Database Technology

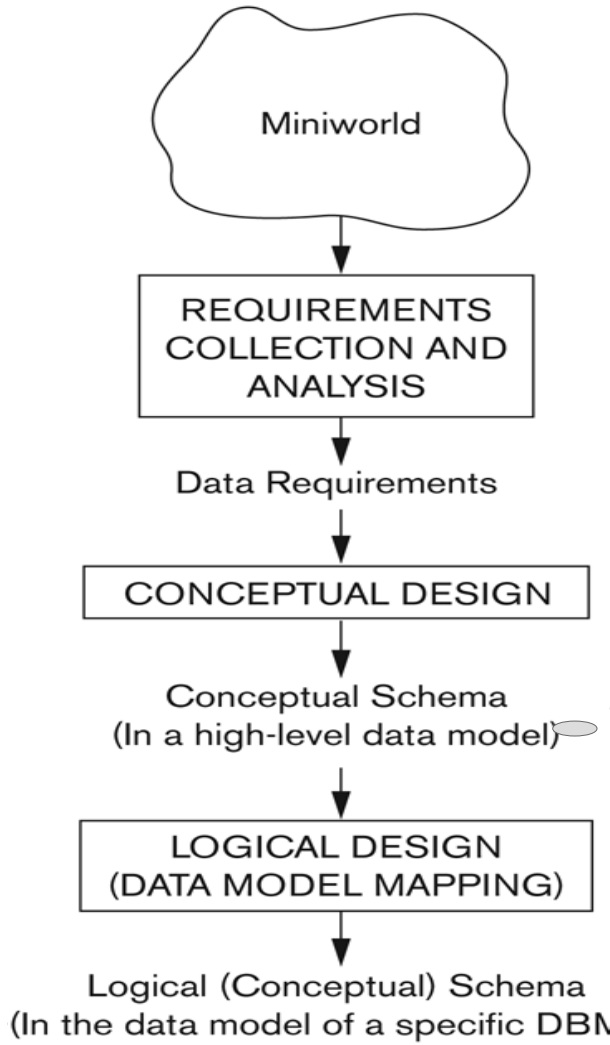
Topic 4: Enhanced Entity-Relationship (EER) Model

Topic 5: Mapping of EER Diagrams to Relational DBs

Olaf Hartig
olaf.hartig@liu.se

LINKÖPING UNIVERSITY

Recall: DB Design Process



ER model or EER model

relational data model

(E)ER Modeling

ER Concepts

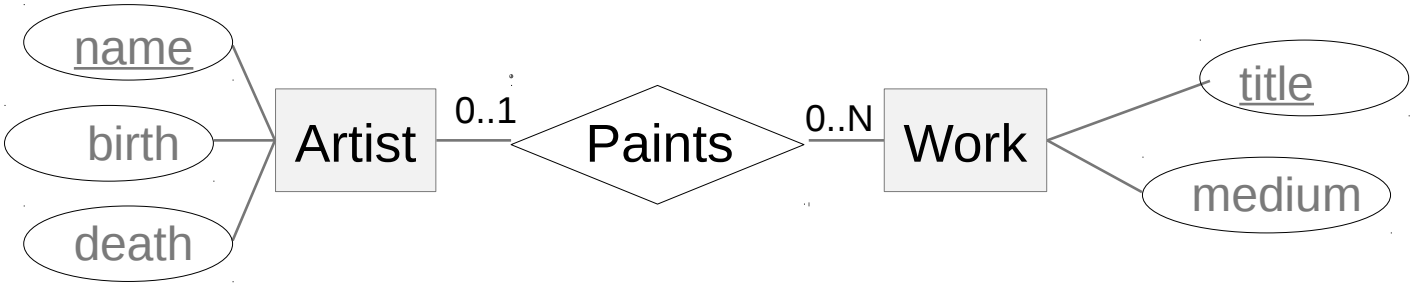
Quiz

Assume that Alicia is an artist. Based on the given ER diagram, which of the following statements is *wrong*?

A. Alicia may have painted five different works using the same medium.

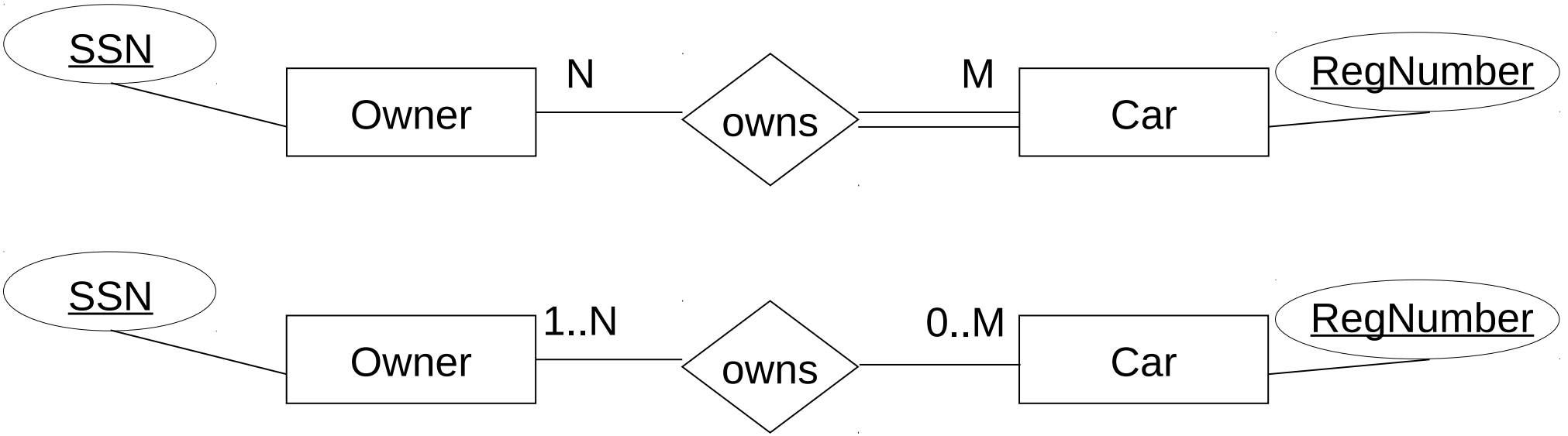
B. Alicia may have painted three works, each of them together with another artists.

C. Alicia may not have painted any work at all.



Total Participation Constraint

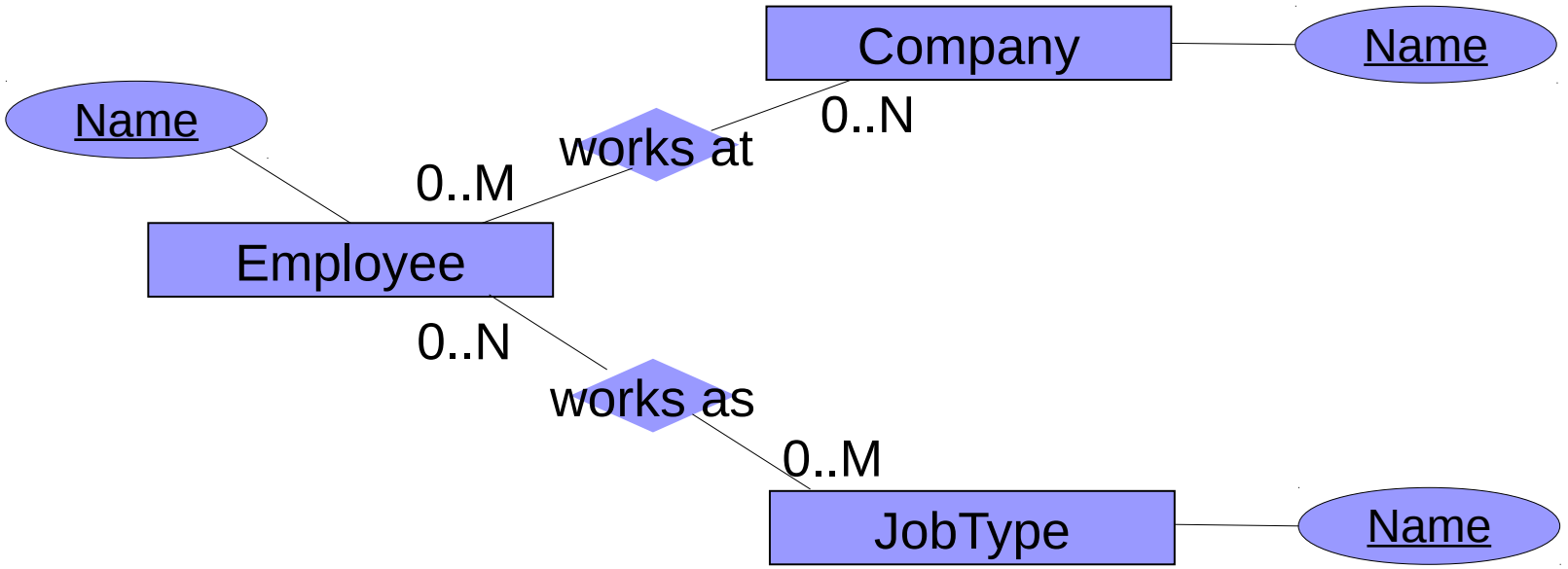
- **Total participation**: Every entity participates in *at least* one relationship with another entity
- Alternative notations:
  - either double line (as in my earlier lecture slides)
  - or lower-bound cardinality (as in the video lecture)
- Example: ”Every car must be owned *by at least* one owner.”



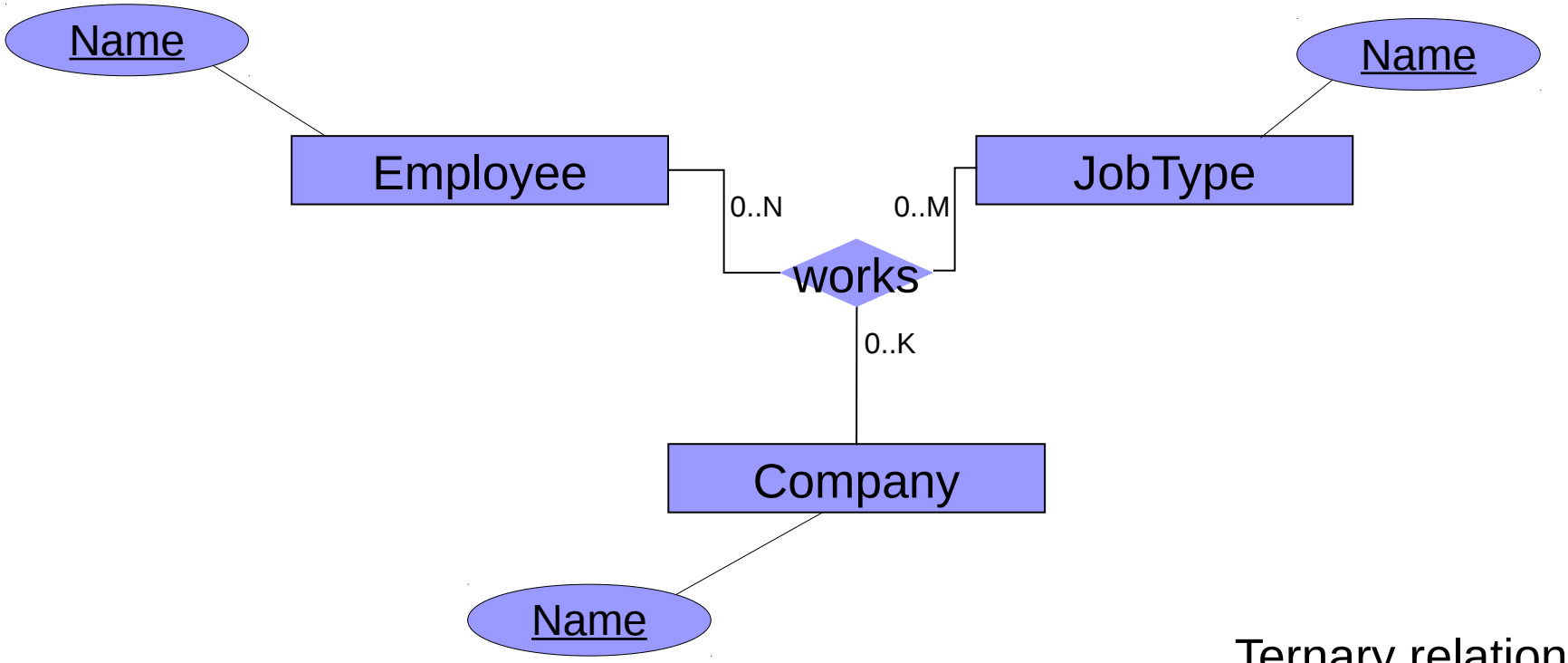
Quiz

- Suppose that Alicia works as an engineer at Ericsson and as a gym instructor at Campushallen.
- Would we be able to capture all of this information in a database designed based on the following ER diagram?

(1) yes (2) no



n-ary Relationships



Ternary relationship

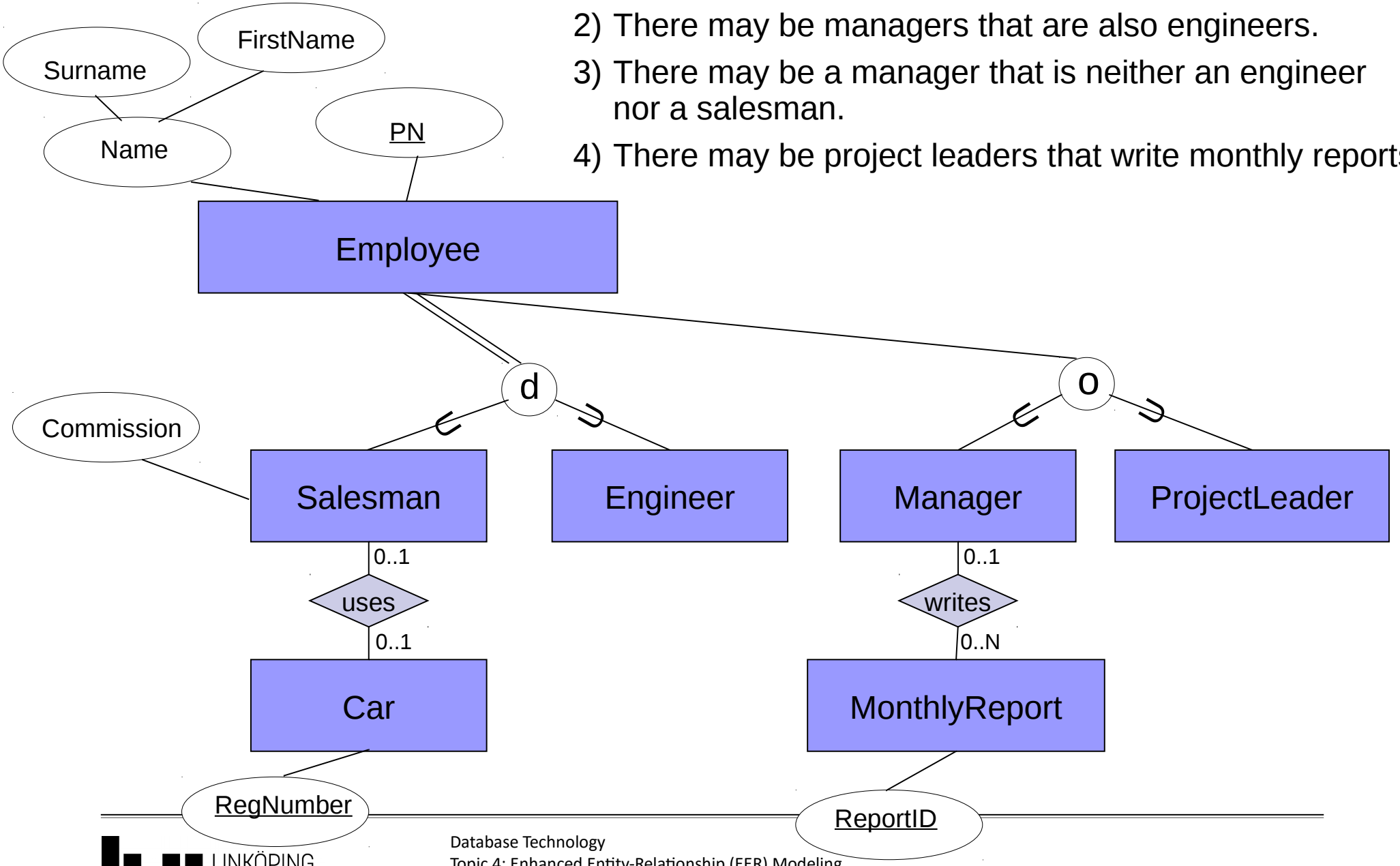
(E)ER Modeling

EER Concepts

Quiz

Which of the following statements is *not* correct?

1) Every engineer has a personal number (PN).
2) There may be managers that are also engineers.
3) There may be a manager that is neither an engineer nor a salesman.
4) There may be project leaders that write monthly reports.



(E)ER Modeling

Example

Example

A taxi company needs to model their activities.

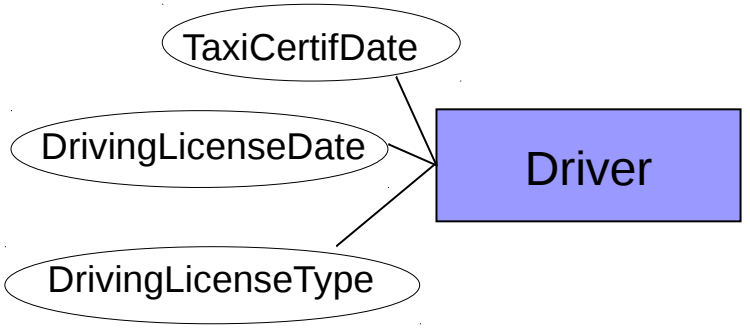
There are two types of employees in the company: drivers and operators. For drivers it is interesting to know the date of issue and type of the driving license, and the date of issue of the taxi driver's certificate. For all employees it is interesting to know their personal number, address and the available phone numbers.

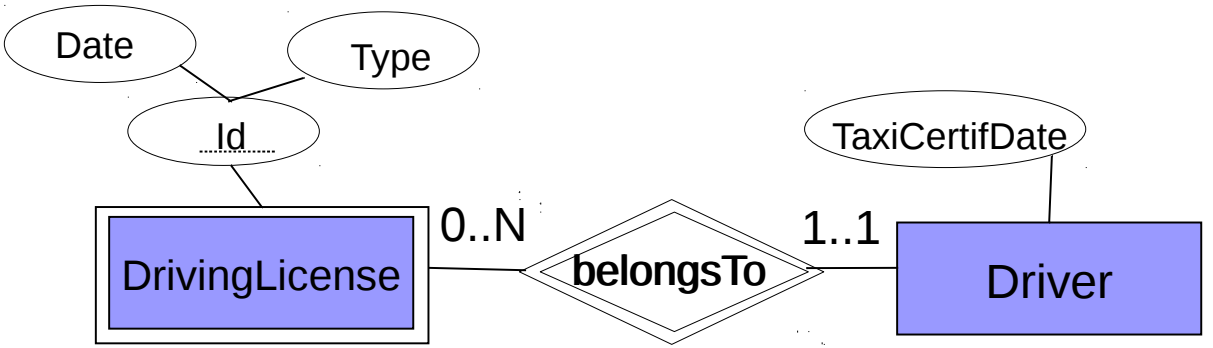
The company owns a number of cars. For each car there is a need to know its type, year of manufacturing, number of places in the car and date of the last service.

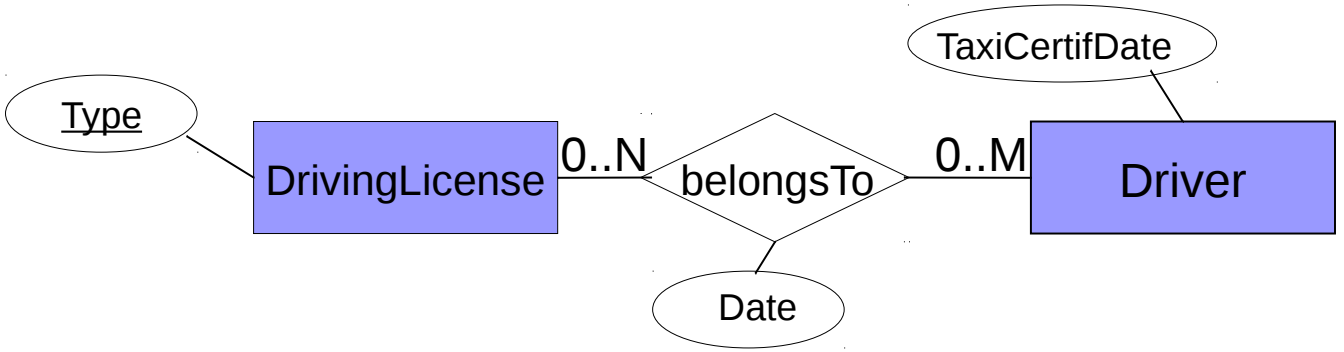
The company wants to have a record of car trips. A taxi may be picked on a street or ordered through an operator who assigns the order to a certain driver and a car. Departure and destination addresses together with times should also be recorded.

Example (cont'd)

A driver may have many driving licenses (types)

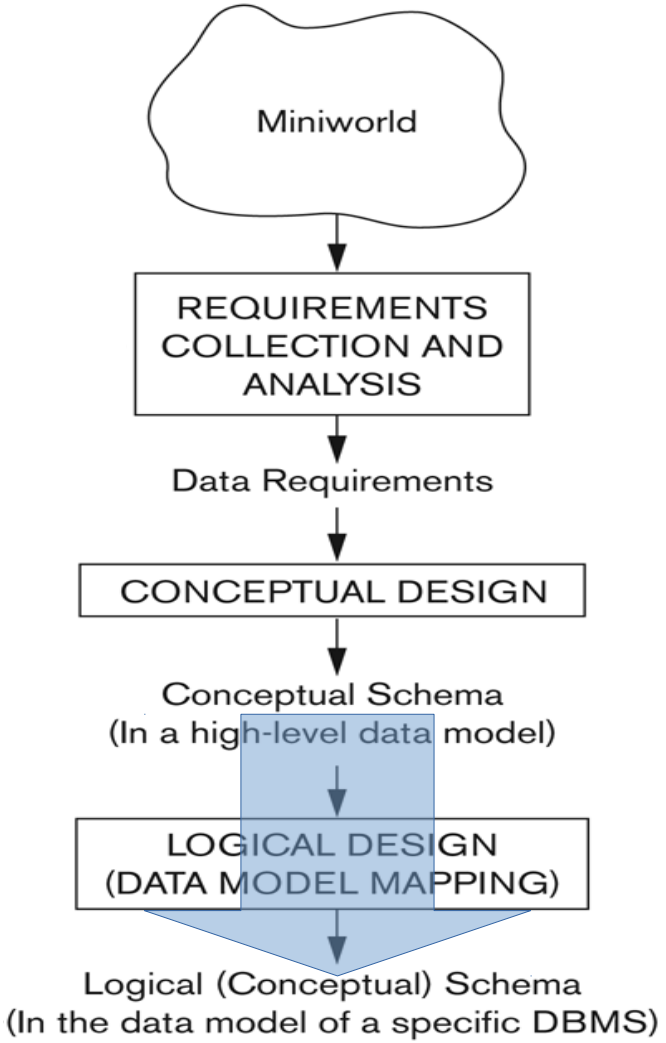






Translating an EER Diagram into a Relational Database

Recall: DB Design Process



Algorithm/Procedure for ER Diagrams

Step 1: Convert all regular entity types
- new relation, flatten composite attributes, ignore multivalued attributes

Step 2: Convert all weak entity types
- new relation, attributes as above, include identifying relationship type(s)

Step 3: Convert all 1:1 relationship types
- foreign key into either relation, include attributes of the relationship

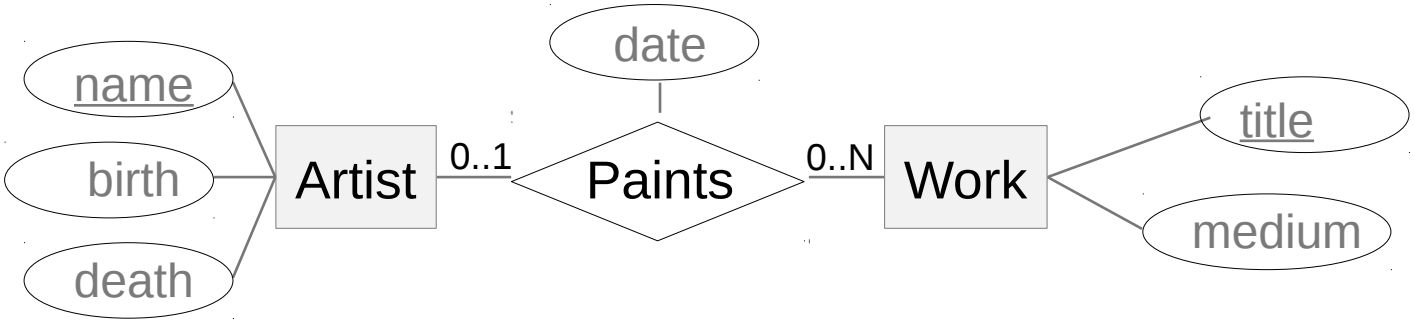
Step 4: Convert all 1:N relationship types
- foreign key into *N*-side relation, include attributes of the relationship

Step 5: Convert all remaining relationship types (N:M, ternary, 4-ary, …)
- new relation with foreign keys, include attributes of the relationship

Step 6: Convert all multivalued attributes
- new relation with foreign keys

Quiz

Consider the given ER diagram and relational DB schema



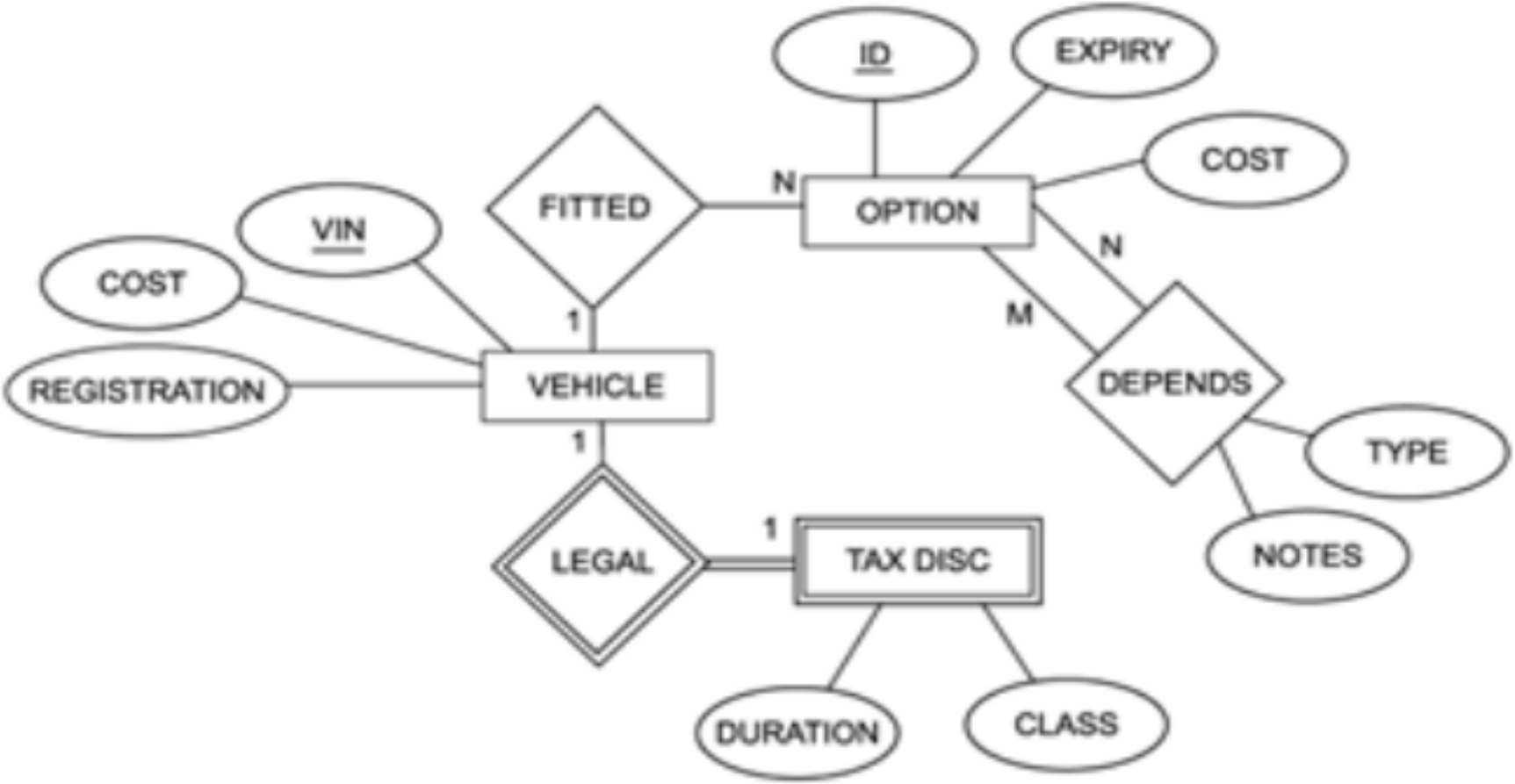
Artist(<u>name</u>,birth,death), Work(<u>title</u>,medium)

The Paints relationship can be represented by:

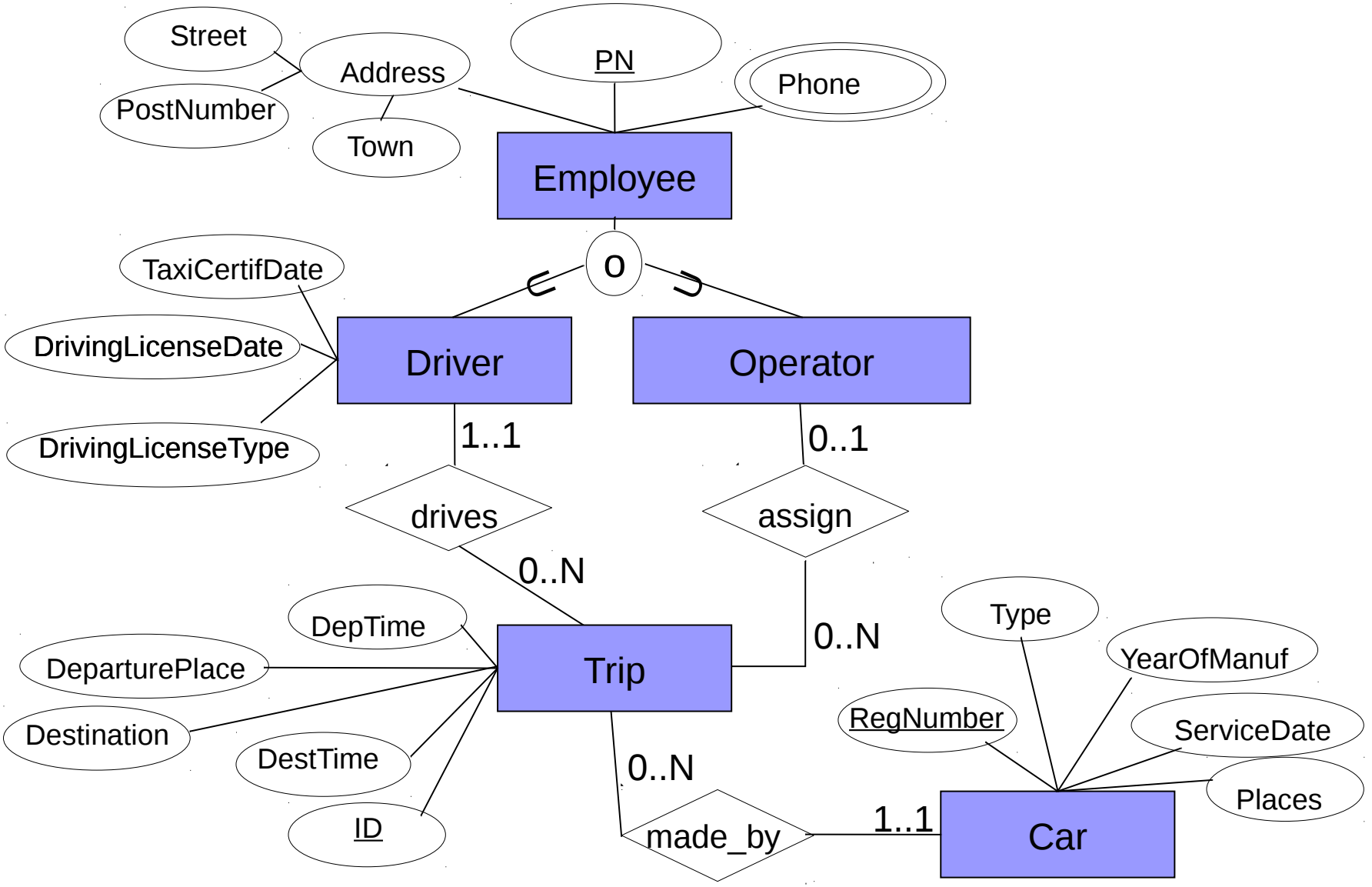
A. introducing a third schema: Paints(name,<u>title</u>,date)
B. extending the Work schema to be Work(<u>title</u>,medium,name,date)
C. extending the Artist schema to be Artist(<u>name</u>,birth,death,title,date)
D. either A or B above
E. any of A, B, or C above

Example

Translate the following ER Diagram into a relational database schema.



Example 2


Street
Address
PostNumber
Town
PN
Phone
Employee
o
TaxiCertifDate
DrivingLicenseDate
DrivingLicenseType
Driver
Operator
1..1
0..1
drives
assign
0..N
0..N
DepTime
DeparturePlace
Destination
DestTime
ID
Trip
0..N
made_by
1..1
Type
YearOfManuf
RegNumber
ServiceDate
Places
Car

www.liu.se

LINKÖPING UNIVERSITY