Ontologies for engineering analysis
Current status - 1

- ISO 10303-209 – a comprehensive information model
    - edition 1 – principally structural analysis
    - edition 2 – CFD added
- Scope
    - definition of a model
        - » mesh
        - » element types
        - » material properties
        - » boundary conditions
    - description of fields with respect to a mesh
    - association between fields and states
    - control structure of states and analysis steps
    - association between parts of a mesh and parts of a design
    - design version control
    - analysis audit trail

Ontologies for engineering analysis
Current status - 2

- ISO 10303-209 – is little used
  - sad!
  - *but the customer is always right!*
- Scope
  - definition of a model
    - » mesh
    - » element types   **native formats do this well**
    - » material properties
    - » boundary conditions
  - description of fields with respect to a mesh
  - association between fields and states
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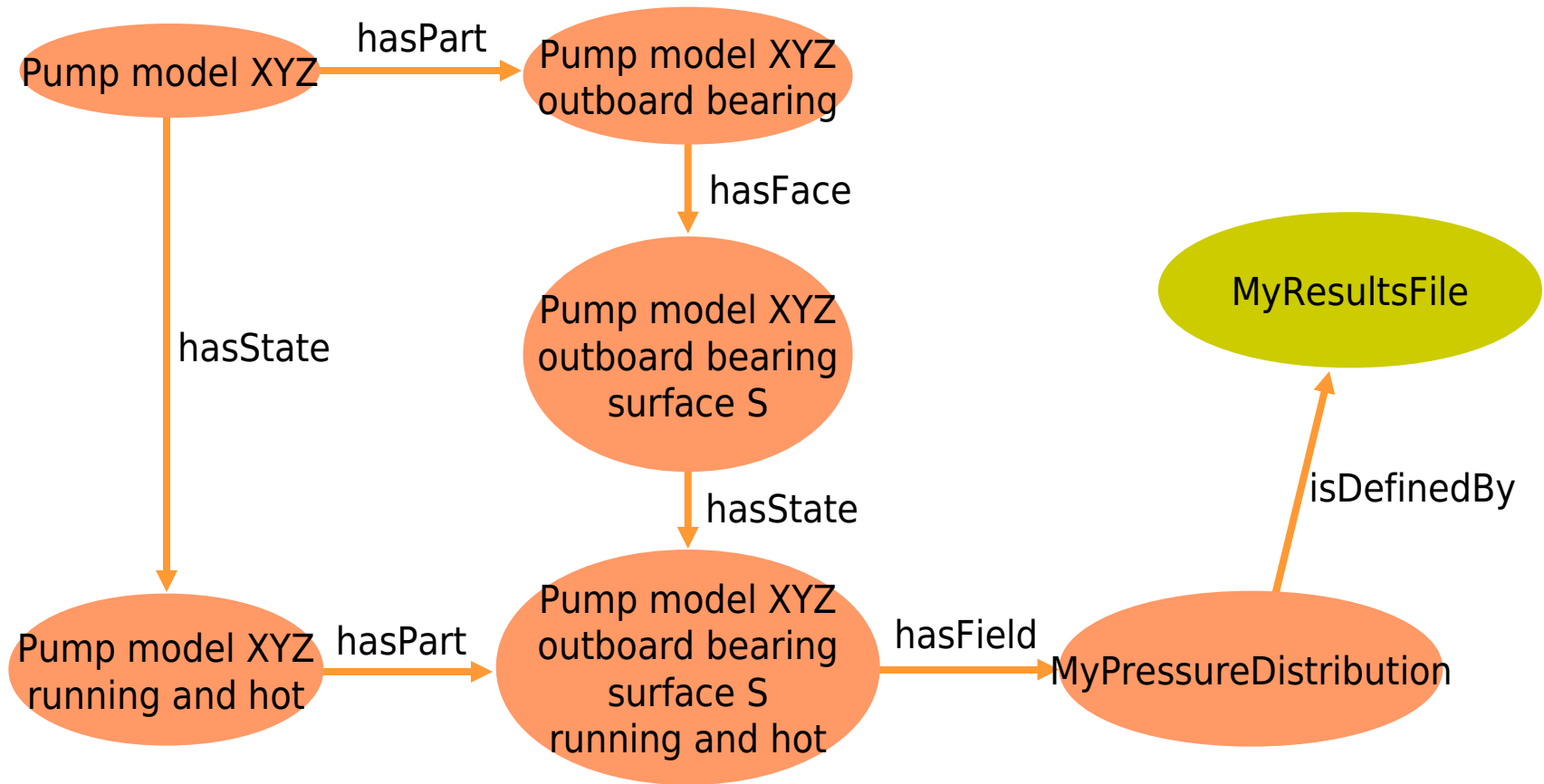# Ontologies for engineering analysis
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native formats do this less well
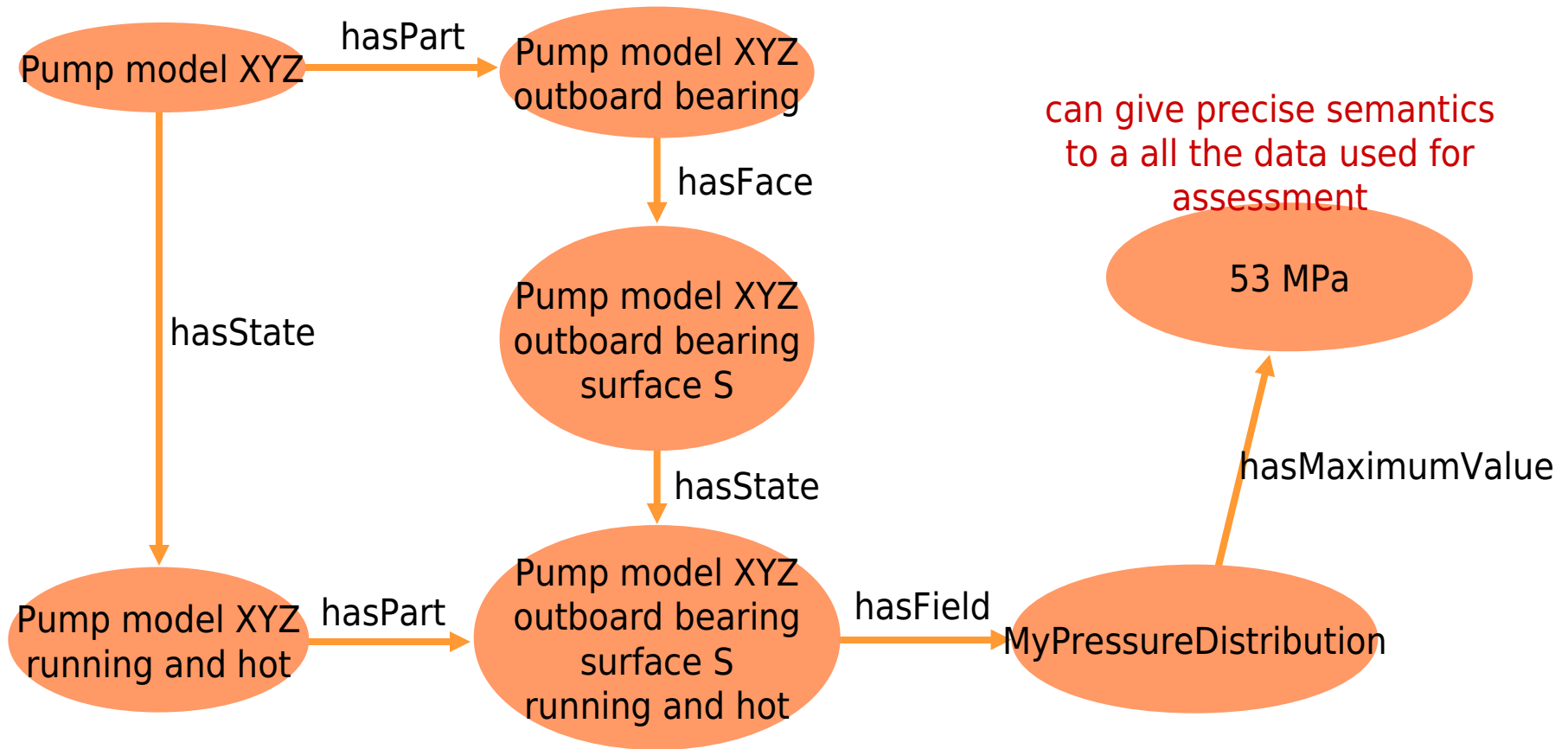
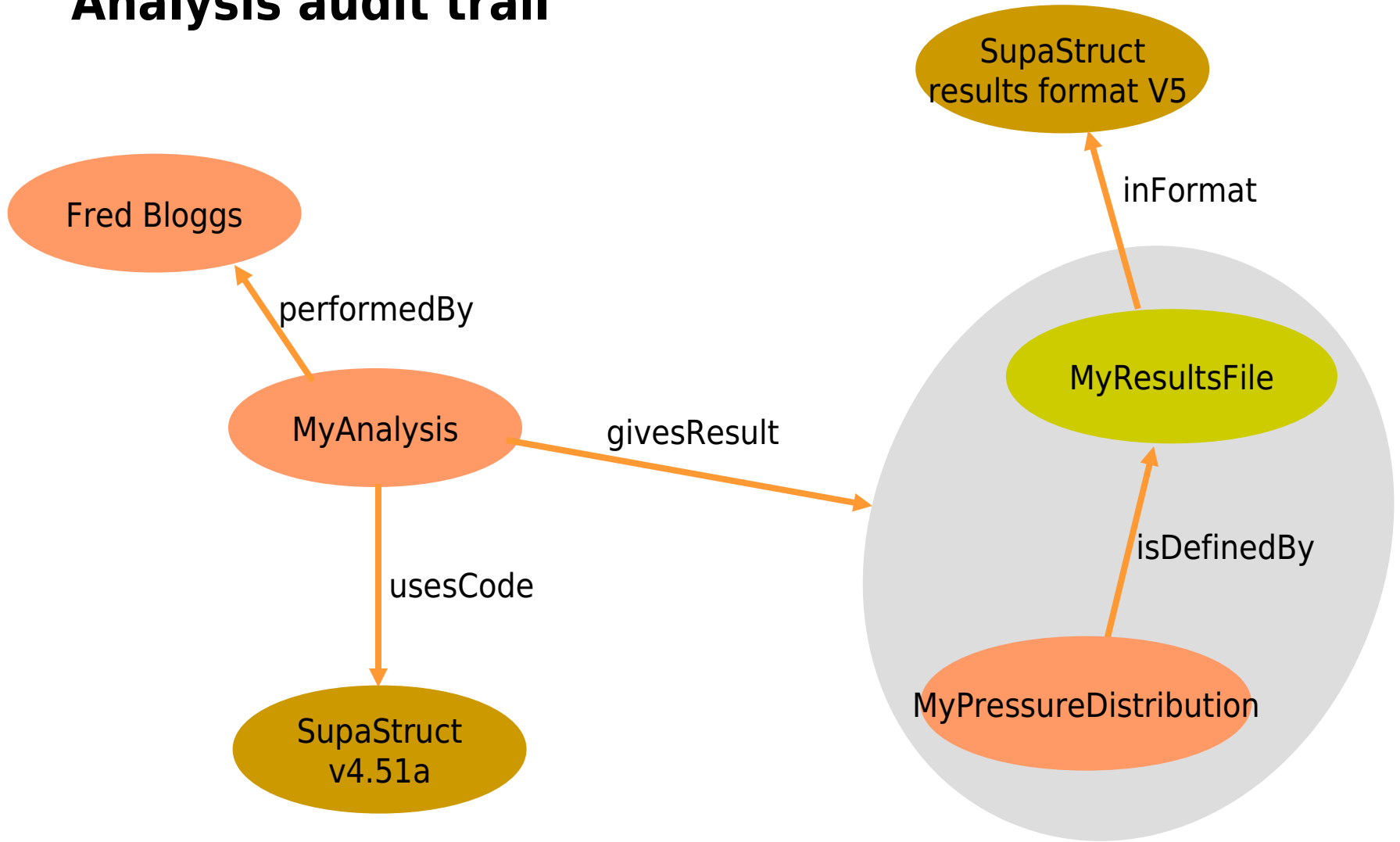# Ontologies for engineering analysis
The customer view – analysis files and meta-data

The ontology necessary for this meta-data can be derived from ISO 10303-209

Ontologies for engineering analysis
The customer view – analysis files and meta-data

Pump model XYZ —hasPart→ Pump model XYZ outboard bearing

Pump model XYZ —hasState→ Pump model XYZ running and hot

Pump model XYZ outboard bearing —hasFace→ Pump model XYZ outboard bearing surface S

Pump model XYZ outboard bearing surface S —hasState→ Pump model XYZ outboard bearing surface S running and hot

Pump model XYZ running and hot —hasPart→ Pump model XYZ outboard bearing surface S running and hot

Pump model XYZ outboard bearing surface S running and hot —hasField→ MyPressureDistribution

MyPressureDistribution —hasMaximumValue→ 53 MPa

can give precise semantics to a all the data used for assessment

The ontology necessary for this meta-data can be derived from ISO 10303-209

Ontologies for engineering analysis
Analysis audit trail

The ontology necessary for this meta-data can be derived from ISO 10303-209

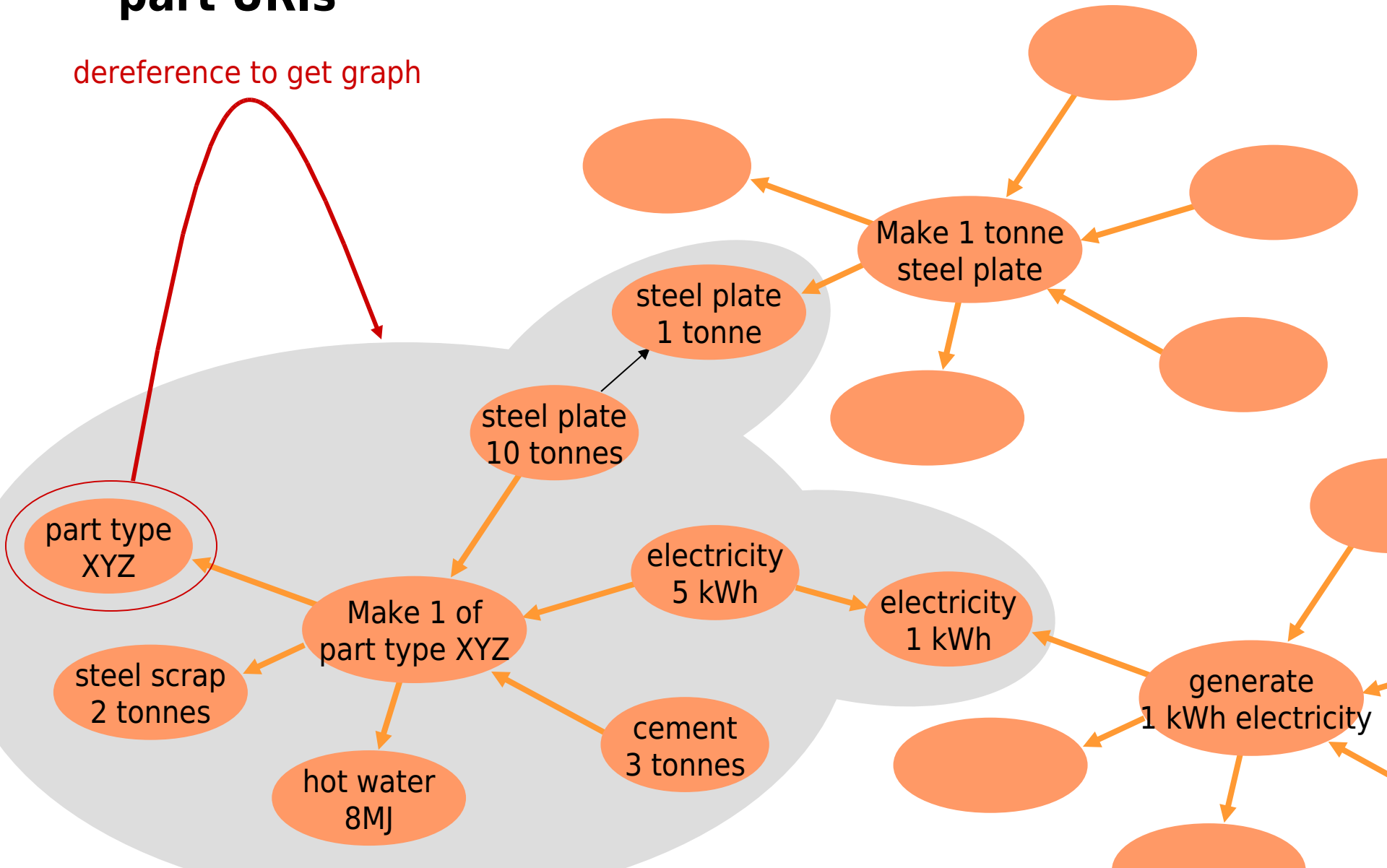# Ontologies for engineering analysis
Making this happen

- A "Dublin Core" for engineering analysis
  - simple concepts
    - » state and analysis step
    - » boundary condition
    - » analysis result
  - largely derived from ISO 10303
- Registry of vendor file formats and analysis codes
- NAFEMS
  - may seek role as ISO maintenance agency for an engineering analysis ontology
  - may act as registry for vendor file formats and codes

Ontologies for the supply chain
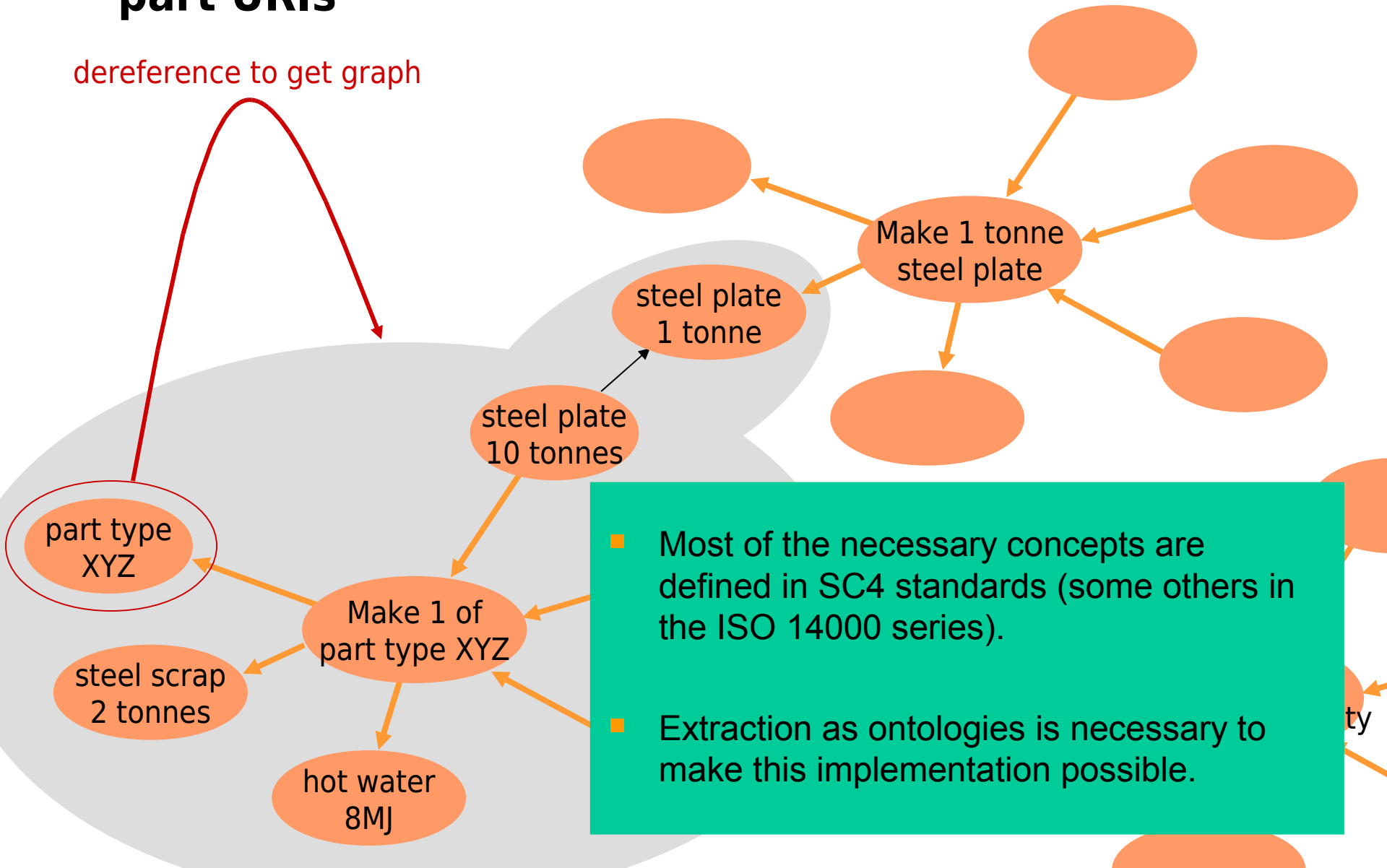## Implementation by dereferencing part URIs

dereference to get graph

Implementation by dereferencing part URIs

dereference to get graph

Make 1 tonne
steel plate

steel plate
1 tonne

steel plate
10 tonnes

part type
XYZ

Make 1 of
part type XYZ

steel scrap
2 tonnes

hot water
8MJ

- Most of the necessary concepts are defined in SC4 standards (some others in the ISO 14000 series).

- Extraction as ontologies is necessary to make this implementation possible.