Open Geospatial Consortium

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OGC Agriculture Information Model SWG Charter

To: OGC members & interested parties

A new OGC Standards Working Group is being formed. The OGC members listed below have proposed the OGC Agriculture Information Model SWG. The SWG proposal provided in this document meets the requirements of the OGC Technical Committee (TC) Policies and Procedures.

The SWG name, statement of purpose, scope, list of deliverables, audience, and language specified in the proposal will constitute the SWG's official charter. Technical discussions may occur no sooner than the SWG's first meeting.

This SWG will operate under the OGC IPR Policy. The eligibility requirements for becoming a participant in the SWG at the first meeting (see details below) are that:

- You must be an employee of an OGC member organization or an individual member of OGC;
- The OGC member must have signed the OGC Membership agreement;
- You must notify the SWG chair of your intent to participate to the first meeting. Members may do so by logging onto the OGC Portal and navigating to the Observer page and clicking on the link for the SWG they wish to join and;
- You must attend meetings of the SWG. The first meeting of this SWG is at the time and date fixed below. Attendance may be by teleconference.

Of course, participants also may join the SWG at any time. The OGC and the SWG welcomes all interested parties.

Non-OGC members who wish to participate may contact us about joining the OGC. In addition, the public may access some of the resources maintained for each SWG: the SWG public description, the SWG Charter, Change Requests, and public comments, which will be linked from the SWG's page.

Please feel free to forward this announcement to any other appropriate lists. The OGC is an open standards organization; we encourage your feedback.

Chapter 1. Purpose of the Standards Working Group

The purpose of this SWG is to develop, publish and maintain an Agriculture Information Model (AIM) to support interoperability of information in the Agriculture Domain, with emphasis on the re-use of generic OGC standards as appropriate.

AIM will be a multi-tier and modular domain model aligning, profiling, and/or extending well known agriculture related and generic ontologies, including existing ontologies published by the OGC. Recognizing that this is an innovative approach to publish such a domain model as a modular ontology the SWG will address both identification of best practices for this specialization approach and the development of a series of complementary models.

AIM provides a common language for agriculture applications to harmonize and improve data and metadata exchange by defining the data elements, including concepts, properties, and relationships relevant to agriculture applications, as well as their associated semantics/meaning for information exchange.

AIM is published as both human and implementation-ready machine-actionable resources. Machine-actionable resources include the canonical ontology representation of the AIM in the Web Ontology Language (OWL) as well as other related artifacts to support implementation.

The SWG will develop implementations of the AIM model compatible with OGC APIs, including:

- JSON schemas supported by OGC APIS;
- JSON-LD contexts allowing identification and validation of AIM-compliant data; and
- SHACL shapes enabling the validation of data against AIM semantics.

In addition, other forms may be derived or supplied to support reusability of the AIM model, according to requirements identified by the SWG:

- UML representation of AIM conceptual model;
- UML representation of one or more logical models for AIM implementation; and
- Formal profiles for implementation of AIM using GeoJSON, FG-JSON, CoverageJSON, and other relevant generic schemas

In line with OGC policies and FAIR principles, the AIM will be published using persistent and resolvable URI identifiers, consistent with OGC Naming Authority processes for publishing semantic resources.

Chapter 2. Business Value Proposition

One of the key challenges hampering the realization of smart farming solutions is related to the lack of interoperability between different systems and platforms in the agri-food sector, especially the ones offered by different technology providers. In this respect, seamless exchange and integration of the data produced/consumed by those systems is unfortunately rarely supported. This is in principle due to the wide heterogeneity of data models and semantics used to represent data in the agri-food domain, as well as the lack of related standards to dominate this space and the lack of sufficient interoperability mechanisms that enable the connection of existing agri-food data models.

The agriculture domain is a broad domain with multiple data reference models defined either as formal ontologies and schemas. These models are heterogeneous in form and may have little or no formal interoperability defined for any implicit or explicit overlaps in scope.

Using data and/or tools from various sources is a considerable burden that limits potential added value creation and brings a risk of further fragmentation of data derivatives' interpretations. This, in turn, hinders the development of smart services and applications supporting the decision making processes.

Best practices in reuse of available standards have emerged through significant projects, culminating in a candidate data model. AIM harmonizes and aligns relevant cross-domain standards like Time Ontology, SOSA, OWL, RDF Data Cubes, with domain models like Saref4Agri, FIWARE and INSPIRE/FOODIE, bridging various views on the agriculture data and providing a formal representation enabling unambiguous translations between them.

2.1. Value to the OGC

Reference data models that are defined based on the OGC ontologies and standards support their uptake and popularization. This leverages OGC’s position as the reference for the spatio-temporal aspects of data exchange to provide the basis for common approaches in an otherwise fragmented domain.

Formal representation of the data in external ontologies limits the lock-in of data and services within solutions that are not OGC compliant and enable incorporation of the OGC standards in new industry stacks like Data Spaces. It is also in line with industry trends to support data exchange with ontologies and vocabularies that will enable lookup, translations, and validations in the continuous integration manner.

In particular, the diversity of information system architectures in domains such as agriculture provide a significant opportunity for OGC to progress best practices regarding the application of common conceptual models, modular encoding building blocks and FAIR principles to heterogeneous but interoperable suites of related data products.

2.2. Value to the OGC Membership

Standardization of the AIM in a form that can be embedded in application-specific profiles of the OGC suite of data model and API standards shall facilitate the uptake of OGC standards and

interoperability principles in the agriculture sector.

Given that semantic model definitions are gaining increasing support and interest among the industries, the process of formalizing AIM will provide significant experience and insight into how to maintain relevance of OGC standardization processes in large, diverse and dynamic domains as they evolve to support greater levels of semantic interoperability.

2.3. Value to the geospatial community

The wider geospatial community will benefit from the emergence of harmonized approaches to reuse of generic spatio-temporal patterns with domain specific models. These approaches, tested in agriculture applications, will provide a template for other domains of application.

The adoption of AIM in operational systems, enabled by its standardization status, opens up a wide range of information types to interoperation with geospatial technologies.

2.4. Value to the wider IT community

The AIM standardization methodology will demonstrate the potential of industry-wide standards from OGC and other bodies to support the FAIR principles in large scale, highly heterogeneous domains.

Chapter 3. Scope of Work

The SWG will undertake:

- a review of available standards relevant to the Agriculture Domain;
- comparison of these with the scope of the existing AIM candidate model;
- establish agreements and prioritizing scope for standardization of modules;
- develop implementations of modules that can be realized using the concepts OGC API Building Blocks; and
- provide feedback to the OGC TC on best practices for domain model definition and its use in the APIs.

3.1. Statement of relationship of planned work to the current OGC standards baseline

The SWG will align the work of the reuse in the OGC APIs with the OGC API SWGs and the SensorThings API SWG. The Group will assess overlaps with work on the other general purpose standards including GeoSPARQL and GeoDCAT to agree on common parts.

3.2. What is Out of Scope?

Standards only state requirements that are important for a significantly large group of users. Proposals for new parts to existing parts must identify the user group that will benefit from the proposal and for each proposed conformance class; otherwise the proposal will be considered out-of-scope. If a community has a need to develop a profile, the profile should be specified and governed by that community and will not be included in the AIM SWG program of work.

3.3. Specific Existing Work Used as Starting Point

AIM reuses and aligns relevant standards at core and cross-domain level, with domain-specific models, bridging various views on the agriculture data and providing a formal representation enabling unambiguous translations between them. These standards used in the core and cross-domain layer include:

- NGSI-LD meta-model for AIM core layer;
- W3C Time ontology for concepts of temporal properties and time values[14];
- OGC GeoSPARQL [3] and associated definitions for geographical and geometrical properties;
- W3C/OGC Standard SOSA/SSN regarding sensor and actuator data, including observations, observation collections, observed properties, systems and platforms [4];
- QUDT regarding units of measurement, and concepts to represent quantities and quantity kinds [5];
- RDF data cube vocabulary[6] to represent statistical data, including datasets, data structures, slices, measure properties, dimension properties, etc.;

- Basic terms from standard or widely used vocabularies like skos[7], foaf[8], schema.org;
- ISO geographic technology standards, including features (domain and sampling feature), and observations; and
- The domain-specific models re-used and aligned in the AIM domain layer include Saref4Agri [12], NGSI-LD[13] and INSPIRE/FOODIE[9], and enable the linking of elements to AGROVOC [10] and EPPO [11] concepts.

The AIM model has been published by the DEMETER project and is the outcome of joint partner efforts where OGC has also been engaged. AIM is released using persistent and resolvable identifiers (namely from w3id service), allowing access to the ontology on the Web via its URI, with support for content-negotiation, and ensuring the sustainability of the ontology over time. The main entry point is: https://w3id.org/demeter/agri [1], which by default opens in the OGC definition server. All concrete modules can also be found in OGC definition server, e.g., http://defs-dev.opengis.net/profiles/vocab/

The AIM sources can be found at: https://github.com/rapw3k/DEMETER/tree/master/models. AIM has been published in the book: Information and Communication Technologies for Agriculture—Theme III: Decision. Springer Optimization and Its Applications [2] , and a full description is available in DEMETER deliverable: https://nc.h2020-demeter.eu/index.php/s/RggDtq76zkXD84n (D2.3) https://h2020-demeter.eu/wp-content/uploads/2020/10/DEMETER_D21_final.pdf

3.4. Is This a Persistent SWG

[x] YES

[ ] NO

3.5. When can the SWG be Inactivated

The SWG can be deactivated once the final standards has been developed and relevant change requests become minimal. The SWG can be re-activated at any time.

Chapter 4. Description of deliverables

4.1. Initial Deliverables

The following deliverables will result from the work of this SWG:

- A final version of the "OGC Agriculture Information Model" document for submission to the TC; and
- Identification of at least two prototype implementations of the core based on the standard — although more would be preferred.

The targeted start date is in March 2023 once the charter is approved. Formal approval of the core Common API is envisaged to take place nearer December 2023.

4.2. Additional SWG Tasks

According to the SWG decisions, resources and progress in related groups SWG can undertake efforts to exemplify the AIM embedding in the OGC APIs.

Chapter 5. IPR Policy for this SWG

[x] RAND-Royalty Free

[ ] RAND for fee

Chapter 6. Anticipated Audience / Participants

The anticipated audience is:

- Agriculture geospatial resource providers;
- Developers implementing services; and
- Users of geospatial resources.

Chapter 7. Domain Working Group Endorsement

The Agriculture, Architecture (with Conceptual Modeling), and Geosemantics DWGs will review the SWG charter at https://github.com/opengeospatial/agriculture-dwg/aim-charter. A statement of endorsement is anticipated after the Feb 2023 OGC Member Meeting.

Chapter 8. Other informative information about the work of this SWG

8.1. Collaboration

SWG cooperation will aim at standards formulation in the shared working space, identification and division of tasks, solving arised issues accordingly to their urgency and severity, tracing the progress and planning.

The AIM SWG will use for collaboration: * Github repository with the standard document and formal model; * Github issue tracker for outstanding tasks and considerations as well as change requests; * A Slack channel; and * bi-weekly telcos for ongoing work and issues discussion.

8.2. Similar or Applicable Standards Work (OGC and Elsewhere)

Deliverable D2.3 of the H2020 DEMETER project (https://nc.h2020-demeter.eu/index.php/s/RggDtq76zkXD84n) elaborates the alignments and relations with different models including: INSPIRE/FOODIE, FIWARE AgriFood dta models, SAREF4AGRI, ADAPT, FOODON, AGROVOC, EPPO, and other OGC Earth Observation standards. D2.3 includes the analysis of other relevant models, describing their potential incorporation in AIM, e.g., Crop ontology, ISOBUS, GS1, and AFarCloud. Deliverable D2.5 of DEMETER that is planned for delivery in April 2023 will present in detail the latest version of AIM along with all recent extensions.

8.2.1. W3C/OGC Spatial Data on the Web Working Group

This group operates within the W3C as well as the OGC in order to develop and maintain vocabularies and best practices that encourage better sharing of spatial data on the Web; and identify areas where standards should be developed jointly by both W3C and the Open Geospatial Consortium (OGC). It allows members of both organizations to collaborate in the creation of standards an best practices related to both Web and spatial data.

https://www.w3.org/2021/sdw/

https://github.com/w3c/sdw

Liaisons

- Linda van den Brink
- Joseph Abhayaratna

8.2.2. RDA IGAD - TBC

Improving Global Agricultural Data (IGAD) Community of Practice, formerly called The Interest Group on Agricultural Data (IGAD), is building practices of interoperability for research data for agriculture. The Group has published several Best Practices for specific subdomains and semantics

in general. Cooperation will help to work out common practice on semantics in the agriculture.

https://www.rd-alliance.org/groups/agriculture-data-interest-group-igad.html

Liaisons

- Cynthia Sims Parr
- Karel Charvat

8.2.3. Saref4Agri/FIWARE - TBC

This group is working on the ETSI standards supported in the AIM and supported in important data-spaces related initiatives namely NGSI-LD and Saref4Agri. Liaison will work on the models alignment and potential representation practices in selected encodings.

https://ngsi-ld-tutorials.readthedocs.io/en/latest/

https://github.com/fiware/tutorials.NGSI-LD

Liaisons

TBC

8.3. Other Related Work

This proposed SWG is to enhance an existing OGC standard - an ontology - however the Best Practices for ontology publication have changed since the original GeoSPARQL publication. The ontology publication methods of other standards bodies, particularly the W3C who continuously generates new standard ontologies, will be considered to determine appropriate, Best Practice, ontology publication.

This may include the use of tools to automatically generate human-readable ontology versions from the technical ontology artifact, such as those used by inputs to this work, for example the GeoSPARQL Extensions Ontology.

In case of profiles definition **profile** as well as an ontology, in line with recent work by OGC members and others to establish standard ways of indicating the dependencies between standards, as per The Profiles Vocabulary.

RDA IGAD Agrisemantics WG report ‘39 Hints to Facilitate the Use of Semantics for Data on Agriculture and Nutrition doi.org/10.15497/RDA00036.

8.4. Details of first meeting

The first meeting of the SWG will be held by telephone conference call within 2 weeks following the week of Technical Committee approval of this Charter. Call-in information will be provided to the SWG’s e-mail list and on the portal calendar in advance of the meeting.

8.5. Projected on-going meeting schedule

The work of the SWG will be carried out primarily by email and conference calls, possibly every two weeks, with face-to-face meetings perhaps at each of the OGC TC meetings.

8.6. Supporters of this Charter

The following people support this proposal and are committed to the Charter and projected meeting schedule. These members are known as SWG Founding or Charter members. The charter members agree to the SoW and IPR terms as defined in this charter. The charter members have voting rights beginning the day the SWG is officially formed. Charter Members are shown on the public SWG page.

Name	Organization
K. Charvat	Plan4All
R. Palma	PSNC
I. Roussaki	NTUA
I. Roussaki	ICCS
R. Atkinson, P. Zaborowski	OGC COSI

8.7. Conveners

Name	Organization
I. Roussaki	ICCS
R. Palma	PSNC
K. Charvat	Plan4All

Chapter 9. References

[1] https://w3id.org/demeter/agri

[2] Palma R., Roussaki I., Döhmen T., Atkinson R., Brahma S., Lange C., Routis G., Plociennik M., Mueller S. (2022). “Agriculture Information Model” in D. D. Bochtis, C. Sørensen, S. Fountas, V. Moysiadis and P. M. Pardalo (Eds). Information and Communication Technologies for Agriculture—Theme III: Decision. Springer Optimization and Its Applications, vol 184. Springer, Cham. https://doi.org/10.1007/978-3-030-84152-2_1

[3] AIM source model https://github.com/rapw3k/DEMETER/tree/master/models

[3] Web: OGC: OGC GeoSPARQL - A Geographic Query Language for RDF Data, http://www.opengis.net/doc/IS/geosparql/1.0 (2012)

[4] Semantic Sensor Network Ontology W3C Recommendation 19 October 2017 (Link errors corrected 08 December 2017) https://www.w3.org/TR/vocab-ssn/

[5] QUDT - Quantities, Units, Dimensions and dataTypes - public repository https://github.com/qudt/qudt-public-repo

[6] The RDF Data Cube Vocabulary W3C Recommendation 16 January 2014 https://www.w3.org/TR/vocab-data-cube/

[7] The Friend Of A Friend (FOAF) ontology http://www.foaf-project.org/

[8] SKOS Simple Knowledge Organization System RDF Schema 20th August 2008 "Last Call" Edition https://www.w3.org/TR/2008/WD-skos-reference-20080829/skos.html

[9] FOODIE Ontology https://foodie-cloud.github.io/model/FOODIE.html

[10] AGROVOC Multilingual Thesaurus https://agrovoc.fao.org/browse/agrovoc/en/

[11] EPPO codes https://www.eppo.int

[12] SAREF4AGRI: an extension of SAREF for the agriculture and food domain https://saref.etsi.org/saref4agri/v1.1.2/

[13] NGSI-LD https://ngsi-ld-tutorials.readthedocs.io/en/latest/

[14] Time Ontology OWL https://www.w3.org/TR/owl-time/

[15]Observations and Measurements https://www.ogc.org/standards/om