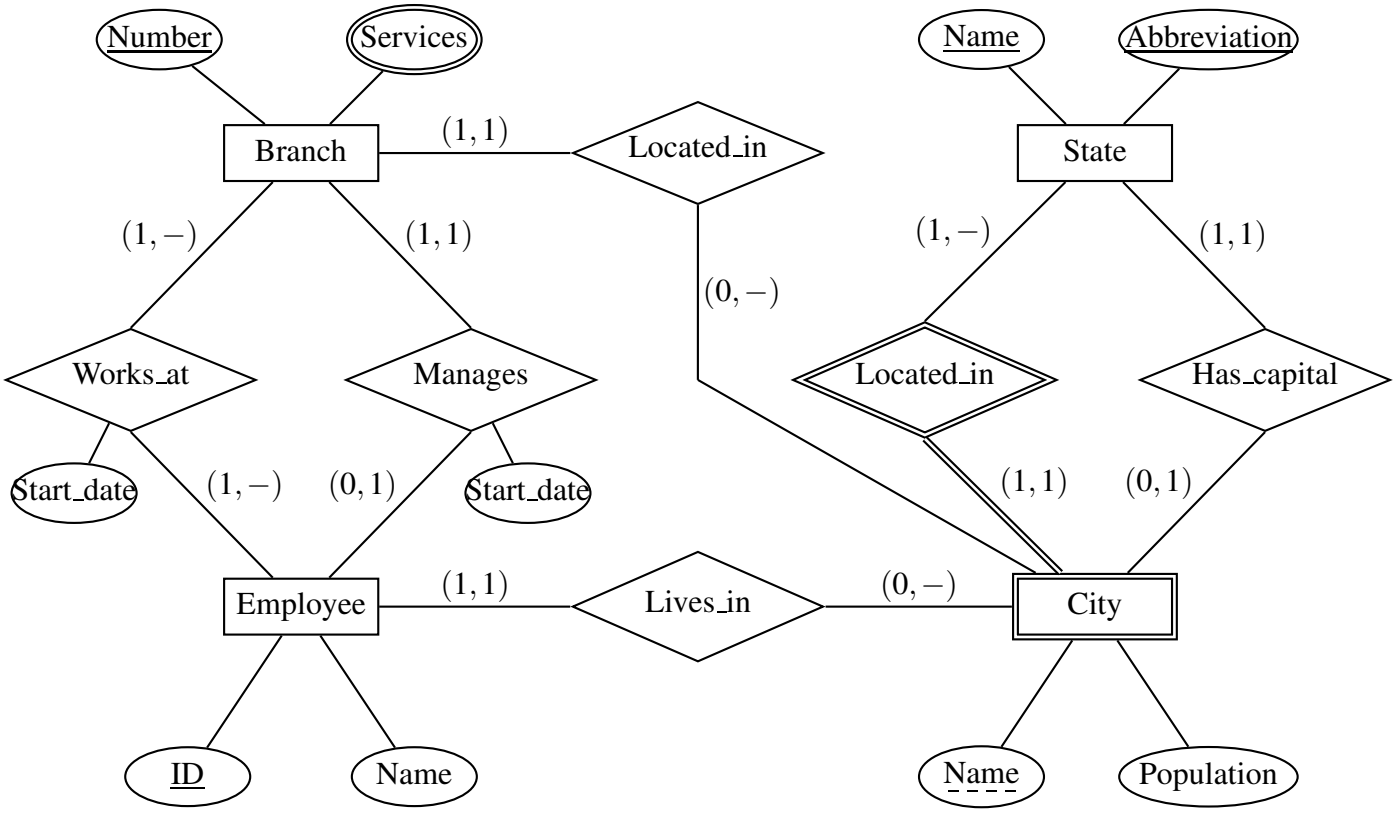
5DV021 Principles of Database Systems Fall 2009
Obligatory Exercise 1
Due date: September 11, 2009 at 8am (0800)

Shown below is an ER-diagram for a banking database. Using the techniques developed in the textbook 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.

Notes:

- 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.

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

- Step 2 (p. 220 of the fifth edition; p. 194 of the fourth edition) 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. 221-223 of the fifth edition; pp. 194-197 of the fourth edition) Replace "for each binary" with "for each regular (strong) binary". [Weak entity types are handled separately, in Step 2.]

Further Notes:

1. As stipulated in the course syllabus, this exercise may be done either individually, in a group of two, or in a group of three. Remember that there are point penalties for late submission. See the course syllabus.
2. It is strongly recommended that you use a graphical tool to display your results. If you draw them by hand, they must be very neat. 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.
3. 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.
4. If you have solved this problem for a previous offering of the course, you may re-use your old solution, subject to the following conditions: (a) You may not work with any partners, except possibly those with whom you worked to prepare the solution in the previous course. (b) You must explicitly note any partners from the previous course with whom you submitted a joint solution for that course. Note that grading criteria may not be identical between years, so that a solution which was found to be satisfactory last year may not be evaluated similarly this year.
5. Once a solution to this exercise is submitted, a carryover of Exercise 1 from last year is not permitted, either for points or for a satisfactory rating.