1- Description and Ontological analysis of the domain:

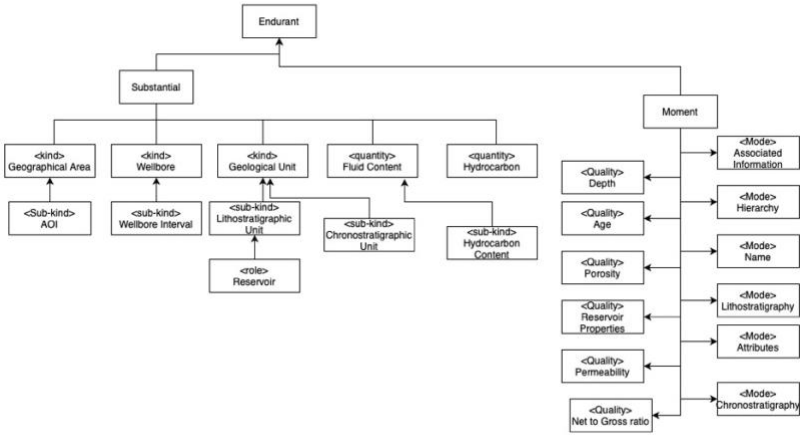
Domain of modeling is the Ontology based data access for Subsurface. Conceptualization needed for such application is based on two things. First, the available G&G data, Geological domain knowledge. The overall scope is limited by some complex end user queries. Following is an example text form a couple of queries.

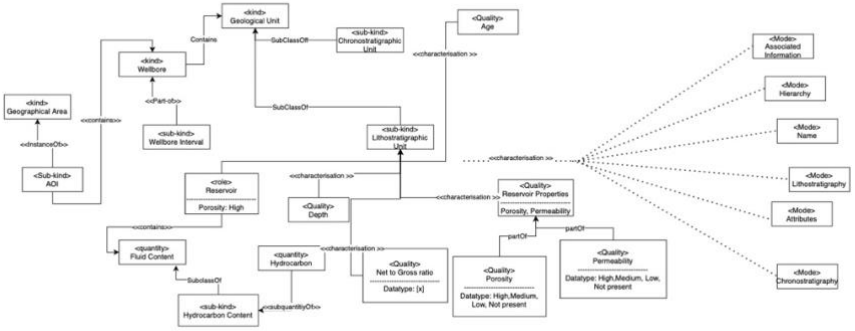
- In my area of interest (AOI) return the wellbores that penetrates chronostrat unit <C1> and return information about the lithostratigraphy and the hydrocarbon content (saterated and moveable + shows) in the wellbore interval that penetrates the <C1> unit. Also return information about other wellbore intervals with hydrocarbon content (saterated and moveable + shows) in the wellbores with hydrocarbon in <C1>.
- Return the wellbores that do not penetrate chronostrat unit <C1> and give information about why they do not. Possible outcomes of why not: Not drilled far enough, eroded, not deposited, missing due to faulting
- In my AOI, return wellbores with reservoir
- If there is reservoir, then give associated information (overlapping 3d line intervals with attributes + ?3d points with attributes)
- Chronostratigraphy (wellbore interval with name, hierarchy, top and base age, top and base depth (MD RKB, TVD MSL,..). Lithostratigraphy (wellbore interval with name, hierarchy, top and base depth (MD RKB, TVD MSL,..). Hydrocarbon content (saturated and moveable, residual, shows). Reservoir properties: Porosity, permeability, Net to Gross ratio, Net thickness (MD), Net thickness (TVD)

Classification based on UFO

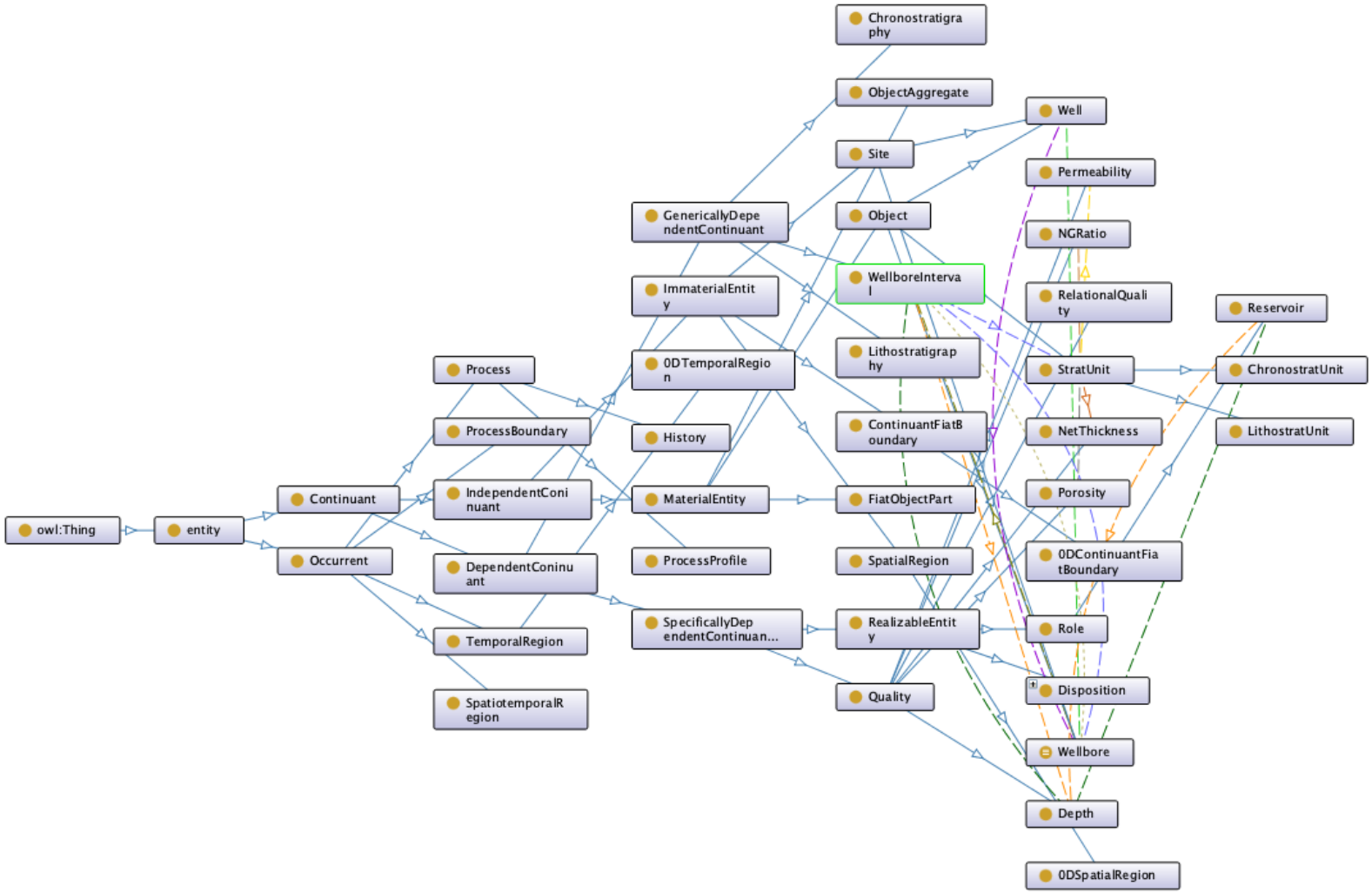
Concept	Supply identity(O)	Carry identity (I)	Rigid (R)	Unity	Relacional Dependence (DR)	Existential Dependence (DE1)	Existential Dependence DE2	Meta-type
AOI	O-	I+	R+	U+	DR-	ED1+	ED2-	Sub-Kind
Wellbore	O+	I+	R+	U+	DR-	ED1-	ED2-	Kind
Chronostratigraphic Unit	O-	I+	R+	U+	DR-	ED1-	ED2-	Sub-Kind
Lithostratigraphic Unit	O-	I+	R+	U+	DR-	ED1-	ED2-	Sub-Kind
Hydrocarbon	O+	I+	R+	U-	DR-	ED1-	ED2-	Quantity
Fluid Content	O+	I+	R+	U-	DR-	ED1+	ED2-	Kind
Wellbore Interval	O-	I+	R+	U+	DR-	ED1+	ED2-	Sub-Kind
Hydrocarbon Content	O-	I+	R+	U-	DR-	ED1+	ED2-	Sub-Kind
Reservoir	O-	I+	R~	U-	DR+	ED1-	ED2-	Role
Associated information	O-	I-	R~	U-	DR-	ED1+	ED2-	Mode
Attributes	O-	I-	R~	U+	DR-	ED1+	ED2-	Mode
Geological Unit) Age	O-	I+	R+	U+	DR-	ED1+	ED2-	Quality
(Geological Unit) Depth	O-	I-	R~	U+	DR-	ED1+	ED2-	Quality
(Geological Unit) Hierarchy	O-	I+	R+	U-	DR-	ED1+	ED2-	Mode
(Geological Unit) Name	O-	I+	R+	U+	DR-	ED1+	ED2-	Mode
(Geological Unit) Reservoir properties	O-	I-	R~	U+	DR-	ED1+	ED2-	Quality
(Geological Unit) Porosity	O+	I-	R~	U+	DR-	ED1+	ED2-	Quality
(Geological Unit) Permeability	O+	I-	R~	U+	DR-	ED1+	ED2-	Quality
(Geological Unit) Net to Gross Ratio	O+	I-	R~	U+	DR-	ED1+	ED2-	Quality
(Geological Unit) Lithostratigraphy	O-	I+	R~	U+	DR-	ED1+	ED2-	Mode
(Geological Unit) Chronostratigraphic	O-	I+	R+	U+	DR-	ED1+	ED2-	Mode

Conceptual model based on UFO

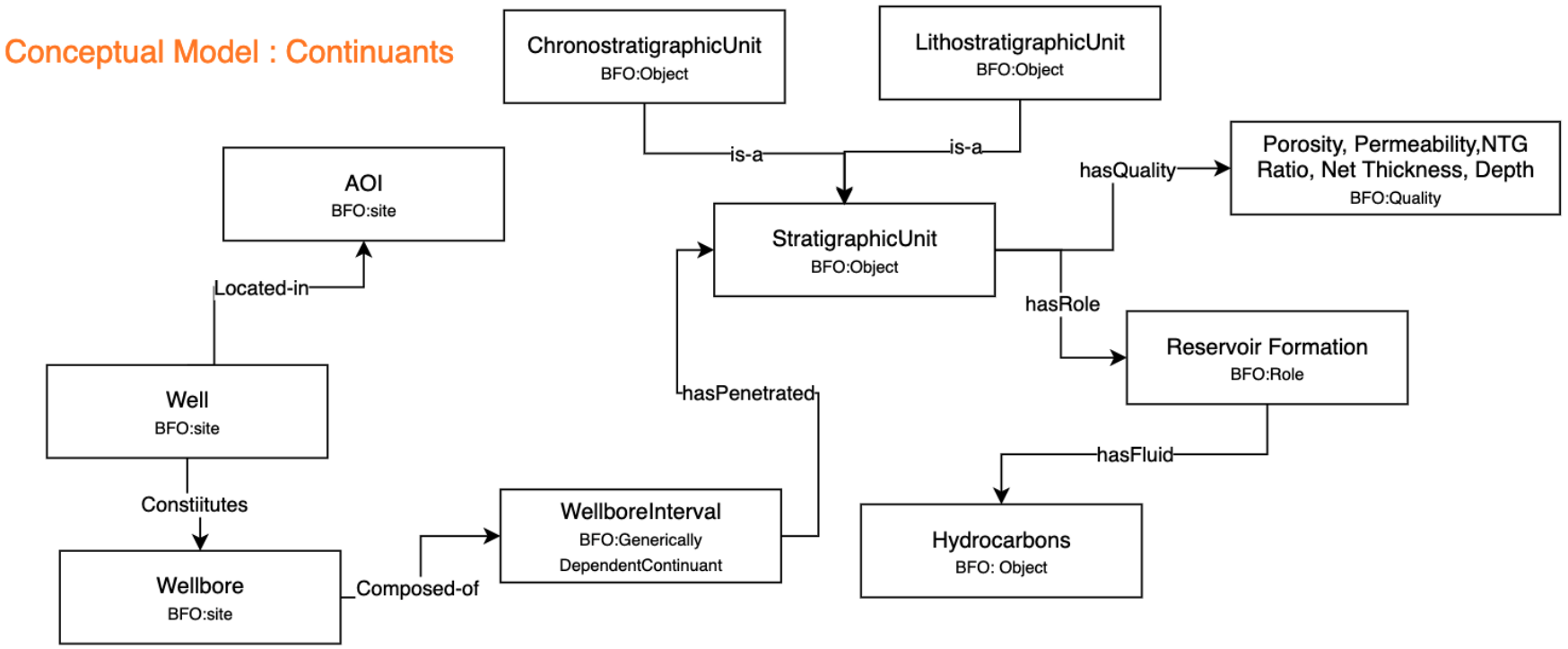




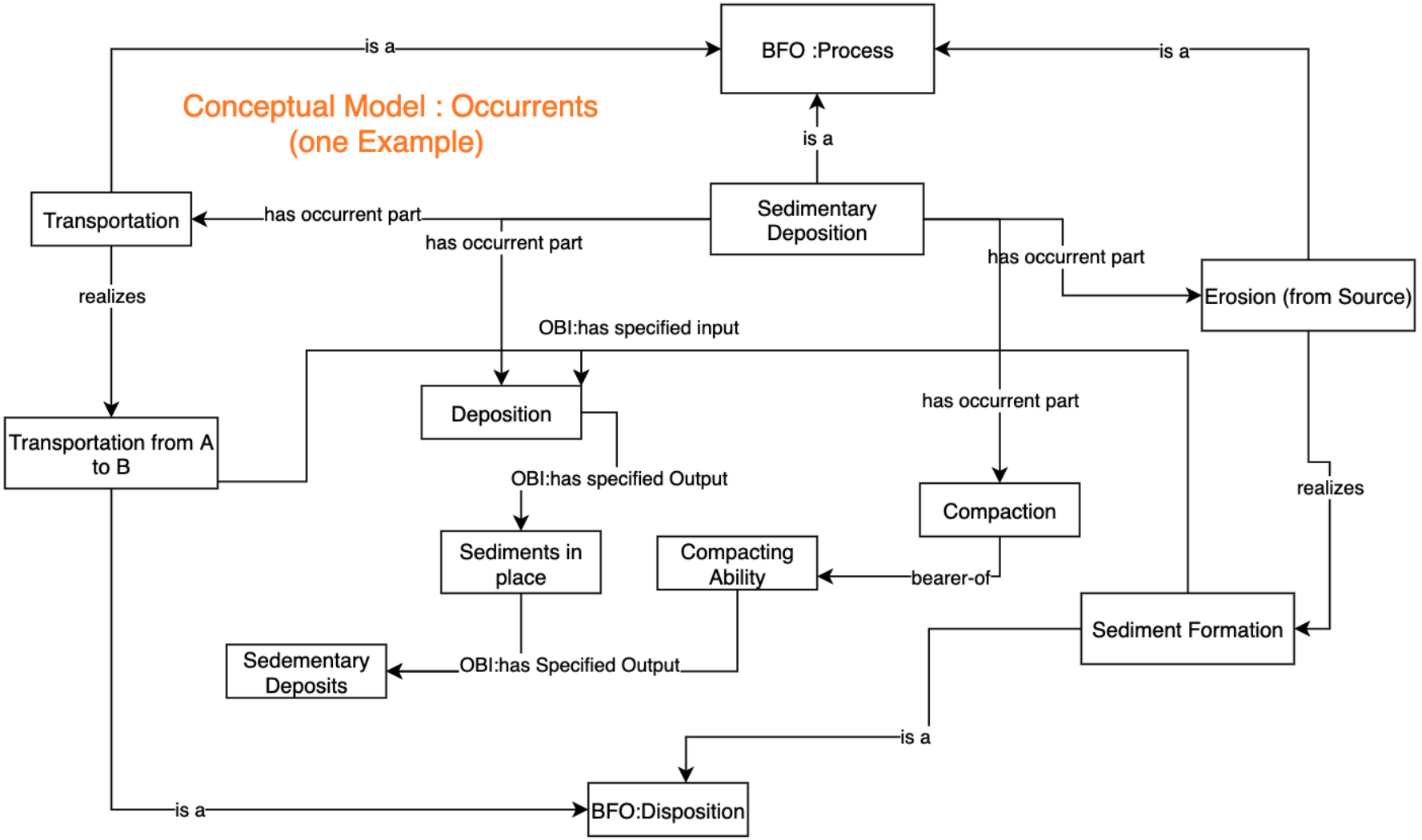
Classification Based on BFO



3. Conceptual model by specializing BFO



2. Process to be modelled and how it affects continuing entities, based on BFO



4. Definition of entities: All definitions of entities, object properties and data properties (task a-f) are in the ontology file(annotation properties)

5. Moments and their quality domains (for formal definitions, see the annotation properties in the ontology file)
Porosity: Absolute value 0-100%| classification: low-medium-high
Permeability: Absolute value 0-xxxMd | classification: low-medium-high
NGRatio: Absolute value 0-100%| classification: low-medium-high
NetThickness: Absolute value 0: xxx M
Depth:0: Absolute value 0: xxx M

6. Relationships (for formal definitions, see the annotation properties in the ontology file)

There are not many relationships in my model But as an Example of Internal descriptive: Wellbore001A <Penetrate> StratigrpahicuUnit C1 (being depth as an internal property)

7.Mereological relationships e.g. Well001 <hasWellbore> Well001A , Well001 <located-In> AOI

8. Instances to validate the model: See instances in the Ontology file

9- Description of information or inconsistencies: No inconsistencies were found while running the reasoner