

Database System Concepts for Non-Computer Scientist - WiSe 24/25

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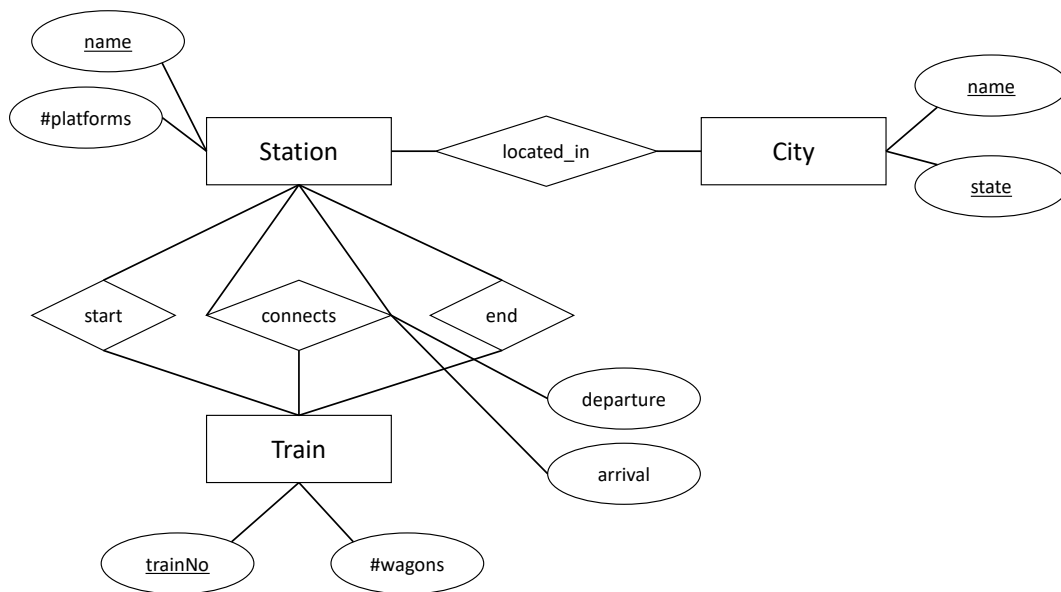
<http://db.in.tum.de/teaching/ws2425/DBSandere/?lang=en>

Sheet 02

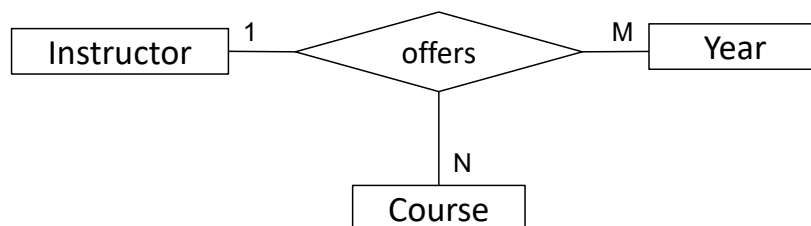
Exercise 1

Consider the entity relationship model of a train connection system (below). Note: The **connects** relationship models a direct connection between two stations. For example, the train starting (**start**) in Munich and ending (**end**) in Hamburg passes through several stations. Each of these route-sections (e.g., Munich → Nürnberg or Nürnberg → Würzburg) has an entry in the **connects** relation. Further, the train entity models a train line: The train line going from Munich to Hamburg, becomes a different train line (different *trainNo*) when returning.

Task: Add functionalities to the shown ER diagram.



Exercise 2



For now, ignore the functionalities in the diagram and answer the following questions:

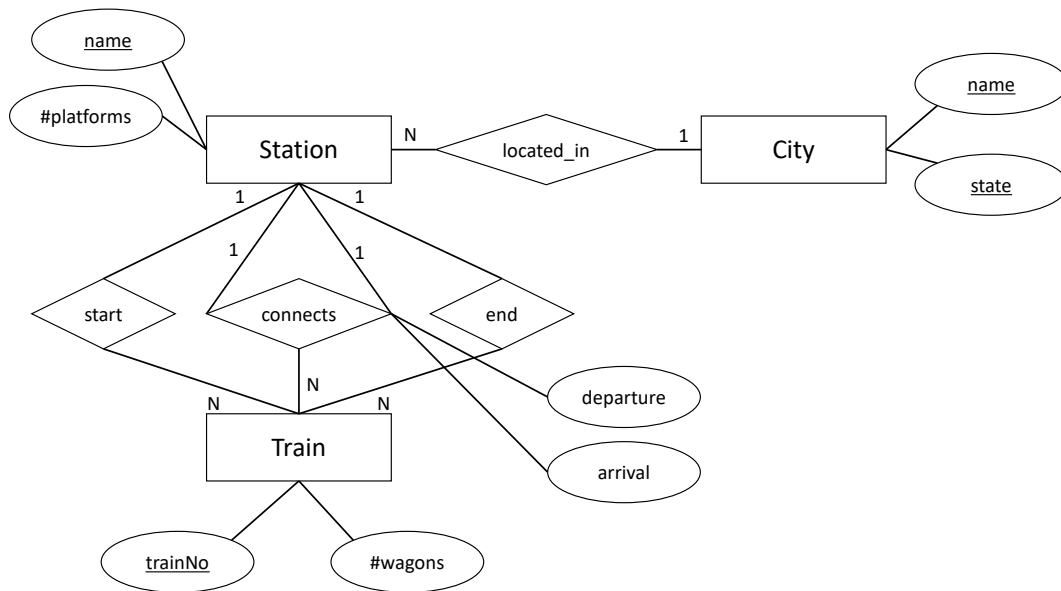
- How many partial functions ($A \times B \rightarrow C$) are possible in a ternary relationship (ignore permutation on the left side of the partial function when counting).
- List **all** possible partial functions of the „offers“ relationship.
- For each partial function, try to describe in natural language which constraints it would enforce (not all of them make sense in the real world).

Now, considering the functionalities:

- Which partial function actually hold?
- What does the absence of the other partial functions allow for? (no need to create an exhaustive list).

Exercise 3

Consider the entity relationship diagram from exercise sheet 2:



Create a relational schema out of the ER-Diagram. Underline keys and find appropriate data types.

Exercise 4

Consider the following description of a hospital and create an entity relationship diagram. Use generalization when appropriate.

- Hospitals consist of departments. Each hospital has an address (which can be used to identify it) and a number of beds. Departments have a name, which is unique only within a hospital.
- Departments in turn consist of rooms which are numbered. Such a number is unique within a department.
- Every hospital has employees who receive a salary. Each member of the staff can be employed in various hospitals.

- Employees are identified by a personnel number and can be divided into doctors and nurses. A doctor can supervise several nurses, but a nurse is supervised by only one doctor. A nurse can not be a doctor and vice versa.
- A department can be run by several doctors. A doctor can also run several departments. It is also known whether a doctor has a room and if she does, the room number is known. No doctor has to share her office with another doctor.
- Shifts are used to organize work. A shift can be uniquely identified by date and time period. Employees can work in shifts at a department. An employee can only work in one department in a given shift.