Application of Service Oriented Architecture (SOA) in Early Warning Systems for Tsunamis and other Natural Hazards

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Objectives

- Generic early warning framework for tsunamis and other natural hazards
- Clear separation between hazard-specific and generic functionality
- Reference architecture

Open Standards

OGC – Open Geospatial Consortium

SWE (Sensor Web Enablement) Standards
- SAS (Sensor Alert Service)
- SOS (Sensor Observation Service)
- WNS (Web Notification Service)

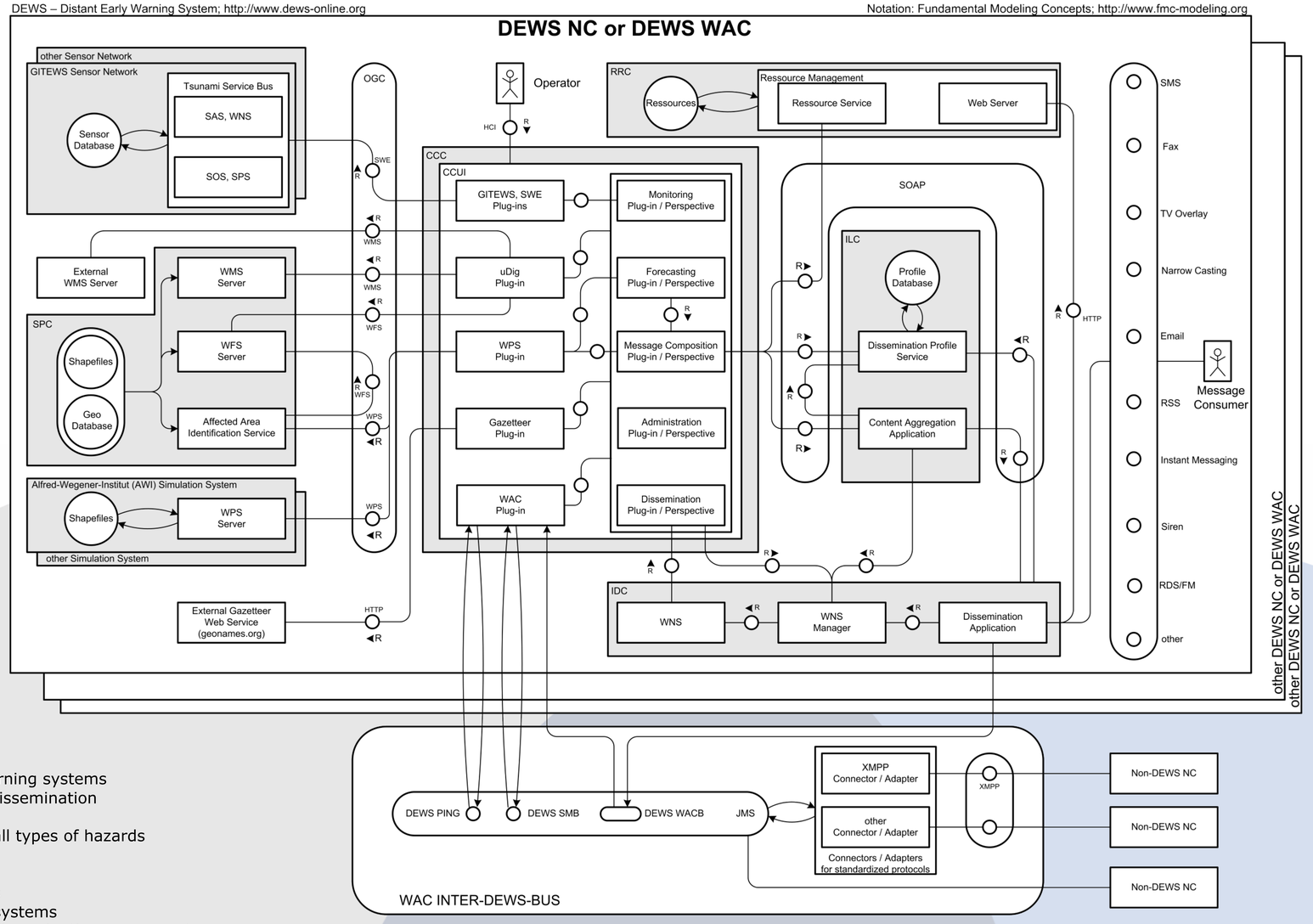
OWS (OpenGIS Web Service) Standards
- WMS (Web Mapping Service)
- WPS (Web Processing Service)
- WFS (Web Feature Service)

OASIS – Organization for the Advancement of Structured Information Standards

EM (Emergency Management) TC Standards
- CAP (Common Alerting Protocol)
- EDXL-DE (Emergency Data Exchange Language - Distribution Element)

DEWS – Distant Early Warning System; http://www.dews-online.org

Notation: Fundamental Modeling Concepts; http://www.fmc-modeling.org



Approach

Integration of sensor networks realized with SWE services
- Semantic integration is hazard specific

Integration of simulation system realized with WPS
- Semantic integration is simulation specific

Integration of Spatial Data Infrastructure (SDI) with WMS and WFS
- Independent from hazard type
- Depends on the data availability and requirements of each warning centre

Realization of downstream components with CAP and EDXL-DE over HTTP SOAP
- Independent from specific hazard type
- Enables re-usage for all kind of emergency messages
- Hazard-specific message types have to be specified

Realization of DEWS centres communication with SWE, CAP and EDXL-DE via MOM
- Message Oriented Middleware (MOM)
  - JMS and XMPP
  - Optionally STOMP, REST et al.
- Wide Area Centre Bulletins (WACB)
  - Warning messages with CAP and EDXL-DE
- Sensor Measurement Bulletins (SMB)
  - Sensor data with SWE and EDXL-DE
- PINGs
  - Status messages with EDXL-DE

DEWS Characteristics

- New generation of open standard based early warning systems
- Reliable hazard detection and effective warning dissemination

- Multi-hazard approach: Application potential for all types of hazards
- Transferable to different geographic areas

- Modular architecture with standardized interfaces
- Upstream: Open integration platform for sensor systems
- Downstream: Information logistics and warning dissemination components

- Open Source wherever possible
- Existing standards wherever possible

- DEWS focuses on downstream by improving information logistics and multi-channel warning dissemination
- Multilingual environment

Conclusion

Used strategies leveraged by SOA principles not only allow (re-)usage of single system components – but also enable replacement of components without modifications of others.

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Distant Early DEWS Warning System

SIXTH FRAMEWORK PROGRAMME

www.gfz-potsdam.de
www.dews-online.org