TU München, Fakultät für Informatik
Lehrstuhl III: Datenbanksysteme
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Database System Concepts for Non-Computer Scientist – **WiSe 20/21**

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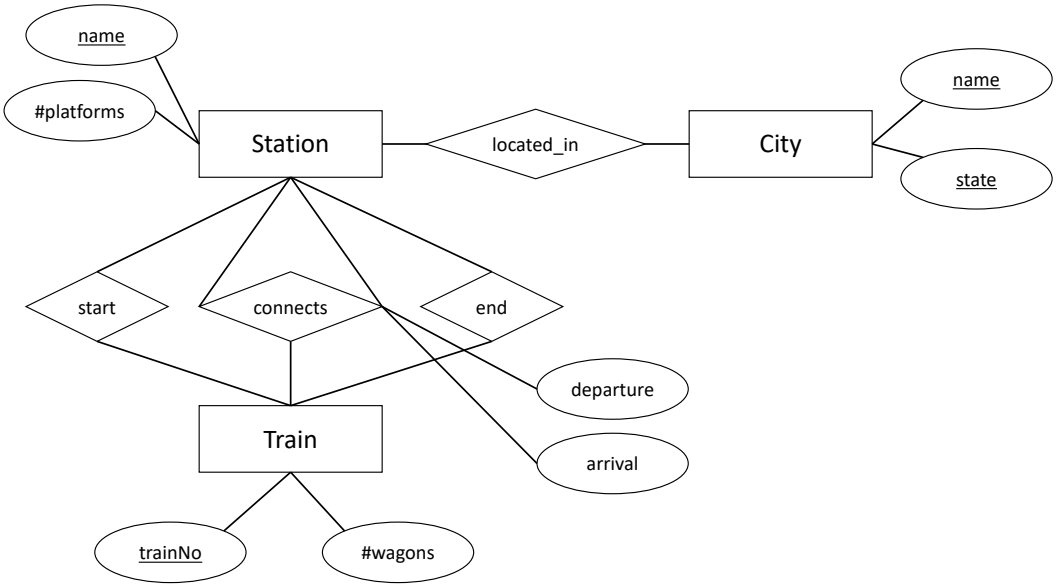
Sheet 02

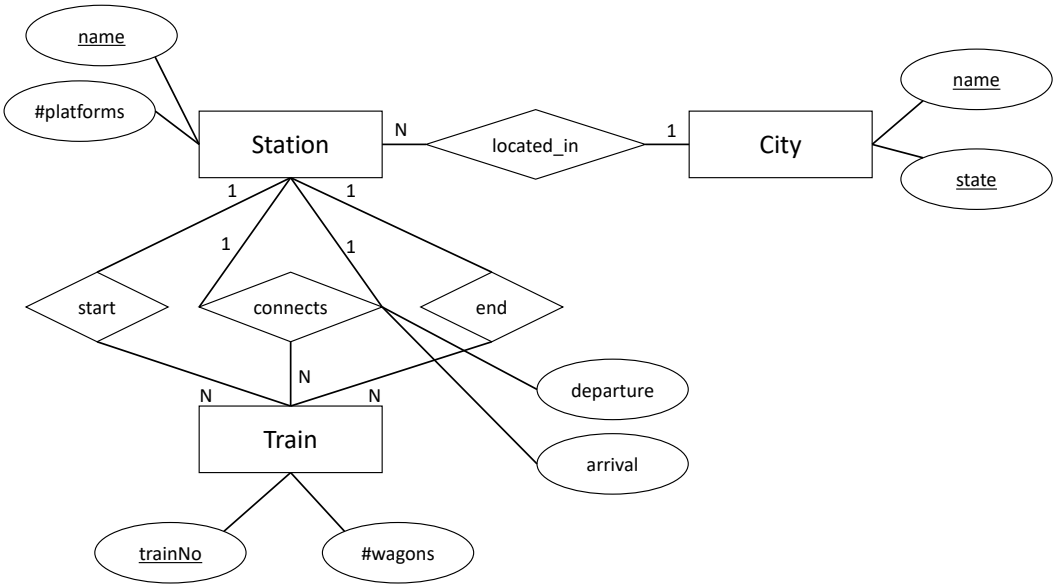
Exercise 1

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.

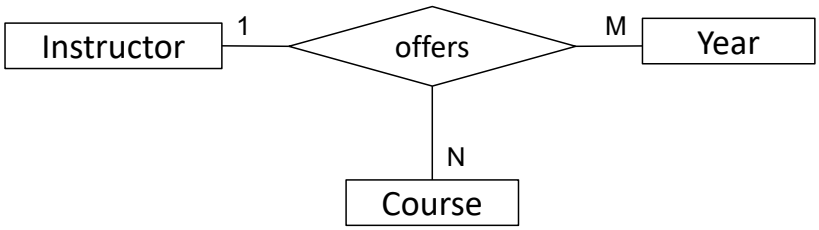
Task: Add functionalities to the shown ER diagram.



Solution:



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).

Solution:

There are three **possible** partial functions:

$$Instructor \times Year \rightarrow Course \quad (1)$$

$$Instructor \times Course \rightarrow Year \quad (2)$$

$$Course \times Year \rightarrow Instructor \quad (3)$$

- (1) would imply that a given instructor may only offer one (or zero) course(s) per year. I.e., an instructor can not do two courses in one year.
- (2) would imply that a given instructor may offer a course only in one year (or not at all). I.e., an instructor can not offer a course twice.
- (3) would imply that a given course is only offered by one (or no) instructor in a certain year. I.e., a course can not be offered twice in one year.

Now, considering the functionalities:

- The functionalities shown in the figure only enforce 3.
- Not having the other two partial functions allows an instructor to offer multiple courses per year and also reuse a course multiple times (in different years).