ID32 - SENSOR WEB ENABLEMENT IMPLEMENTATIONS IN MARINE OBSERVATION PLATFORMS

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Abstract
The study of global phenomena requires the integration of scientific data coming from multiple sources. Data is usually acquired by a wide variety of observation platforms, managed by different institutions and often using non-standardized data and metadata formats. In order to address these issues a generic solution to integrate sensor data into spatial data infrastructures based on the Sensor Web Enablement framework is proposed.

Keywords – Sensor Web Enablement, Interoperability, SensorML, Sensor Observation Service, Plug and Play

I. INTRODUCTION
The study of global phenomena requires the analysis of scientific data acquired by different institutions and usually stored in different formats. A considerable amount of work is required in order to arrange this heterogeneous data into coherent data sets. Furthermore, integrating sensors into marine observation platforms is a time-consuming task that requires expertise in both sensors and acquisition platforms. Despite advances in recent years, interoperability and data harmonization still remains an open issue in the marine community.
The Sensor Web Enablement (SWE) framework aims to address these interoperability challenges by providing a set of protocols and standards to achieve data harmonization and data interoperability among Spatial Data Infrastructures (SDIs) [1]. Although these standards provide well defined interfaces for web services and applications, the integration of sensor data into SDIs still remains a challenge. Due to the wide variety of marine observation platforms, a generic SWE-based architecture is proposed in order to integrate sensor data into data infrastructures in different scenarios.

II. GENERIC SWE-BASED ARCHITECTURE
As a standard solution to integrate sensor data into existing SDIs a generic and flexible architecture is proposed, based on SWE standards. The architecture, suitable to be deployed in various scenarios, is depicted in Fig. 1

The SensorML is a standard metadata language that provides robust encoding for sensor and sensor-related procedures. It is very flexible and permits to describe sensor identifiers, communication protocols, sensor capabilities and configurable parameters among others [2]. Each sensor should have an associated SensorML file, were its metadata will be encoded. Combining a SensorML file describing a sensor with the OGC PUCK Protocol it is possible to embed the sensor metadata in the sensor itself [3]. Afterwards, this metadata can be automatically accessed without any a priori knowledge of the sensor by the observation platform's controller using the OGC PUCK protocol interface [4].

The SWE Bridge is a open source, cross-platform universal driver capable of decoding SensorML files and automatically operate a sensor [5]. It gathers sensor data and generates standard Observations and Measurements data files, compatible with the Sensor Observation Service (SOS) interface [6], [7]. The SWE Bridge also is compatible with the OGC PUCK Protocol, providing sensor auto-detection and auto-identification capabilities.
The SOS Server is a web service that provides a standardized interface to archive and retrieve sensor data and sensor metadata. Using its standard interface data visualization tools and other web services can access to query for sensor data.
The proposed solution to integrate sensor data into SDIs has been deployed and tested in different scenarios, including underwater cabled observatories, buoys, a underwater gliders (SeaExplorer) and Wavegliders.

III. CONCLUSIONS
Adopting the proposed flexible, standards-based architecture the interoperability between sensors and observation platforms is greatly improved. Moreover, sensor data can be integrated into SDIs with minimal human intervention. The flexible nature of the proposed architecture significantly reduce the use of custom software components, facilitating component re-usability and decreasing maintenance costs.

ACKNOWLEDGEMENTS
This work was supported by the project EMSO-Link from the European Commission's Horizon 2020 research and Innovation program under Grant Agreement No. 731036.

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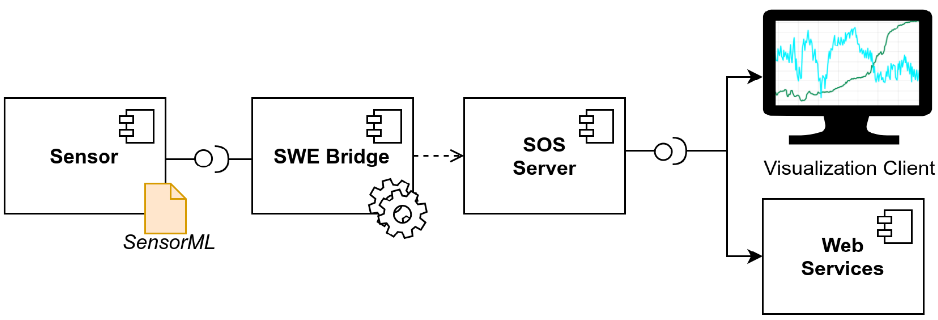

Fig 1. Generic Sensor Web Enablement architecture to integrate sensors