Web Systems Fundamentals and Databases (Grundläggande webbsystem och databaser)
DI4020
11hp

Lab Exercise 1

Course responsible:
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Lab Exercise 1 - Database Design – Conceptual Design

Database Design

Database design is a crucial aspect of building efficient and effective database systems. The database design process is a systematic approach to define and organize the structure of a database to meet specific requirements and objectives. At the heart of the database design process lies conceptual database design, which lays the foundation for the entire database structure.

Conceptual Design using the ER Model

Conceptual database design focuses on understanding the information needs of an organization or system and translating them into a high-level abstract representation. This stage of database design is primarily concerned with identifying the entities, relationships, and attributes that will form the basis of the database schema. By capturing the essential elements and their interconnections, conceptual database design provides a conceptual blueprint for the database system.

In Lab Exercise 1, students will create a conceptual model using entity-relationship modeling for a given scenario.

Objective

Create a conceptual model that organizes the concepts and their relationships that represents data as end users see it in the real world. The model focuses on WHAT instead of HOW and is DBMS independent.

Deliverable

A .pdf document including a picture with the ER-diagram. Please name the file as A1_GrX.pdf, where X is your group number.
The ER-diagram (ERD) in the picture is expected to contain:

1. Entities, their attributes, and relationships,
2. Keys,
3. Multiplicity (cardinality and participation)

NOTE:

- **Results will be submitted individually via Blackboard.**
- **All students in the group are equally responsible for the submitted results.**
- **The group is responsible for making sure that the submitted results do not include cheating and plagiarism issues.**

Deadline

- Tuesday February 4th by 13h.

Preparation

This Assignment is aligned with the content presented and discussed in Lectures 3 and 4. Thus, please consider the material included in Week 5:
Also, consider the following examples:

- Starting at slide 24 in 2015 - Connolly & Begg - Database Systems - Ch16 - Conceptual Databases Design.pdf
- https://www.datanamic.com/support/lt-dez005-introduction-db-modeling.html
- https://opentextbc.ca/dbdesign01/back-matter/appendix-b-erd-exercises
- https://opentextbc.ca/dbdesign01/back-matter/appendix-a-university-registration-data-model-example

Simplified Design Process

1. Identify the main entities—usually, nouns like Property, Owner, Tenant, Room, etc.
2. Document all attributes for each entity, considering normalization.
3. Create the initial ERD and review it with users or per the provided specification.
    a. **Create entity instances as an approach to check your model for correctness.**
4. Make necessary changes following the ERD review.
5. Verify the ER model with users or the provided specification to finalize the design.

To create the ER diagram:

- Start with pen-and-paper, so you can focus on the model and not on learning how to use an ER design tools, such as:
    - https://erdplus.com/standalone
    - https://databasediagram.com
    - https://www.lucidchart.com/pages/examples/er-diagram-tool
    - https://online.visual-paradigm.com/diagrams/features/erd-tool
- Select an ER notation that facilitates understanding (see “ER Summary and Notations.pdf” in Week 5 module).

Scenario[1]

A housing agency currently rents out various types of domestic accommodations, including apartments and houses, to clients. The clients, such as students or groups of students, may require one-year leases or, in the case of families, longer-term rentals.

Details are maintained for each property, including:

- Address (street, city, postal code, country)
- Owner details (document number, name, address, telephone)
- Lead tenant details (document number, name, telephone)
- Tenancy start date
- Tenancy end date
- Rent amount
- Type of property (e.g., apartment, detached house, terrace house)
- Furnished/Unfurnished status (for furnished properties, additional details about furnishings are kept, such as beds and sofas)
- Number of bedrooms
- Number of bathrooms
- Optionally, additional information about the property is:
    - A textual description
    - Photographs
- Any special features (e.g., garage, pool, patio windows)

To facilitate property searches, it has been decided to store details of individual rooms within a property. This includes:

- Room type (e.g., bedroom, bathroom, kitchen)
- Room dimensions (width and length in meters)
- Heating method (e.g., radiator, fireplace)
- Appliances (e.g., microwave, refrigerator, freezer, cutlery)
- Furniture (e.g., bed, dresser, sofa, TV)

A history of occupancy, including periods when the property is unoccupied, needs to be maintained.

The tourist business has started to increase in the area, and the agency plans to expand into holiday lettings. This will involve shorter rental periods and a greater need for up-to-date availability information.

Congratulations, you have now completed Lab Exercise 1.

[1] Based on the GroupWork Research Activity in the book "Concise Guide to Databases" by Peter Lake & Paul Crowther.