International Conference on Hydroinformatics

8-1-2014

Interoperability Between GRDC's Data Holding And The GEOSS Infrastructure

Volker Andres

Henning Bredel

Ralf Busskamp

Simon Jirka

Ulrich Looser

See next page for additional authors

Recommended Citation

Andres, Volker; Bredel, Henning; Busskamp, Ralf; Jirka, Simon; Looser, Ulrich; Schlummer, Manuela; Strauch, Adrian; and Utech, Michael, "Interoperability Between GRDC's Data Holding And The GEOSS Infrastructure" (2014). *CUNY Academic Works.*
http://academicworks.cuny.edu/cc_conf_hic/270

Authors

Volker Andres, Henning Bredel, Ralf Busskamp, Simon Jirka, Ulrich Looser, Manuela Schlummer, Adrian Strauch, and Michael Utech

INTEROPERABILITY BETWEEN GRDC'S DATA HOLDING AND THE GEOSS INFRASTRUCTURE

VOLKER ANDRES (1), SIMON JIRKA (2), MANUELA SCHLUMMER (4), HENNING BREDEL (2), MICHAEL UTECH (3), ADRIAN STRAUCH (4), RALF BUSSKAMP (1), ULRICH LOOSER (1)
(1): Federal Institute of Hydrology (BfG), Germany
(2): 52°North Initiative for Geospatial Open Source Software GmbH, Germany
(3): KISTERS AG, Germany
(4): Department of Geography, University of Bonn, Germany

The Global Runoff Data Centre (GRDC) has tested and deployed new software components that implement latest advances in hydrological data exchange standardization. Utilizing a recently developed hydrology profile of the OGC Sensor Observations Service 2.0 standard, discharge data encoded in WaterML 2.0 can be provided through an up to date web service interface offering a high degree of interoperability.

GEO, GEOSS AND GEOWOW

The Group on Earth Observations (GEO) is a partnership of governments and organizations with the ambition to provide decision makers with coordinated, comprehensive, and sustainable earth observations data and information. For implementing this vision, the Global Earth Observation System of Systems (GEOSS) has been established. This *"[...] system of systems with components consisting of existing and future Earth observation systems across the processing cycle from primary observation to information production [...] provides the means for sharing observations and data products and ensures [...] that the shared observations and products are accessible, comparable, and understandable by supporting common standards and adaptation to user needs."* [1, p. 13]

GEOSS interoperability for weather, ocean and water (GEOWOW) is a project funded by the European Commission which aims at supporting these goals with particular focus on the weather, ocean ecosystem and water domain.

Project partners relating to the water domain have actively contributed to the international standardization process for the interoperable sharing of hydrological data. To ensure the applicability of the developed standards in practice and to validate the developed concepts, several use cases were elaborated and analyzed in close collaboration with the GRDC. This was complemented by software implementations which enable the GRDC to offer new, interoperable methods of data provision and thus to connect to the infrastructure of GEOSS.

GLOBAL RUNOFF DATA CENTRE

The GRDC, established in 1988 [5] at the Federal Institute of Hydrology (BfG) in Koblenz in Germany, operates under the auspices of the World Meteorological Organization (WMO). It was founded to support international research on climate variability and global change by collecting river discharge data and acting as a mediator between data providers and data users.

Currently, the database of the GRDC contains river discharge data collected at daily or monthly intervals from more than 9000 stations in 158 countries. Data sets are provided upon request utilizing an established procedure encompassing many manual steps and human interaction.

Recent technological advances in standardization and software development, however, now allow for innovative means of data provision. Adopting some of these improvements put the GRDC in the position to offer an additional method of data provision relying on advanced web service technology.

STANDARDIZATION

In the field of hydrological data exchange several problems and interoperability issues have become apparent over the years, especially at a global scale. Nevertheless, stepping up efforts to advance standardization in consortia, as e.g. the Open Geospatial Consortium (OGC), has recently led to significant achievements. With the development of a generic OGC standard for describing geographic features and by the creation of the Sensor Web Enablement (SWE) framework of standards, important foundations have been laid to remedy many of those deficiencies.

The Observation and Measurement 2.0 (O&M) standard [3] is a central element of a set of sensor related specifications forming the SWE framework. It offers an approach how observation data shall be modeled and XML encoded. However, O&M is a generic standard intended to be used in multiple domains. Hence, it is not adapted to the specific needs of a specific domain such as hydrology. Consequently, there are certain ambiguities which reduce the interoperability when encoding hydrological time series data sets. This shortage has been addressed by the development of the OGC WaterML 2.0 standard [4] which is a profile of O&M and *"[...] a standard information model for the representation of in-situ water observations data, with the intent of allowing the exchange of such data sets across information systems"* [5, p. 1]. To complement this highly interoperable encoding for hydrological data sets with an appropriate interface for web-based data access is a central goal of the GEOWOW project. To achieve this objective, the Sensor Observations Service 2.0 (SOS) standard was taken as a basis for developing a SOS profile that is specifically adjusted for hydrological purposes [2]. Using software implementing WaterML 2.0 and the SOS 2.0 hydrology profile, hydrological metadata and time series data can now be encoded and accessed in forward-looking interoperable manner.

IMPLEMENTATIONS

To validate the developed profile in the framework of the GEOWOW project, two partners have developed client and server software components that implement the OGC Sensor Observation Service 2.0 Hydrology Profile [2].

The Sensor Observation Service of 52°North[1] is an open source software project published in the context of 52°North' Sensor Web community which focuses on supporting the creation of Sensor Web infrastructures. This SOS implementation has been adapted to the continuing evolution of the corresponding standards and is now able to provide a service interface utilizing the SOS 2.0 profile for hydrology. Moreover, a security component has been developed as a complementary service for applying access restrictions to various web services such as the SOS.

The solution of KISTERS is embedded in a software suite (WISKI[2]) for managing many different aspects of hydrological data handling. The KISTERS Web Interoperability Solution (Ki-WIS) is the component that implements the SOS 2.0 profile for hydrology. It is fully integrated into the system architecture and by this means enabled to use the integrated user and access management capabilities.

DEPLOYMENT AT THE GRDC

Both implementations of the SOS have been deployed at the GRDC and tested thoroughly.

The SOS of 52°North has been deployed and connected to the GRDC's native database. However, due to data policy restrictions of the GRDC database, it is not possible to make this service interface directly accessible on the internet. Only a subset of the GRDC's database is allowed to be published freely and contributed to the GEOSS Data CORE[3]. This limitation has been overcome by additionally deploying a security component which is using an authentication and authorization scheme to restrict the access of individual users to specific data sets.

KISTERS' approach has been deployed, as well. Here it was necessary to migrate the complete database of the GRDC into the WISKI system.

The mentioned software solutions will be fully integrated into the GRDC's production environment for operational service. The appropriate service endpoint will be registered at the GEOSS registry. Thus, not only the metadata regarding the GRDC data are searchable through the GEOSS portal but also a concrete data access interface is offered right after the search process. Consequently, all data in the GRDC database that are allowed to be provided freely can be retrieved via GEOSS (the GEO Web Portal) without going through any personal request procedure.

---

[1] http://52north.org/communities/sensorweb/sos/
[2] WISKI stands for Water Information System KISTERS (http://www.kisters.net/wiski.html)
[3] https://www.earthobservations.org/geoss_dsp.shtml

CONCLUSION

Latest developments in standardization have laid the foundations to connect the database of the GRDC directly to the GEOSS infrastructure using interoperable and standard based web service technology. In the near future, freely available data sets of the GRDC can be discovered and retrieved on an operational basis using the tools provided by the GEOSS portal. Thus, end users and decision makers can search, find, and retrieve GRDC data in a considerably much easier way.

CREDITS

REFERENCES

[1] *Battrick, B. (Ed.), Global Earth Observation System of Systems GEOSS, 10-Year Implementation Plan Reference Document, Noordwijk, (2005), ESA Publications Division*

[2] *GEOWOW Consortium; OGC Sensor Observation Service 2.0 Hydrology Profile, OGC Discussion Paper. Wayland, MA, USA, Open Geospatial Consortium Inc., (2014).*

[3] *ISO TC 211, ISO 19156:2011 - Geographic information - Observations and measurements - International Standard. Geneva, Switzerland, International Organization for Standardization, (2011).*

[4] *Taylor, P., OGC Implementation Standard: OGC WaterML 2.0: Part 1 - Timeseries (10-126r3). Wayland, MA, USA, Open Geospatial Consortium Inc., (2012).*

[5] *World Climate Research Programme, Bundesanstalt für Gewässerkunde (Germany), "Report of the Workshop on the Global Runoff Data Set and Grid Estimation, Koblenz, FRG, 10-15 November 1988", Vol. 22 (1989), World Meteorological Organization*