Driving Innovation in Crisis Management for European Resilience

D934.11 – EXPERIMENT 41 DESIGN & REPORT

SP91 - PROJECT MANAGEMENT

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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

This document reports on the design and results of the DRIVER+ project (before suspension) experiment (EXPE) named EXPE41: the "Operational Data Lift" which was held in Valabre in March 2016. The document will furthermore highlight the added value of this experiment for the DRIVER+ project. The experiment is aimed to address the entire Crisis Management community. The setup and the results may be therefore of interest to any organisation envisaging the adoption of a Common Operational Picture (COP). Especially the design and set-up of EXPE41 may be an inspiration for their own experimentation process, and may help them accelerating or improving it. In addition, the results of EXPE41, which are rooted in a specific context, but aim at reaching some generic perspective, may also be of interest to them.

The main objective of EXPE41, the "Operational Data Lift" experiment conducted within the DRIVER+ was to assess the operational benefit that a COP solution could bring to the coordination of a complex crisis in terms of vertical dissemination of information in the chain of command, and horizontal sharing of information with cross border partners and other agencies (e.g. Health and Police).

Many civil protection organisations contemplate the adoption of a COP as an interesting perspective to enhance the shared vision of the incident between parties, but consider that conditions, benefits and impacts should be explored.

Hosted by Valabre, at the CESIR (Centre Euro-méditerranéen de SImulation des Risques) training centre, the "Operational Data Lift" experiment was led by Thales, co-organized with Valabre and Safe-Cluster, and involved Frequentis, MSB, Valabre and JRC as tool providers, and XVR as simulation provider.

The principle of the experiment was to compare the current legacy solution with a COP based solution. The evaluated solution is the whole system of systems composed of the Command and Control systems used by the French and Swedish chains of command and exchanging information.

The comparison was performed by running the same scenario three times: a first run with the legacy solution based on the SYNERGI portal of the Ministry of Interior, and two other runs based on two COP tools (respectively provided by Thales and Frequentis) and using information exchange standards (EMSI, CAP, EDXL-DE).

The scenario was a forest fire on a border (imaginary border between France and Sweden) with a cascading effect (chemical threat to a village).

The main research questions of the "Operational Data Lift" experiment are the following:

- Do the tested COP solutions bring the expected operational benefits: is information better shared, faster, with less effort?
- Does the use of the CESIR simulator bring effective support to this kind of experiment?

Many civil protection organisations were involved in the scenario. On the French side, apart from Valabre and Safe cluster, who hosted the experiment, the whole chain of command was involved, from field level to local, zonal and national levels, as well as the police. On the Swedish side, the field level and the national levels were involved. Both countries communicated with JRC playing the role of the ERCC (EU level).

Fire officers from Marseille, MSB, Var and Bouches du Rhones *départements*, South of France Zonal Headquarter, Paris, and Valabre played the various levels. Three external evaluators contributed to EXEP41: two trainers in incident command from Germany (IdF NRW) and UK (NRFS) as well as one expert in Security (CESS).

Both qualitative results (questionnaires, open feedback sessions) and quantitative results (C2 systems logs) were collected and led to the following main results:

- the COP based solution provided an interesting operational benefit compared to the legacy solution, mostly in terms of ease of use and better information sharing. This benefit results mostly from a better information exchange between the various C2 systems involved (based on technical and semantic

standards), as well as from the availability in the COP solution of a shared map between local, zonal and national levels.

- the CESIR simulator played an important and positive role in the set-up of the experiment, which was considered as adapted to the objectives of the experiment. This opens new operational and business perspectives for Valabre (and potentially for other platforms) in the experimentation and/or validation of new tools or procedures.

Apart from these results, interesting feedback has been collected on the COP tools, as well as important inputs for future work to be conducted in DRIVER+ concerning the Guidance Methodology, and possible scenarios for new iterations of EXPE41 as part of the planned Trials.

The main recommendations of EXPE41 are related to the need for civil protection tactical information exchange standards in Europe, as well as to the necessity to require from civil protection C2 systems that they implement information exchange functions (as least at technical level).

A paper describing EXPE41 and entitled *Trialling a Common Operational Picture in a simulated environment* was presented at the international ICT-DM 2017 on ICT in Disaster Management in Muenster (Germany) in December 2017 and received the Best Paper Award.

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List of Acronyms

Acronym	Definition
BMPM	Bataillon des Marins Pompiers de Marseille
BSPP	Brigade des Sapeurs Pompiers de Paris
CAP	Common Alerting Protocol
CESIR	Centre Euro-méditérannéen de SImulation des Risques
CEREN	Centre d'Essai et de Recherche National
CESS	Centre for European Security Studies
CIC	Centre Interministériel de Crise
CIS	Common Information Space
CM	Crisis Management
CNIL	Commission Nationale de l'Informatique et des Libertés, France data protection agency
COD	Centre Opérationnel Départemental
CODIS	Centre Opérationnel Départemental d'Incendie et de Secours
COGIC	Centre Opérationnel de Gestion Interministérielle des Crises
COP	Common Operational Picture
COS	Commandant des Opérations de Secours
COZ	Centre Opérationnel de Zone
C2	Command and Control
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
DIREX	Direction of Exercise
DOS	Directeur des Opérations de Secours
ECASC	Ecole d'Application de la Sécurité Civile
EDXL-DE	Emergency Data Exchange Language Distribution Element
EMSI	Emergency Management
ERCC	Emergency Response Coordination Centre
FEMA	Federal Emergency Management Agency (US)
FCP	Field Command Post
FhG-IAO	Fraunhofer-Institut für Arbeitswirtschaft und Organisation, former DRIVER partner organisation
FP7	Seventh Framework Programme: European Union's Research and Innovation funding programme for 2007-2013
I4CM	International Workshop on Innovation for Crisis Management

Acronym	Definition
JRC	Joint Research Centre
KML	Keyhole Markup Language
LAN	Local Area Network
LHQ	Local Headquarter
LISI	Levels of Information Systems Interoperability
MININT	France ministry of interior
MOD	Ministry of Defense
MSB	Myndigheten För Samhällsskydd och Beredskap, Swedish Civil Contingencies Agency. Former DRIVER partner organisation
NHQ	National Headquarter
PÔNT	Pôle des nouvelles technologies
PNG	Portable Network Graphics
SDIS	Service d'Incendie et de Secours
SIDPC	Service Interministériel de Défense et de Protection Civile
SITAC	Tactical situation of the incident. From the French: SItuation Tactique
UK	United Kingdom
US	United States
WMS	Web Map Server
XVR	Simulator of XVR Simulation company, DRIVER partner.

1. Introduction

1.1 Document identification

This document is the DRIVER+ *D934.11 EXPE41 design & report* deliverable. It presents the objectives, design, set-up, preparation and results of EXP41, and gives a set of recommendations for future work to be accomplished in DRIVER+.

Many civil protection organisations contemplate the adoption of a Common Operational Picture (COP) as an interesting perspective to enhance the shared vision of the incident between parties, but consider that conditions, benefits and impacts should be explored.

This report aims at the Crisis Management community at large. It may be of interest to any organisation envisaging the adoption of a COP: the design and set-up of EXPE41 may be an inspiration for their own experimentation process, and help them accelerating or improving it. In addition, the results of EXPE41, which are rooted in a specific context, but aim at reaching some generic perspective, may also be of interest to them.

The main objective of EXPE41, the "Operational Data Lift" experiment conducted within the former DRIVER Sub-Project 4 was to assess the operational benefit that a COP solution could bring to the coordination of a complex crisis in terms of vertical dissemination of information in the chain of command and horizontal sharing of information with cross border partners and other agencies (e.g. Health, Police).

Hosted by Valabre, at the *Centre Euro-méditerranéen de SImulation des Risques* (CESIR) training centre, the EXPE41 was led by Thales, co-organized with Valabre and Safe-Cluster, and involved Frequentis, MSB, Valabre and JRC as tool providers, and XVR as simulation provider. It has been a learning-by-doing experience bringing together organisations from the civil protection agencies, industrial tool providers and researchers.

The experiment design, preparation, execution and analysis of EXPE41 followed a process which spread over more than one year and is detailed in Table 1.1. It included a technical dry run (11/2015), an operational dry run (12/2015) and the experiment itself (03/2016)

The preparation activities which are related to the practical organisation of the event itself (experiment run in 03/2016) are not presented in this report.

Table 1.1: Actual step of the EXPE41 design and preparation

	Description	Date	Meeting / Event
0	Initial idea of experiment	11/2014	Result of Experiment design workshop held during the inventory of tools meeting
1	Team and goals defined	07/02/2015	
2	Schedule set-up	03/2015	
3	Evaluation methodology principles	14/09/2015	EXPE41 coordination meeting (Valabre)
4	Scenario defined	14/09/2015	EXPE41 coordination meeting (Valabre)
5	System architecture defined	23-24/09/2015	Architecture meeting
6	Start of integration tests (on-line testing)	09/2015	
7	Questionnaires developed	10/2015	

	Description	Date	Meeting / Event
8	System integration finalisation Valabre, technical dry run,	20-16/11/2015	Technical dry run (Valabre)
9	Players training, operational dry run, scenario refinement,	14-18/12/2015	Operational dry run in Valabre
10	Run of experiment, feedback collection, operational data collection	2-4/03/2016	Valabre
11	Analysis of results and writing of experimentation report	07/03/2016 and 12/09/2017	

1.2 Document structure

After this Introduction the document describes the design of EXPE41 in section 2: the objectives and associated research questions of the experiments are presented, the scenario which supports the experiment as well as the participants and their roles are presented as well. The necessity of this experiment is introduced by a presentation of the background (operational and technological) which is concluded by a brief presentation of the gap(s) addressed by this experiment. The evaluation methodology is described in section 3 and the resulting experiment set-up which enables the measurements is presented in section 4. The analysis of the measurements (qualitative and quantitative) made during the experiment is presented in section 5. This section is structured by research question: the results corresponding to each research question are discussed in each specific sub-section. The document ends with an analysis of the lessons learnt (section 6) of this experiment, a set of recommendations (section 7) and an overall conclusion (section 8) which sums up the main results and looks ahead to the coming DRIVER+ Trials.

2. Experiment design

This section presents the experiment design of EXPE41. After a first section where the rationale of the experiment is presented and the gap addressed by it is explained, the context of the French civil protection chain of command, in which the experiment takes place is briefly presented as well the status of the legacy Command and Control systems currently deployed.

2.1 Rationale

The idea of the EXPE41, the "Operational data lift" experiment, was initiated during the "Inventory of tools" meeting in November 2014, when an officer from the Zonal Headquarter (COZ) while presenting his activity to participants declared "We need an Operational Data Lift", and explained that a better way of bringing information from lower levels to higher levels would be beneficial to the French civil protection chain of command.

This gap expressed at French level, is also present at European level, where the need to "improve the management of vertical bottom-up information flow for situation assessment" is recognized (1).

It also relates to the "Understanding the relief effort as a whole" gap identified by the ACRIMAS project which recommends to "Develop tools that allow for an updated picture of what response is being carried out where and when, what has been provided, what is being planned to be provided, and by whom" (2).

The gap addressed by this experiment relates to the dissemination of information vertically (in the chain of command) and horizontally (to other civil protection organisations involved in the crisis).

It has been decided to investigate how a Common Operational Picture could help bridge these gaps.

2.2 COP

A Common Operational picture is a particular type of situation assessment supported by a C2 system which is "established and maintained by gathering, collating, synthesizing, and disseminating incident information to all appropriate parties" (3).

The concept of Common Operational Picture was first introduced by the military (4). The concept of COP has since been adopted by the civil protection domain. The idea is well known and several research projects have addressed this issue, including for example the FP7 COPE project (5) or the IDIRA project (6).

According to FEMA, the COP is achieving to allow "on-scene and off-scene personnel—such as those at the Incident Command Post, Emergency Operations Centre, or within a Multiagency Coordination Group—to have the same information about the incident" (3).

A COP tool usually provides geographic information and textual information related to the decision making (a daybook), as well as information exchange functions (Figure 2.1).

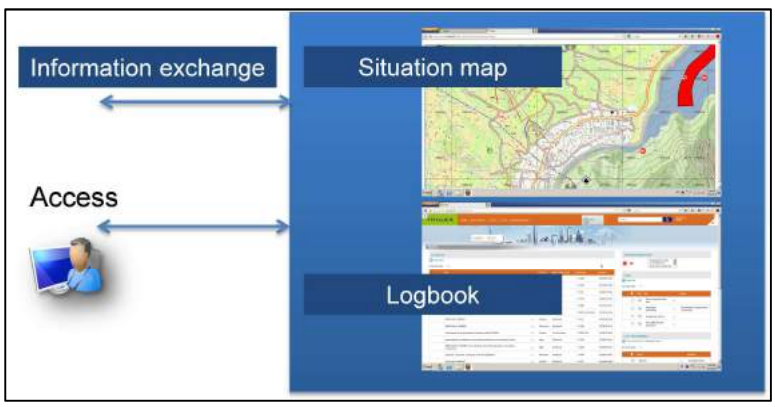


Figure 2.1: COP main functions

The concept of COP particularly applies to the management of complex and cross-border operations, involving diverse Crisis Management organisations.

As it must collect and dispatch information from and to many organisations, a COP system (i.e. a C2 system) needs to be able to ingest information from several external sources (i.e. other C2 systems). This requires systems interoperability at technical (connections) and syntactic or semantic level.

Thus, the effectiveness and efficiency of a COP depends a lot on the information flow between the "appropriate parties": within the chain of command, the cross-border partners and the other civil protection organisations. Consequently, in the rest of this document the COP tool (which brings a COP function) is differentiated from the COP Solution which is the resulting capability that is provided to all involved parties, and consequently also depends on the ability of all C2 systems involved to exchange information.

Many C2 tools used by civil protection agencies have been designed for standalone incident command, rather than for the exchange of information. They often have no import/export functions available or are only supporting import/export but with a poor information representation (i.e. only screenshots of the situation can be sent to the higher levels). This makes the integration of the chain of command poor. This difficulty may partly be explained by the lack of European level standards in the representation and exchange of Emergency Management information (regarding tactical information and symbology).

As mentioned in (7) "for many reasons (political considerations, concern about the confidentiality of the information, competition or conflicting objectives between organisations, human behaviour, lack of financing, etc.) there is no willingness to establish direct interconnection (between systems), but rather a need to utilize liaison officers between organisations."

2.3 Objectives and expected outcomes

Despite all the obstacles mentioned above, COP solutions are considered by many organisations as an interesting solution for complex crises. In its report on the interest of a COP for the national resilience, the UK MOD concludes that "the COP would provide considerable benefit to UK resilience" (8).

This was confirmed during the DRIVER workshop held at the I4CM event in Berlin (December 2015). The question was asked to the audience whether the COP was interesting for them to explore. Many civil protection officers attending the workshop expressed that they considered COP as a direction to follow, but because of its technical and organisational complexity, considered it necessary to further investigate this approach through experiments.

Considering the above, the following main objective for the experiment was chosen:

1. To assess the potential operational benefit of a COP solution (as compared to the legacy solution) in terms of vertical dissemination of information (in the chain of command) and horizontal information sharing (with cross-border partners).

The main operational benefits which could be expected *a priori* from a COP approach were defined as:

- Faster/easier dissemination of situational information between the various levels of command, and the various organisations involved.
- Improved shared understanding.

In addition to this first objective a second objective was added which was related to the DRIVER Test-bed on which the experiment was going to take place: Valabre's simulation centre CESIR. The CESIR was only used for training purpose. Conducting such experiment, where a new solution was going to be assessed, was a premiere. Consequently, this second objective was assigned to the experiment:

2. To assess the suitability of Valabre's simulation centre (CESIR) for the evaluation and validation/certification of new information systems and/or procedures.

2.4 Research questions

Based on the experiment objectives defined above, a set of more detailed research questions was developed to guide the design and the evaluation methodology of the experiment:

- RQ1: Did the COP solutions actually deliver a COP service?
- RP2: Did the way the experiment was set-up enable the current practices to be compared to the COP approach?
- RQ3: Did the COP solution bring operational benefits to those involved in the experiment?
- RQ4: Are the tools implementing the COP solution practical for crisis managers to use?
- RQ5: Did the simulator contribute positively to the set-up of the experiment?
- RQ6: Have all the participants learnt from this experiment?

2.5 Principle of the experiment set-up

The principle adopted for this "Operational data lift" experiment is to compare the new COP solutions (implemented with Large Event and Life-X Cop) to the current legacy solution (implemented with SYNERGI). This comparison is made by running the same scenario several times: once with the legacy solution based on the SYNERGI (Run 1) (9) system of the French Ministry of interior (MININT) and twice with the respective COP solutions: Run 2 based on the Thales Large Event tool, and Run 3 based on the Frequentis with the Life-X COP tool (see overview in Figure 2.2).

The choice of the COP tools, upon which COP solutions are based on, is explained in section 4.3.

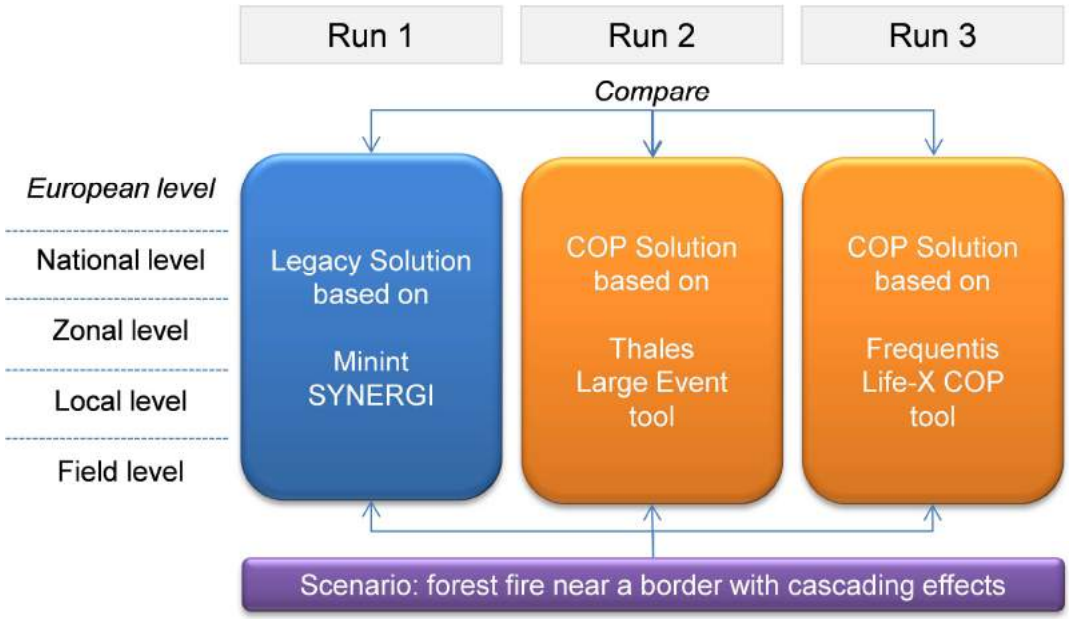


Figure 2.2: Principle of the experiment

The idea is to compare the COP solutions. As it has been said in section 1, a COP solution is a system of systems of C2 systems and it results from the deployment of a COP tool and its integration in its environment.

In this respect, a COP tool plays of course a central role in the experiment, but other supporting tools, which are part of the system of systems of C2 systems, and contribute to the integrated chain of command, play an important supporting role: without them, the COP tool would not be able to produce a COP.

This principle of comparison requires playing three times the same scenario, with the main events and decisions that are fixed, and known by the players in advance. This is necessary, as allowing changes in the

decision making would have made the comparison much more difficult: this variable needed to be fixed. And as the focus is more on the solutions than on the decision-making process, this is acceptable.

2.6 Background

This section presents the French context in which this experiment takes place, explaining the organisation and the procedures relative to the chain of command during a crisis in national and cross border crisis. It also brings some elements on Command and Control systems environment in France, which is also part of the environment in which the experiment takes place. In addition, some information about the French doctrine for the fighting of forest fires can be found in

2.6.1 French chain of command

The French civil protection is governed by the law 2004-811 on the modernization of civil protection, following two main objectives:

- Information and early-warning of the population.
- Protection of the people, the goods and the environment.

The French chain of command is organized into 4 main levels, with their own operational centres:

- National level.
- Zone level.
- Departmental level.
- Local level (municipality).

In case of a crisis, the two main crisis managers are the *Directeur des Opérations de Secours* (DOS) and the *Commandant des Opérations de Secours* (COS):

- The DOS -the director of rescue operations- determines the strategic axes for crisis management, and the Incident Commander,
- The COS –the incident commander- carries out, on the incident site, the coordination of all public, private or associative rescue means, to accomplish rescue operations. The COS acts under the authority of the DOS. He/She usually is a fire fighter.

The level at which the crisis is managed, depends on its importance (Figure 2.3): during local scale events, the Mayor of the municipality is the DOS. In larger crises, the department's Prefect is the DOS. In case of a crisis with a national impact, this responsibility can escalate up to the Minister of the interior or the Prime minister.

The same rule applies for the COS. At local level, a fire fighter officer is the Incident Commander (COS). For a large crisis, the COS usually is the director of the *Service Départemental d'Incendie et de Secours* (SDIS). Due to its specific exposure to the risk of forest fires, in the South of France zone, the zonal level is responsible for the coordination of departmental means, as well as for the aerial means for firefighting (e.g: water bombers). In other zones, aerial means are managed at the national level.

At each level an operational centre or a dedicated department is functioning on a daily basis and can be activated to a reinforced level in case of crisis. This means that new actors are participating in the centre and specific procedures are implemented. Thus, at national level the *Centre Opérationnel de Gestion Interministérielle des Crises* (COGIC) becomes the *Centre Interministériel de Crise* (CIC), at zonal level, the *Centre Opérationnel de Zone* (COZ) becomes the COZ renforcé, and at departmental level, the CODIS and *Service Interministériel de Défense et de Protection Civile* (SIDPC) (prefect administrative department dedicated to the protection of populations) are reinforced by the activation of *Centre Opérationel Départemental* (COD).

This structure and mechanism are represented in Figure 2.3.

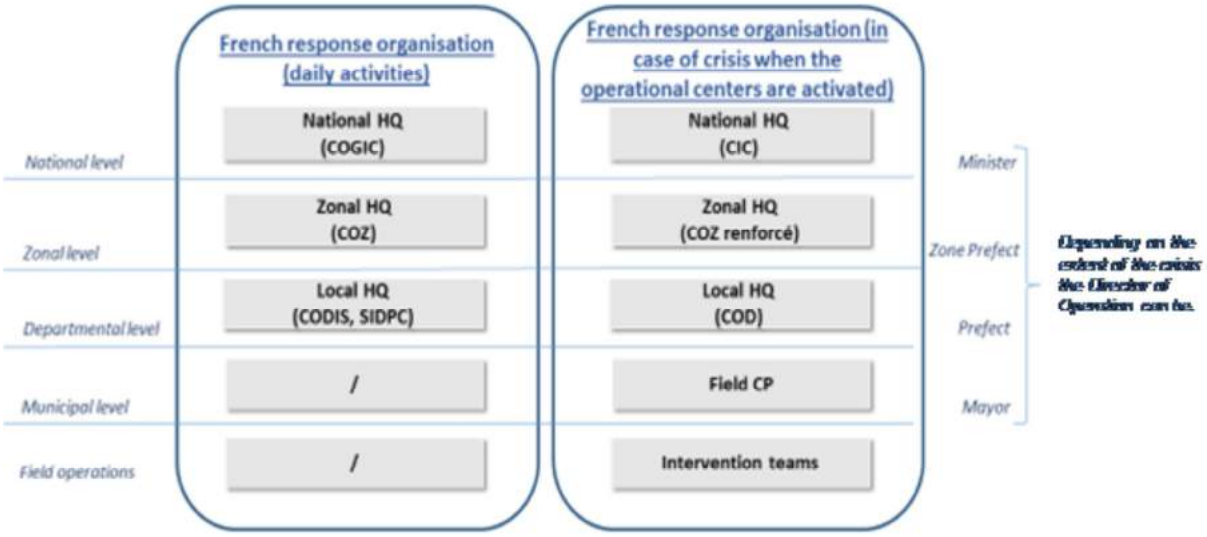


Figure 2.3: French civil protection management organisation

2.6.2 Cooperation between various civil protection organisations

This section describes the organisation of France protection in terms of cross-border cooperation and the coordination and coordination of the various civil protection organisations.

Regarding the cross-border collaboration, this can be organised at two different levels:

- For small operations, it lies with the responsibility of the Prefects.
- For larger operations involving the work of other departments or national resources, the decision falls within the Ministries of the Interior and of Foreign Affairs, and is monitored by the COGIC.

Specific bilateral cross border cooperation can be implemented for firefighting. For example, cross border cooperation exists between France (*Alpes Maritimes* and *Hautes-Alpes départements*) and Italy, as well as with Spain, between *Pyrénées Orientales* department and *Bombers de Catalunya*).

Regarding the coordination of the various civil protection organisations, it is supported by the organisation put in place at zonal level. Figure 2.4 shows that all agencies (from environment protection to health service or road traffic) are involved in the zonal headquarter.

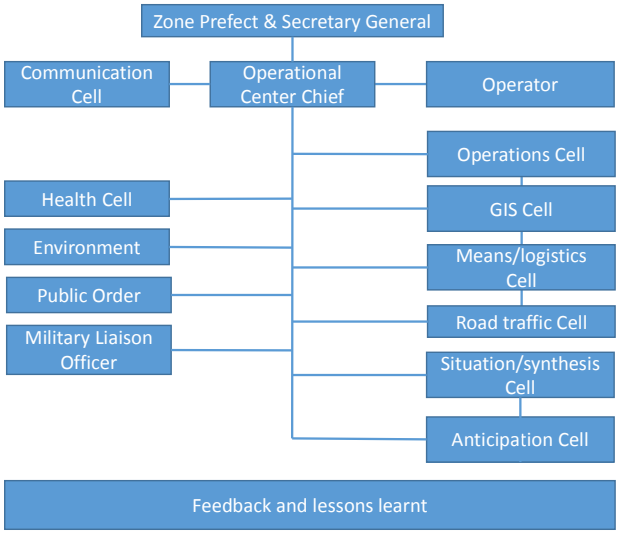


Figure 2.4: Organisation of the zonal headquarter

A similar multi-disciplinary structure exists at local level and is presented in Annex 3.

2.6.3 C2 and COP in French civil protection

This section presents the context in which the "Operational Data Lift" takes place in terms of Command and Control systems.

The COP concept is not new to civil French protection services. In the French civil protection literature, the COP - or common operating picture – is defined as a single and shared display of relevant incident information: "*this collaborative planning tool allows all commandment levels to share a consistent situational awareness* » (10). In France, C2 tools displaying tactic situation (SITAC) in the operational commandment post were launched in the 1990s. The Asphodèle software was developed by the *Université de Savoie* and Valabre for the SDIS of *Alpes Maritimes* (11). Asphodèle is a C2 system for dedicated situation assessment and resource management. It is adapted to all kinds of events. It is used by the firefighters' officer managing the intervention on site. The tactical situation corresponds to a specific intervention scheme on an identified geographical area. About thirty symbols, describing the engaged means or actions are available. Asphodèle complies with the principles of the French national operational mapping. Its main functionalities are the following: drawing a tactical situation, link it with the means table management, export/import data (e.g. fire contour), sending the tactical situation by email, create locations, measuring distances (Figure 2.5).

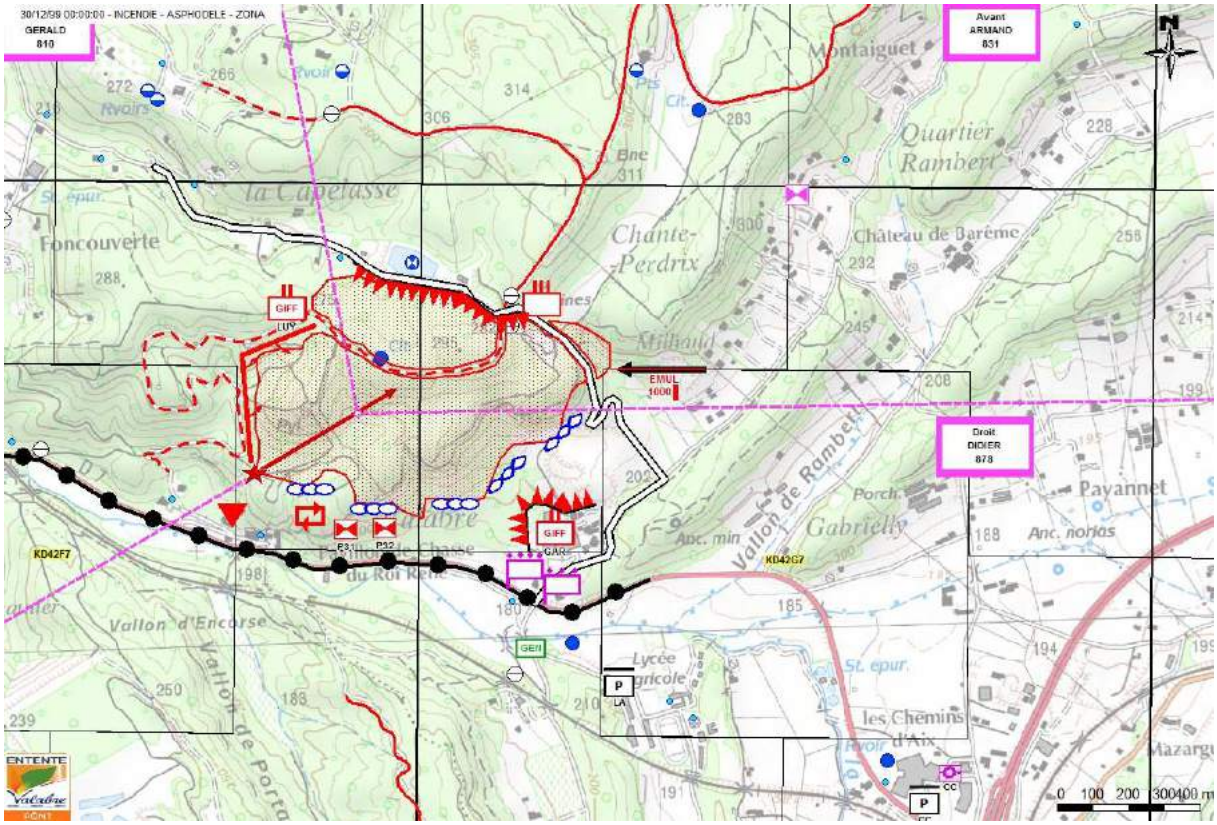


Figure 2.5: Asphodèle's map view

Asphodèle functionalities can be assimilated to a graphic editor based on a GIS. Its user interface is simple: the tool bar allows the selection of the various involved means and actions undertaken or planned. This tool is used in the field command post and is operated by a dedicated officer, called intelligence officer. The tactical situation is then used by the incident commander to manage the crisis. This software was completed in 2003 with the implementation of SYNERGI (9).

SYNERGI is part of the ORSEC portal, the Crisis Management portal of the French ministry of interior. The purpose of SYNERGI is to facilitate the transmission of information between civil protection players and authorities via an event manager and reporting forms.

SYNERGI implements some COP functions such as a daybook (Figure 2.6), a repository of reference documents, and a directory of all the concerned services. The access to SYNERGI is secured: only authorized persons from authorized organisations can access it.

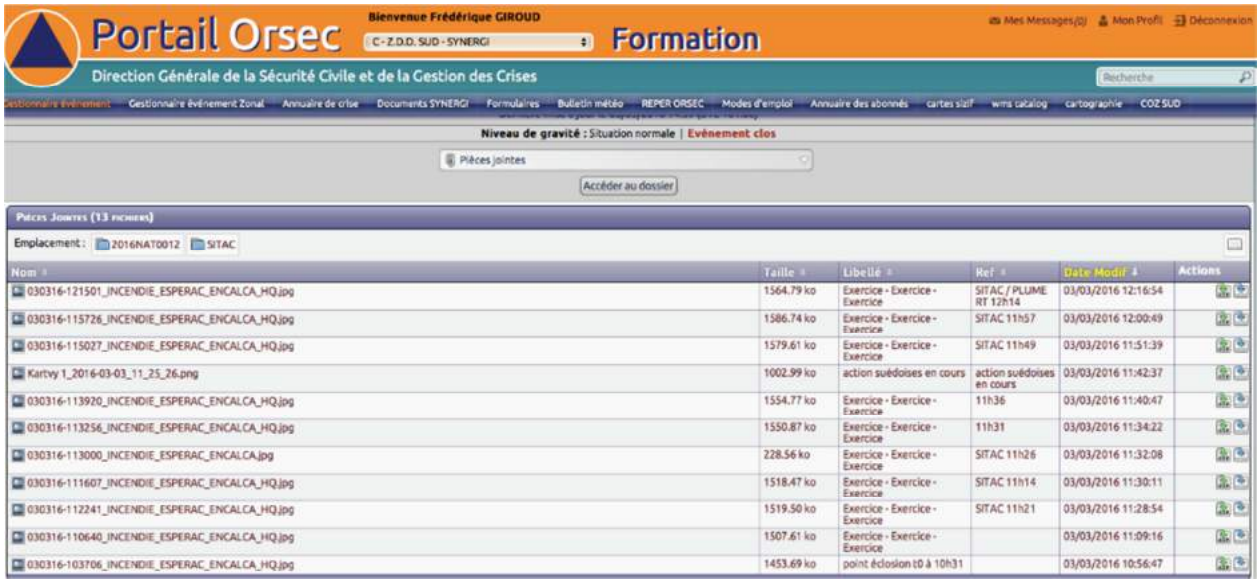


Figure 2.6: SYNERGI daybook

SYNERGI is used from the local level (both by the prefect services and the operational coordination at CODIS) up to the zonal and national levels.

2.7 Scenario

This section presents the scenario that has been chosen for the experimentation and the involved organisations.

2.7.1 Storyline

The scenario was designed to require the sharing of information across border, between the various levels of the chain of command, as well as between various civil protection organisations (firefighters and police). Due the fact that the Swedish contingency agency (MSB) was involved in the scenario, the cross-border aspect has been organised around an imaginary Franco-Swedish border, which was implemented on a simulated terrain automatically generated by the XVR simulator: the Valabre Island (see Figure 2.7).

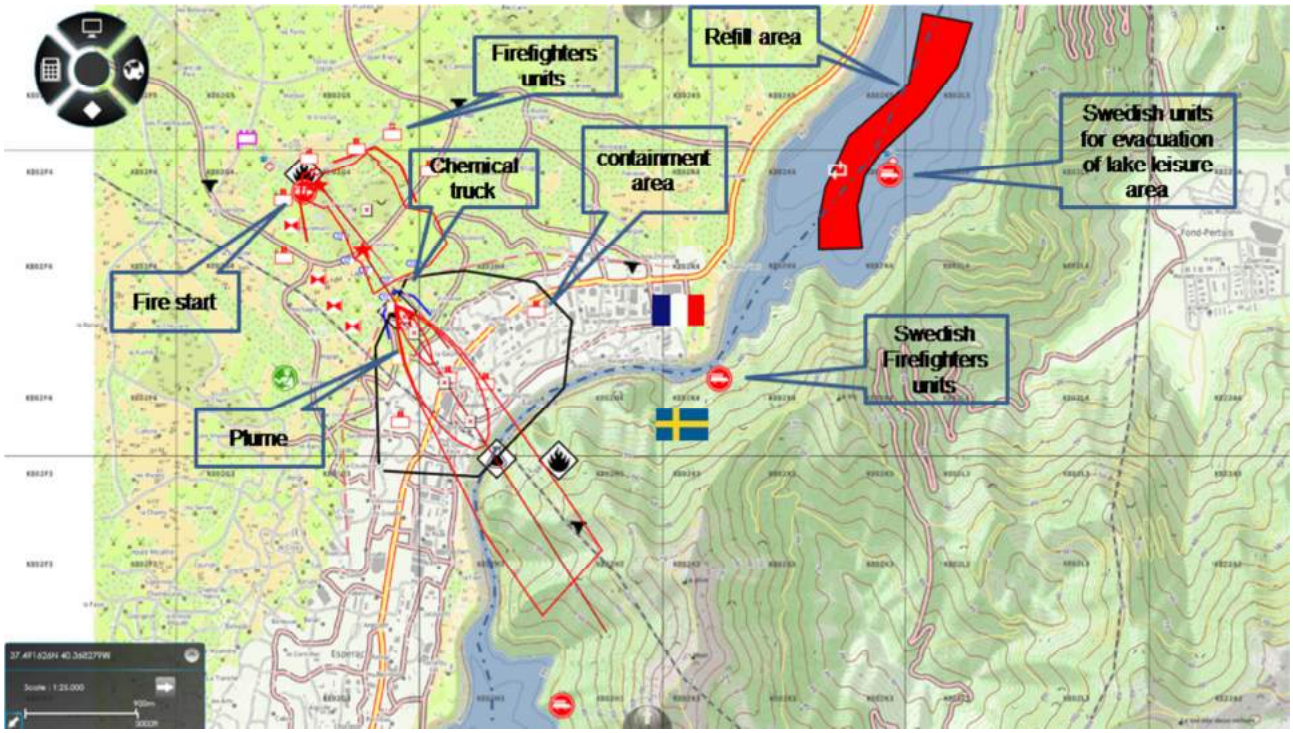


Figure 2.7: Situation map

The general storyline is a forest fire followed by a chemical threat on a nearby village. The fire starts close to the border. Because there is risk that some sparks might fly over the border and light a fire in Sweden, the Swedish authorities are alerted. They send a scouting group to watch the area. In order to fight the fire, the French firefighters must use water bombers which need to refill in the lake. This again requires a green light from the Swedish authorities since the lake is on the border, and the lake is a leisure area which in consequence, needs to be evacuated. The fire reaches a road where a truck containing chemical products is stuck. A plume model shows that the nearby village is threatened and must be evacuated. As the plume shows that the potential toxic cloud may fly over the border, the Swedish authorities need to be alerted of this risk as well.

The scenario is organised in nine major steps. These steps are announced during the execution. After each step, the stop clock is “paused”. This enables to fix any arising problem, to answer potential questions, or give explanations to the observers and evaluators if needed without affecting the time count.

The main inputs ingested in the scenario through simulation, corresponding to the main steps of the scenario, are represented in Table 2.1.

Table 2.1: Scenario major steps

Nr	Scenario Major Steps
1	FIRE IGNITION
2	FIRE EVOLUTION / FIRST MEANS INVOLVEMENT
3	FIRE EVOLUTION /ARRIVAL ON SITE
4	FIRE EVOLUTION /AERIAL MEANS INVOLVEMENT
5	FIRE EVOLUTION: FIRE ARRIVES ON ROAD
6	FIRE THREATENS CHEMICAL TRUCK

Nr	Scenario Major Steps
7	CHEMICAL REINFORCEMENT GROUP ARRIVAL ON SITE
8	ATMOSPHERIC CHEMICAL DISPERSION
9	FIRE IS CONTAINED

This scenario represents around 3 to 4 hours of operational time, and took 90 minutes to play in simulated time.

2.7.2 Involved organisations

The defined scenario is quite important, but is managed by the daily operation structure (Figure 2.8). Thus, the activation of the following organisations is required:

- On the French side, the whole chain of command (firefighters) is involved. From field level to local, zonal and national levels as well as the police, all command posts need to be activated.
- On the Swedish side, the field level and the national levels command post are involved.

The European level, which is not part of the chain of command, as ERCC takes no leading part in the decision process, was included for information only for Run 2 and Run 3.

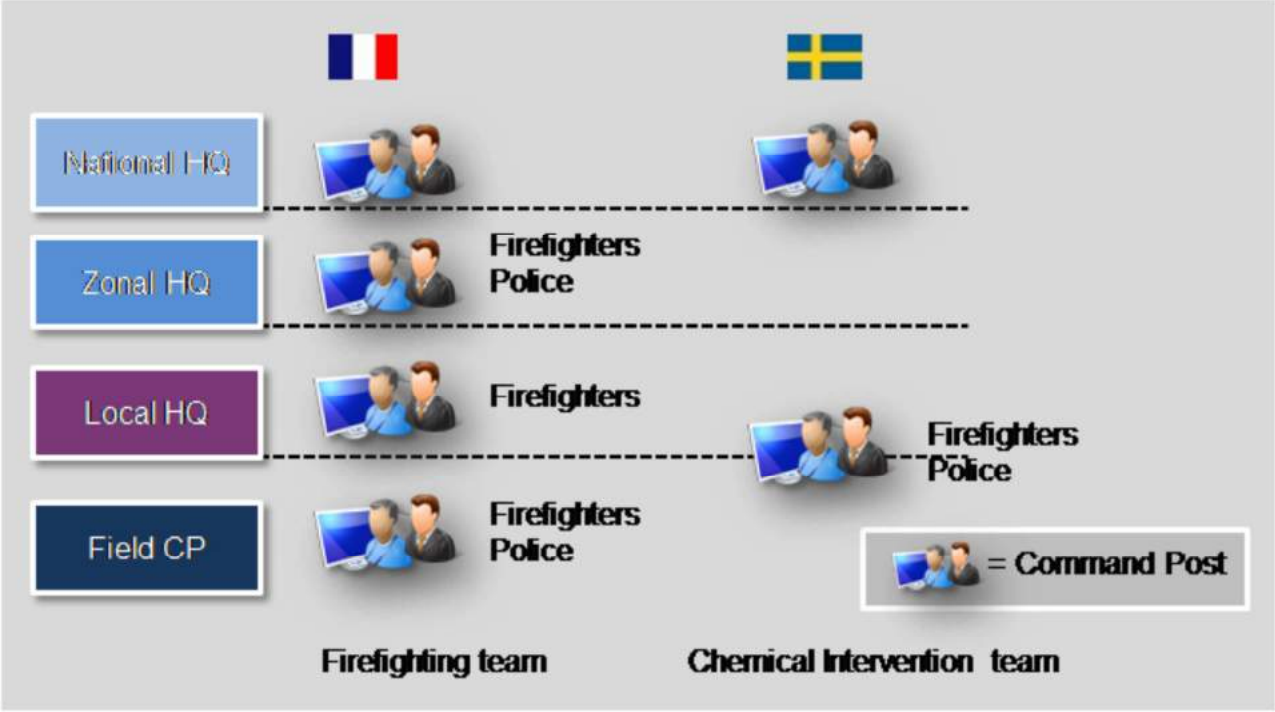


Figure 2.8: Command posts, specialized teams and organisations activated by the scenario

2.8 Hosting Platform

The hosting platform for the EXPE41 consists of Safe Cluster and Valabre which are two organisations located in the *département des Bouches du Rhone*, and are connected to each other.

In DRIVER, a platform is an operational or training facility or one dedicated to experimentation. It is often a mixture of physical and cyber, including fully model-based facilities. The hosting platform of an experiment hosts physically the experiment, provides the rooms, the technical infrastructure and provides some test-bed supporting tools to the experiment (e.g. simulation tools). The hosting platform plays an important role in the choice of the experiment, the design of its scenario. It provides the test bed and contributes to the finding of players and evaluators by activating its network.

2.8.1 Safe Cluster[1]

The Safe Cluster is a French competitiveness cluster specialized in global security. It gathers almost 600 affiliates from companies, to public authorities, including operational units, and training and research organisations related to security, environment protection and aerospace sectors.

Safe Cluster was the French platform partner in DRIVER. In practice it acted as the facilitator for mobilizing training or operational facilities from its member organisations. Valabre is one of them.

Safe Cluster mobilized experts from other members for EXPE41, either as players or evaluators: notably Bouches du Rhône firefighter unit (SDIS13), Marseille marine fire fighter unit (BMPM), zonal headquarter (COZ).

2.8.2 Valabre

Valabre is a public organisation for the protection of the forest and the environment against natural hazards. This organisation coordinates the efforts of the 15 departments most affected by forest fires of the South of France covering 4 regions: Provence Alpes Côte d'Azur, Occitanie, Corsica, and Auvergne-Rhône-Alpes.

Valabre consists of three departments:

- **CEREN** is the test and research centre of Valabre. CEREN is in charge of carrying out all the necessary tests of new or innovative solutions, products and equipment and comparing to the existing ones. This can be realised at the request of the Directorate of Defense and civil protection or by other public organisations (e.g. local fire fighter units).
- **ECASC**, another department of Valabre is a training school with International notoriety, providing a strong network of experts and partners. ECASC is a reference for the specialized training of civil protection professionals in the fields of forest fire, flooding, search and rescue, etc, and for incident commanders.
- **PÔNT** (The New Technology Department) of Valabre is developing technological solutions (mostly in the field of GIS) for operational teams. Although less involved than the other departments of Valabre in EXPE41, it contributed with Asphodel, a solution providing a standardized representation of the tactical situation, developed by Pônt and University of Savoie. This was used by the participants as a legacy solution.

2.8.3 CESIR

Within its various pedagogical means, ECASC uses simulation, notably in its new facility *Centre Euro-méditerranéen de Simulation des Risques* (CESIR). **CESIR** is a facility (Figure 2.9) specially focused on virtual

[1] Safe Cluster is not anymore partner in DRIVER+. In DRIVER, Valabre was a third party of Safe Cluster.

simulation environment, with an area of 600 m² fully customisable for any organisation. It contains a conference room with 200 seats and multi-source displays.

Figure 2.9: CESIR building

The simulation is powered by specific state of the art software: XVR-based on Unity graphic engine. Specific environment and add-ons were developed to provide some new functions and new risks related scenario. All computers in CESIR are linked in the same network to provide a realistic and interactive multiplayer environment.

- 200 computers linked.
- 220 display screens, beam projectors, interactive boards and screens.
- 2 helicopter cockpits.
- 2 plane cockpits.
- 1 boat cockpit.
- 2 training rooms with computers next gen by persons.

Several meeting rooms and class rooms are available, as well are equipment for voice radio communications.

2.9 Participants and roles

Hosted by Valabre, at the *Centre Euro-méditerranéen de SImulation des Risques* (CESIR) training centre, the "Operational Data Lift" experiment was led by Thales, co-organized with Valabre and Safe-Cluster. The experiment also involved Frequentis, MSB, Valabre and JRC as tool providers and XVR as simulation provider. As Valabre is both a technical centre and an operational end-user organisation, it is involved as hosting platform and tool provider. Valabre furthermore provided a firefighter officer as a player. Table 2.2 summarizes the organisations involved in EXPE41.

Table 2.2: DRIVER+ organisations involved in EXPE41

	Category	Organisation	Tool	Role(s)
VALABRE ANTICIPER VOTRE PRÉSENT	End-user & Research	Valabre	Asphodèle	Hosting Platform Tool provider (FCP) Player (Zone)
THALES	Industrial	Thales	Large Event	Experiment Leader Tool provider (COP: LHQ, ZHQ, NHQ) Simulation support
FREQUENTIS	Industrial	Frequentis	Life-X COP	Tool provider (COP: LHQ, ZHQ, NHQ)
MSB	End-user	MSB	LUPP	Tool Provider (Swedish OC) Observers Player (Swedish Operational Centre)
European Commission	End-user	JRC	Crisis Wall	Tool provider Methodological support Observer
XVR	Industrial	XVR	XVR	Simulation support DIREX
Fraunhofer IAO	Research	Fraunhofer-IAO		Observer Provider of usability questionnaire

Three evaluators from external organisations (see Table 2.5) - *Institut der Feuerwehr Nordrhein-Westfalen* (IdF NRW), *Norfolk Fire Service* (NRFS) and CESS (partner of the FP7 ECOSSIAN Project (12) - were involved in the experiment as well as three DRIVER+ project internal observers from FhG-IAO, MSB and JRC. The skill profiles of the evaluators (who filled the general questionnaire) are summarized in the Table 2.3:

Table 2.3: Skill profile of evaluators

Organisation	Professional profile
FhG-IAO	Researcher, specialized in utility analysis
MSB	Project leader (Virtual simulation for fire fighter training)
JRC	Seismologist, expert in crisis management
IdF NRW	Incident Commander (firefighter), teacher in incident command, experienced in being an evaluator in exercises
NRFS	Incident Commander (firefighter), teacher in incident command, experienced in being an evaluator in exercises
CESS	Expert in security
BMPM	Incident Commander, firefighter
BSPP	Firefighter

The following civil protection organisations have been involved as players (see Table 2.4): French firefighters from BMPM (Marseille firefighters), from two other fire departments of South of France (SDIS13 and SDIS83), and from the Zonal Headquarter (COZ) with a contribution of Paris firefighters (BSPP). On the Swedish side, a former professional firefighter officer now working at MSB was in charge of the Swedish local Command Post.

Table 2.4: Organisations involved as players in EXPE41

Logo	Category	Organisation	Full name	Role(s)	Cell
	End-user	BMPM	Bataillon des Marins Pompiers de Marseille	Player	FCP
	End-user	BSPP	Brigade des Sapeurs Pompiers de Paris	Player (Dry run, Dec 2015)	NHQ
	End-user	EMZ	Etat-major Interministériel de Zone Sud	Player (Zonal Headquarter)	ZHQ
	End-user	Valabre	Valabre	Player	ZHQ

Logo	Category	Organisation	Full name	Role(s)	Cell
	End-user	SDIS13	Service d'Incendie et de Secours des Bouches du Rhône	Player	LHQ
	End-user	SDIS83	Service d'Incendie et de Secours du VAR	Player (March 2016)	NHQ
	End-user	Gendarmerie	Gendarmerie Nationale	Player (Dec 2016)	ZHQ
	End-user	MSB	Swedish civil contingency agency	Player	Swedish Operational Centre

Table 2.5: External organisations involved as evaluators in EXPE41

Logo	Category	Organisation	Full name	Role(s)	Cell
	End-user	IdF NRW	Institut der Feuerwehr Nordrhein-Westfalen (D)	Evaluator	All
	End-user	NFRS	Norfolk Fire and Rescue Service (UK)	Evaluator	All
	Industrial	CESS	Centre for European Security Strategies	Evaluator	All

Short descriptions of participating end-user organisations can be found in Annex 5.

3. Evaluation methodology

Both qualitative and quantitative methodologies were used to evaluate the two main objectives.

Quantitative methodologies are applied in order to measure the sharing of information in terms of effectiveness, speed and richness. The main questions are: Does key information arrive, does this information arrive faster, and with what depth in their representation? These measures are implemented by:

- Measurement of COP solution interoperability (as a system of systems).
- Measurement of dissemination time of scenario key information.

Qualitative methodologies are:

- Functional comparison.
- Usability of tools.
- General Questionnaire.
- Open feedback sessions.

The methodologies are detailed in the next sections.

3.1 Solution interoperability measurement

Several models have been proposed to describe the level of interoperability of a system of systems. Because of its usability and experience of the partners, the LISI Model has been applied. The LISI Model (13) was proposed by the C4ISR Working Group of the US Department of Defense. It identifies four levels of interoperability which characterize the way information is exchanged within a system of system: here within the COP Solution. Table 3.1 gives the definition of the LISI model interoperability levels and proposes some colour codes (14).

Table 3.1: LISI Interoperability levels

Level		Description	Example information exchange
Level 0	Isolated	Non-connected	Manual, hard copy, medium (e.g. disk) exchange.
Level 1	Connected	Separate data and applications	Tactical data links, file transfers, asynchronous messages, e-mail
Level 2	Functional	Minimal common functions; separate data and applications	Basic collaboration, e.g. exchange of annotated imagery, maps with overlays
Level 3	Domain	Shared data; separate applications	Shared databases, sophisticated collaborations, e.g. Common Operational Picture (COP)
Level 4	Enterprise	Interactive manipulations; shared data and applications	Distributed information and applications, simultaneous interactions with complex data e.g. interactive COP data updates and event triggered global database updates

The Cross-border COP Solution that is being assessed in EXPE41 is a system of systems which is composed of:

- COP tools (Large Event, Life-X COP and SYNERGI).
- All other C2 systems that contribute to the solutions by being part of the C2 Chain of command and exchanging directly or indirectly information with the COP tools.

Based on the LISI Model, the level of interoperability of the solution can be described as an annotated graph where:

- Nodes represent command posts and are assigned a level which is the level of information representation (on the LISI scale from 0 to 4) supported by the C2 system that is installed in this Command Post.
- Edges represent the connection between the command posts and are assigned the level of information representation (on the LISI scale from 0 to 4) that is supported by the connection between the C2 system of this command post and the C2 systems of other command posts.

The results of this measurement are presented in section 5.3.2.

3.2 Dissemination time of key information

This measurement was applied to some turning points of the scenario, and based on the analysis of the logs of the COP tools. For each turning point the following characteristics were collected:

- Availability (has the information been received through the information system? [y/n]).
- Time (moment in time when the information is received by the organisation through the information system).

All these characteristics rely on the functional import/export capabilities of the information systems which constitute the COP solution, and the exchange capabilities between them.

The results of these measurements are presented in section 5.3.3.

Two threads have been selected to support the evaluation of information sharing. Firstly, the dissemination and management of the warning of the Swedish authorities (Table 3.2) and secondly the dissemination and management of the chemical risk (Table 3.3). Each thread is characterized by a list of key points.

Table 3.2: Scenario key points relative to the warning of the Swedish authorities

Nr	Thread key points
1	Trackers[2] sent
2	National Swedish Authorities warned
3	National Swedish Authorities updated
4	Local Swedish Authorities informed
5	Tactical situation uploaded (SITAC)
6	Tactical situation read by Swedish LHQ
7	Fire warning to Sweden

[2] Trackers : a type of water bombers (airplanes equipped with tanks and dedicated to firefighting)

Table 3.3: Scenario key points relative to the chemical risk

Nr	Thread key points
1	Chemical risk known
2	Plume Requested
3	Plume Uploaded
4	Leak alarm creation
5	Plume consulted by ZHQ
6	Leak alarm transmitted to Sweden
7	Message to European authorities

3.3 Functional comparison

This method consists in describing the main functions of the tools which are at the heart of the COP Solutions: SYNERGI, Large Event and Life-X COP. The comparison is made at a large grain scale, and compares the functions which are activated during the scenario (and consequently can be reported upon by the players):

- **Georeferenced situation map management**: ability to display the incident situation on a georeferenced map, where the situation is represented by georeferenced symbols which can be created, modified and deleted.
- **Daybook**: ability to write a journal related to the incident. In practice this journal is made of short texts which are dated, and are usually related to important information, decisions, orders or requests with respect to the incident.
- **Exchange of information**: ability to receive or send situation related information. The information is formatted in a structured way, and may be following information representation standards.

3.4 Usability of tools

The usability of tools was assessed using SUS questionnaire (15)(Table 3.4). This questionnaire is distributed to the players who used the COP tools immediately after the Runs.

Table 3.4: SUS questionnaire

1	I think that I would like to use this system frequently
2	I found the system unnecessarily complex
3	I thought the system was easy to use
4	I think that I would need the support of a technical person to be able to use this system
5	I found the various functions in this system were well integrated
6	I thought there was too much inconsistency in this system

7	I would imagine that most people would learn to use this system very quickly
8	I found the system very cumbersome to use
9	I felt very confident using the system
10	I needed to learn a lot of things before I could get going with this system

The phrases had to be rated from 1 (strongly disagree) to 5 (strongly agree).

3.5 General questionnaire

The aim of the general questionnaire (Table 3.5) was to collect feedback on some points related to the research questions (section2.4). The questionnaire was distributed to evaluators and players after the experiment. For each question these participants were asked to give a textual answer. For some questions (the ones which are assertions) they were also asked to give a quantitative rating of agreement with the assertion).

The level of agreement was rated using a scale from 0 to 5:

- 0 = No answer.
- 1 = Not at all.
- 2 = A little bit.
- 3 = Somewhat.
- 4 = Quite a bit.
- 5 = Completely.

Most questions were also addressed during the open feedback session, in a group discussion.

Table 3.5 presents the complete list of questions (also part of Annex 7).

Table 3.5: Questions of the general questionnaire

	Question	Related to research question Nr
Q1	In your opinion are the experimented solutions implementing a COP approach?	1
Q2	Do you think that the vertical dissemination of situation information is useful?	3
Q3	Do you think that the detailed tactical situation is useful to upper levels?	3
Q4	What kind of data would you share?	1-3
Q5	Do you think that sharing the same view between firefighters, policemen and municipality is useful?	3
Q6	What kind of data would you share?	1-3
Q7	Do you think that sharing the same operational picture between forces across border is useful?	1-3
Q8	What kind of data would you share?	1-3

	Question	Related to research question Nr
Q9	Do you think the Large Event daybook is easy to use?	4
Q10	Do you think the Life-X COP daybook is easy to use?	4
Q11	Do you think that the information on the Large Event map are useful?	4
Q12	Do you think that the information on the LIFE-X map are useful?	4
Q13	What would improve the Life-X COP tool?	4
Q14	What do you like in the Life-X COP tool?	4
Q15	What would improve the Large Event tool?	4
Q16	What do you like in the Large Event tool?	4
Q17	Do you think that the set-up of this experimentation is well adapted to the objectives?	2
Q18	What improvement in the set-up would you suggest?	2
Q19	Do you think that the simulator plays an interesting role in the experimentation?	2-5
Q20	Do you think that having professional players is important for such experimentation?	2
Q21	Did you learn/discover something during this experimentation?	6
Q22	Do you think that this experimentation will benefit to the crisis management community?	6
Q23	Are there any other comments you wish to make regarding the experimentation?	General
Q24	Do you find this an interesting way forward?	6
Q25	What other perspectives would you recommend?	General
Q26	Would you be interested in being involved in these future experimentations?	6
Q27	Who else would you recommend as a participant?	General

3.6 Open feedback sessions

Two open feedback sessions were organized to collect more in-depth players' feedback (at the day of the three runs) and evaluators' feedback (the day after the runs). These open feedback sessions address the following main topics:

- Comments concerning the organisation of the experiment
- Remarks on COP tools
- Requirements for future experiments
- Evaluation process

With the evaluators, the discussion was focused on the way they work and the methodology they apply to evaluate crisis management exercises.

The results are presented and commented in section 5.

4. Experiment set-up and preparation

This section describes the experiment set-up and preparation. Only preparation activities which directly related to the experimentation process are described here. Other organisational activities like organising the travelling of evaluators, organising hotel rooms and meals at Valabre during the experiment, are not reported in this document.

4.1 Simulation

The role of the CESIR simulator is to simulate the incident and enable field teams (firefighting intervention team, Chemical Intervention team, and Field Command Post) to interact with the simulated incident. The incident was simulated in the XVR simulator of the CESIR. It was located in the fictitious island that Valabre has developed for its training. Valabre Island is a round island of 80 km diameter, located in the middle of the Atlantic. Its geography (e.g. land, costs, roads, towns) has been automatically generated by the XVR simulator and can be adapted for specific purposes. There was no direct interaction or information exchange between Command and Control systems and the Simulation system during the experiment.

The following cells were part of EXPE41 (Figure 4.1). They were installed in specific rooms in the CESIR, and equipped with specific XVR simulation screens:

- DIREX (Exercise direction): the DIREX room is used to trigger the various steps of crisis. The various incidents (e.g. forest fire, chemical truck) have been created in advance. The triggering is made in accordance with the experiment scenario.
- Firefighting intervention team: enable firefighting group to drive specific vehicle to the site and report about fire importance and extension.
- Chemical intervention team: enable chemical group to drive to site and check nature of truck a hazard.
- Helicopter situation assessment: available to Field Commander in a dedicated room.

Figure 4.1: EXPE41 simulation cells

Among the players, only the incident commander, the firefighting group and the chemical group were allowed to see the fire and the resulting chemical accident simulations.

4.2 Playing cells

The following command cells were activated by the EXPE41 scenario (see Figure 4.2):

- French Field Command Post (FCP).
- French Local Headquarter (LHQ).
- Swedish Headquarter (also played Swedish national headquarter).
- French Zonal Headquarter (ZHQ).
- French National Headquarter (NHQ).
- European Emergency Response Coordination Centre (ERCC).

Each command cell was physically installed in a dedicated room of the CESIR with access to the corresponding information system(s) and radio equipment. The ERCC cell, played by JRC, was located at JRC facilities and connected through the Internet.

Each command cell was staffed by professional responders; the ERCC cell – which had no decision role in the scenario - was staffed by JRC colleagues. Commanding officers were assisted by a Command and Control (C2) officer (to assist them in the use of the C2 tools when needed or desired) coming either from first responders' organisations or from the organisation providing the specific tool.

The French ZHQ included (as in real life) a Police liaison officer. All other players were firefighters.

Figure 4.2: Headquarters' staffing

4.3 Tools selection

The COP tools which contributed to EXPE41 were assessed during the "Inventory of tools process". This process is documented in (16), which conclusion states:

> *"In addition to that, the number of protocols and formats supported by the tools has been identified as a good indicator for the potential for technical interoperability, which is a necessary condition for a COP tool: Large Event, Life-X COP, and ESS are eligible for higher level of command Common Operational Picture"*

As GMV was already involved in the EXPE43 with a COP role, Life-X COP and Large Event were chosen to play the role of COP tool in EXPE41.

- Large Event (Thales) is a web-based COP tool dedicated to crisis management. It includes a map view of the COP, and a daybook. Large event can also provide an electronic document management tool and portable field devices (tablets) but these were not used in EXPE41.
- Life-X COP (Frequentis) is a web-based COP tool dedicated to crisis management. It includes a map view of the COP and a daybook. Life-X COP can also provide a portable field device (tablet), but this was not used in EXPE41.

Other tools are legacy tools and have been selected for their ability to create a simulated realistic environment for the COP solutions to be assessed:

- **SYNERGI** is the legacy tool which is compared to the proposed COP solutions. It is described in section 2.6.3.
- **LUPP** is legacy solution for local incident management in Sweden. It is a web-based application for situation awareness and command & control. It provides a map-based operational picture, manages dispatching of resources and includes document-sharing capabilities. It is an operational tool of the Swedish Civil protection agencies.
- **Asphodèle** is the field level legacy tool used by Valabre. It is the field level tactical situation assessment tool used by firefighters to manage the intervention on site. It consists of a graphic editor based on a GIS.
- **Crisis Wall** is the legacy solution system used in ERCC. Crisis wall displays various EU Crisis Management portals such as GDACS (17), EMM (18), ERCC Portal (19) and collaborative risk systems. The software also receives and displays data from various other data sources (e.g. Reliefweb (20)) and direct user input. In this experiment, only the COP functionality was used.
- **XVR** is the legacy simulation tool from the XVR Simulation Company, used in Valabre.

More detailed descriptions of these tools are given in Annex 8.

4.4 COP Solutions

This section describes the solution and the COP solution which were implemented: the tools, and the way they exchanged information, and type of information they exchanged.

The “Operational Data Lift” experiment followed the standards chosen by the DRIVER project (21): EDXL-DE for message envelopes (22), EMSI (23) for tactical information (e.g. fire units, water bombers, fire) and CAP (24) for synthetic alerts that were sent to ERCC.

During the legacy solution run (Run 1), the technical information sharing was provided through SYNERGI (Figure 4.3) which received pictures (screen shots) of the tactical situation via mail from the French field level system Asphodèle. The situation shared though SYNERGI was based on text (daybook) and pictures (tactical situations). Figure 4.3 also includes the LISI levels (Section 3.1) corresponding to the systems and connections deployed in Run 1.

During Run 1, the Swedish side was only informed by telephone and the European level (ERCC) was not involved.

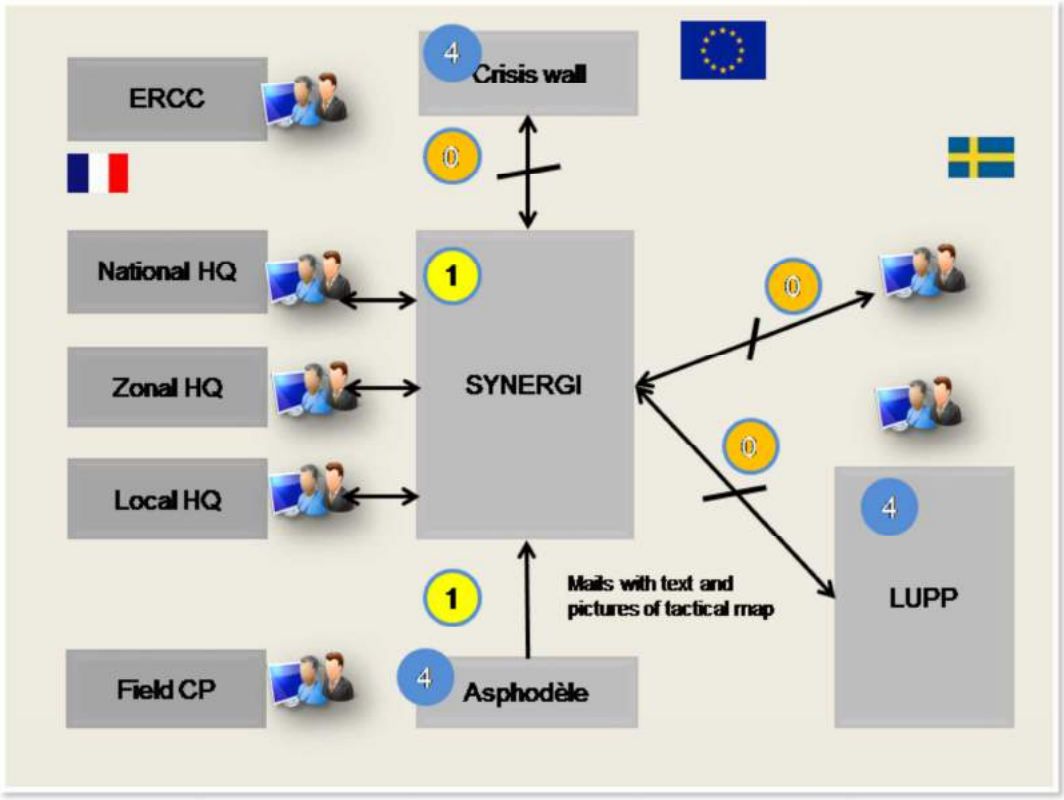


Figure 4.3: Information sharing during Run 1

These interfaces are described in Table 4.1.

Table 4.1: Interfaces between systems for Run 1

Output	Input to	Data type	Protocol		Format
Asphodèle	SYNERGI	Tactical situation	Mail		Screen Shot (png)
LUPP	SYNERGI	-	Telephone		-
Simulator	SYNERGI	Maps	Not applicable (no map SYNERGI)		Not Applicable

During the COP solutions runs (Runs 2 and 3) the technical information sharing was supported by the COP tools (Large-Event in Run 2; Life-X COP in Run 3) (Figure 4.4), which could be accessed through the web by various organisations (here from local to national levels). The reason why the field level did not access the COP is because the participants asked for this: they wanted to be able to focus on the Incident management. Figure 4.4 also includes the LISI levels (Section 3.1) corresponding to the systems and connections deployed in Run 2 and Run 3.

Other tools (field level and EU level) were connected through the exchange of formatted messages. COP tools were fed by field level tools. The COP provides map based situation assessment and a daybook.

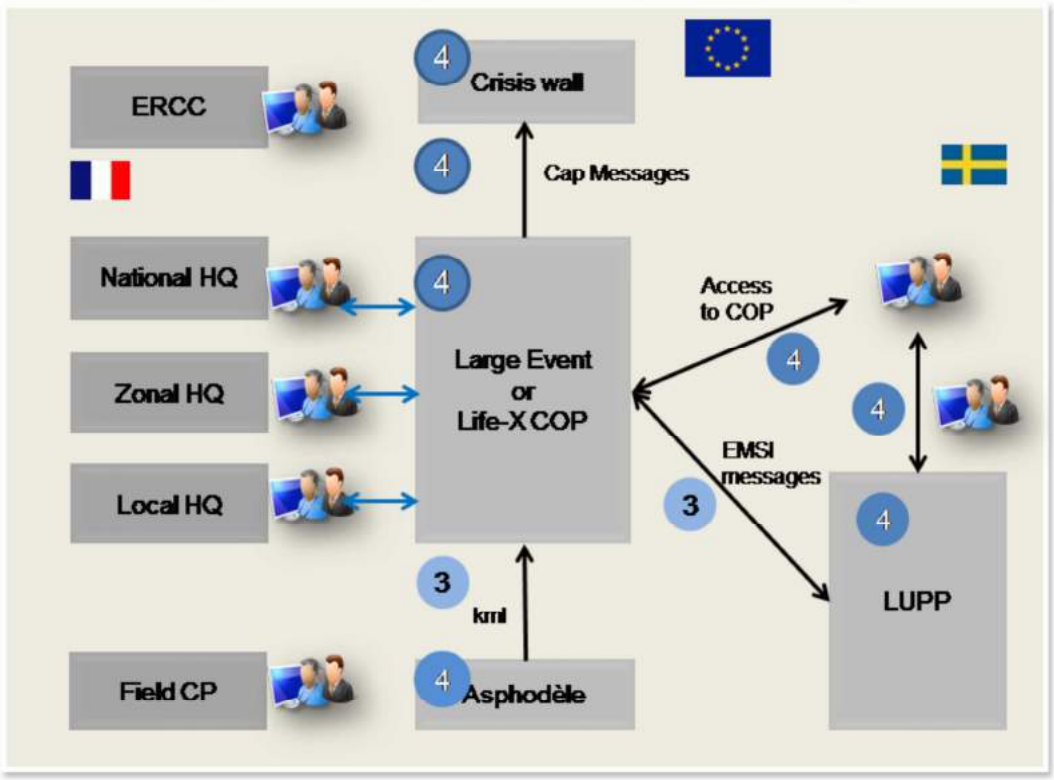


Figure 4.4: Information sharing during Run 2 and Run 3

The interfaces between all tools involved in the experiment for Run 2 (Large Event) and Run 3 (Life-X COP) are described in Table 4.2.

Table 4.2: Interfaces for Run 2 (Large Event) and Run 3 (Life-X COP)

Output	Input to	Data type	Protocol	Format
Asphodèle	Large Event	Tactical situation	drag and drop	KML
Asphodèle	LifeX COP	Tactical situation	Mail	KML
Asphodèle	LUPP	Tactical situation	Mail	PNG
LUPP	Large Event	Tactical situation	http REST	EDXL-DE + EMSI
LUPP	LifeX COP	Tactical situation	http REST	EDXL-DE + EMSI
Large Event	Crisis Wall	Alert	http REST	CAP
Large Event	Life-X COP	Base map	WMS	Technical: Large Event is the map server for Life-X COP
Large Event	LUPP	Base map	WMS	
LifeX COP	Crisis Wall	Alert	http REST	CAP
Simulator	Large Event	Maps	Manual	Shape

This exchange of standard-based structured messages required some specific developments for Asphodèle and LUPP which did not initially include this functionality (section 4.5.2).

4.5 Architecture

This section describes the architecture of the system used during the experiment. The EXPE41 set-up is a constellation (i.e. a system of systems) of Command and Control systems. These systems need to interact (i.e. exchange information) in order to enable the players to perform the mission assigned to them by the scenario. The goal of this architecture is to enable the exchange of information during the experiment.

This architecture was discussed and decided within the former WP420 Architecture and implemented in T430.5. Its design is in line with the main decision made by the SP4 Architecture Work Package (see (21)), the C2 systems exchange information using the Common Information Space (CIS).

The information exchange between C2 systems of EXPE41 were based on:

- CAP messages (Alerts).
- EMSI messages (resource information).
- KML (georeferenced annotations).
- WMS for the distribution of Maps backgrounds to C2 systems.

These formats are described and discussed in (25).

The map used in EXPE41 was generated by the XVR simulator, extracted from the simulation tool as a Shape File, converted, and fed into a Map Server WMS server. This WMS Server provides the background map for the connected tools: Life-X COP, Large Event, LUPP.

4.5.1 Interfaces and CIS specifications

A CIS (Common Information Space) was developed which goal it is to enable the exchange of information between C2 systems during the experiments. The CIS consists of:

- CIS Interfaces which enables C2 systems to connect,
- CIS Core, which provides the routing services.

Because of its early schedule, EXPE41 could not use the CIS implementation, but used the specification of the CIS Interfaces to develop the interfaces between C2 tools. These interfaces used Web services and a message structure that is compatible with the CIS.

This experiment contributed to the improvement of the two legacy software: Asphodèle and LUPP. These improvements will be beneficial to the tools interoperability in the future. They are described in Table 4.3.

Table 4.3: Improvement of the legacy systems during the experiment

Acronym	Before adaptation	After adaptation
Asphodèle	Can only exchange «screenshots » of the tactical situation via mail.	Can exchange a georeferenced standard graphical image (kml) of the tactical situation via drag and drop (with Large Event) or mail (with Life-X COP).
LUPP	Can only exchange screenshots of the tactical situation via mail.	Can exchange EMSI formatted messages, in a EDXL-DE envelope.

4.5.2 Physical architecture

The Figure 4.5 shows the network architecture implemented for EXPE41 and the correspondence between tools and Command Posts:

- LUPP, Asphodèle, Large Event, Life-X COP (COP), are connected to the same LAN in Valabre.
- XVR simulator is on another network, the servers of Large Event and Life-X COP are connected to the same network in Valabre.
- Crisis Wall, which is located in JRC (Ispra) and is connected via Internet.
- The SYNERGI server is also connected via Internet to the client located in Valabre.

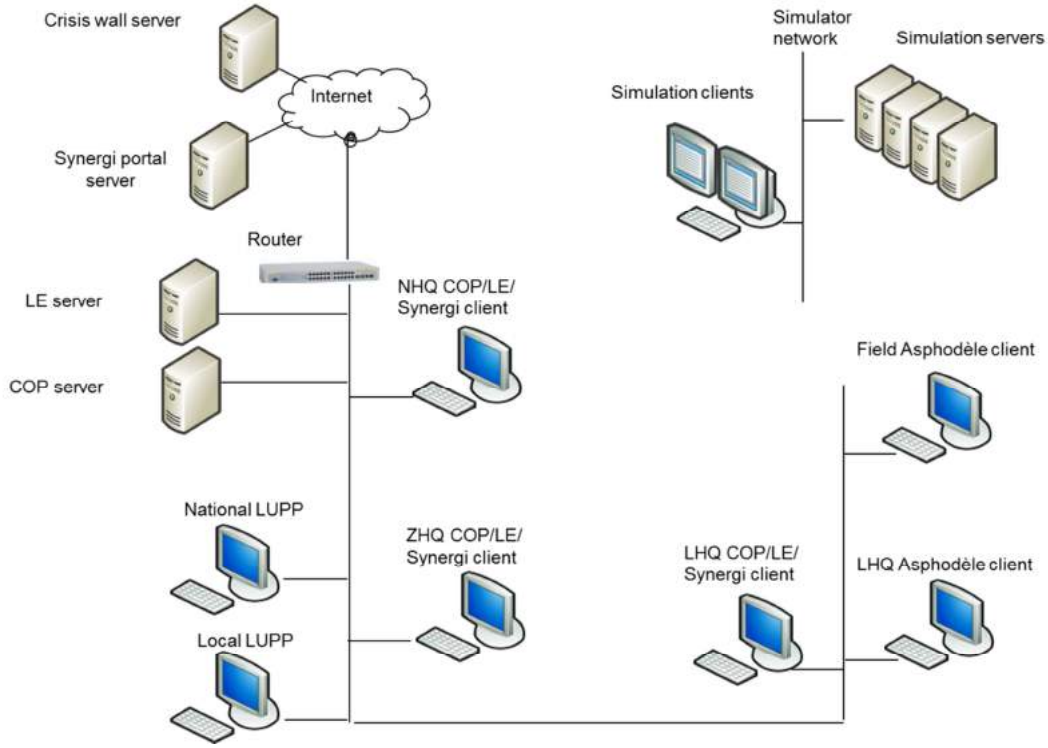


Figure 4.5: EXPE41 system architecture in Valabre

4.6 Training of players

The training to the players was delivered during the operational dry run (December 2015). The training only concerned the Large Event and Life-X COP tools because others (Asphodèle, LUPP, Crisis Wall), were legacy tools and were handled during EZPE41 by players who were already trained on them. The training consisted of:

- A 2 hours presentation of the Large Event and Life-X tools;
- Hands on training: a dry run of a simplified version of the scenario;
- During the dry run, assistance was available: in French (the language of the players) for Large Event and in English for Life-X COP. Players showed no difficulty in using the Large Event and Life-X COP tools.
- In order to mitigate the risk that some of the players might not be available for the actual run of the EXPE41, each command post was staffed with two players, one senior officer and one younger first responder with computer skills. In addition, assistance from tools providers (Thales and Frequentis) was available.

4.7 Ethical, legal and societal considerations

This section presents the way the ethical, legal and societal issues were addressed during the experiment. The experiment is based on a table top exercise performed by project partners and professional first responders. It is a controlled environment inside the building of a French firefighters training centre. The fact that the general public is not involved simplifies the ethical and legal considerations. The players are professional first-responders accustomed to this kind of table-top exercise. All participants filled in an informed consent.

Concerning the data protection, a declaration to the CNIL, the French data protection agency was done by paper mail (25/08/2015). This declaration described the project and the purpose and nature of EXPE41 "Operational Data Lift". It specifies that:

- The experiment was based on simulation and consequently did not involve any "boots on the ground", not personal data regarding victims or survivors' names.
- That the feedback was going to be collected.
- That a report was going to be made on the experimentation and that the names of the persons involved were not going to be mentioned in this report.

In addition to the above, it shall be noted that during the experiment, the following rules applied:

- No personal data of the different participants of the experiment are logged in the course of the experiment.
- Participants are allocated roles. All data logged by the system are identified by the various roles and not by the user names.

The letter to the CNIL can be found in Annex 6.

5. Results

This section presents the results obtained during and after the experiment. The results are organized by the associated research questions (section 2.4) and discussed using the various evaluation methodologies.

1. Did the COP solutions actually deliver a COP service?
2. Did the way the experiment was set-up enable the current practices to be compared to the COP approach?
3. Did the COP solution bring operational benefits to those involved in the experiment?
4. Are the tools implementing the COP solution practical for crisis managers to use?
5. Did the simulator contribute positively to the set-up of the experiment?
6. Have all the participants learnt from this experiment?

The quotes in these sections come from the respondents. Each sub-section will end with concise conclusions regarding the interpretation of the answers. An overview of outcomes is also depicted in Annex 7.

5.1 Delivery of a COP service

This section discusses the results related to the first research question:

RQ1: Did the COP solutions actually deliver a COP service?

This research question is addressed in the questionnaire by the first question (Q1). Participants answer positively to this question (average is 3.9 for all, 4.1 for operational participants, 3.8 for evaluators, Figure 5.1). The COP Solutions operational experts (IdF NRW, NRFS, CESS, BMPM, BSPP) agree on the fact that a COP was delivered, in terms of a picture, i.e. situation assessment.

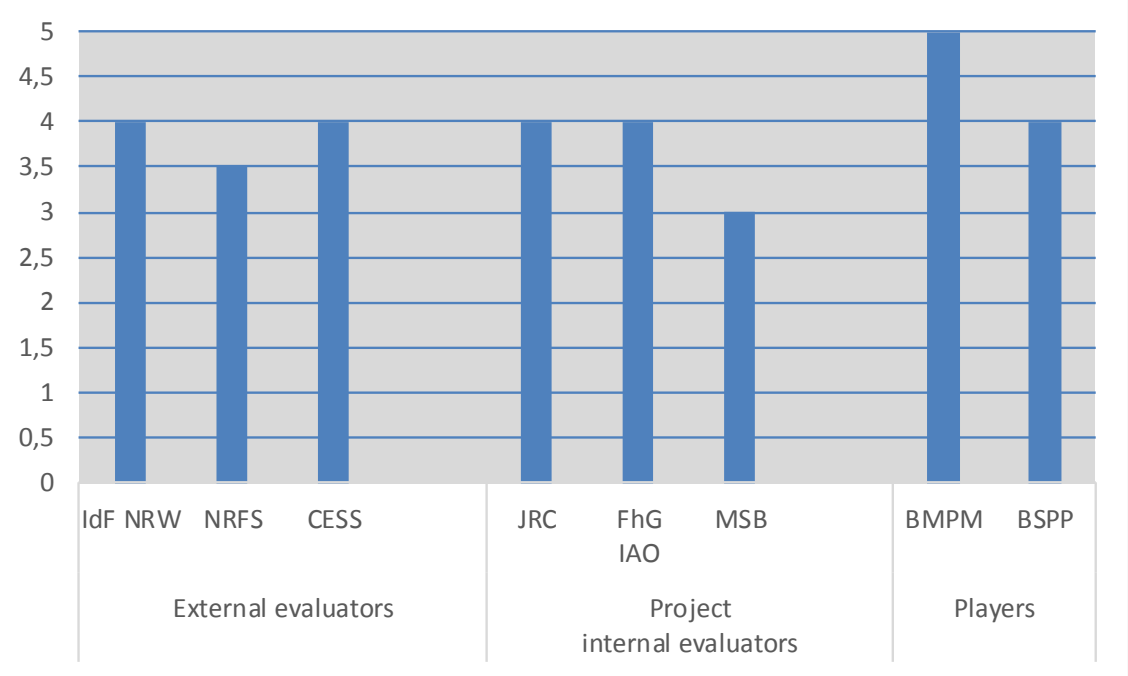


Figure 5.1: Answers to Q1 relative to COP approach

The concept of COP was discussed during the open feedback session. During this session it became clear that the group had various definitions of what a COP is (or what it could be).

The information presented by the COP Solution is judged by some evaluator (answers to Q8) as useful and necessary but not sufficient, as a COP needs a “more holistic concept”. One of the operational evaluators considered that the COP Solutions could also benefit from additional geographic layers on the map (e.g.

population, risk) and additional functions such as tasking, resource management or rationale of decision making.

The answers to Q2, Q3 and Q4 show that the sharing of information with upper levels, and other civil protection organisations participating in the incident management is considered as "crucial". Run 2 and Run 3, where the COP solutions were implemented, showed that the incident management was "accelerated". Furthermore, it was observed and discussed during the open feedback session that vertical dissemination has its benefits across countries and organisations, however "deciding how and which information shall be shared at the different levels will not be easy".

Concerning the sharing with other services (Q5), operational participants outline that the type of information which needs and can be shared with others is clearly "information that is relevant for the tactics of the other actors". For example, "it is useful to point out the staging areas of fire brigade and ambulance services in order to prevent the police from using the same places for their purposes". On the other hand, the sharing must be limited because the sharing of unnecessary information could be useless and counterproductive ("a policeman is not able to understand firemen tactical situation and doesn't need all the information that firemen have"). The UK doctrine, for example, identifies this information with the METHANE acronyms: which stands for: Major incident, Exact location, Type of incident, Hazards, Access (routes), Number – types- severity- of casualties, Emergency services involved.

Concerning the cross-border cooperation, some difficulties were revealed by EXPE41 concerning the language barrier, the lack of international standardisation in the map symbology and the characteristics of entities, as well as the use of French for the daybook (which was not translated into English for the Swedish operational centre). These items were obstacles to interoperability. To overcome these issues the existence of international standards (i.e. EU Crisis Management information management standards) and automatic translation would be of great help.

Conclusion 1: the main functions (Situation map, daybook, information exchange, simple terrain layer) activated during EXPE41 by the COP tools enabled the delivery of a minimal COP solution. Yet additional functions could enrich the COP to reach a more holistic approach, such as: tasking, resource management and other geographical layers (e.g.: including population statistics, risk areas, specific needs).

Conclusion 2: Information shared with other parties through a COP shall be managed: only information useful to other parties and which can be disclosed to them shall be shared.

5.2 Relevance of experiment set-up

This section presents the results which are related to the second research question

RQ2: Did the way the experiment was set-up enable the current practices to be compared to the COP approach?

This research question is addressed by the question Q17 of the general questionnaire: "Do you think that the set-up of this experiment is well adapted to its objectives?" The scores obtained for Q17 are presented in Figure 5.2 which indicates that participants rated the experiment set-up as well adapted to the objectives of the experiment.

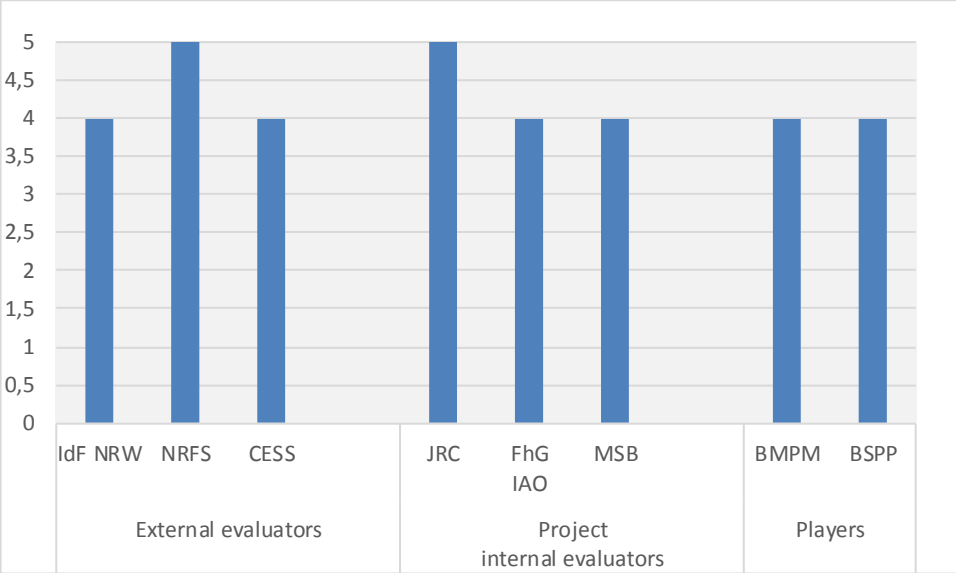


Figure 5.2: Answers to Q17 on experiment set-up

The actors, evaluators and observers appreciated the replay of the same scenario and the comparison to the legacy tools. Players mentioned in their feedback that the comparison of each tested tool with SYNERGI (legacy tool) enabled users to evaluate differences and industrial tool providers (Thales and Frequentis) to have a better knowledge of the currently available tools and of their usage.

Although the set-up was evaluated positively, some potential improvements have been identified:

- The Logs of the COP tools should be improved to facilitate the analysis of information, especially the tracking of key information (section 3.2). This is particularly true of Life-X COP. The analysis of Run 2 (based on Large Event) was made easier by the way the creation of tactical information was logged by Large Event.
- The radio and phone communications were not logged. Logging them could have been interesting to check the number and time of exchanges between parties (which may be reduced if information exchange is improved via the COP). A recording of the conversations could also help tracking decision making, and request for information on key topics.

Conclusion: The experiment set-up can be considered as successful as it enables the comparison between the legacy solution and the COP tool based solutions. Some improvements concerning the logging of information by COP tools and the logging of oral communications could help to improve this set-up.

5.3 Operational benefit

This section presents and discusses the results relative to the following research question:

RQ3: Did the COP solution bring operational benefits to those involved in the experiment?

This research question is analysed in the next sub-sections both qualitatively (in terms of feedback from participants) and quantitatively, in terms of functional comparison (section 0) theoretical system of systems interoperability (section 5.3.2) and dissemination of key information (section 5.3.3).

5.3.1 Functional comparison

Table 5.1 presents a functional comparison between the versions of SYNERGI, Large Event and Life-X COP which were used during EXPE41. This comparison is made according to the principles presented in section 3.3.

Table 5.1: Functional comparison

Function	Synergy	Large Event	Life-X COP
Georeferenced situation map management	Not available in EXPE41 version	Yes: ability to display several layers, including maps, tactical objects, and kml objects	Yes: ability to display several layers, including maps, tactical objects, and kml objects
Daybook	Yes	Yes	Yes, preliminary version
Exchange of information	Information is received via standard mail	Ability to exchange formatted messages	Ability to exchange formatted messages

This functional comparison shows that Large Event and Life-X COP, in comparison to SYNERGI, bring two major additional functions relative to Situation map management, and information exchange.

An evaluator answering Q12 (Annex 7) stated “the map is the most important function”, indicating the map function present in Large Event and Life-X COP brings a considerable operational benefit.

The ability to exchange information which is also more advanced in Large Event and Life-X COP also brings an interesting operational potential which is discussed in the next sections.

5.3.2 Solution Interoperability Measurement

This section presents and discusses the results of the application of the LISI Model presented in section 3.1 to both the legacy solution and the COP solutions. The result is a “map” representing the level of technical interoperability of the various solutions. The application of the LISI Model on the legacy solution, played during Run 1, based on SYNERGI and including Asphodèle and LUPP is shown in Table 5.2.

Table 5.2: Technical interoperability of the legacy solution

Run 1		Sweden		France				EU
	From ↓To ->	FCP & LHQ	NHQ	FCP	LHQ	ZHQ	NHQ	ERCC
EU	ERCC							4
France	NHQ	0	0 (Phone)		1 (Daybook)			1
	ZHQ	0						
	LHQ	0						
	FCP			4	1	1	1	
Sweden	NHQ							
	FCP & LHQ	4						

The legacy chain of command, which was operational in Valabre at the time of the EXPE41, implemented a low level of interoperability between the field level and the upper levels. Tactical situations were sent as images by mail.

In addition to that, the SYNERGI application that was shared by the Local, Zonal and National Level did not include a georeferenced map in the version that was tested. Shared data were limited to a daybook made of text. Maps could only be attached as non-georeferenced pictures.

The application of the LISI model on the COP Solutions which were used during Run 2 and Run 3 reveal comparable results and differ from the one of Run 1. They are represented by Table 5.3.

Table 5.3: Technical interoperability of the COP based solutions (Run 2 & Run 3)

Run 2 & 3		Sweden		France				EU
	From ↓To ->	FCP & LHQ	NHQ	FCP	LHQ	ZHQ	NHQ	ERCC
EU	ERCC							4
France	NHQ	3	4 + Phone		4 (Map and Daybook)			3
	ZHQ	3	4					
	LHQ	3	4					
	FCP			4	3	3	3	
Sweden	NHQ							
	FCP & LHQ	4						

The overall interoperability improvement added by the COP solutions can be represented using the variation of the technical interoperability level. This variation is represented in Table 5.4.

Table 5.4: Variation of technical interoperability between legacy and COP solutions

Delta		Sweden		France				EU
	From ↓To ->	FCP & LHQ	NHQ	FCP	LHQ	ZHQ	NHQ	ERCC
EU	ERCC							Unchanged
France	NHQ	+3	+4		+3			+2
	ZHQ	+3	+4					
	LHQ	+3	+4					
	FCP			Unchanged	+2	+2	+2	
Sweden	NHQ							
	FCP & LHQ	Unchanged						

The main variations can be described as follows:

- Cross-border cooperation was strongly improved by the deployment of a shared interactive COP application accessible from National level: they all interacted dynamically on the COP instead of interacting on the phone. In addition to that, the French LHQ, ZHQ and NHQ were able to exchange (EMSI messages) with the Swedish FCP and LHQ when during Run 1 they were only talking by phone.
- On the French side, there was an improved connection from field level to local level. Screen copies of tactical situation were replaced by KML georeferenced tactical symbology which can be superimposed on COP tools' maps as a layer. This improved greatly the way information related to the incident was disseminated in the whole chain of command.
- The connection between ERCC and the COP was a novelty, as it was not present in the legacy solution. This can be seen as a potential improvement.

These measurements underpin comments made by the players regarding the fact that communication was eased. This belongs primarily to the fact that less had to be explained to other participating command posts in Run 2 and Run 3 than in Run 1 over the phone. For example, the size of the fire or the location of the chemical trucks were represented on the map, and were visible to all.

Conclusion: The technical interoperability was improved by the COP solutions mostly because a larger number of parties were connected to the COP, and because information exchange was based on standards. This improved interoperability contributed to ease the coordination between parties, and brought a clear operational benefit.

5.3.3 Dissemination of key information

This section analyses the operational benefit brought by the COP solutions in terms of propagation of key information. The effectiveness of the information sharing activities was analysed along two main threads: the cross-border cooperation (Figure 5.3) and the chemical risk (Figure 5.4).

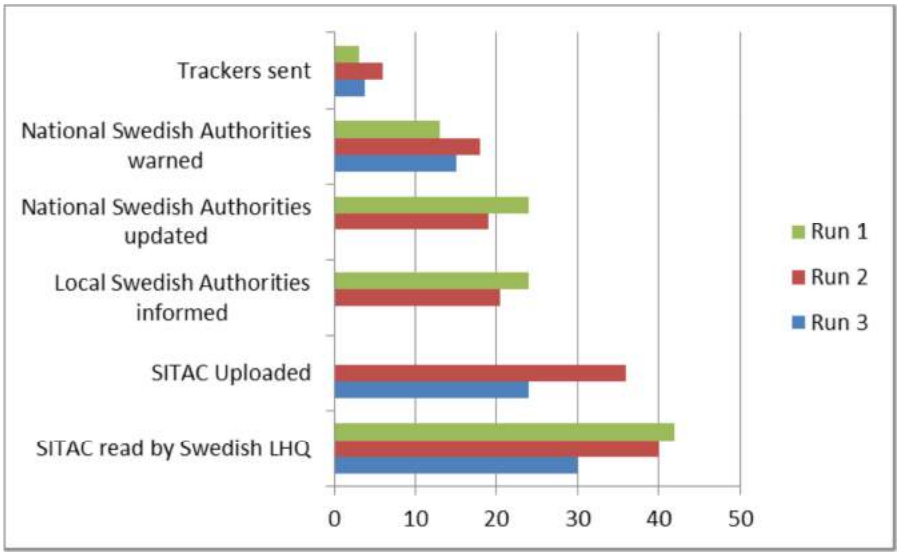


Figure 5.3: Warning of Swedish authorities (minutes)

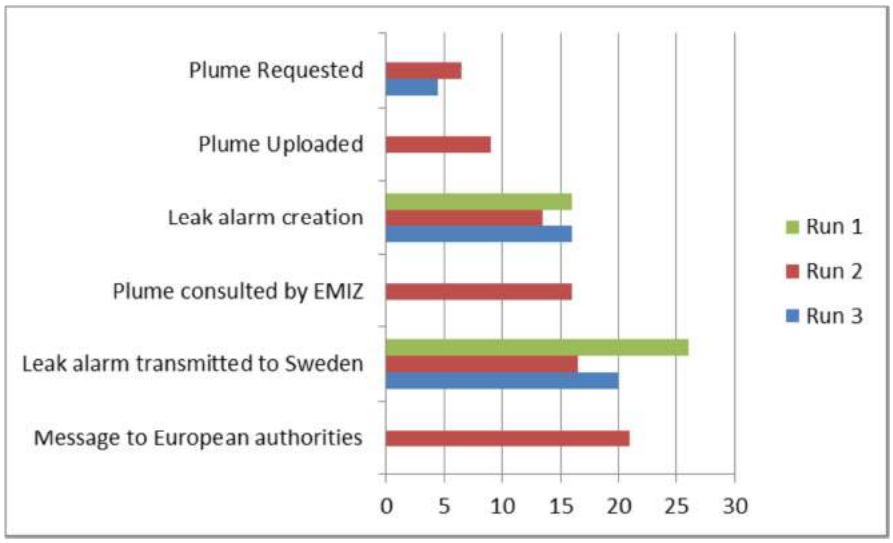


Figure 5.4: Chemical risk thread (in minutes)

The analysis of Figure 5.3 and Figure 5.4 shows that the COP solution (Runs 2 and 3) did not introduce a significant improvement in terms of speed. Especially since the data transfer does not depend on the tool, but rather on the speed at which the information is prepared by the team in charge.

The qualitative feedback regarding the COP solution shows that the information exchange is perceived as much more seamless and that the increased richness of information facilitates a better common understanding. With the COP solution, it is not only text or images, but also text and images and tactical objects on a map, and the map view of the COP as a whole that can be shared.

This reduces the number of questions which need to be answered by radio (e.g. the size of the fire). However, as the radio communication was not logged, this improvement could not be quantitatively evaluated.

Conclusion: No significant improvement was measured in terms of speed of dissemination of key information. The feeling of easier coordination reported by players can thus be explained by the increased richness of information that is conveyed (section 5.3.2).

5.4 Usability of COP tools

This section presents specific remarks on the COP tools themselves. It has to be mentioned that these remarks are relevant for the versions presented at the EXPE41 in March 2016. Since March 2016 the tools under consideration have evolved (see Table 5.5).

Table 5.5: Tools' versions and main evolutions

Tool name	EXPE41 Version	Dec. 2017 Version	Main functional evolution
Large Event	V1.0.2	V2.1.1	Management of Events in a calendar Search of a location by postal address Use of WMS maps off-line in mobile application.
Life-X COP	V2.1.8	V3.3.0	Daybook extension/handling Layer grouping/data filtering/transparency handling
SYNERGI	V 2012	idem	No changes
LUPP	V6.2	V6.4	Optimized speed and reliability
Asphodèle	V1.0	V1.0	No changes
CrisisWall	V1.0	V1.0	No changes

5.4.1 SUS questionnaire

This section presents and discusses the results which are relative to the research question:

RQ4: Are the tools implementing the COP solution practical for crisis managers to use?

This usability measure questionnaire was submitted to the three players using the COP tools at Local Headquarter, Zonal Headquarter and National Headquarter. Players received a simple one-hour hands-on training on each COP tool, and assistance was available during the runs: in French (the language of the players) for Large Event and in English for Life-X COP. No major difficulty was faced during experiment in the use of the tools.

The usability of both COP tools was evaluated by players as good (Figure 5.5).

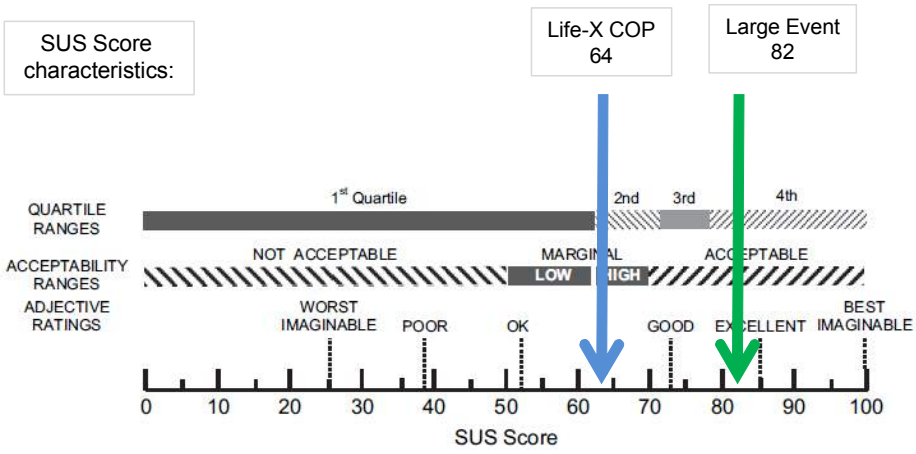


Figure 5.5: Usability of tools (SUS Questionnaire Score)

Considering that only three persons participated in this rating, the difference between the scores obtained by the two COP tools cannot be considered as revealing any significant superiority in terms of usability. This conclusion was confirmed during the qualitative feedback: both tools were described as easy to use.

The relative strength and weaknesses of these tools are detailed in the next section.

5.4.2 Comparative strengths and weaknesses

The questionnaires provide interesting material to detail the strengths and weaknesses of the two COP tools Large Event (Run 2) and Life-X COP (Run 3).

- Q9: Do you think the Large Event daybook is easy to use?
- Q10: Do you think the Life-X COP daybook is easy to use?
- Q11: Do you think that the information on the Large Event map is useful?
- Q12: Do you think that the information on the Life-X COP map is useful?
- Q13: What features would improve the Life-X COP tool?
- Q14: What do you like in Life-X COP tool?
- Q15: What features would improve the Large Event tool?
- Q16: What do you like in the Large Event tool?

The analysis of the answers to these questions as well as the analysis of the feedback given during the open feedback session can be summarized as follows:

- Life-X Cop Map is more user-friendly and flexible than Large Event Map.
- Large Event daybook is more user friendly than Life-X COP daybook.
- Language barrier (the daybook of Large Event was written in French) with no translation in English.
- Lack of a common (cross-border) symbology: Both systems would benefit from a common EU agreed symbology for tactical situation, which unfortunately does not exist.
- In Life-X COP, some automatically generated messages distracted the attention of players.
- The option offered in Life-X COP to add figures about the affected persons (injured, missing, dead) with the possibility to aggregate these data on higher levels was appreciated.
- In general, during the open feedback session, participants insisted on the need for information to be aggregated for the higher level of command.

Regarding the difference between the COP Solutions and the legacy solution, the main positive difference between the legacy solution and proposed COP solutions which was during the qualitative feedback was the ability of headquarters from Local to Zonal and National levels to access a common map-based situation. This was perceived as a simplification.

Conclusion: As a conclusion, the usability can be rated as good. Players managed to use them after a short training and reported positively on their usability. Improvement can be achieved though: Large Event map should improve the user interactions, and Life-X COP should mature its look and feel.

5.5 Role of Simulator

This section presents and discusses the results related to the research question:

RQ5: Did the simulator contribute positively to the set-up of the experiment?

This research question has been addressed by Q19 of the general questionnaire: “Do you think that the simulator plays an interesting role in the experimentation?”

The added value of CESIR was unanimously recognized by players who rated the hosting of the experiment and the use of the simulation very positively. The players stated during the open feedback sessions, that it gave them a sense of thrill, as it made their use of tools closer to operational conditions. Their answers reached an average of 4.8 for the five operational evaluators and players (Figure 5.6).

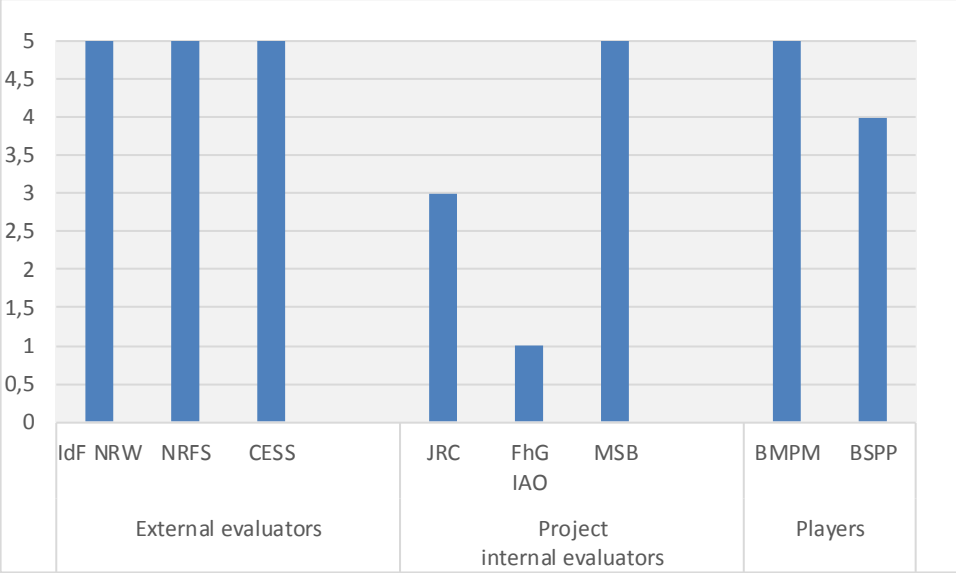


Figure 5.6: Q19 result; interest of simulator

Interestingly enough the answer was much more contrasted with other participants (average of other three non-operational participants is 3). The main criticism came from the lack of feedback loops from the decisions and actions taken by the players and the simulation. All these interactions were played "by hand" by the DIREX.

As expressed during the open feedback sessions, the positive feedback was also due to the CESIR building itself and the many facilities it offered during the EXPE41: the several playing and meeting rooms, its various simulators (truck, helicopters, boat), the radio devices which were given to players, which definitively created a very rich and professional environment for the experiment.

Consequently, EXPE41 also demonstrated that the CESIR, which until now was exclusively used for training purposes, could be used for other purposes; namely, the validation of new solutions, tools, or procedures.

Conclusion: EXPE41 demonstrated the soundness of the use of CESIR simulator for the testing and evaluation of new solutions or procedures. This opens new operational and business perspectives for Valabre in particular and end-user platforms in general.

5.6 Learning experience

This section presents and discusses the results related to the research question:

RQ6: Have all the participants learnt from this experiment?

This document describes a learning-by-doing experience. Apart from the collection of significant measures, the success of the experiment is dictated by the fact that all participants enhance their knowledge when participating. End-users, industrial partners and researchers were involved in EXPE41:

- The end-users (players) got an interesting insight on the available technology, and its potential benefits, and investigated the potential benefits of a COP.
- The project partners altogether gained experience in designing, preparing, executing and reporting on an experiment, and received interesting suggestions from the participants for the next steps.

- The hosting platform, Valabre, obtained confirmation that the CESIR simulator could be used for the validation of new tools or processes (section 5.5).
- The tool providers learnt more about the operational needs and practice and benefited from the feedback of the players on the usability of their tools.

As shown in Figure 5.7, the answers to Q24 "Do you find this an interesting way forward ?" show that the evaluators were positive about the experience and considered that is was a positive step forward. They also declared they would be interested in being involved in future DRIVER+ Trials.

Conclusion: Participants to EXPE41 had various backgrounds and learnt from this experience. The hosting platform obtained a confirmation that the CESIR Simulator could be used for the validation of new tools and procedures, tools providers gained a deeper knowledge of the civil protection's needs, and the project gained feedback on the methodology for designing experiments.

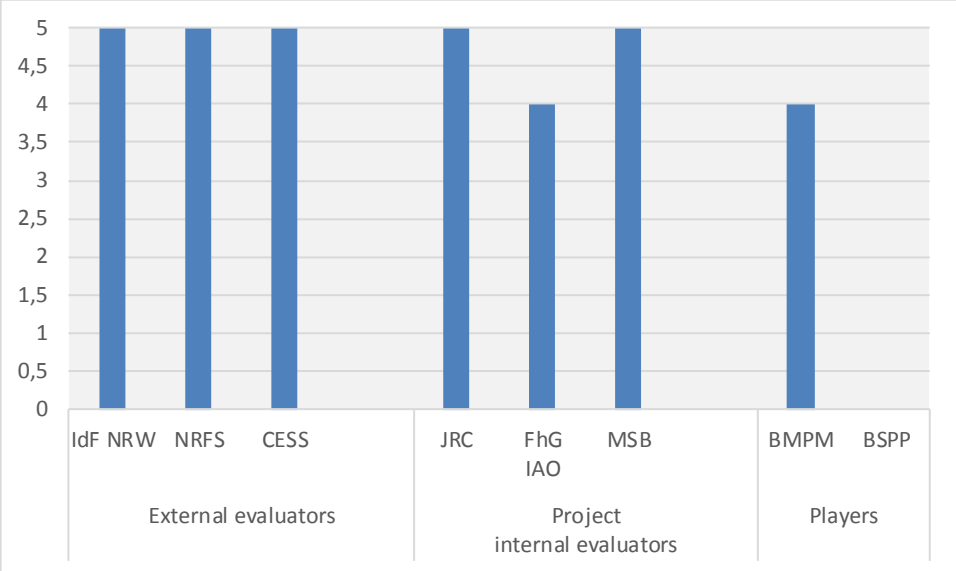


Figure 5.7: Q24 results, Interesting way forward

6. Lessons learnt

EXPE41 was the first experiment to involve external end-users as players in the former Sub-Project 4. The results help to formalise some aspects on the nature of experiments, as well as on the preparation process. These lessons are now feeding the on-going elaboration on the DRIVER+ methodology and the upcoming DRIVER+ Trials.

In addition to this, interesting suggestions were collected through the questionnaires and during the open feedback sessions which deal with the COP tools under consideration (Large Event and Life-X Cop), the evaluation methodology, and on requirements for future experiments. These lessons learnt belong to the following topics:

- Trial preparation process for DRIVER+.
- Nature of Trials in DRIVER+.
- Requirement on COP tools for future Trials.
- Evaluation methodology for DRIVER+.

Lesson 1: Trial preparation process for DRIVER+

The design and preparation of EXPE41 enable to formalise additional steps in the process which were not described in the former methodology:

- Technical dry run: make sure tools work and interoperate.
- Operational dry run: train players, play a simplified version of scenario, allocate rooms.
- Feedback workshop: present results to players and their organisations to make sure that their feedback has been well understood and summarised before communicating to the external world.

Introduced by EXPE41, these steps have been later on adopted by most former SP4 experiments and will now be fed into the DRIVER+ Guidance Methodology.

Lesson 2: Nature of Trials in DRIVER+

During the preparation of EXPE41, it was very important to clarify to players that the experiment was not focusing on the proficiency of first responders, but on the potential benefit of a solution. This knowledge makes the players much more comfortable in using tools which they do not know. This will be respected and taken into account when preparing DRIVER+ Trials.

It is also important to explain that the aim of a Trial is to trial a new solution and not to choose / or not to choose a COP tool, rather than another one. What shall be evaluated is a different category of interoperability, relying of information representation standards, and dynamically shared applications.

Lesson 3: Requirement on COP tools for future Trials

During the debriefing the players formulated the following requirements which sum up the main lessons learnt from the “Operational Data Lift” experiment:

- The way of presenting information in the COP should be adapted to the level of command. Higher levels should see information in an aggregated way. Players mentioned that tools should be adapted to enable different representation for higher levels which should see information in an aggregated way.
- There is a need for more complex scenario, for example a multi-sited terrorist attack, with a risk of saturation of high-level decision makers by huge flows of information.
- In the “Operational Data Lift” experiment, only firefighters and policemen were involved. The involvement of other domains (e.g. health) in the COP is recommended. This is regarded as both possible and expected by the developers.
- The sharing of information with other civil protection bodies requires that each organisation contributing to the COP identifies the type of information that it wants to share with others.

A follow-up Trial of "Operational Data Lift" will be organized in 2018. The requirements from above will be taken into consideration for the preparation of this Trial.

Lesson 4: Evaluation methodology for DRIVER+

During the open feedback session with evaluators, it appeared that they lacked directions in their evaluation task. During EXPE41, they were not attached to any specific command cell, and were asked to look at the process as a whole. Evaluators suggested that one interesting task they could perform in such experiment would be to track scenario key information along the command chain, and see how and when it is taken into account (or not) by the various parties involved. This approach would complement the tracking of key information based on the log files (section 5.3.3). These aspects should be included in the Guidance methodology.

7. Recommendations

This section gives a set of recommendations based on the results of EXPE41, which have been discussed in the previous sections.

The first recommendation is relating to the major functions of a COP tool. A COP tool should include at least a map-based situation assessment, a daybook, and data exchange functions. Additional functions such as tasking, resource management and document sharing functions have a lower priority.

The second recommendation relates to the ability of the Command and Control tools to exchange information. C2 systems are not always needed and many civil protection organisations still work with physical maps or white boards. Yet, whenever C2 tools are used, they should be able to exchange information with other C2 tools. This very basic ability is often not satisfied, and is costlier to implement when it has not been included at design phase. The adoption of technical standards (e.g. KML, WMS) can be a default minimal option until European standards are adopted.

The third recommendation is belonging to the availability of European standards in terms of information exchange, representation of information, symbology, and operational terminology. The main operational benefit of the COP is related to the increase in interoperability of the COP Solution. The enhanced integration achieves an increase in exchanged information content. This higher interoperability is achieved by the adoption of standards (EMSI, CAP, EDXL-DE). On the other hand, one of the main lacks of the COP solutions mentioned by the evaluators and players were related directly or indirectly to the lack of standards. The French symbols were not understandable by the Swedish commanders when looking on the map of the COP tools. Additionally, the daybook, being written in French and consisting of many operational French terms, was not easy to translate to Swedish.

Consequently, EXPE41 emphasises the high necessity of national and European standards in the field. This European standardisation is a precondition to the enhancement of interoperability, which will contribute to a higher integration of the civil protection in Europe.

Once these standards are published, the adoption of these standards by newly developed C2 systems shall be a requirement or at least a recommendation given by civil protection central authorities to lower level authorities in charge of the purchasing of such civil protection C2 systems.

The fourth recommendation is relative to the need for information management. The adoption of a COP is considered as useful by end-users, but there is a strong prerequisite for its adoption: information shared with other stakeholders shall be only information that is useful to them. This requirement is derived from two main needs: (1) to avoid jamming the COP with too much information, and to keep it readable, (2) not to disclose information that is internal to each civil protection organisation, and needs to remain internal.

This information management requirement means that the COP shall remain separated from the situation assessment picture of each individual organisation.

The fifth recommendation is relative to the organisation of experiments in order to validate COP solutions and/or procedures. COP solutions are complex and involve many parties. A series of learning-by-doing experiences like EXPE41 is a good way to collect concrete feedback and accelerate the design of potential COP solutions.

The recommendations are summarized in Table 7.1.

Table 7.1: Recommendations

Nr	Topic	Recommendation
1	Functions of a COP	A COP tool should include at least a map-based situation assessment, a daybook, and data exchange functions.
2	Information exchange	C2 tools should be able to exchange information with other C2 tools. Before they shall support at least technical standards (e.g. KML, WMS) can be a default minimal option until European standards are adopted.
3	European standards	The development and promotion of civil protection European standards in the field situation assessment information (tactical information representation, symbology) as well as the standardization of operational terminology (used in daybooks) is a precondition to the use of COPs in cross-border operations.
4	Information management	Information shared with other parties through a COP shall be managed: only information useful to other parties and which can be disclosed to them shall be shared.
5	Conduct experiments	COP solutions are complex to design. A series of learning-by-doing experiences like EXPE41 is a good way to collect concrete feedback and accelerate the design of potential COP solutions.

8. Conclusion and future work

The EXPE41 “Operational data lift” experiment can be considered a success. It gathered a heterogeneous community of industrial research institutions and civil protection organisations in a learning-by-doing process around the COP.

EXPE41 demonstrated the interest in a COP as a method of facilitating the dissemination of information - both in the vertical (chain of command) and the horizontal (cooperation) dimensions. It showed that giving access to the same map, and providing richer information, facilitated a common understanding of the situation, which in turn facilitated better cooperation during the incident. It also demonstrated the interest of using the CESIR not only for training but for also for the validation of new tools, solutions or procedures. EXPE41 demonstrated the soundness of a new business model for the CESIR.

Conducing Trials does not aim to prove some abstract truth. It enables civil protection stakeholders, who want to try a new solution (tools and procedures) and/or want to close a gap in their needs, to do so in a secure and structured environment where no life is at stake, and where it is not their proficiency that is being evaluated but the solutions and procedures.

EXPE41, the “Operational data lift” experiment, has created a positive feeling about the DRIVER+ approach and opens up many promising perspectives for future Trials. Organisations, which were at first reluctant to share a COP with other domains, are now ready to extend the number of domains involved in the frame of a Trial.

EXPE41 was conducted before the restructuring of the project. It will be continued in the upcoming Trial 2, which is led and hosted by Valabre, with the contribution of Thales as solution coordinator and other tool providers. Trial 2 will take place in October 2018, in Valabre and will benefit from the results of EXPE41.

References

1. **Mandate M/487 to establish Security Standards.** *Final Report Phase 2, proposed standardization work programmes and road maps.* 2013. p. 31.

2. **ACRIMAS.** *D4-3 Requirements specification report.* 2012. SEC-2010.4.1-1 /Aftermath Crisis Management Phase I/ Grant agreement 261669/.

3. **FEMA.** IS-0700.A: National Incident Management System, An Introduction - Student Manual. 2014.

4. *NATO initial common operational picture capability project.* **Fanto, L.; Beach, D.** [ed.] NATO C3 Agency. s.l. : Proceedings of the SPIE. pp. 80-89. 10.1117/12.478702.

5. **COPE (Common Operational Picture Exploitation), FP7 217854,.** 2010. D1.3.

6. **IDIRA (Interoperability of data and procedures in large-scale multinational disaster response actios), FP7 261726,.** 2015.

7. **Mandate M/487 to establish Security Standards.** *Final Report Phase 2, proposed standardization work programmes and road maps.* 2013. p. 29.

8. **Dickinson, Ian.** *National Resilience Extranet Common Operating Picture.* Niteworks. s.l. : UK MOD, 2013. W/Pj/ResComms/4902a.

9. *Portail ORSEC mode d'emploi S.Y.N.E.R.G.I.* Sous-direction de la gestion des risques, Ministère de l'Intérieur. http://www.mayenne.gouv.fr/content/download/9239/59739/file/Mode%20emploi%20SYNERGI%20-%20r%C3%9Adacteurs.pdf .

10. **S.HURIET, Commandant.** *Renseignement image et sécurité civile.* Master II 'Gestion des risques et des crises de sécurité civile. 2012. p. p.55, Mémoire. Annexe 1.

11. *PôNT, Asphodèle.* 2016. http://www.pont-entente.org/activites.php?activite_id=23&activite_id_parent=7.

12. **ECOSSIAN, (European COntrol System Security Incident Analysis Network).** s.l. : FP7 Security project 607577, 2017.

13. **Group, C4ISR Interoperability Working.** *Systems Interoperability (LISI).* Department of Defense Levels of Information. Washington : s.n., 1998.

14. *Measuring and Evaluating Interoperability for COmplex C2 Information Management System-of-Systems.* **S.M. Russell, N.Suri, R.Lenzi, H.Fouad.** 2016.

15. *SUS-A quick and dirty usability scale.* **Brooke, John.** 1996. Vol. Usability evaluation in industry , pp. 4-7. 189.194.

16. **DRIVER.** *D43.51- Shared situation awareness experimentation report.* 2016.

17. *Global Disaster Alert and Coordination System (GDACS).* [Online] http://gdacs.org/.

18. *Europe Media Monitoring.* [Online] European Commission. http://emm.newsbrief.eu.

19. *European civil protection and humanitarian aid operations.* [Online] European Commission. http://erccportal.jrc.ec.europa.eu/.

20. *Reliefweb.* [Online] United Nations Office for the Coordination of Humanitarian Affairs (OCHA). https://reliefweb.int/.

21. **DRIVER.** *D42.1- Report on architecture design.* 2016.

22. **OASIS.** EDXL-DE . [Online] http://docs.oasis-open.org/emergency/edxl-de/v2.0/edxl-de-v2.0.html.

23. **ISO/TR.** 22351:2015 "Societal security — Emergency management — Message structure for exchange of information". 2015.

24. **OASIS.** "doc.oasis-open.org". [Online] [Cited: Feb 04, 2015.] http://docs.oasis-open.org/emergency/cap/v1.2.html.

25. **DRIVER.** D45.1 Interoperability Standards. 2015.

26. Guidance Note on project reporting edited by the European Commission available at. [Online] [Cited: 11 24, 2017.] https://ec.europa.eu/research/participants/portal/desktop/en/funding/reference_docs.html#fp7.

27. *A Guide to the Project Management body of Knowledge - fifth edition.* s.l. : Project Management Institute, Inc. Pennsylvania, USA, 2015.

28. DRIVER+ Updated Project Handbook.

29. Consortium Agreement. Project DRIVER+. Contract number 607798.

30. FP7 Grant Agreement Number 607798. Project Title DRIVER+.

Annexes

Annex 1 – DRIVER+ Terminology

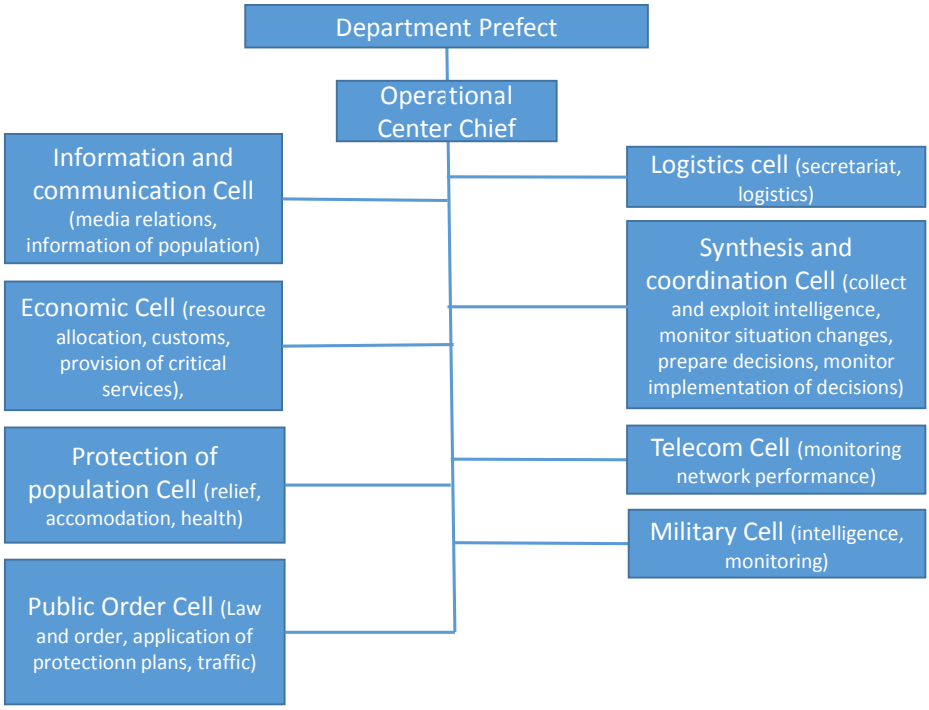
In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated[3]. 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.

Table A1: Terminology

Terminology	Definition	Comment
Command & control	Activities of target oriented decision-making, situation assessment, planning, implementing decisions and controlling the effects of implementation on the incident (disaster).	
Experiment	Purposive investigation of a system through selective adjustment of controllable conditions and allocation of resources	
Experiment design	Systematic methodology for collecting information to guide improvement of any process	
Evaluation	Process of estimating the effectiveness, efficiency, utility and relevance of a service or facility	
Gap	Gaps between the existing capabilities of responders and what was actually needed for effective and timely response	
Interoperability	The ability of diverse systems and organisations to work together, i.e. to interoperate.	
Legacy systems	(Crisis management) system currently in operational use.	
Observer	Exercise participant who watches selected segments as they unfold while remaining separate from role player activities Note 1 to entry: Observers may be part of the evaluation process.	
Scenario	Pre-planned storyline that drives an exercise; the stimuli used to achieve exercise objectives	
System function	broad category of activity performed by a system	

[3] 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.

Annex 2 – Local Headquarter multidisciplinary organization



FigureA1: Organisation of the departmental operational centre

Annex 3 – Scenario

This Annex presents the scenario that was prepared. This scenario was mostly used during the preparation phase to design and test the information exchange between the C2 systems.

During the experiment itself, the main steps were respected, yet, the "let play" phases introduced some variations in the way players organised the exchange of information.

Table A2: Scenario preparation

ACTION	WHO	TOOL USED	DATA
1- FIRE IGNITION	1- DIREX	1- XVR	
2- FIRE EVOLUTION / FIRST MEANS INVOLVEMENT			
2a – Phone call to LHQ to alert about the fire ignition	a - Mr X	2a – Phone	Fire approximative location
2b- Creation of the fire ignition on the map	2b – LHQ	2b – Asphodèle	Fire type …
2c- Ground means involvement for field investigation	2c- LHQ	2c – Asphodèle (SITAC)	Vehicle type
2d- opening of the incident on SYNERGI by the LHQ, the LHQ asks to ZHQ aerial means	2d – LHQ	2d – Phone + SYNERGI (daybook)	SYNERGI: Type Fire, location, Description Manually placed on the map.
2e – FCP is sent on site	2e – LHQ	2e – SYNERGI (daybook)	SYNERGI: Type Fire, location update if needed, Description update
2f- 1st information of the Swedish authorities from the NHQ	2f- NHQ	2f- Phone	Information by phone, e-mail.
2g- 1st local activation in LUPP (S-LHQ) Patrol sent along the border to verify the risk of propagation in Sweden.	2g – S-LHQ	2g - LUPP	Creation of Fire Incident to be inspected in LUPP.
3- FIRE EVOLUTION /ARRIVAL ON SITE			
3a –First Fire contour creation	3a - DIREX	3a- XVR	
3b - Arrival on site of fire chief: asks for ground reinforcement and confirms the need of aerial means (Fire Box activated)	3b- fire chief	3b-Radio of CESIR forest fire ground means box	Request of new means by voice on radio.
3c- creation of 10 ground groups on the map (simulated by XVR)	3c- DIREX	3c - XVR	

ACTION	WHO	TOOL USED	DATA
LET PLAY			
3d- FCP activation	3d – FCP	3d –Asphodèle activation	
3e - SITAC creation	3e – FCP	3e –Asphodèle	Fire extension and position of all trucks.
3f – SITAC is sent to the COP	3f – FCP	3f- Asphodèle	Asphodèle SITAC extracted into picture.
3g - SITAC is available to LHQ	check		
3h – SITAC is available to ZHQ	check		
3i- SITAC is available to NHQ	check		
3j- SITAC is available to Sweden	check		
LET PLAY			
4- FIRE EVOLUTION 4a - Second Fire contour creation / aerial means involvement	4a – DIREX	4a – XVR	
4b- SITAC update	4b – FCP	4b - Asphodèle	Fire extension and position of all trucks/plane.
4c - SITAC is sent to the LHQ	4c- FCP	4c- Asphodèle	Asphodèle SITAC extracted into picture.
4d – SITAC is available to ZHQ	check	4d –	
4e - SITAC is available to NHQ	check	4e –	
4f- ZHQ disengages the aerial means. They are requested on another fire.	4f – ZHQ	4f - / Phone to LHQ	
4g- LHQ / FCP see that aerial means are disengaged	4g- LHQ	4g - / Radio to FCP	
4h - SITAC is available to Sweden	check	4e –	
LET PLAY			
5- FIRE EVOLUTION 5a- Third Fire contour creation / fire arrives on the road	5a – DIREX	5a – XVR	

ACTION	WHO	TOOL USED	DATA
5b- SITAC updated and sent to LE Police requested to block traffic on road.	5b – FCP	5b –Asphodèle	Fire extension and position of all trucks.
5c - SITAC is sent to the COP	5c - FCP	5c- Asphodèle	Asphodèle SITAC
5d - SITAC is available to LHQ			
5e- LHQ contacts the Police: block road	5e- LHQ	5e- Phone	
5f -SITAC is available to ZHQ	check	5f – SYNERGI	
5g - SITAC is available to NHQ	check	5g – SYNERGI	
5h - Police show roadblock on road	5h - Police	5h – SYNERGI	
5i - SITAC is available to Sweden	check	5i – SYNERGI	
6- FIRE THREATENS THE TRUCK			
6a – Creation of a sulphur dioxide truck on the road (code : 268 1079)	6a- DIREX	6a – XVR	
6b - Police informs that a sulphur dioxide truck is trapped on the road.		6b – Phone of Police HQ	
6b - FCP (fire chief), after local check, informs LHQ that the fire threatens the road, and that vehicles are blocked on the road – a sulphur dioxide truck is threatened by the fire – asks for reinforcement : a chemical group and police to manage the traffic problem	6b – FCP/Fire chief	6b – Radio of CESIR forest fire ground means box	
6c- LHQ contacts the Police	6c- LHQ	6c- Phone	
6e-NHQ informs the Swedish national authorities that a truck containing sulphur dioxide is threatened by the fire and that the Swedish road needs to be closed	6e - NHQ	6c- Phone	
6f – update of the situation in LUPP with the sulphur dioxide threat	6f - S-NHQ or S-LHQ	6f- LUPP	
6f – Swedish LHQ contacts the French LHQ	6f- SLHQ	6c- Phone	Voice exchanges : phone call between LHQ.
6g – SITAC is available to Swedish LHQ	6g - check	6g-	
6i- SITAC update	6i – FCP	6i - Asphodèle	Fire extension and position of all trucks.

ACTION	WHO	TOOL USED	DATA
6j - SITAC is sent to COP	6j – FCP	6j– Asphodèle	Asphodèle SITAC extracted into picture file.
6k - SITAC is available to LHQ	check	6k -	
6l – SITAC and daybook updates are available to ZHQ	check	6l -	
6m – SITAC and daybook are available to NHQ	check	6m -	
6n – SITAC and daybook are available to Sweden	check	6n -	
LET PLAY			
7- FIRE EVOLUTION / CHEMICAL REINFORCEMENT GROUP ARRIVAL ON SITE			
7a –Fire smoke plume evolution	7a - DIREX	7a- XVR	
7b - Arrival on site of chemical group	7b- chemical group	7b- CESIR chemical ground means box	
7c- FCP asks S-FCP to get a sulphur dioxide plum simulation	7c - FCP	7c -	
7d- chemical dispersion simulation performed by S-LHQ and sent to FCP	7d- S-LHQ	7d – LUPP /	Calculation of dispersion plume on LUPP / shared with
7e - decision to stay indoors in the Swedish camp site	S-LHQ	LUPP	
7f- Asphodèle SITAC / daybook update	7f - FCP	7f- Asphodèle	Fire extension and position of all trucks.
7g - SITAC is sent to COP	7g – FCP	7g –Asphodèle	Asphodèle SITAC extracted into picture file.
7h - SITAC is available to LHQ	check	7h -	
7i– SITAC is available to ZHQ	check	7i –	
7j - SITAC is available to NHQ	check	7j-	
7k – SITAC and daybook are available to Sweden	check	7k -	

ACTION	WHO	TOOL USED	DATA
LET PLAY			
8- ATMOSPHERIC CHEMICAL DISPERSION			
8a- Sulphur dioxide leak and toxic dispersion cloud creation towards the camp site	8a – DIREX	8a- XVR	
8b- FCP (fire chief) informs LHQ that a leak of chlorine from the truck appeared -	8b- FCP	8b - Radio from CESIR FCP box	
8c FCP informs S-FCP of the leak	8c- FCP	8c- phone	
8c- Preparation of firefighters in Sweden. TSO to LE		LUPP	
8d- daybook updated in COP	8d - FCP	8d- Asphodèle	Asphodèle SITAC extracted into picture file
8e- daybook is available to LHQ	8e – LHQ	8e-	
8f- daybook is available to ZHQ	8f- NHQ	8f-	
8g- daybook is available to NHQ	8g- ZHQ	8g-	
8h – Chemical Alert msg sent to JRC (option)	8h - NHQ	8h – JRC	NO MESSAGE TO JRC
8i - Police confirms patrol in village	8i - Police	8i- phone +	Police patrol resource put in village manually by Police Officer.
LET PLAY (forest fire group should contain the fire)			
9- FIRE IS CONTAINED			
9a- Fire smoke plume decreases	9a - DIREX	9a- XVR	
9b- FCP (fire chief) informs LHQ that the fire is contained part of ground means are disengaged	9b- FCP	9b- radio	
9c- FCP informs S-FCP that the fire is contained.	9c - FCP	9c- phone	
9d- SITAC/daybook update in the COP	9d – FCP	9d- Asphodèle +	Asphodèle SITAC extracted into file.

ACTION	WHO	TOOL USED	DATA
9e- SITAC/daybook is available to LHQ	9e – check	9e-	
9f- SITAC/daybook is available to ZHQ	9f – check	9f-	
9g - SITAC/daybook is available to NHQ	9g - check	9g -	
9h- LUPP : prepositioned team sent back : TSO to LE	9h - S-LHQ	9h - LUPP +	
LET PLAY (chemical group should stop the chemical leak)			
10 CHEMICAL LEAK IS STOPPED			
10a- Chemical leak is stopped / toxic cloud dispersion decreases	10a – DIREX	10a- XVR	
10b- FCP (fire chief) informs LHQ that the chemical leak is contained	10b- FCP	10b- Radio from FCP box + Large Event	DAYBOOK entry
10c- FCP (fire chief) informs S-FCP that the chemical leak is contained	10c - FCP	10c- Phone	
10d- LUPP : chemical alert over once the chemical cloud is dispersed, people can come back. TSO to LE.	10d-S-FCP	10d - LUPP	
10e- SITAC/ daybook update on COP	10e- FCP	10e – Asphodèle	Asphodèle SITAC extracted into file.
10f- SITAC/ daybook is available to LHQ	10f- check	10f -	
10g- SITAC/daybook is available to ZHQ	10g - check	10g -	
10h - SITAC/daybook is available to NHQ	10h- check	10h -	
10i – end of chemical alert sent to JRC (option)	10i - NHQ	10i – CAP message through Large Event	NO MESSAGE TO JRC
10j -French and Swedish LHQ confirms the end of crisis.			
LET PLAY (disengagement of all the means)			

Annex 4 – List of participants

The table below shows the complete list of participants. For Data protection reasons, names have not been included. A cross ("x") means the person was present at either the Operational Dry Run of the experiment itself (Runs 1, 2 and 3). Some participants participated in the preparation phase and their presence was not required during the experiment itself.

Table A3: Participant lists

Operational dry run	Experiment	Organisation	Role of the person
x	x	Thales	Experiment leader, tool provider,
x	x	Thales	Technical support
x	x	Thales	Sub-project leader
		Thales	Methodological Point of Contact for Supporting tools
x	x	Valabre	Incident commander, player,
x	x	Valabre	Hosting platform project manager
x	x	Valabre	Player Police on March 3rd
x	x	Valabre	Head of Valabre research centre
x	x	XVR	Simulation, Animation
x	x	Safe Cluster	Hosting platform organisation
x	x	Safe Cluster	Hosting platform organisation, Player French NHQ during Experiment
x	x	Frequentis	Tool provider
x	x	Frequentis	Technical support
	x	Frequentis	Technical support
x		Frequentis	Technical support
x		ARTTIC	Dissemination PoC
x		ARTTIC	Film & Photos
x		MSB	Technical
x	x	MSB	Incident commander, Player
x	x	MSB	Technical & Player
	x	MSB	Evaluator
	x	MSB	Evaluator
	x	MSB	Evaluator
	x	JRC	Technical

Operational dry run	Experiment	Organisation	Role of the person
	x	JRC	Evaluator
		JRC	Methodological support
	x	FhG IAO	Evaluator
x		BSPP	Player French NHQ
x		BSPP	Player Field Command Post
x		BSPP	Player French LHQ
x	x	BMPM	Player Field Command Post
x		BMPM	Player French LHQ
	x	BMPM	Player French LHQ
x		SDIS 13	Player French LHQ
x	x	EMZ	Incident Commander, player French RHQ
x		Gendarmerie Nationale	Player Police
	x	SDIS 83	Player French NHQ
	x	CESS	Evaluator
	x	NRFS	Evaluator
	x	IdF NRW	Evaluator
14	28		TOTAL (number of persons)

Annex 5 – End-user organisations

This annexe gives a short description of the end-user organisations which provided players during the "operational data lift" experiment.

BMPM

BMPM, the Marseille's Navy firefighter battalion, is a military structure of the French Navy, placed under the direct authority of Marseille's Mayor and is responsible of the protection of people, infrastructures and the environment of the second city of France. The city of 850,000 inhabitants for a 240 km² territory presents all the potential risks of a big city: industrial areas, public buildings, high floor buildings, highway, railways… Moreover, its location between the Mediterranean Sea and hills adds natural risks such as forest fire and flooding to the list.

EMZ

The EMZ (Zone Staff) carries out a permanent operational watch on behalf of the zone prefect and deputy prefect to security and defense. The South defense zone covers three French regions, Provence-Alpes-Côte d'Azur, Languedoc-Roussillon and Corsica, with thirteen departments, and includes Drôme and Ardèche during the forest fire season. The South defense zone serves 7,165,000 inhabitants over a territory of 67,456 km².

SDIS 13 and SDIS 83

SDIS 13 and SDIS 83 are the departmental firefighting organisation of the Bouches du Rhone and of the Var departments. They are in charge of the prevention and civil protection risk evaluation, rescue means organisation, people, goods and environment protection, emergency means to protect people and evacuate them in case of natural or technological hazards.

BSPP

BSPP (The Paris Fire Brigade) is in charge of four districts (Paris, Hauts-de-Seine, Seine-Saint-Denis, Val-de-Marne) representing approximately 7 million inhabitants. It is the largest fire brigade in Europe (8700 men and women). BSPP is in charge of fire prevention, protection from fire and firefighting. Together with other services, BSPP contributes to accident, disaster catastrophe prevention and response, technological and natural hazards assessment and prevention, and emergency relief provision within its operating area.

IdF NRW

The State Fire Institute North Rhine Westphalia (IdF NRW) is the state's central training facility for civil protection and is with more than 150 employees Germany's largest fire service training institution. It offers a large variety of courses for fire officers as well as for crisis committees of local and regional administrations. The focus of the institute is the qualification of leading personnel and the training of special skills. Moreover, the institute runs three competence centres, i.e. for engine operated equipment, for digital radio and for security research.

Annex 6 – Ethical and Data Protection Issues

The letter to the CNIL can be found below.

THALES

Thales Communications & Sécurité SAS
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78141 VELIZY Cedex
France
Jean-Michel Boisnon
Tél. 01.73.32 00 49
www.thalesgroup.com

Commission Nationale Informatique et Libertés
8, rue Vienne
75012 PARIS

A l'attention de : M. G. DELCROIX & M. LIM

Velizy le, 25 août 2015

N/Réf. : TCS/PRS/SID/15/0033

Objet : Demande d'autorisation concernant une expérimentation du projet DRIVER

Madame, Monsieur,

Dans le cadre du projet européen de recherche sur la gestion de crise DRIVER (dont la description est fournie en pièce jointe Thales Communications & Security est responsable d'une expérimentation informatique intitulée « Expérimentation 41 : Ascenseur de données opérationnelles » qui se tiendra du 12 au 16 décembre 2015 au Centre Euro-méditerranéen de Simulation des Risques (CESIR) à Valabre (13). J'assure pour Thales la coordination de cette expérimentation.

Ce courrier a pour objet de solliciter auprès de la CNIL l'autorisation préalable pour ces travaux. Je vous prie de noter que la fourniture de cette autorisation est une obligation contractuelle dans le cadre de DRIVER.

L'expérimentation vise à tester les bénéfices opérationnels de nouvelles solutions informatiques concernant la chaine de commandement de gestion de crise, et notamment l'élaboration d'une situation de synthèse de la crise au niveau « haut » de commandement à partir des informations fournies par les niveaux « bas ».

Les bénéfices seront évalués en terme de productivité et de qualité de l'information produite.

Cette expérimentation durera 3 fois 1 heure et demi. Elle n'implique aucune manœuvre réelle sur le terrain (la crise – en l'occurrence un feu de forêt avec des conséquences industrielles) étant simulée sur le simulateur informatique d'entrainement du CESIR. Les solutions testées sont également toutes purement informatiques. L'expérimentation ne présente donc pas de dangerosité propre à toute situation de crise.

Cette expérimentation mettra en jeux des pompiers, et des policiers ainsi que des ingénieurs du projet DRIVER.

Le scénario étant entièrement fictif et simulé, aucune donnée personnelle réelle ne sera utilisée lors de cette expérimentation, ni concernant les utilisateurs, ni concernant d'éventuelles victimes, ou d'éventuels survivants.

THALES

L'expérimentation sera précédée d'une journée de préparation dans laquelle une déclaration de consentement informé sera délivrée aux participants, après les avoir dûment informé de la finalité de la recherche et du traitement qui sera fait des données les concernant.

Le bénéfice opérationnel apporté sera estimé (principal objectif de l'expérimentation) à partir de mesures informatiques, mais également à partir du retour des utilisateurs ayant participé à l'expérimentation (concernant la facilité d'utilisation des outils informatiques, leur intérêt…).

L'expérimentation donnera lieu à l'écriture d'un rapport d'expérimentation, décrivant la méthode suivi, le scénario et les résultats quantitatifs et qualitatifs. Les noms de personnes participant à l'expérimentation ne seront pas consignés dans ce rapport.

Thales coordonnera l'ensemble de ces travaux. Ces travaux impliqueront des partenaires de diverses nationalités européennes, et une équipe israélienne.

J'ai tenté d'utiliser votre formulaire en ligne (déclaration normale), mais il se prête assez mal à la description de notre recherche dont l'objet principal n'est pas les personnes. C'est pourquoi je vous sollicite par ce courrier.

Je vous remercie de bien vouloir accuser réception de ce courrier et nous faire connaitre votre avis ainsi que vos éventuelles recommandations.

Cordialement,

Jean-Michel Boisnon
Coordinateur de l'expérimentation 41 : Ascenseur de données opérationnelles

Thales Communications & Security SAS
SAS au capital de 163 949 805 euros – 383 470 937 RCS Nanterre
Siège social : 4, Avenue des Louvresses – 92230 Gennevilliers France

2 / 2

Modèle : 63050538 DOC TCS FR 003

This letter has been received by CNIL on the 21st of September, 2015. A copy of the receipt can be found below.

Annex 7 – Completed general questionnaire

This annex contains the raw data of the questionnaire. Both qualitative evaluations and comments to the question are reproduced here.

It shall be noted that although the questionnaire has been distributed to all evaluators and players, only two players have sent their questionnaire back (from BMPM and BSPP) and only three internal evaluators (FhG IAO, JRC, MSB) have done so. The player form BSPP participated in the operational dry run, not in the experiment itself. All other participated in the experiment.

The table below shows the rating of the assertions included in the general questionnaire.

The scale is the following:

- 1 = Not at all.
- 2 = A little bit.
- 3 = Somewhat.
- 4 = Quite a bit.
- 5 = Completely.

The “mean value all” column is based on the rating of the evaluators of all except BSPP, who only participated in the operational dry run.

The “mean value external” column is based on the rating of external evaluators only: IdF NRW, NRFS and CESS, who are not DRIVER project partners.

The Standard deviation is calculated on all except BSPP, who only in the operational dry run. A low standard deviation is a sign of consensus; a higher standard deviation is a sign of controversy.

The questionnaire enabled textual answers to the questions. These textual answers can be found on the internal Collaborative Workspace (CoW) and on request by sending an e-mail to coordination@projectdriver.eu.

Table A4: Questionnaire results

		External Evaluators			DRIVER Internal Evaluators			Players				
Nr	Question	IdF NRW	NRFS	CESS	JRC	FhG IAO	MSB	BMPM	BSPP	Mean value all	Mean value External	Std. Dev
Q1	In your opinion are the experimented solution implementing a COP approach	4	3.5	4	4	4	3	5	4	3.9	4.0	0.61
Q2	Do you think that the vertical dissemination of situation information is useful?	5	4	5	5	4	3	5	1	4.4	3.3	0.79
Q3	Do you think that the detailed tactical situation is useful to upper levels?	3	2	5	3	2	3	5	2	3.3	3.0	1.25
Q5	Do you think that sharing the same view between firefighters, policemen and municipality is useful?	4	2	5	4	4	5	1	5	3.6	3.8	1.51
Q7	Do you think that sharing the same operational picture between forces across border is useful?	4	4	4	4	3	4	5	5	4.0	4.3	0.58
Q9	Do you think the Large Event daybook is easy to use?	5	3	4	4	3	3	5	No Answer	3.9	3.7	0.90
Q10	Do you think the Life-X COP daybook	4	3	No Answe	4	4	3	5	No	3.8	4.0	0.75

		External Evaluators			DRIVER Internal Evaluators			Players				
Nr	Question	IdF NRW	NRFS	CESS	JRC	FhG IAO	MSB	BMPM	BSPP	Mean value all	Mean value External	Std. Dev
	is easy to use?			r					Answer			
Q11	Do you think that the information on the Large Event map are useful?	4	3	4	4	3	4	5	No Answer	3.9	4.0	0.69
Q12	Do you think that the information on the LIFE-X map are useful?	5	3	No Answer	4	3	No Answer	5	No Answer	4.0	4.0	1.00
Q17	Do you think that the set-up of this experimentation is well adapted to the objective?	4	5	4	5	4	4	4	4	4.3	4.0	0.49
Q19	Do you think that the simulator plays an interesting role in the experimentation?	5	5	5	3	1	5	5	4	4.1	3.8	1.57
Q20	Do you think that having professional players is important for such experimentation?	5	5	5	5	4	5	5	5	4.9	4.8	0.38
Q21	Did you learn/discover something during this experimentation?	5	3	4	4	4	4	4	No Answer	4.0	4.0	0.58
Q22	Do you think that this experimentation will benefit to the crisis management community?	4	4	4	5	4	3	No Answer	No Answer	4.0	3.5	0.63

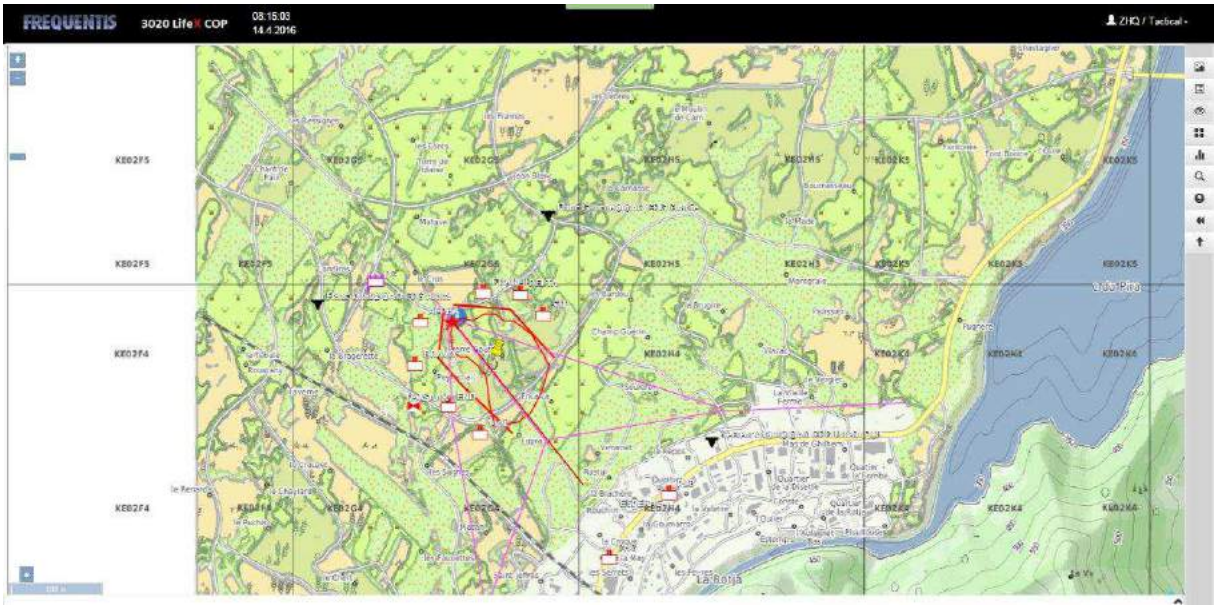
		External Evaluators			DRIVER Internal Evaluators			Players				
Nr	Question	IdF NRW	NRFS	CESS	JRC	FhG IAO	MSB	BMPM	BSPP	Mean value all	Mean value External	Std. Dev
Q24	Do you find this an interesting way forward?	5	5	5	5	4	5	4	No Answer	4.7	4.3	0.49
Q26	Would you be interested in being involved in these future experimentations?	5	5	4	5	5	4	5	No Answer	4.7	4.7	0.49

Annex 8 – Tools descriptions

This Annex contains more detailed descriptions of the tools used in EXPE41.

Life-X COP

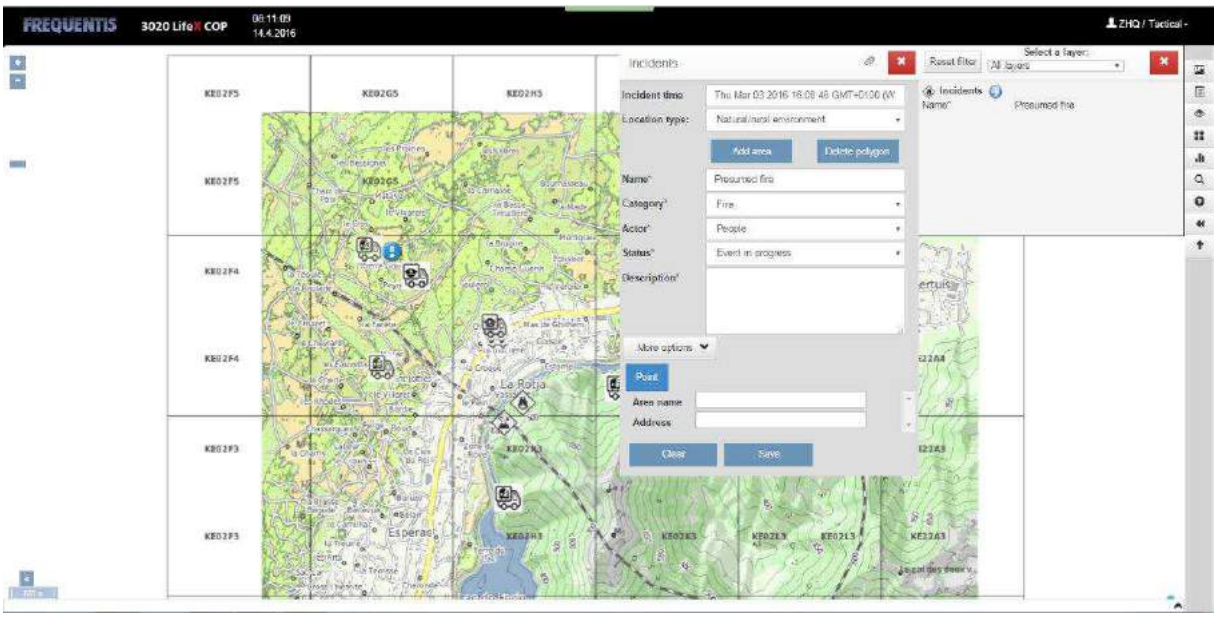
Frequentis contributed the Life-X COP prototype, a Common Operational Picture tool. It provides shared situational awareness on the tactical command level with a GIS based user interface, collection of data from various data sources and presentation of all data in selectable layers on a map.



FigureA2: Map with SITAC imported from Asphodèle

The purpose of the Common Operational Picture is to provide and present data and views for decision makers in the field, in Command and Control centres and administrative headquarters in order to support time critical decision processes and to give a near real time overview of the situation on site. It is the platform for the visualization of geographically related information in a crisis situation.

This geographical information may be continuously provided in the preparation phase (fixed infrastructure), imported ad-hoc by the administrator GUI from standard GIS formats, provided by components integrated in the system, or as input from external sources using the standard interfaces of the common information space.



FigureA3: Map with alert, resources and incidents; input panel for incident data

COP is not only a visualization system for an operational picture, but also a means of communication and sharing information, and provides a GUI for the input of geo-referenced operational data. That allows the operational users to post alerts, incidents, observations, and resources.

FigureA4: Daybook – chronological list of events and remarks recorded in COP

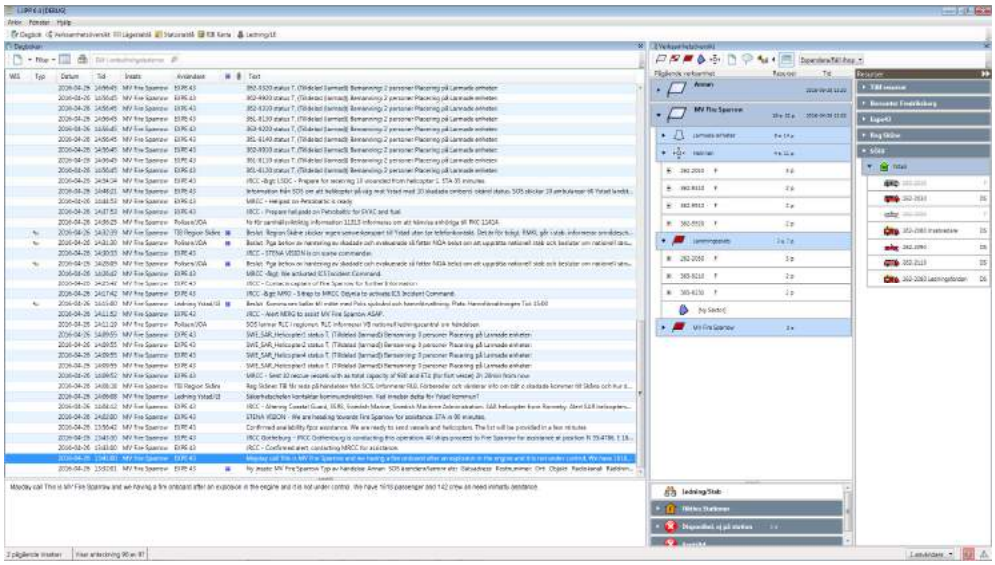
A daybook lists all modifications of data items entered in the GUI by the user or from imported data. The user may also enter text in the daybook in order to comment on the current situation, or to communicate with other Life-X COP users.

For EXPE41, Life-X COP was configured for sending and receiving CAP messages (alerts), receiving EMSI messages (situation reports and resource information), and for importing KML files (exported SITAC from ASPHODÈLE)

LUPP

MSB contributed LUPP Resource Management tool used by Swedish firefighters in their daily operations.

LUPP is an operative logging, Command and Control tool for local rescue services organisations.

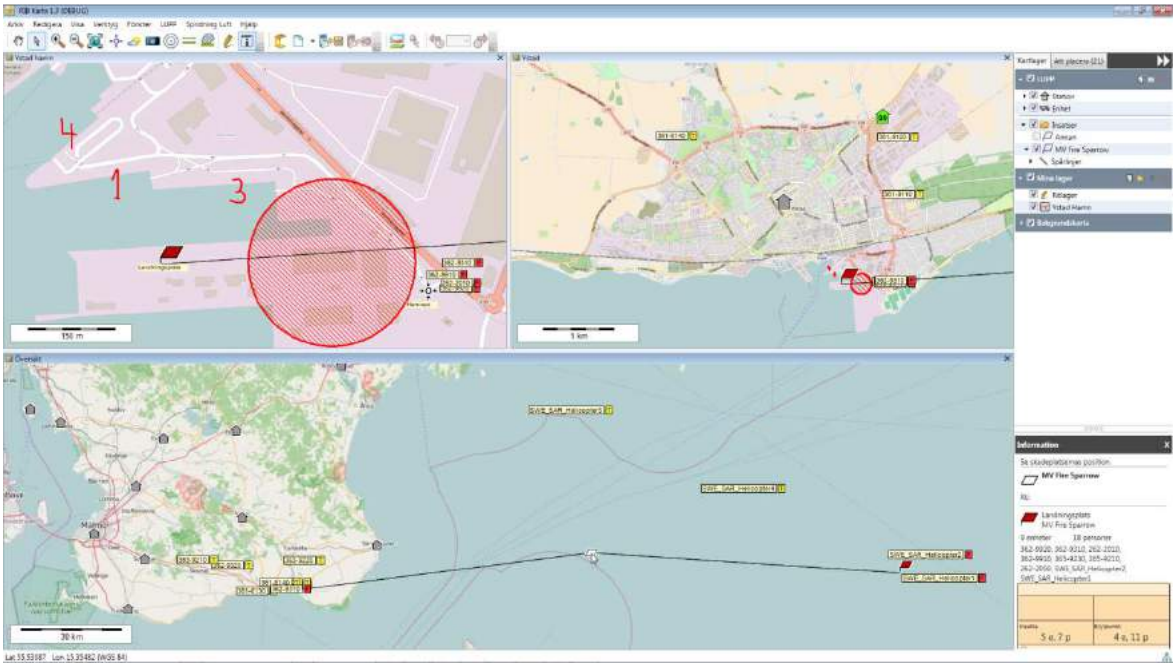


FigureA5: LUPP 's control view

LUPP is used in the response phase as an easy to use and intuitive tool for providing situation awareness and command & control.

Operational decisions, situation reports and other information are logged and can be used as documentation afterwards.

LUPP can share information with others by LUPP API



FigureA6: LUPP's map view

LUPP also provides map based operational picture with resources, incidents, units and other geographical information.

The map component can visualise data from other tools such as aerial gas dispersion "plume" calculation.

All the tools features are available for users in the field with off-line capabilities by synchronisation. This enables officers to manage the missions equally well from the field or remotely from the station.

Large Event

Thales contributed Large Event pre-production product. Large Event is specially designed for large-scale events and crisis situations.

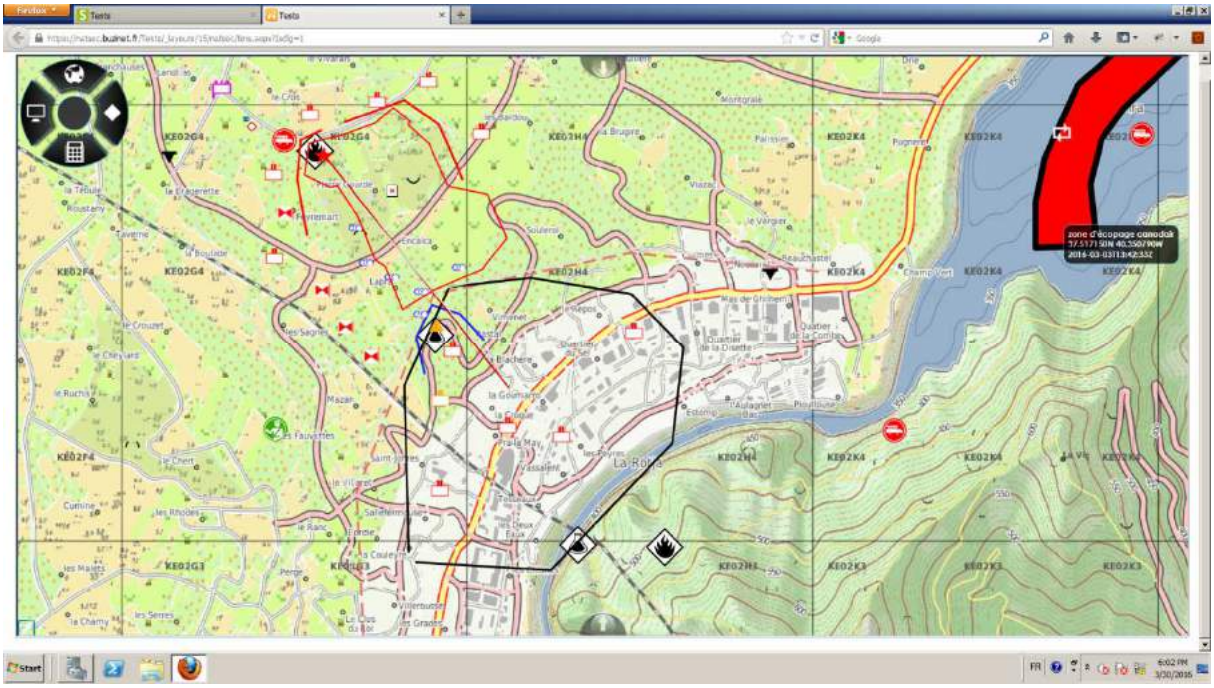
First responders, city departments and agencies, transport operators, event organisers and other stakeholders in different places can share information securely. They can organise tasks and coordinate their operations in easy-to-use collaborative workspaces.

All stakeholders have immediate access to reliable, multi-source information including action plans, secure documents and on-the-spot information from agency field staff.

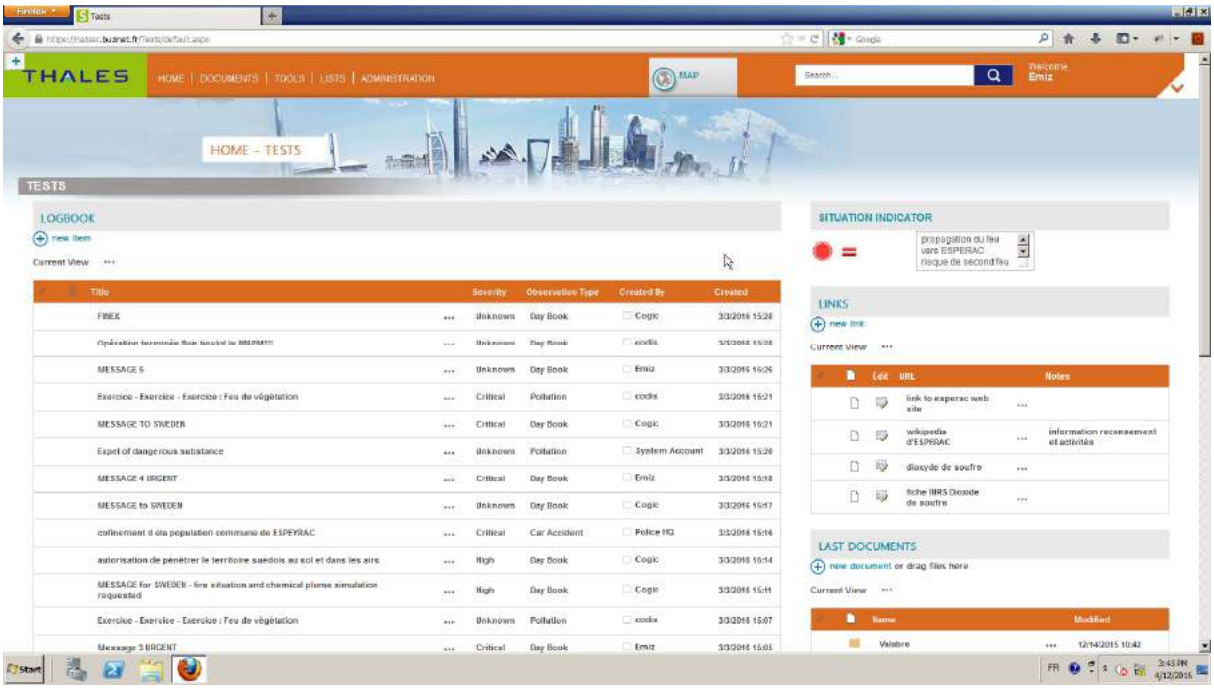
The **map display** provides a comprehensive overview of the situation.

The **daybook** entries are either recorded manually by operators or stakeholders using the Human Machine Interface or are recorded by messages received from other systems (EMSI messages from LUPP in this experiment).

Large Event figure below shows the resources (red circles icons for firefighter's trucks), the geo-localized elements of the daybook (white squares) and the data exported from Asphodèle (KML file).



FigureA7: Large Event's map view

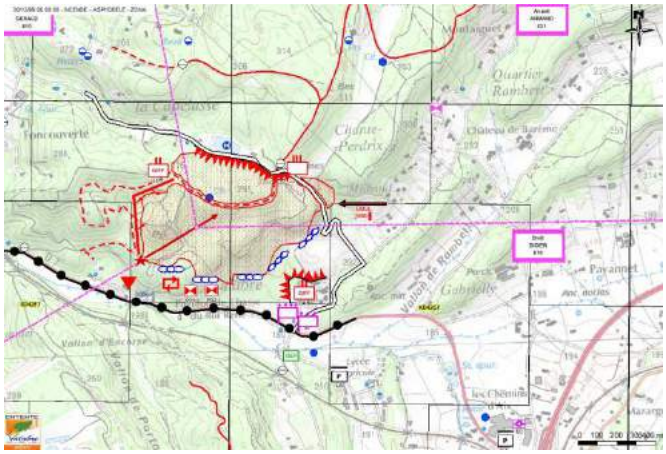


FigureA8: Large Event's daybook view

Asphodèle

Valabre contributed Asphodèle tool. Asphodèle is a software system dealing with the tactical situation creation and the means management adapted to all kind of events. It is used by the firefighters officer managing the intervention on site. The tactical situation corresponds to a specific intervention scheme on an identified geographic area. About thirty of symbols, describing the engaged means or actions are available.

Asphodèle complies with the principles of the French national operational mapping. Its main functionalities are the following: drawing a tactical situation, link it with the means table management, export/import data (e.g. fire contour), sending the tactical situation by email, create locations, measuring distances.



FigureA9: ASPHODÈLE's map view

Asphodèle functionalities can be assimilated to a graphic editor based on a GIS. Its user interface is simple: the tool bar allows the selection of the various involved means and actions undertaken or planned. This tool is used in the field command post and is operated by a dedicated officer, called intelligence officer. The tactical situation is then used by the incident commander to manage the crisis.

Crisis Wall

CrisisWall combines novel layouts for the big wall display, support for multiple interaction modes (touch-screen, surface table, iPad, space mouse, etc.) and OLAP (on-line analytical processing) techniques. The software is in essence a presentation layer exploiting to the maximum the existing information systems of the unit, but in a harmonized and integrated way: GDACS (17), EMM (18), ERCC Portal (19) and collaborative risk systems. The software also receives and displays data from various other data sources (e.g: Reliefweb (20)) and direct user input.

FigureA10: Crisis Wall earth view

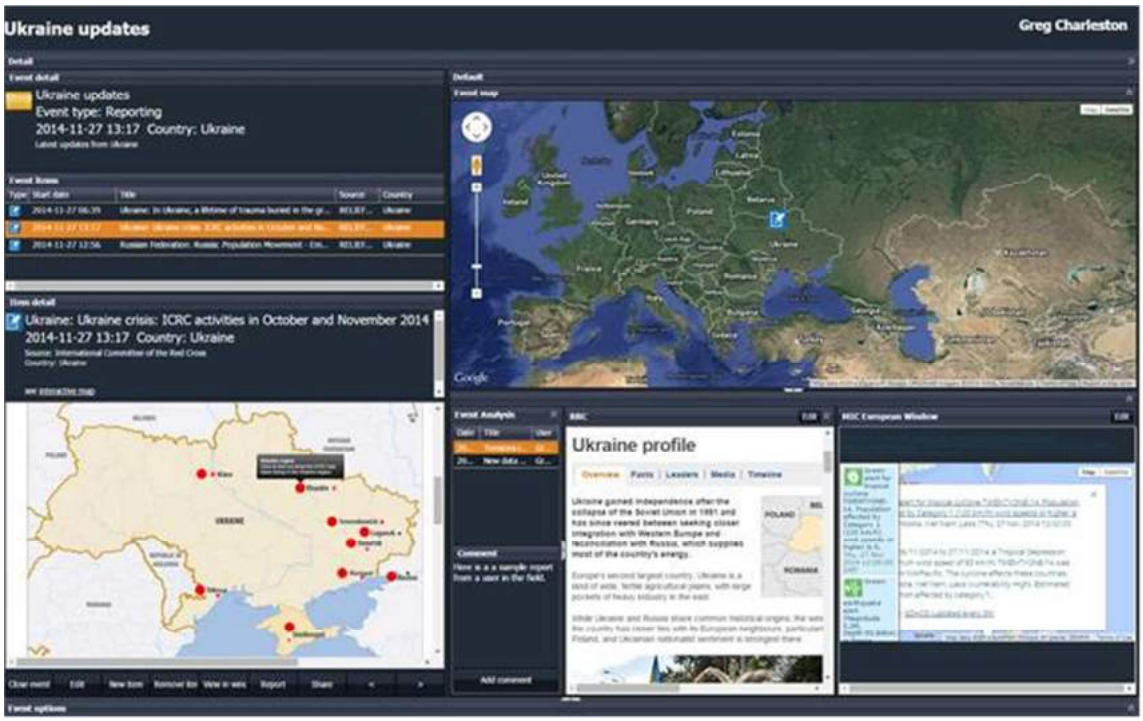
The CrisisWall addresses a particular situation of crisis management at a regional coordination hub. The European Union's crisis management policy establishes a shared responsibility between Community level (implemented by the European Commission) and national level (the Member States). The EU's role is one of coordination of response, rather than response itself. This entails sharing of information, brokering requests and offers of assistance, and developing – in collaboration with Member States – guidelines and procedures that increase efficiency and effectiveness of crisis response in the EU.

Therefore, the CrisisWall software is less about Command and Control (the traditional paradigm in crisis management) and more about Coordination and Sharing. The new paradigm is described well in the work of Wolbers and Boersma (2013), which was central in the organisation of an ECML workshop on "Situation Awareness and Incident Management" in 2014.

The key features provided by CrisisWall currently include:

- Functionality
  - Real-time data gathering
  - Sense-making: filter and search capabilities to provide a flexible Common Operational Picture (COP)
  - Event management
  - Consult COP (multi-platform)
  - Collaborative analysis, implementation of social interaction through comments
  - Varied visualizations
- Supported tasks
  - Situation assessment
  - Information management / distribution
  - Monitoring / information gathering
  - Configurable event layouts

FigureA11: Crisis Wall event view



FigureA12: Crisis Wall detailed view

Annex 9 – Agenda of EXPE41

This annex presents the agenda of EXPE41, which took place in Valabre, from March the 2nd to March the 4th, 2016.

Table A5: Agenda of March the 2nd, 2016

Time	Topic	Speaker
9:00	Welcome coffee	
9:30	Introduction / Agenda (EXPE41 partners)	Thales and All
9:45	System Set-up (including CrisisWall connection test)	Thales, Frequentis, MSB, Valabre, JRC
9:45	EXEP41 organisation: • Scenario review & players' roles • Questionnaire review • Evaluation sheet review	Thales, Valabre
13:30	Introduction / Agenda afternoon	Thales
14:00	Presentation from guests (ECOSSIAN, IdF NRW, NRFS) 20' each	ESS, NRFS, IdF NRW
15:15	Presentation of the DRIVER project	Thales
15:30	Presentation of EXPE41	Thales
16:00	Break	
16:15 – 17:30	Presentation of tools (XVR, Asphodèle, SYNERGI, LUPP, Life-X, Large Event)	Tool providers: Thales, Frequentis, Valabre, XVR, MSB
17:30	Break	
17:45 – 18:15	French Sécurité Civile organisation & CESIR tour	VALABRE

Table A6: Agenda of March the 3rd, 2016

Time	Topic	Speaker
9.00 – 9:30	Welcome coffee	
9:30	General briefing	Thales
10:00 – 10:30	Scenario	Valabre
10:45-12:15	Run 1 (SYNERGI)	
12:30 – 13:30	Lunch break	
13:30 – 15:00	Run 2 (Large Event)	

Time	Topic	Speaker
15:00 – 15:15	Break	
15:30 – 17:00	Run 3 (LIFE-X COP)	
17:15 – 18:00	Open feedback session with players and evaluators	Moderator: Thales and Valabre

Table A7: Agenda of March the 4th, 2016

Time	Topic	Speaker
9:00 – 10:30	Open feedback session with evaluators	Moderator: Thales& Valabre
10:30	End of experiment	