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Applying Sensor Web Technology to Marine Sensor Data

Simon Jirka (1), Joaquin del Rio (2), Daniel Mihai Toma (2), Daniel Nüst (1), Christoph Stasch (1), and Eric Delory (3)

(1) 52°North Initiative for Geospatial Open Source Software GmbH, Münster, Germany, (2) SARTI Research Group, Electronics Dept., Universitat Politècnica de Catalunya (UPC), Vilanova i la Geltrú, Spain, (3) Plataforma Oceánica de Canarias PLOCAN, Telde, Las Palmas, Spain

In this contribution we present two activities illustrating how Sensor Web technology helps to enable a flexible and interoperable sharing of marine observation data based on standards.

An important foundation is the Sensor Web Architecture developed by the European FP7 project NeXOS (Next generation Low-Cost Multifunctional Web Enabled Ocean Sensor Systems Empowering Marine, Maritime and Fisheries Management). This architecture relies on the Open Geospatial Consortium's (OGC) Sensor Web Enablement (SWE) framework. It is an exemplary solution for facilitating the interoperable exchange of marine observation data within and between (research) organisations. The architecture addresses a series of functional and non-functional requirements which are fulfilled through different types of OGC SWE components. The diverse functionalities offered by the NeXOS Sensor Web architecture are shown in the following overview:

- Pull-based observation data download: This is achieved through the OGC Sensor Observation Service (SOS) 2.0 interface standard.

- Push-based delivery of observation data to allow users the subscription to new measurements that are relevant for them: For this purpose there are currently several specification activities under evaluation (e.g. OGC Sensor Event Service, OGC Publish/Subscribe Standards Working Group).

- (Web-based) visualisation of marine observation data: Implemented through SOS client applications.

- Configuration and controlling of sensor devices: This is ensured through the OGC Sensor Planning Service 2.0 interface.

- Bridging between sensors/data loggers and Sensor Web components: For this purpose several components such as the "Smart Electronic Interface for Sensor Interoperability" (SEISI) concept are developed; this is complemented by a more lightweight SOS extension (e.g. based on the W3C Efficient XML Interchange (EXI) format).

To further advance this architecture, there is on-going work to develop dedicated profiles of selected OGC SWE specifications that provide stricter guidance how these standards shall be applied to marine data (e.g. SensorML 2.0 profiles stating which metadata elements are mandatory building upon the ESONET Sensor Registry developments, etc.).

Within the NeXOS project the presented architecture is implemented as a set of open source components. These implementations can be re-used by all interested scientists and data providers needing tools for publishing or consuming oceanographic sensor data.

In further projects such as the European project FixO_3 (Fixed-point Open Ocean Observatories), these software development activities are complemented with additional efforts to provide guidance how Sensor Web technology can be applied in an efficient manner. This way, not only software components are made available but also documentation and information resources that help to understand which types of Sensor Web deployments are best suited to fulfil different types of user requirements.