Collaborative, Complex and Critical
Decision-Support in Evolving Crisis

TRIDEC – The ICT flagship project for information management and software architecture for crisis management

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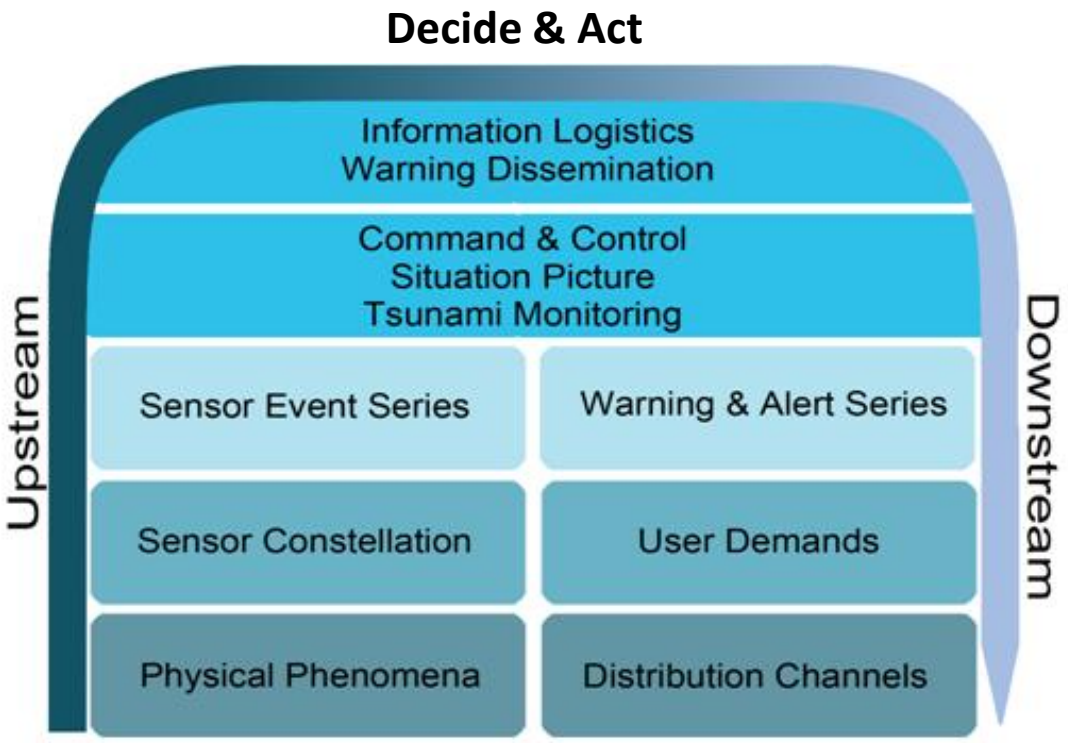
Challenge Crisis Management

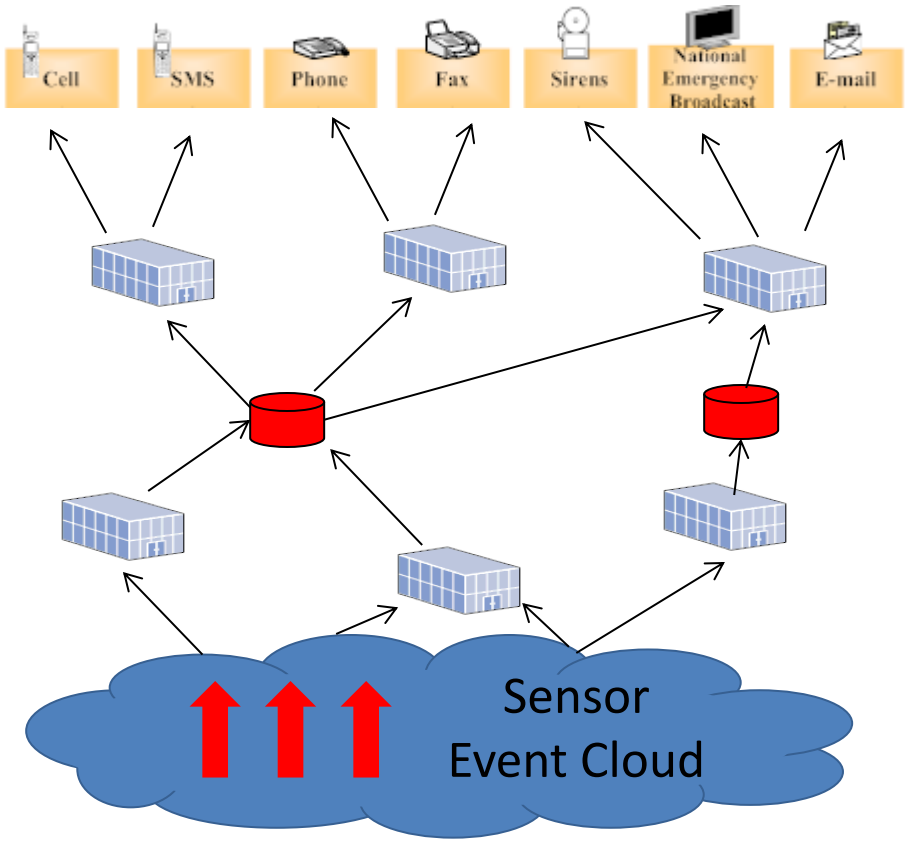
- Dynamically increasing volumes and dimensionality of information
- Data from an increasing number of distributed sensor systems
- New types of sensors (Human Sensors, Unconventional Sensors)
- Role of Events in controlling activities of complex warning systems
- Cooperation of independent information system in collaborative complex tasks
- Integration of computer simulations for prognostic modelling (what-if calculations)
- Knowledge-base: dealing with context information, e.g. geographic data, and historical events/lessons learned

An Initial Approach for Information Management in Tsunami Early Warning



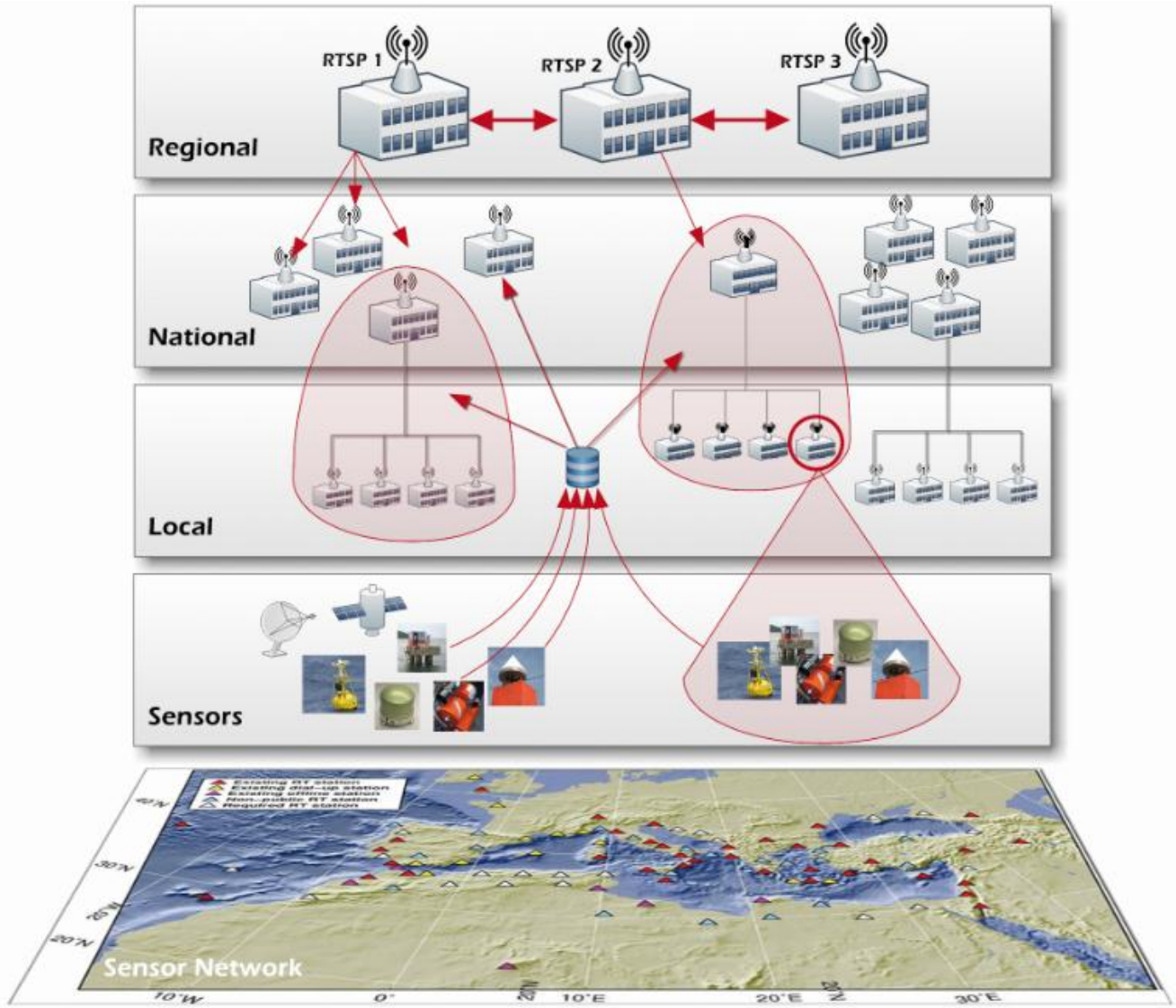
- **Upstream**
  - Sensor data
  - Context information
  - Dynamic evaluation and filtering
- **Decide & Act**
  - Decisions based on data and context information
  - Validation of alternatives
  - Initiation of warning activities
- **Downstream**
  - Preparation of Warning messages based on target group parameters
  - Multi-channel dissemination of messages
  - Control of actuators

Event Processing Network

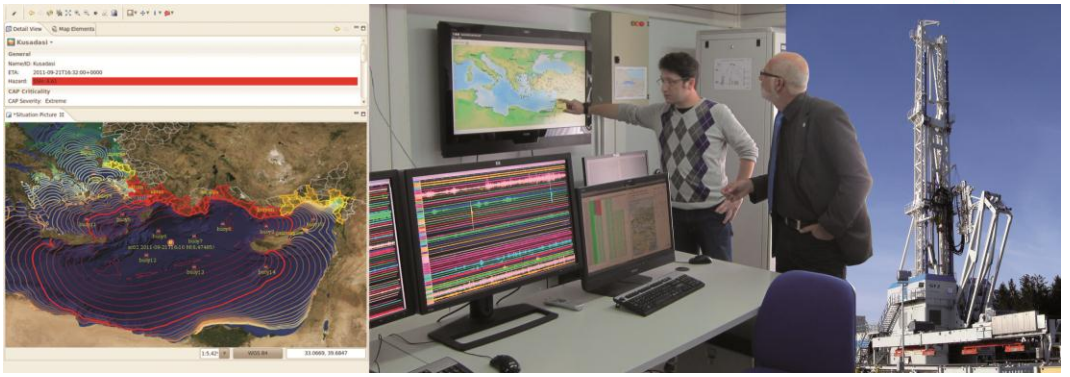


- Connection and collaboration of components via buffers (channels)
  - Sensor systems to warning centre
  - Warning centre to warning centre
  - e.g. National to local warning centre
- Buffers dedicated to special themes (topics)
  - Sensor events
  - National warning messages
  - Specific messages for defined regions
  - Redundancy
- Components/Systems responsible for their reaction
  - Very loosely coupled systems
  - Standardisation of sensor events

Result: System-of-Systems Approach for Tsunami Early Warning



Key Objectives



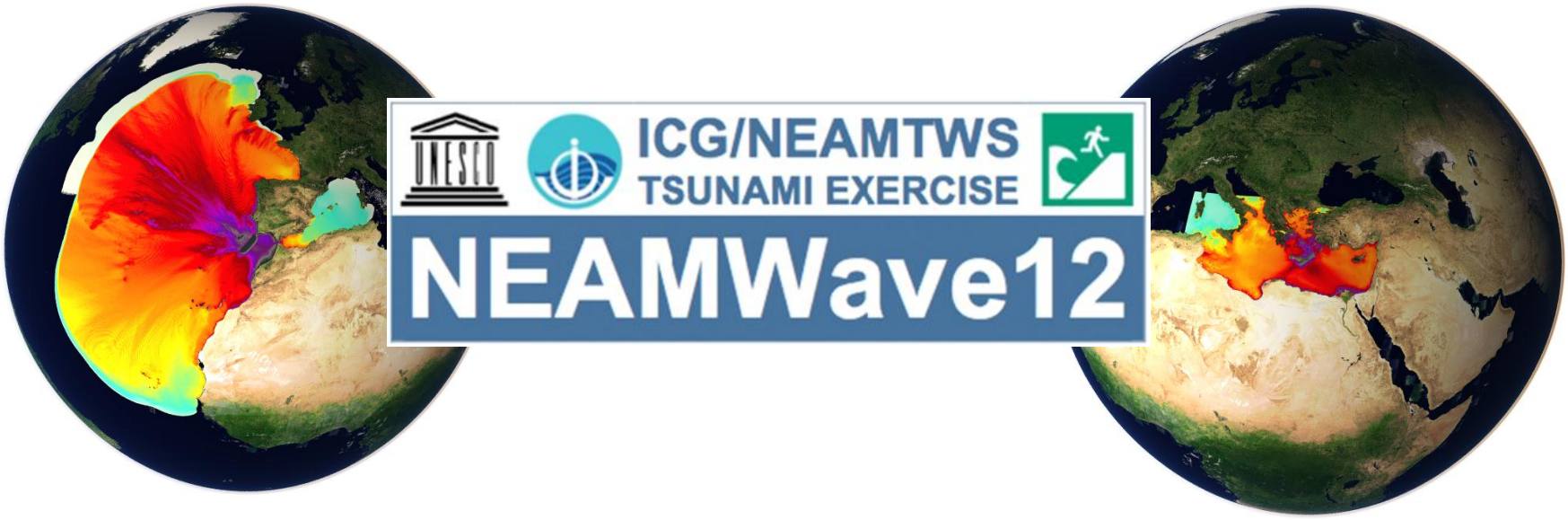
TRIDEC focuses on new technologies for real-time intelligent information management in colloborative, complex critical decision processes in Earth management

- Key Objectives:
  - A **communication infrastructure of interoperable services** for the **intelligent management of dynamically increasing volumes and dimensionality of information**.
  - A **robust and scalable service platform** supporting the integration and utilisation of existing and- growing resources such as sensor systems, geo-information repositories, simulation-, and data-fusion-tools.
  - A **knowledge-based service framework** for context information and intelligent information management with flexible orchestration of system resources.
  - An **adaptive framework for collaborative decision making** with the support of complex business processes and workflows.

Demonstration in two real scenarios: Tsunami Early Warning System (Natural Crisis Management) and Drilling Operations (Industrial Subsurface Development).

TRIDEC References

- NEAMWave 2012 Tsunami Exercise Drill
  - North East Atlantic and the Mediterranean Sea
  - 18 national Tsunami warning organisations participating
  - Two independent TRIDEC installations participated



TRIDEC References

- **IRM Global Risk Award 2013**

Institute of Risk Management's Global Risk Awards 2013 WINNER MANAGING RISK ACROSS BOUNDARIES

- Competitors:
  - Intel,
  - SAP,
  - Parsons Brinkeroff,
  - Nest Investment Holdings,

Potentials for Big Data and Geosciences

- System Architectures
  - Reference Architecture including patterns and best practices
  - Integration of heterogeneous decoupled systems
- Event Processing
  - From signals to relevant information for decisions
  - Interdisciplinary exchange of real-time data
- Contributions to e-Infrastructure
  - Free and Open Source Software components
  - Construction of a repository for scientific exploitation
  - Processing as services of a scientific cloud

NH5.6

Early warning systems for tsunamis and other natural hazards

Wednesday, April 10

13:30 – 17:15 hours

Room G8

- Integration of heterogeneous sensor systems
- Application of unconventional sensors for situation assessment and damage estimation, e.g. blogs, smartphone apps, and low cost mobile airborne sensors
- Process design of standard operational procedures in warning centres
- Integration of simulation systems for forecasting of processes as well as systematic testing of warning systems
- Message-based coordination of activities of warning centres in a system-of-systems environment, e.g. based on the Common Alerting Protocol (OASIS)
- Concepts of and best practices for the operation of complex multinational warning systems, e.g. utilisation of service level agreements (SLA) and IT Infrastructure Library procedures (ITIL).