SECURITY2People – Features of and experience with the first demonstrator of an integrated disaster management system

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Abstract

The project SECURITY2People (Secure IT-Based Disaster Management System to Protect and Rescue People) that is part of the German Security Research initiative, aims at exploring the needs for and the structure of an integrated disaster management system. This system should be applicable for all types of emergencies and at all levels of disaster management from the local to the Federal Government. Following a first system design, the question to be addressed in the second half of the project is mainly related to the functionality of the demonstrator. To this purpose a first demonstrator has been completed and presented to the potential end users for comment. Based on the feedback, the demonstrator will be further developed to reach a final status at the end of the project in about one year's time.

1 Introduction

The project SECURITY2People (Secure IT-Based Disaster Management System to Protect and Rescue People) is part of the German Security Research initiative and aims at exploring the needs for and the structure of an integrated disaster management system with simulation, decision support and interoperability as key elements [1]. It will be applicable for all types of emergencies and at all levels of disaster management. Operators of critical infrastructures and organisations dealing with security issues are also seen as potential users of that system. Furthermore the project strives for integration of emergency planning, training and mission support.

The project follows an iterative approach: Requirements will be identified in co-operation with disaster managers, followed by design and creation of a respective demonstrator system. Within each iteration the demonstrator is validated together with end users to verify the approach.

At the end of 2010 the first SECURITY2People demonstrator was finalized and presented to a group of experts from different organisations (so-called "associated partners"). Members of this group are executives from police, fire brigade, rescue services, critical infrastructures and public administrations. The chosen disaster scenario was based on a release of toxic gases out of a chemical factory requiring decisions about evacuation, sheltering and further environmental or economic consequences. The aim of the first demonstrator was to get direct feedback from the experts for the further refinement of the system.

2 The Demonstrator

An open source portal was used as technological platform to implement the demonstrator, which combines simulation, decision support and common operational picture (COP) components. The COP components support most of the common geo standards and provide a set of tools for data creation and integration. In the demonstrator they are used, for instance, for the cartographic display of the simulation results (e.g. the movements of rescue forces).

The figure 1 depicts the general setup of the first demonstrator which combines two out of three main use cases of SECURITY2People (S2P), namely command and staff training (CAST) resp. exercising and mission operation. As basis for the demonstration and evaluation, an exemplary scenario was implemented focusing on a large crisis situation in the area of NRW affecting Cologne and its surroundings. A large scale frontal zone with high wind speeds and heavy precipitation resulted in many car accidents, a crash of an air plane at the Cologne Bonn Airport, mass panic at an exhibition hall and finally a power blackout in the southern areas of Cologne, which could result in a gas

dispersion. In particular the potential release of a pollutant from an industrial area was the focus of a workshop presenting the demonstrator to the end users.

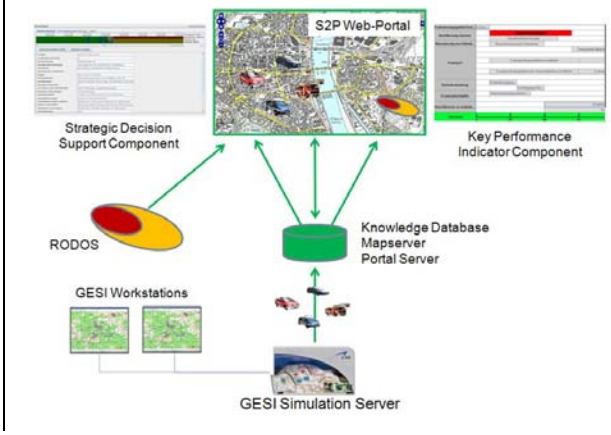

Figure 1 Demonstrator layout with the various components and the connection to simulations such as GESI and RODOS

Starting from the bottom of figure 1, resources such as police and rescue forces but also incidents are provided by a tailored version of the GESI emergency management simulation system, a detailed, entity level simulation system provided by CAE. The data is either populated into the S2P database, which holds a combination of pure SQL and geo-referenced database schemes, or through other, standardized means such as geo-referenced RSS-Feeds.

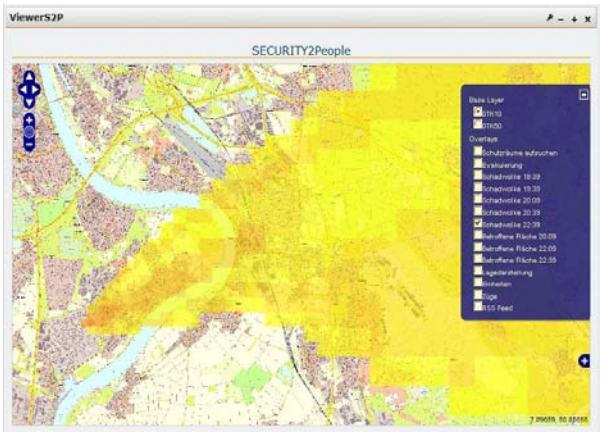

Figure 2 Area affected by the pollutant; darker colours indicate areas for potential countermeasures (picture from the COP component of S2P)

For the gas dispersion, the simulation and decision support system RODOS was used [2]. RODOS does simulate the transport of the gaseous substance with a ten minute time step to allow for a detailed picture of the ongoing release. Furthermore, RODOS provided also information on the area for which countermeasures might be necessary. Based on reference levels for the pollutant, areas for sheltering and evacuation have been derived. Together with the area, also the number of affected people could be provided to other components of the S2P system.

All these data – simulated resources, incidents and gas dispersion – are merged in the Common Operational Picture Component in the S2P-portal. The Common Operational Picture Component in itself again uses open source software.

The following figure shows a screenshot of the Common Operational Picture component with resources at the KoelnMesse in Cologne, Germany. Important to note here is the capability to display resources as individual units or aggregated as in particular on the higher levels of decision making individual units are not longer important.

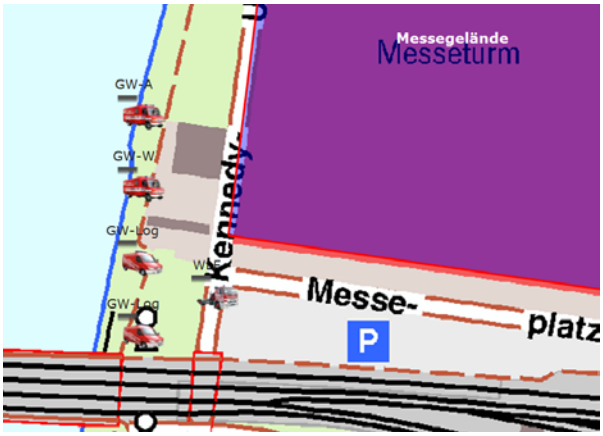

Figure 3 Resources displayed as individual units close to KoelnMesse (picture from the COP component of S2P)

For the main use case “mission support”, the demonstrator offers two interacting decision support components: The first component is based on key performance indicators (KPI module), which are used to calculate the time or resources required for relief measures applied on a current disaster site [3]. The idea is to provide a calculation methodology using elementary performance values (e.g. the average speed of a police car) to extrapolate the duration of the entire measure. This methodology - once defined in a certain framework - can be applied to any process that can be split up into smaller parts. The second component addresses the strategic decision level in disaster management. It depicts the impact of the disaster on key aspects (e.g. human beings, economy and environment) on a time line. In addition the component supports decision making by proposing countermea-

sures that might be applicable in that given situation. These countermeasures and their impact can be simulated and visualized on that time line. If the countermeasure “evacuation” is proposed, the KPI module can be triggered and returns on one hand if that measure is applicable under the given constraints, on the other hand whether it is possible to carry out the measures allocating further resources to that task. In this way it validates the measure and eliminates those which are not applicable at all.

Both components share the same data base that contains knowledge on individual events and potential countermeasures. This is an important feature as investigations are ongoing to which extend cased based reasoning (CBR) approaches can be applied [4]. Knowledge databases have an enormous potential when they will be expanded to CBR systems that contain functionalities providing guidance on countermeasures based on historic cases or exercise scenarios. A CBR system has the purpose to solve new problems by adapting solutions that were applied for previous cases. Even if the cases do not fit exactly, algorithms can be developed allowing an adaptation of past knowledge to the current situation.

3 Evaluation of the demonstrator

The demonstrator has been presented to the potential end users during a two days workshop. Within this workshop, the S2P system was used as decision making support system, embedded into a command and staff training situation. The decision support provided by the system was highly appreciated by the end users. In particular the COP together with the decision support on the tactical-operational (KPI module) and strategic (simulation based on knowledge data bases) was evaluated as extremely valuable in case of an emergency event. It was also commented that the various levels of decision making should be separated in terms of information provided (avoiding information overflow) and that particular components might be tailored to the use at these levels. Suggestions were also made to expand the system to other use cases such as a pandemic event.

Also the idea and the presentation of S2P as command and staff training tool was highly appraised. Through the integration of a tool which simulates in detail resources such as police and fire brigades in space and time, but also forecasts various events which can lead to critical situations, crisis managers and their staff gain an important insight and understanding of the evolution of a crisis situation and can be better prepared for the reality.

Communication and information exchange with and to the public was also discussed during the demonstration. No question, informing the public at the right time with the ‘right’ information is becoming more and more important. In S2P it is envisioned that the system will provide help to the crisis managers e.g. in form of checklists for an optimized and timely communication.

Last but not least another area of comments received by the end users addressed the coupling of S2P to existing (simulation) models but also control centre systems used in emergency management. Here the end users clearly pronounced that a duplication of work should be avoided. Therefore, existing simulation models such as those for environmental contamination or notification should be connected to S2P.

4 The way forward

Based on the end users comments, in the next iteration the project will focus on the interoperability of the system to guarantee the necessary information exchange between the organisations involved and to connect existing systems. The so-called interoperability platform will be a combination of tools, technologies and data models. Hereby, existing or emerging standards will be preferably selected, however, extensions to these standards are expected as well. After all, access to external systems is essential for simulation, decision support and common operational picture components to provide the most valuable information at the right time to the stakeholders involved but also to the public. Apart from the integration of the German Emergency Preparedness Information System deNIS IIplus there is also a need to integrate a control centre system for the resource management to receive reliable data for the different components.

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