*Driv*ing Innovation in Crisis Management for *E*uropean *R*esilience

D43.51 - Shared situation awareness Experimentation Report

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2.0	**26/02/2015**	**Final version**	**Quality check performed on this document**

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List of Acronyms

Abbreviation / acronym	Description
ACRIMAS	Aftermath Crisis Management System-of-systems Demonstration
AIT	Austrian Institute of Technology – DRIVER Partner
C2	Command and Control
C&C	Command and Control
CM	Crisis Management
COP	Common Operational Picture
COP	C2 tool from Frequentis (Austria)
CRISYS	Critical Response In SecuritY and Safety emergencies
DOW	Description Of Work
DRIVER	Driving Innovation in Crisis Management for European Resilience
EC	European Commission
EMIZ	Etat Major Interministériel de Zone – Regional Headquarter of French Security Organisation
ESS	Emergency Support System – tool from GMV (Spain)
EU	European Union
FHG-IAO	Fraunhofer IAO – DRIVER Partner
FRQ	FREQUENTIS – DRIVER Partner
GMV	DRIVER partner
IPSC	Institute for the Protection and Security of the Citizens (Italy)
JRC	Joint Research Centre – DRIVER Partner
LE	LARGE EVENT: C2 tool from Thales (France)
ESS	C2 tool from GMV (Spain)
LUPP	Fire brigade management C2 from MSB (Sweden)
MS1	Sub-Project Experiment 2 design milestone (DRIVER)
MSB	Sweden Civil Security Organisation
SMS	Short Message Service
SOS	System of Systems
SP	Sub-Project (DRIVER)
SP4	DRIVER Sub-Project 4

TCS	**THALES COMMUNICATIONS & SECURITY – DRIVER partner**
THW	**Technisches Hilfswerk – German Civil Security Organisation – DRIVER partner**
TNO	**Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek - Netherlands Organisation for Applied Scientific Research – DRIVER Partner**
TRL	**Technology Readiness Level**
WP	**Work Package (DRIVER)**

Project Description

DRIVER evaluates solutions in three key areas: civil society resilience, responder coordination as well as training and learning.

These solutions are evaluated using the DRIVER test-bed. Besides cost-effectiveness, DRIVER also considers societal impact and related regulatory frameworks and procedures. Evaluation results will be summarised in a roadmap for innovation in crisis management and societal resilience.

Finally, looking forward beyond the lifetime of the project, the benefits of DRIVER will materialize in enhanced crisis management practices, efficiency and through the DRIVER-promoted connection of existing networks.

DRIVER Step #1: Evaluation Framework

- Developing test-bed infrastructure and methodology to test and evaluate novel solutions, during the project and beyond. It provides guidelines on how to plan and perform experiments, as well as a framework for evaluation.
- Analysing regulatory frameworks and procedures relevant for the implementation of DRIVER-tested solutions including standardisation.
- Developing methodology for fostering societal values and avoiding negative side-effects to society as a whole from crisis management and societal resilience solutions.

DRIVER Step #2: Compiling and evaluating solutions

- Strengthening crisis communication and facilitating community engagement and self-organisation.
- Evaluating solutions for professional responders with a focus on improving the coordination of the response effort.
- Benefiting professionals across borders by sharing learning solutions, lessons learned and competencies.

DRIVER Step #3: Large scale experiments and demonstration

- Execution of large-scale experiments to integrate and evaluate crisis management solutions.
- Demonstrating improvements in enhanced crisis management practices and resilience through the DRIVER experiments.

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Executive Summary

The purpose of this document is to report on the activities led by Task 43.5 Shared Situation Awareness during the first period particularly on the *Initial Inventory of Tools* and the subsequent Experiment Design.

The Situation Awareness is the perception of the elements of an event and the comprehension of their meaning. It is very important to the members of a Crisis Management team to share the understanding of the situation. This is mainly performed by the mean of a tool providing a Common Operating Picture (COP). This kind of tools provides staff members with a view of on-going events by the mean of icons and drawings on a map.

In order to be able to design an experiment related to Task 43.5 in 2015, gaps related to the Situation Awareness have been identified and objectives have been shared.

A first analysis of these tools has been made in the second half of 2014. This analysis has been performed in two steps:

- **First by collecting and analysing descriptive information on these tools: functional, operational and technical**
- **Then by holding what has been called an Initial Inventory of these tools, which was a formal evaluation of their functional features, relevance and future potential performed by evaluators on the bases of a demonstration**

The analysis of the technical and functional characteristics of these tools have led to the conclusion that LARGE EVENT, ESS and COP were eligible as Common Operational Picture Tools, with quite similar features, while LUPP was more seen as a Local Incident management tool.

As *the Initial Inventory of tools* was organized at SP4 level, it gave all SP4 partners a general view of what tools were made available by DRIVER Partners to contribute to future experiments.

The *Initial Inventory of Tools* was one step of the activities relative to the COP which will include the following steps:

- **Situational Awareness & Incident Management SAIM2014: legacy and development on SA (June 2014)**
- ***Initial Inventory of Tools*: verification of main functionalities of a number of COP tools available at DRIVER consortium partners (November 2014);**
- **Expe41: assessment of COP solution operational benefits (March 2016)**
- **JE2 SP4 preparatory experimentation : assessment of COP solutions operational benefit (2017)**

During the inventory phase, four tools provided by the DRIVER partners have been identified as being COP tools: LUPP by MSB, COP by Frequentis, LARGE EVENT by Thales and ESS by GMV.

Following *the Initial Inventory of Tools* **Task 43.5 has designed** the "Operational Data Lift" experiment **(Expe41) which aim is to assess the potential operational benefit that a Common Operational Picture based approach could bring to professional first responders in a complex operation involving diverse Crisis Management organizations.**

The scenario will be based on a forest fire with cascading effects in a cross border environment. It will be played on the Valabre simulator (French civil security) by professional first responders.

The experiment is centered on the Common Operational Picture tools and involves several Command and Control (C2) systems in its set-up (including Legacy) to play all levels of command. The experiment will compare the current reporting process with a process involving a COP tool. The comparison will be made in terms of accuracy and timeliness of information, effort required and cooperation between stakeholders.

1 Introduction

1.1 Scope

The purpose of this document is to report on activities related to the *Initial Inventory of Tools* **and more specifically activities that took place within the scope of Task 43.5 Shared Situation Awareness during the first period (before MS1) of the project.**

This Initial Inventory of Tools was necessary to build the subsequent experiments. It provided all DRIVER participants not only SP4 members with a comprehensive knowledge of all the available tools' capabilities.

The work was structured in three steps:

- **Collection of descriptive information on regarding tools: functional, operational and technical**
- **Preparation and execution of the Initial Inventory of Tools (conducted in November 2015), which was a formal evaluation of their functional features, relevance and future potential performed by evaluators on the bases of a demonstration, and analysis of its results**
- **Design of the Task 43.5 related Experiment (Expe41)**

During the *Initial Inventory of Tools* **a specific session has taken place to present all tools that are related to Task 43.5. Selected tool features have been evaluated by a group consisting of project partners from various backgrounds.**

The purpose of this methodology was not only the validation and presentation of tool related features, but also to develop ideas and concepts that enable interworking of different tools in order to contribute to the first design of a next step experiment.

The details on the design of *the Initial Inventory of Tools***, its preparation, execution and results are collected in the document [1].**

1.2 Document overview

This document contains the following chapters:

- Chapter 1 is this introduction
- Chapter 2 discusses the concept of Shared Situation Awareness
- Chapter 3 describes the COP tools involved
- Chapter 4 presents the inventory results
- Chapter 5 presents the initial experiment design of Expe41
- Chapter 6 draws conclusions on the presented results and gives recommendations for the future experiments

In the Annex can be found:

- 1: The technical characteristics of the tools
- 2: The actual evaluation sheets filled by evaluators

2 Shared Situation Awareness

This paragraph discusses the content and relevance of Task 43.5 with regards to the needs of first responders.

2.1 Task description

According to the Description of Work (DOW), Task 43.5 *Shared Situation Awareness* **is described as follows.**

This task aims at improving the situation awareness by integration of information from different agencies and various dimensions (equipment, society, health, security, transport) into a common operating picture (COP). User requirements for the preparation phase and the reaction phase will be considered with a particular focus on:

- *Shared situation awareness in the field using mobile devices*
- *Shared situation awareness between control centres*
- *Aggregation of information in order to support the tactical/strategic level*

This task addresses the need for a common understanding of the situation in order to facilitate effective collaboration and efficient use of resources.

This WP will make use of results of WP41 "Vision on 'Response 2025", WP45 "Secured **interoperability** for information exchange" and collaborates with WP36 "Organisation and **Mobilisation of Individuals and** Communities".

2.2 COP Concept

The description of Task 43.5 refers implicitly to the concept of the Common Operational Picture (COP). The COP can be described as a standardised approach to collect and summarise information and to make information immediately available for all involved parties (all levels, all Crisis Management bodies).

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

Traditionally, first responders have been working in "silos". Each body (police, fire brigade, health **services, etc.) has its own chain of command and its own situation assessment and the coordination between the various participants of a relief effort is usually done by liaison officers.**

The COP shall be seen as a win/win approach. Each first responder gives information relative to its organization and receives the global picture in return. This COP can be shared across various levels of commands and can be made available to selected participants in the case of cross border cooperation.

Working with a COP cannot be achieved only by using a COP tool. It affects also the reporting and dissemination procedures.

It was mentioned by deliverable D41.21 *Vision on response 2025* **(p27**) that "**solutions supporting** shared situation awareness are currently on their way to maturity and practical usability". Some **organisations have already adopted a COP approach, with success.**

The example of the Netherlands with the project LCMS shows that this adoption has a strong impact on the procedure and the organization and thus cannot be achieved by the simple adoption of a new tool. Moving to a COP approach is a process, which has to be managed as a major change in the organization. It requires time, communication and training.

The main challenge of the COP approach lies in the diversity of actors involved and interested in the COP. This diversity is technical (connecting various tools, not always capable of exchanging information), operational (dealing with diverse types of information, sometimes very specialized and interesting only for the specialists of a certain domain), and organisational (it is sometimes difficult to share information between organisations).

For these reason, the COP approach has to be conceived as a system approach. The exact needs depend on the technical, organizational and operational environment in which a COP approach shall be adopted.

Therefore the aim of Task 43.5 shall not be to enable end-users to choose the "right" tool, but rather **to enable them to assess the potential operational benefit of such an approach in general, and to help them define the requirements of such a systems, in their particular case.**

The experimental approach adopted by DRIVER enables to bring researchers, industry and crisis management stakeholders together to experiment with different COP tools.

The initial inventory of tools was one step of the activities relative to the COP which will include the following steps:

- **Situational Awareness & Incident Management SAIM2014: legacy and development on SA (June 2014)**
- **Initial Inventory of Tools: verification of COP tools main functionalities (November 2014)**
- **Expe41: assessment of COP solution operational benefits (March 2016)**
- **JE2 SP4 preparatory experimentation : assessment of COP solutions operational benefit (2017)**

2.3 Related operational needs

This paragraph discusses the way, various projects or stakeholders have mentioned, and validated the needs addressed by Task 43.5.

In the list of Gaps identified by ACRIMAS (cf.[4]), three topics with identified improvement needs are closely related to the concept of Common Operational Picture:

- **Understanding the relief effort as a whole,**
- **Inter-agency information sharing,**
- **Efficient ways to gather data from first responders.**

It is interesting to note that these needs have been also identified by other studies.

The CRISYS project (cf.[3]) has identified 8 main capabilities out of which two are particularly relevant to the Task 43.5:

- **Situational awareness: Collect and present relevant static and dynamic information about the incident,**
- **Adaptable Command & Decision Support: Coordinate action between various rescue organizations.**

Among the "Prioritised Domain Capabilities" identified by end**-users during the CRISYS project,** "Situational awareness tools and integration", rated as a "medium" priority need, relates also to the **capacity addressed by Task 43.5.**

This also is an axis of improvement and technological evolution identified in DRIVER's D41.21 Vision **on Response 2025 (cf. [5]) and D41.22 First stage SOTA (cf. [6]).**

Finally, an officer from France South EMIZ (Etat Major Interministériel de Zone) presented his practice to the participants during the *Initial Inventory of Tools***, and clearly expressed his need for a system that would bring situational information from lower local to higher level of commands, which** he called "operational data lift" (cf.**[1]).**

2.4 Rationale and Objectives

The "Operational Data Lift" experiment**ation (Expe41) aims at assessing the potential operational benefit that a Common Operational Picture (COP) based approach could bring to professional first responders in a complex operation involving diverse Crisis Management organizations.**

It is a discovery experimentation in the sense that it introduces new tools into a known system without any organisational change (cf [2]).

This assessment is made by comparing this COP based approach to the current practice. The focus is on the required effort, the accuracy of the produced situation and the collaboration of participants.

Detailed objectives will be defined during the detailed design of the experimentation.

3 Tools involved

The tools considered as relevant for Task 43.5 Shared Situation Awareness, i.e. addressing mainly the features of the task, are COP by Frequentis, LUPP by MSB, LARGE EVENT by Thales, and ESS by GMV.

This paragraph first presents extracts of the agenda giving a short text description of the tools, the tool provider and the tools evaluators.

After this additional descriptive information given by the tools providers and collected during the preparation phase of the Inventory present:

- **Addressed Crisis Management phases,**
- **Implemented protocols,**
- **Supported data formats.**

The tables about protocols and data formats have been used as inputs for the T42.1 *Architecture Design* **and for T45.1:** *Interoperability Standards***.**

All collected information, as well as the results from the evaluation have been used for the design of Expe41 (cf. §5 Experiment Design).

3.1 Tools text descriptions

The following tools are provided by DRIVER partners:

- **COP (Frequentis):**
  COP, developed by Frequentis, provides shared situational awareness (Common Operational Picture) with a map based user interface. It supports the collaboration of independent response units and enables information exchange for all involved stakeholders.
  It supports the integration of data from various data sources: static (e.g. maps) and dynamic data (e.g. fire front, location of first responders units)
- **LUPP (MSB):**
  LUPP is a tool suite for incident management and follow up, developed by MSB, mainly geared towards municipal rescue service organisations.
  Its main target is to provide a detailed documentation of the sequence of events before, during and after an incident. MSB provides this tool to Swedish civil protection organisations. It is used by more than 700 organisations in Sweden.
- **LARGE EVENT (Thales):**
  LARGE EVENT, developed by Thales, provides collaborative workspaces per event and shared situational awareness with a map based user interface. It provides collaborative tools to prepare for events and to capitalize afterwards. LARGE EVENT enables to manage the tactical level, the big picture and overview.
- **ESS (GMV):**

Emergency Support System (ESS) is a suite of real-time, data-centric technologies, developed by GMV which provides actionable information to crisis managers during abnormal events. This information will enable improved control and management, resulting in real-time synchronization between forces on the ground (police, rescue, fire-fighters) and out-of-field command and control centres (C&C).

Other tools have been presented during the SAIM2014 workshop (cf. [7]):

- GINA (GINA Software s.r.o.):
  The GINA is a mobile tactical GIS enabling its users to rapidly map the situation, coordinate staff in real-time, reduce management costs and make faster and better decisions. It is designed for emergency and security management and applicable for management of land and infrastructure assets.
- Dashboard Water Safety (HKV consultants):
  The Dashboard Water Safety was implemented for water boards and the Ministry of Public Works. It is HKV proprietary software and was developed together with clients under innovation subsidies. It aims at sharing and visualising information related to floods and other crises based on the netcentric principles.
  It enables to display information from various sources on floods (including Met-office forecasts, flood forecasting systems, social media).
- Jixel (IES Solutions):
  JIXEL is a Cloud based service for the Emergency sector. It allows incident management, resources management and data exchange between emergency services during day-to-day operations.
  JIXEL is designed to enhance Command and Control Room solutions used by the abovementioned entities in the following 2 aspects:
  - By providing advanced functionality aimed at making the work of the operators more efficient (Web GIS interfaces for incidents and resources management)
  - By providing an interoperable Web 2.0 environment for seamless exchange of relevant data between different emergency authorities and/or control rooms, during the joint management of an emergency situation; responding to the need for Interoperability
- CrisisWall (JRC, IPSC):
  With experience gained in human computer interaction (HCI) in several projects (including ECML experiments and developments for multitouch phones and tablets), the Global Security and Crisis Management Unit (GlobeSec) have developed a concept of dedicated software exploiting the benefits of a large video wall and supporting a clear set of situation room tasks: analysis, collaboration, and presentation.
  The concept 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: Global Disaster Alert and Coordination System (GDACS), Europe Media Monitor (EMM), Global Human Settlement Layer (GHSL), Theseus, Spatial Data Infrastructure (SDI), etc.

The following tools are provided by Entente Valabre, the platform owner:

- ASPHODELE:
  ASPHODELE is provided by Entente Valabre to French fire brigades. It is used to sketch the tactical situation of an intervention of fire-fighters. This tool is used in the site command post and in the local headquarter of the fire brigade. The position of the various fire-fighters resources and means are positioned on a map. In case of fire, the fire extension is also sketched on the map. It is shared between the site command post and the local headquarter. ASPHODELE is based on the commercial Geoconcept product family.
- SYNERGI:
  SYNERGI is a reporting tool used by the French Ministry of Interior. All fire brigades report every day the incidents managed during the day. It is composed like a daybook with at least one entry for each incident. It is also used to share information between the various entities of the French administration in case of crisis, e.g. police and fire brigades share information.

3.2 Related operational phases

Table 1 shows the operational phases that the tool providers have declared for their tools.

It can be noted that these tools target users are the professional responders (no tool is considering the citizens as a target organization).

LUPP is specifically targeting civil protection and fire brigades while the others, LARGE EVENT, COP and ESS, are general purpose tools.

This shows a different nature of these two groups of tools. Just looking at Table 1, we could deduce that LUPP shall be more considered as specialized Incident Management tool than a Common Operational Picture tool, which by nature should aim at aggregating information from many different organizations. This deduction is confirmed in the further course of this document (cf. Section 3.3)

		CM Phasis	Preparedness & Planning	Response	Recovery	All phases (generic)	Target organizations	Public health	Civil security	Law enforcement	Fire brigade	All bodies (generic)	Other	Citizens	
Name	**Provider**														
Lupp	MSB		x	x	x	x			x		x				
Large Event	TCS		x	x	x	x		x	x	x	x	x			
COP	FRQ		x	x	x	x		x	x	x	x	x			
ESS	GMV			x				x	x	x	x	x			

Table 1: Target phases and organizations

3.3 Technical characteristics

This paragraph analyses the technical information that has been collected during the preparation of the Inventory. This information is related to:

- The kind of technology, (thin client, full application),
- The formats and protocols supported.

The technology (thin client or full application) has a strong impact on the deployment of the tools. Thin client tools can be deployed easily though a web navigator with minimum requirements on the configuration of the target device. Thin client applications enable to have several distant (and not a priori know) users in parallel connected through the Internet.

Full application (or Heavy weight) tools need to be installed before usage. The installation requires a specific configuration. Full application technology is well adapted for applications of which users are known in advance, and not distributed in space.

In the COP approach several organization need to contribute to the elaboration of the Common Operational Picture. In the Thin client paradigm, this collaboration can be implemented by either or two ways:

- Organisations connect through the internet and enter directly information into the tool,
- Organisations send information in a common structured format to other participants.

In the heavy weight paradigm, this can be achieved also in two ways:

- Organisations can input directly into the tool provided that they have installed it,
- Organisations send information in a common structured format to other participants.

Table 2: Technology (thin client and heavy weight) Table 2 shows the kind of technology that is used by the tools.

Tool	Thin client	Heavy weight
LUPP		x
LARGE EVENT	x	
COP	x	
ESS	x	x

Table 2: Technology (thin client and heavy weight)

In order to assess the potential usage of each tool as COP tool, we need then to assess its technical ability to exchange structured information. This is done by analysing the format and protocols they support.

In the following, we analyse the technical information that has been collected during the preparation of the Inventory and that is related to technical interoperability:

- **Supported technical protocols,**
- **Supported data formats.**

More detailed information on protocols and formats can be found in the Annex.

Both formats and protocols are relevant to provide technical interoperability. The sum of the numbers of supported formats and protocols can be considered as an indicator of the tools' potential **for technical interoperability.**

Table 3 presents this indicator for the Task 43.5 tools.

Potential for technical interoperability					
		LUPP	LARGE EVENT	COP	ESS
Protocols	Input	0	5	3	5
	Output	0	6	4	7
Data Formats	Input	0	7	5	3
	Output	0	8	3	3
Total		0	26	15	18

Table 3: Number of formats and protocols supported by the tools

This table (which is a still picture, not taking into account the tools roadmaps) brings important information and should be put in direct relation with the level of maturity of the tools.

- **LUPP (maturity level 9) is an operational tool designed to work on its own, and is, like most legacy tools, poor in technical interoperability.**
- **COP and ESS (maturity level 6) for COP have integrated technical interoperability in their constraints, but as prototypes, they have limited their efforts to the formats and protocols used in the project they originate from.**
- **LARGE EVENT (maturity level 7) as a new generation COP tool has medium potential for technical interoperability.**

As a conclusion it can be said that LUPP has been designed to manage local first responders' staff. Yet, to be included in a COP experiment, some technical interoperability will be required.

COP, LARGE EVENT and ESS show a similar level of technical interoperability and are already eligible to play a COP role in a COP experiment.

COP and LARGE EVENT are designed to manage a COP for Shared Situation Awareness. As they are at a low maturity level, they require technical interoperability and evolutions to fit the needs of first responders' staff. They are well suited to test the Shared Situation Awareness paradigm.

4 Inventory results

This paragraph presents an analysis of the evaluation sheets filled by the evaluators.

The evaluations sheets completed by the evaluators and a statement of the tool provider can be found in the Annex.

4.1 Assigned evaluators

The evaluators assigned on a volunteer basis to each tool are the following:

Tool	Assigned reviewers
COP	TNO, FHG-IAO
LUPP	TNO, THW, JRC, FHG-IAO
LARGE EVENT	TNO, THW, JRC
ESS	TNO, MSB, AIT

Table 4: Evaluators assigned to each tool

- The selected evaluators from THW and the MSB are a responsible for the THW and MSB civil protection platform and, as such, will be in charge of the co-design and hosting of some future SP4 experiments.
- The TNO evaluator has a good knowledge of COP tools and has participated in the development by TNO of a COP tool at National Level for the Dutch Civil Protection.
- The FHG-IAO evaluator is specialist in usability.
- The JRC participant has contributed to the development of CRISIS, the ERCC situation assessment tool.
- The AIT participant is a specialist in volunteer management, and has a good knowledge in computer systems in crisis management.

4.2 Completed evaluation sheets analysis

The actual evaluation sheets can be found in the Annex.

Each tool provider had a 30 minutes time slot to perform a structured demonstration. During the demonstration, selected features listed in the evaluation sheet have been presented. Some partners preferred to dedicate their time to a more extensive demonstration of some features and did not demonstrate others. In this case, there has been no evaluation performed for this tool and feature.

Although it was requested, some tool providers did not announce explicitly all features they were demonstrating so it was left to the evaluators to "guess" if the feature had been demonstrated or

not. For this reason, there are some minor inconsistency in the results (some evaluators expressed that a feature has not been demonstrated when other did rate it).

It can be noted that evaluation sheets filled by the evaluators are poor in free text comments. This can be explained by two factors:

- **These tools are rich by nature, and time (20 minutes demonstration, 10 minutes for questions) was probably a bit short.**
- **The tools and their main functionalities are straight forward. There is not much to say at this stage. The demonstration of the specific COP aspects (with regards to a common situation assessment tool) requires some interoperability, i.e. a scenario. This will be done in the next step, during Expe41 (cf. Section 5).**

The following sections discuss the results regarding the tools' relevance, and potential for innovation.

4.3 Tools relevance

Table 5 shows a synthetic view of the relevance of the tools as assessed by evaluators.

Feature	Sub-feature	Relevance (0=none, 3=Full) ND=Not Demonstrated Dark green : Observed by evaluators Light green: declared by Tool provider but not included in the demonstration Yellow: Partially covered White: not covered			
		COP	LUPP	LARGE EVENT	ESS
Acquisition	Acquisition (manual / automatic)	3,0	3,0	3,0	ND
COP Production	Fusion / Aggregation	2,5	3,0	ND	ND
	Visualization /filtering / Querying of common operational picture	3,0	3,0	3,0	3,0
Dissemination	Dissemination (manual automatic)	3,0	3,0	3,0	ND
Equipment/ Deployment	Control centers & Field devices	2,5	2,0	3,0	3,0

Table 5: Relevance of demonstrated features

The table above indicates that the evaluated set of tools is covering the whole spectrum of the COP major features. This can be explained by the fact that the chosen features are pretty common in situation assessment systems and have been mentioned with a very thick granularity.

For this reason, this table should be seen more as a necessary than a sufficient condition for considering a tool as a COP tool.

The average relevance is 2,9 which is a pretty good score. We can conclude that the reviewers have no doubt on the relevance of the tools presented here. There is no significant difference between the tools with respect to this.

4.4 Potential for innovation

This chapter discusses the result of the evaluation regarding the "potential for innovation". Table 6 presents the evaluation of the potential for innovation estimated for each tool.

Feature	Sub-feature	COP	LUPP	LARGE EVENT	ESS
		Potential (0=none, 3=Full) ND=Not Demonstrated			
Acquisition	Acquisition (manual / automatic)	2,5	2,0	2,5	ND
COP Production	Fusion / Aggregation	2,5	2,0	ND	ND
	Visualization /filtering / Querying of common operational picture	2,5	2,0	2,5	3,0
Dissemination	Dissemination (manual/ automatic)	2,5	2,0	2,5	3,0
Equipment/Deployment	Control centres & Field devices	2,0	1,0	2,5	2,0

Table 6: Tools' future potential

The average value is 2,3, which is significantly lower than the relevance average. Our interpretation is that the process of the inventory did not enable to really assess the potential for innovation that lies in the COP approach, because it lies more in the change in the procedure, than in dramatically new functionalities. The Inventory enabled to build the next step of the experimentations leading to the joint experiments.

In other words, the assessment of the tools' future potential shall be the objective of the next step: the scenario based experiment (cf. Section 5).

If we look at details in this table we can notice contrasting values:

Value 1 given to LUPP with regards to field devices: indeed LUPP does not have specific field devices.

Value 3 to ESS field devices: evaluators have recognized the potential for interoperability in the ESS Wi-fi, SMS, multiplatform (Android & Windows) field devices.

5 Experiment Design

5.1 Introduction

This paragraph presents the experiment design activity led under Task 43.5 following *the Initial Inventory of Tools* **event in Aix-en-Provence in November 2014.**

This activity resulted in the design of Expe41: *Operational Data Lift* **which is summarized in this section. The status that is reported here is the status as of November 2015. The experiment is designed, prepared and executed in close cooperation with practitioners, industrials and research organizations. Expe41 is planned to take place in March 2016.**

The design of this experiment is based on D23.1 Experiment Design Methodology document (cf. [2]).

The experiment is conducted by Thales and hosted in Valabre with the active participation of Valabre, Thales, Frequentis, JRC, MSB as well as players and TNO.

The ESS tool by GMV which was evaluated during the Inventory of Tools of Task 43.5 will participate in other experiments.

5.2 Scenario and experiment set-up

The chosen scenario is a forest fire with cascading effects on a main road creating a chemical threat on the nearby town across the border.

The scenario will be played by professional first responders representing all levels of command. They will use the advanced Valabre simulator; first with the legacy tools (ASPHODELE, LUPP, CrisisWall) and then with innovative COP tools (Thales: LARGE EVENT; Frequentis: COP).

The experiment involves the following entities:

- **The French legacy ASPHODELE is used at field and local level,**
- **The Swedish legacy incident management tool LUPP is used at the local level on the other side of the border,**
- **The current French operational data lift SYNERGI is used between the Département Level, the Zone level and the National level,**
- **The COP tools LARGE EVENT and COP are used at all levels and are the main tools at Regional Level,**
- **The CrisisWall tool is used at the ERCC Level.**

All levels will be represented, from the field to the European level. Figure 1 depicts the set-up with the different tools and levels within Expe41.

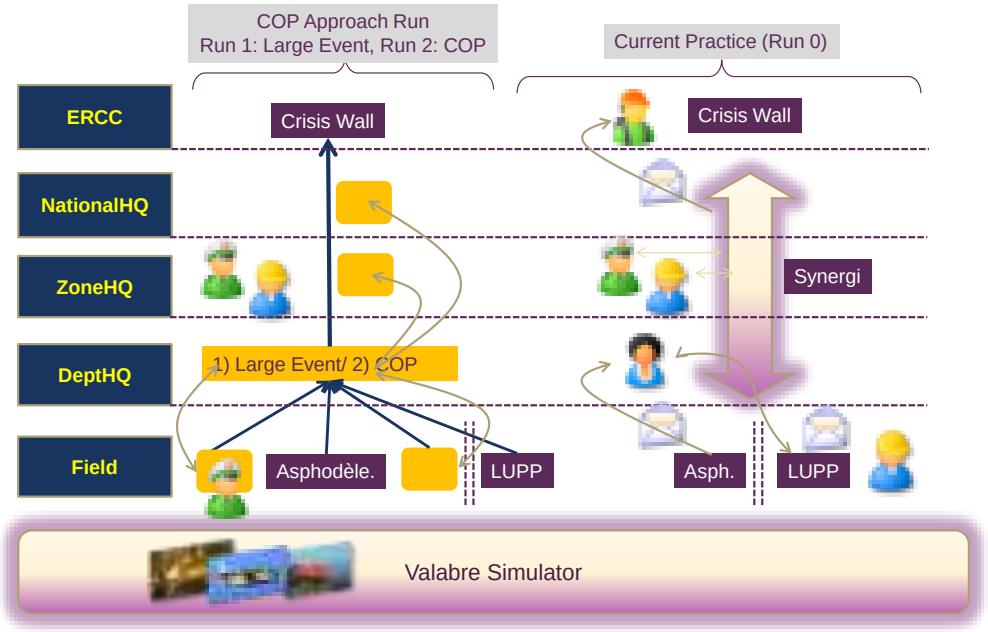

Figure 1: Experiment Set-Up

5.3 Objectives

The key objectives of this experiment are:

1) the ability to assemble the messages and reports of all participants in a COP and to share them,

2) the ability to make the comparison between the current practices and the COP process.

During the experiment, the messages exchanged by the players as well as the generated COPs will be recorded. The exploitation of these measurements will allow a detailed assessment of the speed and accuracy of the situation assessment process as well as the information workflow between the various levels of command.

Participants will provide qualitative feedback (interviews) to assess the relevance of the proposed COP approach, as well as its potential impact on operational practice.

The process and results of this experiment will be assessed by evaluators and observers, who are all experts in Crisis Management.

5.4 Expected outcomes

The final outcome will of this experiment will be:

- **Elaboration on the potential operational benefit of a COP solution,**
- **Feedback on the DRIVER experiment design methodology,**
- **Detailed discussion on potential replications of such an experiment in other contexts,**
- **Insights on the usage of the Valabre Simulator for the assessment of innovative solutions and operational procedures.**

6 Conclusion

The various COP tools presented during the SP4 initial inventory cover the whole set of features of Shared Situation Awareness (Task 43.5) listed in the evaluation sheet. The functional criterion is not sufficient to discriminate between these tools.

These tools have various levels of maturity:

- **LUPP is a legacy tool used by around 700 end-user organizations (municipalities),**
- **LARGE EVENT is used by one end-user organization,**
- **ESS and COP are currently prototypes from research programs.**

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, COP, and ESS are eligible for higher level of command Common Operational Picture,**
- **LUPP is more suitable for field or local level incident command.**

This segmentation is confirmed by the technology used by the tools. LARGE EVENT, COP and ESS are based on light weight technology, which eases their deployment and enables the connection to the tools by various organizations through the internet.

The relevance of the tools for Crisis Management in general is recognized by evaluators as high (2,9/3), but their future potential gets a lower score (2,3/3). Our interpretation is that the process of the inventory did not enable the evaluation of this potential. It would have required a scenario-based experiment where several levels of command interact with each other and where the COP tool is interconnected with other tools.

Based on these observations, partners of Task 43.51 have designed Expe41: Operational Data Lift, in close cooperation with Valabre and Pôle Risques, who are acting as platform owners.

Because the tools are quite similar, the focus of the experiment shall be put on the assessment of the potential operational benefits of a COP approach rather than on choosing the "right tool".

The benefit of the approach will be assessed by comparing a COP approach and the current practice in the French context, on a cross border scenario.

The initial inventory of tools was one step of the experiment activities relative to the COP which will include the following steps:

- **Situational Awareness & Incident Management SAIM2014: legacy and development on SA (June 2014)**
- **Initial Inventory of Tools: verification of COP tools main functionalities (Nov 2014)**
- **Expe41: assessment of COP solution operational benefits (March 2016)**
- **JE2 SP4 preparatory experimentation : assessment of COP solutions operational benefit (2017)**

References

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[5] Stolk, Dirk and Treurniet, Willem (ed.1): D41.21 Vision on Response 2025. Deliverable of the DRIVER project, [2015].

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Annex

1 Supported formats & protocols

This annex presents the technical characteristics of the tools which are related to:

- Supported formats
- Supported protocols

The overall architecture of the global DRIVER system is provided in document [8]. Most of the protocols cited hereafter are placed in the context of the DRIVER system in document [8].

Please note that this is a still picture which does not show the dynamic of the tools. The integration of these features is usually a big part of the roadmaps of such tools (or systems).

Supported Protocols	Name	LUPP	LARGE EVENT	COP	ESS
	Provider	MSB	TCS	FRQ	GMV
SOAP	Input				
	Output			x	
REST	Input				
	Output				
WebService	Input		x		x
	Output		x	x	x
SMTP	Input		x		
	Output		x	x	x
WMS	Input		x		
	Output		x		
Web socket	Input				
	Output				
http	Input				
	Output		x	x	

Supported Protocols	Name	LUPP	LARGE EVENT	COP	ESS
ftp	Input				
	Output				
file	Input				x
	Output				x
WMS	Input		x	x	x
	Output		x		x
WFS	Input			x	x
	Output				x
WPS	Input				
	Output				
SWE	Input				
	Output				
OGC	Input		x	x	x
	Output		x		x
JNDI	Input				
	Output				
ldap	Input				
	Output				
Active Directory	Input				
	Output				
JMS	Input				
	Output				
odbc	Input				
	Output				
corba	Input				
	Output				
Remote EJB	Input				

Supported Protocols	Name	LUPP	LARGE EVENT	COP	ESS
	Output				
xmpp	Input				
	Output				x
udp	Input				
	Output				
Ubicity	Input				
	Output				
ElasticSearch	Input				
	Output				
Couchbase	Input				
	Output				
Couchbase sync gateway	Input				
	Output				
TraCI/Protocol	Input				
	Output				
sms	Input				
	Output				
cti	Input				
	Output				
tts	Input				

Table 7: Protocol supported by the tools

Table 8 shows the technical formats (input and output) supported by the tools.

Supported Formats	Name	Lupp	LARGE EVENT	COP	ESS
	Provider	MSB	TCS	FRQ	GMV
EDXL	Input		x	x	
	Output		x	x	
CAP	Input		x	x	
	Output		x	x	
SensorML	Input			x	
	Output				
SOS	Input			x	
	Output				
SAS	Input				
	Output				
KML/KMZ	Input		x	x	x
	Output		x		x
Geotiff	Input				
	Output				
Shape	Input		x		
	Output		x		
GML	Input				
	Output				
Stanag 4586	Input				
	Output				
FEWS-PI	Input				
	Output				
Fliwas	Input				
	Output				
Edifact	Input				
	Output				
XML	Input		x		x
	Output		x		x
CSV	Input				x
	Output				x
XLS	Input				
	Output				
JSON	Input				
	Output				

Supported Formats	Name	Lupp	LARGE EVENT	COP	ESS
	Provider	MSB	TCS	FRQ	GMV
GeoJSON	Input		x		
	Output		x		
database	Input				
	Output				
CMIS	Input				
	Output				
XACML	Input				
	Output				
SAML2	Input				
	Output				
CSTA-III	Input				
	Output				
html	Input		x		
	Output		x	x	
rss	Input				
	Output			x	
PDF	Input				
	Output				x
JPEG/GIF/PNG	Input				
	Output		x		
Plain text	Input				
	Output				
doc	Input				
	Output				
Water related format	Input				
	Output				
Twitter	Input				
	Output				
Proprietary	Input				

Table 8: Data formats supported by the tools

2 Completed Evaluation sheets

2.1 Evaluation sheet structure

The purpose of the evaluation sheet is to support and structure the evaluation. It contains:

- **Descriptive information (main features – functional or non-functional) which might be expected from a COP tool.**
- **A description of the specific implementation that is made of these functions by each tool,**
- **Empty columns left for the evaluators to assess the following aspects in accordance with their observations:**
  - **Availability of functions,**
  - **Relevance,**
  - **Maturity,**
  - **Suggested improvements,**
  - **Evaluated potential.**

The grid structure has been established cooperatively at SP4 and WP43, 44, 45 level.

Features relevant for Task 43.5 have been selected collectively by Task 43.5 partners.

The evaluation sheet structure for the Task 43.5: Shared Situation Awareness is described in Table 9.

			Written by tools providers	Written by evaluators in relation to the tool				
Task	Feature	Sub-feature	Tool specific implementation	Feature availability (Yes, No, Partly)	Feature relevance (0=None, 3= Fully)	Feature Maturity (1= Basic, 9 proven)	Suggested improveents (+ free text)	Future potential of the feature 0=not at all- 3=fully(+free text)
Task 43.5 Shared Situation Awareness	Acquisition	Acquisition (manual/Automatic)	< description per tool >					
	COP Production	Fusion / Aggregation						
		Visualization /filtering / Querying of common operational picture						
	Dissemination	Dissemination (manual automatic)						
	Equipment/ Deployment	Control Centers						
		Field Devices						

Table 9: Evaluation sheet for Task 43.5

2.2 Tools evaluation

2.2.1 COP

2.2.1.1 General remarks

COP	TNO	FHG-IAO	Evaluator 3
Overall impression	OK overall (certainly from technical point of view)	good tool, which helps to get an solid COP	
Usability	2 remarks: End-user involvement and expertize required. Also instructions on how to use it in optimal way. Procedures, etc. Some extension with major critical infra. E.g. critical objects (electricity, telecom,) would be worthwile.	2	
Position within the DRIVER System of Systems	Useful for COP. I wonder how it works in a real big incident. How to manage all data.	Empty	

Table 10: General remarks on COP

2.2.1.2 Explicit feedback tables

Feature	Sub-feature	COP	relevance	maturity	potential	Suggested improvements / comments			
						TNO	FHG-IAO		
Acquisition	Acquisition (manual / automatic)	Observations, Resources, Incidents can be edited manually. Alerts (CAP messages) and Resource info (EDXL RM messages) are exchanged automatically with connected systems.	3	6	2-3				
COP Production	Fusion / Agregation	Several observations, alerts and resource needs can be aggregated to one incident - all details can be visualized within the Incident.	2-3	6	2-3				
	Visualization /filtering / Querying of common operational picture	The user can insert various information layers as map overlays. In list views, he can filter the items by various criteria (attributes and free text) and directly link to the item in the map.	3	6	2-3				

Dissemination	Dissemination (manual automatic)/	All information held in the system is immediately available for all users; automatic refresh of info layers. Basic reporting function for storing/ distribution of snapshots	3	6	2-3				
Equipment/Deployment	Control centers	Web GUI (HTML5), running in the browser (Chrome), for tactical and operational users	2-3	6	2	Not able to measure the feature maturity.			
	Field devices	Native Android tablet client for operational users							

Table 11: Feedback on COP

2.2.1.3 Statement of the tool provider

Dependency on the Web:

Supplementary to the installation in the cloud (access via internet), there is a physical server installation in a mobile rack that can easily be moved to the disaster site and enables working in a local LAN/WLAN. The tablet clients are offline-capable and can be synchronized when connectivity is available.

End-user involvement:

COP was largely developed and tested within the FP7 project IDIRA, with a close feedback loop with various end-users (Red Cross, Italian and Greek Fire Brigades, civil protection authorities, military …).

Layers are realized as plug-ins that easily can be amended, and ad-hoc layers can be included even during operations. Taxonomy and icons are subject to configuration, and can be adapted per user organisation differently in one deployed system.

Further development:

Frequentis is going to further develop the COP in own responsibility. It is separated from other IDIRA components and dependencies from the IDIRA partners will be resolved. COP will be integrated in the DRIVER SoS architecture and so provide interoperability with the other systems of DRIVER.

The features and usability will be continuously improved according to the results of DRIVER experiments and other inputs. Results from other research projects and customer requirements will be included.

2.2.2 LUPP

2.2.2.1 General remarks

LUPP	JRC	FHG-IAO	Evaluator 3
Overall impression	The tool looks mature an established, though no live demo was performed. Its limitation to local use is not clear: it should integrate easily with large scale systems.	useful tool with high maturity	
Usability	Empty	3	
Position within the DRIVER System of Systems	Empty	Empty	

Table 12: General remarks on LUPP

2.2.2.2 Explicit feedback tables

Feature	Sub-feature	LUPP	relevance	maturity	potential	Suggested improvements / comments			
						JRC	TNO	FHG-IAO	THW
Acquisition	Acquisition (manual / automatic)	Decisions and situation reports are manually logged and documented. Alarms (request to initiate response operation) are imported automatically from alarm central. Vehicle positions collected from networked clients' GPS sensor and positions collected from the organisations' own TETRA terminals are displayed on map.	3	9	2		Consider that national or neighbouring region can watch at your region's accidents. They can prepare themselves in serious case (trust them!)		Very useful to see where your units are on the map. But requires connection to Tetra.

Feature	Sub-feature	LUPP	relevance	maturity	potential	Suggested improvements / comments			
						JRC	TNO	FHG-IAO	THW
		Geo data entered manually, shared within the network for the response operation. *Connection to TETRA requires custom integration. This integration can be used by Driver in Swedish locations.							
COP Production	Fusion / Agregation	It is possible to aggregate geographical information and dispersion calculations from severeal different users to one incident.	3	9	2				Which information is accurate/ Trustworthy? Where does the geographical wheather info

Feature	Sub-feature	LUPP	relevance	maturity	potential	Suggested improvements / comments			
						JRC	TNO	FHG-IAO	THW
									come from?
	Visualization /filtering / Querying of common operational picture	The user can filter the list view in several different ways (attributes and free text). It is also possible to filter the geographical information in the map in different ways.	3	9	2				Which added info is relevant? Can one user overwrite the info added by another user?
Dissemination	Dissemination (manual automatic)/	Several different users can connect to the same database and collaborate by reading and adding information. Automatic refresh of	3	9	2				Cost? Open source ? Platform interoperability ?

Feature	Sub-feature	LUPP	relevance	maturity	potential	Suggested improvements / comments			
						JRC	TNO	FHG-IAO	THW
		geographical information. Possible to export and share snapshots of map view. The tool can disseminate information to a national tool, WIS, for inter-agency information sharing. Dissemination is performed via LUPP:s API.							
Equipment/Deployment	Control centers	Windows application.	2	9	1	Is it mono compatible? Which version of .Net FW was used?			

Feature	Sub-feature	LUPP	relevance	maturity	potential	Suggested improvements / comments			
						JRC	TNO	FHG-IAO	THW
	Field devices	Windows application All units have database synchronisation to enable field units to operate independently if Internet connection is lost.							

Table 13: Feedback on LUPP

2.2.2.3 Statement of the tool provider

The information is provided by security and safety staff. It therefore is supposed to be accurate.

LUPP is designed and developed by MSB. It is not an open source project. It is currently used by about 700 organizations mostly in Sweden.

The interoperability with other tools is ensured by a set of APIs.

2.2.3 LARGE EVENT

2.2.3.1 General remarks

LE	TNO	THW	JRC
Overall impression	It can be of help for higher crisis management level but more testing with end-users is definitively required	Not really a new idea. Similar systems are already being used by the UN.	Much matured from previous demo in Ispra. It is very web dependent.
Usability	2 More integration with end-users is required. Link with what they really need for response and collaboration is weak.	Empty	2
Position within the DRIVER System of Systems	Use for higher level crisis management (Strategic / Tactical)	Empty	Empty

Table 14: General remarks on LARGE EVENT

2.2.3.2 Explicit feedback tables

Feature	Sub-feature	LARGE EVENT	relevance	Maturity	potential	Suggested improvements / comments			
						THW	TNO	JRC	
Acquisition	Acquisition (manual / automatic)	Observations, Resources, Incidents can be edited manually. Alerts (CAP messages) are exchanged automatically with connected systems. Geographic data from other systems can be shared via kml files or WMS link.	3	7	2-3	What are your sources ? How reliable are they ? Cost ?			
COP Production	Visualization /filtering / Querying of common	The user can insert various information layers as map overlays. In list views, he can	3	7	2-3				

Feature	Sub-feature	LARGE EVENT	relevance	Maturity	potential	Suggested improvements / comments			
						THW	TNO	JRC	
	operational picture	filter the items by various criteria.							
Dissemination	Dissemination (manual automatic)/	All information hold in the system is immediately available for all users (including tablet) according to rights and tool capacity; automatic refresh of info layers. Basic reporting function for storing/ distribution of snapshots	3	7	2-3	which user has which rights ? Who decides ? Hierarchical issues?			

Feature	Sub-feature	LARGE EVENT	relevance	Maturity	potential	Suggested improvements / comments			
						THW	TNO	JRC	
Equipment/Deployment	Control centers	Web GUI, running in the browser (Firefox), for tactical and operational users	3	7	2-3	interoperability ?		Internet explorer is the reference browser for the best part of the Commission, keep in mind.	
	Field devices	native Android tablet client for tactical and operational users							

Table 15: Feedback on LARGE EVENT

2.2.3.3 Statement of the tool provider

LARGE EVENT is used by staff of civil safety organizations and not by citizens. The information added is therefore supposed to be trustworthy. It can be interfaced with tools and apps provided to citizens in order to exchange information. But this information is not directly sent to LARGE EVENT. It needs to be moderated beforehand.

The access to the data stored in the LARGE EVENT system is managed by a role based schema. Each user in the system has a role per collaborative project she/he is working on. These rights are managed by the administrator of the system.

The interoperability is reached by a set of interfaces to other systems.

LARGE EVENT is web based and it can be accessed by Firefox or Internet Explorer.

2.2.4 ESS

2.2.4.1 General remarks

ESS	AIT-1	AIT-2	TNO
Overall impression	This tool appears to be well done and my impression is that it's either already at the "operative" level or pretty near to being operative. Main functionalities it offers are in my opinion: - middleware for gathering and sharing of information from various sources. - mass-informing functionality through several channels. Most interesting appears to be a feature which allows sending of SMSs to everyone in an area even if the network is down. - modelling sub-system which can be used to assess and predict the risk development for certain types of events (e.g. fire)	Appears to be a very mature tool with a lot of possible use cases in CDM and in the environmental domain.	Technical promising. Non technical part should be improved. E.g. How to deal with N (N>100) messages.

ESS	AIT-1	AIT-2	TNO
Usability	3	3 Is it only for COP during the crises or also in all other phases?	2.5
Position within the DRIVER System of Systems	In my opinion, the tool could be used as a part of the complete crisis management support infrastructure and provide one or more of the three main functions listed above. From AIT point of view (CrowdTasker), incorporating a map of danger areas resulting from model runs in local situation shown to volunteers would be nice. Also the possibilitiy to send some tasks to "everyone" - even in situation when the network is down sounds interesting.	Could be used as a general crisis management supporting tool in DRIVER or as middleware to combine input from other tools. Depending on the use cases, this coul be e.g. social media monitoring or crowdtasking.	relation with SP3 (w.r.c. communication with citizens)

Table 16: General remarks on ESS

2.2.4.2 Explicit feedback tables

Feature	Sub-feature	ESS	relevance	maturity	potential	Suggested improvements / comments			
						MSB	AIT	TNO	
COP Production	Visualization /filtering / Querying of common operational picture	COP can be setup in the ESS interface, stored and shared with other EM	3	6	3		Not demonstrated ?	Not shown	
Dissemination	Dissemination (manual automatic)/	COP can be shared with other ESS users		6	3		Not demonstrated ?		
Equipment/Deployment	Control centers	ESS is a portable and deployable emergency response system including a portable C3I, resilient communication	3	6	2	deployable server, incl wifi etc. android windows voice message, sms nice easily understood interface for users choice of custom or	Not demonstrated ?		

Feature	Sub-feature	ESS	relevance	maturity	potential	Suggested improvements / comments			
						MSB	AIT	TNO	
		system and on-field deployable sensors				template messages			
	Field devices	Multiple field devices were used in the project, including: UAV, UGV, Balloons, and ruggedized On-Board Units that can connect to a host of sensors and vehicles							

Table 17: Feedback on ESS

2.2.4.3 Statement of the tool provider

No comment provided by the tool provider.