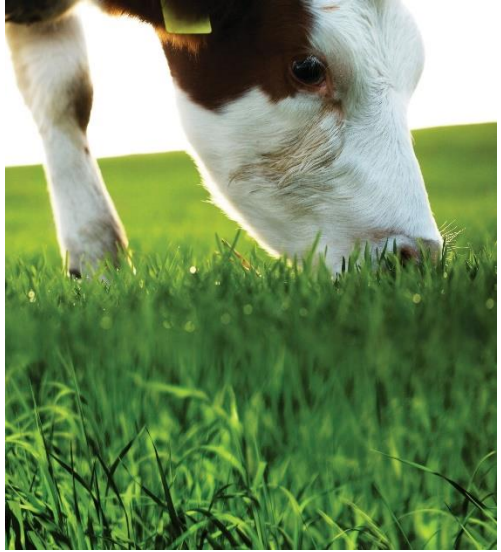
BDVA 2022 - Digital Twins and Standards
Prague, Czech Republic
22/11/2022

demeter

Agriculture Information Model (AIM)



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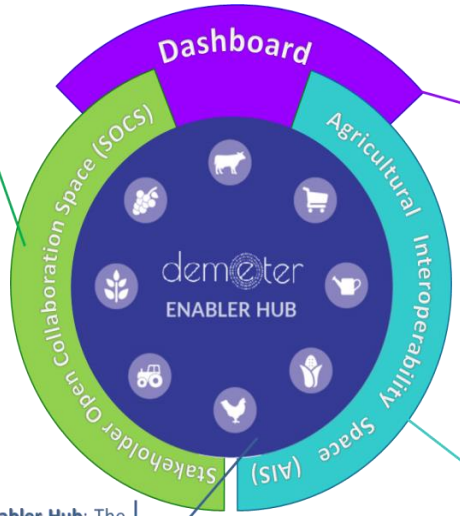
DEMETER approach towards a common agri data space

DEMETER aims at the creation of a common agricultural data space, where semantic interoperability is ensured.



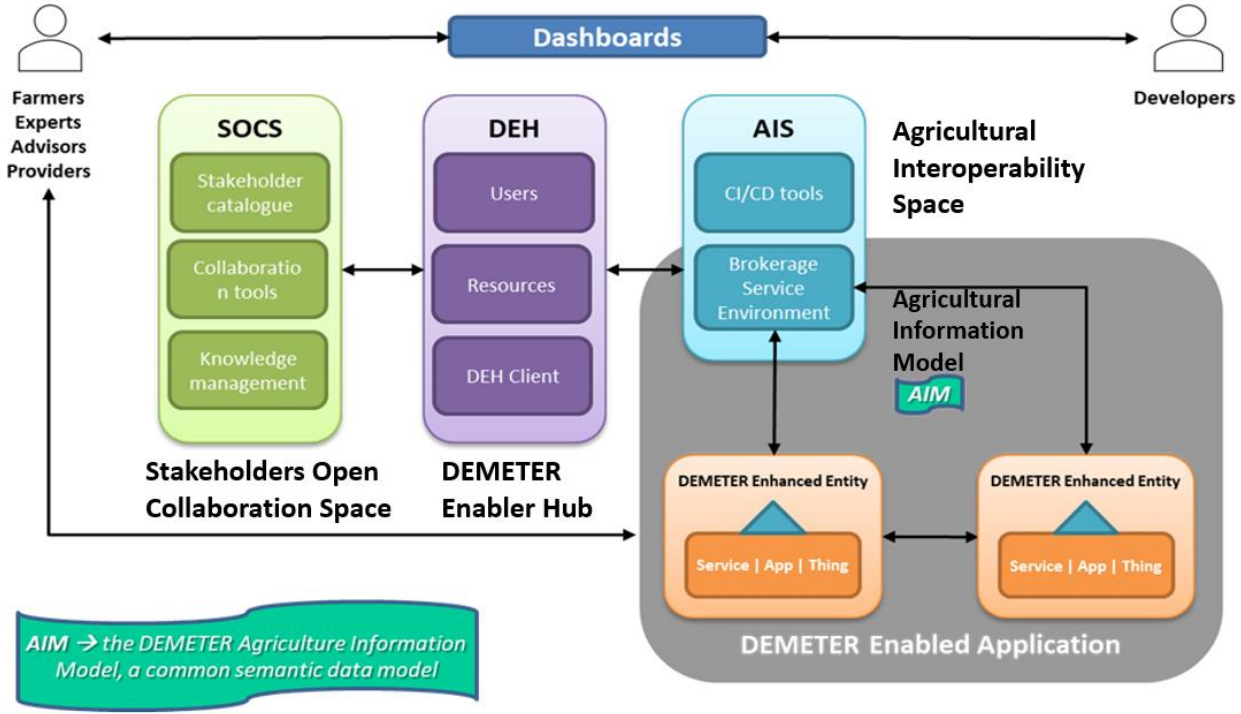
Knowledge sharing and co-creation space where
- Farmers/service advisors express their needs and
- Service advisors and providers team-up to define the most appropriate combination of tools.

DEMETER Dashboard: Sole entry point to the DEMETER ecosystem for all DEMETER Stakeholders.

DEMETER Enabler Hub: The available collaboration spaces (SOCS and AIS) are built around this hub that enables access to all resources that are available for integration and deployment.

Implementation Space: A virtual space where providers team-up and interoperate to develop and deliver the appropriate combinations and customisations of tools to the farmers ensuring interoperability with existing solutions.

Agriculture Interoperability Space (AIS) and Information Model (AIM)



AIS: mechanisms to integrate and deploy solutions

AIM: the common language to exchange data.

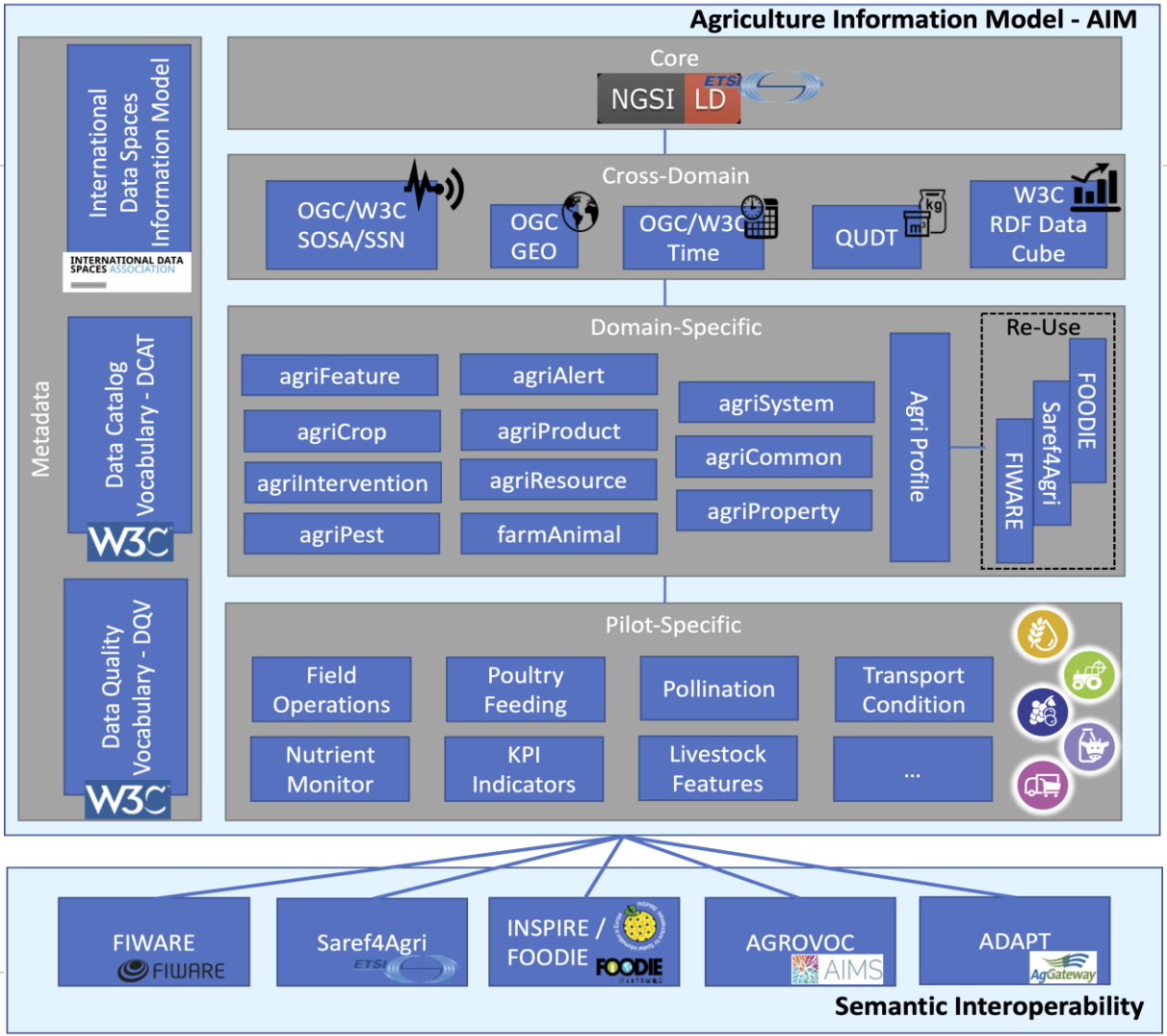
DEMETER Agriculture Information Model - AIM

AIM aims to establish the basis of a common agricultural data space, enable the interoperation of different systems, and the analysis of data produced by those systems in an integrated manner

AIM follows a modular approach in a layered architecture:

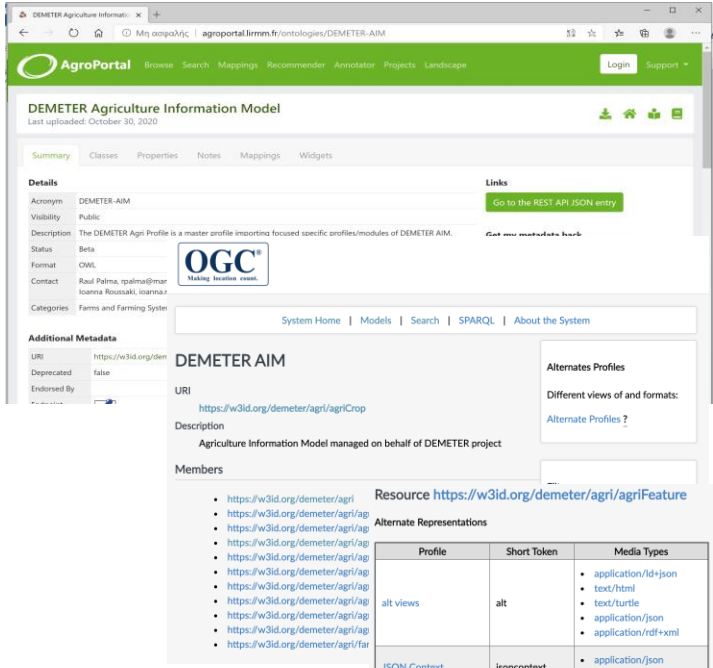
- realized as a *suite of* ***ontologies*** and associated ***JSON-LD contexts*** enabling both the specification of formal semantics, and a simple adoption and implementation by tech providers, plus a set of ***SHACL shapes*** enabling validation of data at the semantic level.
- implemented in line with best practices, ***reusing*** existing ***standards*** and well-scoped ***models***
- establishes ***alignments*** between base models to enable their ***interoperability*** and the ***integration*** of existing data

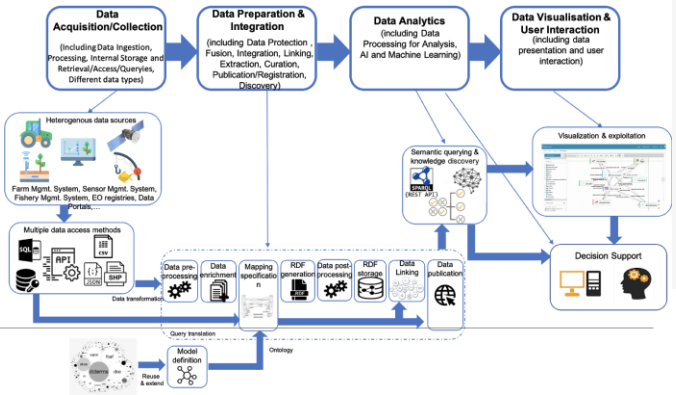
Layers of the DEMETER Agriculture Information Model (AIM)



AIM adoption and evolution

- All DEMETER pilots have already adopted AIM
  - Still on-going development of extensions
  - Issue Tracker: used to report and request for AIM changes.
- Examples of how to represent AIM compliant data
  - Recommended terms
- Usage guidelines – AIM adoption
  - How to find terms and retrieving annotations (reference terms)
  - How to create JSON-LD content using AIM
  - How to validate data is AIM compliant
- Profiling methodology by OGC
  - From a domain model to multiple implementation patterns
- Data preparation & integration enabler based on AIM
  - Implement Linked Data Pipelines





AIM-based JSON-LD content

- Context links terms in a JSON file to elements in an ontology
- @context needs to be defined and include AIM context(s) as reference
- Main AIM context contains all AIM terms (upper image), but also individual contexts -equivalent to modules- may be used (lower image)

Simple farm example


```
{
  "@context": [
     "https://w3id.org/demeter/agri-context.jsonld"
  ],
  "@id": "urn:ngsi-ld:farm:72d9fb43-53f8-4ec8-a33c-fa931360259a",
  "@type": "Farm",
  "name": "Wheat farm",
  "description": "A farm producing wheat",
  "hasGeometry": {
    "@id": "urn:ngsi-ld:AgriFarm:geo:72d9fb43-53f8-4ec8-a33c-fa931360259x",
    "@type": "Point",
    "asWKT": "POINT(11.3 44.12)"
  },
  "containsPlot":[
    {
      "@id": "urn:ngsi-ld:plot:72d9fb43-53f8-4ec8-a33c-fa931360259a",
      "@type": "Plot",
      "hasGeometry": {
        "@id": "urn:ngsi-ld:plot:geo:72d9fb43-53f8-4ec8-a33c-fa931360259y",
        "@type": "Polygon",
        "asWKT": "POLYGON (100 0, 101 0, 101 1, 100 1, 100 0)"
      },
      "area": 2012120,
      "description": "Spring wheat parcel",
      "category": "arable",
      "crop": {
        "@id": "urn:ngsi-ld:crop:df72dc57-1eb9-42a3-88a9-8647ecc954b4",
        "@type": "Crop",
        "cropSpecies":{
          "@id": "urn:demeter:croptype:df72dc57-1eb9-42a3-88a9-8647ecc954b4",
          "@type": "CropType",
          "name": "Wheat",
          "alternateName": "Triticum aestivum",
          "agroVocConcept": "http://aims.fao.org/aos/agrovoc/c_7951",
          "description": "Spring wheat"
        },
        "cropStatus": "seeded",
        "lastPlantedAt": "2016-08-23T10:18:16Z"
      }
    },
```

Semantic Interoperability via AIM

AIM provides the basis to enable a semantic interoperability data space: it defines the data elements (concepts, properties and relations) relevant to agri applications, including the semantics associated to the information exchanged.

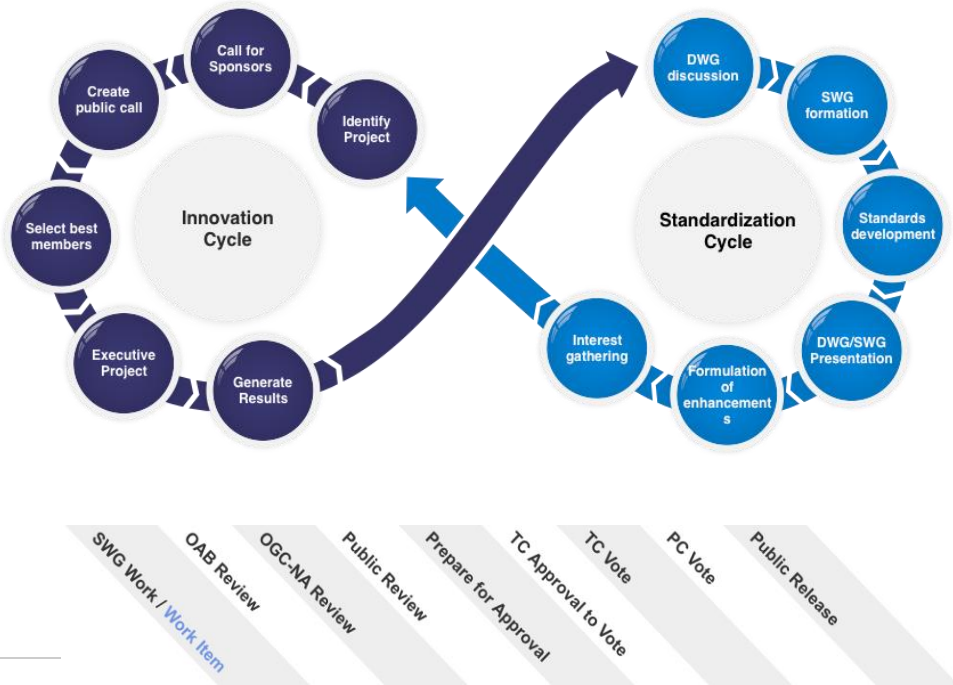
AIM establish (semantic) mapping to the various standards/ontologies

- GS1 EPCIS
- AFarCloud
- FIWARE (NGSI-LD)
- ETSI (Saref4Agri)
- EU initiatives (INSPIRE, FOODIE)
- FAO AIMS (AGROVOC)
- OGC (EO standards)
- ISO standards
- QUDT (Units Ontology)
- Other dominant solutions (ADAPT)

Towards AIM standardization

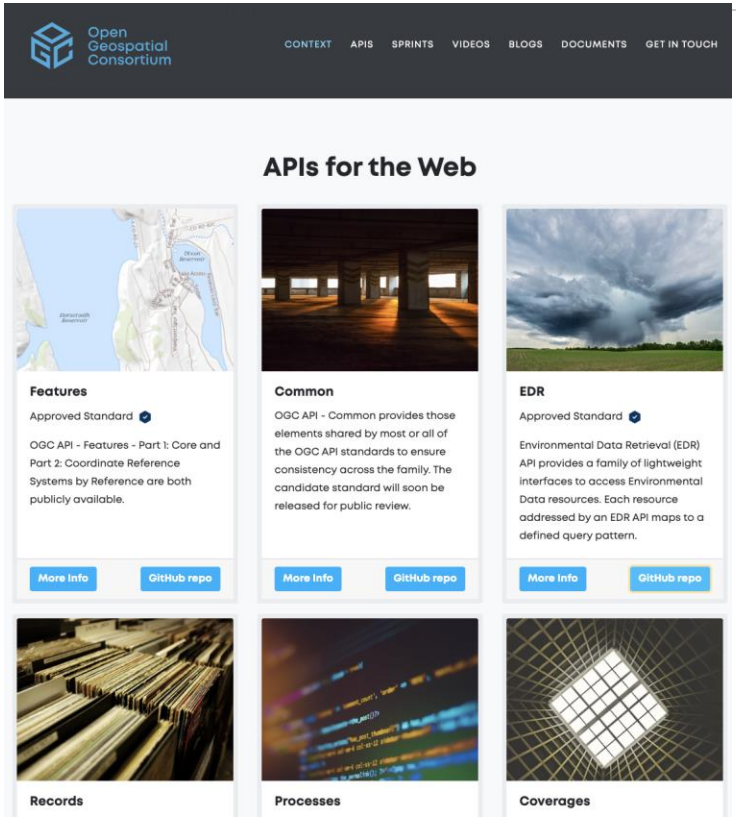
- OGC Agriculture Information Model (AIM) SWG Charter, proposed via the OGC agriculture DWG, to specify:
  - Purpose of the standard
  - Business value proposition
  - Scope of work
  - Description of deliverables
  - IPR Policy for this SWG
  - Anticipated Audience / Participants
  - Domain Working Group Endorsement
  - Other informative information about the work of this SWG

OGC innovation – standardization



From common semantic data models to standard APIs

- The semantic data models provide the common language (lingua franca) to represent data, with explicit semantics, so that different components can understand and validate it
- The data pipelines allow the harmonization of data according to those models in order to enable an integrated view over different data source
- However, different components normally implement different APIs that expose or consume the data
  - -> need for standardized APIs



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The Digital Twin of the Ocean

AD4GD

AGRI DATASPACE

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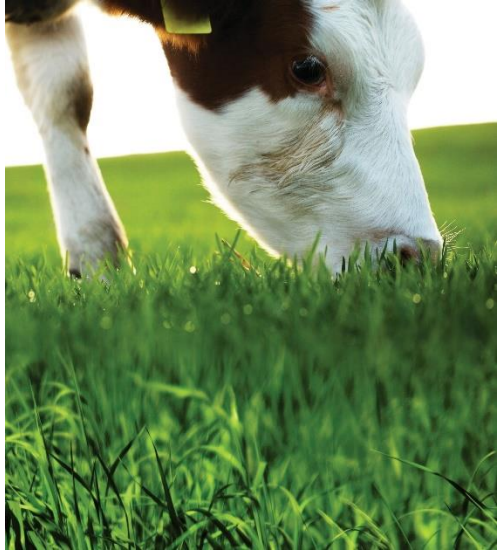

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