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A Distributed Architecture for Tsunami Early Warning and Collaborative Decision-support in Crises

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The presentation will describe work on the system architecture that is being developed in the EU FP7 project TRIDEC on "Collaborative, Complex and Critical Decision-Support in Evolving Crises". The challenges for a Tsunami Early Warning System (TEWS) are manifold and the success of a system depends crucially on the system's architecture. A modern warning system following a system-of-systems approach has to integrate various components and sub-systems such as different information sources, services and simulation systems. Furthermore, it has to take into account the distributed and collaborative nature of warning systems.

In order to create an architecture that supports the whole spectrum of a modern, distributed and collaborative warning system one must deal with multiple challenges. Obviously, one cannot expect to tackle these challenges adequately with a monolithic system or with a single technology. Therefore, a system architecture providing the blueprints to implement the system-of-systems approach has to combine multiple technologies and architectural styles. At the bottom layer it has to reliably integrate a large set of conventional sensors, such as seismic sensors and sensor networks, buoys and tide gauges, and also innovative and unconventional sensors, such as streams of messages from social media services. At the top layer it has to support collaboration on high-level decision processes and facilitates information sharing between organizations. In between, the system has to process all data and integrate information on a semantic level in a timely manner. This complex communication follows an event-driven mechanism allowing events to be published, detected and consumed by various applications within the architecture.

Therefore, at the upper layer the event-driven architecture (EDA) aspects are combined with principles of service-oriented architectures (SOA) using standards for communication and data exchange. The most prominent challenges on this layer include providing a framework for information integration on a syntactic and semantic level, leveraging distributed processing resources for a scalable data processing platform, and automating data processing and decision support workflows.