Automated Data Quality Assurance using OGC Sensor Web Enablement Frameworks for Marine Observatories

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Over the past years, environmental sensors have continuously improved by becoming smaller, cheaper, and more intelligent. Therefore, many sensor networks are increasingly deployed to monitor our environment. But due to the large number of sensor manufacturers, accompanying protocols and data encoding, automated integration and data quality assurance of diverse sensors in an observing systems is not straightforward, requiring development of data management code and manual tedious configuration. However, over the past few years it has been demonstrated that Open-Geospatial Consortium (OGC) frameworks can enable web services with fully-described sensor systems, including data processing, sensor characteristics and quality control tests and results. So far, the SWE framework does not describe how to integrate sensors on-the-fly with minimal human intervention. The data management software which enables access to sensors, data processing and quality control tests has to be implemented and the results have to be manually mapped to the SWE models. In this contribution, we describe a Sensor Plug & Play infrastructure for the Sensor Web by combining (1) OGC PUCK protocol – a simple standard embedded instrument protocol to store and retrieve directly from the devices the declarative description of sensor characteristics and quality control tests, (2) an automatic mechanism for data processing and quality control tests underlying the Sensor Web - the Sensor Interface Descriptor (SID) concept, as well as (3) a model for the declarative description of sensor which serves as a generic data management mechanism - designed as a profile and extension of OGC SWE's SensorML standard. We implement and evaluate our approach by applying it to the OBSEA Observatory, and can be used to demonstrate the ability to assess data quality for temperature, salinity, air pressure and wind speed and direction observations off the coast of Garraf, in the north-eastern Spain.