University of Patras

Computer Engineering & Informatics Department

Knowledge Representation in WEB

2nd exercise

1. The following sentence in natural language is given:

The Iliad was composed by a poet who lived in the 8th century BC. in the Ionia of Asia Minor.

a. Write the sentence in RDF triplets without empty nodes, using at least 3 triplets.

b. Write the sentence in RDF triplets using at least one empty node, using at least 3 triplets. Validate your RDF with the validator http://www.w3.org/RDF/Validator/ by choosing to show both triples and graphs and list them in the report.

2. Write the following sentence in RDF using reification:

Google reports that the Computer & Informatics Department is located in Rio.

Validate your RDF with the validator and list the triplets and the graph in the report.

3. Write an RDFS ontology about Persons and Departments. Specifically create:

- 6 classes that will represent Person, Student, Professor, Department, Lesson, Classroom
- 2 subClassOf statements, so that Professor and Student are Person subclasses
- 9 Properties:

i. A **has_name** property restricting the domain to **Person** and the range to literal. [Name]
ii. A **has_phone** property restricting the domain to **Person** and the range to literal.
iii. A **has_email** property restricting the domain to **Person** and the range to literal.
iv. A **has_age** property restricting the domain to **Person** and the range to integer.
v. A **member_of** property restricting the domain to **Person** and the range to **Department**.
vi. A property teaches restricting the domain to **Professor** and the range to Lesson.
vii. A **les_name** property restricting the domain to **Lesson** and the range to literal [Course Name].
viii. A **taught_by** property restricting the domain to **Lesson** and the range to **Professor**.
ix. A **dep_name** property that represents the name of a department, restricting the domain to **Department** and the range to literal.
x. A **dep_city** property that represents the city of a department, restricting the domain to **Department** and the range to literal.
xi. A **room_name** property restricting the domain to **Classroom** and the range to literal [room name].
xii. A **room_capacity** property restricting the domain to **Classroom** and the range to integer [room capacity].

xiii. A **room_department** property restricting the domain to **Classroom** and the range to **Department** [department that owns the classroom]

• Create at least 6 **departments** of which 3 should be located [dep_city] in the city of Patras and the rest in other Cities.

• Create at least 10 **professors** and 15 **students** in total and set values for their properties. In their declarations you will mention the class they belong to [professor or student] however you do NOT have to mention that they belong to the Person class.

• Create 10 **lessons** [Lesson] in total by setting a value in the lec_name and taught_by properties. You must NOT declare that they belong to the Lesson class.

• Create at least 2 classrooms for each department.

4. Form the following SPARQL queries for the ontology you formed:

i. The first returns the phones of all professors.

ii. The second returns the phones of all students over the age of 23 (using FILTER)

iii. The third returns the names of all Individuals [must belong to the Persons class] who are members of a department located in Patras.

iv. Returns the names of the classrooms with a capacity of more than 150, located in departments in Patras. Test queries in the RDF file of Query 3 using a SPARQL query engine such as ARQ (also included in JenaAPI). For each question, list the results it returned and comment on whether it returned the data you expected. Does the SPARQL query engine you selected use any Inference Engine? If yes, indicate which of the results were due to the application of the Conclusion Mechanism.

5. Develop a program in Java using JenaAPI:

The program will load the rdf file you created in query 3 and:

A. It will locate the Departments defined in the RDF file and allow the user to select one of them. When the user selects a department, it will display tables with the staff, students, classrooms and courses of the department. For example, for the staff there will be a detailed table in the following format: Name | Age | Phone respectively for the students, the classrooms and the lessons of the department.

B. It will allow the user to add new data (Professors, Students, Departments, Courses and Classrooms) to the RDF file.

C. It will allow the user to give the URI of a Resource and will display all the triplets [Statements] that exist for it in the graph.

For each student or professor, the information that he / she is a person should also be displayed, although this will not be defined directly by you in the RDF file. The same for each lesson should also display the information that it is a lesson even though it will not be defined directly by you in the RDF file. To achieve this, apply an Inference model [InfModel].