OIL & GAS

ISO 15926 Part 12 *DL profile*

Motivation and examples

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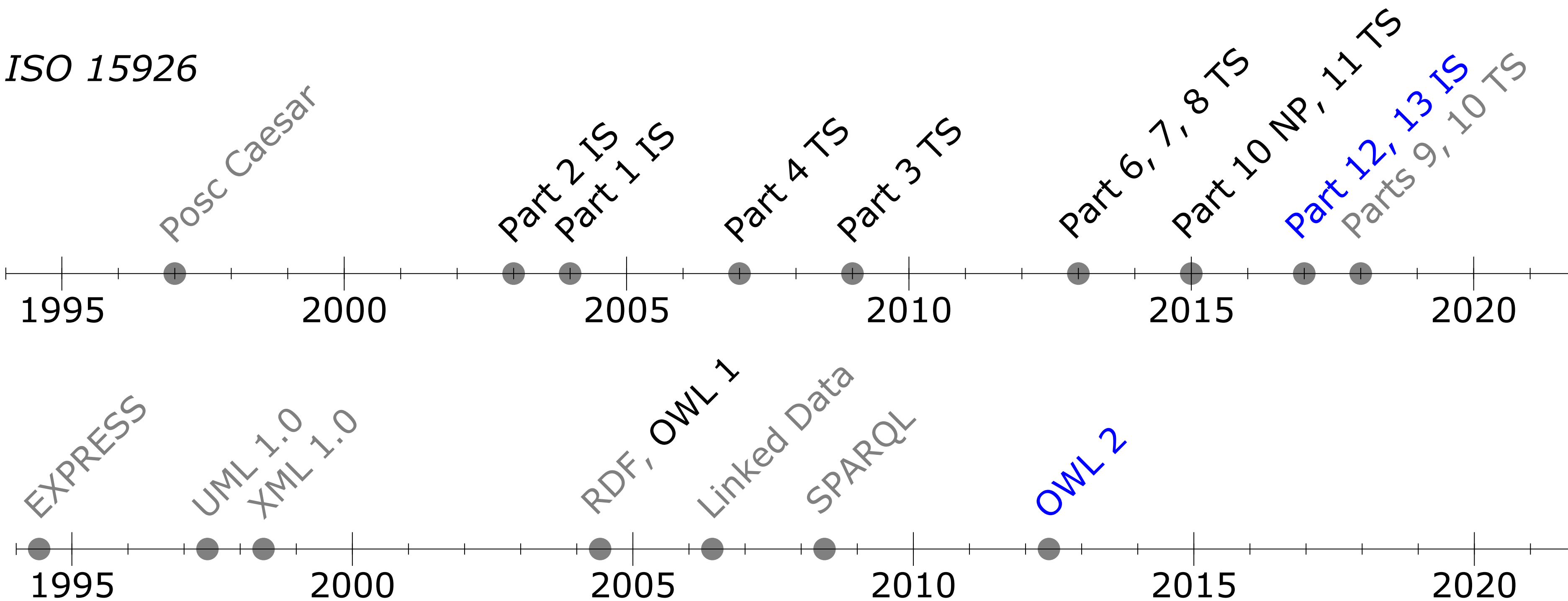
SAFER, SMARTER, GREENER

Timeline: ISO 15926 and OWL



What is the “DL profile”?

Part 2 (2003) is a generic data model in EXPRESS

Part 12 (2017) updates Part 2 for OWL 2 (W3C, 2012)

The DL profile accommodates the Part 12 Community Draft ballot comments NO-13 – NO-24, which are all to do with best practice use of OWL.

The DL profile: Features

The *DL profile* renders ISO 15926 Part 2 in common OWL 2 DL patterns

- ontology modelling
- automated reasoning

Features:

- Builds on experience from projects since 2008
- Covers practically all of Part 2
- Avoids ISO 15926 idiosyncracies

The DL profile at a glance

- owl:Thing
  - Activity
    - Event
      - PointInTime
    - PeriodInTime
  - Function
  - InformationObject
    - QuantityDatum
      - ScalarQuantityDatum
  - Organisation
  - PhysicalObject
    - Compound
    - Feature
    - InanimatePhysicalObject
      - Stream
    - Organism
      - Person
  - Quality
    - PhysicalQuantity
  - Role
  - Site
  - SpatialLocation
    - PointInSpace
    - RegionInSpace
  - UnitOfMeasure
    - Scale

- owl:topObjectProperty
  - connectedTo
    - directlyConnectedTo
  - creates
  - datumUOM
  - hasFunction
  - hasPart
    - hasArrangedPart
    - hasParticipant
    - hasTemporalPart
  - hasQuality
  - hasRole
  - interests
    - approvedBy
  - locatedRelativeTo
    - containedBy
    - contains
  - occursRelativeTo
    - after
    - before
  - partOf
    - arrangedPartOf
    - participantIn
    - temporalPartOf
  - realizedIn
  - representedBy
    - qualityQuantifiedAs
  - roleOf

- owl:topDataProperty
  - approvedOn
  - datumValue
  - qualityQuantityValue

The DL profile: Resources

We currently have

- Ontology representing the data model, i.e., Part 2
- Ontology with examples of common patterns
- Documentation

Industrial user community

The Norwegian community wants DL reasoning:

- Aibel
- Aker
- DNV GL
- EPIM

DNV·GL

Industrial ontology: the challenge

- Patterns for the right kinds of basic facts
- Scalability to relevant sizes of data
- Reasoning support for quality control and smart services

Characteristic fact types – modelling patterns

The Part 12 *examples* document demonstrates

- Physical measurements
- Requirements on replaceable items
- Functions and roles
- Coding schemes
- Certificates and qualifications

Examples

Ontology mainstream alignment

The DL profile is closer to other ontologies than a “literal” Part 2

- BFO
- DOLCE

ISO 15926 can benefit more from the literature, and communities like FOIS.

It is noted in discussion that mentioning alignment to BFO and DOLCE tends to provoke negative sentiment in the ISO 15926 community.

Semantic Web alignment

Use Part 12 with

- Development tools like Protégé
- RDF databases
- Linked Data
- Existing OWL ontologies, like SKOS and PROV-O
- Standardised URI references, once ISO and other standards bodies deliver them (e.g., Units of Measure)

OBDA with ISO 15926

OWL 2 DL is a prerequisite for current Ontology Based Data Access (OBDA).

OBDA needs restrictive OWL profiles

- QL
- RL

Scalability: Industrial ontologies have thousands of classes. On strategies for implementing OBDA with ISO 15926, see Optique deliverable D11.5 (November 2016).

The limitations of description logic

OWL DL is a predicate logic

- maximize expressivity
- while remaining tractable

Intuitively, any (consistent) Part 12 ontology describes a situation where all requirements are fulfilled.

- no temporal logic
- no defaults
- no obligations

Retire all modal notions – “possible”, “materialised”, “actual”.

Modalities deemed unsuitable

Example: *materialised physical object*

```
materialised(a)
not materialised (b)
a partOf b      -- intuitively, false
```

The notion of *functional* objects has been reviewed and reworked.

Beyond description logic

Provide recommendations for content that can’t be represented in DL.

- Rules
- Modelling patterns
- Ontology transformation