CEN TC442/WG4/TG3 SML PROPERTY MODELLING

A proposal for a common linked data approach for CEN & bSI | Michel Böhms

TNO innovation for life

LANDSCAPE

- ISO TC 59 SC 13 WG 6
  - ISO 12006-3:2007 (EN ISO 12006-3:2016)
  - ISO 12006-3:2021 (committee draft: added UML, updated spec, Turtle annex)

- CEN TC442/WG4
  - EN ISO 23386: “International version of French PPBIM”, “set of attributes for properties”, conceptual
  - EN ISO 23387: ISO 12006-3:2007 “implementation” of “EN ISO 23386”
  - **TG3 Semantic Modelling and Linking (SML) Standard (in enquirey phase)**
    - **Including modelling pattern for Quantities inspired by W3C LBD OPM Level 2 & 3**
    - **Annex on 12006-3:2021 integration (complementary use)**

- W3C
  - Linked Building Data (LBD) Community Group
    - OPM: https://w3c-lbd-cg.github.io/opm/
    - BOT 0.3.2: https://github.com/w3c-lbd-cg/bot/releases/tag/v0.3.2
  - RDF-DEV COMMUNITY GROUP
    - https://w3c.github.io/rdf-star/rdf-star-cg-spec.html

- bSI bSDD
  - https://github.com/buildingSMART/bSDD/tree/master/2020%20prototype
  - JSON Schema / API (link to 12006-3/23387: unclear, some property subset of EN ISO 23386)
    - https://github.com/buildingSMART/bSDD/blob/master/2020%20prototype/import-model/bsdd-import-model.json

- **Hope: One future-proof, ‘Linked Data’-based approach for (Product &) Property Modelling !**

CEN SML

- Scope
  - Conceptual Meta Model (CMM)
    - Language-bindings for RDF + (SKOS, RDFS, RDFS+OWL & RDFS+SHACL)
      - OPM Level 1-based by default
    - Identification/URI, naming/labels and annotation conventions
    - Enumeration Datatypes (smls:EnumerationType)
    - Decomposition (smls:hasPart)
    - **Quantities**
      - OPM Level 2/3 based (via relations having range smls:QuantityValue)
      - Quantity kinds & units > QUDT version 2.1.2
    - Grouping (SKOS/RDFS-based)
  - Conceptual Modelling (CM) Patterns
    - Top Level taxonomy and relations
  - Linking approaches for both data and ontology level

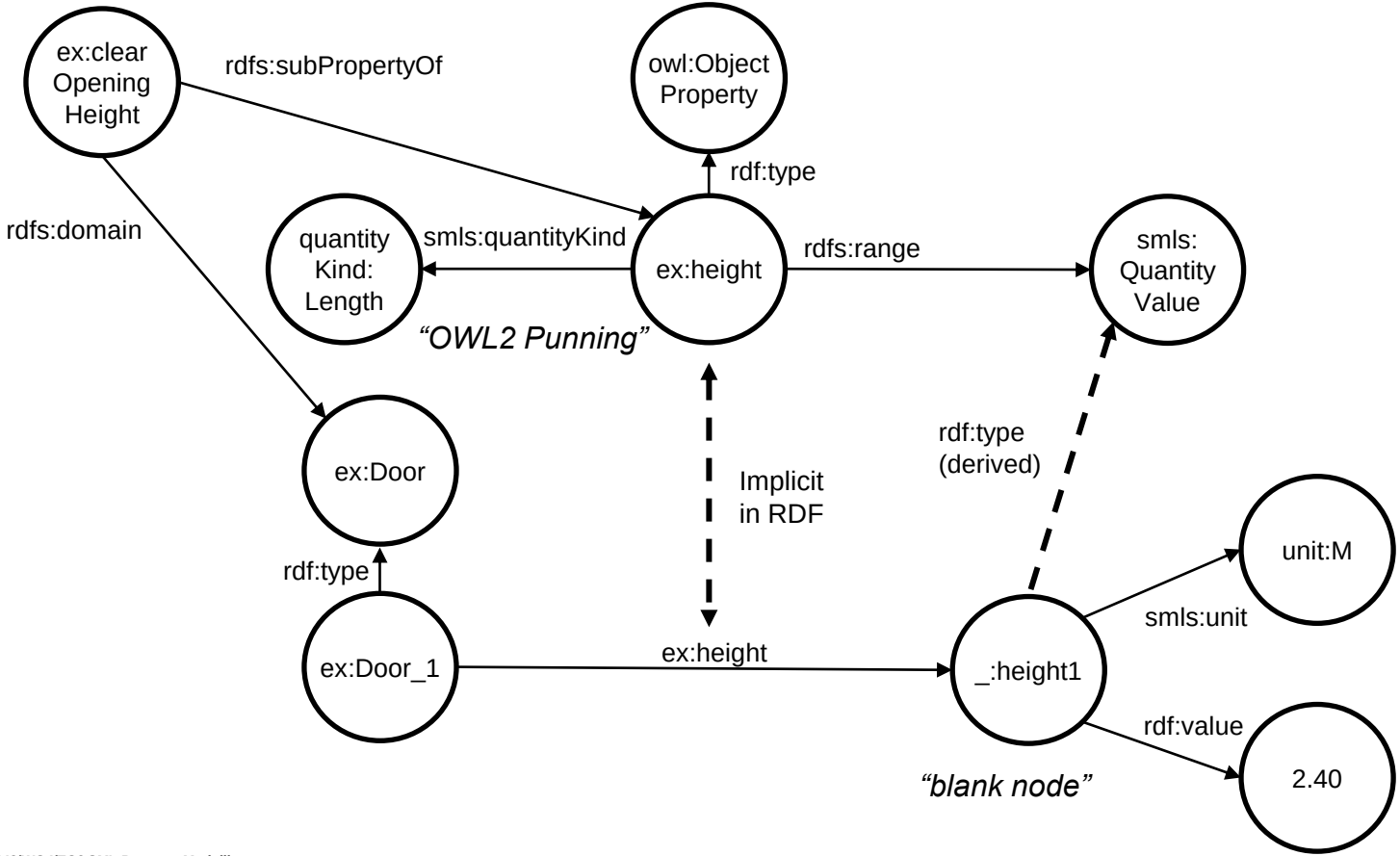
THE SML PROPERTY PROPOSAL

- Attribute
  - Annotation > owl:AnnotationProperty
  - Quality (non-enumeration) > owl:DatatypeProperty
  - Quality (enumeration) > owl:ObjectProperty wit rdfs:range (subclass of smls:EnumerationType)
  - **Quantity** **> owl:ObjectProperty with rdfs:range smls:QuantityValue**
- Relation > owl:ObjectProperty
- Grouping > rdfs:Container, rdfs:member

SMLS:QUANTITYVALUE (IN OWL & TURTLE)

```
smls:QuantityValue
  a owl:Class ;
  rdfs:subClassOf [
      a owl:Restriction ;
      owl:allValuesFrom xsd:float ;
      owl:onProperty rdf:value ;
    ] ;
  rdfs:subClassOf [
      a owl:Restriction ;
      owl:cardinality "1"^^xsd:nonNegativeInteger ;
      owl:onProperty rdf:value ;
    ] ;
skos:prefLabel “Quantity value"@en .
```

EXAMPLE (GRAPHICAL)



EXAMPLE (OWL / TURTLE)

```
ex:Door a owl:Class .

ex:height a owl:ObjectProperty ;
  rdfs:range smls:QuantityValue ;
  smls:quantityKind quantitykind:Length .

ex:clearOpeningHeight a owl:ObjectProperty ;
  skos:definition "height measured from top threshold to bottom of stop"@en ;
  rdfs:subPropertyOf ex:height ;
  rdfs:domain ex:Door ;
  rdfs:seeAlso "EN12519" ;                -- example external reference
  dt:languageCode nace:FR ;               -- example CEN DT meta-data
  dt:dateOfVersion "2019-11-06T16:10" . -- example CEN DT meta-data

ex:Door_1 a ex:Door ;
  ex:clearOpeningHeight [rdf:value 2.40 ;
                         smls:unit unit:M ;
                         ex:hasAccuracy 85.5 ;
                         ex:measuredBy "Somebody" ; ] .
```

In **bold**: some more data added

FUTURE SIMPLIFICATION IN RDF*/TURTLE*

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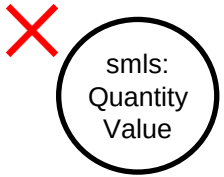
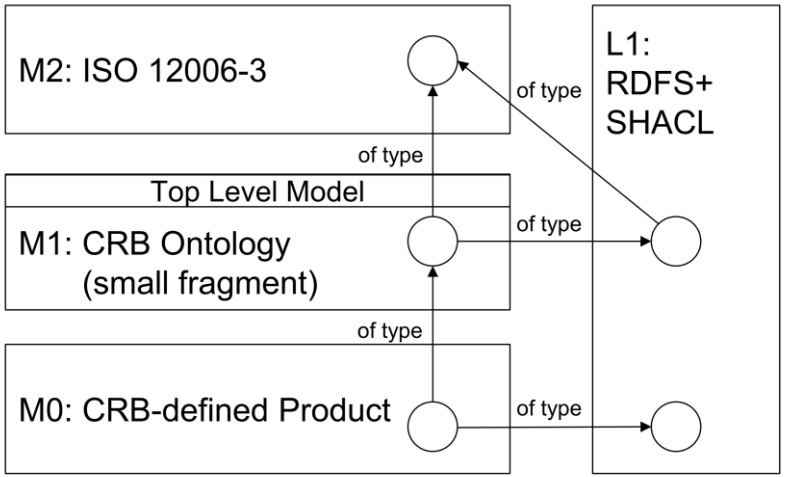
```
ex:Door a owl:Class .

ex:height a owl:DatatypeProperty {| smls:quantityKind quantitykind:Length |} .
ex:height rdfs:range smls:QuantityValue .

ex:clearOpeningHeight a owl:DatatypeProperty {| dt:languageCode nace:FR ;
                                                dt:dateOfVersion “2019-11-06T16:10” |}.
ex:clearOpeningHeight
  skos:definition “height measured from top threshold to bottom of stop”@en ;
  rdfs:seeAlso "EN12519" ;
  rdfs:subPropertyOf ex:height ;
  rdfs:domain ex:Door .

ex:Door_1 a ex:Door ;
  ex:clearOpeningHeight 2.40 {| smls:unit unit:M ;
                                ex:hasAccuracy 85.5 ;
                                ex:measuredBy “Somebody" |}.
```



COMBINING 12006-3 & SML

2012 update

Separate or as part of bSDD



or RDFS+OWL
as in 12006-3:2021 CD
(not compliant to SML yet!)

CURRENT BSI BSDD: JSON (SWAGGER API/GRAPH-QL)


```
{
  "OrganizationCode": "",
  "DomainCode": "",
  "DomainVersion": "",
  "DomainName": "",
  "ReleaseDate": null,
  "Status": "",
  "MoreInfoUrl": "",
  "UseOwnUri": false,
  "DomainNamespaceUri": "",
  "LanguageIsoCode": "",
  "LanguageOnly": false,
  "License": "",
  "LicenseUrl": "",
  "QualityAssuranceProcedure": "",
  "QualityAssuranceProcedureUrl": "",
  "Classifications": [{
    "Code": "",
    "OwnedUri": "",
    "Name": "",
    "Definition": "",
    "Status": "Active",
    "ActivationDateUtc": "2020-12-09T00:00:00+01:00",
    "RevisionDateUtc": null,
    "VersionDateUtc": "2020-12-09T00:00:00+01:00",
    "DeActivationDateUtc": null,
    "VersionNumber": null,
    "RevisionNumber": null,
    "ReplacedObjectCodes": [],
    "ReplacingObjectCodes": [],
    "DeprecationExplanation": "",
    "CreatorLanguageIsoCode": "",
    "VisualRepresentationUri": "",
    "CountriesOfUse": [],
    "SubdivisionsOfUse": [],
    "CountryOfOrigin": "",
    "DocumentReference": "",
    "ClassificationType": "Class",
    "ParentClassificationCode": "",
    "RelatedIfcEntityNamesList": [],
    "Synonyms": [],
    "ClassificationRelations": [{
      "RelationType": "",
      "RelatedClassificationUri": ""
    }],
    "ClassificationProperties": [{
      "Code": "",
      "PropertyCode": "",
      "PropertySet": "",
      "ExternalPropertyUri": "",
      "Unit": "",
      "SortNumber": null,
      "Symbol": "",
      "PropertyType": "",
      "PredefinedValue": "",
      "MinInclusive": null,
      "MaxInclusive": null,
      "MinExclusive": null,
      "MaxExclusive": null,
      "Pattern": "",
      "Values": []
    }]
  }],
  "Properties": [{
    "Code": "",
    "OwnedUri": "",
    "Name": "",
    "Definition": "",
    "Status": "Active",
    "ActivationDateUtc": "2020-12-09T00:00:00+01:00",
    "RevisionDateUtc": null,
    "VersionDateUtc": "2020-12-09T00:00:00+01:00",
    "DeActivationDateUtc": null,
    "VersionNumber": null,
    "RevisionNumber": null,
    "ReplacedObjectCodes": [],
    "ReplacingObjectCodes": [],
    "DeprecationExplanation": "",
    "CreatorLanguageIsoCode": "",
    "VisualRepresentationUri": "",
    "CountriesOfUse": [],
    "SubdivisionsOfUse": [],
    "CountryOfOrigin": "",
    "DocumentReference": "",
    "Description": "",
    "Example": "",
    "ConnectedPropertyCodes": [],
    "PhysicalQuantity": "",
    "Dimension": "",
    "DimensionLength": null,
    "DimensionMass": null,
    "DimensionTime": null,
    "DimensionElectricCurrent": null,
    "DimensionThermodynamicTemperature": null,
    "DimensionAmountOfSubstance": null,
    "DimensionLuminousIntensity": null,
    "MethodOfMeasurement": "",
    "DataType": "",
    "MinInclusive": null,
    "MaxInclusive": null,
    "MinExclusive": null,
    "MaxExclusive": null,
    "Pattern": "",
    "IsDynamic": false,
    "DynamicParameterPropertyCodes": [],
    "Units": [],
    "PossibleValues": [],
    "TextFormat": ""
  }]
}
```


JSON Schema

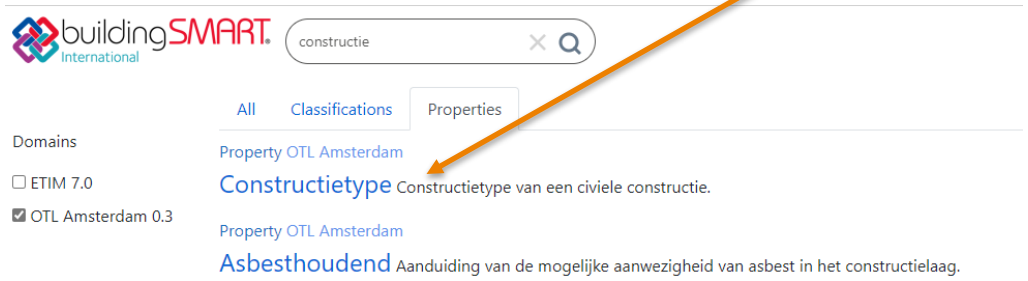
Language code?
Date of version?

EXAMPLE

- City of Amsterdam Ontology (OTL)
  - “otl-0.31_Civiele_constructies.ttl”
  - CEN SML compliant

```
adam-p:constructietype a owl:ObjectProperty ;
  skos:definition "Constructietype van een civiele
  constructie."@nl ;
  skos:prefLabel "Constructietype"@nl ;
  skos:related imborp:P676 .
```

  - Send to bSI for bSDD (prototype):



Nice, but many conversion issues towards simpler JSON Schema!

ISSUES

- (Even) more reuse of QUDT, beyond quantity kinds and units, like for smls:quantityKind & smls:unit
- Provide RDF/Turtle/SPARQL* languages/serialisations

- Harmonize / align with current 12006-3 / bSI approach!?

- Now: how to deal with more complex/structured/technical properties?
  - Big (sensor) data properties (spacetime series)
  - Geometries
  - Dependent properties

  >>> Richard Pinka, life-cycle properties for HVAC

NEN-EN-ISO 16757-1
(en)

Data structures for electronic product catalogues for building services - Part 1: Concepts, architecture and model (ISO 16757-1:2015,IDT)


THANK YOU FOR YOUR ATTENTION
Take a look:
TNO.NL/TNO-INSIGHTS
TNO innovation for life