



Large Environmental Sensor Observation Data and Knowledge Base for Collaborative Decision-support in Crises

Zoheir Sabeur (1), Joachim Wächter (2), Andreas Küppers (2), and Kym Watson (3)

(1) University of Southampton IT Innovation Centre, Southampton SO16 7NP, United Kingdom (zas@it-innovation.soton.ac.uk / +44 23 8076 0833), (2) Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum, Potsdam, Germany (wae@gfz-potsdam.de ; kueppers@gfz-potsdam.de /+49-331-2881703), (3) Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB, Karlsruhe, Germany (kym.watson@iosb.fraunhofer.de)

We describe the research work being carried out in the EU FP7 project TRIDEC on “Collaborative, Complex and Critical Decision-Support in Evolving Crises”[1]. TRIDEC focuses on new technologies for real-time intelligent information management in decision making processes in the geo-science applications tsunami early warning and industrial drilling operations.

A key challenge is the construction of a communication infrastructure of interoperable services through which intelligent management of dynamically increasing volumes and dimensionality of information and data is efficiently supported; where groups of decision makers collaborate and respond quickly in a decision-support environment. The research and development objectives include the design and implementation of a robust and scalable service infrastructure supporting the integration and utilisation of existing resources with accelerated generation of large volume of data. These include sensor systems, geo-information repositories, simulation- and data-fusion-tools. A knowledge-based service framework is deployed for context information and intelligent information management with flexible orchestration of system resources. An adaptive framework for collaborative decision making is enabled with new functions for the support of complex business processes. The two TRIDEC application scenarios involve intelligent management of large volumes of data for critical decision-support. Specifically, one concerns a large group of experts working collaboratively in crisis centres and government agencies using sensor networks. Their goal is to make critical decisions and save lives, infrastructural and industrial facilities in evolving tsunami crises. The other concerns a large group of consulting engineers and financial analysts from energy companies working collaboratively in sub-surface drilling operations. Their common objective is to monitor drilling operations in real-time using sensor networks, optimising drilling processes and critically detecting unusual trends of drilling systems functions. This prevents operational delays, financial losses, and environmental accidents and assures staff safety in drilling rigs.

TRIDEC is designing and implementing a knowledge base service infrastructure using structured data fusion and data mining services as follows:

- Implementation of context aware text and data mining tools for pattern recognition and handling of large scale distributed datasets,
- Implementation of high dimensional and distributed clustering techniques for sensor, text and multi-media datasets
- Handle uncertainty information and extracted information for decision-support and the training of the data fusion and modelling, belief and trust management algorithms
- Implementation of multi-levelled generic data fusion and modelling services for decision-support

References:

- [1] TRIDEC(2010). Collaborative, Complex and Critical Decision-Support in Evolving Crises. EC Integrated Project, Contract: FP7 258723.