TU München, Fakultät für Informatik
Lehrstuhl III: Datenbanksysteme
Prof. Alfons Kemper, Ph.D.

Exercise for *Database System Concepts for Non-Computer Scientist* im WiSe 19/20

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http://db.in.tum.de/teaching/ws1920/DBSandere/?lang=en

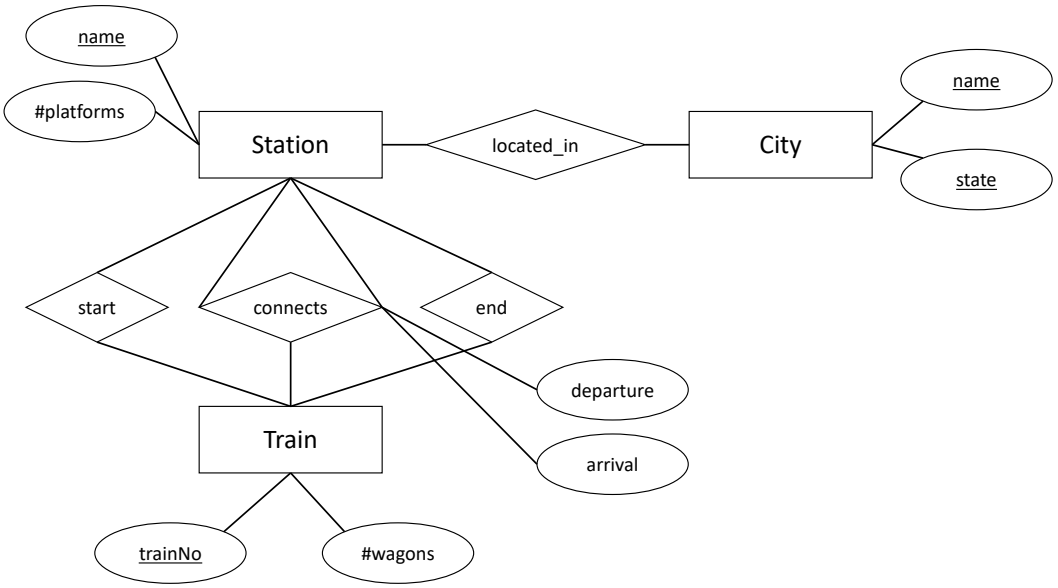
Sheet 04

Exercise 1

Consider the entity relationship model of a train connection system (below). Note: `connects` models a the direct connection between two stations. For example, the train starting in Munich and ending 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.

a) Add functionalities to the ER diagram.

b) Transform the ER diagram into a relational schema.



Solution:

a) Adding functionalities

Figure 1 shows the entity relationship model with functionalities.

b) Create a relational schema

The un-refined translation yields the following relations for the entities in the model:

$$\text{City} : \{[\underline{\text{name} : \text{string}, \text{state} : \text{string}}]\} \quad (1)$$

$$\text{Station} : \{[\underline{\text{name} : \text{string}}, \#\text{platforms} : \text{integer}]\} \quad (2)$$

$$\text{Train} : \{[\underline{\text{trainNo} : \text{integer}}, \#\text{wagons} : \text{integer}]\} \quad (3)$$

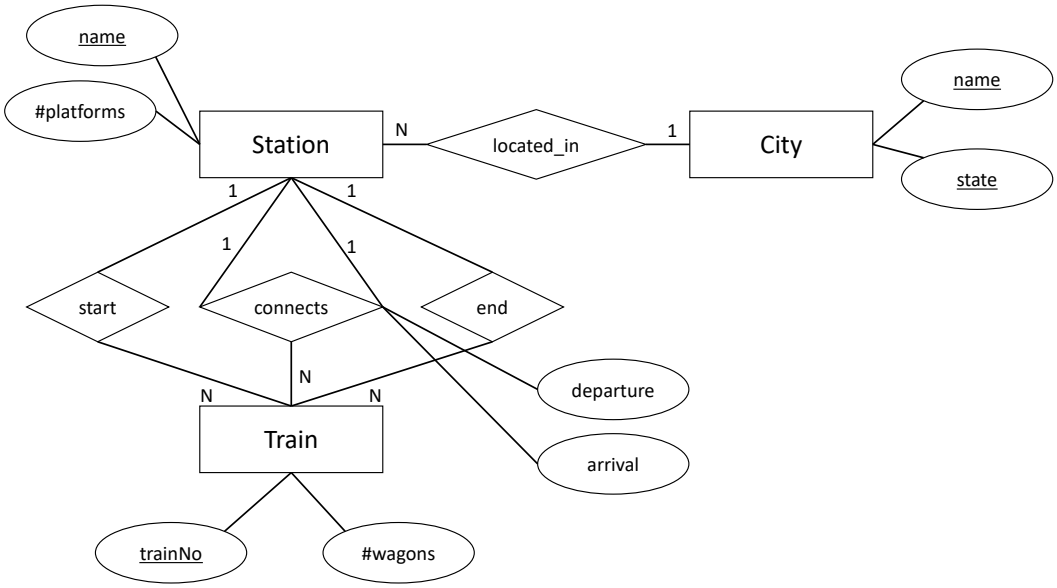


Figure 1: ER-Model for train connection with functionalities.

For the relationships in the model, we create the following relations:

$$\text{located\_in} : \{[\underline{\text{stationName} : \text{string}}, \text{cityName} : \text{string}, \text{cityState} : \text{string}]\} \tag{4}$$

$$\text{start} : \{[\underline{\text{trainNo} : \text{integer}}, \text{stationName} : \text{string}]\} \tag{5}$$

$$\text{end} : \{[\underline{\text{trainNo} : \text{integer}}, \text{stationName} : \text{string}]\} \tag{6}$$

$$\text{connects} : \{[\underline{\text{fromStationName} : \text{string}}, \text{toStationName} : \text{string}, \underline{\text{trainNo} : \text{integer}}, \text{departure} : \text{date}, \text{arrival} : \text{date}]\} \tag{7}$$