Databases

WWI-19-DSA/WWI-19-DSB

Database project - description

24. January 2021

This project is designed for the assessment of basic skills to design and implement relational databases. The project can be an individual or a group work while one single group could have at most three members. Each project should address it's own independent problem. PostgreSQL has to be used as an RDBMS.

1 Requirements specification

Select an arbitrary problem and write a specification of requirements for your database application. The specification should be written in a form similar to the form used to describe UNIVERSITY database in the lecture exercise No. 2.

2 ER Diagram

Create an Entity-Relationship diagram for the database whose specification is described in task No. 1. ER-diagram should be created using Chen notation which was used in lectures. This ER-diagram has to be submitted as part of the final project documentation.

1. ER diagram should contain at least 7 entities.
2. Many-to-many, one-to-many and one-to-one relationship have to be included in the diagram.
3. The diagram has to include at least one weak entity set.
4. For the design can be used a database design tool such as MySQL Workbench. However it's not necessary.

3 Transforming ER-diagram into Relational Model

Convert the ER diagram into a relation schema represented in SQL. You have to include tables (relations), keys (primary keys and unique constraints), referential integrity constraints (foreign keys) as well as all additional constraints necessary to implement the database.

1. Make an analyses to check whether database relations satisfy at least 3NF. Documentation of the project should contain this normalization section.
2. Declare relations using SQL DDL statements. Final documentation of the project has to contain a database dump file of your database with DDL statements and insert statements to populate the database with test data necessary for the project evaluation.
3. The database should have at least one view.
4. The database should implement at least one transaction.
5. The database should define at least one stored procedure. This procedure should be executed by a trigger when an event occurs.

6. Documentation of the project should include at least 7 SQL queries defined over the database. These queries cannot be just simple SQL queries. These SQL queries should contain advanced constructs for retrieving data such as joins, renaming, nested queries, set operations and aggregate functions. Queries should additionally contain explanation of a kind of data they retrieve (explained in plain English).

7. Based on the business functions and defined queries, choose attributes that should have secondary indexes defined on them in order to increase efficiency of certain defined queries.

4 Application

Database application should have a graphical user interface to execute corresponding business functions. To this end, the application uses CRUD (create, read, update, delete) operations, views and queries over database tables, and other database elements defined in task No 3. The application should be developed as a web application.

1. Backend of the database application should be implemented using the Python programming language.

2. The application could be developed using a Python framework for web programming such as Flask, SQLAlchemy can be use as Object-Relational Mapping tool. Using other Python frameworks, similar to those already mentioned, is allowed.

3. Given that the backend is implemented in Python, students can use given Python frameworks to implement the frontend. However, students could also use another technologies to implement frontend of the application.

5 Submission

Groups should submit the project in the following form:

1. Groups should first submit preliminary specification of the project requirements with the names of group participants.

2. Final documentation of the complete project containing specification, ER diagram and explanation of all other necessary project elements has to be submitted as a pdf file to the Moodle assignment for the project which will be open during the next semester.

3. Source code of the project and scripts that create and populate the database.

4. Each group is expected to record a video of 5 - 10 minutes in which it presents it's project. Videos should explain how application functionalities work using frontend of the application.

5. The application and database should be wrapped up in Docker containers.

- Deadline for the submission of the preliminary specification with names of group participants is 10.February.2021 (11:59 pm).

- Deadline for the submission of the complete project is June 01,2021 (11:59 pm).

- Before submitting the project make sure that it satisfies necessary requirements and that all necessary files are included. A good way to check whether project works could be to install and running it on a machine different from the one on which it was developed.