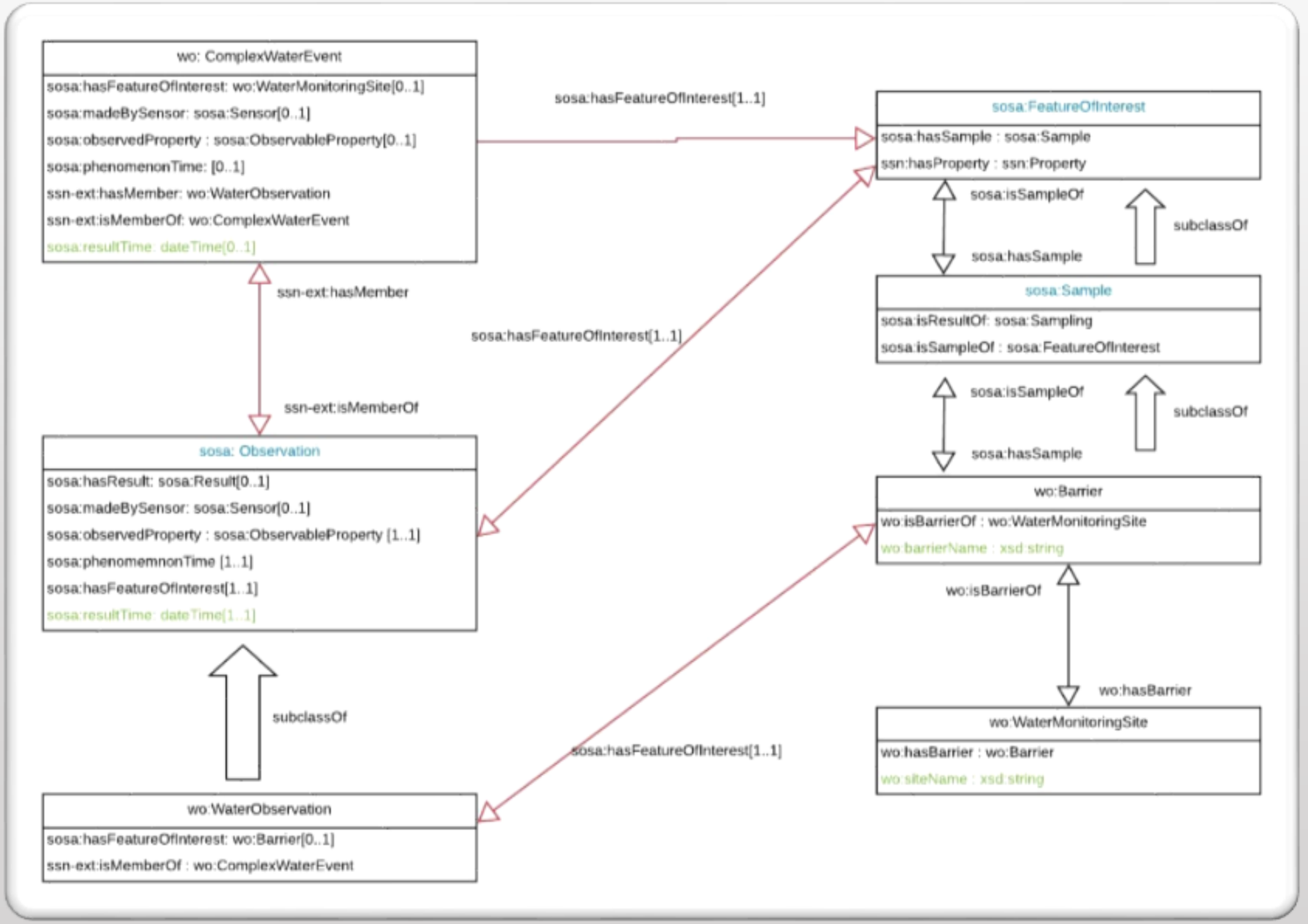
Query rewriting

The Ontology

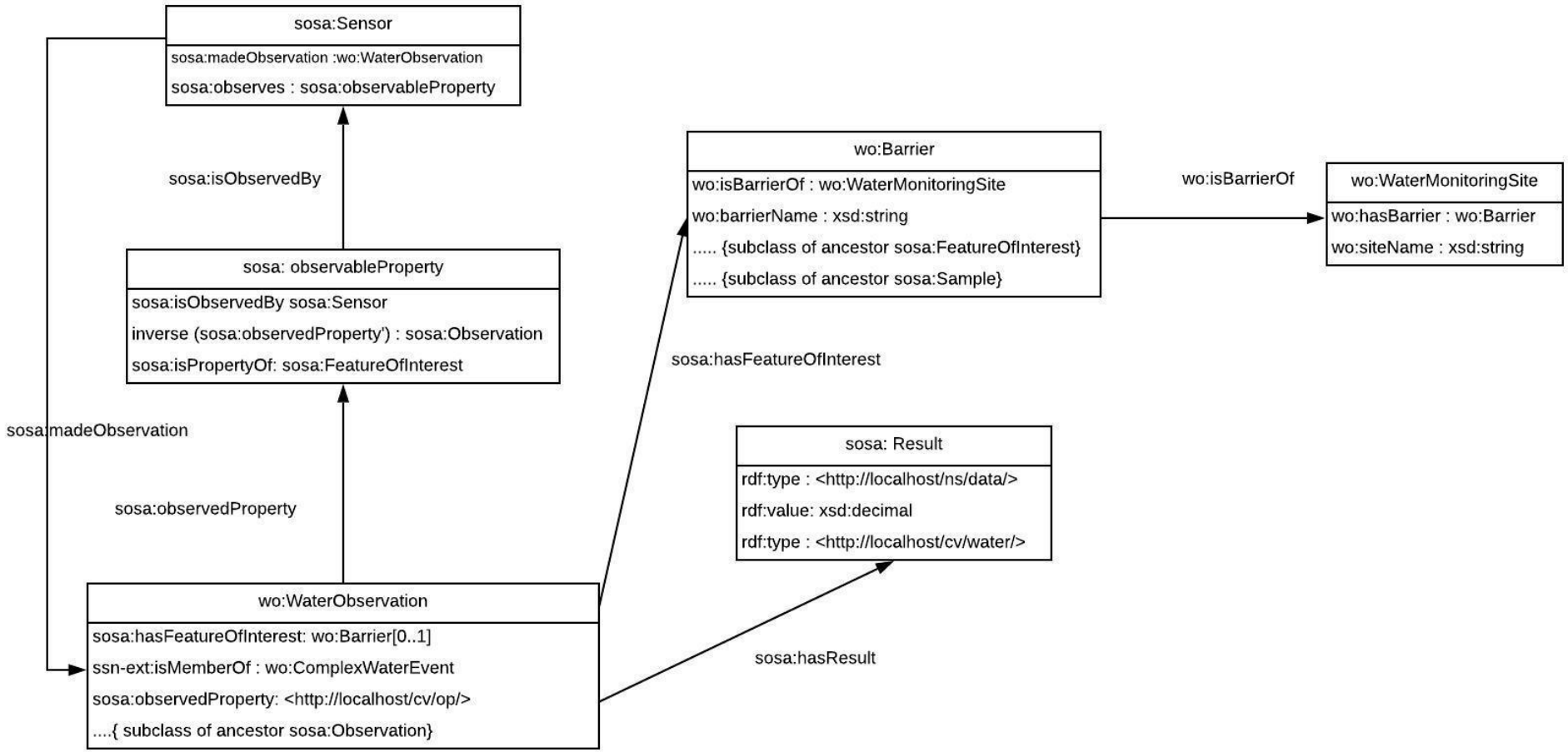
HTTPS://GITHUB.COM/SUNYI000/WATER-ONTOLOGY

- Extends existing ontologies
  - Ssn/sosa ontology
  - ssn-ext
- control vocabs for water monitoring

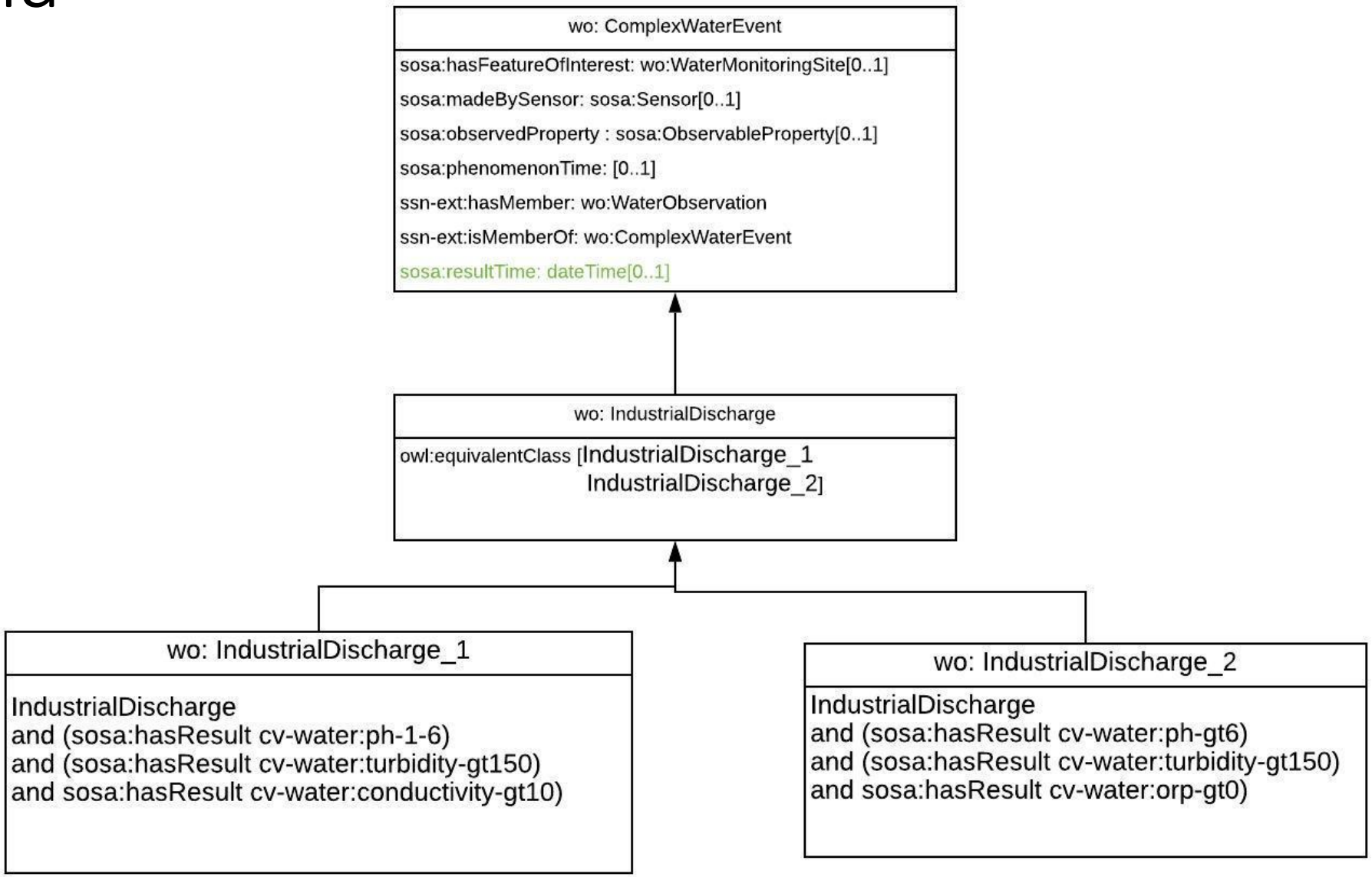
schema


wo: ComplexWaterEvent
sosa:hasFeatureOfInterest: wo:WaterMonitoringSite[0..1]
sosa:madeBySensor: sosa:Sensor[0..1]
sosa:observedProperty : sosa:ObservableProperty[0..1]
sosa:phenomenonTime: [0..1]
ssn-ext:hasMember: wo:WaterObservation
ssn-ext:isMemberOf: wo:ComplexWaterEvent
sosa:resultTime: dateTime[0..1]
sosa:hasFeatureOfInterest[1..1]
sosa:FeatureOfInterest
sosa:hasSample : sosa:Sample
ssn:hasProperty : ssn:Property
sosa:isSampleOf
sosa:hasSample
subclassOf
ssn-ext:hasMember
ssn-ext:isMemberOf
sosa:hasFeatureOfInterest[1..1]
sosa:Sample
sosa:isResultOf: sosa:Sampling
sosa:isSampleOf : sosa:FeatureOfInterest
sosa:isSampleOf
sosa:hasSample
subclassOf
sosa: Observation
sosa:hasResult: sosa:Result[0..1]
sosa:madeBySensor: sosa:Sensor[0..1]
sosa:observedProperty : sosa:ObservableProperty [1..1]
sosa:phenomemnonTime [1..1]
sosa:hasFeatureOfInterest[1..1]
sosa:resultTime: dateTime[1..1]
wo:Barrier
wo:isBarrierOf : wo:WaterMonitoringSite
wo:barrierName : xsd:string
wo:isBarrierOf
wo:hasBarrier
subclassOf
sosa:hasFeatureOfInterest[1..1]
wo:WaterMonitoringSite
wo:hasBarrier : wo:Barrier
wo:siteName : xsd:string
wo:WaterObservation
sosa:hasFeatureOfInterest: wo:Barrier[0..1]
ssn-ext:isMemberOf : wo:ComplexWaterEvent

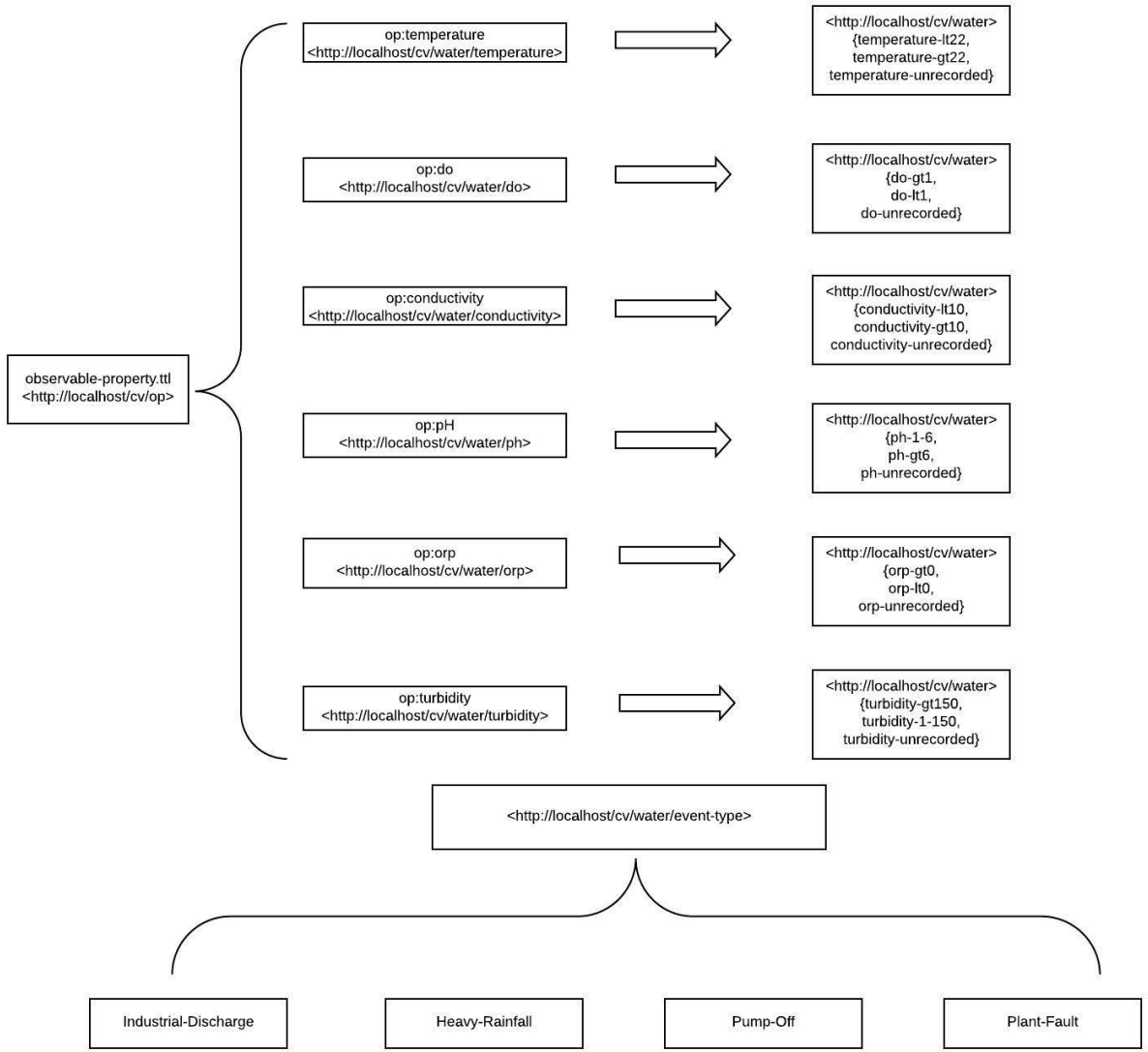
Schema

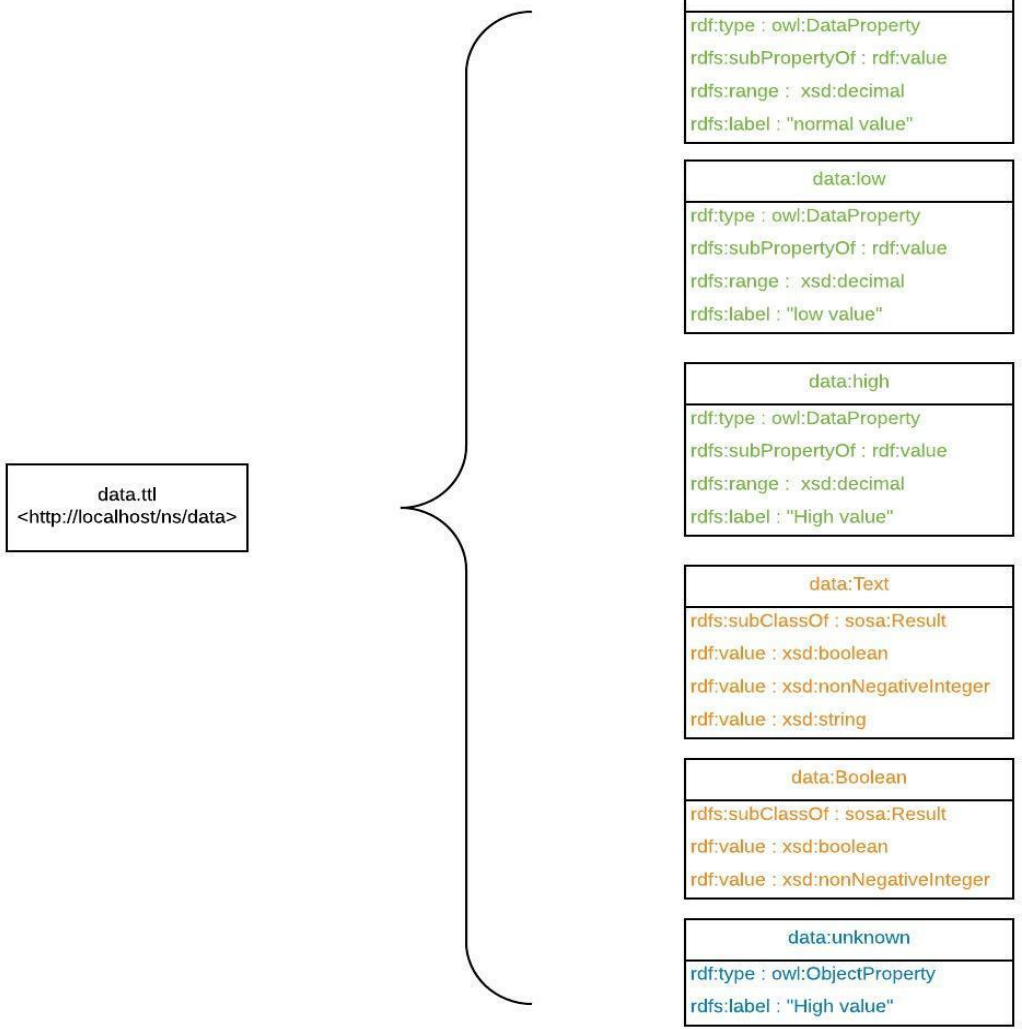

sosa:Sensor
sosa:madeObservation :wo:WaterObservation
sosa:observes : sosa:observableProperty
sosa:isObservedBy
sosa: observableProperty
sosa:isObservedBy sosa:Sensor
inverse (sosa:observedProperty') : sosa:Observation
sosa:isPropertyOf: sosa:FeatureOfInterest
sosa:madeObservation
sosa:observedProperty
wo:WaterObservation
sosa:hasFeatureOfInterest: wo:Barrier[0..1]
ssn-ext:isMemberOf : wo:ComplexWaterEvent
sosa:observedProperty: <http://localhost/cv/op/>
....{ subclass of ancestor sosa:Observation}
wo:Barrier
wo:isBarrierOf : wo:WaterMonitoringSite
wo:barrierName : xsd:string
..... {subclass of ancestor sosa:FeatureOfInterest}
..... {subclass of ancestor sosa:Sample}
sosa:hasFeatureOfInterest
wo:isBarrierOf
wo:WaterMonitoringSite
wo:hasBarrier : wo:Barrier
wo:siteName : xsd:string
sosa: Result
rdf:type : <http://localhost/ns/data/>
rdf:value: xsd:decimal
rdf:type : <http://localhost/cv/water/>
sosa:hasResult

schema


wo: ComplexWaterEvent
sosa:hasFeatureOfInterest: wo:WaterMonitoringSite[0..1]
sosa:madeBySensor: sosa:Sensor[0..1]
sosa:observedProperty : sosa:ObservableProperty[0..1]
sosa:phenomenonTime: [0..1]
ssn-ext:hasMember: wo:WaterObservation
ssn-ext:isMemberOf: wo:ComplexWaterEvent
sosa:resultTime: dateTime[0..1]
wo: IndustrialDischarge
owl:equivalentClass [IndustrialDischarge_1
IndustrialDischarge_2]
wo: IndustrialDischarge_1
IndustrialDischarge
and (sosa:hasResult cv-water:ph-1-6)
and (sosa:hasResult cv-water:turbidity-gt150)
and sosa:hasResult cv-water:conductivity-gt10)
wo: IndustrialDischarge_2
IndustrialDischarge
and (sosa:hasResult cv-water:ph-gt6)
and (sosa:hasResult cv-water:turbidity-gt150)
and sosa:hasResult cv-water:orp-gt0)

Data & Control vocabs





Complex Events

- Industrial discharge
- Heavy rainfall
- Pump off
- Plant fault

Industrial discharge

- low ph, high turbidity, high conductivity (InducstrialDischarge_1)
- high ph, high turbidity, low orp (IndustrialDischarge_2)

Example High level queries

IndustrialDischarge = IndustrialDischarge_1 OR IndustrialDischarge_2

Rewriting IndustrialDischarge

- IndustrialDischarge_1= IndustrialDischarge
  and (sosa:hasResult cv-water:ph-1-6)
  and (sosa:hasResult cv-water:turbidity-gt150)
  and sosa:hasResult cv-water:conductivity-gt10)
- IndustrialDischarge_2= IndustrialDischarge
  and (sosa:hasResult cv-water:ph-gt6)
  and (sosa:hasResult cv-water:turbidity-gt150)
  and sosa:hasResult cv-water:orp-gt0)