THE NEED

- Maintaining the standardization and interoperability effort initiated by domains (Geoscience, Hydro, ...)
- Providing a reference for publishing content as Linked Data
- Exploring a more formal and expressive way to represent knowledge
THE STRATEGY

UML Model → Automated transformation → Manual improvement → Reference Ontology

- ShapeChange: ISO-19150-2 rules and SC encoded rules, mapping to other ontologies, etc.
- Correct bugs and limits, apply non-automated rules, etc.
THE STRATEGY

UML Model \[\rightarrow\] Automated transformation \[\rightarrow\] Manual improvement \[\rightarrow\] Reference Ontology

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Correct bugs and limits, apply non-automated rules, etc.

Cf. Strategies for Publishing Domain Ontologies as Linked Data.docx

OGC domain standard EA project

ShapeChange configuration script

Ontology editing tools and eventually editing Sparql queries.

OWL file
URI NAMING CONVENTION
Options for naming policy

- Option 1: http(s)://www.opengis.net/def/{ontology}/<authority>/<schemaAcronym>
  ex: http(s)://www.opengis.net/def/ontology/GeoSciMLSWG/gsmlb

- Option 2: http(s)://www.opengis.net/def/<authority>/ontology/<schemaAcronym>
  ex: http(s)://www.opengis.net/def/GeoSciMLSWG/ontology/gsmlb

- Option 3: http(s)://www.opengis.net/def/{ontology}/<schemaAcronym>
  ex: http(s)://www.opengis.net/def/ontology/gsmlb, http(s)://www.opengis.net/def/ontology/gsmlb/GeologicUnit will be the identifier of the class in the ontology

- Option 4: http(s)://www.opengis.net/def/<schemaAcronym>
  ex: http(s)://www.opengis.net/def/gsmlb/GeologicUnit will be the identifier of the class in the ontology

⇒ The forth option is currently used in the ontologies we generated.
Needs to coordinate with OGC-NA
ISO 19150-2
A wide set of rules for transforming UML models to OWL ontologies but

- We can’t always automatically exploit the full expressiveness of OWL
  ⇒ the resulting ontologies seem to be restricted to the UML way of modelling

- Some artefacts seems handled in a way that don’t seem to respect UML (ex: association classes) / OGC (ex: union) semantics
IDENTIFIED ISSUES

Meta-model issues between UML and OWL

- Replace the “character string” data properties by object properties when possible and needed.
- Revisit/delete OWL classes issued from abstract UML classes.
- Enrich the semantics with more axioms and relations regarding classes and properties (equivalence, disjointness, transitivity, symmetry, functionality, etc.)
IDENTIFIED ISSUES

Meta-model issues between UML and OWL

- Use `owl:disjointUnionOf` for class union (instead of `owl:unionOf` as in ISO 19150-2)
- The placeholder attribute “any” (in GeoSciML Lite) is useless in owl: delete it
- When possible, encode model constraints (features def, OCL) as OWL restrictions and axioms
IDENTIFIED ISSUES

Meta-model issues between UML and OWL

- If no confusion, properties naming should be scoped to the ontology name space. Else, the naming should be scoped to the classes (cf. ISO-19150-2 §6.2.6)

- To favor reuse, leave the domains and ranges of properties empty. A restriction on the values of the properties should be defined for every class.

- Reuse as much as possible the Semantic Web existing classes/properties or link the newly defined classes/properties to external ontologies.
IDENTIFIED ISSUES

SWE related issues

Reference to basic SWE types must be modified if needed by specialized classes from other ontologies or by defining new ones.

- Use GSML_QuantityRange instead of swe:QuantityRange as recommended in GeoSciML definition.

- Rename swe:Category to skos:Concept or mdl:Lineage (depending on the case) and swe:Quantity to the relevant class in the context (ts:TimePosition, mdq:PositionalAccuracy, etc.).
IDENTIFIED ISSUES
Software limits: ShapeChange

- Association classes must be handled differently than what is suggested in ShapeChange
  ⇒ ShapeChange does the association class -> owl:Class transformation but the newly generated class is linked to no-one
  ⇒ Need to specify properties to link it to the related classes.

- Use owl:disjointUnionOf for class union instead of the rule proposed in ShapeChange
IDENTIFIED ISSUES
Standing issues

- Usage of SKOS VS dedicated classes when transforming `<codeList>` from the UML
- Version in URI
THANK YOU

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