

INF1343, Week 4

Database Design and ER Modeling

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Announcements

1. Assignment 1 due **now**.
Submit late assignments via email as PDF.
2. Assignment 2 to be posted today.
(Due in 3 weeks. Start early.)
3. No office hours today.

Schedule

Intro	Design	Interfacing	Etc.
SQL	Design	Etc.	Etc.
SQL	Design	Etc.	Etc.

```
+-----+
| Tables_in_diveshop |
+-----+
| BIOLIFE             |
| BIOSITE             |
| DEST                |
| DIVECUST            |
| DIVEITEM            |
| DIVEORDS            |
| DIVESTOK            |
| SHIPVIA             |
| SHIPWRCK            |
| SITES               |
+-----+
```

Good DB Design

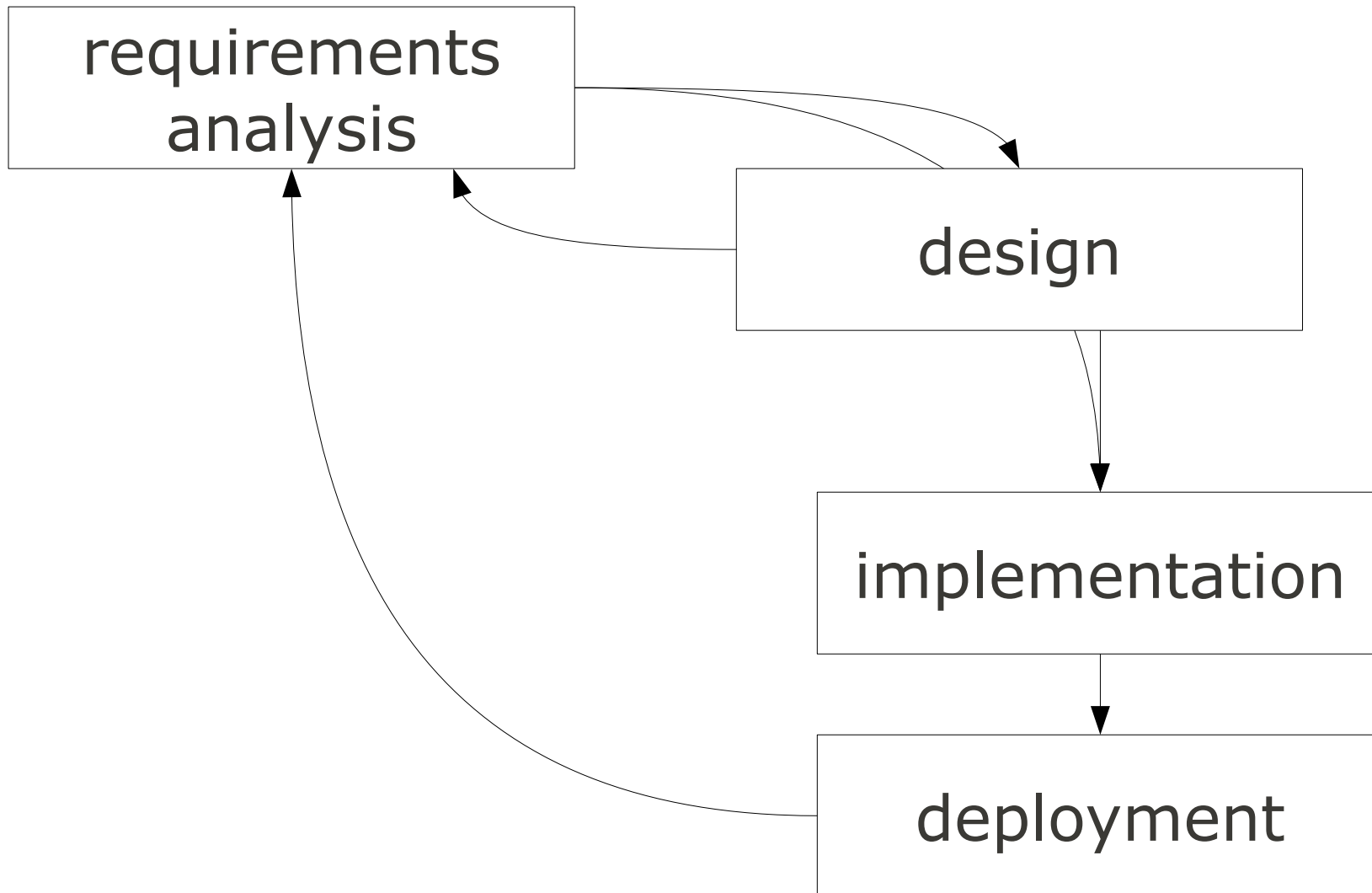
1. Serves the purpose.
2. Simplifies updates.
3. Avoids “anomalies”.

Two Approaches

1. Start with whatever, then fix it
2. Start by modeling

ER Modeling

Database Design



client

you

database

users



Functional Specifications

What is the system going to do?
(Not **how**, but **what**.)

Course Enrollment

What do we want from a course enrollment system?

“Use Cases”

A student wants to enroll in a course for the next semester. The student goes to the website for the enrollment system and logs in. The student is presented with a list of courses there he or she is enrolled in. There is a button next to each course to un-enroll from it. There is also a search box that the student can use to look for courses that they are not enrolled in. The student can find the course by the course code or course title...

ER Model

E is for “Entities”

R is for “Relationships”

(“relationships” != “relations”)

“Use Cases”

A **student** wants to **enroll** in a **course** for the next semester. The student goes to the website for the enrollment system and logs in. The student is presented with a list of courses there he or she is enrolled in. There is a button next to each course to un-enroll from it. There is also a search box that the student can use to look for courses that they are not enrolled in. The student can find the course by the course code or course title...

Entities

The “things” we need to keep track of in our database:

students

courses

instructors

rooms

time slots

attributes

last name

first name

utorid

date of birth

student

program

payment

course

other entities

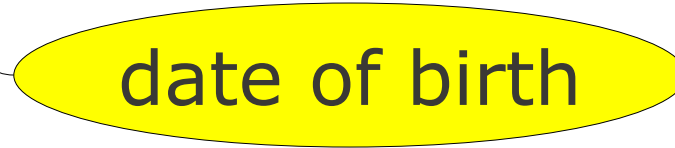
“domains”

what
alphabet?

up to 8 letters
or numbers

a date

Local?
Domestic?



student

last name

first name

utorid

date of birth

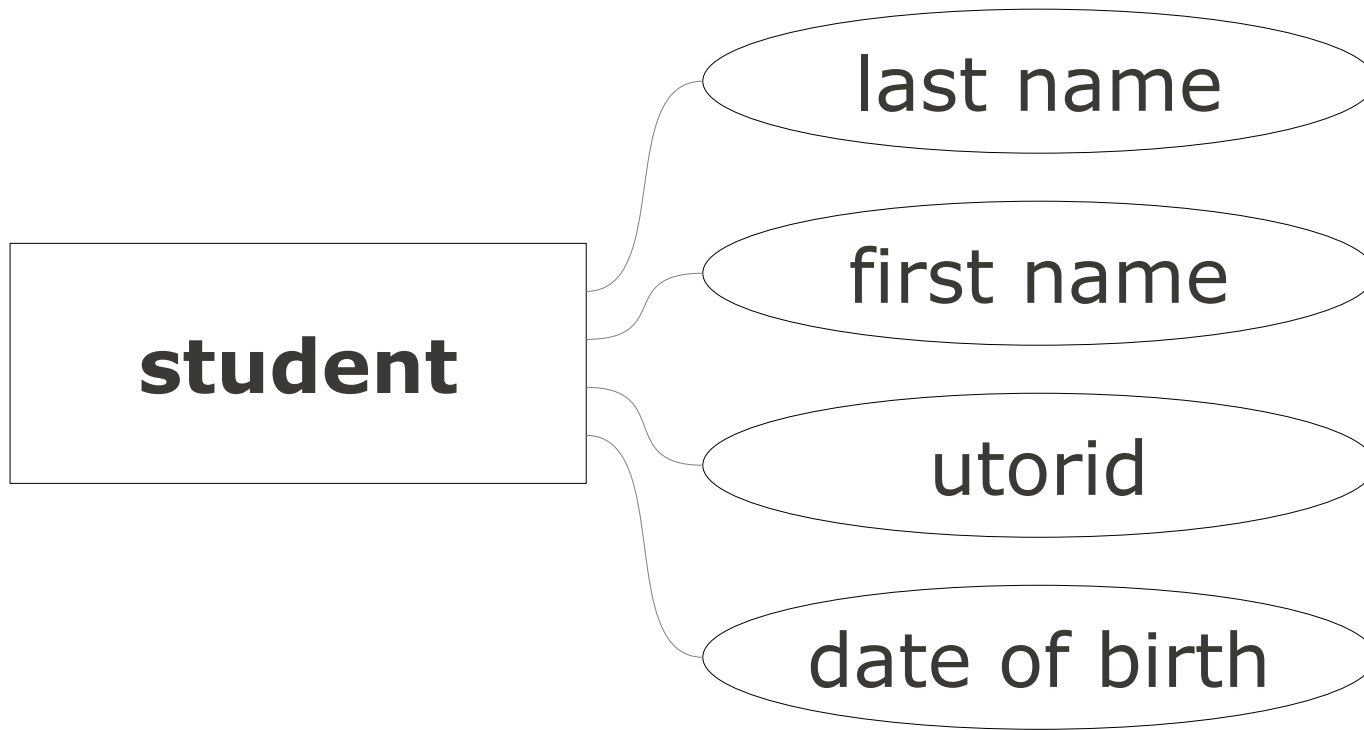
phone number

program

payment

course

other entities



“Chen’s notation”

student

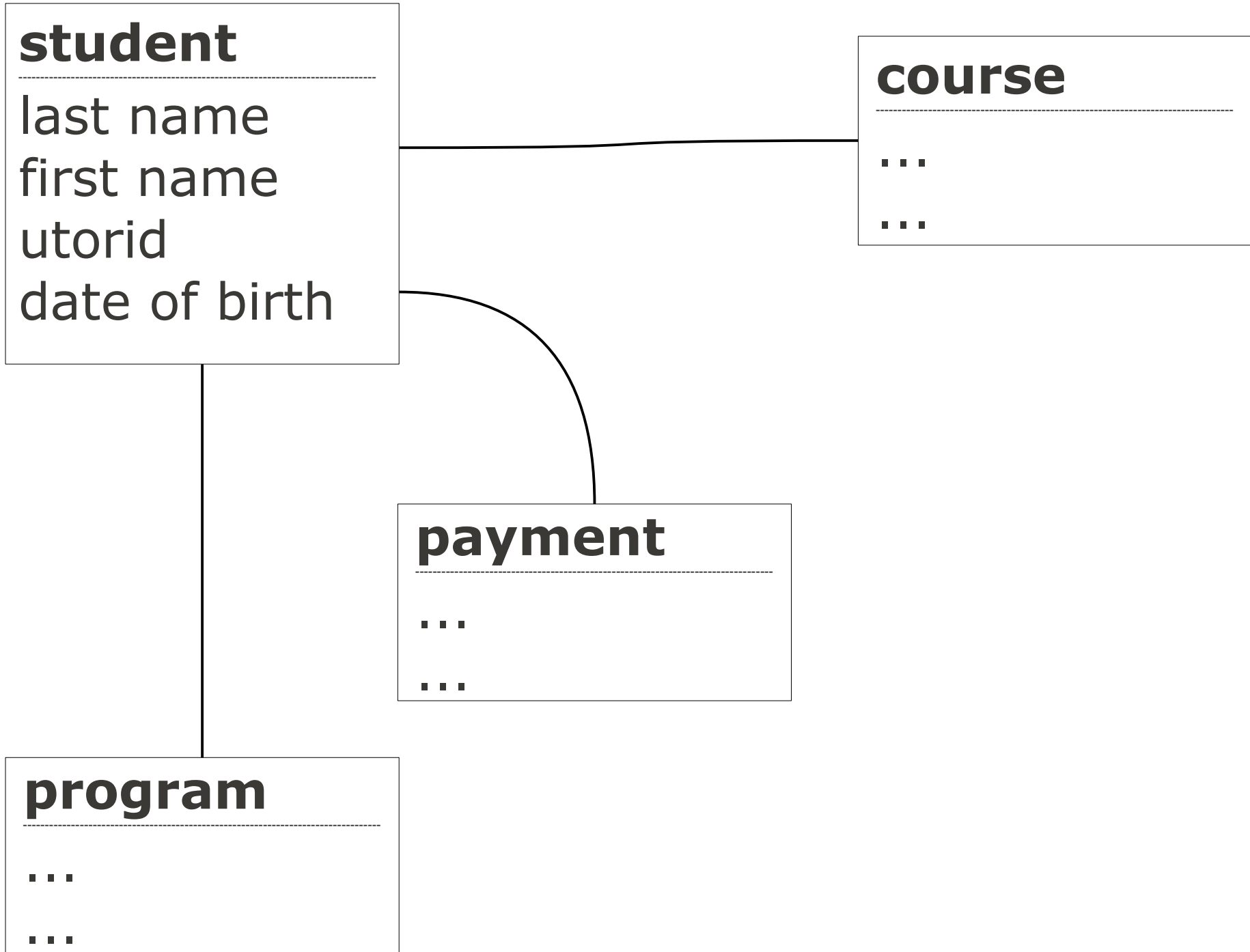
last name

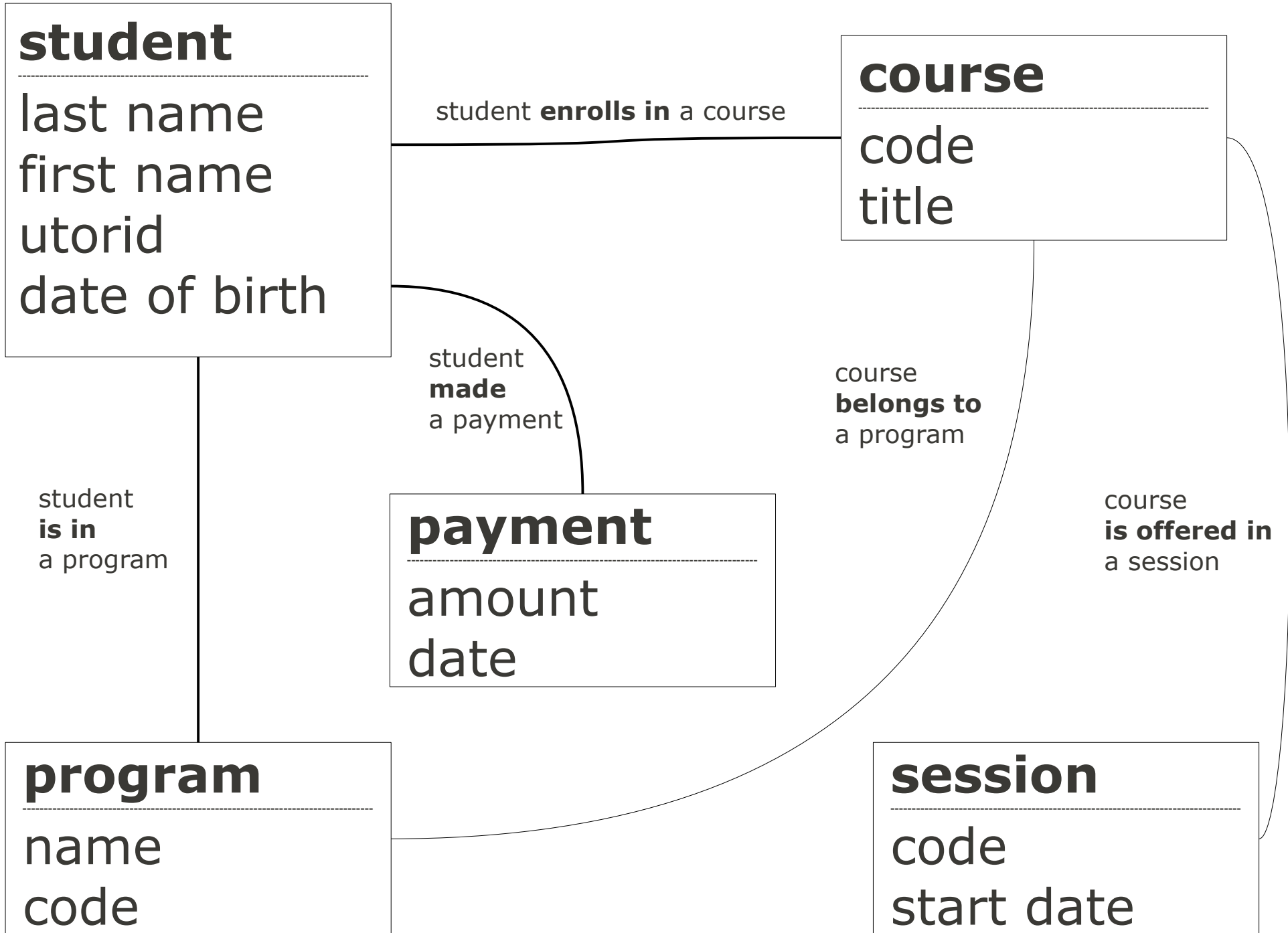
first name

utorid

date of birth

“UML notation”
(simplified)

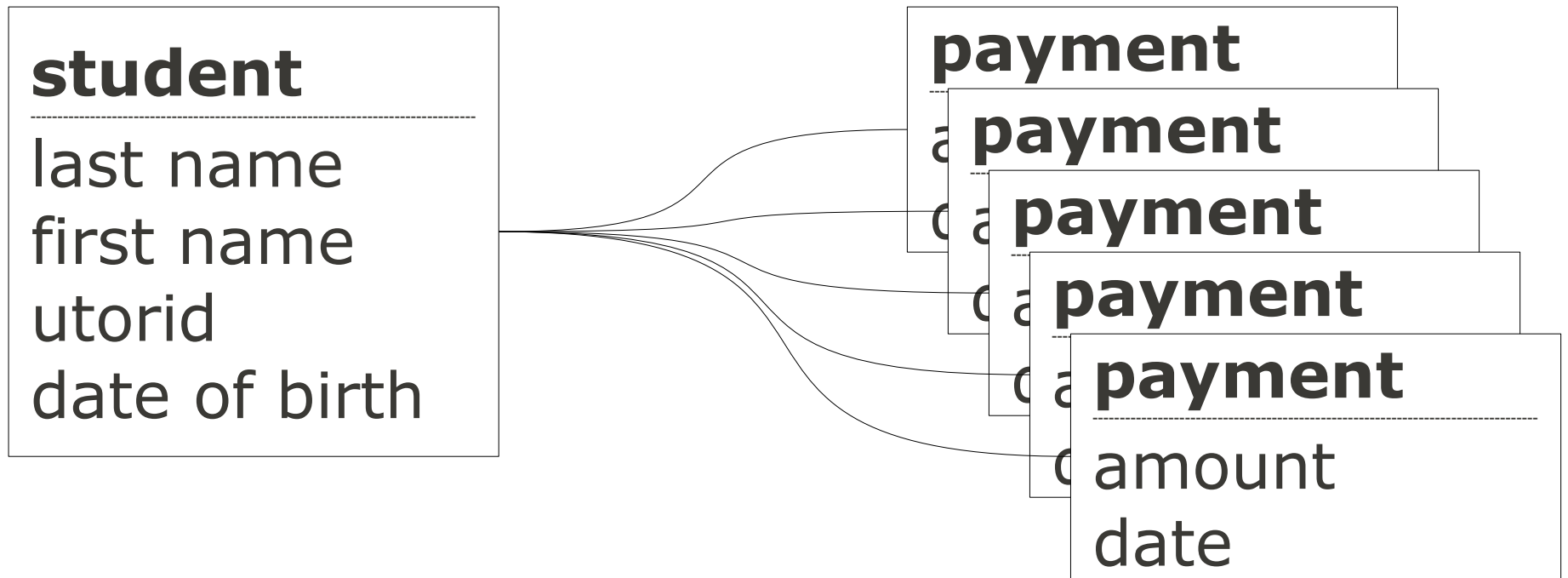




A Movie Database

What are the entities?
Which are related?

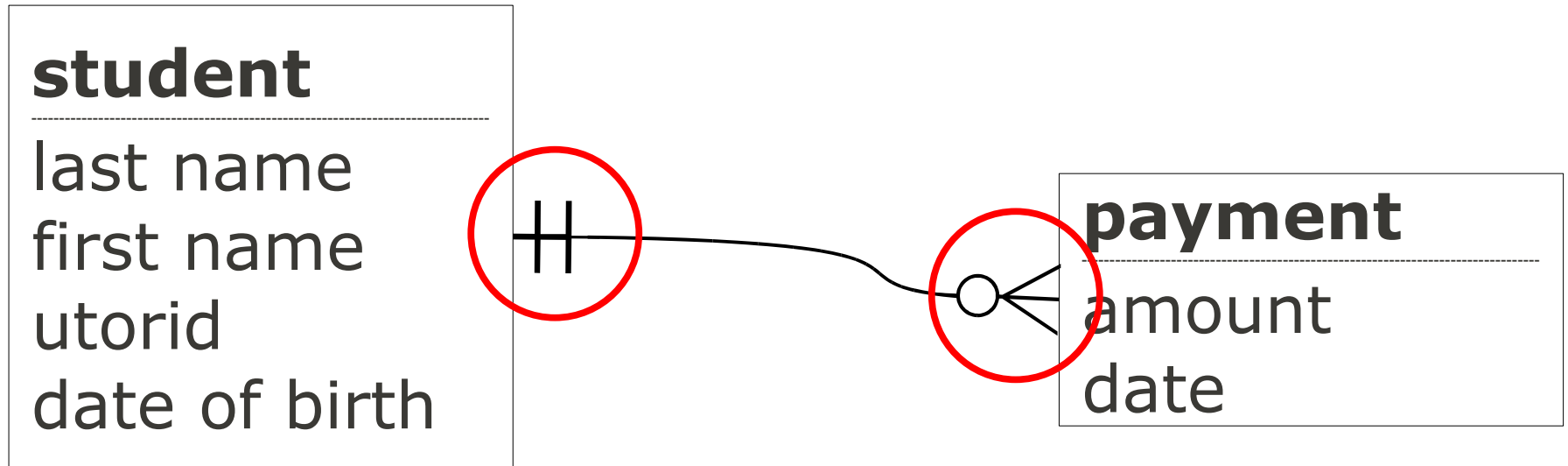
Cardinality



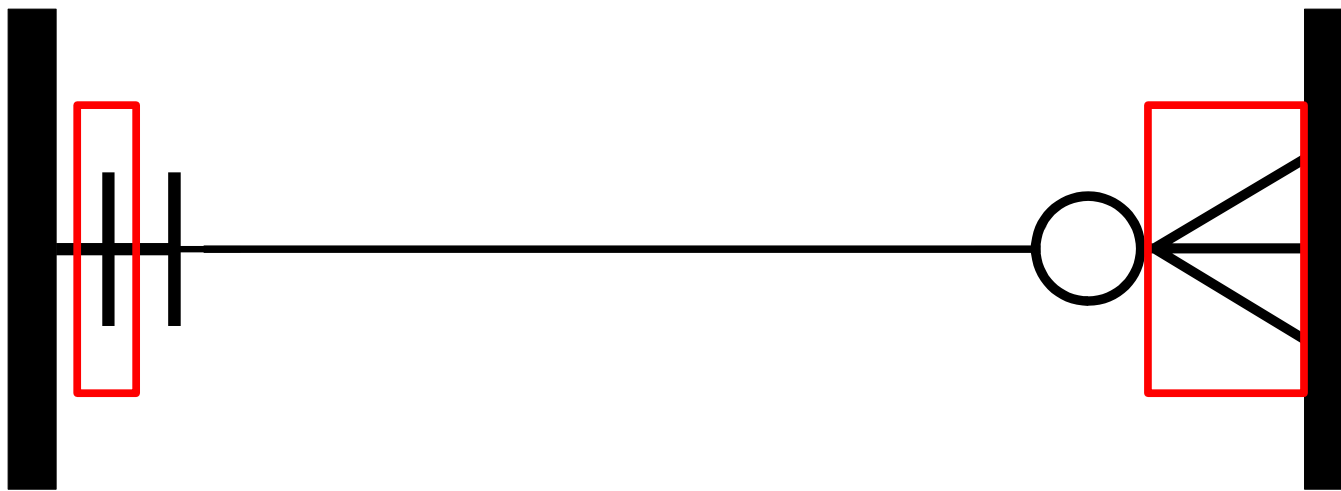
one student, many payments

“one-to-many” relationship

“Crow’s Foot Notation”



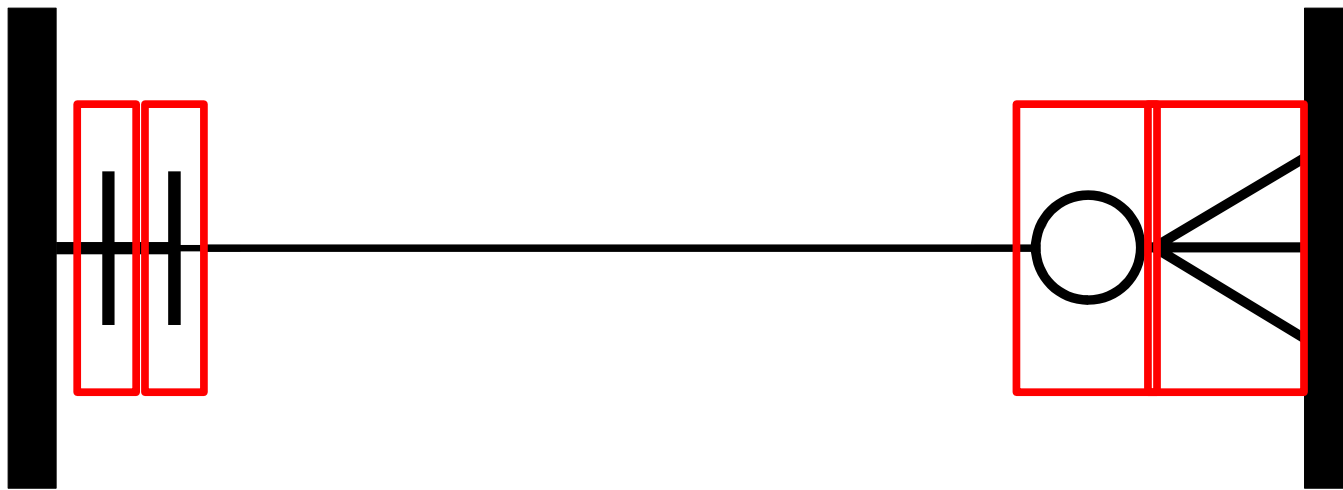
“Crow’s Foot Notation”



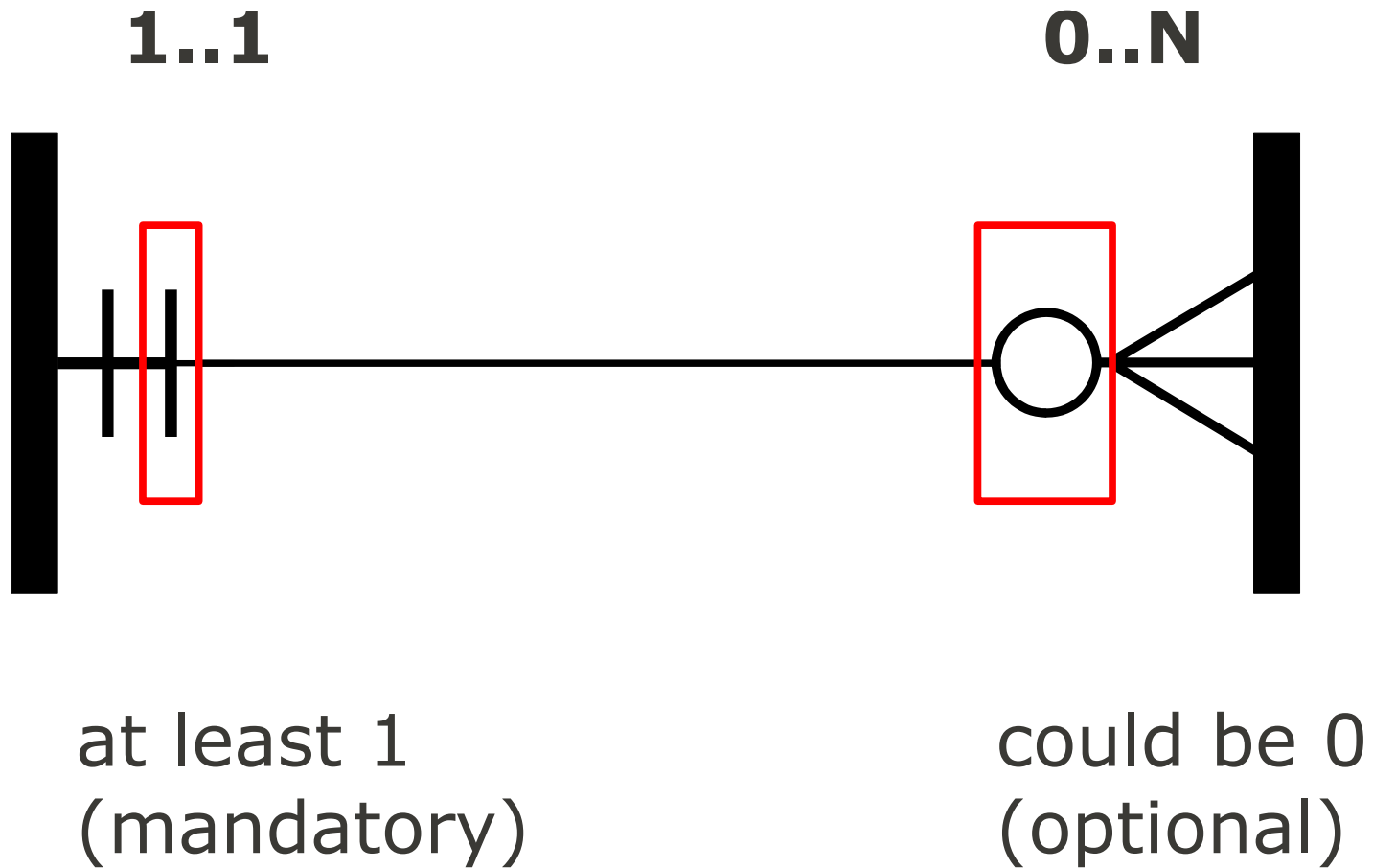
not more than 1

many

“Crow’s Foot Notation”



“Crow’s Foot Notation”



“UML Notation”

1..1

0..N

1..1

0..N

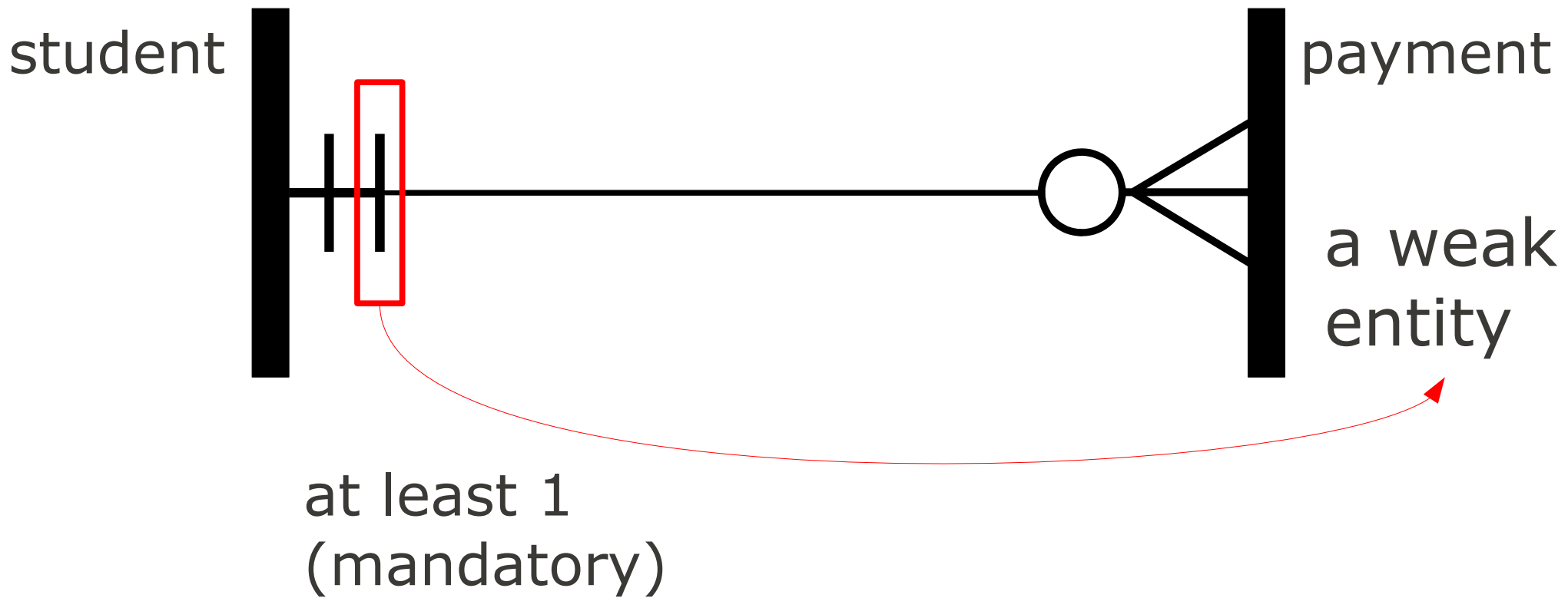
or just “1”

or “0..*”

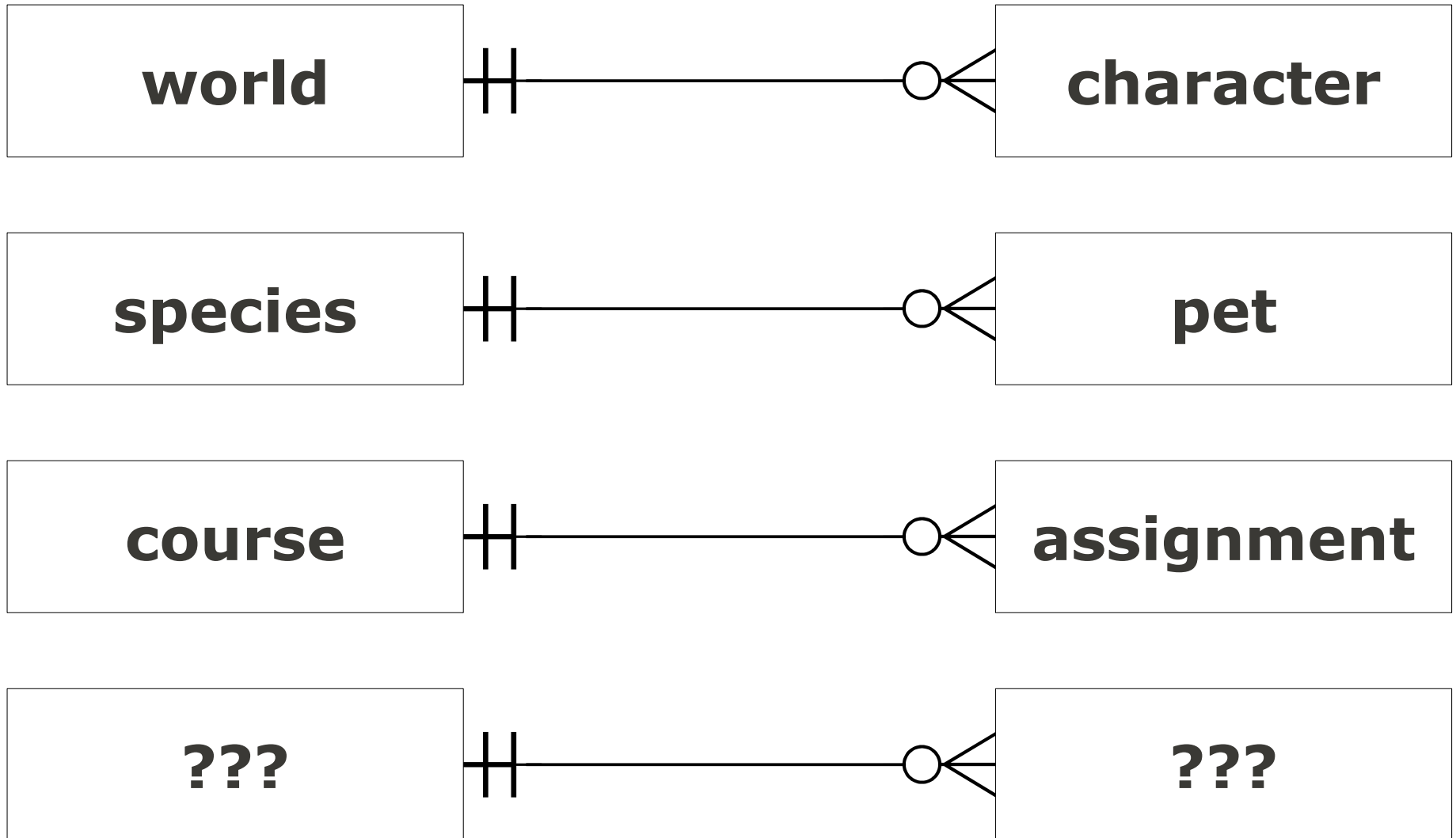
just
one

zero or
many

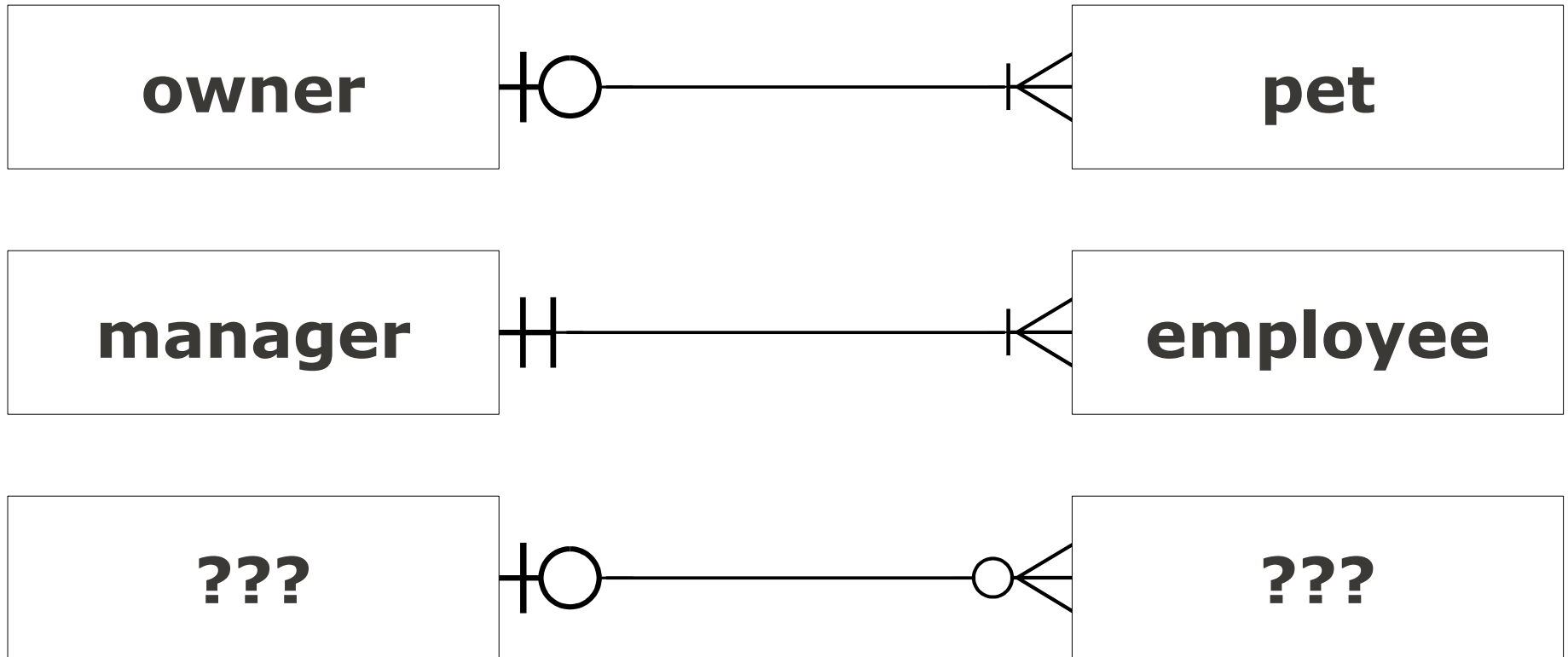
“Weak Entity”



More Examples



Variations



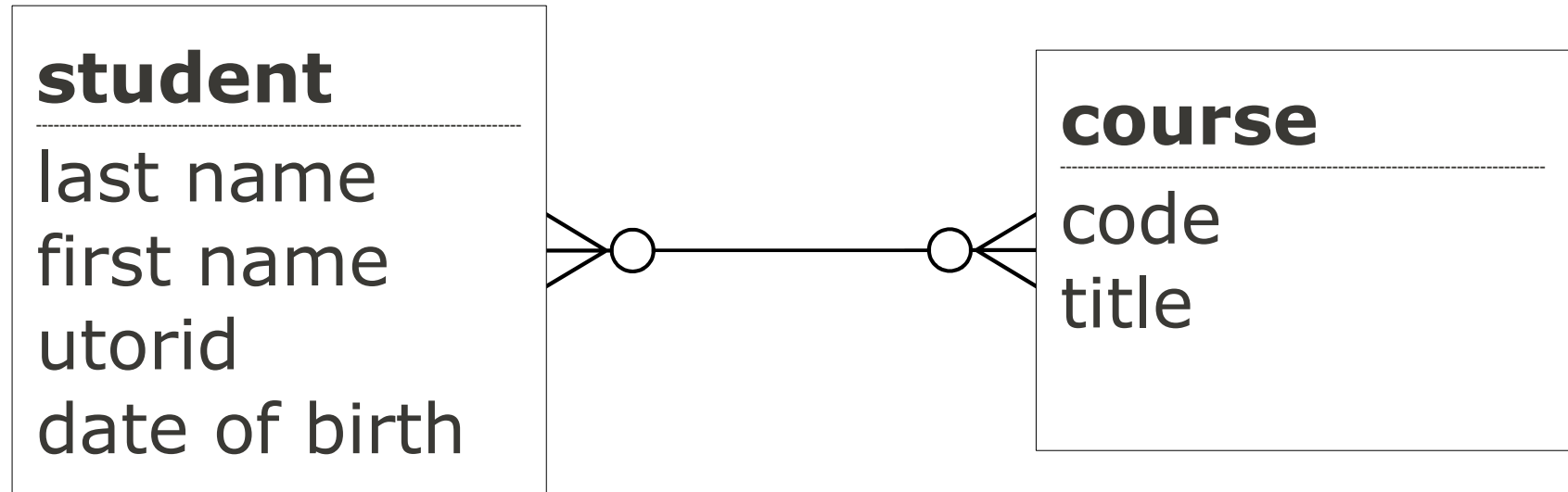
Questions on 1:M?

We 

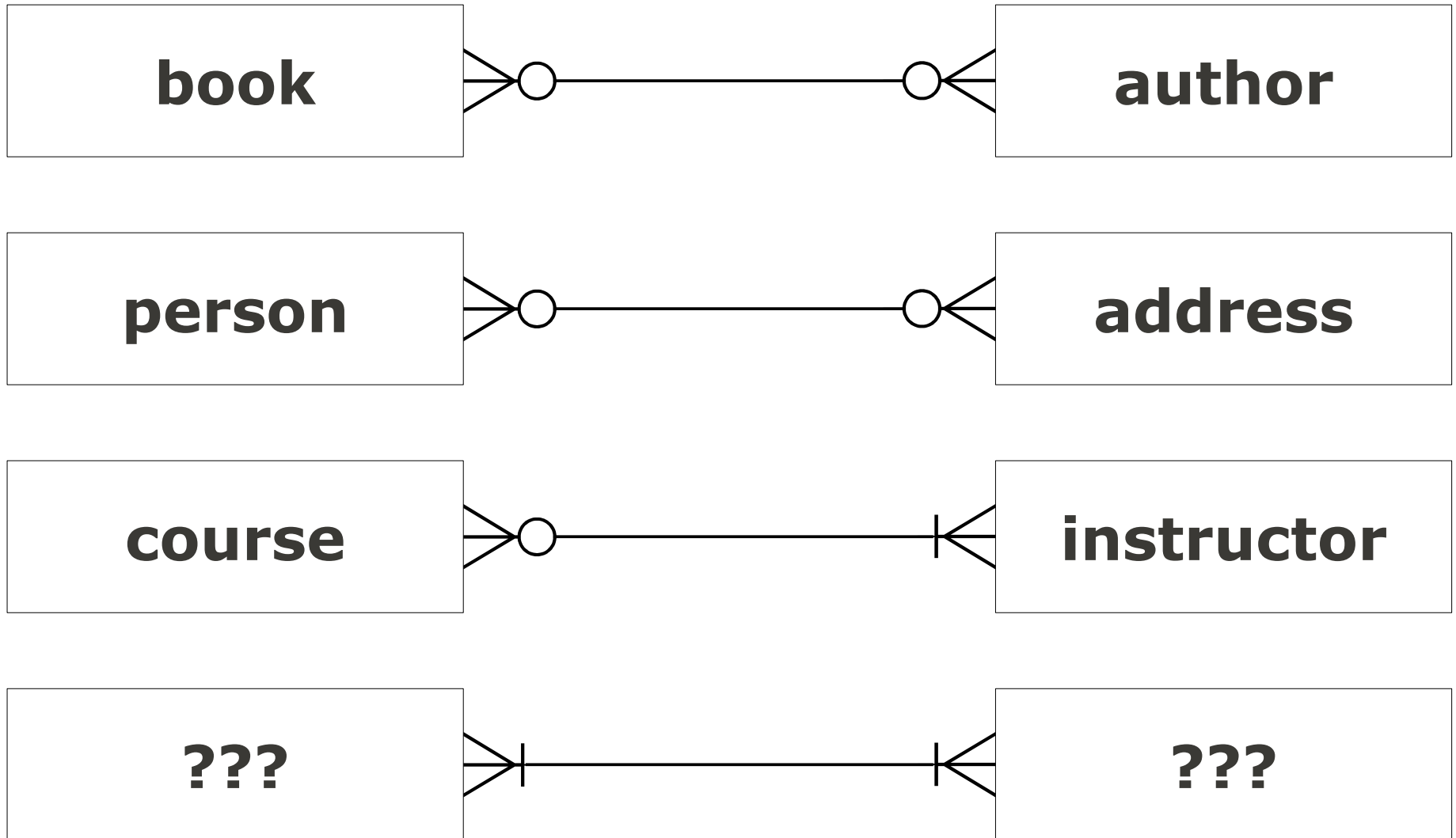
1:M

Because they are really
easy to represent in a
relational database.

Many-to-Many



Examples



Movie Database

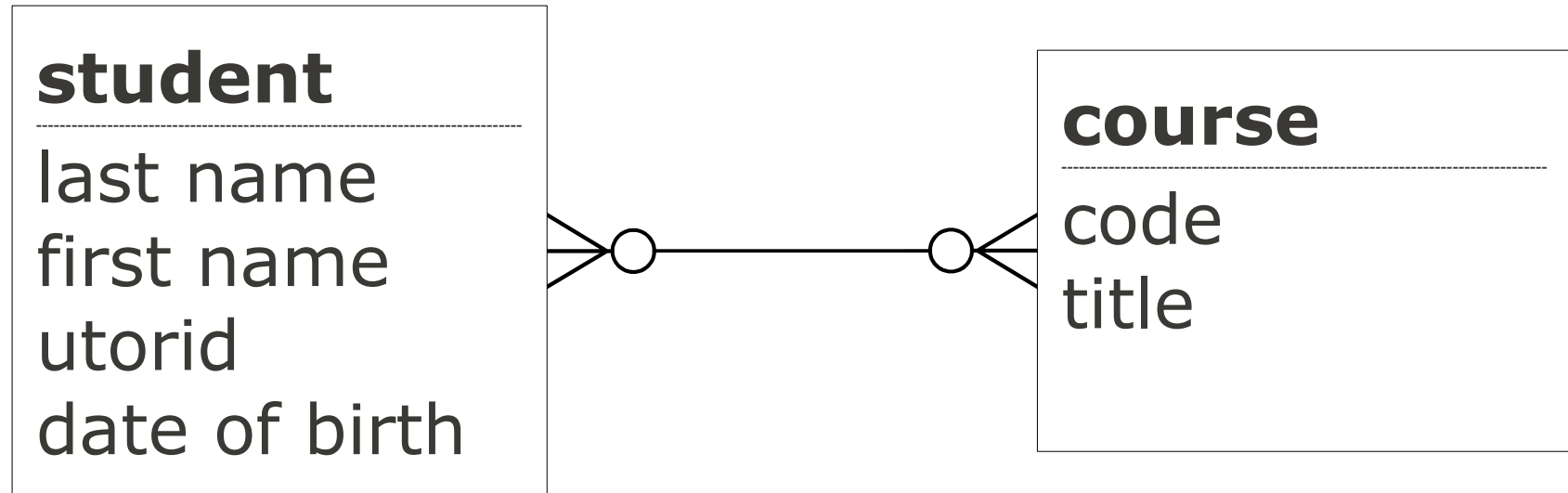
Which relationships are 1:M and
which are M:M?

We! 

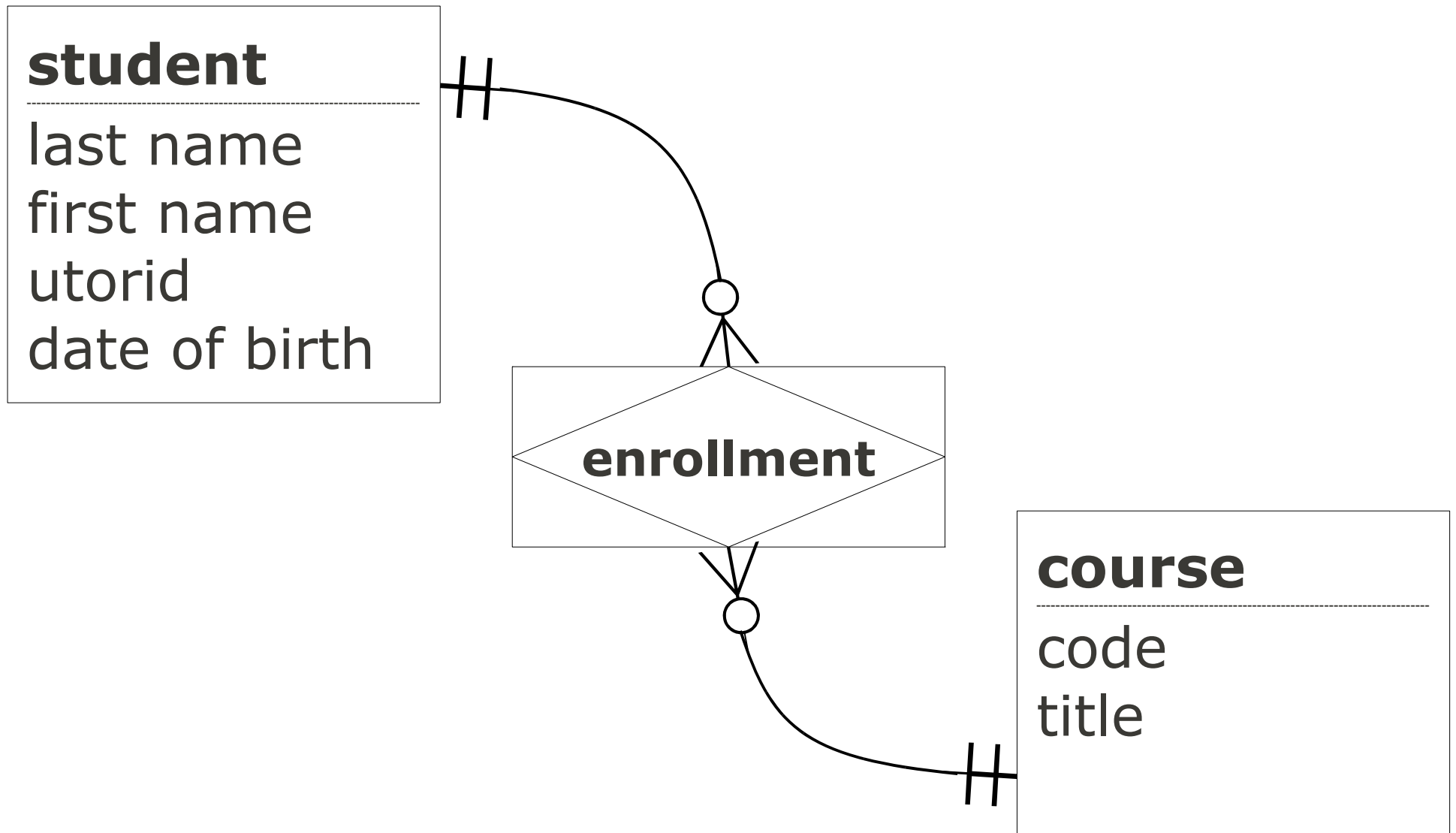
M:M

Because they **cannot**
be represented in a
relational database.

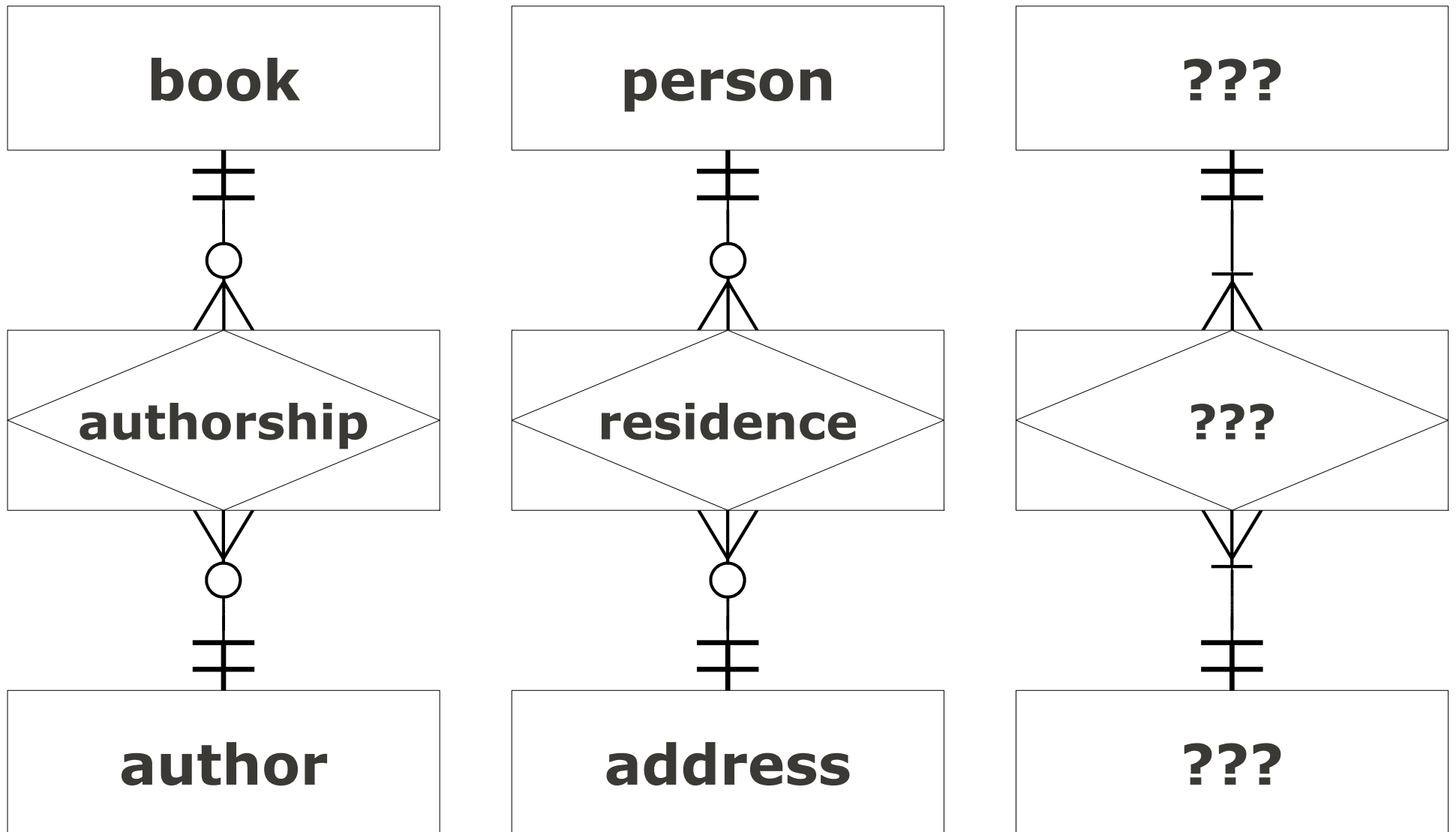
Breaking Up M:M



“Associative Entity”

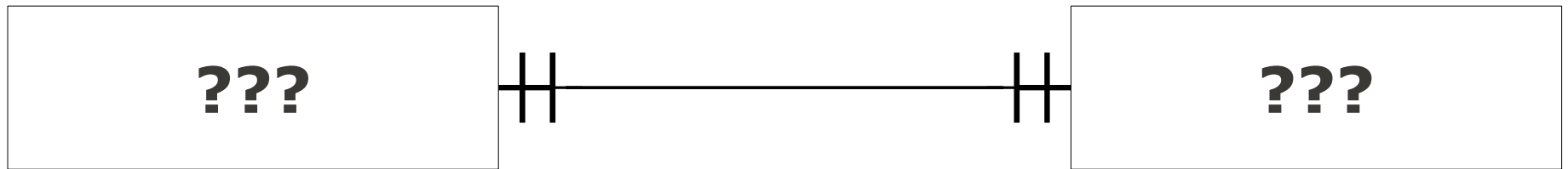


Examples

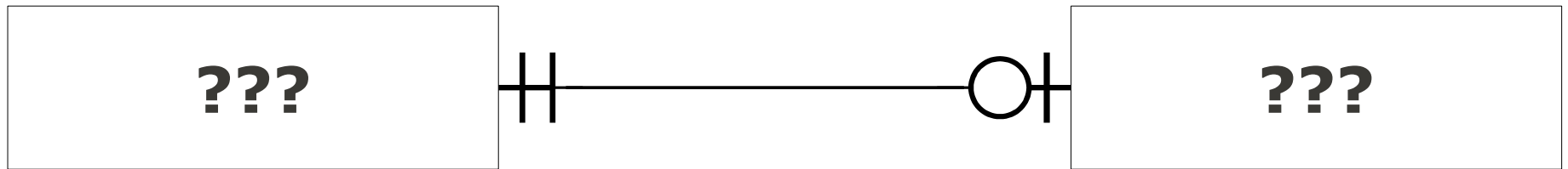


Questions on M:M?

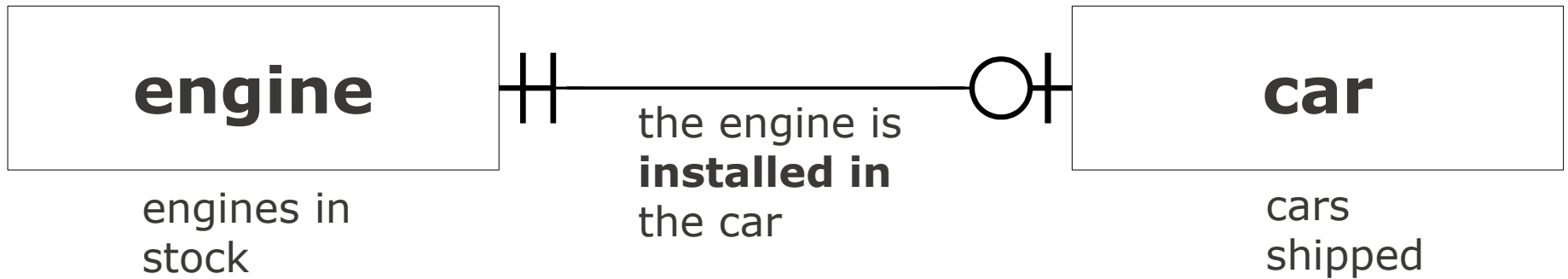
One-to-One



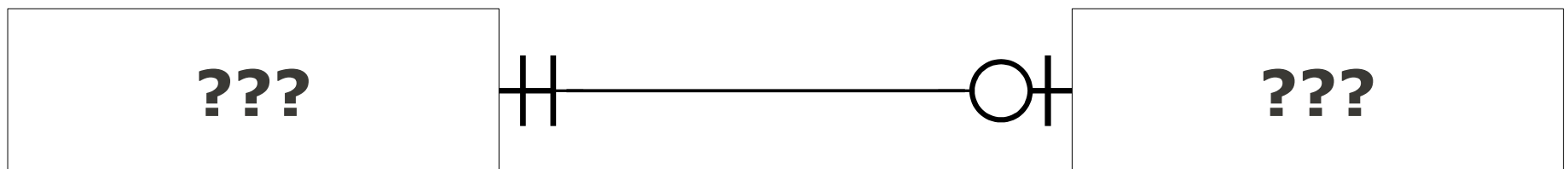
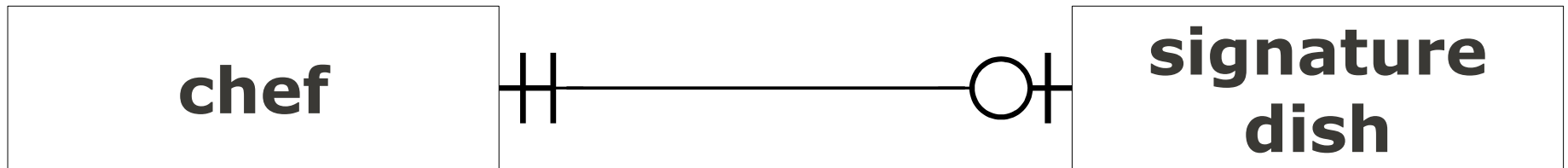
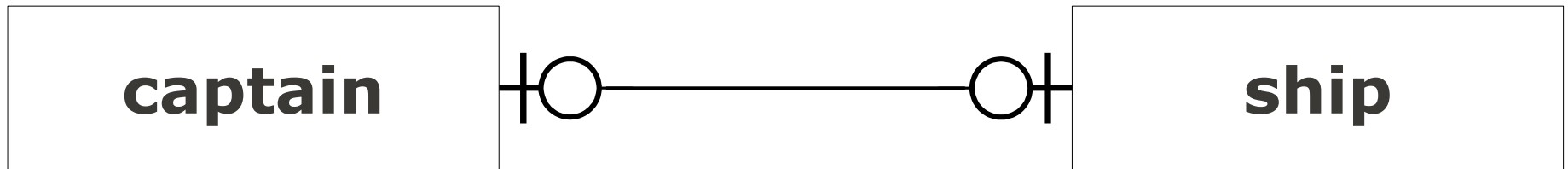
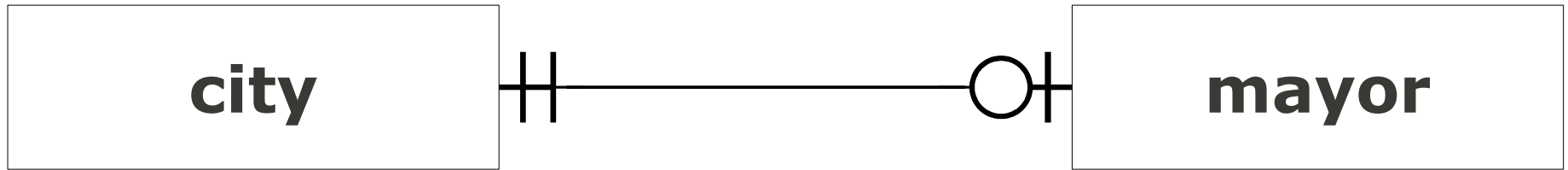
One-to-One



One-to-One



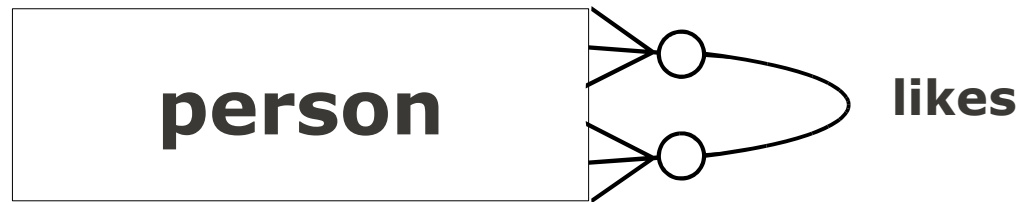
Examples



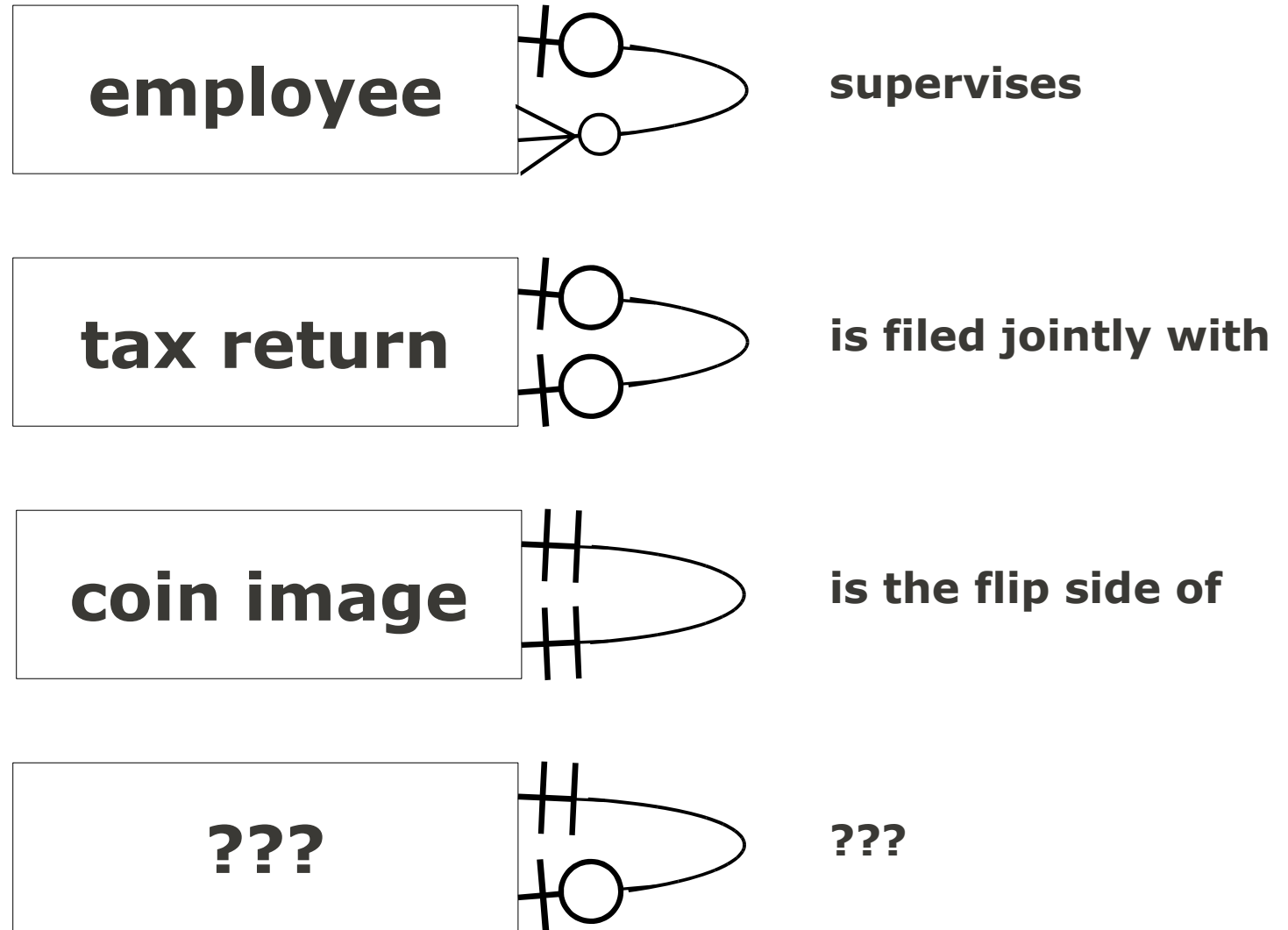
Recursive Relationships



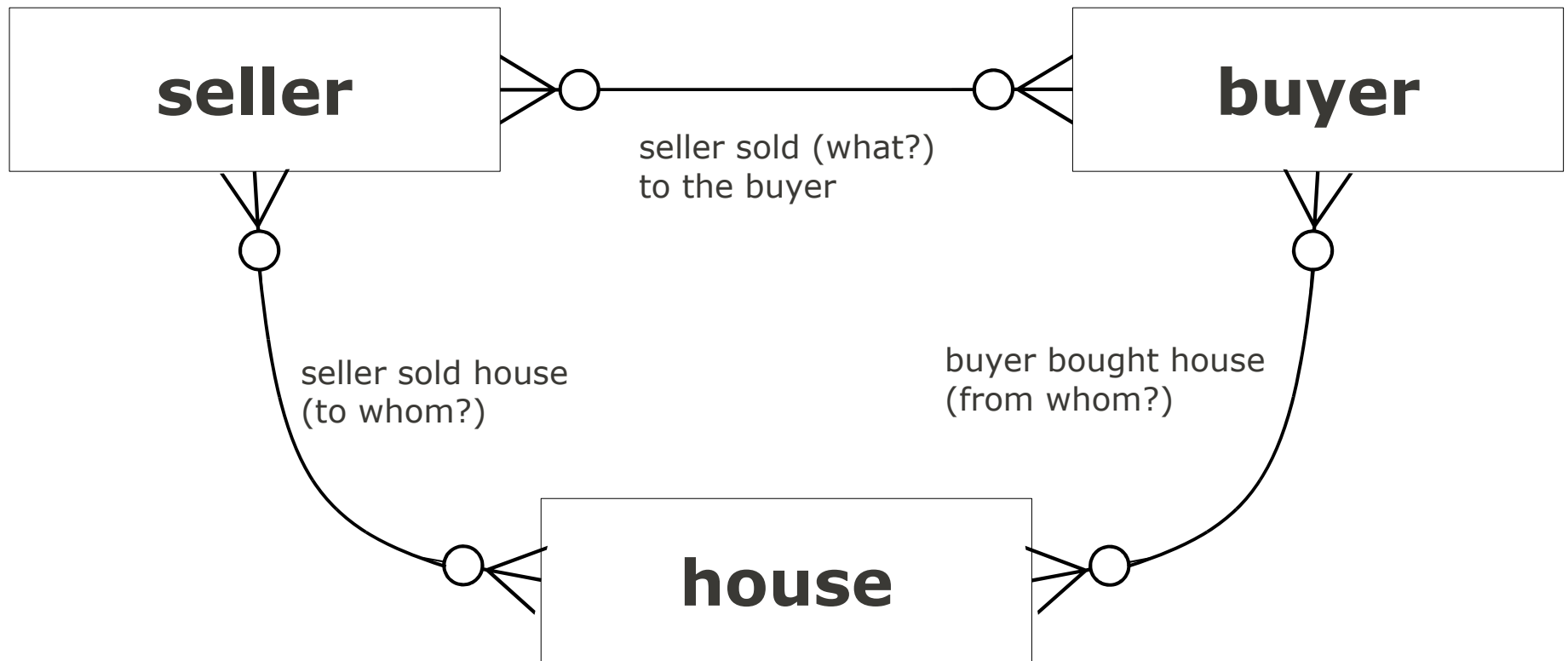
Recursive Relationships



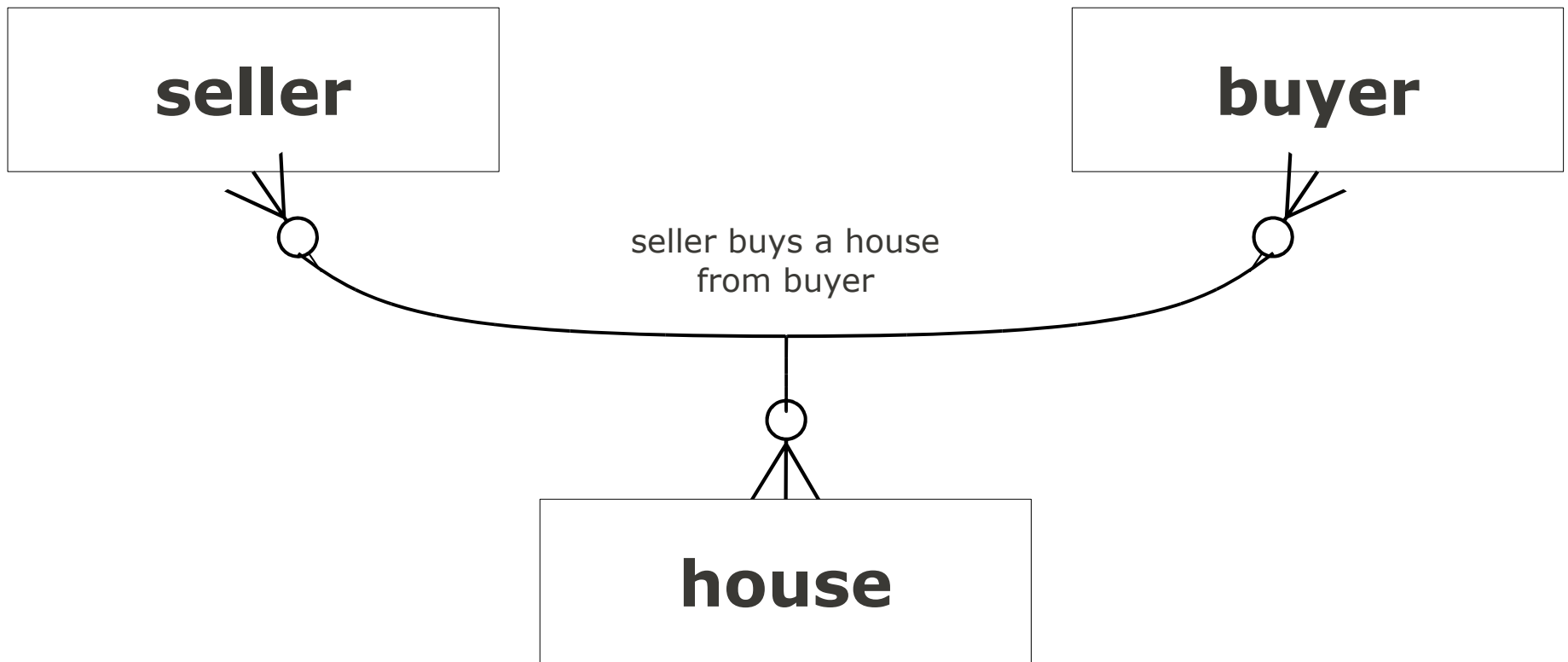
Examples



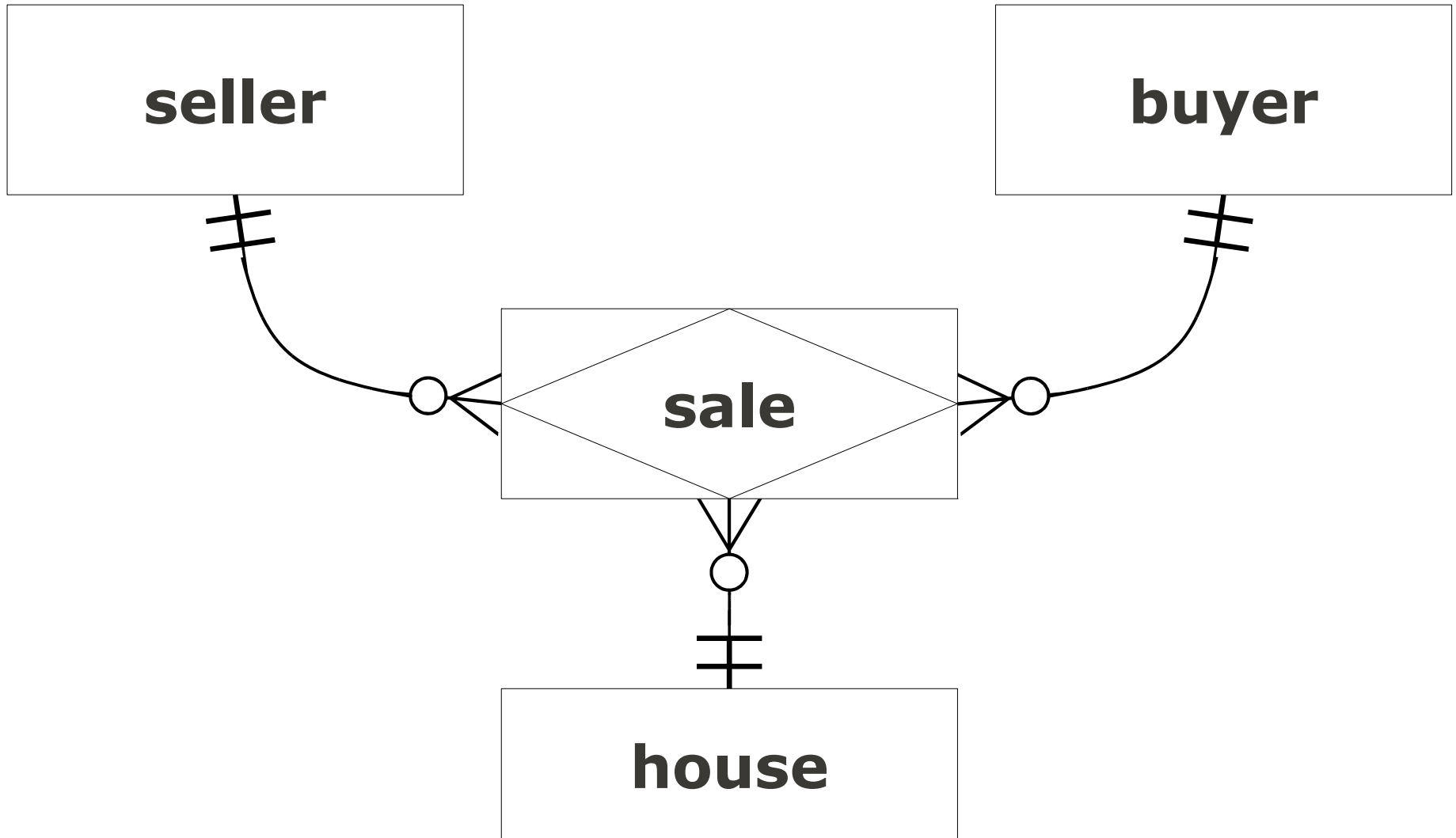
N-nary Relationships



N-nary Relationships



N-nary Relationships



Putting It Together

Options for software:

- OpenOffice Draw
 - Free / open source
 - Available in the lab
 - You can get "Crow's Foot" templates at <http://www.thinktek.ca/articles/article2.php>
 - Alternatively, do UML notation ("n..m") by hand
- Microsoft Visio
- Your favorite software

Questions?

