

Executive Summary:

Common Operation Picture Exploitation - COPE
January 31, 2011

The objective of the Common Operational 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. 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 results show that the objectives of the COPE project were reached. The first sentence of the abstract of the COPE Description of Work sets the frame requirements of the project:

"The Common Operational Picture Exploitation (COPE) project will integrate COTS solutions and novel technologies to achieve a step change 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."

This goal could be achieved by:

- The identification evaluation, screening and selection of a set of different technologies adequate to this task;
- The in-depth analysis of requirements for building the COPE innovative solutions;
- Several development activities in modifying and adapting the technologies for the purpose of COPE;
- An intensive effort in regarding the human factors aspects in all processes of technology development and verification, and in trial exercise design and validation;
- The integration of all components into a demonstrator "COPE System of Systems" and the setup of a large scenario based mixed live and tabletop type trial exercise.

According to the judgement of the first responder end-users and external stakeholders, the system and its components worked from the satisfaction level "good" to "very good". Some temporary failures and reductions in functionality were at a level usual for such a complex research project, and did not derogate the detailed and overall result as planned.

The COPE solutions form a basis for advanced common operational picture (COP) solutions and its status of advancement can be compared to other highly advanced COP projects. Efficient use of the COPE results in real operations will require further customisation for the individual domains of the customers and intensive training of the end-users.

The COPE dissemination event that place in the PSCE conference in November 2011 (Public Safety Communication Europe, see <http://www.psc-europe.eu/index.php?id=378#c885>).

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

Project Context and Objectives:

The key objective was to develop novel technical support tools and mechanisms to collect, gather and disseminate information to develop a common operational picture (COP) for a significant improvement in emergency response management command and control performance, reliability, and cost. This was to be accomplished through the following project objectives:

- To carry out research for specifying and understanding the information requirements of the first responder;
- To enable effective and appropriate communication links between teams at the First Responder level and to enable them to feed information back to support the common operational picture;
- To develop a user driven methodology to understand working processes in order to map technologies on to user requirements;
- To define information requirements for the First Responder;
- To define how the First Responder can feed the COP to give ground truth and to reduce the cultural power distance between the gold command and the ground;
- To trial and evaluate the technological viability of the solution in a realistic scenario environment.

To support the primary work programme topic the following project objectives were accomplished for the supporting decision support technologies:

- To develop and evaluate tailored decision support systems which address requirements both today as well as developing sophisticated computer-based support tools;
- To enhance cognitive situational awareness of the First Responder capability in terms of decision making support.

The primary focus of the project was the COP in the emergency situation and to support this, technologies were developed and tailored to allow common operational evaluation driven by the use cases for command and control.

The objectives for the first project period included one milestone "Use case descriptions" and several other deliverables. Generally the objective was a thorough understanding of the first responder work and the issues essential for COP, and a review of the appropriate methods and technologies.

The objectives for the second period included two milestones "Human Operator Support requirements" and "Scenario descriptions from a user perspective" and also several other deliverables. Generally the objective was to map the user requirements to the technological possibilities, design and develop the technological solutions, and also to design the trials and scenarios for testing the technologies.

The objectives for the third period included three milestones "Technology Solutions for Trials Evaluation", "First User Evaluation Trials", and "Final End User Event" and also several other deliverables. Generally the objective was to test the COPE concept and the technological solutions in several trials (Bucharest technology integration trial, Kuopio integrated test, Rochester technical integration trial, and Kuopio final evaluation trial).

Objectives for each work package

WP1 Exploitation (lead beneficiary BAE UK):

The purpose of Work Package 1 was to "to maintain end user group involvement throughout the COPE programme, assess the key impacts of the programme (with respect to performance, reliability, speed & cost) and develop a deployment route map."

WP2 Human Factors (lead beneficiary VTT):

The objective of WP2 was to ensure that a usage-driven approach is adopted in the design of first responder decision support tools. Human Factors (HF) principles were considered at every stage of the design which made this work package a transverse action that contributed to all other work packages. In developing and accomplishing the usage-driven approach WP2 worked in close interaction with WP3 and WP4.

WP3 Concept of Operations and User Requirements (lead beneficiary TCD):

The objective of WP3 was to build a model of current first responder operations on the basis of which a COPE Concept of Operations (CONOPS) was to be developed, a set of end-user requirements were

to be delivered to the technology developers and technology evaluation criteria to be identified for evaluating the technology in operational context.

WP4 Technology Mapping (lead beneficiary BAE UK):

- (1) To align the User requirements with the Technology solutions by brokering and technology mapping;
- (2) To define System Architectures for technology solutions;
- (3) To develop user driven scenarios which define both WP5 development towards integrated solutions, as well as define the key performance indicators for success in the evaluation trials (WP6).

WP5 Technology Solutions and Integration (lead beneficiary BAE C-ITS):

The objective was to develop the technology solutions for addressing the requirements defined in WP2, WP3 and WP4. 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 trialled and operational valuated in realistic scenarios with end users within WP6.

WP5 Task 5.1 System Integration (lead beneficiary BAE C-ITS):

The final objective of WP5.1 was to set up a prototype systems integration environment and to test and verify the systems of systems execution. In order to achieve this, an information model that supports different agencies, nations and command levels needed to be defined and also the communication infrastructure to be used for integration. Interfaces and components, and their interaction need to be analysed. The effects of component failures were also to be studied.

WP5 Task 5.2 Command and Control (lead beneficiary BAE C-ITS):

One COPE project goal was to enhance the exploitation of the common operational picture. The COPE Command and Control System (C2) supports this by processing data from different sources and fusing information to get a more complete and better COP. The information flows from the sources through different processing stages and in the end out from the C2 system as missions or orders to resources so that they can act correctly and in a safe way to get the emergency or crisis condition back to normal.

WP5 Task 5.3 Decision Support (lead beneficiary GMV-Skysoft):

- (1) Design of the Cope Decision Support System software and document its specifications;
- (2) Development and testing of the software;
- (3) Producing the User Manual, Test Plan and Test Report documents.

WP5 Task 5.4 Sensors (lead beneficiary UTI):

The objective was the development of the Sensors Integration Platform (SIP). The Sensors and the sensor integration platform send and receive information to first responders as well as the operational command and control centre through the network. The Sensor platform is in charge of isolating the rest of the system from the "sensor" environment, so any data request will be issued and served in a standardized way.

WP5 Task 5.5 Technology Development and Integration & Communication (lead beneficiary VTT):

The goal was to develop communication methods including wireless and wired communication techniques for the needs of the project. One of the objectives was to identify and progress a set of network issues where special solutions are required to build and operate a communication infrastructure for emergency management.

WP5 Task 5.6 First Responder (lead beneficiary BAE UK):

The overall objective was to 'Take a user-centred approach to investigating how technologies such as mobile computing, ad-hoc communications networks, and localisation algorithms, can support and enhance the first responder capability.'

WP6 Operational Testing and Evaluation (lead beneficiary CESS):

The main objective of WP6 was the evaluation of the technological solutions as developed and implemented in WP5. The framework of the evaluation was set by the results of the preceding efforts

mainly of the Human Factors (HF) analysis (WP2), the concept of operations (WP3) and of the technologies and the overall COPE system as developed in WP5.

Project Results:

The objective of the Common Operational 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.

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.

A generic concept of Common Operational Picture (COP) was defined 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 was 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.

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.

A user demonstration and an integrated technology test trial 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 were implemented by the technology developers.

The fourth milestone "Technology Solutions for trials evaluation" was already included a prototype demonstrator that was delivered and used in the Kuopio integrated test trial in May 2010. The fifth milestone was the "First User Evaluation trials" were 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>).

The final trial of COPE system of systems took place in Kuopio Emergency Services College training grounds during September 23rd-25th, 2010. In the trial, various COPE technologies to support

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

- 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

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 be 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, as also the other public deliverables, 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 COPE final evaluation trial. The report also contains short descriptions of the trial set up and the methods used. The report consists of a detailed evaluation of the trials findings as recorded in the questionnaires as well as the findings reported by the external stakeholders and the project team. In addition, a detailed evaluation of the achieved state of the art is given. It is based on the set of criteria important for modern and future

COP systems which have been derived from several leading COP projects worldwide. The criteria take into account technological, operational, and end-user related evaluation.

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 final trial as well as their associated functionalities. The document also describes the operational tasks for which the first responders were using the equipment. Finally it details the advantages and disadvantages of the technologies based upon the analysis of user feedback alongside observed operational results.

According to the judgement of the first responder end-users and external stakeholders, the system and its components worked from the satisfaction level "good" to "very good". Some temporary failures and reductions in functionality were at a level usual for such a complex research project, and did not derogate the overall trial results.

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

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Work progress and achievements

WP1 - Exploitation (Lead beneficiary: BAE UK)

Deliverables:

- D1.1 - Cross Project Workshop Report (workshop held 12/13 May 2008)
- D1.2 - Dissemination Route Map
- D1.3 - Final Project Event

Summary:

The first task under WP1 was a cross project workshop which was held in London in May 2008 in support of Task 1.1. Previous related work and potential stakeholders were present at the workshop. In addition, as part of Tasks 1.1 - 1.3, various end-users (for example, in the UK Avon Fire & Rescue Service) participated in the human factors and CONOPs work (WP2 and WP3). They were also invited to provide support to the various user trials and evaluations. These stakeholders were also invited to attend the D1.3 End of project workshop and to provide their feedback and ideas for technology exploitation in future (feeding into D1.2). Other COPE partners were encouraged to contact and record contact details of potential stakeholders (users, equipment providers, program managers, and policy makers) in preparation for exploitation activities identified in D1.2 (Exploitation road map) and D1.3 (End of project workshop).

During the period M13-M24, WP1 was focussed on tracking and recording the various interactions that the Consortium partners have had with external stakeholders, end users, equipment developers and vendors, and other researchers working in the emergency response period. Contact information for these external parties were tracked on a spreadsheet provided by CESS. In addition, activities related to current and future exploitation and dissemination activities were requested from all partners to support the development of D1.2 Exploitation Road Map. These activities were recorded under the following headings in D1.2:

- Networks: End Users - who have you spoken to about COPE in the end user community? Do you have any plans for follow up with those people?
- Networks: Researchers - who have you spoken to about COPE in the academic/research community? Do you have any plans for follow up with those people?

- Networks: Technologists - who have you spoken to about COPE in industry/R&D community? Do you have any plans for follow up with those people?
- Networks: Other Stakeholders - who have you spoken to about COPE in other related communities (e.g. equipment manufacturers; policy makers; government organizations related to emergency/crisis response, emergency/crisis planning, and/or emergency/crisis management? Do you have any plans for follow up with those people?
- Publications (Past) - what papers have you written for external publication (either academic or professional journals or other publications)? (Please provide references)?
- Publications (Planned) - what papers do you plan to write for external publication (either academic or professional journals or other publications)? (Please provide the names of the journal or publication)?
- Meetings/Conferences (Past) - what meetings or conferences have you attended in connection with COPE (presenting or exhibiting; representing COPE in some way)?
- Meetings/Conferences (Planned) - what meetings or conferences do you plan to attend in connection with COPE (presenting or exhibiting; representing COPE in some way)?
- Technology Gaps - What areas of technology have you identified through the COPE project that need to be explored further but are beyond the scope of the COPE project (time/money)? What technology will you be exploring as a result of your experiences working in COPE? (E.g. GPS III/Galileo; WiFi RFID triangulation/AeroScout#174;)
- Research Gaps - what areas of conceptual/theoretical work have you identified from your COPE work that you have not been able to explore but hope to in the future? (E.g. link between COP, common ground, and coordination of action in multiagency teams;)
- Operational Issues - what areas of operations have you identified in the course of your work that you believe might be worth pursuing in terms of technological or research opportunities? Are there areas of emergency response operations that appear to be opportunities for applying existing or near-future technologies or research to? (E.g. common symbology set for Incident Ground/operational level command and control)
- Non ER/IC Opportunities - What Areas outside Emergency Response and C2 for Incident Command have you identified for further exploitation of the COPE project work?

With respect to D1.3, the final project workshop, contact had been made with the Public Safety Communication Europe (PCSE) forum with respect to their bi-annual meetings and the possibility of conducting the COPE final event in October/November 2010 in Brussels (<http://www.psc-europe.eu>). Eventually, it was decided that D1.3 would be arranged to coincide with the PSCE November/December meeting in Amsterdam. Invitations were sent to all COPE participants and to a variety of stakeholders and end users who had been contacted at various points in the project. Three presentations for PSCE were arranged with the PSCE coordinator Marie-Christine Bonnamour: 1) COPE overview (1 hour, to be presented by Jari Hamalainen (VTT) and Aapo Immonen (ESC), 2) Technology Discussion (30 minutes, to be lead by Johan Forsling (BAE C-ITS), and 3) Human Factors and Evaluation Summaries (30 minutes, lead by Leena Norros (VTT) and Reinhard Hutter

(CESS). In addition, exhibition space was identified for project posters and COPE system demonstrations.

This PCSE press release describes the final event:

"Held in CISCO Systems premises in Amsterdam (the Netherlands), the conference brought together over 80 participants including top-level policymakers, academic researchers, industrial experts and other interested stakeholders who discussed the new developments in this domain. In particular, they had an opportunity to learn about various aspects of Critical Information Protection and Public Warning Policy and broadened their knowledge of existing projects in public safety communications.

For the first time, the PSCE Forum Conference successfully hosted also an external dissemination event on Common Operational Picture Exploitation (COPE) Project. The objective of this EU funded project is to create technological solutions which enable improved emergency management by better command and control performance and reliability of technical support. Booth presenting the COPE technology developments was available during the conference. More information about the project is available at <http://cope.vtt.fi/>"

Specific Results:

- A cross-project workshop was held in May of 2008 in support of Task 1.1. The presentations on related work such as RUNES, MARIUS, and OASIS, were included with a written summary report of workshop, were delivered as D1.1, and accepted by the partners.
- Final project Event (D1.3) was held in Amsterdam on Nov 30-Dec 1, 2010 as part of the PSC Europe meeting. Presenters and exhibitors were identified and arrangements made. A summary report of the workshop was provided.

WP2 - Human factors (Lead beneficiary: VTT)

Deliverables:

- D2.1 - Use case descriptions
- D2.2 - HF based design inputs to COPE technology
- D2.3 - COPE Technology enabled capability for First Responder

- D2.4 - Usage-centric design cooperation

Summary:

According to the initial plans of the COPE project the design and development of COPE technologies should follow a usage centred approach. Fulfilling this requirement was thought to be essential for the successful development process. Indeed, the participants of the COPE project agreed from the beginning that in order to create added value to the emergency response activity and all the end users it was necessary to put sufficient effort to defining what the demands of the emergency response work are and what kind of properties successful technologies need to have in order for them to become part of the future emergency response work. We labelled this proactive perspective as the target of defining and evaluating the potential of the developed technologies. Hence it was necessary to construct an interdisciplinary design process with which the end user participants could be actively involved.

In the very beginning of the project, the human factors group worked rather independently from the technology developers. During this phase several research steps took place.

- Human Factors White Paper was written by WP2 group. The aim of this paper was to define the scope of the COPE project with regard to the entire emergency management, and to provide an initial conceptualisation of the concept Common Operational Picture COP.
- D2.1 "Use case descriptions and a Human Factors Engineering framework" was written. It focused on the analysis of first responder work on the basis of previous literature. A proposal for so called initial use cases was made and a plan for empirical data gathering concerning end user activities proposed.
- D3.2 "End user requirements" (responsibility of WP3) was supported by the WP2 activities focused on empirical user studies in three countries Finland, England and Ireland, in which Critical Decision interviews and observations at work places were accomplished.

At this stage it became clear that more interaction was needed among the human factors group and the engineering design. WP2 proposed that design oriented experiments and four technology mapping working groups were established to increase the interaction and joint design work. The work resulted in D2.2 "HF-based design inputs to COPE technology - Conceptual and empirical considerations of Common Operational Picture". This deliverable includes analysis of end user interviews. Moreover it reports in detail the design study trial accomplished at the Emergency Services College in Kuopio (May 2009). The deliverable also makes a first proposal for the methodology to be used in the human factors evaluation of the COPE technology. WP2 contributed to all the four technology mapping working groups the work of which were summarised in Deliverable 4.2. "The technology mapping workshop outputs".

The work for defining the concept of operations was found to be restricted if it only would focus on the singular technologies. Hence, a comprehensive architecture was defined (by WP5 and WP4) and the work for defining the quality criteria for a good system could begin (Key Performance Indicators). WP2 also took the responsibility for D4.4 "Scenario descriptions from user perspective - Key performance indicators and scenario requirements".

As the next step the work was focused on analysing the data from available end-user interviews, design experiments etc. to formulate a set of comprehensive human factors evaluation metrics. The metrics was used in two large scale exercises with end-users and developed further. The first was the integrated test in Kuopio (May 2010) that was planned with ESC. The results of end-user studies in design contexts were used to improve and finalise the COPE technology concept. the trial also resulted in concrete design improvements in C2 and First responder systems as a joint work between WP2 and WP5 (extra deliverable D2.4). The developed training material could also be used for training the end-users in the final demonstration. The task was accomplished by WP2 (material included in D2.4).

The final evaluation trial and demonstration took place in September 2010 in the form of a large-scale final exercise. About 60 end-users and experts participated in the exercise and comprehensive data acquisition was organised by the human factors group concerning the activities of the personnel and their experience of the technologies. WP2 also took an active part in planning the trial.

Deliverable 2.3 "COPE technology enabled capacity for first responder" summarises the empirical results acquired of the usage of COPE technologies during the project. For synthesizing the results verification and validation evaluations were accomplished and reported. For the validation, which is focused on the issue of the added value of the COPE technology for future emergency response, a new "Usability Case" approach was utilised and developed further.

WP3 - Concept of operations and user requirements (Lead beneficiary: TCD)

Deliverables:

- D3.1 - Model of user operations and concept of operations
- D3.2 - End user requirements
- D3.3 - Technology Evaluation criteria

Summary:

The evaluation criteria presented in D3.3 were based on a model developed in TCD known as the Knowledge Space Model. The Knowledge Space Model (KSM) is a framework structured around a series of modules pertaining to various elements which either characterise the nature of human input and output to an operational process or highlight the inputs and dependencies required in the performance of a task or operational process from other sources. The KSM allows for a broad interrogation of operations including the various inputs, outputs and dependencies and is divided into the following categories:

- Task/Process logic. This includes the analysis of the internal dynamics of a task or process, the sequence of actions, parallel activities, etc. The external links and dependencies are also examined which feed into and receive an output from the task or process.
- Process Enablers include the various human competencies (skills, experience and knowledge) that are required to enable the process, the availability and suitability of procedures that specify or guide the action being carried out and the social relationships and interactions that take place and allow a process to run more or less smoothly.
- Process Resources include the people and their characteristics, the required information to perform a task or process and the material and equipment involved.
- Context includes personal factors such as health and wellbeing of people involved, their family situation, sources of stress, etc., environmental factors such as occupational health, noise, ventilation, etc., and organisational factors including organisational structure, culture, attitudes to safety, etc.
- System Outcome refers to what the process produces in terms of lower level
- Performance measures (criteria).
- Impact refers to the relationship between the aspects of these modules and the system outputs and how they impact of the overall performance of the system. In terms of emergency crisis management such as fire fighting. These may be listed as enhanced safety, effectiveness, efficiency, time and cost.

Specific results: The most significant result of WP3 is that it has been able to provide a number of requirements in order to give WP5 partners an indication of issues to be addressed. This proved to be a useful starting point for iterative exchanges between technology and human factors partners that were carried over into the current reporting period. Another achievement was to win Dublin Fire Brigade, Cobh Fire Services in County Cork and the Irish Police Service, An Garda Síochána, as end users to replace the Police Service of Northern Ireland that had to withdraw from supporting the project.

WP4 - Technology mapping (Lead beneficiary: BAE UK)

Deliverables:

- D4.1 - Technology Mapping Framework
- D4.2 - Technology Mapping Workshop Outputs
- D4.3 - Architecture for Technology Solutions
- D4.4 - Scenario Descriptions from a User Perspective and Key Performance Indicators

Summary: This task required the matching of requirements from WP2 and WP3 and the technology capabilities offered by the WP5 partners. Given the user-driven design approach, we spent time supporting the human factors and CONOPs work packages with their task analysis work and end-user requirements analysis in order to understand the activities that need to be supported and enhanced by the potential technologies. In addition, each technology partner was asked to provide a description of their technologies with respect to the types of problems that they believed their technologies solved (within an emergency response incident command context). This process was guided by a framework document delivered as D4.1 Technology Mapping Framework. D4.1 clarified the relationship between inputs from WP3 and WP5, described the WP4 outputs to support the technology development and evaluation, and provided a structure for the process. This structure deviated a little from that proposed given the iterative approach being taken with respect to the identification of the end-user requirements and the iterations of the various technology capabilities. The technology mapping process was a continuous one of analysis of interim findings (from the HF work and the technology work) and consultation between end-users and technology developers as potential solutions are tested and evaluated. This made the technology mapping process a more open process than merely nailing it down to one or two workshops

Technology Mapping working groups were then set up to provide the human factors and technology perspective for the key capabilities that COPE will deliver. Each Working Group conducted various meetings and workshops between the human factors representatives and the technology partners to support the technology mapping activities. Each working group completed a Technology Mapping table that was delivered as D4.2, outlining the operational requirements, the technology capabilities and initial ideas about how to measure the effectiveness of the technology concept in supporting the operational requirements.

Following the identification of the potential technology capability/operational requirement matching, the actual technologies being developed were clarified and a systems' architecture for the technology solution to be evaluated by the COPE project was delivered as D4.3. In addition, based on D4.3 and

the evaluation ideas generated in D4.2, D4.4 was developed, primarily by VTT (Leena Norros & Paula Savioja). D4.4 was a description of scenarios from a user perspective and key performance indicators for the final technology evaluation.

WP5 - Technology solution and integration (Lead beneficiary: BAE C-ITS)

Summary: In the beginning of the project the WP5 partners created a technical white paper which described the technical starting point of the project. Present technologies and ideas of improvement and development were discussed and described. The purpose was to introduce all partners in the project to the technique that will be used in the COPE project. In the second phase of the first project year WP5 had its focus on design. Use cases and scenarios were developed by other work packages and WP5 took part of these results and made several comments. In parallel WP5 developed planned deliverables. All with a focus on design, laying the ground for the development work in the next year of the project.

During the second period the system requirements were developed. Different Work Groups (WG) were formed, each WG having its own technical focus. Each WG had representation from both human the human factor and technical partners of the project, ensuring that all aspects of the requirements were addressed. The results from the WG's were then used by the technology partners for the development work. In the end of the second project year the development work was in progress and integration tests have started.

The main focus of the third year of the project was integration and test. The COPE Gateway was set up for every partner to use. A integration plan was developed and used during implementation. At first integration was performed remotely. In May 2010 the first live integration meeting was held in Kuopio with several important findings, resulting in an intense work until the next technical integration meeting in the end of August 2010. This meeting was the last integration test before the final trial in September 2010 in Kuopio.

During the final trial the system was tested live in a realistic environment with a large amount of people involved. The evaluation results are described in D6.6 and D5.6.3.

WP5 Task 5.1 - System Integration (lead beneficiary BAE C-ITS)

Deliverables:

- D5.1.2 -1 - System risk analysis document version 1

- D5.1.2 -2 - System risk analysis document version 2
- D5.1.3 - Interface and dependencies analysis document
- D5.1.4 - Initial integration activity report
- D5.1.5 - System trial integration report
- D5.1.6 - Test & verification protocol
- D5.1.7 - Prototype Demonstrator to be used in WP6

Summary: Prototype systems integration environment was set up for testing and verifying the systems of systems execution. In order to achieve this, an information model that supports different agencies, nations and command levels needed to be defined and also the communication infrastructure to be used for integration. Interfaces and components, and their interaction were analysed as well as the effects of component failures.

Specific results:

- The COPE data dictionary was created
- All partners needing the COPE Gateway could successfully connect to the gateway
- Integration tests according to the Integration Test Matrix were conducted
- Integration testing with all partners showed that the systems worked together.

WP5 Task 5.2 - Command and Control (lead beneficiary BAE C-ITS)

Deliverables:

- D5.2.1 Overall description of adapted C2 solutions
- D5.2.2 - Data information flow design document
- D5.2.3 - Data processing design document
- D5.2.4 - Software and I&VV plan

Summary: The COPE Command and Control System (C2) supports the exploitation of the Common Operational Picture (COP) by processing data from different sources and fusing information. The information flows from the sources through different processing stages and in the end out from the C2 as missions or orders to resources. The resources can then act properly and in a safe way in the emergency situation.

Specific results:

- The C2 application was developed according to requirements defined by the C2 working group.
- The C2 application was successfully connected to the COPE Gateway and is capable to display data from other partners
- The C2 application was run in several instances for different roles of users in the final trial.

WP5 Task 5.3 - Decision Support (lead beneficiary GMV-Skysoft)

Deliverables:

- D5.3.1 - Design definition for Decision support
- D5.3.2 - Decision support software (SW) package
- D5.3.3 - Decision Support integration and validation plan
- D5.3.4 - COPE decision support system definition

Summary: Cope Decision Support System (CDS) including risk cards in electronic form was developed. The output of WP5.3.1 was the release of the deliverable. D5.3.1 "Design Definition for Decision Support": An extra deliverable "D5.3.4 COPE Decision System Definition" was also made. Deliverables D5.3.2 and D5.3.3 describe the COPE Decision Support Software and its validation results. The decision support system was successfully used in the final trial.

Specific results:

- From the trial until the end of July GMV chaired the Cope Decision Support System (CDS) and First Responder System (FRS) working group. All the feedback from the users for the

CDS was successfully collected. Effort was also put into SW integration with the COPE System (WP5.1)

- The CDS SW successfully achieved its goals in the final trial.
- A version of the Air Quality Estimator's AQEST that communicates with the COPE gateway was developed by VTT. The application fetches information provided by the gas and the weather sensors and periodically calculates the air quality estimate. The estimate is then submitted to the COPE Gateway in TSO format to be used by the applications of the other partners.

WP5 Task 5.4 - Sensors (lead beneficiary UTI)

Deliverables:

- D 5.4.1 - Sensors integration platform Interface Control Document;
- D 5.4.2 - Sensors integration platform Software / Hardware Specifications;
- D 5.4.3 - Sensors integration platform qualification test documents;
- D 5.4.4 - Sensors integration Platform.

Summary: A Sensors Integration Platform (SIP) was developed. The Sensors and the sensor integration platform send and receive information to first responders as well as the operational command and control centre through the network. The Sensor platform is in charge of isolating the rest of the system from the "sensor" environment, so any data request will be issued and served in a standardized way.

The COPE SIP has two main module types: (1) SIP Wearable - one for each FR, which will collect the information from the FR; (2) SIP Deployable - meant to be used for toxic gases detection and for resource monitoring into the intervention area and on the vehicles heading to that.

The modules were tested at both UTI and IGSU (Romanian General Inspectorate for Emergency Situations) facilities; apart from the regular development tests, we conducted mainly the following tests: outdoor and indoor localisation accuracy, toxic gases detection, resources identification. In order to perform the tests a special test application was developed.

At the final evaluation trial in Kuopio COPE's sensors platform capabilities were fully tested, along with the rest of the system. The results confirmed that SIP worked properly and provided the necessary data to be processed in order to support the common operational picture.

Specific Results:

- COPE sensor platform with wearable (SIP-W) and deployable (SIP- D) modules that were used in a dedicated test trial. The COPE platform allows the collection and processing of data related to environment, first responder indoor and outdoor localization and safety and resource identification; it has a versatile communication structure, allowing standalone (GPRS) communication or integration with the COPE communication (developed by VTT) and first responders platforms (developed by BAE UK).
- Sensor integration platform can be deployed on land or vehicles and can be worn by people.
- The platform design allows easy integration of additional sensors without affecting the rest of the system, in order to expand the system operational and functional capability, according to the mission.

WP5 Task 5.5 - Technology Development and Integration & Communication (lead beneficiary VTT)

Deliverables:

- D5.5.1 - Communication Methods Document
- D5.5.2 - Communication Methods Specification
- D5.5.3 - Communication Technology Integration

Summary: Communication methods including wireless and wired communication techniques were developed as required by the project and special solutions were developed for an operative communication infrastructure for emergency management.

Specific results:

- Software and hardware development for radio communication and integration with sensor platform was carried out.
- SIP-D and WPAN modules were integrated. An overall system which consisted of the deployable wireless sensor network (WSN), wireless weather station, graphical user interface (GUI) including data visualization with a map for the Incident Commander was developed and demonstrated. Also a hazmat simulation algorithm was developed and integrated into the WSN (AQEST). The results of the work can be found in D5.1.4 and D2.2. The functionality and reliability of the WSN and overall system was proved to be adequate for such emergency operation environment.
- An integrated sensor node of the SIP-D was developed, including the WSN radio and SIP-D sensor units.
- Interface between the WSN receiver and SIP-C was implemented and tested, so that sensor data could be delivered from the WSN to the COPE Gateway to be utilized by C2, AQEST and the COPE decision support system (CDS).
- COPE WLAN mesh network was built up and prepared to be used for the COPE FRS Communication platform.
- In the COPE final evaluation trial at the ESC facilities the overall COPE Communication System (WAN,WLAN, WPAN) was successfully used.
- COPE demonstrator, which includes the gateway, C2, AQEST, SIP-C and WSN was designed and implemented.

WP5 Task 5.6 - First Responder (lead beneficiary BAE UK)

Deliverables:

- D5.6.1 - Integration plan for wearable displays and sensor technologies with command and control system, decision support and the Common Operational Picture (COP)
- D5.6.2 - Report on the feasibility of autonomous mapping using man-mounted sensors and laser rangefinders
- D5.6.3 - Report on the use and benefits of wearable displays, sensors and localization technologies for first responder support

Specific results:

- A study was conducted of the feasibility of using IMU and Visual Odometry (video) sensors to track the position of fire fighters during typical activities inside a building (including walking, crawling (with and without Breathing Apparatus; with and without smoke) and dragging a hose. IMU sensors were procured and a helmet made up for sensor attachments. Data was collected over three days with the Avon Fire & Rescue Service.
- The video and IMU sensor data was analysed and reported in D5.6.2.
- The First Responder System (FRS) was implemented.
- Several systems were built (three FRS-C systems for sector commanders and four FRS-HW systems for fire fighters).
- The FRS was successfully integrated with the SIP-W and the COPE Gateway.
- The FRS performed reasonably well during the COPE final evaluation trial. There were, however, a few technical issues with the FRS that were mainly maturity issues due to the technology demonstrator nature of the system as a whole.

WP6 - Operational testing and evaluation (Lead beneficiary: CESS)

Deliverables:

- D6.1 - Evaluation Methodology
- D6.2 - Scenario
- D6.3 - Trials Plan
- D6.4 - Trials Organised
- D6.5 - Execution Report
- D6.6 - Trials results and user feedback

Summary: The technological solutions developed and implemented were evaluated. The framework of the evaluation was set by the results of the human factors analysis (WP2), the concept of operations (WP3), and the technologies of the overall COPE system as developed in WP5. The overall integration of the various COPE technologies could be proven successful. Some of the COPE applications could not or not fully be implemented in the COPE System. This led to a slightly reduced capability of fully demonstrating the COPE system and technologies. These reductions, however, did not endanger to overall objective and success of the project. The overall trial concept, scenario and technical configuration may even have exceeded the originally planned volume and complexity.

In the final evaluation train in Kuopio (September 2010), the various COPE technologies to support common operational picture exploitation were demonstrated. In a highly complex environment, the COPE system and its technologies were exposed to the developed COPE scenario, in a two tier setting:

- (1) The live exercise LIVEEX with real fire and hazards events and first responders involved,
- (2) The Tabletop exercise (TTE) with end users involved in additional C2 and decision making tasks.

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. The overall exercised was composed of over 100 persons in different roles: Planners, supervisors, first responders, players, analysts/evaluators, observers and supporting staff. Players and observers were invited from external stakeholder organizations like Avon Fire & Rescue fire fighters (UK), Dublin Fire Brigade, Finish police. Both parts of the exercise were based on the same scenario and were synchronized. 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 results documented in technical reports (WP5), Human Factors documentation (WP2), and in the final evaluation summary report (WP6).

Specific results:

- Detailed evaluation reports were produced, including the report with focus on human factors (D2.3) and the report on overall operational evaluation (D 6.6) which also includes detailed annexes on in-depth evaluations, on the methodologies used, and on the final scenario.
- D6.6 also includes the description of the total trial setup and the resources (personnel and technologies) used.
- A detailed statistical evaluation shows the grade of performance which could be reached by the individual COPE components and by the overall system.
- A separate analysis was performed which compares the COPE results with the "global" state of the art in the development of common operational picture (COP) systems. The dominating gain achieved by COPE was not so much the improvement of the individual technologies but the fact that these numerous technologies were integrated into a complex system of systems, and their benefits were demonstrated and measured in a very complex scenario.

ESC had the key responsibility in organising the live parts of the trials (D6.3). This included the analysing process of the scenario where the key vignettes to be demonstrated were identified. ESC

took care of the recruitment, training and motivation process of the end-users: this included negotiations and planning of the trial and training session in conjunction with the local fire authorities and police, Emergency Response Centre Operators as well as the staff of ESC. Also the evaluation of the usability of the test site was essential in order to ensure the possibilities to record the trials, duplicate the trials, interview the end-users etc.

The trial was divided into three separate vignettes and the table top (see doc. 6.3 for more details) .In practice the live trial was organised so that at the ESC practise area there were two separate burning industry buildings representing the fireworks factory and the brewery of the scenario. In addition, there was the HazMat area with an exploding toxic gas tank located on rail. The table top was arranged in the observatory tower within vision contact to the live trial.

The units involved in the final trial:

- 6 Incident Commanders (3 operative) - all using the COPE System
- 9 Sector Commanders - 3 using the COPE System
- 21 Fire- Fighters - 4 using the COPE System
- Emergency Response Centre Operator
- 2 Police Units
- Table top exercise (TTE) + supporting staff (instructors security, admin, technical support etc.)
- Approximately 60 persons all together (consisting ESC staff, local fulltime fire brigade personnel and police as well as ESC officer students)

Exceptionally high attention was put on the training process of the end-users. The staff of ESC did consultative work by providing end user comments to the deliverables of WP5 (D5.5.2, D5.5.3, and D5.6.1).

Final results:

The final results as documented in D6.6 and D2.3 show that the objectives of the COPE project were reached. The first sentence of the abstract of the COPE Description of Work sets the frame requirements of the project:

"The Common Operational Picture Exploitation (COPE) project will integrate COTS solutions and novel technologies to achieve a step change 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."

This goal could be fully achieved by:

- The identification evaluation, screening and selection of a set of different technologies adequate to this task.
- The in-depth analysis of requirements for building the COPE innovative solutions.
- Several development activities in modifying and adapting the technologies for the purpose of COPE.
- An intensive effort in regarding the human factors of the end-users in all processes of technology development and verification, and in trial exercise design and validation.
- The integration of all components into a demonstrator "COPE System of Systems" and the setup of a large scenario based mixed live and tabletop type trial exercise.

According to the judgement of the first responder end-users and external stakeholders, the system and its components worked from the satisfaction level "good" to "very good". Some temporary failures and reductions in functionality were at a level usual for such a complex research project, and did not derogate the detailed and overall main result.

The COPE solutions form a basis for advanced common operational picture (COP) solutions and its status of advancement can be compared to other highly advanced COP projects. Efficient use of the COPE results in real operations will require further customization for the individual domains of the customers and intensive training of the end-users.

Potential Impact:

A cross project workshop was held in London in May 2008 with potential stakeholders present at the workshop. In addition, various end-users (for example, in the UK Avon Fire & Rescue Service) participated in the human factors and CONOPs work (WP2 and WP3). They were also invited to provide support to the various user trials and evaluations. These stakeholders were also invited to attend the final workshop to provide their feedback and ideas for technology exploitation in future. Other COPE partners were encouraged to contact and record contact details of potential stakeholders (users, equipment providers, program managers, and policy makers) in preparation for exploitation activities described in the COPE dissemination and exploitation road map (see deliverable D1.2).

The final project workshop was arranged in the PSCE November/December meeting in Amsterdam (2010). Invitations were sent to all COPE participants and to a variety of stakeholders and end users who had been contacted at various points in the project. Three presentations were given: 1) COPE overview (1 hour, presented by Jari Hamalainen (VTT), Leena Norros (VTT), and Aapo Immonen (ESC), 2) Technology Discussion (30 minutes, given by Johan Forsling (BAE C-ITS), and 3) Human Factors and Evaluation Summaries (30 minutes, given by Leena Norros (VTT) and Reinhard Hutter (CESS)). In addition, COPE poster as well as developed hardware and software were presented in an exhibition space.

This PSCE press release describes the final event:

"Held in CISCO Systems premises in Amsterdam (the Netherlands), the conference brought together over 80 participants including top-level policymakers, academic researchers, industrial experts and other interested stakeholders who discussed the new developments in this domain. In particular, they had an opportunity to learn about various aspects of Critical Information Protection and Public Warning Policy and broadened their knowledge of existing projects in public safety communications. For the first time, the PSCE Forum Conference successfully hosted also an external dissemination event on Common Operational Picture Exploitation (COPE) Project. The objective of this EU funded project is to create technological solutions which enable improved emergency management by better command and control performance and reliability of technical support. Booth presenting the COPE technology developments was available during the conference. More information about the project is available at <http://cope.vtt.fi/>"

Partner exploitation plans for the COPE results

This section summarises the exploitation plans for the organisations who participated in the COPE project team. In addition, the Appendices 1-2 in COPE Deliverable D1.2 - Dissemination Route Map describe the current and planned exploitation activities.

COPE project substantially deepened the knowledge in the emergency response management from the human factors point of view and a new COPE Concept was created for improving the communication between the actors.

The COPE Concept builds on three requirements:

- (1) Forming the model of the situation
- (2) Presenting the model of the situation
- (3) Sharing the model

The COPE Concept solutions constitute of:

- (1) Actor's terminals for participation
- (2) Sensors for extending human senses
- (3) Semantic structuring for relevance of information
- (4) Gateway of WLAN for availability of information.

The solutions were based on the following software and firmware (name, owner, deliverable, background vs. foreground):

- COPE Gateway; BAE Systems C-ITS; D5.2.4; Developed in COPE
- C2; BAE Systems C-ITS; D5.2.4; Developed in COPE
- EMAS Software; BAE Systems C-ITS; D5.4.1; based on background code
- Air Quality Estimator (AQEST); VTT; D5.3.4; Developed in COPE
- SIP-C 1; VTT; D5.5.3 and D5.1.7; Developed in COPE
- SIP-C 2; UTI; D5.5.3 and D5.1.7; Developed in COPE
- SIP Firmware; UTI; D5.4.4; Developed in COPE
- SIP Radio Firmware; VTT; D5.1.4; Based on background code
- FRS-C; BAE Systems; D5.1.7; Based on background code

- FRS-HW; BAE Systems; D5.1.7; Based on background code
- COPE Decision Support System - CDS; GMV Skysoft; D5.3.2 (executable code and manuals); Developed in COPE

According to the Consortium Agreement (CA) the software and firmware are owned by the developers. None of the software or firmware has joint ownership. All COPE beneficiaries have access right for the executable codes for demonstration purposes (see CA 9.4). The right should be requested in writing, and shall be granted royalty free. If necessary, access rights for source code should be agreed by the partners separately.

VTT has set up a COPE Demonstrator (COPE Demo) that will be used for the demonstration of the COPE Concept (for details, see section "VTT (Finland) - Exploitation Plan").

General description of the COPE results and the public deliverables are available on the COPE website (<http://cope.vtt.fi>) that will be open at least until the end of the FP7.

In the final meeting of COPE Steering Committee all of the beneficiaries were interested in finding out possibilities to continue research in the area.

BAE SYSTEMS (UK) - EXPLOITATION PLAN

Results and Findings

The COPE programme has produced a series of results and findings that BAE Systems (UK) is able to use. BAE Systems (UK) is particularly interested in the first responder element of the COPE programme and a number of clear user requirements have been generated in this area. The integration and trials activities carried out have helped to identify many suspected issues with wireless data communications as well as acquire data about how to package and mount man-wearable technologies.

The human factors activities on the COPE programme have identified key functionalities for first responder equipment that are desired by the end users. The human factors activities have also identified how best to present those technologies to the end users.

The COPE programme has provided BAE Systems (UK) with an interface to different end user groups in different countries and this has helped to determine the composition and state of the emergency services market as potential purchasers of first responder technologies.

Exploitation Plan

BAE Systems (UK) intends to use the results of the COPE programme to help structure its product and technology route maps for first responder technologies. These route maps will enable BAE Systems (UK) to allocate investment for the development of first responder technologies. The end user requirements that have been generated will also help to direct research & development activities. The work carried out with the wireless communications technologies within the COPE programme will help to de-risk further wireless data communications activities across many different product lines.

Engagement throughout the COPE programme with the end users followed by the trials and user feedback will help BAE Systems (UK) to understand the requirements for size, weight and environmental ruggedness of man-wearable equipment. It will also help BAE Systems (UK) to understand the state of the first responder market along with its requirements and timescales.

Development of the first responder technologies within the COPE programme has helped BAE Systems (UK) to identify the state of the COTS products that are available for use with first responder technologies and to assess the development streams and timescales of those COTS products. All of this information will help BAE Systems (UK) to understand the timescales that potential technologies could be brought to market.

BAE SYSTEMS C-ITS (SWEDEN) - EXPLOITATION PLAN

The Command and Control software (C2) in its present version could not be used stand alone. It is depending on data from other parts of the COPE system of systems. Therefore further development is needed if it was to be a product on the market. Indirectly C-ITS could make use of the Command and Control software in any new security application being developed.

The BAE Systems Bofors contribution to the COPE project was to integrate an existing sensor platform into the COPE framework, to contribute to the common operational picture. The integrated sensor platform is called EMAS (Environment Monitoring and Analysis System). EMAS is a cost effective solution for environmental monitoring and analysis, primarily with regard to Chemical, Biological, Radiological, Nuclear or Explosive (CBRNE) substances. The purpose of the system is to provide Automatic Warning and Reporting (AWR) functionality.

Integration of EMAS into the COPE project involved the creation of a communication channel to the COPE-gateway, adaption of the TSO-protocol to facilitate the provided information and conversion of EMAS data into the TSO-protocol. The technical results from the COPE project consist of COPE-specific interfaces and protocols that have little or no exploitability for other purposes. However, the successful participation in the COPE project is by itself of interest as an opportunity to show the abilities of EMAS in the COPE scenario setting. Good business relations have also been established with other COPE members. Therefore, any exploitable results will consist of marketing opportunities and possible cooperation with COPE team members in future projects. Target markets for the EMAS platform are both civil- and governmental agencies

GMV - "SKYSOFT" (PORTUGAL) - EXPLOITATION PLAN

GMV will mainly exploit the work and the project results to support the Portuguese Civil Protection stakeholders. Particularly, GMV will exploit the COPE by:

- Supporting the Portuguese Civil Protection stakeholders, particularly the first responders, in the improvement of their operational procedures and protocols and their technical means to face an emergency.
- Supporting the the Avon Fire & Rescue Service, through intermediation of BAES UK.
- Supporting the Portuguese stakeholders, in the improvement of their coordination with regional and local administrations to react to a crisis.
- Consulting with industry and government on Emergency Planning.
- In the same way, support to the local and regional organisations to deploy the technical solutions and implement the procedures from the project, and to improve their coordination with other public/private organisations.

Furthermore, we are planning to develop new ideas establishing partnerships with the research community to further develop COPE results and integrate them into products having a greater market potential. Technically, GMV plans to explore the integration of other data source means in order to cover the first responder needs, and to get an improved big picture in situation awareness, for instance earth observation, or UAVs sensor capture. Additionally, work is expected to be carried in the improvement of data fusion mechanisms of different sensors.

VTT (FINLAND) - EXPLOITATION PLAN

VTT Technical Research Centre of Finland acted as a coordinator of the COPE project and had important roles in the analysis of emergency management from the human factors point of view, defining the common operational picture and concept of operations, the final COPE Concept as well as the development of integration and communication technologies needed for the demonstration of the COPE Concept (wireless network, deployable sensors and hazmat simulation software etc.).

Exploitation of COPE results:

- VTT has deepened its knowledge in the emergency management application area and the new research results as well as the gained new experience in the area will be exploited in research and development work.
- VTT has set up a COPE Demonstrator (COPE Demo) that includes the COPE Gateway, command and control system (C2), hazmat simulation (AQEST), SIP-C, and the wireless sensor network (WSN). The main results of the project including the whole COPE Concept can thus be demonstrated with COPE Demo for different actors (companies and authorities) in the emergency management area and also for other FP7 Security research project groups.
- In Finland, the started cooperation with the Emergency Services College (ESC) will be continued.
- Possibilities to continue the research in the FP7 Security area will be found out when the next call will open in summer 2011.

UTI SYSTEMS (ROMANIA) - EXPLOITATION PLAN

The COPE sensors platform allows the collection and processing of data related to environment, first responder indoor and outdoor localization and safety and resource identification; it has a versatile communication structure, allowing standalone (GPRS) communication or integration with the COPE communication (developed by VTT) and first responders platforms (developed by BAE UK).

Exploitable results

- Using the Sensors Integration Platforms the flow of information between command and control center and intervention teams was improved; it also increases the efficiency of the command center's data evaluation and response.
- By using the data from the SIP, the intervention time decreased due to availability the information (gas type, concentration, wind speed, etc.) gathered by the deployable and the wearable modules and due to the possibility to have in transit visibility over the resources heading to the intervention area.

- One of the main SIP usage effect is the improvement of the command and control process, enabling the development of an efficient integrated information flow to and from intervention teams.
- The design principles of the platform can be used for making other products that require integration of a variable number of data sources.
- The platform design is allowing easy integration of additional sensors without affecting the rest of the system, in order to expand the system operational and functional capability, according to the mission.
- Using the Sensors Integration Platforms the flow of information between command and control center and intervention teams was improved; it also increases the efficiency of the command center's data evaluation and response.
- By using the data from the SIP, the intervention time decreased due to availability the information (gas type, concentration, wind speed, etc.) gathered by the deployable and the wearable modules and due to the possibility to have in transit visibility over the resources heading to the intervention area.
- One of the main SIP usage effect is the improvement of the command and control process, enabling the development of an efficient integrated information flow to and from intervention teams.

User, Community and Market needs

This kind of integrated sensor platform is addressing especially the Crisis and emergency management services, involved into catastrophic event management. Currently, the intervention time in the operating area is high due to the fragmentation of the information collected from the different actors involved: CBRN research team, extrication team, fire fighters (imprecise localization done only by radio communications), medical team etc., each of them with its own equipment. Using SIP, the information is obtained, processed and transmitted quickly and timely. Apart of this main segment, the sensors platform may also be used in: homeland security, people remote monitoring (eg. Telemedicine), industrial remote monitoring, special transportation fleet management and safety monitoring etc.

Target "Market" and Potential target user groups/"Customers"

Among the main target markets for the sensors platform are:

- Fire-fighters brigades;
- EMS;

- Private companies for safety and security

Positioning of results within identified target "Markets"

The COPE platform allows the collection and processing of data related to environment, first responder indoor and outdoor localization and safety and resource identification; it has a versatile communication structure, allowing standalone (GPRS) communication or integration with the COPE communication (developed by VTT) and first responders platforms (developed by BAE UK). Sensor integration platform can be deployed on land or vehicles and can be worn by people. The platform design is allowing easy integration of additional sensors without affecting the rest of the system, in order to expand the system operational and functional capability, according to the mission. Those features recommend the COPE SIP as an appropriate solution for the Fire-fighters brigades and EMS. Also it may be adapted for: homeland security, people remote monitoring, industrial deployable & remote monitoring, special transportation fleet management and safety monitoring.

TRINITY COLLEGE DUBLIN (IRELAND) - EXPLOITATION PLAN

TCD is continuing to develop and adapt the KSM analytic framework which was applied within the emergency response context in COPE, to other areas within the security and aviation domains with research activities continuing in current projects, MASCA, Alicia and TASS. The work on CONOPS is also being extended and applied on these projects looking at airport security concept of operations and it is planned that CONOPS work started in COPE will be further developed in current project proposals currently submitted and under review. These proposals range from interoperability to psychosocial support in crisis management and would benefit greatly from the findings from COPE WP3.

TCD is keen to maintain its contacts with the COPE consortium, as there is scope for continued work in expanding the COPE concepts to other areas.

CESS (GERMANY) - EXPLOITATION PLAN

COPE has generated considerable gains for CESS which will be exploited in the future. Typically, this will be either exploiting the knowledge gained in the project and identifying and exploiting paths for the marketing of COPE products, which then will have to be followed up by COPE partners alone or in cooperation with CESS.

There are mainly three categories of outcomes of the COPE project which will be exploited by CESS in the process of future business development:

1. The knowledge of CESS personnel gained on the architecture, functionalities, vulnerabilities and possible risks of a disaster management environment
2. Specific products developed by CESS, particularly the scenario and script, and the evaluation methodology
3. The products developed by other COPE partners

Knowledge

CESS is primarily a consulting company. The business plans foresee extension into, and acquisition of new projects in the areas of strategic and operative security concepts. The customers which have already been approached during the course of the COPE project include governmental security organizations and major energy providers in Germany. Some project proposals have already been submitted or are under preparation. One business strand of CESS is the organization of workshops on specific future security issues. These financed workshops are business of their own for CESS, but they are considered the starting events of further networking and business development.

CESS has also been invited to participate in a national and a foreign project on establishing so called security competence centres. From COPE, the Command and Control component and possibly the decision support tool will be offered as candidates of a future security experimentation and training platform.

The Scenario

Part of the CESS business is the planning, organization, technical preparation, execution support and evaluation of security related exercises. Predominant examples are the projects COPE and SICMA. One part of the technical preparation is the design, scripting and implementation of operational scenarios. The scenario as developed in COPE allows a considerable advance in cooperative development, standardization of the generation and scenario maintenance process. It will be used as the baseline component for the related future CESS business. Specifically, it is intended to offer this kind of scenarios together with the CESS-owned scenario generation and support tool as a core element in the upcoming project of a national security competence centre where it can be implemented in support of training and exercising tasks. Further business chances will be followed in foreign countries and at international level (EU, the Mediterranean region, and possibly the Gulf area and NATO).

Exploitation can comprise training concepts of critical infrastructure operators in varying scenarios, they can be used for testing alternative security investments, and they can serve as awareness-raising tools e.g. in governmental security organizations.

Products of partners

From today's and CESS's point of view, the best exploitation chances will have the COPE C2 tools. This is not a general assessment of the marketing chances but results from the fact that CESS activities are more concentrated at the strategic and operational level rather than on the level of first responder technologies in the field. Finally, the state-of-the-art analysis performed by CESS and documented in D6.6 gives valuable information on the COP market and eases the assessment of market chances of the various COPE components.

ESC EMERGENCY SERVICES COLLEGE (FINLAND) - EXPLOITATION PLAN

ESC has three main result areas of the project and will exploit them as follows:

- The specifications and modelling of the work of the first responders will be utilised in the future development projects targeted to enhancing the capacity of the response efforts. Many of the development projects have been hampered with the meagre understanding of the relevant aspects of the work of responder.
- The technological innovations and specifications will be integrated in the procedures of the rescue services as appropriate. This will call for additional planning and possible future tailoring in order to fully exploit the technology.
- The strengthened ability within the ESC to arrange quality based validation of innovation project results is already being incorporated to the standard operative projects of the college and will be produced in a guidance book to be used also in future international projects.

List of Websites:

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