*** 0
Are there criteria that may not be important for learning, but that are important to keep the scenario developing and maintain the enthusiasm of the participants? Please describe what, if any, such criteria that you have identified in this experiment		*** 0
Are there aspects that are especially important to keep the training audience focused and motivate more training? Please argue. Eval team		*** 0
In a scenario-driven exercise, what aspects could be improved or what could be added to ensure increased involvement of the training audience?		*** 0
In a scenario-driven exercise, what aspects could be improved or what could be added to ensure increased enthusiasm in the training audience?		*** 0
In a scenario-driven exercise, what aspects could be improved or what could be added to ensure amore authentic experience for the training audience?		*** 0
Flexible and Adaptive Platforms		*** 0
To what extent do you think it would be valuable to follow activities from another location? Eval team		*** 0