SECURITY2People

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Introduction

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. In addition operators of critical infrastructures and organisations dealing with security issues are also envisaged as future users of that system. The following functionalities are major components of the system:

- Role-based information management;
- Decision support at all levels of management;
- Different types of simulation techniques;
- Applicability in training, exercises, planning and operation.

An important feature of such a system is the appropriate information exchange between different stakeholders and public communications. For this purpose, social and psychological aspects of crisis communication have to be explored. Crisis communication is most effective if undertaken in a systematic way, and generally starts with the gathering of information. The system shall support the end users at an early stage in order to elicit interest and stakeholder input. Communication must then continue throughout the entire process.

Finally the system has to be designed in such a way that existing specialised management tools can be integrated into SECURITY2People.

As such a system can only be designed with the strong support of potential end users, ten executives from police, fire brigade, rescue services, operators of critical infrastructures and public administrations became associated partners of SECURITY2People.

The project started in June 2009 and will last for three years. Work so far focused on the analysis of the current status in emergency management and the functional and technological requirements for such an integrated system. Now in the starting second phase, the results of the analysis will be realised in a concept and a first demonstrator that will provide a basis for further feedback of the associated end users. Within the three years operation, this cycle of analysis, realisation and validation will be repeated three times to assure that whenever a concept is finalised immediate feedback from the end user is considered for the further refinement of the system.

Analysis and requirements

Key objective of this first phase of the project was to analyse exemplarily the current situation in emergency management in the German federal state North Rhine-Westphalia (NRW) and to explore the needs of the various end users. To facilitate the interaction with the end users,

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subject matter expert interviews and two workshops were conducted in 2009 and 2010. The interviews focused on the role and the needs of individual users in the context of an emergency, whereas the workshops aimed to explore the interaction of the various role players in an ongoing crisis situation. To facilitate the interviews, structured questionnaires, tailored to the role of each end user have been prepared. For the first workshop, an exemplary scenario was provided 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.

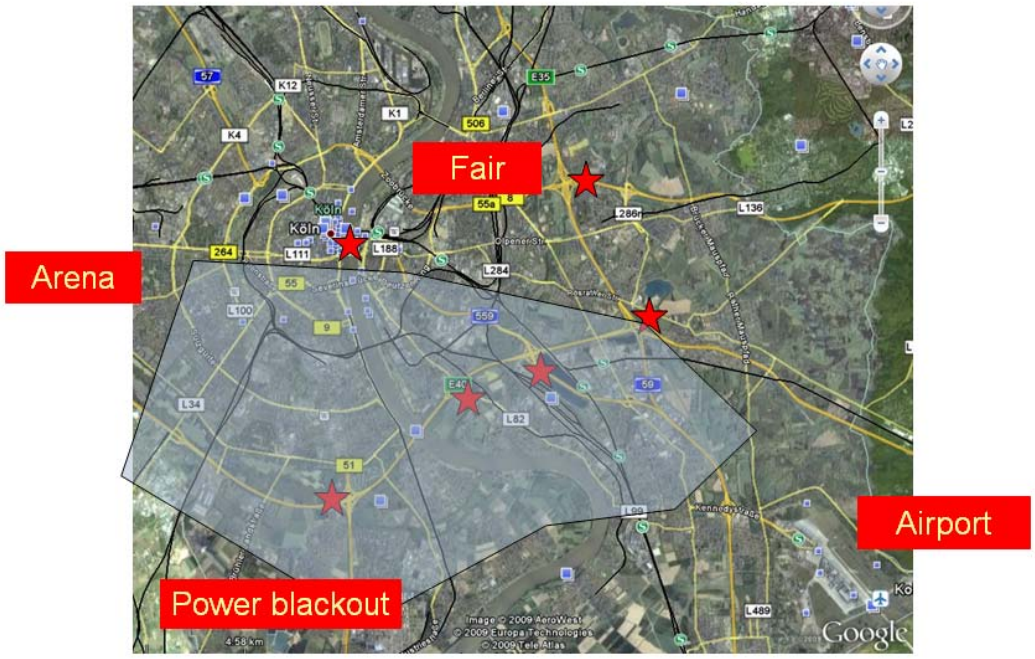

Fig1: Scenario area in central Cologne with damaging event locations (as presented at the first workshop)

By using Roadmap management processes, this scenario and the end users' different roles were analysed in the workshop. As a result, a clear picture of roles, dependencies and relationships of the various stakeholders in the management of a crisis situation has been obtained. Based on the evaluation of the workshop and many interviews with associated partners the requirements for an integrated disaster management system were derived. These include among others:

- Simple operation of the system with intuitive user interaction (usability)
- Application of the system for training, exercises, planning and operation
- Daily use anticipated (for both simple and complex situations)
- Robust and scalable situational awareness component
- Simulation based prognostic planning capabilities to perform an estimation of the future evolution of the situation with and without application of countermeasures
- Evaluation and ranking capabilities to allow the selection of the most promising countermeasures for a given situation
- Extensive background information with knowledge data bases to facilitate the selection of countermeasure options

- Interoperability with existing (and future) software solutions in crisis management centres and end users portfolios

Further important aspects for the final design are the cognitive requirements for the user interaction and the role based information needs of the various users. Here again the interviews provided the necessary results that allowed to structure the information needs for the various roles in emergency management of NRW. Clearly the operational/tactical level with police and fire brigades has different information needs than the strategic level in a ministry or a higher level administrative department.

System design and architecture

With these recommendations in mind a technological and conceptual design was proposed and several simulation components were presented to the end users in the second workshop. The technological design is based on service oriented architecture principles, and considers web services and portlets as central components of the system. PostgreSQL as data base and PostGIS as geographical information extension as well as a MapServer are part of the design.

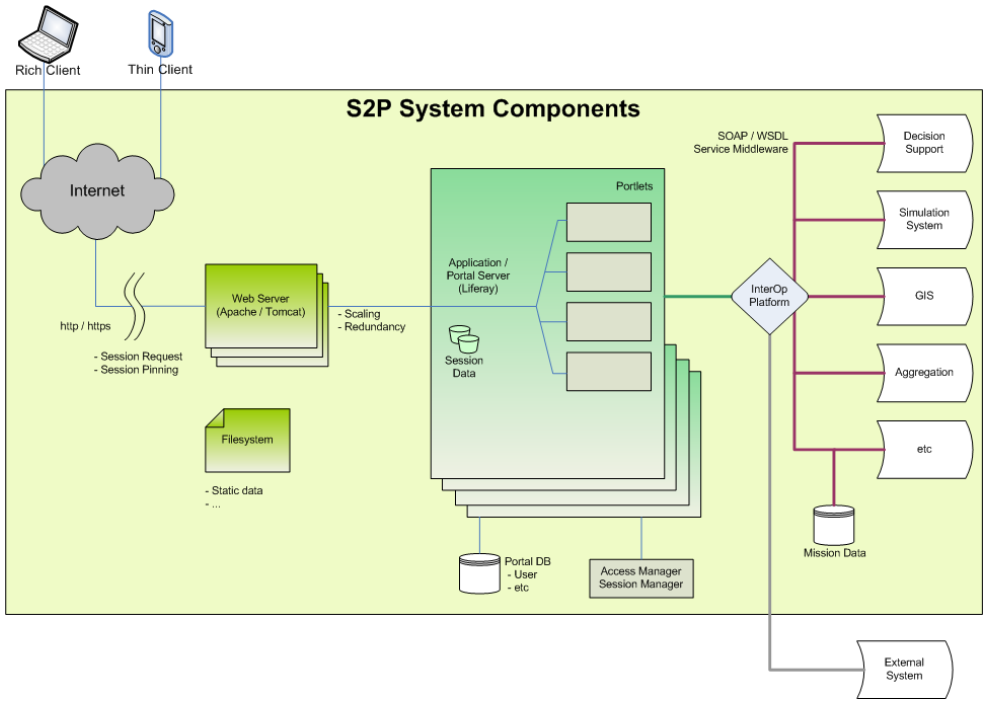

Fig2: System design

An important aspect of the integrated disaster management system is the communication between lower (operational/tactical) and higher (strategic) management levels. Decision making on the strategic level has to consider all aspects of a crisis situation. Thus, the decision support components of the integrated system have to provide methods that not only take into account hard facts derived from the simulation models but also soft facts. The latter could be the preferences of decision makers or the acceptance of the population in the affected areas. Such techniques are available in the multi-criteria or multi-attribute decision aiding domain and applied successfully in decision support systems (see e.g. [1]). Strategic decision making may require only limited information on the applicability of the potential countermeasures; however, the resources associated with and available in the affected area are of high importance. Therefore, the consortium decided to use the indicator approach to

support resource management on the strategic level. As the indicator approach is process oriented, the support of resource management is also possible on the operational/tactical level. As a consequence, resource management is applicable to validate selected countermeasures on the operational/tactical level.

Furthermore, the design of the disaster management system considers situation awareness components, knowledge data bases and tools facilitating the definition and final selection of countermeasures. As mentioned before, the simulation of the prognostic evolution of the situation is a key aspect in decision support. Only with the information on the potential future developments depending on the possible countermeasures, a sound basis for decision making can be established. The whole process described in Figure 3 would run in a loop optimising the selection of countermeasures with regard to their effect on each of the focal points in the disaster scenario.

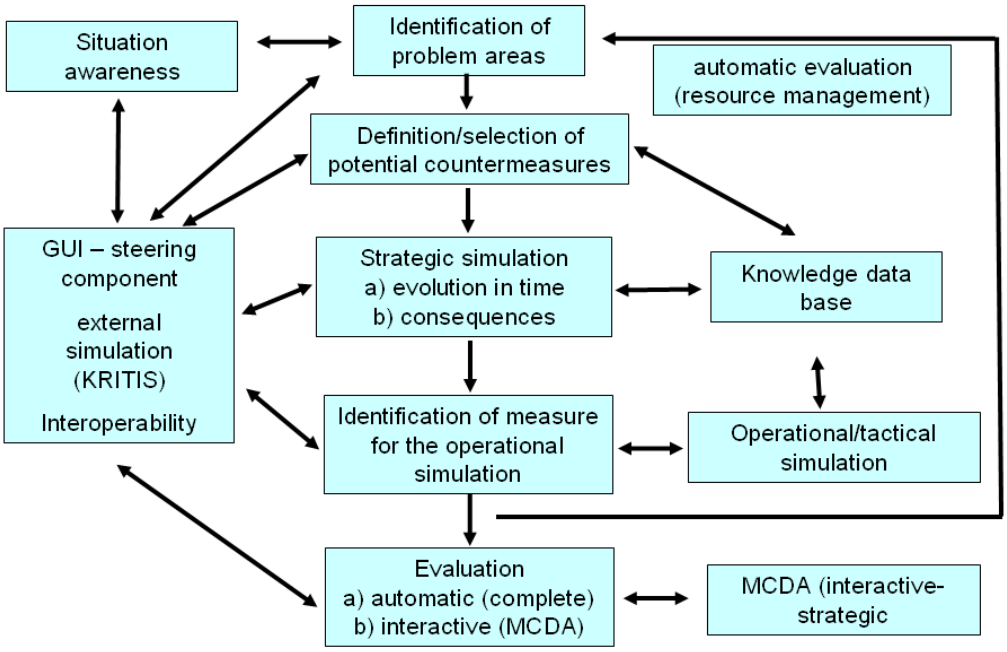

Fig3: Simulation concept

Conclusions and future work

The usage of expert interviews and facilitated workshops allowed the consortium to derive the end users' needs and requirements. Based thereon, a conceptual design of the system and the simulation components was developed. This concept will be evaluated during the next workshop in October 2010. With the proposed iteration process, the system will be refined step by step to become a final demonstrator by the end of the project.

Acknowledgment

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References

[1] French, S., Multi-attribute decision support in the event of a nuclear accident. Journal of Multi Criteria Decision Analysis 5: 39-57, 1996.