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# Situational Awareness & Incident Management SAIM2014


## 5th JRC ECML Crisis Management Technology Workshop

Editors:
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**Abstract**
The 5th JRC ECML Crisis Management Technology Workshop on Software and data formats used in Crisis Management Rooms and Situation Monitoring Centres for information collection and display, organised by the European Commission Joint Research Centre in collaboration with the DRIVER Consortium Partners, took place in the European Crisis Management Laboratory (ECML) of the JRC in Ispra, Italy, from 16 to 18 June 2014. 32 participants from stakeholders in civil protection, academia, and industry attended the workshop.

The workshop's purpose was to present, demonstrate, and explore IT solutions for Situation Awareness and Incident Management and the related design considerations, applied within the context of humanitarian aid and civil protection.

During the first day the demonstrators set up in the JRC environment. A week before they were provided the contents to be processed.

The second day was devoted to the presentations including:

- Beyond the Myth of Control: toward the Trading Zone by Kees Boersma & Jeroen Wolbers, Department of Organization Sciences, VU University of Amsterdam
- The organizers' descriptions, the JRC and the DRIVER project
- The software to be demonstrated on day three
- Data exchange Challenges (From computer-readable data to meaningful information) by Christian Flachberger, FREQUENTIS AG


**European Commission**
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**Global Security and Crisis Management Unit**


**DRiving InnoVation in crisis management for European Resilience**

# Situational Awareness &

# Incident Management - SAIM2014

## 5th JRC ECML Crisis Management Technology Workshop on Situation mapping and incident management ICT technologies in crisis management

**16-18 June 2014**
**Ispra, Italy**

**Organised conjointly by:**
**European Commission Joint Research Centre &**
**DRIVER Consortium Partners**

Editors:

Daniele A. Galliano,

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# 1 Introduction

In 2001, the EU Civil Protection Mechanism was established, fostering cooperation among national civil protection authorities across Europe. The Mechanism currently includes 31 countries: all 28 EU Member States in addition to Iceland, Norway, and the former Yugoslav Republic of Macedonia (the latter currently renewing its membership). The Mechanism was set up to enable coordinated assistance from the participating states to victims of natural and man-made disasters in Europe and elsewhere.

The operational hub of the Mechanism is the Emergency Response Coordination Centre (ERCC) which monitors emergencies around the globe 24/7, and coordinates the response of the participating countries in case of a crisis. Thanks to its pre-positioned and self-sufficient civil protection modules, the ERCC teams are ready to intervene at short notice both within and outside the EU. They undertake specialized tasks such as search and rescue, aerial forest fire fighting, advanced medical posts and more.

The European Commission supports and complements the prevention and preparedness efforts of participating states, focusing on areas where a joint European approach is more effective than separate national actions. These include improving the quality of and accessibility to disaster information, encouraging research to promote disaster resilience, and reinforcing early warning tools.

In the frame of the Civil Protection mechanism as described above, the JRC performs investigations on the technologies that can be applied to the crisis management, their suitability and their technological maturity level. Where a technology can get operational, the JRC will provide its knowledge to assist doing it.

Situation awareness and incident management tools are needed to create the information flow from first responders to decision makers and vice versa, and to coordinate actions to be undertaken at European level or in actions across member states borders.

Being the genesis of the civil protection a bottom-up process, the challenge is the creation of a common, or at least shared, discipline leading the EU member states to collaborate in such a demanding task like the safety of the citizens. The harmonization of the mechanisms developed at country or regional level can be fostered by the adoption of common or at least interoperable technological solutions.

The Civil Protection mechanism is presently leaving its initial cultural background shared with military operations for a collaboration mechanism where it is requested to agree on the exchange of the information and the effort sharing.

The technology (mainly ICT) is now requested to provide the means to share the knowledge in this trading zone. DRIVER project aims at determining how to build a system of systems able to provide to the member state organs devoted to Civil Protection with the necessary technological means.

While universities and research centres are studying new approaches and developing not only prototypes but also mature solutions, in the scope of Horizon 2020 and the present Seventh Framework Program the European Commission is financing a large number of projects, because at the moment the software available is still not covering all the technological gaps as found by ACRIMAS project.

The market on the other end is adapting to the new principles, but slowly, asking for more information to the end-users and to the research.

ECML workshops are meant to bring these three actors together, in order to let them share a common background based on their different perspectives and experiences. The intended outcome is the identification of the next steps to enable the development of new solutions.

# 2 Executive Summary

The 5th JRC ECML Crisis Management Technology Workshop on Software and data formats used in Crisis Management Rooms and Situation Monitoring Centres for information collection and display, organised by the European Commission Joint Research Centre in collaboration with the DRIVER Consortium Partners, took place in the European Crisis Management Laboratory (ECML) of the JRC in Ispra, Italy, from 16 to 18 June 2014. 32 participants from stakeholders in civil protection, academia, and industry attended the workshop (see Table 1).

| Organisation / Company | Member State / European Commission |
|---|---|
| European Community Humanitarian Office (DG ECHO): Monitoring and Information Centre (MIC) / Emergency Response Centre (ERC) | EC |
| Pole Risques | FR |
| Swedish Civil Contingencies Agency (MSB) | SE |
| Frontex: Frontex Situation Centre (FSC) | EC |
| Danish Emergency Management Agency (DEMA): National Operation Centres | DK |
| National Crisis Centre of the Netherlands | NL |
| Ministery of Security and Justice | NL |
| Joint Research Centre, Global Security and Crisis Management Unit | EC |
| MAGEN DAVID ADOM | IL |
| Institute for Physical Security (IFV) | NL |
| | |
| VU University Amsterdam | NL |
| Swedish Defence Research Agency | SE |
| Chalmers University of Technology | SE |
| Netherlands Organization for Applied Scientific Research TNO | NL |
| | |
| iTTi | PL |
| Frequentis | AT |
| Thales Communications & Security | FR |
| GINA Software | CZ |
| IES Solutions | IT |
| HKV Consultants | NL |
| Atos Spain | ES |
| Fraunhofer INT | DE |

**Table 1: List of participants.**

The workshop's purpose was to present, demonstrate, and explore IT solutions for Situation Awareness and Incident Management and the related design considerations, applied within the context of humanitarian aid and civil protection.

During the first day the demonstrators set up in the JRC environment. A week before they were provided the contents to be processed.

The second day was devoted to the presentations including:

- Beyond the Myth of Control: toward the Trading Zone by Kees Boersma & Jeroen Wolbers, Department of Organization Sciences, VU University of Amsterdam
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On day three, the software was demonstrated using a set of communication messages in standard formats about a fictive earthquake that happened nearby.

The first set of messages reported simply that an earthquake occurred and were provided as a CAP file and a GeoRSS file.

Then two messages reported the activity of two different teams deployed in the field. The used formats were EDXL-SitRep and GeoRSS.

The capability to handle victims of three nearby hospitals was then reported both in EDXL-HAVE and in KML format.

At last, a paper report about a landslide was handed out to the demonstrators.

At every step, the demonstration was paused to allow the demonstrators to explain the behaviour of the different implementations and to allow a short Q&A session.

The following applications were presented at the workshop:

- **GINA.**
  Zbynek Poulicek, GINA software, CZ
- **Dashboard Water Safety.**
  Cor-Jan Vermeulen, HKV Consulting, NL
- **Jixel.**
  Uberto Delprato, IES Solutions, IT
- **Large event.**
  Bruno Quere, Thales, FR
- **The CrisisWall application.**
  Greg Charleston, European Commission Joint Research Centre, IT

## 2.1 Status-Quo and Further Development Needs

The demonstrations proved that the systems have different levels of maturity and are not ready to encompass all the activities of a crisis management centre. None of the systems is able, at the moment, to handle all the most common data formats used to exchange information. On the other hand, some data formats still lack some functionality necessary for their intrinsic reliability. Where the document flow is not traced or it is not possible to assign the message authority in a not repudiable way, the format is still not mature.

Further standardization should lead to a recognizable yet user-oriented visualization. Where the same semantic can be brought to the end user in the right context, being it linguistic or cultural in a wider sense, thanks to the chosen data format, it will allow a better interaction between all the people involved.

Given one-week preparation time, the systems were not completely able to integrate the information sources, thus implying that on-the-fly connections amongst situation awareness centres or with scientific and technical centres are not easily feasible at the moment.

The experiment also led to interesting conclusions about conducting experiments and many refinements were suggested. It has to be highlighted though that it was a demonstration of the experimentation approach, since a thorough examination of such complex systems would require several weeks and an appropriate and quantitative evaluation grid. Allowing the present systems to be proposed to end-user was the main goal of the workshop, while the evaluation experiments are an ongoing activity that will continue in the next years.

# 3 Beyond the Myth of Control: toward the Trading Zone

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## 3.1 Introduction

Starting from their previous work, Beyond the Myth of Control: toward network switching in disaster management (2), where the contribution of new technologies allows population to be a more effective participant in crisis management, the authors present the result of The Common Operational Picture as Collective Sensemaking, Journal of Contingencies and Crisis Management. The concept of Trading Zone is then introduced as the semantic centre of the management process, where the different perceptions of the situation are aggregated, the information translated to meet the understanding of each actor.

## 3.2 The Myth of Control

The international disaster management literature has questioned the reliability and legitimation of formalized response organizations (Comfort, 2007, 5). Response organizations typically organize their efforts in terms of the '3-C' emergency governance model. The assumption is that disasters cause 'Chaos', which can be put under 'Control', by a strict 'Command' structure (Quarantelli and Dynes, 1977, 20). This control model has proven to be unrealistic decades ago (Dynes, 1994, 8; Quarantelli, 1997, 19). Disaster sociology vividly describes how governments tend to resort to means of control for protecting the established social structures and to restore public order (Quarantelli and Dynes, 1977, 19; Tierney, et al. 2006, 24). The paradoxical result is that the resilience of communities during disasters tends to be hampered, rather than supported by government responses, due to their quest for control (Solnit, 2010, 22).

Research on emergency response shows that control and centralization is unrelated or even destructive to actual response capacity (Moynihan 2009, 17). Moreover, Tierney et al. (2006, 24) show that engaging in a militaristic command style of disaster response can literally have lethal consequences; for instance, citizens affected by Hurricane Katrina were symbolically regarded as the enemy that needed to be defeated, instead of victims that needed help (Curtis, 2008, 6). This astonishing notion is well-illustrated by the title of a salient National Guard article, describing the military response to Katrina as: 'Troops begin combat operations' (Chenelly, 2005, 4; Tierney, et al., 2006, 24).

## 3.3 Doctrines

An alternative 'C3' model can be proposed, which comprises networked responses that include communities, instead of top-down, bureaucratic organizing. This alternative model is based on a 'continuation' of societal and institutional structures after a disaster occurs, despite the severe pressure on these structures. In order to deal with the disaster effects, responses must be 'coordinated' by different stakeholders, in 'cooperation' with citizens (Dynes, 1994,8; Helsloot and Ruitenberg, 2004, 10). This means stronger bottom-up involvement, local ownership, and participation (Telford and Cosgrave, 2007, 23). Yet, how to best incorporate citizen participation and other stakeholders into a coordinated form of emergency response is still an open research and management issue (Majchrzak & More, 2010, 14).

Recent discussions in disaster management indicate that merely confronting command and control (Quarantelli & Dynes, 1977, 20) with coordination and cooperation approaches (Dynes, 1994, 8) is too limited (Moynihan, 2008, 16).

Namely, both approaches have virtues and limitations. The command and control paradigm is known for its hierarchical decision capacities and clear role structures, and is a powerful instrument for accomplishing tasks characterized by repetition and uniformity. Yet, it insufficiently accounts for the decentralization and flexibility that are required during turbulent response operations, and increasingly so for the incorporation of Web2.0, citizen-based information streams. A virtue of the coordination and cooperation approach is its decentralized flexibility, but it underestimates the consequences of slow consensus building in a turbulent environment where fast decisions are necessary to organize coherent and sustainable response operations (Moynihan, 2009, 17).

Overall, despite its recognized limitations, the traditional 3-C governance model still dominates the disaster management agenda, partly because it is difficult to yield control (Tierney et al., 2006, 24), and partly because the consequences of citizen participation and Web2.0 platforms remain unexplored (Roberts, 2011, 21). Therefore, it is relevant to consider an alternative, net-centric framework that is more comprehensive and less hierarchical.

## 3.4 Trading Zone: Negotiation

The Common Operational Picture (COP) is considered as one of the most promising solutions in emergency management to improve the quality of information sharing and to support the development of situational awareness (Comfort, 2007, 5). The COP is often manifested as a geographical representation combined with a checklist that describes the characteristics of the response operation. Despite its common use in emergency management, a univocal definition of the COP lacks both in the field and in the literature.

The actors' different institutional backgrounds and the time criticality show that information sharing cannot be reduced to gathering information from a warehouse.

A different perspective on the COP is possible, in which information sharing is about sense making that is better characterized by using the metaphor of a trading zone. In the literature, the trading zone is used as metaphor to describe the process of negotiation between actors from different communities in which they work out 'exchanges' 'in exquisite local detail, without global agreement' (Galison, 1997, p. 46, 9). During the exchanges, actors must make sense and reach consensus about procedures of exchange in a mutually comprehensible language. In emergency management, trading is not just a metaphor because it sometimes literally means that actors have to reach an agreement on for instance the size of an evacuation zone. During this process, actors have to share their expertise to convince the other about the value of the alternatives. In this way, actors exchange ideas, learn from one another and make sense of each other's position and institutional background.

Working out exchanges in this way is useful in conditions of uncertainty and change because the collaboration 'doesn't depend on shared ideas, interests, or norms, which are difficult to accomplish when time is short, meanings are divergent, and conditions are ambiguous' (Kellogg et al., 2006, p. 39, 13; Vaughan, 1999, 26). In the literature, exchanges or trades often occur through the use of a boundary object (Hsiao, Tsai, & Lee, 2012, 12; Kellogg et al., 2006, 13). Boundary objects are coordination mechanisms of representation, in which coordination is reached by disseminating information and providing a common referent as basis for aligning work between organizations (Okhuysen & Bechky, 2009, 18; Henderson, 1991, 11). The COP can be regarded as a boundary object because constructing a COP is about sharing and constructing information about the response operation in such a way that it enables its users to continually redefine and mutually adjust their relationships. The COP provides a platform that allows experts to coordinate and negotiate their plurality of points of view through general procedures of exchange, without making their perspectives uniform or completely transparent to each other (Trompette & Vinck, 2009, 25; Hsiao et al., 2012, 12). In turn, the trading zone perspective provides a way of analysing how this exchange process influences the actors' sense making efforts.

In summary, for us, the COP resembles not an 'information warehouse' but a form of materiality that facilitates the ongoing negotiation process that takes place in a 'trading zone', in which actors share and give meaning to information to synchronize their actions.

## 3.5 Networks: Switching & Programming

Presently the interaction of all involved actors can be depicted in heavily interconnected networks of communication, as in the example of Figure 1 Actual information sharing network.

A segmentation of the network will produce partial clusters that can be identified as separate networks with an internal structure based on common goals and communication means.

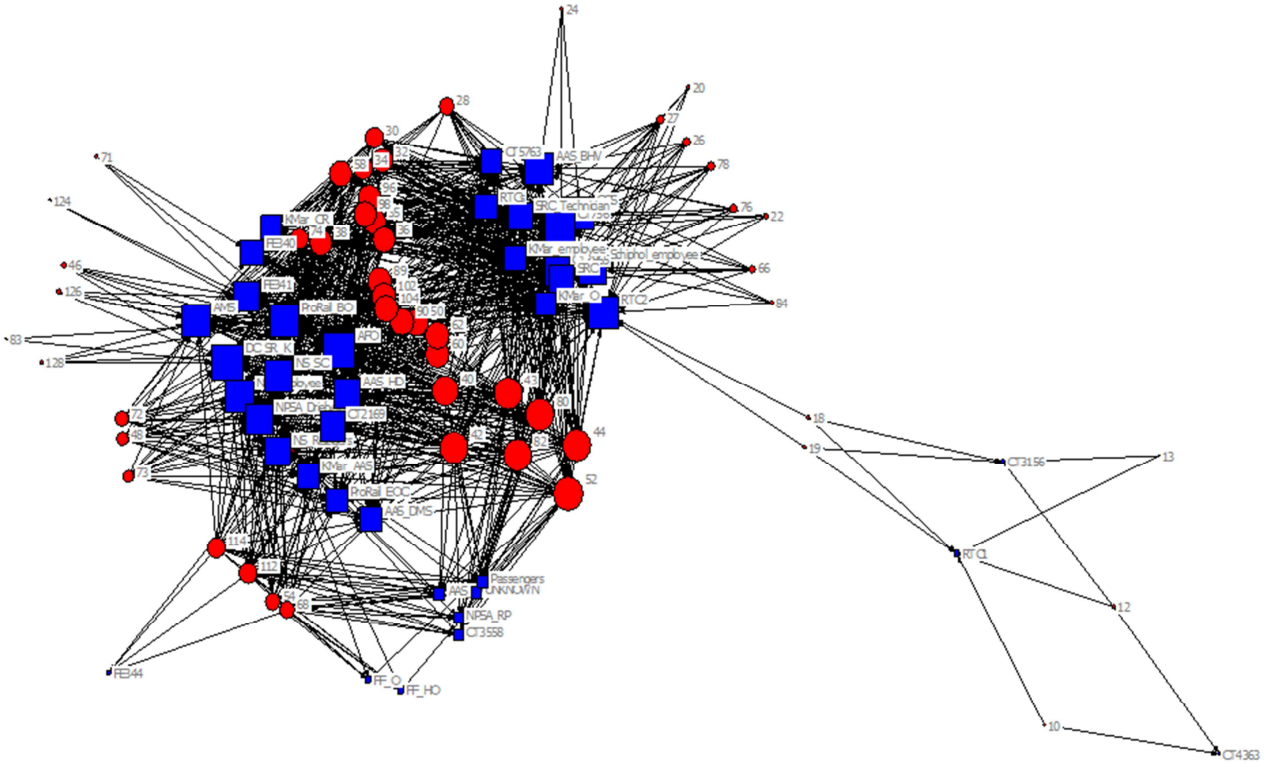


Figure 1 Actual information sharing network

To discover the potential of net-centric governance toward more legitimate and reliable disaster response, the proposed framework involves acknowledging the differences between networks, their 'programs', and 'switching' between them. An important starting point is the vast array of evidence on disasters highlighting the convergence of emergent and unforeseen collaborations with official planned and response oriented networks, resulting in misunderstandings when these interconnections occur. These collaborations emerge in particular when demands are not met by existing response organizations, or when responses are insufficient or inappropriate (Drabek and McEntire, 2003, 7).

Switches are "the ability to connect and ensure the cooperation of different networks by sharing common goals and combining resources, while fending off competition from other networks by setting up strategic cooperation." (Castells, 2009: 45, 1).

This leads to a net-centric model with improved communication and simplified flow of information, see Figure 2 Netcentric Operations.

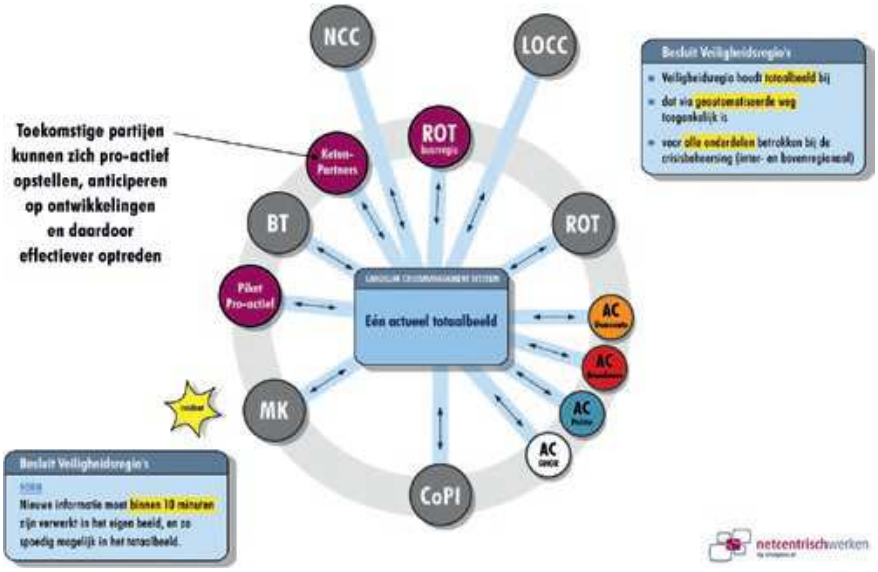


Figure 2 Netcentric Operations

## 3.6 Adaptive Capacity

Challenges lies in the collaboration between existing response organizations and emergent groups, as described above. Since local communities continuously adapt to an environment in flux, their initiatives are hard to recognize, govern and support by formal response organizations (Majchrzak et al. 2007, 15).

Adaptive leadership is therefore defined as emergent and changing behavior under conditions of interactions, interdependence, asymmetrical information, complex network dynamics, and tension. Adaptive leadership manifest in complex adaptive systems and interactions among agents rather than in individuals, and is recognizable when it has significance and impact.

It presupposes interaction, collaboration and coordination.

## 3.7 Conclusion and discussion

The presentation explained how the Common Operational Picture is a collaborative process toward a collective sense making. In the process the communities can and should be involved, providing a valuable knowledge of the local environment and collaborating in managing the emergency rather than be shepherded by the formal response organizations.

The flow of information developed around the communication network allows accommodating the inputs from the many actors involved in the Trading Zone. The adapting capacity of this model provides more response capabilities when facing new conditions.

This requires also that the society develop internally this sense of community, where not present or, even worse, assumed to provide a local response.

On the other end, large disaster implicitly creates military situations, since the responsibility of decision-making requires a chain of command, even if the Command&Control model does not provide all the answers. Whoever is involved in providing the information and the related evaluation, two key factors are accountability and deniability. In the evaluation of the situation, responders are responsible and should be accounted for their statements, but on the other end, the population afraid of the lack of deniability can easily undergo forms of censorship.

## 3.8 References

Please, refer to *Jeroen Wolbers and Kees Boersma, The Common Operational Picture as Collective Sensemaking (Journal of Contingencies and Crisis Management Volume 21 Number 4*

*December 2013)* and *Boersma et al., Beyond the Myth of Control: toward network switching in disaster management (Proceedings of the 11th International ISCRAM Conference – University Park, Pennsylvania, USA, May 2014)* for complete information and references.


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# 4 Data exchange Challenges - From computer-readable data to meaningful information

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## 4.1 Information Interoperability

The concept of interoperability between all the stakeholders participating to a common space of information relies upon several layers of communication that range from the technical to the organisational, whereas they meet and the information exchanged begin to be used. This meeting point is where the knowledge produce awareness, in the sense that we understand how information, events, and one's own actions will impact goals and objectives, both immediately and in the near future, see Figure 3 Interoperability layers.

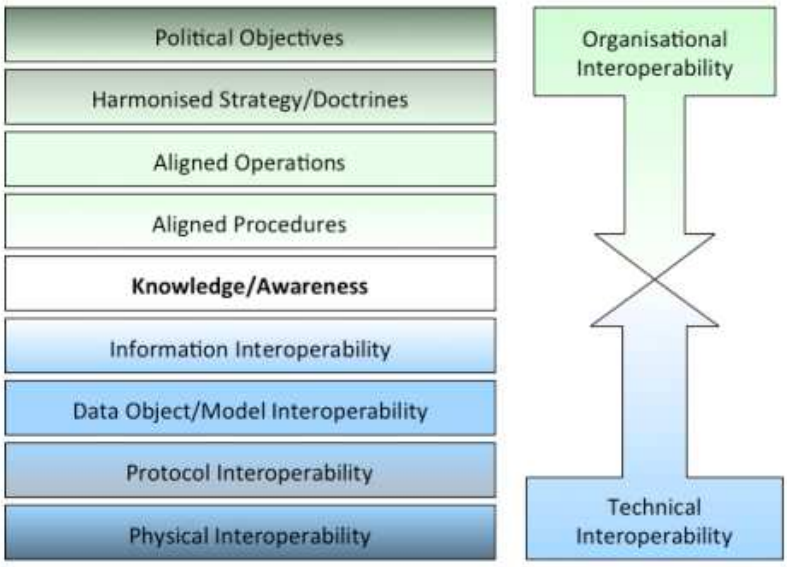


Figure 3 Interoperability layers

At technical level, many standards are now available to cover at least the lowest three layers. There are more structured protocols specifically task-oriented and others more general-purpose: KML, CAP, EDXL, RSS, WMS, Sensor-ML, and so on. At information level though, the issue is still open, even if some solutions were proposed, like EIDD, TSO, or the IFRC emergency items catalogue.

## 4.2 Semantic Communication

The interoperability at information level is achieved if a common information space is fed with information that every organization can consume it within the appropriate semantic context. Suppose that a common operational picture is the intended output of this information activity. If a common, well defined dictionary is used for the description of all information items (i.e. a common taxonomy) in the common information space then a common operational picture could be produced, where

- ☐ each organisation could still use its own language and terms, a semantic mapper would care for the translation
- ☐ each organisation could still use its own tactical symbols, while looking at the same picture of the situation
- ☐ mapping of needs and available capacities across organisations could become much quicker and more efficient, since electronic systems can detect matches and provide meaningful proposals

Now, the communication is no longer purely syntactic, but semantic: its meaning is carried to all intended recipients within a context they can receive it naturally.

Semantic communication allows

- ☐ mapping of resource types, incident categories, task classes, status, …
- ☐ language translation (e.g. for the situational assessment)
- ☐ transformation of tactical symbols specific to each organization

This approach respects not only the specific needs of the organizations involved in the information sharing and their existent approach and procedures, but accommodates also cultural differences: the intended goal is to achieve understanding even when there is no common background to rely upon.

## 4.3 Outlook

In order to reach such a level of communication, several activites are pushed forward on different levels:

- ☐ **Policy Making and Standardisation**

  Example: Programming Mandate M/487 of the DG Enterprise, an effort to establish standards on the different layers of interoperability (technical, syntactic, semantic and organisational)

- ☐ **Focused R&D:**

  Examples: The recently started European research project EPISECC focusses on the architecture of a collaborative information space for the crisis & disaster management. The Demonstration Programme DRIVER will conduct a number of experiments in different member states involving collaboration and information exchange.

- ☐ **Stakeholder involvement and awareness raising**:

  Example: The European research project ESENET conducts a number of workshops in different European member states and provides a structured possibility for online discussions, addressing communication from citizen to authority, authority to citizen and authority to authority. Also DRIVER contributes to this kind of activity by involving stakeholders into the experiments.

# 5 “CrisisWall” - A Multi-Device, Multi-System Crisis Management Software

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## 5.1 Introduction

After two years of extensive experience with operating a big wall display it can be concluded that many large display installations are functioning from a hardware point of view. However, the software available to operate and utilize such video walls has much room for improvement in functionality, in particular for a situation room environment.

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.

## 5.2 Concept for “CrisisWall”

The CrisisWall will follow classical service oriented architecture. All GlobeSec systems have well-defined, standardized Application Programming Interfaces (APIs), providing access to their data and functionality. Future systems to be integrated will need to have similar APIs.

### 5.2.1 Architecture

The CrisisWall software uses the APIs to get data from the systems dynamically and display it on the wall as text, lists, maps, graphs, time series, images, networks or other formats. The CrisisWall could also interact with the systems for editing, manipulating, processing, and storing data by back channel communication.

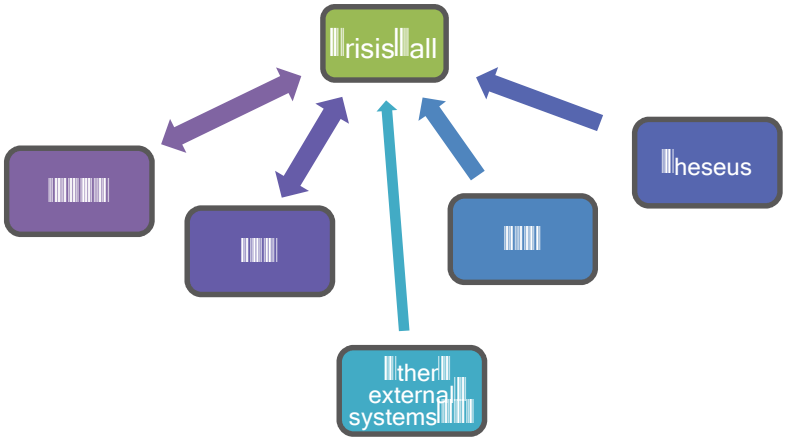



**Figure 4: Systems feeding information to CrisisWall and possible back channel communication**

Central to the concept is a well-defined data structure (see Figure 5). All systems expose their content in a similar way, using json. The data object consists of two levels:

- *item*: a single data item with common metadata and system-specific metadata.
- *event*: a group of items, with additional metadata (e.g. statistics, aggregate data)

The common metadata elements must be such that all items can be mapped (geographic information), displayed as a time series (time or period) or as a table (attribute, value). Specific metadata elements are used by system-specific visualization methods.

The data elements are not static. The Crisis Wall software allows users to add or change metadata elements. The key analytical tasks usually consist of validating, interpreting and judging data, and then recording the context-specific data. (For instance, one article may report on death tolls in different provinces; these numbers must be recorded by province in a table-like format.)

The Crisis Wall stores information in an *activation* object. This is the core object supporting visualization of event-related information, but also triggering processes (e.g. “calculate population in affected area”, “get GHSL statistics in this area”), composing situation maps and reports. An *activation* object contains one or more events (themselves containing items), one or more analyses, *view-settings* and a link to a *sitrep* and a *sitmap*.

The results of analyses, a selection of items, or new *analysis* text are posted in a *sitrep*. A *sitrep* object stores a list of data objects, their visualization settings (text, table, map, graph) and editing information. It works similar to Google Docs, with immediate storage and multiple simultaneous authors. It is similar to Critech’s and Optima’s newsletter solutions in its use of structured lists of data (RSS feeds or - in this case - json feeds). A *sitmap* object is similar, but defines a map.

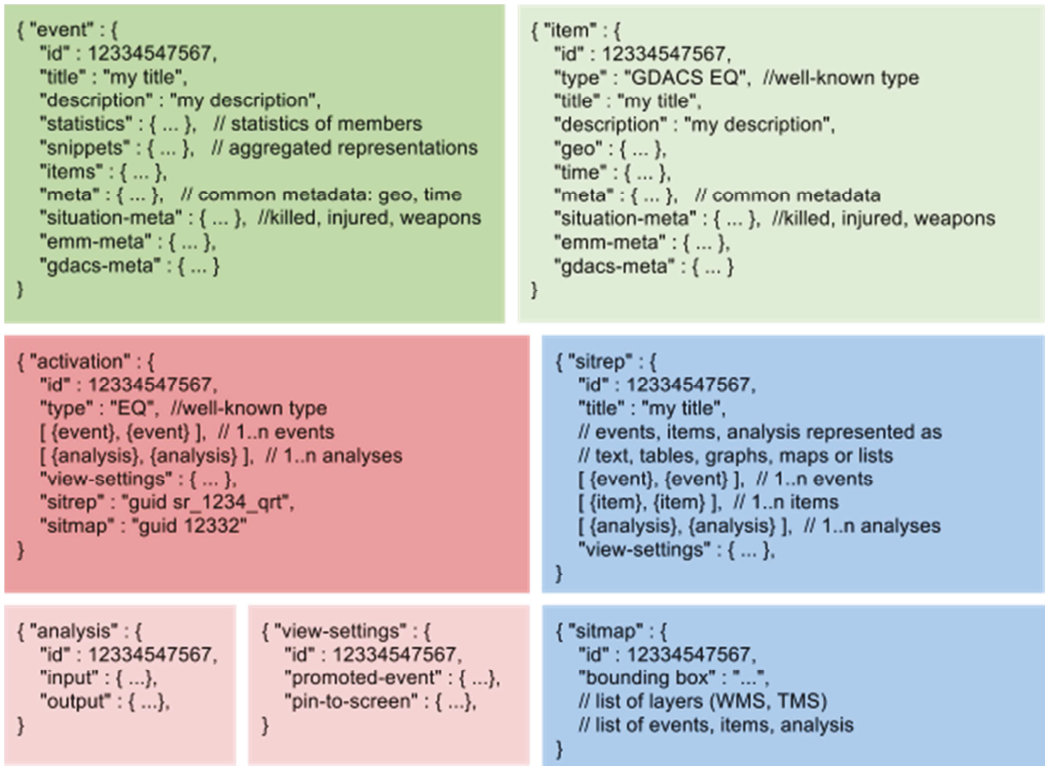



**Figure 5: Unified data structure for items, events, activations, sitreps, sitmaps, analysis, and view-settings..**

### 5.2.2 Emergency Management Tasks

The Crisis Wall software is targeted to the principle emergency management tasks in a national or international crisis room, such like the European Emergency Response Centre. Driven by the outcomes of previous research and ECML experiments, the following tasks were identified as having the most potential to benefit from the Crisis Wall.

- Surveillance
  - Overview of events in the world, with automatic notifications and attention management
- Activation: analytical tasks for an emergency
  - Operational coordination: tools for information management for the operations chief, with integrated, single access.
  - Collaborative analysis: tools for managing simultaneous interaction with the video wall to support collaborative, distributed and/or parallel tasks.
- Presentation
  - Handover among analysts: tools for showing tactical information
  - Situation overview for decision makers: tools for showing strategic information
  - Press room: tools for showing public, strategic information

### 5.2.3 Support for Multiple Devices

The main scope for the Crisis Wall software is to exploit the large display and interaction surface of the large video wall. However, a principal design element of the software is collaboration, be it with several analysts in front of the video wall, or distributed analysts using different devices. Therefore, the Crisis Wall software - or elements of it - should work on normal PCs, tablets, and smart phones, but also on surface tables and alternative devices.

An example of this is the joint writing of SitReps. Different analysts should be able to contribute to a single SitRep in an activation, each focusing on a particular task. They work each on their device of choice, best supporting their work. When their analysis is ready, they can post their contribution to the SitRep. The chief analyst, in charge of validating, editing and publishing the SitRep, has workflow control over the report (changing sections to read-only).

## 5.3 Vision on crisis response

The European Emergency Response Coordination Centre is a valuable partner in this project, providing user feedback and many use cases to develop on:

- DG-ECHO: Humanitarian and Civil Protection
- Coordination of response of EU Member States
- Semi-open system: ECHO, Participating States, United Nations, Experts
- Information sharing:
  - Daily situation reporting and mapping, publish-and-subscribe
  - Event-based situational awareness

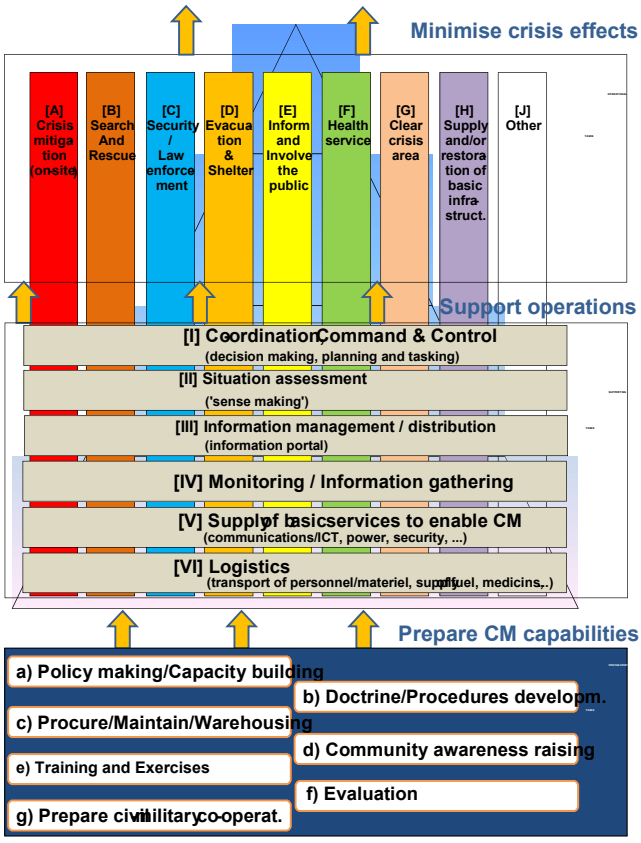
The intended use of this solution will be in terms of

- ERCC duty officers (hand-over, event management); briefing of senior staff; briefing of EU meetings; briefing of Participating States
- Operational phase: monitoring (No Crisis) + response (Crisis)
- Visualization on large video wall in crisis centre

## 5.4 Functional features of the solution

Features provided by CrisisWall

- ☐ Functionality
  - Real-time data gathering
  - Sense-making: filter, search → COP
  - Event management
  - Consult COP (multi-platform)
  - Collaborative analysis → social graph
  - Varied visualizations
- ☐ Supported tasks
  - Situation assessment (II)
  - Information management / distribution (III)
  - Monitoring / information gathering (IV)




*Courtesy of ACRIMAS project*

# 6 GINA – Geographic INformation Assistant

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## 6.1 Introduction

The GINA is a mobile tactical GIS enabling it's 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.

Its key features are:

**DYNAMIC MAPPING**

Mapping of terrain and situation as simple as drawing on a paper map (on mobile handhelds, tablets and PCs)

**TACTICAL COORDINATION**

Integration of staff and assets with dynamic map by GPS location tracking (variety of hardware: GSM, satellite, radio)

**DATA EXCHANGE**

Reliable offline access to information from various sources from anywhere (map portfolio, data layers, teammates locations, files, data from sensors)

**COMMUNICATION**

Accurate communication of information which words nor pictures can express (drag & drop navigation, task management, events scripting)

GINA is the next generation geographic coordination technology. It serves as a platform for live communication between unlimited number of units, provides automated reporting, tracking and optimizes incident management. Today GINA is used during emergency and security situations around the world. It is also part of national emergency systems in Central Europe, used by firefighters on every day basis making their work safer and easier.

The manufacturer emphasizes prevention and preparedness. For this reason GINA helps users to create scenarios (e.g. evacuation, emergency roads, etc.) where they can pre-assign specific tasks to team members and reduce the reaction time. Thanks to real-time synchronization of the data stored in GINA devices every team member receives in no time all the necessary information (safe and dangerous zones, hospital capacity, helicopter landing zones, visible points for way pointing, etc.).

The system consists of sturdy mobile terminals, pocket tracking devices, smartphone and tablet apps, mission control software and possibly also third party components (such as automated sensors or drones). These components are combined together and provide the task forces with all the crucial data right in the field. Dispatching has a full control over the situation and dynamically navigates the task forces in the most efficient way.


Daily/weekly reports with pre-defined criteria are done in one click and can be sent automatically. The obtained data can be furthermore analyzed and visualized in many ways (cf. http://haitisituation.com/ live security map powered by GINA).

## 6.2 Benefits

- NO MORE MISUNDERSTANDINGS

Almost 70% of communication is wasted on localization of team members and description of the terrain. With GINA it is possible to share via a collaborative map even the information which is difficult to describe. This way the GINA significantly improves the speed and accuracy of communication and thus supports faster and more accurate decision making.

- REDUCTION OF THE MISSION PREPARATION TIME

Mission preparation time is drastically reduced by instant availability of all information in mobile terminals. A variety of maps and live information is always mission-ready.

- FASTER TERRAIN & SITUATION MAPPING

Situation mapping is a key element for mission success and staff protection. It is faster and easier thanks to mapping features available in the field.

- INCREASED STAFF CAPACITY

Staff capacity is increased due to reduced administration overhead. Decisions are made and tasks are accomplished in the right time and in the right place.

- TIME SAVED ON REPORTING

Reporting time is greatly reduced by automated reporting services documenting missions, including pictures, positions and notes of detected incidents.


Figure 6 GINA system PC interface

## 6.3 Vision on crisis response

The European Emergency Response Coordination Centre is a valuable partner in this project, providing user feedback and many use cases to develop on:

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- Semi-open system: ECHO, Participating States, United Nations, Experts
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The intended use of this solution will be in terms of

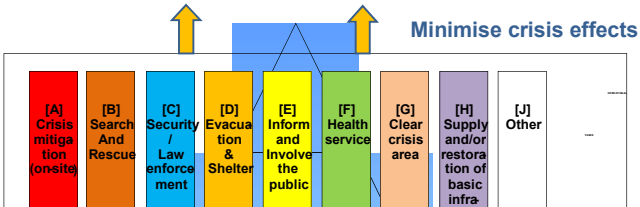
- ERCC duty officers (hand-over, event management); briefing of senior staff; briefing of EU meetings; briefing of Participating States
- Operational phase: monitoring (No Crisis) + response (Crisis)
- Visualization on large video wall in crisis centre

## 6.4 Functional features of the solution

Features provided by Gina

☐ Functionality

- Search and rescue operations
- Security management
- Waypointing



- ☐ Supported tasks
  - ◘ Coordination, Command & Control (I)
  - ◘ Situation assessment (II)
  - ◘ Information management / distribution (III)
  - ◘ Monitoring / information gathering (IV)

# 7 Dashboard Water Safety

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## 7.1 Introduction

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.

Netcentric flood management means:

- ☐ Using information published from trusted partners
- ☐ Adaptable to all procedures, current or new
- ☐ Uses meaningful data
- ☐ Saves time during crises

The system uses trusted information sources:

- ☐ Met-office forecasts
- ☐ Flood forecasting systems (i.e. Delft-FEWS)
- ☐ Geographic information systems
- ☐ Internal documents (csv, excel, doc)
- ☐ Internet sources
- ☐ Switchboard connection
- ☐ Social media
- ☐ Off-line distributed sources, making them digital

Dashboard is a viewer: Data storage is minimized. And it is Web based: a web site, a mobile app, widgets inside other websites.

To support the procedures, the solution provides:

- ☐ Monitoring water levels and forecasts
- ☐ Monitoring weather forecasts
- ☐ Monitoring/forecasting flood defence strength
- ☐ Closing flood gates
- ☐ Defining risk area
- ☐ Planning emergency measures
- ☐ Advising on evacuation
- ☐ Overview of emergency activation levels
- ☐ Monitoring (social) media coverage
- ☐ And many others can be easily added

The data are then presented in order to suit at the best the users' needs, because the visualization is tailored to the user requirements and the officers have access to the selected sources.

Information is presented on the level of aggregation that corresponds to the user's task.

## 7.2 Vision on crisis response

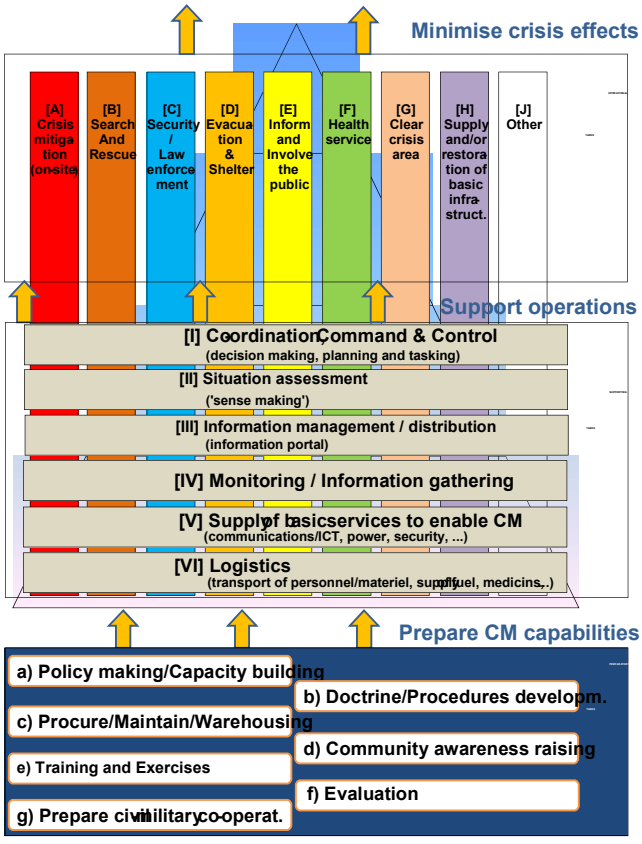
The underlying vision of the dashboard: guidance of information.

- ☐ Providing overview on information
  - ◘ internal information sharing between teams
  - ◘ keeping one version of environment information: news, weather
- ☐ Pre-structure information instead of letting users search
- ☐ No discussion about facts by keeping information actual and showing the time stamp and source of information
- ☐ Information interpretation at the right level, no plain data from expert systems
- ☐ Only show the level of detail that is needed at the particular user level by predefining dashboard screens
- ☐ Flexibility
- ☐ Intended use of the Dashboard
- ☐ Water authorities
- ☐ Levels: information suppliers/operational level, command level, public
- ☐ Training, preparation, response

## 7.3 Functional features of the solution

The features provided by the solution are:

- ☐ Providing overview on information
  - ◘ internal information sharing between teams
  - ◘ keeping one version of environment information: news, weather
- ☐ Supported tasks:
  - ◘ situation assessment (II)
  - ◘ monitoring, gathering information (III)




*Courtesy of ACRIMAS project*

# 8 jiXel: Interoperability made real

**Uberto Delprato**

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## 8.1 Introduction

IES created JIXEL, the first Web 2.0, Cloud Based Joint Command and control room (see http://www.jixel.eu) as a result of its work with the CAP OASIS Committee (https://www.oasis-open.org/ ).

Eventually, it paved the way for the adoption of CAP in Italy.

It also deployed JIXEL for the Italian National Fire Corps, covering all Italy and it is Advisory Board member of the European Emergency Number Association http://EENA.org and Member of the Public Safety Communication Europe forum http://www.psc-europe.eu/.

## 8.2 Description

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

3 STEPS:

1. INCIDENT CREATION (or updates)
    - C&C publishes CAP Messages OR message are created by a “CAP Generator”, i.e. a web app or a smartphone app
2. INFORMATION DISTRIBUTION
    - The Addresses of intended recipients are analyzed and publishes as protected, personalized CAP feeds (SENDER/RECIPIENTS)
3. INFORMATION VISUALIZATION
    - C&C read the feed OR the feeds are read by a “CAP viewer” or a Feed reader/Browser

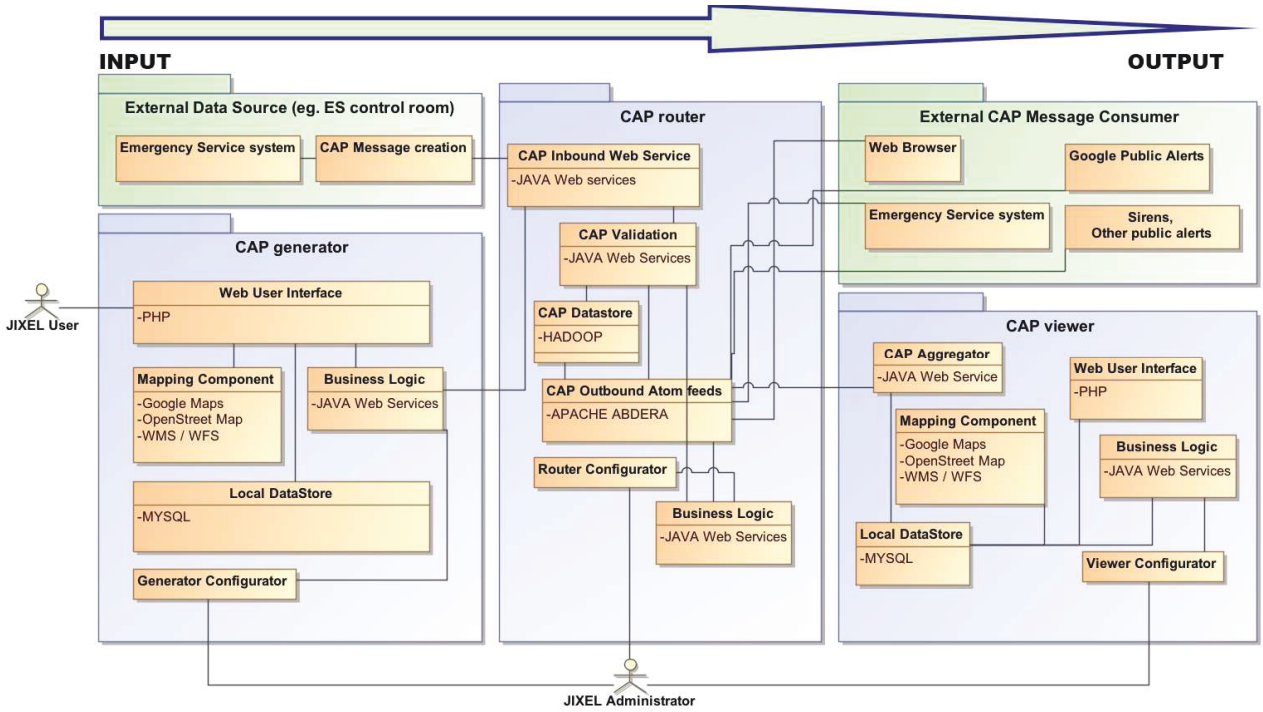



Figure 7 JIXEL made simple

The core component is the CAP ROUTER:

- Concepts
  - Validation and ingestion of incoming CAPs
  - Publication / Distribution of CAPs via public and private (password protected) ATOM feeds
- Technology
  - Web Service interfaces
  - CAPs storing using Apache Hadoop
  - ATOM feeds implementation using the Apache Abdera framework

The features provided by this solution are therefore:

- It allows to share alerts and increase common awareness
- It is based on Open standard EDXL-CAP
- It uses standard based taxonomies (e.g. Tactical Situation Object)
- It allows inbound CAP coming from external data sources, e.g. USGS or WMO
- It allows outbound CAP in Atom feeds that can be:
  - Restricted for other agencies / emergency services
  - Open to the public for alerts broadcast
  - Addressed to Digital Radio or Sirens for (semi)automatic alert broadcasting
- It makes mobile access possible via browser
- It offers compatible Mobile Apps available for wildfires, floods, deaf people

In order to maximize the interoperability, the solution

- Is compatible with the existing Legacy Systems (with minor adaptations)

- Can be deployed on the Cloud as SaaS
- Uses secure HTTPs connection to the Cloud
- Doesn't need installing any hardware
- Is fully redundant and failsafe, available 24/7/365
- Is Flexible in creating and profiling users
- Has no limitations in connecting different agencies/PSAPs (Public Safety Answering Point)
- Allows full ownership of data, with no costs for maintaining the hardware
- Has negligible impact of the TCO (Total Cost of Ownership) of the EMS (Emergency Management System)
- Is accessible from anywhere, also on the move

More information are available at http://jixel.eu/index.php?lang=EN.

## 8.3 The Italian experience

The requirements of the Department of Fire Service of the Ministry of the Interior include:

- Management of all incidents with 103 control rooms distributed all over Italy
- Unique body (>31.000 professional fire fighters + >6.000 volunteers)
- Main Body in the Italian Civil Protection mechanism
- Interoperates with "everybody"

The project developed according to the following timeline:

- 17 June 2008 1st: DECREE
  - CAP as interoperability standard
- 2009 Used after L'Aquila Earthquake
- 2010-2011 – Used for Calabria Fire seasons
- 23 May 2011 2nd DECREE
  - Definition of the Italian CAP Profile
- 2012 - Adaptation of Italian Fire Brigades C&C (SO115)
- 2013 – Full Deployment and POC in Roma
- 2013/2014 – Operational Trials in Latium, Veneto and Calabria Regions
- NOW – Fully operational, with links to some other actors
- All this means AGREEMENT btw Fire Brigades and other C&Cs

The CAP Profile defined by decree provides the following features:

- Carrying also "normal" incidents, not only major events
- Use of the Tactical Situation Object as Data Dictionary
- Use of the SAME codes allowed
- Gives brief information about RESOURCES
- Distinction btw CALLS and INCIDENTS
- Keeping track of the incident progress
- The Italian profile introduced new CAP parametric fields but also:
  - rules for updating incidents, and for modifying messages generated by other organizations
  - rules for representing incidents categories using universal and standard codes (TSO and SAME) inside the CAP message
  - rules to link resources to a given incident, by inserting information about mobilized resources inside the CAP message

- It also defined ATOM feeds as standard for CAP distribution and the format for these ATOM feeds

## 8.4 Vision on crisis response

The vision underlying JIXEL is focused on:

- Collaboration and cooperation (hierarchical command & control, shared awareness of resources, sharing of alerts)
- Information sharing (common operational picture, publish-and-subscribe, updates on alerts, aggregation of disparate sources)

JIXEL is intended for

- Emergency Organisations at any level (National, regional, local)
- Local communities (e.g. volunteers and resiliency forums)
- Response and reconstructions phases
- Communication to the general public.

## 8.5 Functional features of the solution

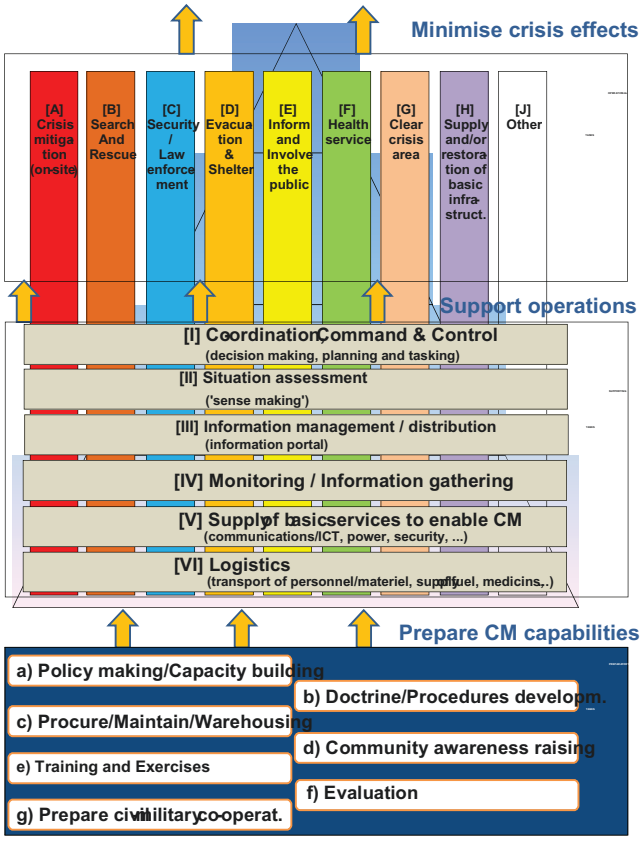
JIXEL features:

- Alerts creation/update and sharing
- Aggregation of several sources
- Use of EDXL-CAP
- Flexible for accommodating other standards
- Personalised level of sharing
- Use of taxonomies

Operational Tasks A, E

Supporting Tasks I, II, and III

Preparatory Tasks a, b, d, e




*Courtesy of ACRIMAS project*

# 9 Large Event

**Bruno Quere**

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## 9.1 Introduction

Thales presents its new integrated system for large-scale event management and crisis management. Designed for civil security forces, this solution enables more effective collaboration between deployed units and command centres.

The authorities and forces responsible for public safety and security must contend with increasingly frequent and wide-ranging incidents, from crime and accidents to natural disasters and crisis situations. They also need to process and analyse an ever-growing volume of information and intelligence data gathered on the ground.

These trends present a new set of challenges for security professionals. At command level, the risk is information overload. For units, response times can be slower, due to an inability to sort and analyse information.

To meet this need for increased efficiency, Thales has developed a new solution incorporating the key conventional functions — situation awareness, management of command information and crisis management system resources — combined with new modules, such as advanced decision support and asset coordination.

Operations managers now have a clear picture of forces deployed on the ground, via a touchscreen tablet. Coordination officers at a command centre can monitor overall operations as they evolve, using a screen wall. This ability to disseminate the right information, calibrated to the needs of each user, according to their level of responsibility, is a distinctive feature of the new Thales solution.

The system is designed around the key objectives of mobility, with the use of smartphones and tablets, and access to multimedia data, including still and video imagery. With the Thales solution, users of standard devices have access to secure applications tailored to the needs of decision-makers and personnel in the field. These applications include Field Observer, which instantly enriches situation updates with georeferenced still and video imagery.

A mobile component developed in partnership with Renault Trucks Défense offers additional functions, such as 'last mile' reconnaissance imagery, thanks to a micro-UAV.

To improve operational efficiency from the highest decision levels of government through to agency personnel on the ground, Thales has developed new tools based around communities of interest, information sharing and a coordinated vision of all phases of an intervention, from planning to debriefing. As a result, the authorities have a real-time picture of the situation to support a proactive and timely resolution.

This integrated and collaborative solution can be deployed at a national or regional operations centre or on-site in a mobile command vehicle.

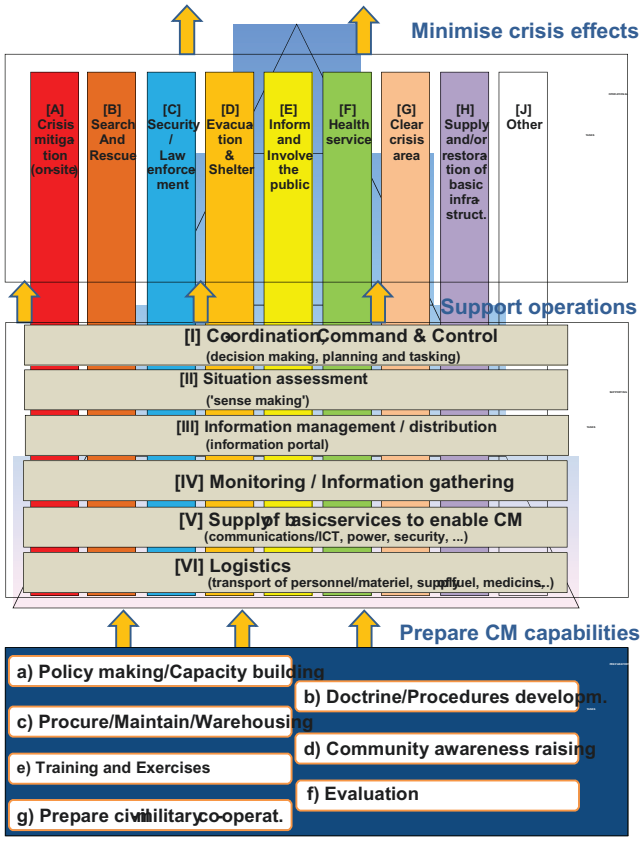
From the design concept of this new solution, Thales has drawn on its world-class experience and credentials in public safety and security, such as the Ciudad Segura (secure city) project in Mexico, where Thales helps protect the people of Mexico City from a wide range of risks, and in France, where Thales developed the BDSP public security database for the Gendarmerie Nationale.

## 9.2 Vision on crisis response

- Large Event provides
  - Collaborative workspaces
    - Information sharing
  - Situation awareness
  - Common Operational Picture
  - Daybook
- It can be used by all the bodies implied in crisis management
  - Civil security, law enforcement agencies, public health, fire-brigades
- Centralized, easy to deploy in HQ and on the ground.
- Can be used for training, preparation, response …

## 9.3 Functional features of the solution

- Large Event is a C2 solution
  - Co-ordination, Command & Control
  - It provides also tools to help
    - Situation assessment (II)
    - Information management/distribution (III)
    - Monitoring/ Information gathering (IV)
- The supported operational tasks are mainly :
  - Crisis mitigation (A)
  - Search and rescue (B)
  - Security / Law enforcement (C)
  - Health service (F)




*Courtesy of ACRIMAS project*

# 10 Summary of the experiment

On the second day of the workshop, an experiment was performed to let the solutions show their functionalities against the same input, a set of information regarding an earthquake in a nearby area.

All manufacturers were provided in advance with a set of messages in different format. These messages provided information about an earthquake and were available in two different formats each: the experiment aimed at demonstrating the solutions rather than evaluating their capabilities, since it was more related to the methodology of this kind of evaluations.

After each information was made available to the systems, there was a brief explanation about the results of each solution delivered by its operator. Thales Large Event did not participate in the experiment.

The following steps were followed during the experiment.

- A first communication signalled an earthquake happened in a nearby area. This information was delivered both in CAP format and as a GeoRSS
- As a response, two teams were dispatched to the area and their Situation reports were made available both in EDXL and GeoRSS formats
- Then, three hospital in the area provided their capabilities in terms of availability of ER and surgical beds. This information was delivered both in EDXL and KML format
- Finally, a sheet of paper carried a brief description of a landslide occurred because of the earthquake. Hand written coordinates were also provided

The following table summarizes the outcome of the experiment.

| | GINA | JIXEL | Dashboard | CrisisWall |
|---|---|---|---|---|
| 10:00 CAP Green Earthquake Alert | ☑ | ☑ | ☑ | ☑ (with delay) |
| | No color | Green | Red (“immediate”) | Green |
| 10:20 Field report (EDXL SitRep, ERCC) | ☑ With manual input | ☒ Format issue | ☑ | ☑ |
| | Format issue. Feed not compliant?<br>Configuration can be set for auto | Format issues. Feed not compliant? | Automatic<br>Shown in different tab<br>No geolocation | Automatic<br>Asks to update information |
| 10:30 2nd report (GeoRSS, EDXL SitRep) | ☒ Format issue | ☒ Format issue | ☑ | ☑ |

| | | | | |
|---|---|---|---|---|
| | Manual input<br>Can be filtered by icon | Yesterday's input works. Icon = EQ<br>Filtering possible | No geolocation | Icon = EQ |
| 10:40 Hospital location and capacity available (EDXL HAVE, KML) | ☑ KML | ☑ EDXL | ☑ KML | ☑ Manual input (KML) |
| | Automatic<br>Info as test | Notified of update<br>Info available as link to XML | Automatic<br>Info as HTML | Info as HTML |
| 10:50 Paper input: landslide triggered by EQ | ☑ Form | ☑ New CAP alert | ☒ | ☑ Form |
| | Geocoded | Not linked to master event | | Geolocation wrong |
| COP complete (map as SitRep) | ☒ | ☒ | ☒ | ☒ |
| | Can be corrected with manual input | Should be, if XML formatting issue solved | Partial, as no manual input is possible | Partial, as some location are wrong and couldn't be modified |

If a common trading zone for the information is to be established as suggested in the workshop, the data interoperability is still a challenge. Some of the systems were not ready to exploit partly or entirely the messages because of their data formats.

Nevertheless, also the semantic of the presentation components was heterogeneous and sometimes misleading for lack of interpretation. This was particularly evident where the systems' features overlapped.

Where the systems were more flexible, it was possible to accommodate partly the unforeseen data formats; but it required IT knowledge not appropriate for crisis management operators. In addition, other trivial tasks needed this high-end capacity to interact with the systems.

One concern of end-user is that present solutions were fit the tasks in a general way without any clear link with the real day-by-day tasks of the operators.

The participants found the experiment to be difficult to follow: it was very condensed and not thoroughly introduced; therefore, they did not know in advance the expected result for each step and had no metrics to evaluate it. On the other end, even if it worked well in the previous experience, the comparison of many systems in the same environment was difficult and hampered by the technical problems met during the experiment.

Beside from the experiment design comments, these are the key points of the discussion session that followed:

- Handling information overload

All the system were very fit for the simple case proposed, but some of the proposed user interfaces could be easily cluttered by a big amount of information flowing into the systems. The challenge is related to filtering and arrange the information keeping them understandable at a glance.

- Data exchange formats

  Presently the systems work well after establishing data contracts with the information sources, or require skilled configuration to accommodate the differences between the many sources of information. A relevant exception is Dashboard, which is born to acquire easily new sources; nevertheless, a certain amount of time (not crisis compliant) is always required to create a new data consumer.

- Media inclusion (paper, Word, Excel)

  Beside from the standard developed for crisis management, multimedia documents are de facto standards in the operating procedures for the operators. The interoperability of SAIM systems with these formats must be improved to ease to extract information from them and to provide them easily.

- Situation Report Production

  In a similar way, the final document that summarizes a lengthy analysis or a tiresome collection of field reports is the best way to help decision makers and communication officers. Synthetic and meaningful pictures of the situation can transfer a lot of valuable information or can hide and distort the details based on their quality. A complete system must help the operators producing a situation report with a minimum effort, possibly templating it against different needs, if intended to be shared with the decision makers, with other services, with the media or directly with the population.

- Sharing COP

  The Common Operating Picture as a new paradigm that maintains all participating entities at the same level in a peer-to-peers collaboration requires both a shared basis for transferring and handling the data, but also the capability to preserve the semantic peculiarities of all the involved partners. The presentation layer must be therefore detached from the shared information and the multiple layers that compose them must retain their individuality in order to address better the different audiences involved in the COP. Anyway, at the moment the challenge is still the interoperability of the systems, which requires that the communication means are agreed, then tested and carefully tuned: no on-the-flight emergency connection is usually possible.

# 11 Conclusions

Situation awareness is a very complex concept that includes the different perceptions of reality of all actors involved in it, since now Civil Protection is involving services that are different in training and purposes. Giving a good understanding of a situation requires that the information flow be presented to everybody in the best way to be grasped as fast as possible, that all actors be able to interact with it effortlessly and that it be available to all actors in the most natural way, without requiring additional effort, but the initial setup of the information sharing.
The points of interest of the ICT solutions are many and not all could be even hinted in one day, therefore the demonstration concentrated on

- Data formats, therefore also interoperability at some extent
- Technological aspects
- Approach in visualization

The evaluation of a tool's features requires a proper introduction of the evaluation exercise, a clear set of questions and a quantitative way to compare the results.

## 11.1 Collaboration models

In the past, the military-like approach to large-scale crisis led automatically to require that everybody shared the same background in order to exploit a common training. This being no longer the reality, since now many entities like Civil Protection Departments, Fire Departments and others are equally involved in the Crisis Management process, they are adopting a network oriented collaborative model instead of a hierarchical command and control approach.
This peer-to-peers networking allows every entity to adopt the technologies that best suit its needs, as long as they allow it sharing its information. Where possible, the information has to be abstracted in a form that is independent from cultural peculiarities, it doesn't matter whether they are the language or the icons used in the user interface, or if a specific perspective is requested by the operators using it. During the workshop this new trend was analysed and its feasibility aspects were discussed, in order to introduce this perspective to the participants for the sake of the tools' demonstrations.

Many projects are born at local level, which already implements new collaboration paradigms, aiming at exploiting the networks of actors and involving where possible the citizens in the process.

All these successful stories should be analysed and classified on the basis of their scope (local, regional, country-wide or cross-borders), in order to benefit from these experiences when describing at European level the collaboration models, which can better fit the citizen security related policies.

During the workshop, the end-users proposed their interest in each other's experiences: this is one of the reasons the ECML workshops are designed for.

## 11.2 Tools portfolio

The experiment performed during the workshop did not aim at producing a quantitative and detailed evaluation matrix of the presented technologies: the workshop meant to show to the end-users a spectrum of solutions with their strength points.
The proposed tools were at different maturity levels: some are already used operationally while others were still in development; therefore, no fair comparison was possible, but the joint demonstration proposed different approaches to the SAIM topic, providing the end users with a panoramic of the different ICT solutions for this subject, but preserving some key principles such as the interoperability on common standards, the visual presentation based on well-established principles including the use of colour coded maps, and the use of mobile devices.
This experience must help sharing ideas and technologic approaches amongst the researchers, the market and mostly the end-users.

In order to achieve a better interoperability, some years ago several projects led to the adoption of data formats specifically aimed at exchanging this kind of information, like CAP or EDXL (both are OASIS Open standards). At the moment it is more relevant to spread these means of interoperability rather than refining or replacing them with more sophisticated solutions. The adoption of data exchange formats specifically designed for the alerts and other crisis management information improved the interoperability of SAIM systems, as demonstrated by the use of CAP messages in Italy. Nevertheless, the tools seem to be still fragile regarding the flow of information and require technical interventions to introduce new systems, even when just slightly different. The input handlers require more intelligence, in order to improve their capabilities of extracting information from different configurations or dialects of the data formats. On the other hand, the output from all systems should be certified and receive a compliancy rating compared to the standard.

The DRIVER project is also testing a wider set of tools related to the Crisis Management in an experimental campaign, which aims at determining how to combine them in Crisis Management ICT platform encompassing more than just Situation Assessment Tools, but also Tasking and Resource Management and Technical Coordination.

## 11.3 Experimental methodology

The methodology DRIVER is developing will require more time than a half day to evaluate a technology and will need the end-users to interact directly with it. More precise metrics will also be needed to provide an objective evaluation. These will be of technological nature (latency times, number of data format recognized, GUI effectiveness) or procedural (the compliance with the information workflow adopted by each end-user). The previous work done by ACRIMAS project will be exploited referring the evaluated tools in terms of the technological gaps they are able to fill.
The ECML will continue its study of crisis management technology providing itself with a test-bed facility where lengthy and thorough test of the systems will be possible. The DRIVER project aims at developing a testing methodology on top of an assessment of the present technology available and the resulting publications will help all involved actors (the research, the market and mainly the end-users) to steer the development of new tools in the best direction to provide solutions adequate to the real needs of a society facing new and old safety threats in scenarios that changed from the past, often dramatically.

The next activities in the ECML, including the work for DRIVER project, will consolidate the evaluation procedures, in order to provide fair comparisons of similar solutions. Many are the aspects of a Crisis Management tool that need a quantitative evaluation, but this effort does not aim at producing a buyer's guide to crisis management systems. The purpose of the experiments led in the ECML and planned in the DRIVER project is the determination of areas of development for the existing and future tools, where their effectiveness will improve and the overall collaboration between end-users can benefit. These include:

- Integration
- Robustness
- Information semantic

## 11.4 Challenges, Recommendations, Next Steps & Actions

The challenge for SAIM ICT solutions is not to be out of the box and all-comprehensive solutions: they have to adapt to the specific needs of a varied audience and must be able to cooperate with similar solutions, in order to allow the best interoperability possible.

The workshop will be repeated in two years and a comparison with the present situation will hopefully present many improvements in term of interoperability and usability of the systems, with a more precise mean to evaluate their effectiveness.

| | Challenge | Recommendations |
|---|---|---|
| 1 | **Interaction**<br>Improve interoperability by adopting smarter readers and more precise writers. | The design of the systems must make them agile and ready to face fast evolving situations. The time to establish a precise agreement about data exchange is seldom available. |
| 2 | **Participatory Design & Development**<br>Software needs to meet users' needs. | The best software cannot require a revolution of an existing and well-tuned organization of the work. The end-users' contribution in terms of experience and feedback will provide a better insight of their work.<br>It is important to remember that a SAIM system is used every day and must be a friendly environment even where no crisis arise. |
| 3 | **Information Visualisation & Visual Analytics**<br>Data ≠ Information ≠ Knowledge | Support knowledge generation and thus decision making by applying well known information visualisation principles based on cognitive psychology findings. Once big wall displays become highly interactive systems (see recommendation 1) visual analytics principles will then facilitate a new quality of dealing with the data at hand. |
| 4 | **Information Overload**<br>Support systems are needed | Improving the interoperability of the systems imply that the flow of information available to operators and analysts can grow over the human capability to organize it. The SAIM systems must help the users by providing the best trade-off between quality and quantity. |

Table 2: Main challenges, recommendations, and suggested next steps/actions for 2014+.

## 12 Acknowledgements

Thanks to the DRIVER project for the great and fruitful collaboration in co-organising this workshop.

Thanks to Serena Zarbo for the perfect organisational support.

A special acknowledgement to Markus Rester for his fundamental role in organizing this workshop.

# 13 Annex A: Workshop Schedule

European Commission

## 5th JRC European Crisis Management Laboratory (ECML) / DRIVER Workshop

# Situation Awareness & Incident Management SAIM2014

16–18 June 2014, Ispra, Italy

**Target Audience**
Situation awareness system providers,
situation monitoring centre staff, crisis managers

**Goals**
Presentation, demonstration, and exploration of situation awareness and incident management ICT systems for situation
monitoring centres and crisis management headquarters:

- **Dashboard** *HKV Consultants, NL*
- **GINA System** *Gina Software, CZ*
- **CrisisWall** *Joint Research Centre (JRC), EC*
- **JIXEL** *IES Solutions, IT*
- **Shared Situation Awareness** *Thales, FR*

Demonstration showing systems' strengths including:

- Dealing with ever-changing incoming information
- Support of exchange formats (EDXL, CAP, WMS, KML, …)
- Adding, deleting, masking, tagging, consolidating, associating, and abstracting of information pieces
- Collaborative analysis of information
- Inclusion of paper-based info in the SitAware systems
- Situational Report (SitRep) production
- Communication needs (e.g., validation of information, requests for support, informing the public).
- Preparation of printed documentation/backup material
- Sharing, presentation, and briefing on situational picture

**DRIVER Consortium Partners**
*Frequentis, AT* supports this workshop by providing input data (KML, EDXL, CAP) for the demonstration exercise.
*TNO, NL* supports this workshop by moderating data collection and outcome discussions.

**Monday, 16. 06. 2014 Bldg. 68 ECML**
a.m. Arrival of system providers
12:00 Lunch break *(Mensa nuova)*
13:30 System installation / setup / adjustment
17:00 End of Day 1

**Tuesday, 17. 06. 2014 Bldg. *100/1003***

09:30 Introduction: JRC, IPSC, Globesec.
Introduction: ECML SitAware Workshop
09:45 The **DRIVER** Project: Scope & Goals
10:00 Opening Talks: **The Common Operational Picture as Collective Sensemaking / Beyond the Myth of Control** *Kees Boersma & Jeroen Wolbers, VU Univ. Amsterdam*
11:00 Break
11:15 **Data Exchange Challenges** *Frequentis*
11:30 **Participants** Mandates & SAIM Systems in Use (ca. 5 mins each)
12:30 Lunch *(La Saletta)* *[courtesy of JRC]*
***Introduction of SAIM software products:***
14:00 IFV: **LCMS** *Willem Treurniet*
14:20 JRC: **CrisisWall** *Tom De Groeve*
14:40 IES: **JIXEL** *Uberto Delprato*
15:00 Gina: **Gina System** *Zbynek Poulicek*
15:20 HKV: **Dashboard** *Kees de Gooijer*
15:40 Coffee Break *[courtesy of JRC]*
16:10 Discussion: **End-Users' Perspective on State-of-the-Art & Vision 2020**
17:30 Closing of Day 1
20:00 Social Dinner *(Belvedere)* *[courtesy of JRC]*

**Wednesday, 18. 06. 2014 Bldg. 68 ECML**

***Demonstration of SAIM software products via predefined tasks:***
09:30 Introduction: Demonstration Exercise
09:45 **Systems Demo (parallel & sequentially)**
12:15 Wrap-Up Demo
12:30 Lunch *(La Saletta)* *[courtesy of JRC]*
14:00 **Handling Information Overload**
14:10 **Data Exchange Formats**
14:20 **Media Inclusion (Paper, PDF, …)**
14:30 **Situation Report Production**
14:40 **Sharing Common Operational Picture**
14:45 Coffee Break *[courtesy of JRC]*
15:00 Discussion: **Technological Perspective on State-of-the-Art & Vision 2020. Needed R&D and possible Roadmap.**
15:45 Closing of Day 2 & Workshop


www.jrc.ec.europa.eu

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Joint Research Centre

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European Commission • Joint Research Centre
Institute for the Protection and Security of the Citizen
Global Security & Crisis Management Unit

# 14 Annex B: Invitation to the workshop


**European Commission**
**Joint Research Centre**
**Institute for the Protection and Security of the Citizen**
**Global Security and Crisis Management Unit**


**DRiving InnoVation in crisis management for European Resilience**

# Situational Awareness & Incident Management – SAIM2014

5th JRC European Crisis Management Laboratory (ECML)
Crisis Management Technology Workshop

*Organised by:*
European Commission Joint Research Centre &
DRIVER Consortium Partners

Monday 16 – Wednesday 18 June 2014, Ispra, Italy

## Workshop Overview

The 1st JRC European Crisis Management Laboratory (ECML) workshop on mobile interoperability for international field deployment was held on 12-13 March 2012. One major outcome of the experiment conducted during this workshop was the need for proper ICT tools to support the work of crisis managers in On-Site Operations Coordination Centres (OSOCCs) or crisis management headquarters and situation monitoring centres. To deal with large amounts of incoming real-time information on an evolving crisis situation sophisticated editing, filtering, and visualization functionalities have to be available to crisis room staff. There is need for a software suite covering the whole workflow of procedures essential in crisis room operations (e.g., prioritisation, decision support, scheduling, resource planning, communications, etc.).

The 5th JRC European Crisis Management Laboratory (ECML) Workshop on Situational Awareness & Incident Management will pick up this demand of practitioners and crisis managers. A demonstration of available ICT solutions for crisis room operations will show the state of the art of such software suites. The proposed scenario and related actions to demonstrate are based on the outcomes of the 1st ECML workshop and the requirements formulated there by experienced emergency management practitioners from UN OCHA, UN WFP, EU member states' Civil Protection bodies, and NGOs.

The number of participants is limited to 35. Participation is free of charge. Lunches, coffee breaks, and social dinner are courtesy of the JRC. Registration is mandatory for preparing entry permits to the JRC site.

## Target Audience & Goals

The workshop will bring together 4 stakeholders in the design, development, and use of ICT tools for situational awareness in crisis room operation:

1. **Manufacturers & technology providers** of ICT solutions fostering situational awareness.
2. **Practitioners** of information analysis and crisis management, operating national or European situation rooms in the context of Civil Protection (CP) and/or humanitarian disaster relief operations.
3. **Academia experts** of fields relevant to situational awareness systems as broad as and including, e.g.:
   a. InfoVis & VA – Information Visualisation & Visual Analytics
   b. GIS – Geographical Information Systems
   c. CSCW – Computer Supported Cooperative Work
   d. Crisis Management
4. **JRC staff** operating the ECML, providing information analysis and early warning systems to the United Nations, the European Commission, EU member states, and the humanitarian and disaster relief community.

**Technology providers** will have ample room for the presentation of their solutions and products. Demonstration exercises will provide hands-on experience on systems' use. Participating and showcased ICT systems and products will be described in the workshop report. A collaborative evaluation by all participants will provide the basis for lessons learned, state of the art, directions and needs for further development.
**Practitioners** will have the opportunity to see promising designs of relevant tools and available systems for their work. The more important is their end-user perspective in the assessment discussions and the chance to give directions for future development needs of required ICT systems.

**Academia experts** are invited to present outcomes of their research in the form of near mature or ready to use ICT solutions for situational awareness and incident management. Respective system descriptions shall be included in the workshop report. Their input in the assessment discussion and in outlining future R&D needs is very much looked forward to.

## Programme

Day 1 afternoon is reserved for systems providers' arrival, installation, and setup of hard- and/or software.
Day 2 will open with a keynote talk after introductory presentation incl. the DRIVER project. Civil Protection end-users are then invited to present briefly their mandate and their systems in use for SAIM. End-users are kindly asked in addition to send in their vision and ideas on SAIM that would support their crisis management organisation best by filling in a brief questionnaire distributed 2 weeks before the workshop.

ICT system providers will then introduce their products and are kindly asked to address apart from technical aspects the philosophy behind their systems and the functional background of the systems' use. Templates for 1-2 slides to be included in their presentations will be distributed 2 weeks before the workshop. A discussion on the end-users' perspective on the state-of-the-art and a "Vision 2020" will close day 1.

Day 3 will start with the demonstration (in parallel; streamed to the video wall of the ECML) and then followed by the presentation and discussion of results and outcomes focused on the different tasks at hand. A collaborative evaluation and assessment discussion will provide directions for further R&D and will close day 2.

## Scenario

For the demonstration exercise the proposed scenario to be followed includes tasks at hand in crisis management headquarters and situation monitoring centres identified in the 1st JRC ECML workshop:

- Dealing with ever-changing incoming electronic information of field teams reporting on the situation.
- Deletion or masking of irrelevant, duplicate, or already processed information.
- Consolidation, association, or abstraction of multiple information pieces.
- Inclusion of paper-based information into the ICT systems.
- Situational Report (SitRep) production.
- Planning support for drafting of operation schedules or action plans.
- Communication needs (e.g., clarification and validation of information by callback to field teams).
- Preparation of printed documentation and/or backup material in case of ICT failure.
- Efficient utilization of big wall display area (e.g., multiple view visualization).
- Sharing of final situational picture to cooperating crisis room (interoperability, data formats).
- Presentation of and briefing on final situational picture to the crisis manager in charge.

## Data Exchange Formats

During the 1st JRC ECML workshop **KML**[1] feeds proved very suitable to ad hoc share information with an OSOCC from different field teams using different data collection systems. In addition to KML other formats for data and information exchange are of great interest: e.g., **EDXL-SitRep**[2], **CAP**[3], **WMS**[4], etc.
Depending on the support of mentioned formats the situational awareness ICT systems participating in the 5rd JRC ECML workshop will showcase input and/or output utilising these. Later the strengths and weaknesses implied by different formats will be discussed. All participating systems should ideally be able to read KML feeds, EDXL, and CAP that will provide information during the demonstration. Input feeds in other formats will be provided as necessary.

## Proposed Workflow of Demonstration Exercise

Participating systems shall deal with the following course of events. None of the presented tasks are eliminatory. Some systems will be specialised for some areas and therefore tasks not relevant for these systems shall be skipped and have no influence on the further demonstration.
The systems will be operated in parallel in different offices next to the ECML and their video output will be streamed to the wall-sized display of the ECML for the participants to follow the progress. In addition groups of participants are invited to visit the different system stations for hands on experience during the demonstration. Important steps of the exercise might be demonstrated sequentially in more detail on participants' (system providers or end-users) request.

00:00 An initial **input of information input feed** (e.g., field reports) is received that has to be **mapped and analysed**. Every 5 minutes an updated feed is provided giving more and more incoming information.

[1] http://www.opengeospatial.org/standards/kml/
[2] https://www.oasis-open.org/news/announcements/emergency-data-exchange-language-situation-reporting-edxl-sitrep-v1-0-committee-s
[3] http://docs.oasis-open.org/emergency/cap/v1.2/CAP-v1.2.html
[4] http://www.opengeospatial.org/standards/wms

00:05 More reports come in. Some **information duplicates** already available reports from initial feed. Duplicates should be **removed or masked** properly.

00:10 **Situation report** as seen by involved CP organisation **comes in via EXDL format**.

00:15 **Paper based** reports come in (e.g., fax or telephone notes). **Information** has to be **entered** in the system **manually**.

00:20 Ranking of so far know hazards and resulting **prioritisation of next steps** is performed.

00:25 First **Situation Report (SitRep)** has to be prepared asking for: situation summary, known hazards, affected area, affected number of people, relief units on location, prioritised list of most urgent actions to be taken.

00:30 Incoming information is contradictory to previously recorded information. **Identification of sources** and **clarification is required**.

00:35 **Paper based export** of available **information and interpretation** is requested for distribution and/or backup in case of system failure.

00:40 Large display area of big wall screen is utilised efficiently to **communicate situation overview / common operational picture**.

00:45 **Sharing of situation awareness** with cooperating crisis room and/or field units is requested. Exported information of system X ideally should be made available on provided server to be read by other participating systems.

00:50 End of demonstration exercise.

## Evaluation

During the exercises check lists of the aforementioned basic tasks will be used to record if and how the participating systems support its execution. Final remarks and explanations by technology providers complement the fact sheets for each system in the context of the demonstration. Detailed presentations of systems and exhaustive lists of functionalities as reported by system providers shall be part of the final report.
After the demonstration session a collaborative assessment performed in a discussion together with all participants. Lessons learned, state of the art in ICT solutions for situational awareness systems in crisis rooms, and interesting directions and needs for further research and development will be outlined.

## ECML Crisis Room Hardware Setup

The European Crisis Management Laboratory acts as a research, development and test facility for ICT focused solutions which integrate devices, systems, and relevant information sources to support crisis management needs, such as threats analysis, situational awareness, early warning, response and coordination, and collaborative decision making. For the exercise all crisis management systems shall be integrated in the ECML to a reasonable extent. Minimum requirement for participation is the streaming of the respective video outputs to the video wall. Individual setups and most practicable solutions to be clarified bilaterally. The ECML has the following setup:

### Video Wall

- 5x3 matrix (5m x 2.22 m) rear projection video wall
- Overall resolution 5120x2304 pixels
- Simultaneous digital & analogue video inputs
- Touchable over the whole surface (single touch, medium precision)

### Other hardware

- Samsung SUR 40 multi-touch table
- AppleTV for AirPlay streaming to video wall
- iPad, iPhones, Windows 8 touch tablets
- Professional video conferencing system (Tandberg), landline phones, webcams, microphones
- A0 plotter
- SMART Board interactive whiteboard (single touch)
- Guest WiFi
- Meeting table

### Computers

- 4 workstations to feed the video wall, 2 used to control it
- 1 server (Windows 7) to control the video inputs and drive the video wall

Figure 8: European Crisis Management Laboratory (ECML). Briefing of European Commission President Barroso, European Commissioner Geoghegan-Quinn, and EC JRC Director General Ristori

## Data Sources in addition to field reports

In emerging crisis situations directed information searches are often done by analysts. This includes websites, newsfeeds, or live streams of official sources (national metrological/geological institutes, national civil protection bodies), media sources (news agencies, national broadcasting stations, local newspapers), and private sources (twitter feeds of trustworthy NGOs or individuals). Such information once discovered and analysed contributes to the situation awareness and might be entered appropriately in the situation awareness system. For examples of possibly relevant sources, some of which could be described as situation awareness systems themselves, please see Table 3.

| Source | Type | URL |
|---|---|---|
| **DMA Monitor EMM Top Stories** | Website | http://dma.jrc.it/monitor?user=SituationRoom |
| **DMA Flood Map** | Website | http://dma.jrc.it/map/?application=FLOODS |
| **DMA Cyclone Map** | Website | http://dma.jrc.it/map/?application=CYCLONES |
| **EMM Newsbrief** | Website | http://emm.newsbrief.eu/NewsBrief/clusteredition/en/latest.html |
| **EMM MediSys** | Website | http://medisys.newsbrief.eu/medisys/clusteredition/en/latest.html |
| **GDACS** | Website | http://gdacs.org/ |
| **UN OCHA** | Website | http://reliefweb.int/organization/ocha |
| **Bookmark collection by country: official sources, weather forecasts, media & news agencies, etc.** | Websites | |
| **ReliefWeb** | Website | http://reliefweb.int/updates |
| **Euronews** | Videos, Website | http://www.euronews.com/news/ |
| **BBC** | Videos, Website | http://www.bbc.co.uk/news/ |
| **CNN** | Videos, Website | http://edition.cnn.com/ |
| **Twitter feeds (official & trusted)** | Feeds | |

Table 3: Examples of relevant information sources.

## Venue

The workshop takes place at the European Commission Joint Research Centre site in Ispra, Italy. Nearest airport is Milan Malpensa (MXP). The JRC organises and takes care of taxi transfers between nearby airports and train stations, the JRC, social dinner location, and the hotel. Our secretariat supports you in booking at nearby hotel in your name. All accommodation and other travel costs are at the participants' expenses.

| | |
|---|---|
| European Commission (EC) - Joint Research Centre (JRC) | http://ec.europa.eu/dgs/jrc/ |
| Institute for the Protection and Security of the Citizen (IPSC) | http://ipsc.jrc.ec.europa.eu/ |
| Global Security and Crisis Management (GlobeSec) Unit | http://ipsc.jrc.ec.europa.eu/?id=40 |
| European Crisis Management Laboratory (ECML) | http://ipsc.jrc.ec.europa.eu/index.php?id=659 |
| Inauguration of the ECML 2012 by EC President Barroso | http://www.youtube.com/watch?v=buREBB0jQP0 [07:10-10:27] |
| Via Enrico Fermi 2749, I - 21027 Ispra (VA) Italia | http://en.wikipedia.org/wiki/Ispra |



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