Dr. Volker Riediger
M.Sc. Mahmood Al-Doori
M.Sc. Veronika Vasileva

ist

uk university of koblenz
Computer Science

— Engineering Web and Data-intensive Systems - Winter Term 2022/23 —
Assignment 5.

From: Jan 9th 2023 | To: Jan 23rd 2023

1 Mapping to Graph Database

Based on the domain model of the OLAT system provided with this assignment (olat-system.asta), you are asked to design and implement a *graph database*.

Tasks & Deliverables:

a) **Essay Question:**

What are the major properties of and the main differences between relational databases and graph databases? How do data queries work in both paradigms? Please state some (possibly fictitious) applications that benefit from one or the other technology. Provide a rationale why you think that the selected DB type fits better.

Submit as PDF. We expect around 500 words (1 page of text).

b) **Document your Graph structure:**

Provide a graph schema design for the Neo4j database, e.g. like the following UML class diagram.
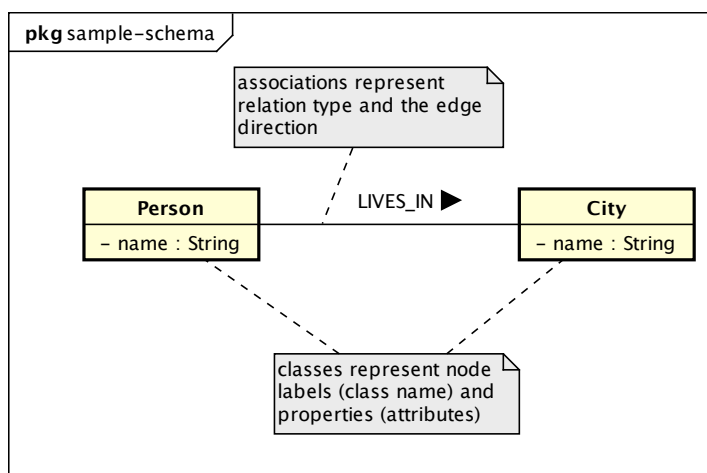
Use a class with attributes for each node type. Since Neo4j doesn't support generalization, you have to come up with a solution to that problem.

Use an association for each relation type. You have to pick a meaningful name, and you have to choose decide on the direction of the relation.

To save some time, you could simply start with the model file from the previous assignment.

We recommend using Astah as modeling tool.

Of course, it's also possible to extract the schema by the Neo4j function
`CALL db.schema.visualization()`
after you have created your graph. The resulting schema graph is only based on sampling the data. You may use this function to check whether your graph fits the intended schema.

c) **Explain Decisions:**

Make sure to include annotations/comments in the schema diagram that explain your design choices!

d) **Test Data:**

Please populate your graph database with example data such that you provide one (1) Course. Add data such that you get around 5 instances of all associations and classes. The deliverable here is a Cypher file containing CREATE statements.

e) **Write Cypher Queries:**

Try to provide two Cypher `MATCH...` queries to answer the following questions. If you think that there can be no solution (with a single query), state why!

- Given a Course (referenced by its ID), please provide a sorted list of its Groups with the number of members in each group.

- For each top-level DiscussionTopic, compute the set of Persons who contributed to the topic and its replies.

General Instructions:

- Please submit your solutions in the solutions/assignment05 group folder

- Make sure to include your group's name in the file names, e.g. as a prefix. For group *alpha*, you could use a name like `alpha-query1.cypher`.

- For the testing the Cypher queries, please install Neo4j Desktop `https://neo4j.com/product/`

  This tool comes with extensive tutorials to practice creating and querying graphs.

- Regarding the schema decisions, we encourage you to read about Graph Data Modeling at `https://neo4j.com/developer/data-modeling/`

- Please be prepared to discuss your solution in your next exercise slot!

- It's better to have all the members in the discussion, and it's possible for the members to do that in different exercise slots.