5DV119   Introduction to Database Management   Spring 2015
## Obligatory Exercise 5
Submission deadline to avoid lateness penalty: March 02, 2015 at 0800 (8am)

1   Problem Statement

Shown below is an ER-diagram for a banking database. Using the techniques developed in the text-book and lectures, map this diagram into an equivalent relational schema. Show all keys, primary and foreign, and link foreign keys to their primary partners.
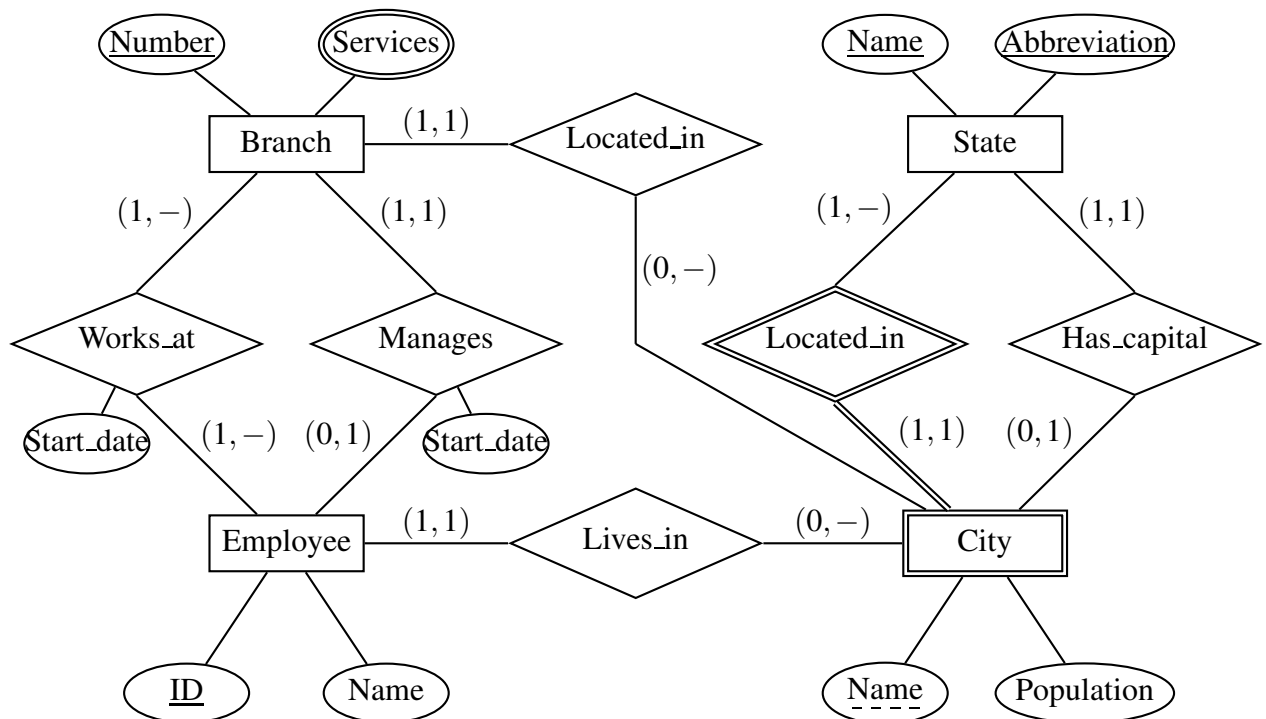
Important: If a primary and/or foreign key consists of more than one attribute, make sure that your notation identifies and links these composite keys as groups.

- The (x, y) notation gives the minimum and maximum number of times that a given instance of the entity may participate in the relationship. Thus, $(1, 1)$ means exactly one, and $(0, -)$ means any number.

- An employee may work at several branches in this model. This is not a mistake.

- A state is an administrative unit (delstat in Swedish) roughly corresponding to län in Sweden.

- Assume that the capital of a state is located in that state.

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The following are some clarifications which may be useful in understanding the algorithms presented in the textbook.

- Step 2 (p. 272 of the course textbook) Replace "with owner entity type E" with "with owner entity type(s) $\{E_1, E_2, \ldots, E_n\}$". [The point here is that there may be multiple owner entity types, and the algorithm must take all of them into account.]

- Steps 3, 5, and 7 (pp. 273-276 of the course textbook) Replace "for each binary" with "for each regular (strong) binary". [Weak entity types are handled separately, in Step 2.]

2 Submission Rules

1. All solutions must be typeset. Handwritten solutions will not be accepted. Either a markup language such as LaTeX or a word processor such as LibreOffice may be used. Solutions in plaintext ASCII will not be accepted. The relational diagrams should be drawn using arrows for foreign keys, as in Figure 3.7 of the course text.

2. The solution **must** be obtained by using the ER-to-relational algorithm described in the textbook and course slides.

3. Descriptions of the steps taken to reach the final solution must be included in the submission. Each step must be accompanied by a diagram which shows the relational schema, including both primary and foreign keys, which has been obtained up to that point.

4. Solutions which deviate from these guidelines risk losing points or not being corrected at all.

5. All submissions must be in the form of a single PDF file.

6. A printout of the PDF submission must be placed in the submission mailbox for the course on the fourth floor of MIT-huset.

7. The PDF file must also be uploaded using the submission system found at the following URL:
   `https://www8.cs.umu.se/kurser/5DV119/VT15/handin/`

8. The PDF file must include a cover sheet which lists the names and `cs.umu.se` user IDs of all partners.

9. This exercise may be done either individually or in a group consisting of no more than four (4) individuals.

3 Further Notes

- Remember that there are point penalties for late submission. See the course syllabus.

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- It is not allowed to copy the work of others. The submission must be the original work of the individual(s) in the working group.

- The grader reserves the right to interview members of the working group about the solution.

- So that solutions may be discussed in a class meeting, students and/or groups that are very late in preparing a solution may be required to solve an alternate problem to receive credit for this exercise.