Nome: Marcos Pivetta
Curso: CMP196

Universidade Federal do Rio Grande do Sul

Final Work - Domain Ontology Construction

For the purpose of making an application directed to the oil-gas industry, a domain-specific ontology is described here. Its objective is to model - at a high level - the production aspects of an oil well field, and the generation of time series data during its lifetime. The concepts provided were compiled from a literature review of 42 papers that study the application of the time-series concept of “forecasting” petroleum production. In summary, we take into consideration sensorial data for pressure, choke opening and production and injection rate of oil, gas and water. Wells have multiple producing/injection intervals, each acting on a particular layer of the geological formation. They also have a well downhole, where pressure of the reservoir is measured. All measurable information relating to the operation of the well is stored as timestamped data and makes up a well’s history. The observed data from these wells make up clusters of similar production or other properties. The producing/injection layer contains a source rock, that houses water and hydrocarbons. It also has the qualities of porosity and permeability.

Upper-Ontologies and Core ontologies used:

- BFO
- IAO
- GeoCore

1. **Independent Continuants (Rigid)**

	Subsumption	Mereological
Well	Object Aggregate	
Well Downhole	Site	part_of well
Well Interval	Site	part_of well
Amount of oil	Earth Material/Material Entity	located_in source rock
Amount of gas	Earth Material/Material Entity	located_in source rock
Amount of water	Earth Material/Material Entity	located_in source rock
Source rock	Rock/Material Entity	constitutes geological object
Sensor	Material Entity	part_of well downhole part_of well interval part_of choke
Choke	Material Entity	part_of well
Geological	Object/Material Entity	has_part geological object

Object		constituted_by rock has_amount
Rock	Earth Material	
Earth Material	Earth Material	

2. **Specifically Dependent Continuants (Anti-rigid/not-rigid)**

	Subsumption
Porosity	Quality
Permeability	Quality
Pressure	Quality
Volume	Quality
Choke opening	Quality
Operational Interval	Function
Producing Interval	Operational Interval/Function
Injecting Interval	Operational Interval/Function
Geological Contact	Relational Quality/Quality

3. **Generically Dependent Continuants (Anti-rigid/not-rigid)**

	Subsumption
Well timeseries cluster	Information Content Entity/Gen. Dep. Con.
Time Stamped Measurement Datum	Information Content Entity/Gen. Dep. Con.

Time Sampled Measurement Data Set	Information Content Entity/Gen. Dep. Con.
Well history	Time Sampled Measurement Data Set/Gen. Dep. Con.
Well timeseries cluster	Data Set/Gen. Dep. Con.
Observed datum	Time Sampled Datum/Gen. Dep. Con.
Petrophisical datum	Measurement Datum/Gen. Dep. Con.

4. Occurrents

	Subsumption
Measurement	Process
Flow Measurement	Measurement/Process
Pressure Measurement	Measurement/Process
Measurement	Process

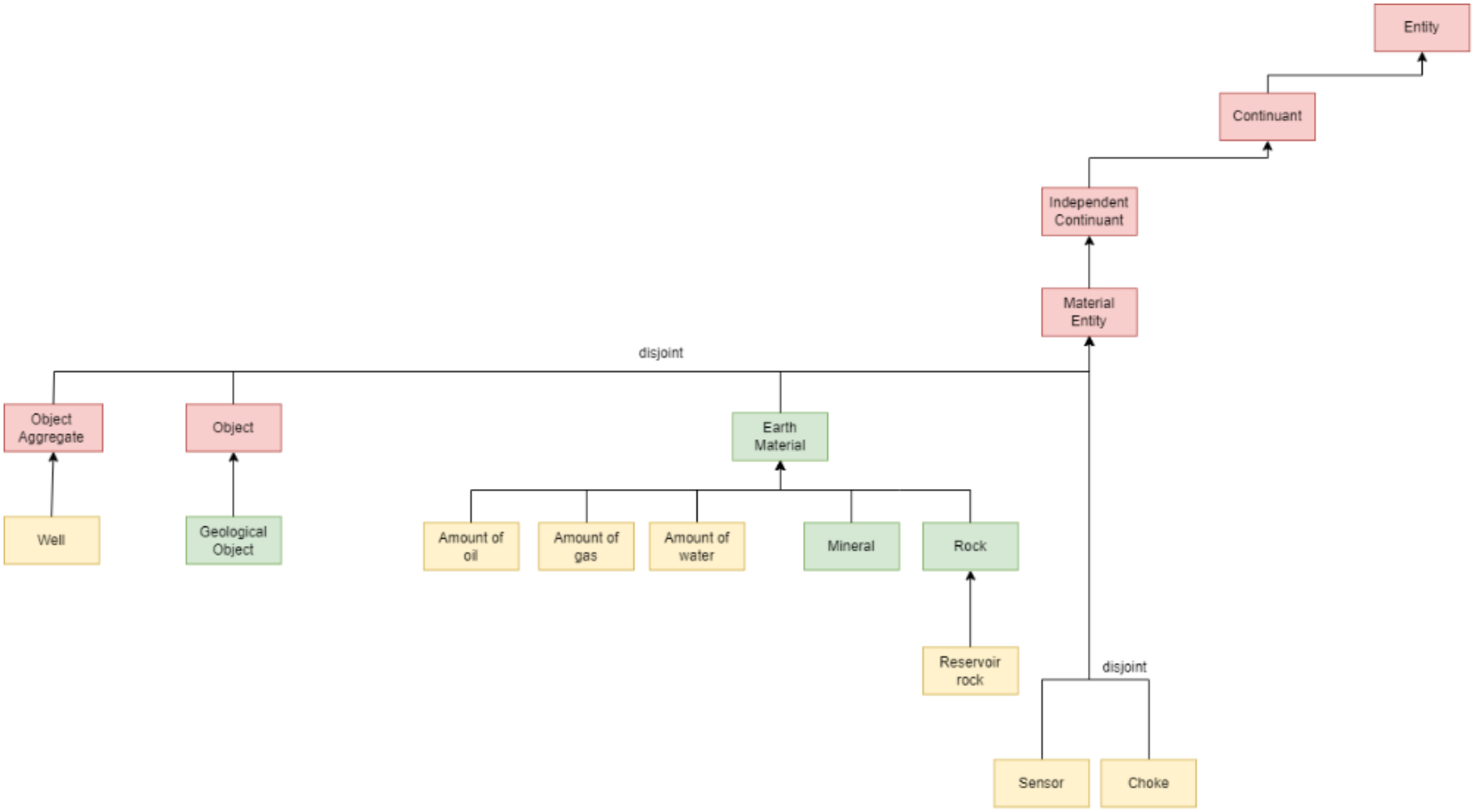
5. Relations

part_of
located_in
constituted_by
participates_in

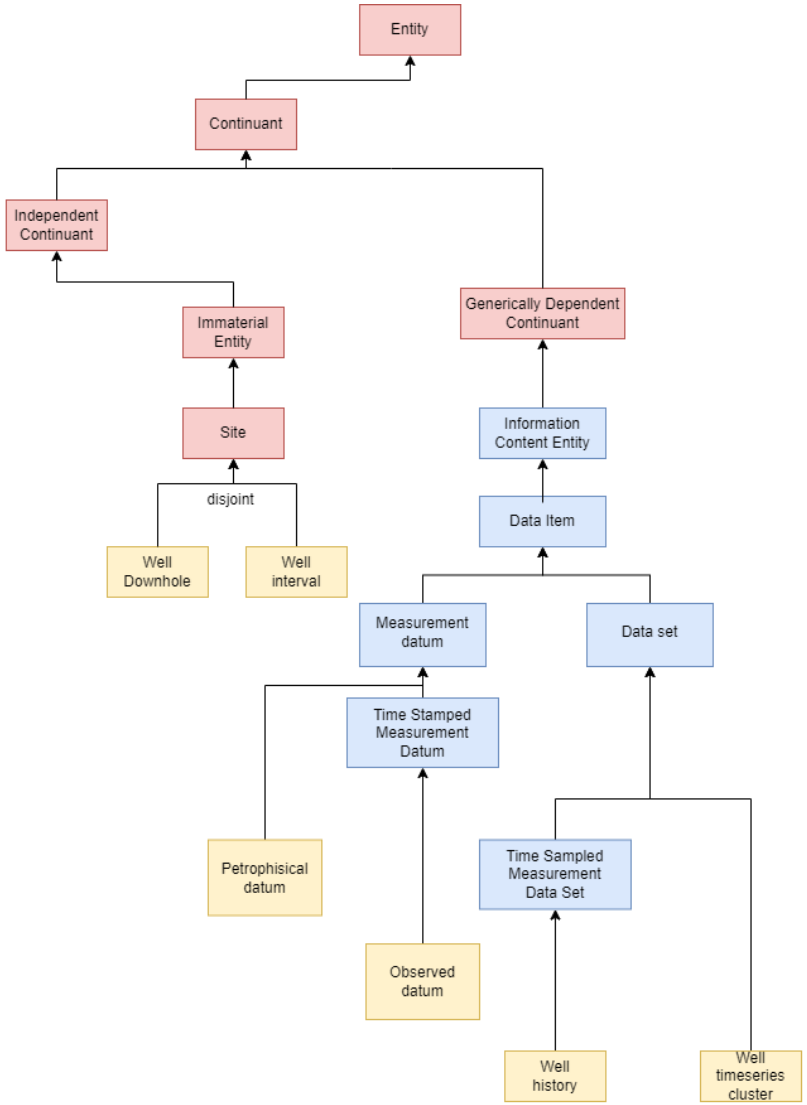
function_of
quality_of
concretizes
has_specified_input
has_specified_output

6. Taxonomy

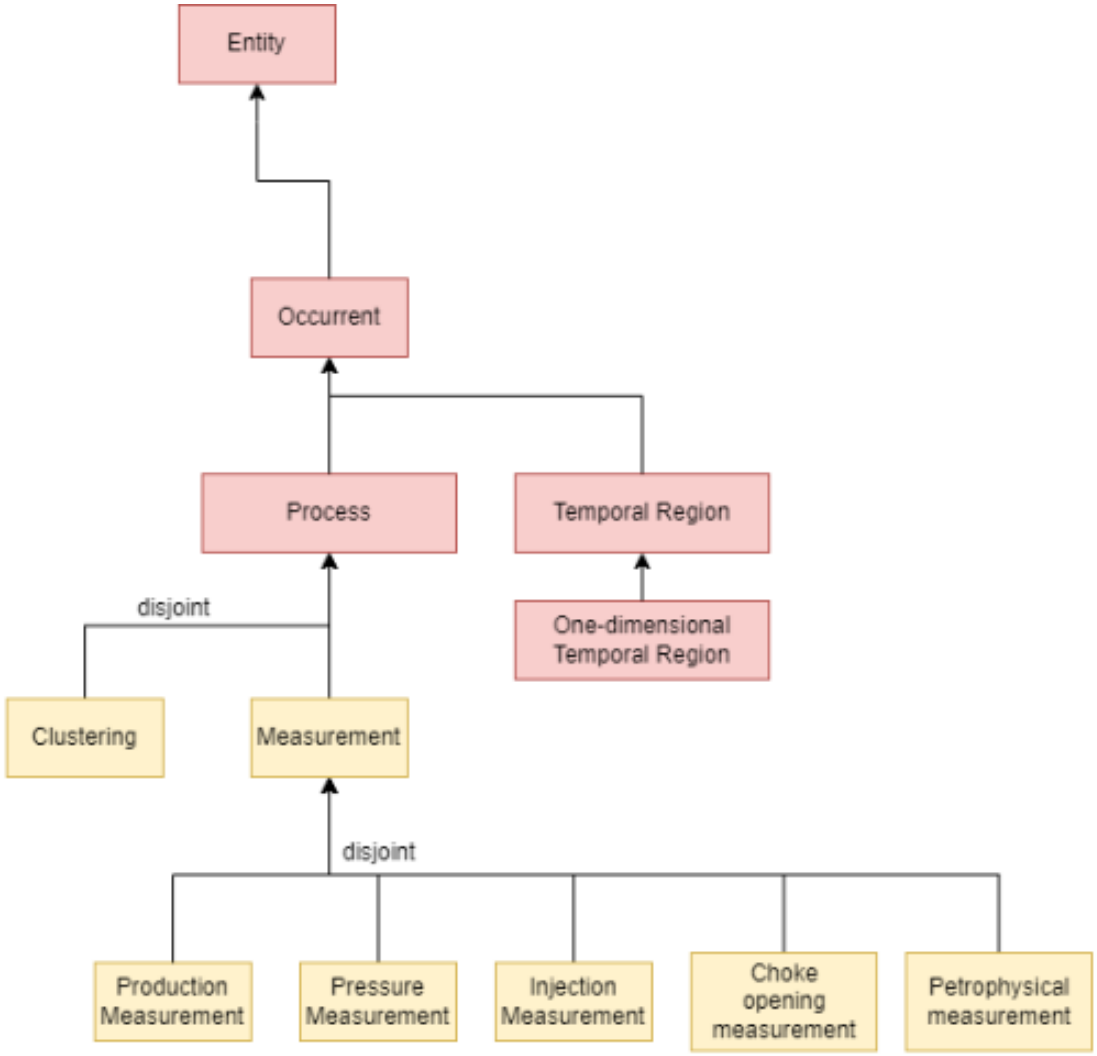
a. Independent Continuants



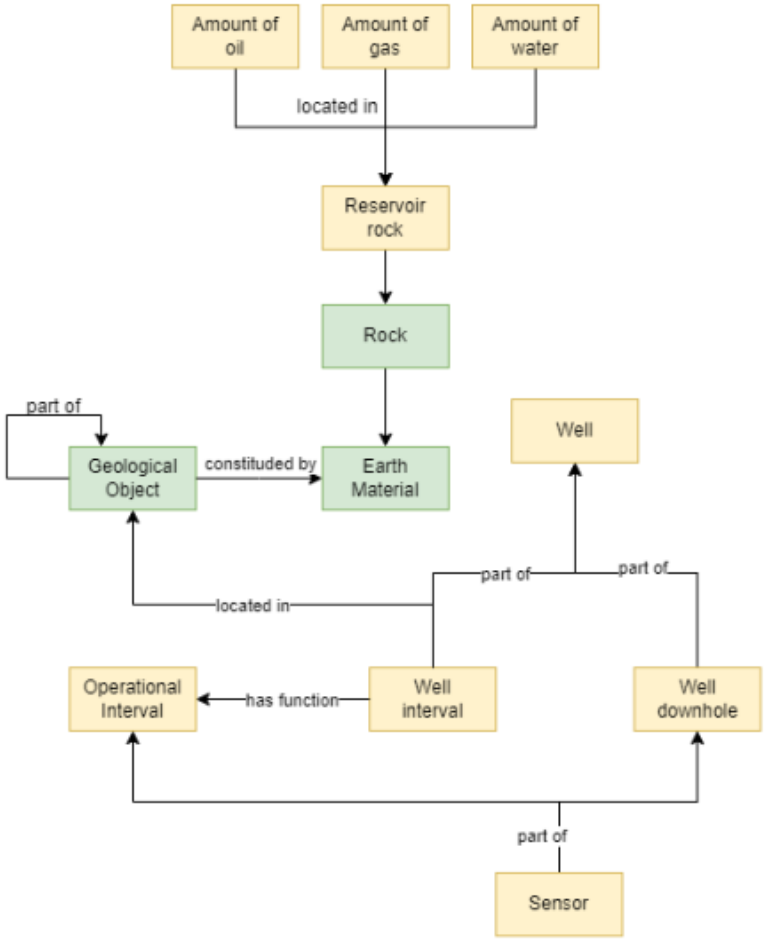
b. Immaterial entities and Generically Dependent Continuants



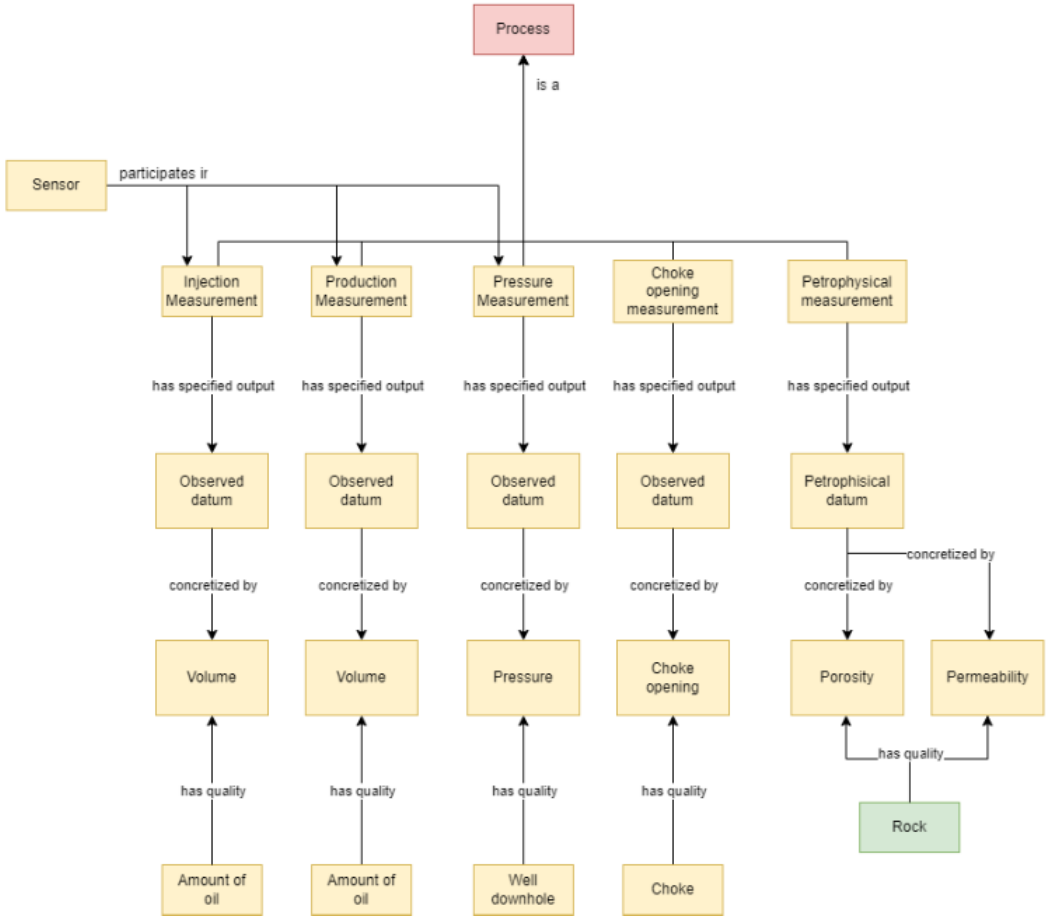
c. Occurrents



7. **Relations**
    a. **Well intervals and source rock**



b. Measurement processes



c. Clustering process