A communication model for interlinking national tsunami early warning systems

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The integration of national Tsunami Early Earning Systems (TEWS) to ocean-wide networks is a main objective of the UNESCO Intergovernmental Oceanic Commission (IOC) tsunami programme. The intention is to interlink national TEWSs leveraging warning communication during hazards.

For this purpose a communication model has been developed enabling an efficient message exchange within a centre-to-centre (C2C) communication in a system-of-systems environment. The model, designed to be robust and simple, is based on existing interoperability standards from the Open Geospatial Consortium (OGC) and the Organization of the Advancement of Structured Information Standards (OASIS). For the exchange of tsunami warning bulletins the Common Alerting Protocol (CAP) is used. It supports geospatial referencing by addressing geocoded Points of Interests (POIs), Areas of Interest (AOIs) and Coastal Forecast Zones (CFZs). Moreover it supports hazard classification by standardized criticality parameters and the transmission of attachments, e.g. situation maps.

The communication model also supports the exchange of sensor observations and measurements such as sea level data or earthquake parameters. For this purpose markup languages of the Sensor Web Enablement (SWE) suite are used.

Both communication products, warning bulletins and sensor observations, are embedded in an envelope providing addressing and routing information using the Emergency Data Exchange Language Distribution Element (EDXL-DE).

The communication model has been implemented in a first pilot based on Message Oriented Middleware (MOM). Implementation, test and validation was started in the European research project Distant Early Warning System (DEWS) and is continued successively in the project Collaborative, Complex, and Critical Decision Processes in Evolving Crises (TRIDEC). Stimulated by the concepts and results of the German Indonesian Tsunami Early Warning System (GITEWS) and based on its sensor integration platform forming the upstream information flow, the DEWS project focused on the improvement of downstream capacities of warning centres especially by improving information logistics for effective and targeted warning message aggregation for a multilingual environment. Based on these results, TRIDEC continues this task focusing on real-time intelligent information management in Earth management. The addressed challenges 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 volumes of data.