B0B36DBS, BD6B36DBS: **Database Systems**

http://www.ksi.mff.cuni.cz/~svoboda/courses/182-B0B36DBS/

Practical Classes 1 and 2

Conceptual Modeling: ER, UML

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ER

Entity-Relationship Model

Exercise 1

Create a diagram of an **ER conceptual schema** for a simple **student information system**…

- Each **person** has a name, personal id number, postal address, and e-mail address
- Values of personal ids are unique among persons

Exercise 2

Extend the previous ER schema…

- Each person may also have several **login** names
- Hashed password value is stored together with each individual login name

Exercise 3

Modify the previous ER schema…

- Split the unstructured postal address attribute of a person into separate components of a street, city, and postal code
- Each person must have at least one e-mail address

Exercise 4

Extend the previous ER schema…

- Two types of persons are now distinguished
  - **Student** has at least one phone number
  - **Teacher** can have a website and is also identifiable using an employee number

Exercise 5

Extend the previous ER schema…

- **Course** is identified by its code, it has a unique name, and also a number of credits
- Each course is guaranteed by exactly one teacher

Exercise 6

Extend the previous ER schema…

- A pair of courses may have a mutual dependency
- Two types of such dependencies are distinguished
  - Corequisity
  - Prerequisity

Exercise 7

Extend the previous ER schema…

- Students work on **theses** which are lead by teachers
- Each thesis has its type (bachelor, master, doctoral), unique title, and year of assignment
- Use an entity type for thesis and two separate relationship types
- Determine all the relationship cardinalities correctly

Exercise 8

Modify the previous ER schema…

- Can the relationship types of thesis assignment / supervision be modeled using one ternary relationship type (instead of two standalone binary)?
- What will be the consequences?

Exercise 9

Extend the previous ER schema…

- Each thesis may also be associated with several teachers acting as consultants

Exercise 10

Extend the previous ER schema…

- **Departments** consist of research **groups**
- Each department has its name and code, both allowing to be used as independent identifiers
- Research group can only be identified locally using its abbreviated name within a particular department

Exercise 11

Extend the previous ER schema…

- Model a timetable using a relationship type
- I.e. describe timetable **events** of teaching courses by teachers, always on a given **day** of a week, at a given **time**, and in a given **room**
- Limit yourself just to one active semester only

Exercise 12

Extend and modify the previous ER schema…

- Timetable events must support different **semesters**
- Students can enroll in courses (even repeatedly)
- For each such enrollment, final achieved grade (if any) needs to be recorded

Exercise 13

Modify the previous ER schema…

- Model timetable events using an entity type

Modeling Tools

Creately Online

- https://creately.com/
- Free registration
- Diagrams shared with the community
- New document: *Entity Relationship Diagrams*

UML

Unified Modeling Language

Exercise 14

Create a **UML** schema diagram for the entire **student information system** as described so far

- I.e. model all the following classes and associations
  - Person, student, teacher, login, course, thesis, timetable event, time slot, room, semester, department, group

Modeling Tools

Visual Paradigm Community Edition

- https://www.visual-paradigm.com/download/community.jsp
- Free for non-commercial use
- New diagram: *Class Diagram*

Enterprise Architect

- http://www.sparxsystems.com/
- 30-day free trial