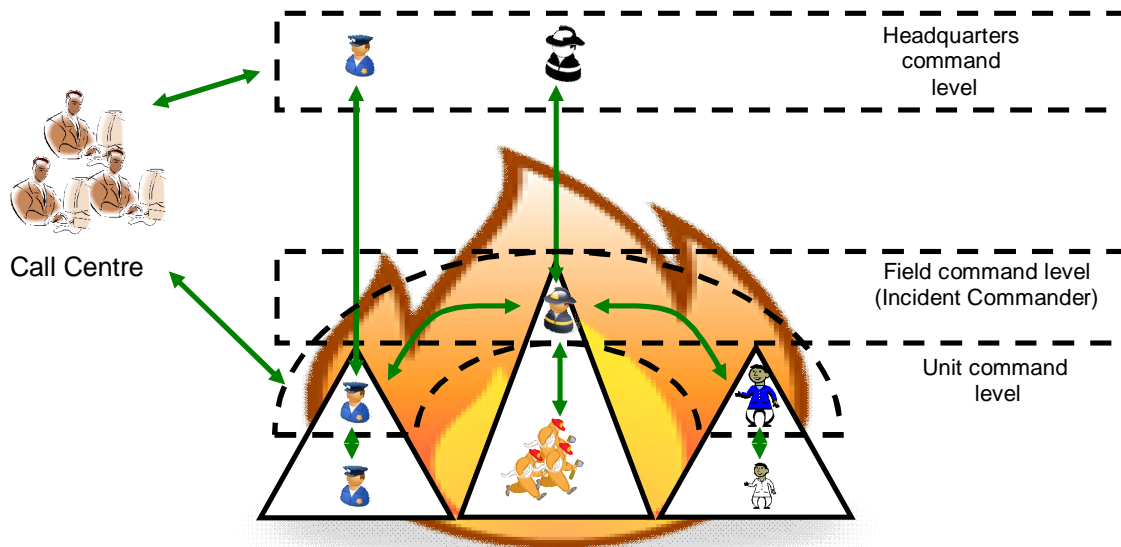




## Common Operation Picture Exploitation – COPE

January 31, 2011

The objective of the Common Operation Picture Exploitation (COPE) project was to achieve a significant improvement in emergency response management command and control performance, reliability, and cost. New solutions were created by combining a user oriented human factors approach with the technology development. The aim was a step improvement in information flow both from and to the first responder in order to increase situational awareness across agencies and at all levels of the command chain in emergency management situations.



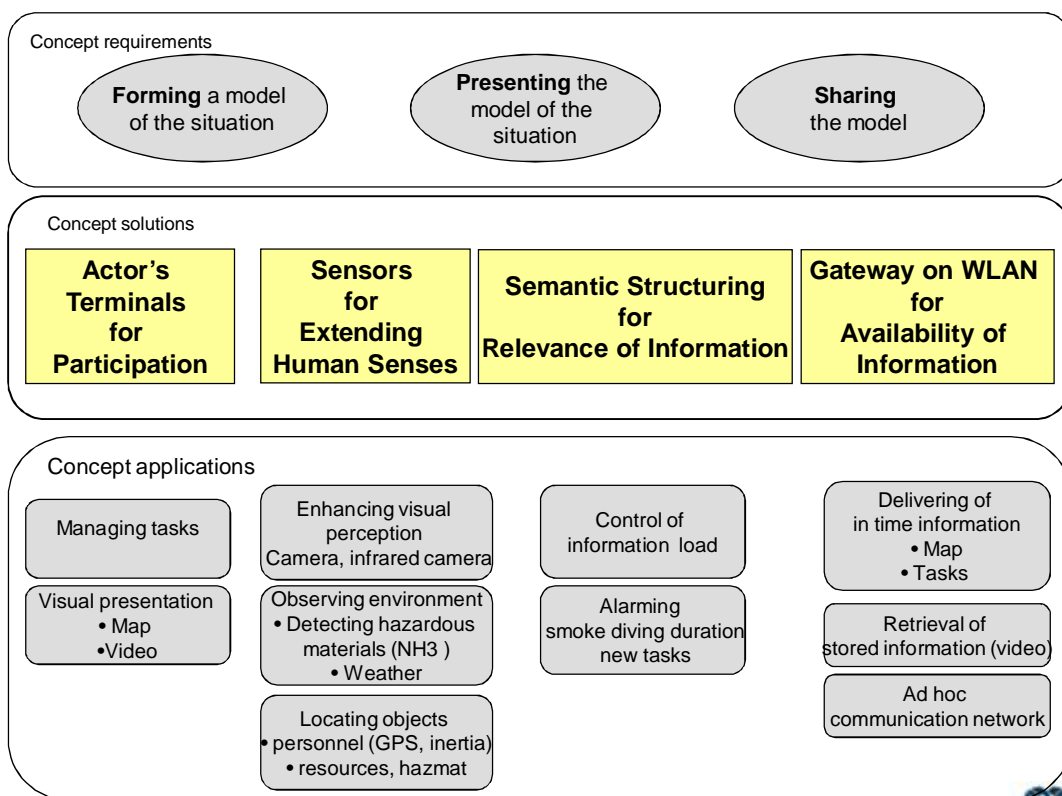
*Figure 1. Schematic representation of an organisation of multi-agency first response activity (Finland).*

A user-driven approach was taken to develop new technologies for supporting user information requirements at the scene of the event. First responders belong to a heterogeneous group in terms of emergency environments as well as roles, command structure, organisational and national differences. The project applied a wide range of human factors methods from functional task modelling to end user simulations to better understand the processes of individual agencies and to ensure that new systems both match requirements and can be integrated with legacy processes and technologies.

The project started on 1 February 2008 and the first reporting period ended on 31 January 2009. The first milestone of the project “Use case descriptions” was achieved. The work included multiple

interviews of end users, internal meetings, and workshops. Three different emergency situations were analysed and approaches for modelling and transform of accident scenarios into use cases were created. The different human factors modelling approaches were analysed and developed further.

## COPE Concept Solutions



*Figure 2: Common Operational Picture COP*

A generic concept of Common Operational Picture (COP) was defined (Figure 2) as the description in time of the emergency situation that supports the emergency responders within and between different agencies to act appropriately. The primary functions of the COP are to support the development and maintenance of common ground and to support coordinated action across actors. The term Concept of Operations (CONOPS) is used to indicate the design target that composes the work organisation, human activity and technologies. The new CONOPS developed in COPE project is based on a model of current first responder operations.

The second milestone “End user requirements” was achieved during the second period that ended on 31 January 2010. It included the specification of the field work methodology and establishing end user cooperation with several agencies and fire fighter incident commanders. First responder activity was observed and over twenty interviews in three countries were accomplished. Methods and

technologies were reviewed for information model development, command and control solutions, sensors integration, communication, and decision support.

The third milestone “Scenario descriptions from a user perspective“ was also achieved during the second period. The document describes the Key Performance Indicators (KPIs) which are used in the evaluation of the COPE technologies and also the human factors informed requirements for the test scenario. Two leading ideas were developed. First, it is maintained that the evaluation has two forms, verification and validation. The distinction between them is important because the focus of evaluation differs depending on which one is in question. Verification focuses on controlling the fulfilment of the set of requirements for the designed applications. In contrast to this, validation is more synthetic in nature. It is focused on evaluating the added value of the COPE technologies to the emergency response activity as such. Thus validation is based on comprehensive analysis of the first responder activity during the final tests. Validation has an integrative character and considers first responder behaviour from a context-dependent point of view. The second theoretical idea proposed is the set of systems usability metrics which identify different types of indicators.

The goal of the technology mapping work package was to align the user requirements with the technology solutions by brokering and technology mapping; to define the system architecture for technology solutions, and to develop user driven scenarios as well as defining the key performance indicators. The technology mapping process is a continuous analysis of interim findings from the human factors and the technology work, and consultation between end-users and technology developers as potential solutions were tested and evaluated. In the technology solutions work package, a systems integration task brought together the outputs of the other tasks addressing the areas of command and control, sensors, communication, decision support and first responder solutions. The final solutions were later trialled and evaluated in realistic scenarios with end users.



*Figure3: COPE integration trial in ESC premises in May 2010*

The first COPE design study trial was successfully carried out with the facilities of the Emergency Services College (ESC) in Kuopio (Finland, May 2009). The evolution of the COPE concept and technologies was continued in the technology integration trial in Bucharest (Romania, March 2010) and in an integrated test trial in Kuopio (May 2010). The trial in Bucharest concentrated on the testing of the first responder sensor platform and wireless communication connections.

In May 2010 a user demonstration and a technology integration study was carried out in Kuopio ESC training grounds. In the tests the developed technologies worked as intended and a large amount of data was collected about the usage of the systems. Many operational enhancement needs were identified and during the summer of 2010 these were implemented by the technology developers.

The fourth milestone “Technology Solutions for trials evaluation” was included a prototype demonstrator that was delivered and used in the Kuopio trial in May 2010. The fifth milestone was the “First User Evaluation trials” that were also carried out in Kuopio in September 2010. The sixth milestone was the dissemination event that took place in the PSCE conference in November 2011 (Public Safety Communication Europe, see <http://www.psc-europe.eu/index.php?id=378#c885> ).

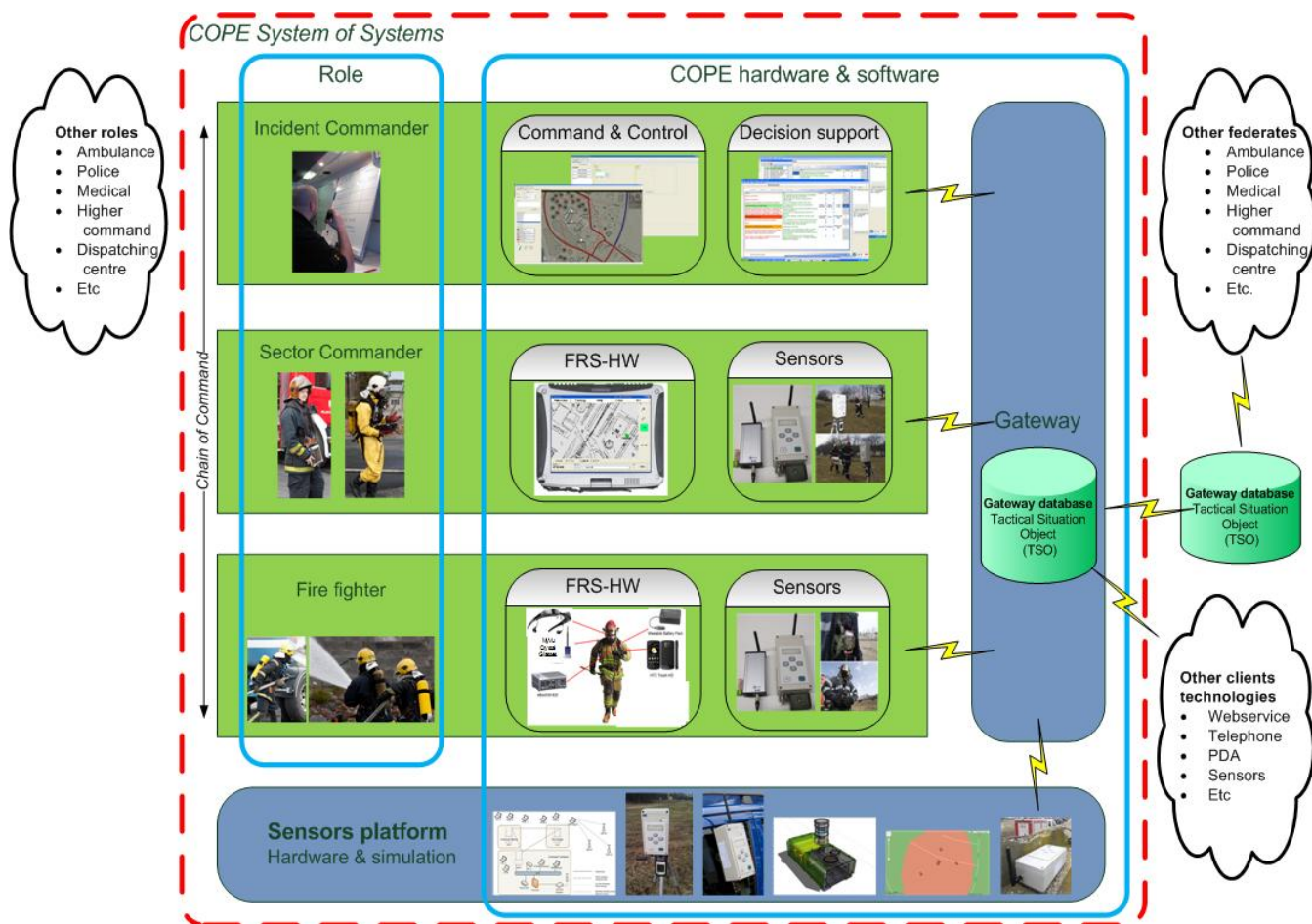


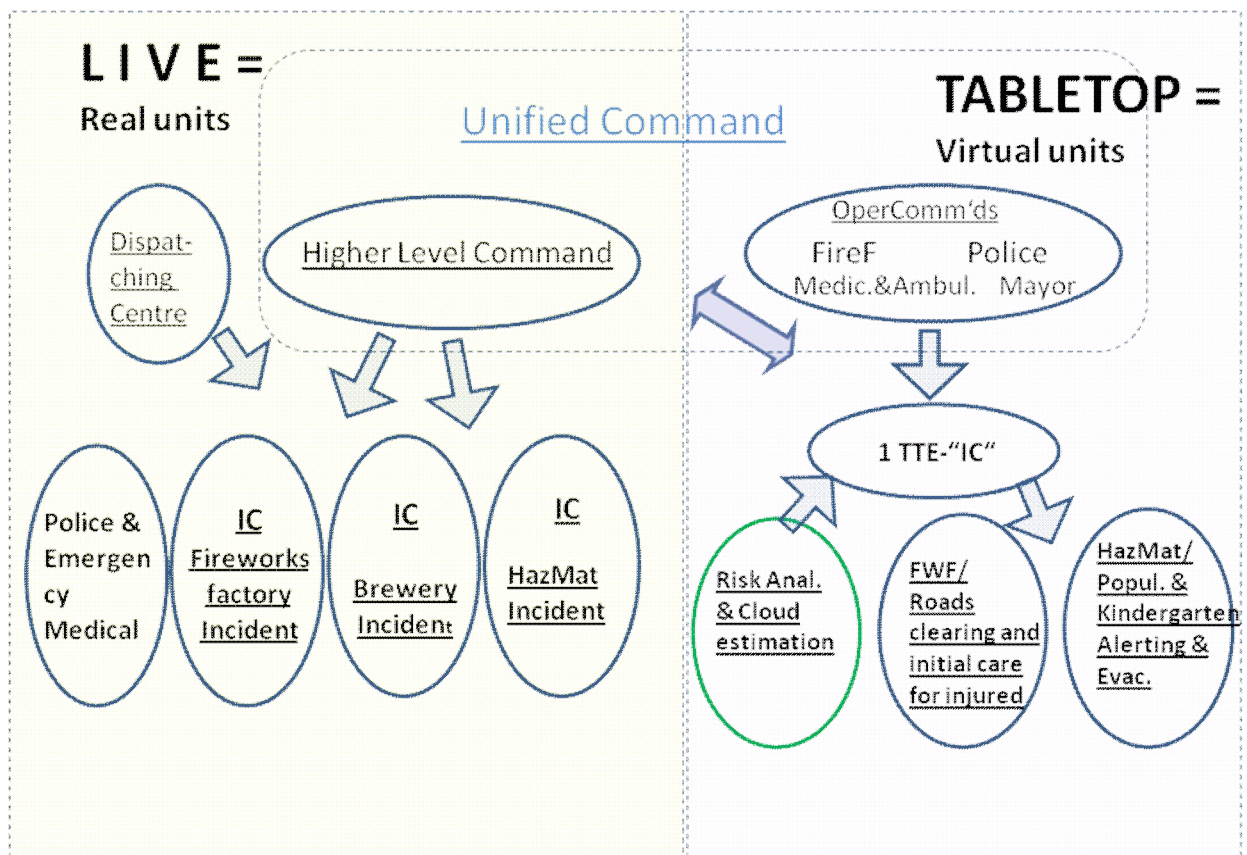
Figure 4: COPE system of systems

A final trial of COPE system of systems was carried out in Kuopio Emergency Services College training grounds during September 23<sup>rd</sup>–25<sup>th</sup>, 2010. In the trial, various COPE technologies to

support common operational picture exploitation were demonstrated (Figure 4). In a highly complex environment, the COPE system and its technologies were exposed to the developed COPE scenario, in a two tie setting (Figure 5):

- The Live Exercise (LIVEEX) with real fire and hazards events and first responders involve
- The Tabletop Exercise (TTE) with end users involved in additional C2 and decision making tasks

## COPE Trial Setup



*Figure 5: COPE Trial Setup*

The LIVEEX was designed to test the system in reality, the TTE to expose the COPE system to a very large and complex scenario which was not possible to fully feature live.

Both parts of the exercise were based on the same scenario and were synchronised. They produced the basis for the evaluation, in the form of data files, questionnaires, feedback from interviews and past-event debriefings, and recordings. This information base was analysed and the results were documented in technical reports (WP5) Human Factors documentation (WP2), and in the final evaluation summary report (WP6).

The main research results of the COPE project can be found in the following public deliverables that are also available on the COPE website (<http://cope.vtt.fi>):

***COPE Technology Enabled Capability for First Responder (D2.3)***

This deliverable contains the main results of the Human factors work carried out in COPE project. The report provides first an overview of the usage centred design approach, the research measures taken and the outputs provided by the human factors group of the project. Then the components of the COPE technology are explained from the point of view of the three main end-user groups, the fire fighters, sector commanders and the incident commanders. The main part of the report deals with the evaluation approach used in assessing the technology during the design process, and with the results of this evaluation.

***Trials Results and User Feedback (D6.6)***

This deliverable describes the results, findings and conclusions of the Final COPE trial held between 22-24 Sept. 2010 at the training site of the Finnish Emergency Services College in Kuopio. The report contains descriptions of the trial set up and the methods used.

***Report on the Use and Benefits of Wearable Displays, Sensors and Localization Technologies for First Responder Support (D5.6.3)***

This deliverable details the types of wearable sensors and displays that were used by the first responders in the COPE trial as well as their associated functionalities. This document describes the operational tasks for which the first responders were using the equipment. Finally this document details the advantages and disadvantages of the technologies based upon the analysis of user feedback alongside observed operational results.

COPE website: <http://cope.vtt.fi>