ISO 15926 - Integration of life-cycle data for process plants including oil and gas production facilities

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What is the application domain of your taxonomy and/or ontology?

ISO 15926 has a number of parts, these include

- A Top Level Ontology (ISO 15926-2 in EXPRESS, ISO 15926-12 in OWL)
- A domain Reference Data Library/ontology for Process Plant including Oil and Gas.

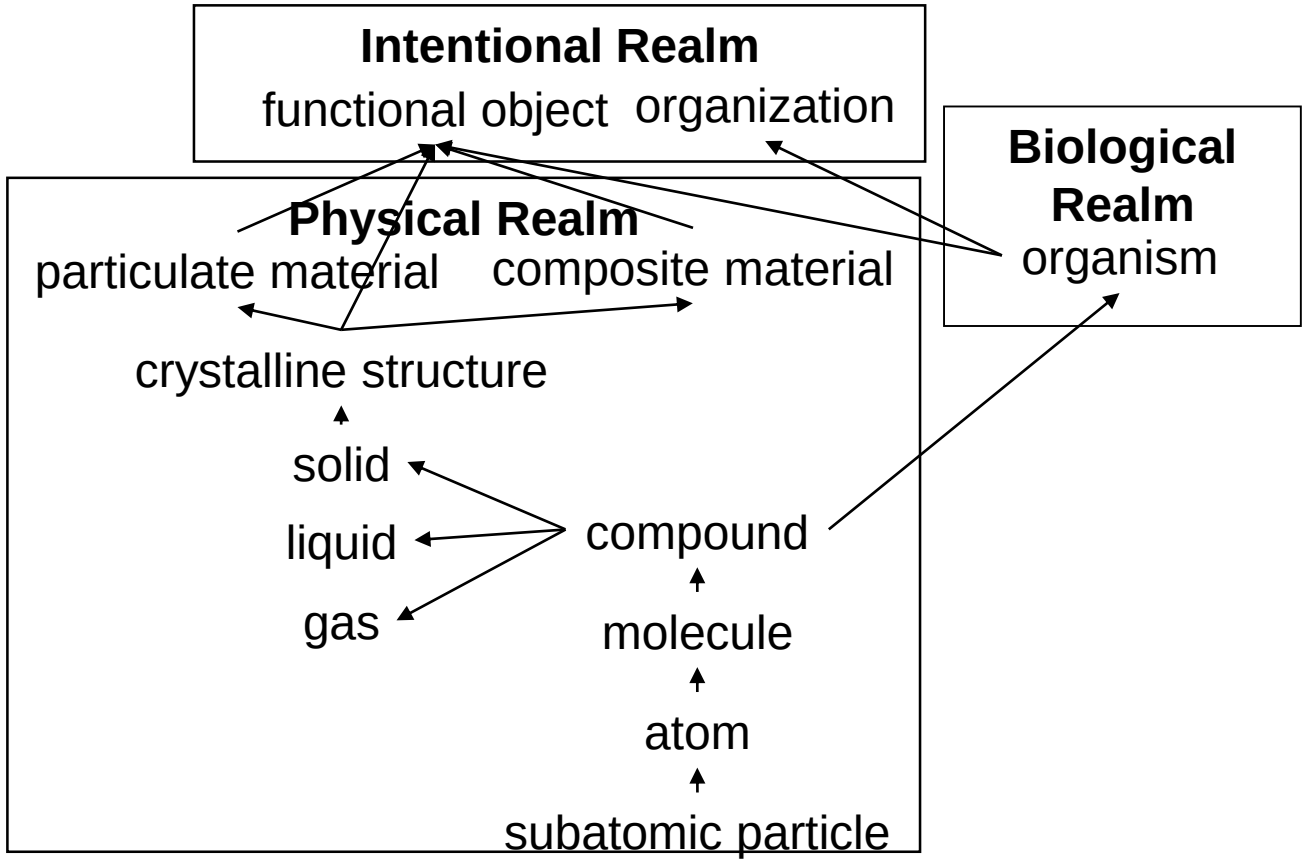
What is the intended purpose of the taxonomy and/or ontology?

- To support the integration of data across the lifecycle of Process Plant and their use.
  - ISO 15926 is used to move data between different applications used in the design, construction and operation of process plant. To do this it needs to be able to hold data in a neutral format relative to the context of those different uses.
- The purpose of the Top Level Ontology is to support data integration across any scope.
  - It does not try to define everything ab initio, but rather to be extensible by providing a framework that allows the consistent addition of additional things of interest.

How do you represent the world: as a continuum, Particles, Quantum level objects?

ISO 15926/HQDM supports different levels of granularity, from the subatomic through to an entire possible world (a whole universe extended over all time).

Individuals at higher levels of granularity consist of parts that are at lower levels of granularity.



What are the concepts, with definitions, in the upper level of your taxonomy and/or ontology?

- Thing
  - Possible individual
    - Physical Object
    - Activity
    - Event
    - Period in time
    - Whole life individual
    - Actual Individual
    - Arranged Individual
  - Abstract Object
  - Abstract Object
    - Class
    - Relationship
    - Multi-dimensional object

See: http://15926.org/topics/part2/ECM4.5.1/lifecycle_integration_schema.html

For further details and definitions

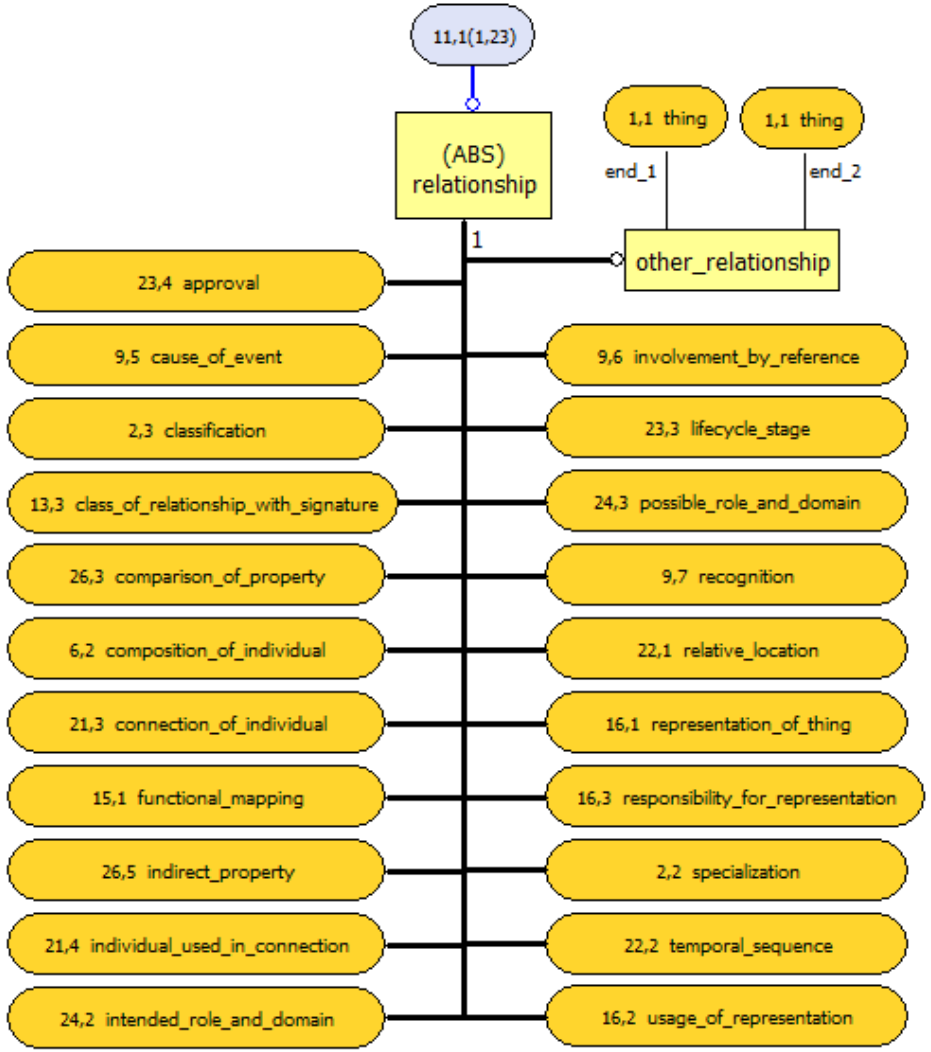
What are the industrial use cases of the taxonomy and/or ontology (e.g. in ontology-driven tools)?

- The main use of ISO 15926 has been in integrating design data for use in construction and operations and hand-over of design data from design contractors to owner operators
  - Examples of projects can be found here: https://www.posccaesar.org/wiki/Projects
- In recent years there has been increasing interest in using ISO 15926 for reasoning, which is why an OWL version has been developed.

What overlaps do you see with other taxonomy and/or ontologies?

- ISO 15926-2/12 is a Top Level Ontology and so overlaps/competes with other Top Level Ontologies such as BFO/CYC/DOLCE etc. However, it has been developed with different purposes in mind, that is data integration rather than reasoning.
- ISO 15926-4, the Reference Data Library is the primary focus for reference data/domain ontology in the process industries. It overlaps with domain ontologies from other industries in as much as the industries overlap (e.g. lots of industries use pumps, pipes etc)

What are the main relations in your ontology?



What is the knowledge your ontology represent?

- ISO 15926 gives an explanation of the world that is:
  - Realist
  - Possibilist (possible (imaginary) as well as actual entities)
  - 4 dimensionalist (particulars are extended in time as well as space)
  - Uses a non-well founded set theory

How does your ontology represent the relations between different granularity views?

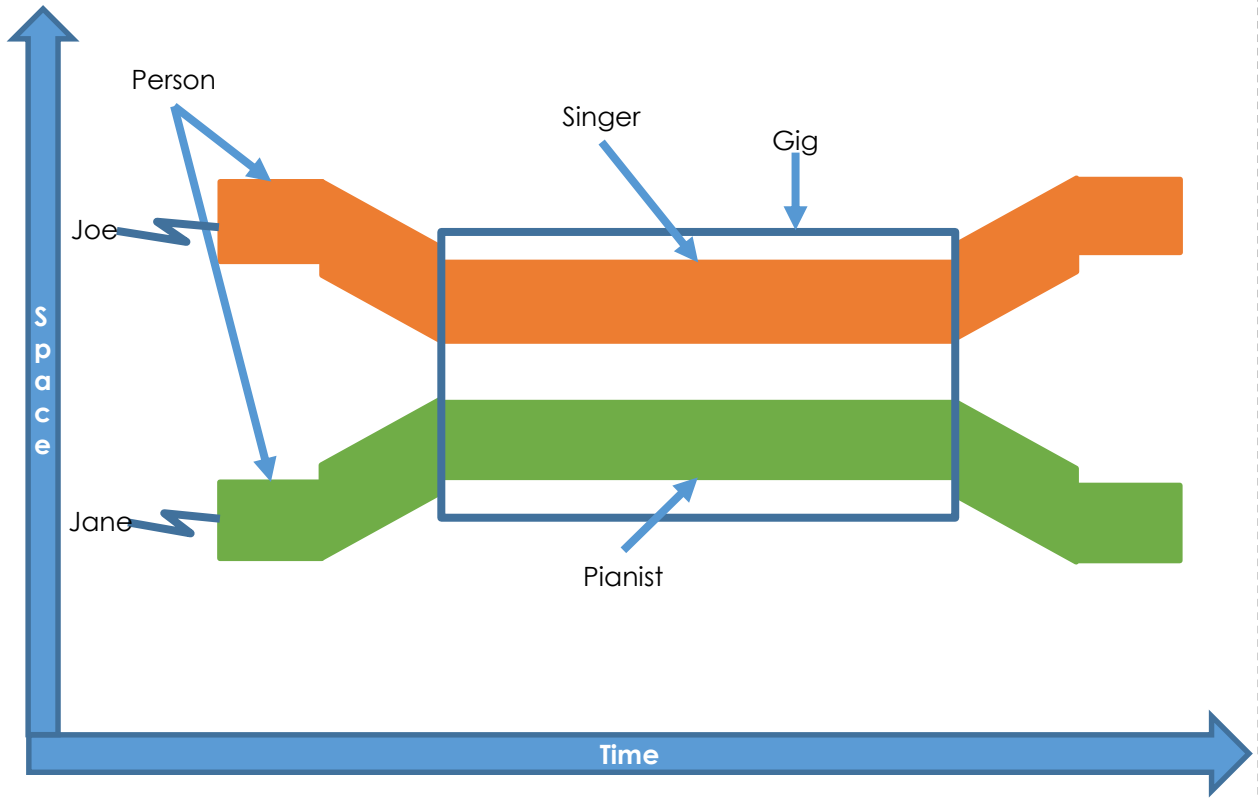
- Objects at different levels of granularity are related by composition relationships. Objects at lower levels of granularity compose objects at higher levels of granularity.
- Objects at lower levels of granularity are usually distinct from the objects at higher levels of granularity because they have a different lifetime, so a different spatiotemporal extent
  - Example: The life of a plastic cup is shorter than the life of the piece of plastic it is made from. Therefore they are different objects because they have different spatio-temporal extents.

How does your taxonomy and/or ontology capture materials?

- Material entities (physical objects in ISO 15926) are spatio-temporal extents, i.e. they are extended in time as well as space. They are not continuants.
- Change over time is captured through states, that are temporal parts (the object for a period of time) of the whole for which something is asserted to be true.
- Physical objects are extensional. That is if two physical objects (or states of physical objects) have the same spatio-temporal extent, they are the same.

How does your taxonomy and/or ontology represent processes?

- Processes (activities in ISO 15926) are spatio-temporal extents.
- An activity is composed of its participants which are the states of those individuals that participate in the activity during the time when they participate.
- Activities cause events where events are spatio-temporal planes that mark the beginning or ending of some state.
- Activities can have attributes.



How does your taxonomy and/or ontology capture manufacturing?

- Manufacturing is an activity that has participants.
- An activity can cause an event that is the start of something that has been manufactured.
- An activity can be broken down into parts and have sequences
- Processes can be defined at the class level that is instantiated at the particular level

How does your taxonomy and/or ontology address the circle connection between physical properties, materials models (see definition in RoMM Review of Materials Modelling VI) and measurement?

- Measurement is an activity that determines an approximation for a property (usually a physical quantity) of something
- Models are usually used to provide predictions of what properties will be, or will be required to be. Such models are kept in possible worlds so they are not confused with actuality.

What is the representation language and implementation (logics)?

- ISO 15926-2 is represented in EXPRESS (ISO 10303-11)
- ISO 15926-12 is represented in OWL 2. There is an OWL 2 DL subset of this.