

Data Modeling and Normalization

Exercise taken from TOD122 exam spring 2010

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The data

- ▶ Åse Åsen (Student ID: XY97235), female, born in 1990, Norwegian, National ID (Fødselsnummer): 230790 35432, Room: E815, Room phone: 35 98 23 75
- ▶ Ola Lien (Student ID: XZ45535), male, born in 1987, Finnish, National ID: 150287 03225, Room: A153, Room phone: 35 98 12 35
- ▶ Jacob R. Smith (Student ID: TT98762), male, born in 1992, National ID: 211292 02212, Room: A122, Room phone: 35 98 12 29
- ▶ Patterson, Jane K (Student ID: XQ82319), female, born in 1979, National ID: 191179 01231, Room: C632, Room phone: 35 98 21 11
- ▶ Brown, Richard E (Student ID: TZ18201), male, born in 1987, British, National ID: 300787 18979, Room: B332, Room phone: 35 98 19 19

The queries

The following queries will be carried out on the data:

- 1 Find out the average ages of all female tenants from the same country. Namely, find out the average ages of female tenants grouped by nationalities.
- 2 Search for the full names and room phone numbers of all tenants whose surnames are “Lien”, ordered by first names lexicographically.

Data sample

Åse Åsen (Student ID: XY97235), female, born in 1990, Norwegian, National ID (Fødselsnummer): 230790 35432, Room: E815, Room phone: 35 98 23 75

The exercise

- ▶ See the exam for the complete exercise.
- ▶ We will here only focus on the design of the database.
- ▶ Will make a 3NF logical database model suited for the given queries.

First attempt (solution of most candidates)

<u>national_id</u>	first_name	last_name	gender	nationality
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Table: Entity **Person**

<u>student_id</u>	national_id (FK)	room_number (FK)
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Table: Entity **Student**

<u>room_number</u>	phone_number
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Table: Entity **Room**

► The queries:

- 1 Required attributes: *national_id*, *nationality* and *gender*.
- 2 Required attributes: *first_name*, *last_name* and *phone_number*.

- ▶ The attributes of entity **Student** could have been put into **Person**.
- ▶ Is the model good?
- ▶ It is 3NF, but:
 - It is not good for the queries!
- ▶ The problem:
 - The model give unnecessary joins (more on this later).
 - Query 2 requires a join between all the entities.
 - Performance may suffer!

A solution?

Question

Can we make a 3NF model where all attributes required by a query belong to the same entity?

A working solution

<u>national_id</u>	student_id (CK)	first_name	last_name	gender	nationality	phone_number (FK)
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Table: Entity **Student**

<u>phone_number</u>	room_number
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Table: Entity **Room**

The queries:

- 1 Required attributes: *national_id*, *nationality* and *gender*.
- 2 Required attributes: *first_name*, *last_name* and *phone_number*.