KIT — Karlsruhe Institute of Technology

Universität Karlsruhe (TH)
Forschungsuniversität · gegründet 1825

Institut für Technologie und
Management im Baubetrieb

tmb

Model based management of resources for flood water scenarios and interoperability of the components involved

Summary

Flood waters are among the natural disasters with the highest damage potential. The event at the river Elbe in Germany in August 2002 for example resulted in 38 casualties and material damage of 13.3 billion €. Apart from the elimination of landscaping and urbanistic deficiencies, published analyses especially suggest the improvement of organisation as well as preparation and coordination of response resources. The goal of this project is the creation of theoretical foundations for absolutely essential but yet non-existent flexible systems for training and operation support in flood management.

Within the scope of the research project a model for the spatial and temporal mapping of response resources, including an approach for its optimisation is to be created. A multi-agent system (MAS) with a web service interface serves as a starting point for the system architecture. Based on this a specialised interoperability architecture for flexible communication and cooperation of spatial and temporal-dynamic information services and processing services is developed. Furthermore it has to be evaluated to what extend this architecture is capable to provide a better decision support before, during and after extreme events.

System architecture
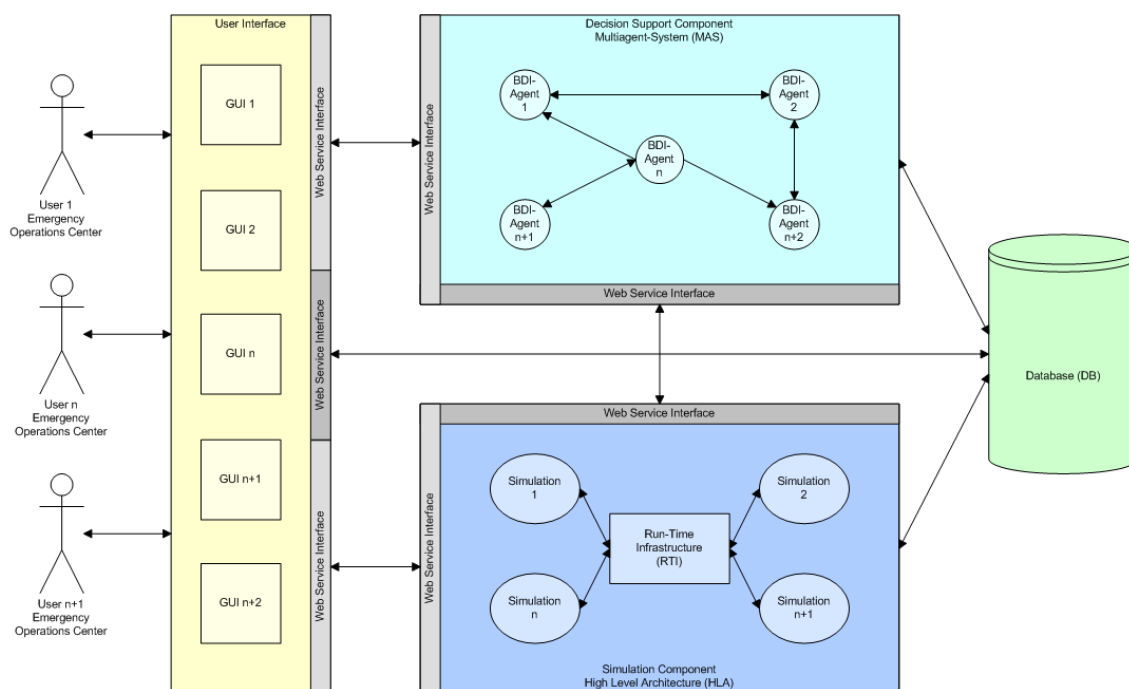
The system consists of four interacting components. The first is a **user interface**, whose appearance is configured depending on the current user. Web service interfaces are provided to interchange data with both the decision support and the simulation component.

The **simulation component** simulates the disaster scenario of a floodwater by describing the dynamic handling process of the disaster in various scenarios. Performed user actions interact with the simulated scenario. The simulation component consists of various independent and distributed simulations based on the High Level Architecture (HLA).

The **decision support component** supports the user's decision process by suggesting possible actions to optimize the dispatch of resources, based on unsure and incomplete information about the disaster scenario. To model this decision component a multi agent system was chosen, which allows for a realistic mapping of both the communication process and the decision process within the executive staff. The software agents implement the Belief-Desire-Intention (BDI) paradigm while forming an MAS according to the FIPA Agent Management Specification (FIPA AMS). An adequate web service interface is used for the information interchange between the decision support, the simulation and the user interface.
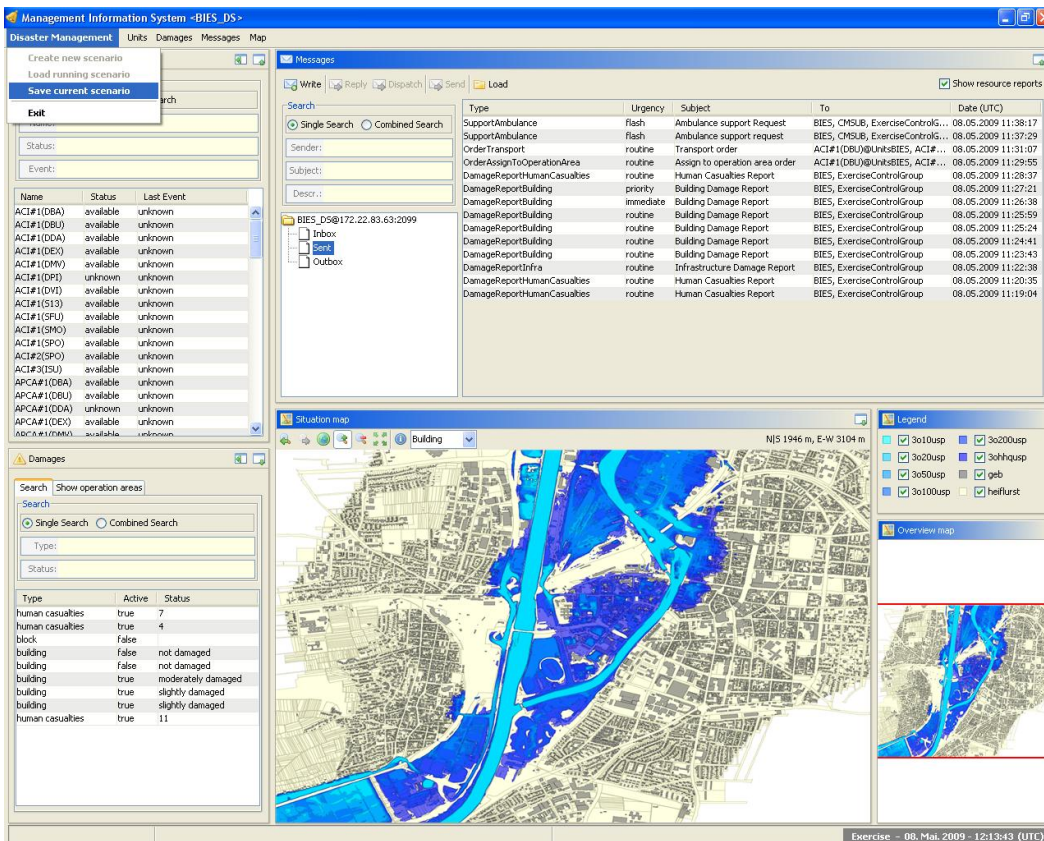
The fourth and last component is a central **database** in which the previously known information about the operation area and changes during the disaster is stored. For this decision support and simulation interact with the database as well as the user interface that can be used to access and store data. This database can contain e.g. information on the available resources as well as details about stationary institutions like hospitals and resources depots. Furthermore the database allows for the storage of information collected during a real disaster operation, which serves as a source for the improvement of the simulation and decision support component of the system.

M.Sc. Dipl.-Inform. (FH) Christian Paulus
Tel: 0721 / 608 6544
Email: christian.paulus@kit.edu

http://www.tmb.kit.edu

Dipl.-Wirtsch.-Inform. Hagen Engelmann
Tel: 0721 / 608 4121
Email: hagen.engelmann@kit.edu