Universidade de Nova de Lisboa **MIEI/MCL**

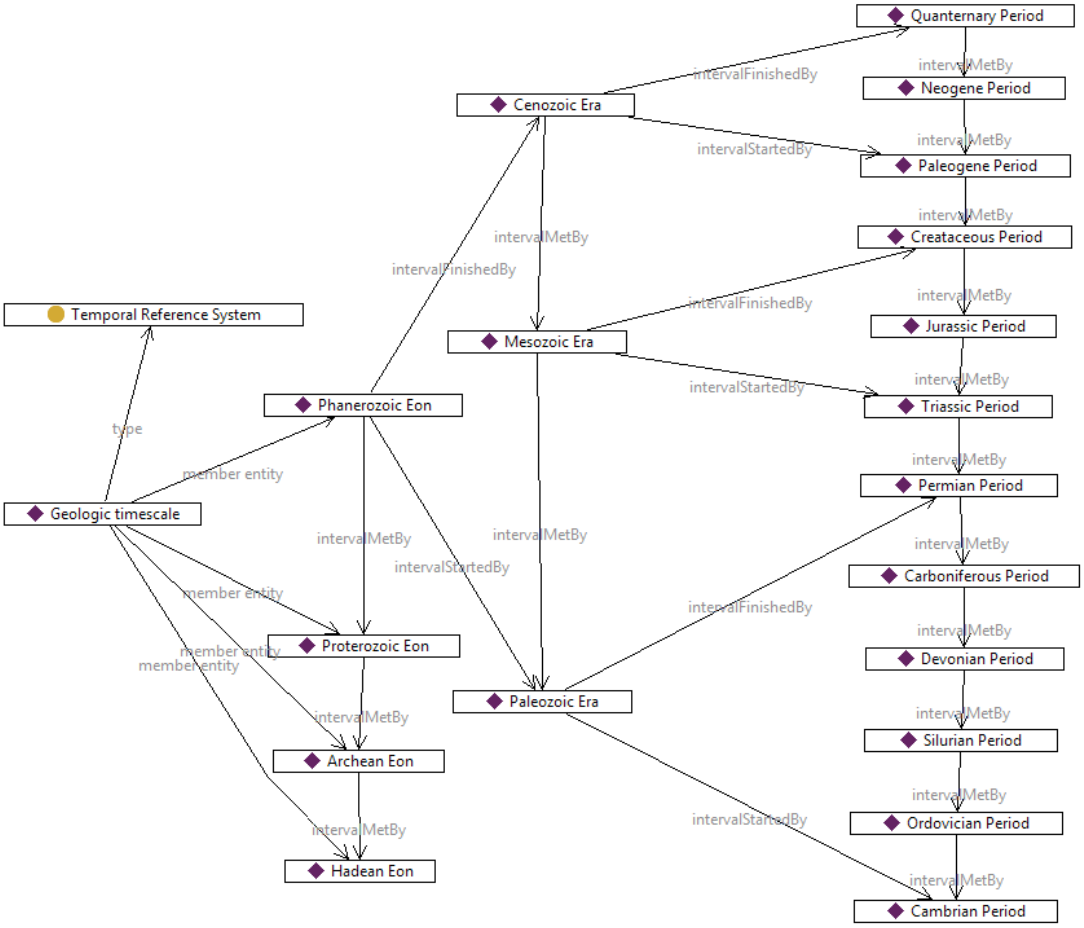
Faculdade de Ciências e Tecnologia **November 5th, 2016**

Data Modelling
Modelação de Dados

Test
Open book -- Duration: 2 hours

Group 1

Consider the following graph representing (part) of the Earth's geological eras. The nodes' text represent the value of attribute "name". The node with the circle represents role "TRS" while all the other nodes are of role "Interval".



1a) Present the solutions for the following queries in tabular format:

```
1. MATCH ()-[:member_entity]-()-[:intervalStartedBy*]->(p) RETURN p.name
2. MATCH (r)<--(p)-->(q), (q)-->(r) RETURN p.name, q.name, r.name
3. MATCH (p)-[:intervalFinishedBy]->(q)
   OPTIONAL MATCH (r)-->(q) WHERE r is NULL RETURN p.name
```

1b) Define a query that obtains the Era with more Periods "inside" (i.e. the result should be Paleozoic Era).

Group 2

Consider the following N3 data of the RDF graph **O**:

```
@prefix : <http://foo.ex/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .

:i1 :start :t1; :end :t2; rdfs:label "December" .
[ :start :t1 ; :end :t3 ] rdfs:label "Cold".
[] :contains :i1, [] .
:t1 :before :t2 ; rdfs:label "December, 1st" .
:t2 :before :t3 .
```

Consider the following four RDF graphs where the default prefix : is associated to IRI <http://foo.ex/>

1. _:x :start _:y . _:x :end _:z. _:z :before _:y .	2. _:x :start _:y . _:z :start _:x . _:x rdfs:label _:z .
3. _:x :end _:y . _:z :end _:y . _:x :contains _:y .	4. _:x :start _:y . _:y :before _:z . _:z :before _:x .

2a) From the graphs specified previously indicate the ones which are simply entailed by graph **O**. Justify in detail by using any of the methods studied for RDF simple entailment.

2b) The initial data in O is extended with the following schema information where the rdfs prefix is associated with the usual URI identifying RDF Schema:

```
1. :start rdfs:subPropertyOf :contains .
2. :start rdfs:domain :Interval .
3. :start rdfs:range :Instant
4. :end rdfs:subPropertyOf :contains .
5. :end rdfs:domain :Interval .
6. :end rdfs:range :Instant
7. :Interval rdfs:subClassOf :TemporalEntity .
8. :Instant rdfs:subClassOf :TemporalEntity
```

Using the inference rules for RDF Schema entailment, check whether the following graph is entailed by the initial RDF graph **O** when extended by the schema information. Justify your answer.

```
[ a :TemporalEntity ] :contains [ a :Interval ], [ a :Instant ] .
```

2c) Construct a SPARQL query that retrieves the instant that starts an interval but for which there is no end instant. The label of the start interval must be returned, whenever it exists. Assume that entailment mode is simple but the graph has been previously closed with all the triples obtained with RDFS closure rules.

2d) Present the solutions to the following SPARQL query when applied to graph **O**, justifying the obtained solutions using the studied SPARQL algebra. Treat blank nodes in **O** as if they were distinct and different IRIs.

```
@prefix : <http://foo.ex/> .
SELECT ?x ?y ?z
WHERE { { { ?x :start ?z } UNION { ?x :end ?y } } OPTIONAL { ?x :contains ?y } } .
```