# OpenGIS Project Document 15-029: Activity Plan for an OGC Interoperability Experiment

Title: OGC Soil Interoperability Experiment (Soil IE) Activity Plan

Abbreviation: **SoilIE**

# Summary

This soil interoperability experiment (SoilIE) will further develop and test a global Soil Markup Language. This will be achieved by harmonizing and advancing existing initiatives such as ISO28258 SoilML, the EU-INSPIRE soil data specification, eSoterML, ANZSoilML, and others. This IE will produce an OGC engineering report that will be the basis for an OGC candidate data model and encoding standard. The standards work is planned for after the SoilIE is completed.

A soil encoding standard is required for the exchange of soil feature data, including data about soil bodies, profiles, horizons and related entities. A standard is also required as a reference for soil observations, as these features typically host the properties that are observed.

# INITIATOR ORGANIZATIONS

The OGC members who are initiators of this Interoperability Experiment are:

* Commonwealth Scientific and Industrial Research Organisation (CSIRO)
* Landcare Research (NZ) Ltd (LCR)
* ISRIC World Soil Information (ISRIC)

Contact information for these organizations is at the end of this activity plan.

# Participant ORGANIZATIONS

The following organizations will participate in the SoilIE.

* Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia.
* Landcare Research (LCR), New Zealand.
* ISRIC World Soil Information (ISRIC), Netherlands.

Participants are

* Federation University Australia
* Agriculture and Agri-Food Canada/Agriculture et Agroalimentaire Canada

Others TBC participants may include

* United States Department of Agriculture National Resources Conservation Center
* The German Federal Institute for Geosciences and Natural Resources (BGR)
* FAO Global Soil Partnership
* IUSS Global Soil Map
* Joint Research Centre (JRC)
* Columbia University CIESIN
* ISO (ISO TC190)
* IUSS Working Group Soil Information Standards (IUSS-WGSIS)

# DESCRIPTION

## Objectives

The objectives of the SoilIE include:

* Further develop and test SoilML2, a GML compatible information model for soil features, based on existing international initiatives.
* Prepare an OGC/IUSS engineering report with intent to develop it into a data specification subsequent to the IE.

## Background

OGC data standards delineate two types of information models: those for (1) observations, and (2) features. These models are related in that features host properties that are measured by observations (pH is a property of a soil body that can be measured at specific locations, times and depth). This relation is often realized by cross-referencing: e.g. observations can refer to their host features, and features can refer to observations made on their properties. For example, the Observations and Measurements (O&M) standard contains a unidirectional relation between an observation and a feature hosting a property, and another unidirectional relation between feature and related observations. In the water domain, the HydroDWG has developed an O&M-based data standard for water time-series observations (WaterML2), along with a reciprocal globally recognized feature groundwater feature model (GWML2). The HydroDWG are proposing to elevate WaterML2 to a more generic TimeSeriesML for use by non-hydro domains. However, there exists no globally recognized feature standard for soil. Initiatives for soil features are being developed regionally in Europe (INSPIRE, eSoterML), Oceania (ANZSoilML), and through ISO TC190 (SoilML). These initiatives require harmonization for global applicability and to be a natural correlate with O&M and the emerging ‘TimeSeriesML’.

## Use Cases

## Four use cases are described below, with commercial, scientific, policy and technologic orientations. These use cases are to be confirmed at the IE kick off meeting. Use cases 1-3 involve the delivery of specific soil features using web services, to satisfy specific requirements. Use case 4 involves the use of the schema as a canonical structure into which heterogeneous soil data formats are transformed.

1. **Use Case 1**: Technologic (soil data integration)

This use case involves using the schema as a canonical structure into which heterogeneous soil data (for sites, maps, laboratory results and historical reports) formats are transformed and published.

***Features***: soil profiles, soil horizons, soil samples, soil layers, field observations, laboratory analyses, morphological and functional soil descriptions, soil taxonomy.

***Services***: features are delivered using WFS and WMS (getFeatureInfo)

## Use Case 2: Commercial and Public (soil sensor data)

This use-case involves identifying the location and properties of soil monitoring sensors, to inform farmers and the public about local soil conditions.

***Features***: sensors and their host platforms, soil bodies, time-series observations.

***Services***: features are delivered using SOS and WMS (getFeatureInfo).

## Use Case 3: Policy (soil property modelling and predictions)

The provision of high resolution estimates of functional soil properties across the globe to support the development and implementation of policies for the management of the soil resources.

***Features***: soil profiles, soil bodies, soil layers, soil sampling artefacts.

***Services***: features are delivered using WCS, WFS and WMS (getFeatureInfo)

1. **Use Case 4**: Scientific (pedo-transfer functions[[1]](#footnote-1))

This use case involves the delivery of observed and interpreted soil properties (by soil type and/or by spatial distribution) in a standard format that allows using algorithms/pedo-transfer functions to use these properties to calculate additional interpreted soil properties.

***Features***: all of the above.

***Services***: input features are delivered using WFS and WMS (getFeatureInfo), input observations are delivered using SOS and TimeSeriesML. The pedo-transfer function may be exposed as an OGC Web Processing Service (WPS) process.

## Experiments

The SoilIE will attempt to address the following experiments:

* Experiment #1: determine the validity and efficacy of SoilML2 instance documents, generated mainly by web services, against use cases 1-3.
* Experiment #2: determine the efficacy of SoilML2, by determining its suitability as a canonical structure as per use case 4.

# TECHNICAL APPROACH

The Technical Approach for this Interoperability Experiment follows existing principles for development of information models as exemplified by GeoSciML, GWML2 and WaterML2 creation.

## Experimental Methodology

The methodology involves:

* Development of use-cases.
* Comparison of existing information models.
* Consolidation of existing information models into a unified UML conceptual model.
* Development of a GML-XML implementation specification and schema (XSD).
* Development of GML-XML instance documents.
* Deployment of WFS, SOS, WPS, and WMS utilizing SoilML2.
* Evaluation of instance documents against the use-cases.
* Development of an engineering report.

## Demonstration Planning

The results of the experiment will be demonstrated by making public the related documents (GML-UML and XML) by providing a demonstration of the web services at an appropriate OGC TC meeting.

## Candidate Standard Development

The primary focus of the SoilIE will be on the development and testing of SoilML2, a GML compatible encoding for soil features. The end result will be an engineering report, in preparation for its migration into a candidate standards document to be developed after completion of the SoilIE.

## Component Development

The following components will be developed concurrently by the responsible organization(s), to be completed by the execution end date.

|  |  |
| --- | --- |
| Description | Implementor(s) |
| Use-cases (in this proposal) | All |
| Comparison document | All |
| GML-UML EA model | LCR |
| GML-XML XSD schema | LCR |
| GML-XML instances | All |
| WFS, SOS, WMS deployment |  |
| Use Case 1: Commercial and Public (soil data publication) | TBA |
| Use Case 2: Policy (soil data publication) | TBA |
| Use Case 3: Scientific (soil data publication) | TBA |
| Use Case 4: Technologic (soil data integration and transformation) | TBA |
| Engineering Report | All |

## Testing

Testing will involve:

* Evaluation of the GML-UML against GML principles;
* Validation of the XSD;
* Evaluation of the functionality of web services;
* Evaluation of instance documents against use-cases.
* Evaluation of data exchange between participants

# DELIVERABLES

The documentation listed below will be considered the deliverables for the project.

## Documentation

* The documents listed under Component Development will be developed.

## Demonstration

* The developed documents will be made available on the AgDWG twiki and the OGC portal.
* A live demonstration of the web services will be shown at an appropriate OGC TC meeting.

# SCHEDULE (Tentative)

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| **Startup**Activity Plan submission: Apr. 2015Anticipated OGC Review Board approval: May. 2015Includes posting for 2 weeks for member comments |
| **Execution**Planned kickoff date (execution start date): June. 2015Includes 30-day Participation Notification period SoilML2 Development Oct. 2015 –Dec. 2015Planned end date: Dec. 2015 |
| **Wrap-up and Reporting**SoilML2 Demonstration at OGC TC Sydney. Dec. 2015Final document submission March. 2016 |

# RESOURCE PLAN

The Initiative Manager will be David Medyckyj-Scott (LCR) and the Initiative Technical Lead will be Alistair Ritchie (LCR).

The following resources will be available.

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| *Staffing* | Each initiating and participating organization will provide adequate staff resources to support their defined responsibilities for the duration of the SoilIE.  |
| *Hardware* | Initiating organizations will provide hardware as needed to support the SoilIE. |
| *Software* | Initiating organizations will provide software as needed to support the SoilIE. |
| *Other Resources* | Participants in the SoilIE are self-funded. All expenses incurred in carrying out the SoilIE will be assumed by the participating agencies within their regular line-of-business.  |

# INITIATOR ORGANIZATIONS – Contact Information

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1. Pedo-transfer functions (PTF) are predictive functions of certain soil properties using data from soil surveys. [↑](#footnote-ref-1)