CCT395, Week 4

Database Design and ER Modeling

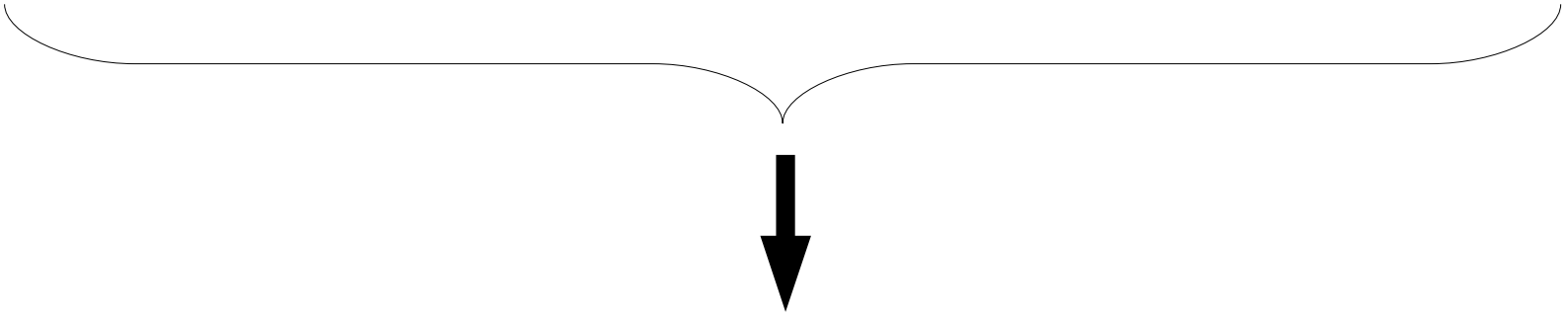
Yuri Takhteyev
University of Toronto
September 29, 2010

Assignment 1

Updated on Sept. 24 -
please get the newest version
from the website

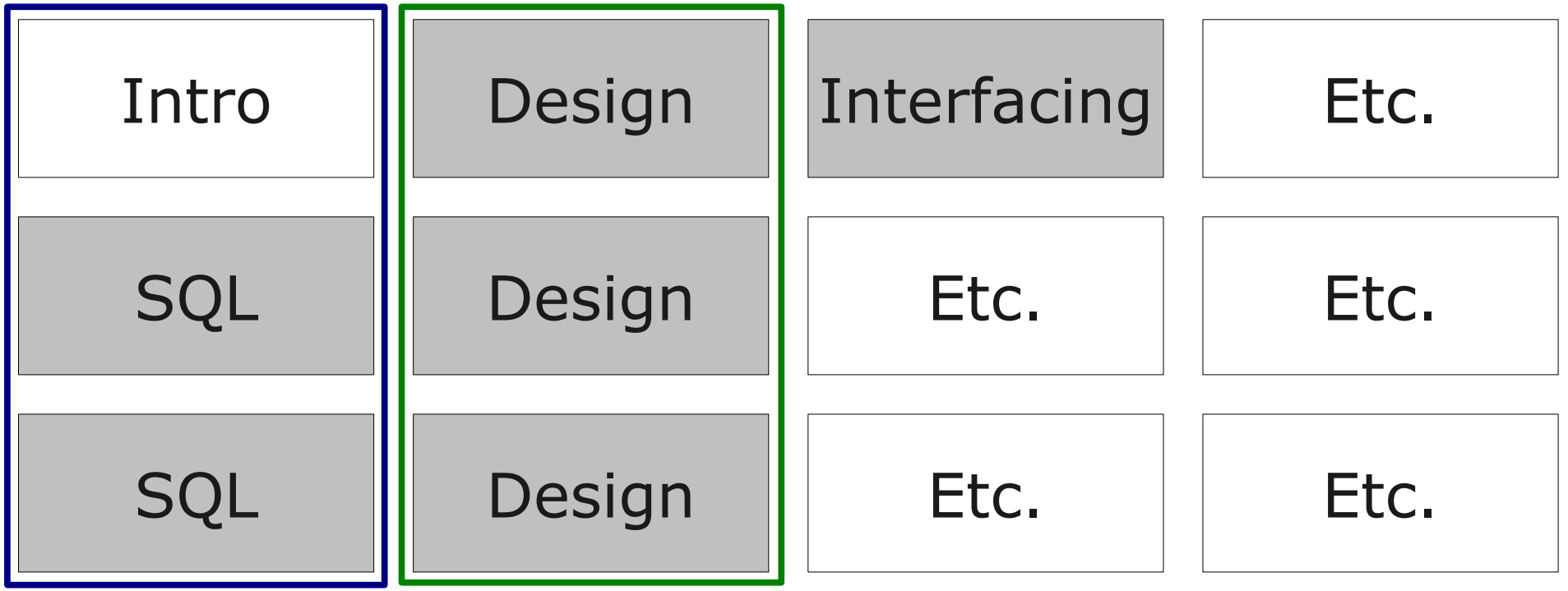
Schedule

Inserting and modifying data
Creating tables



Week 6

Schedule


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

course

course_instance

session

student

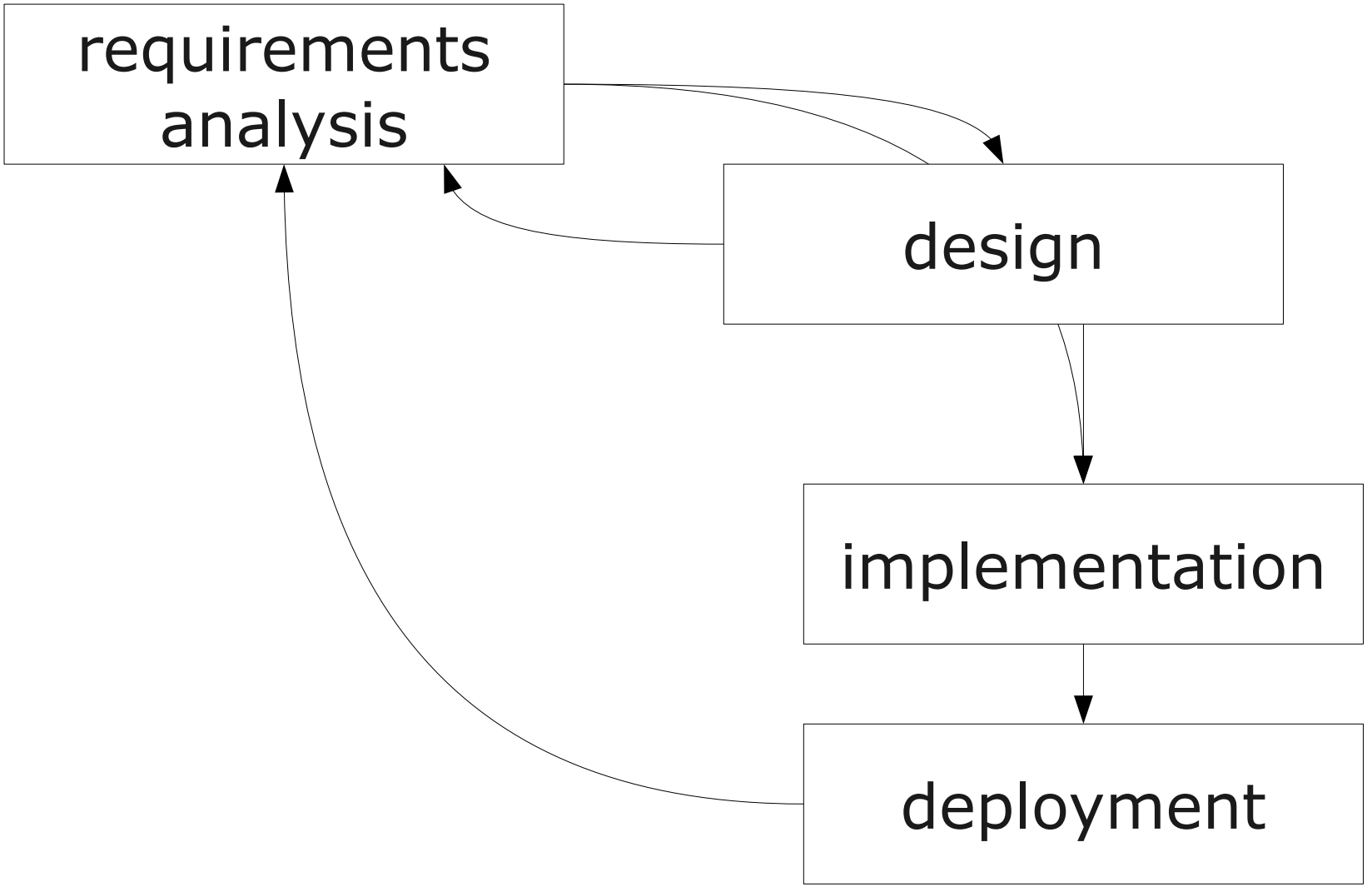
building

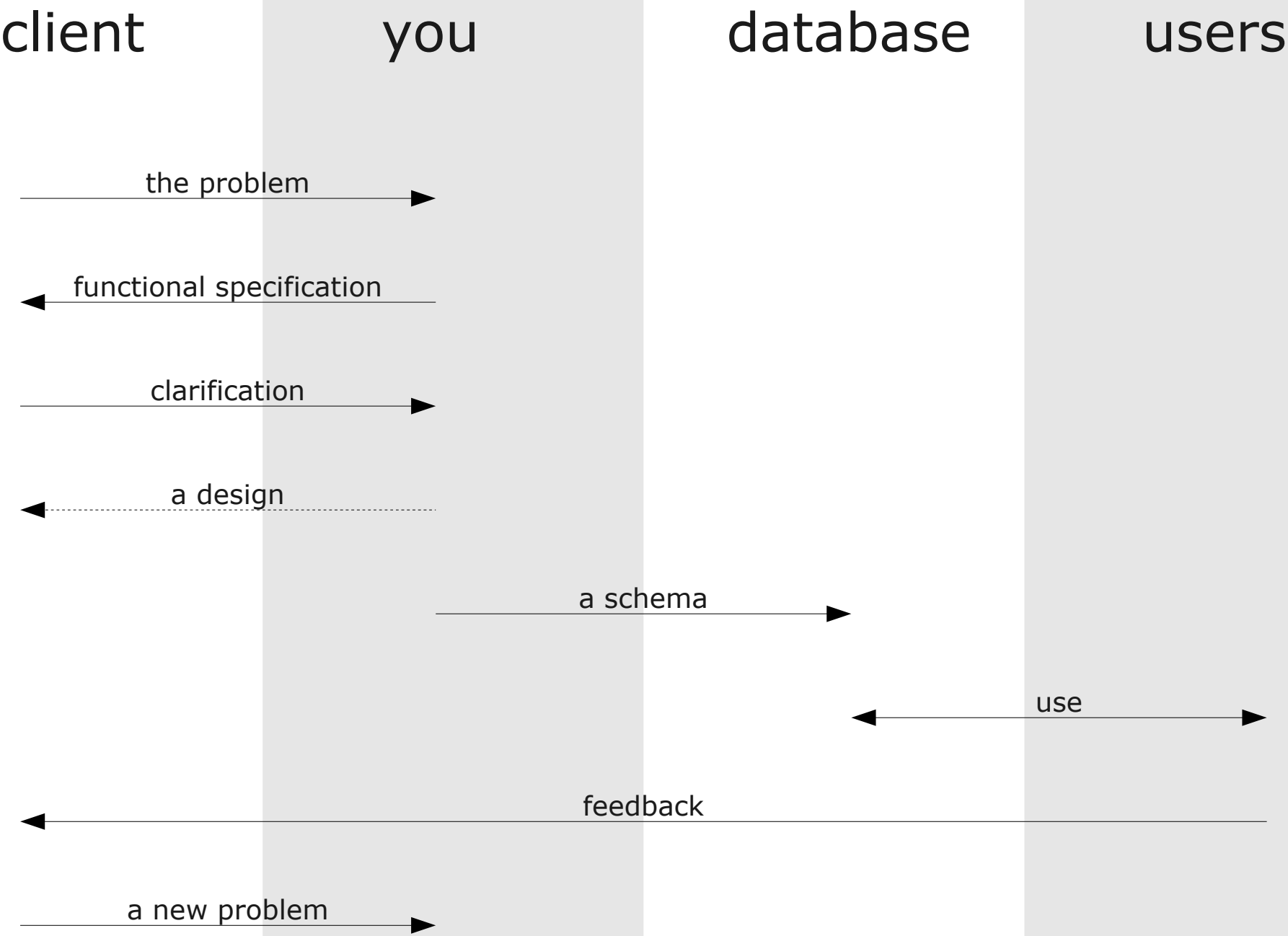
enrollment

room

Why so many? Why those seven?

Database Design




client
you
database
users
the problem
functional specification
clarification
a design
a schema
use
feedback
a new problem

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 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”

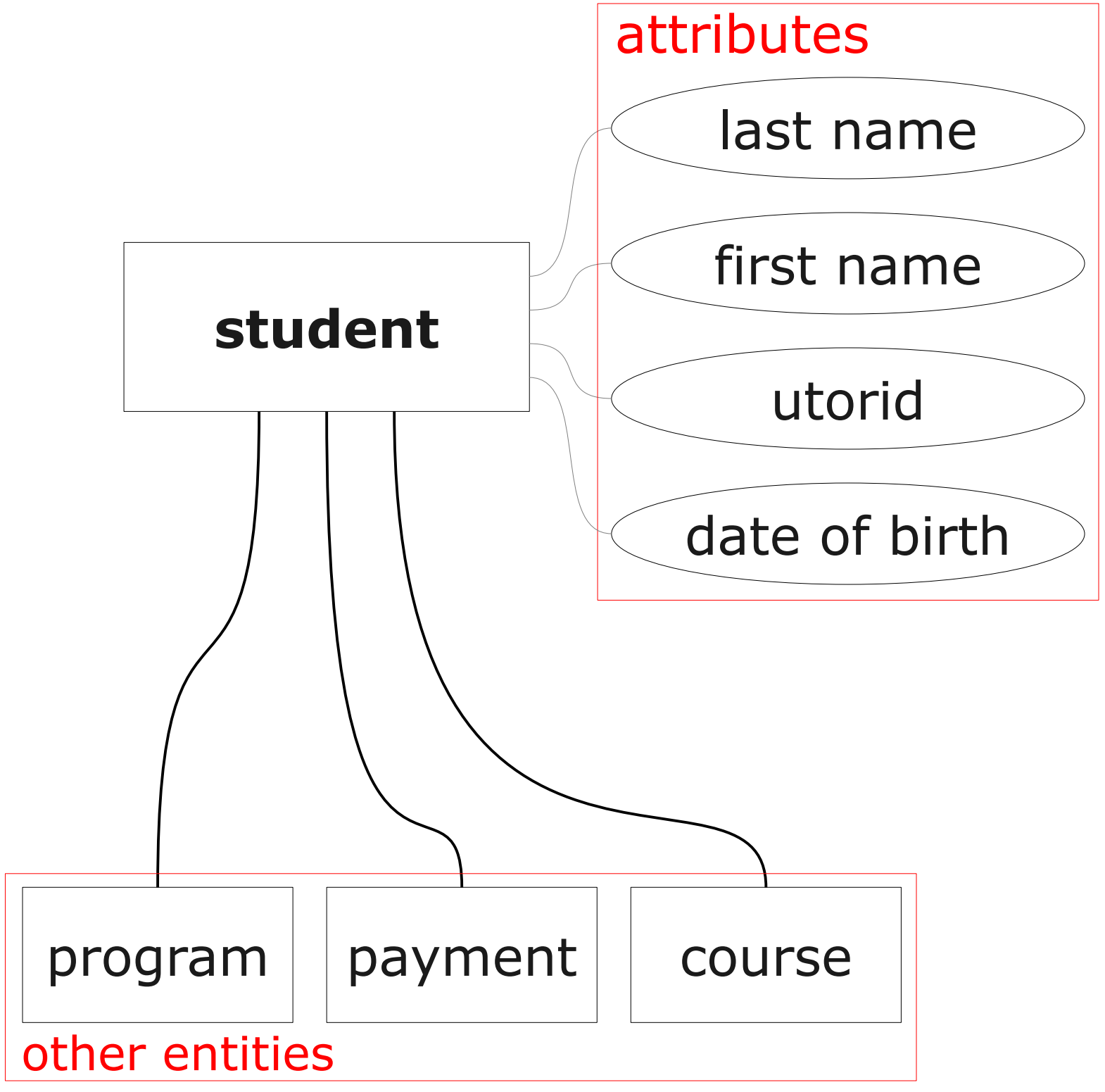
“Use Cases”

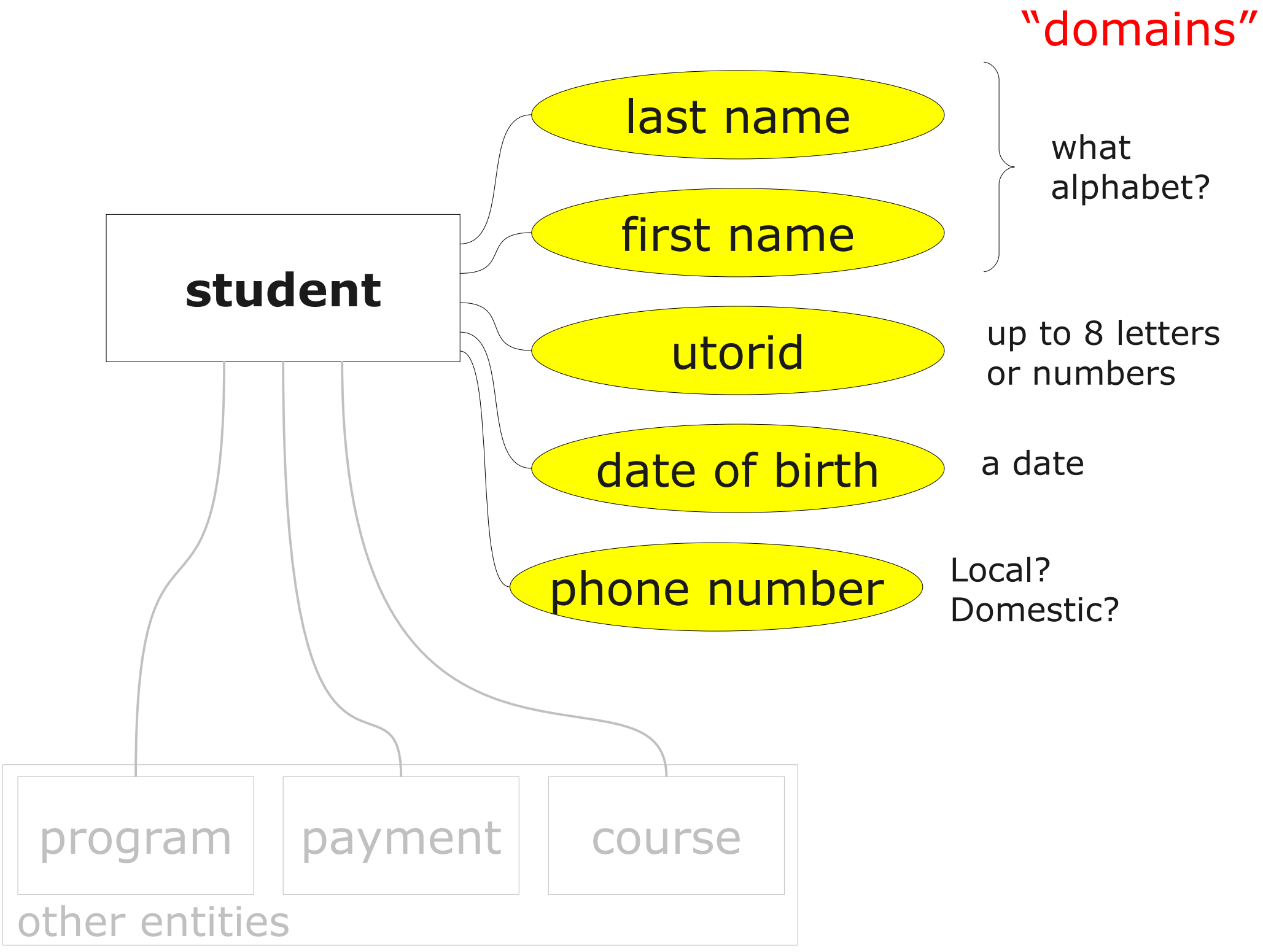
A student wants to enroll in a course for the next semester. The student goes to the website for the enrollment system and logs in. The student is presented with a list of courses there he or she is enrolled in. There is a button next to each course to un-enroll from it. There is also a search box that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

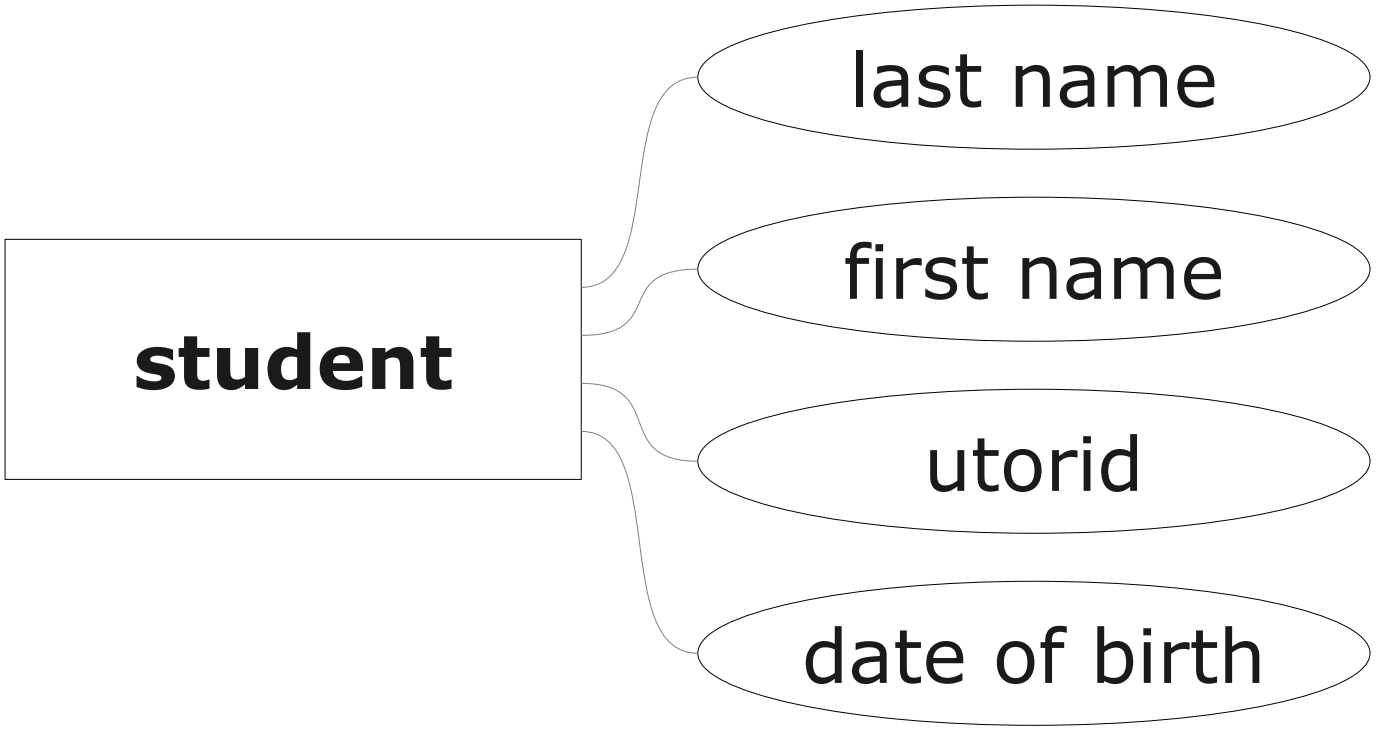
Entities

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

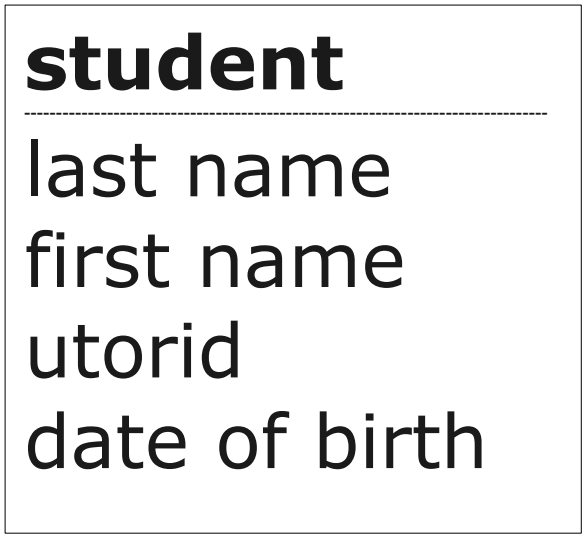
students
courses
instructors
rooms
time slots


attributes
last name
first name
utorid
date of birth
student
program
payment
course
other entities

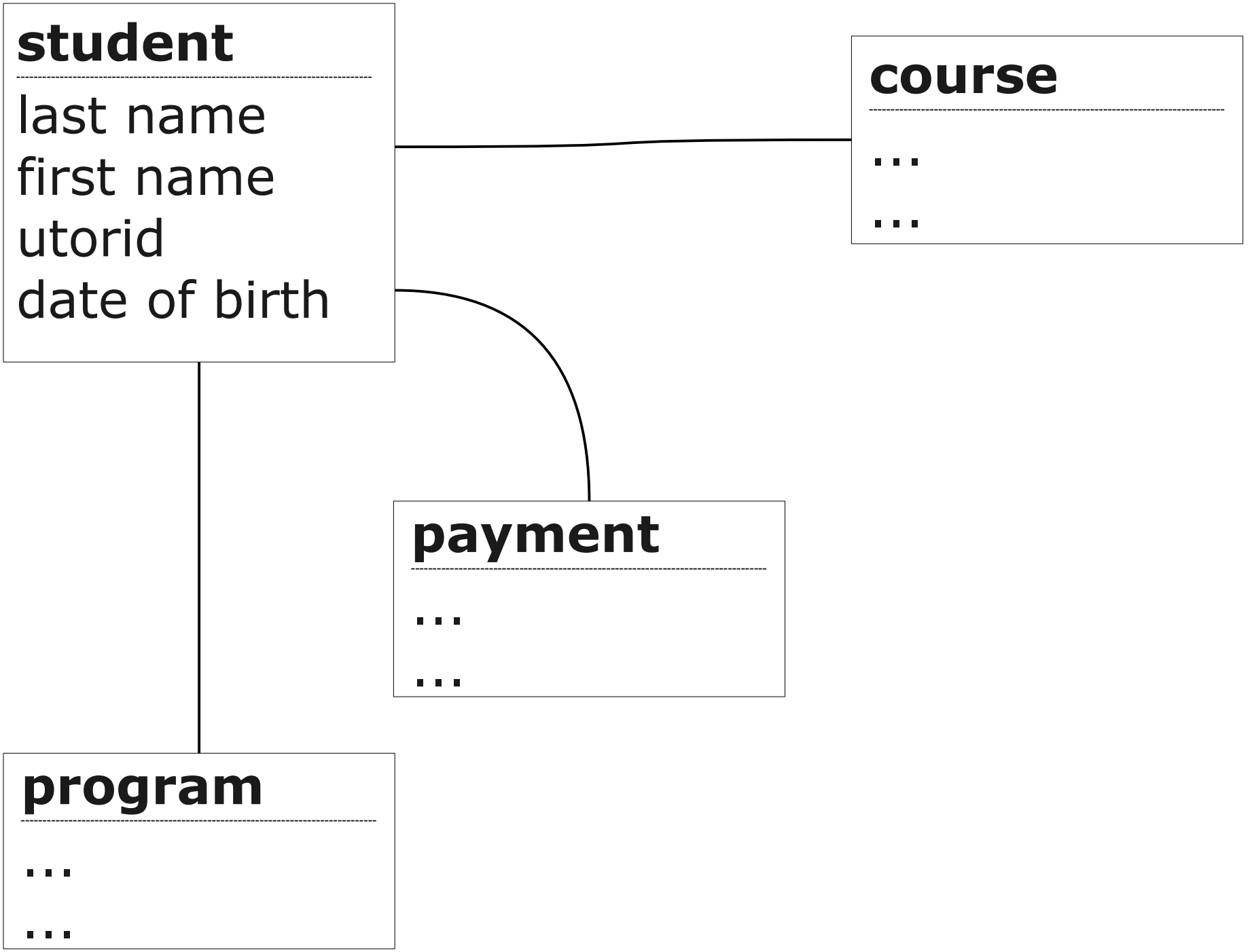

"domains"
student
last name
first name
what alphabet?
utorid
up to 8 letters or numbers
date of birth
a date
phone number
Local? Domestic?
program
payment
course
other entities

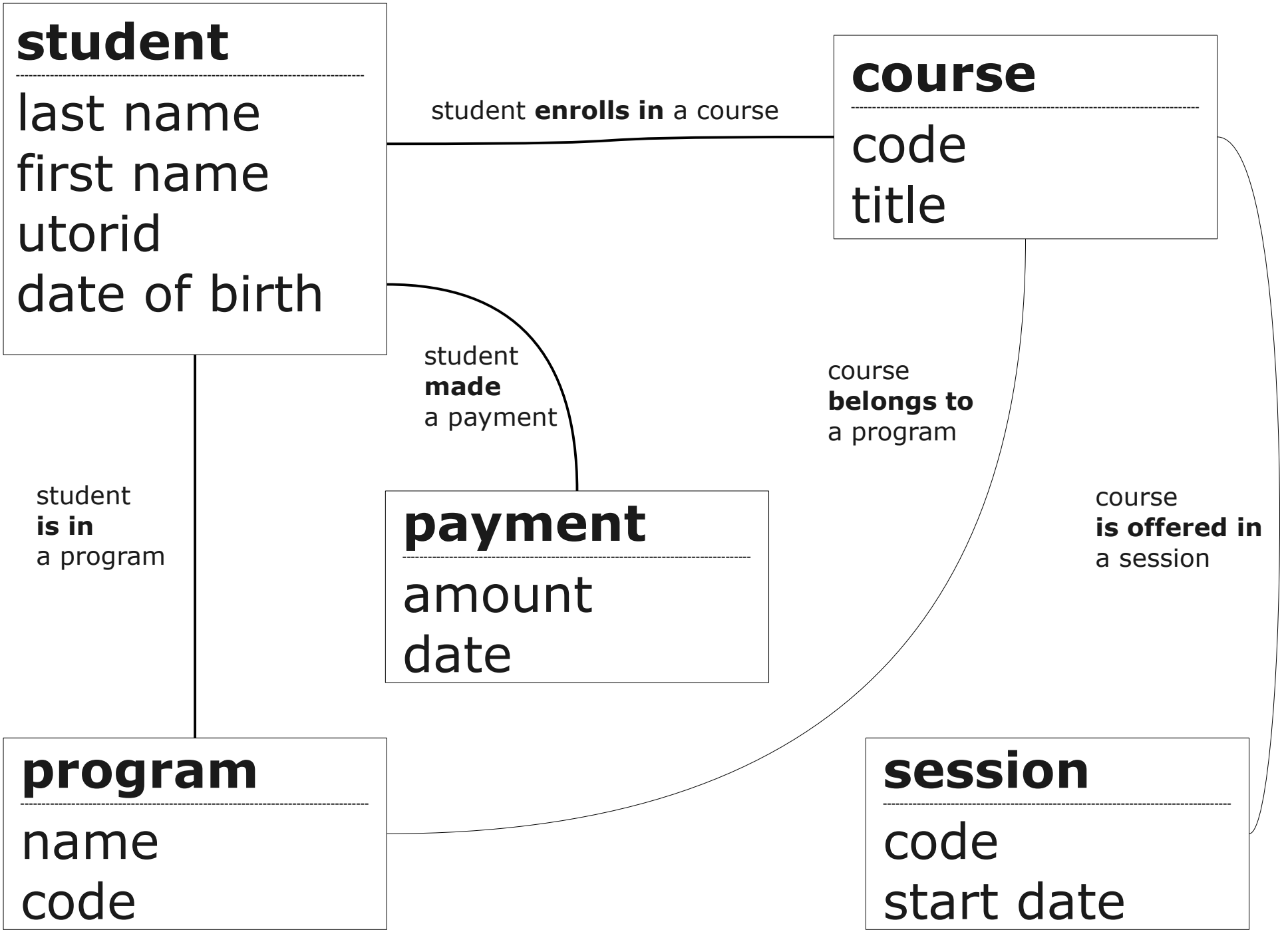


“Chen’s notation”

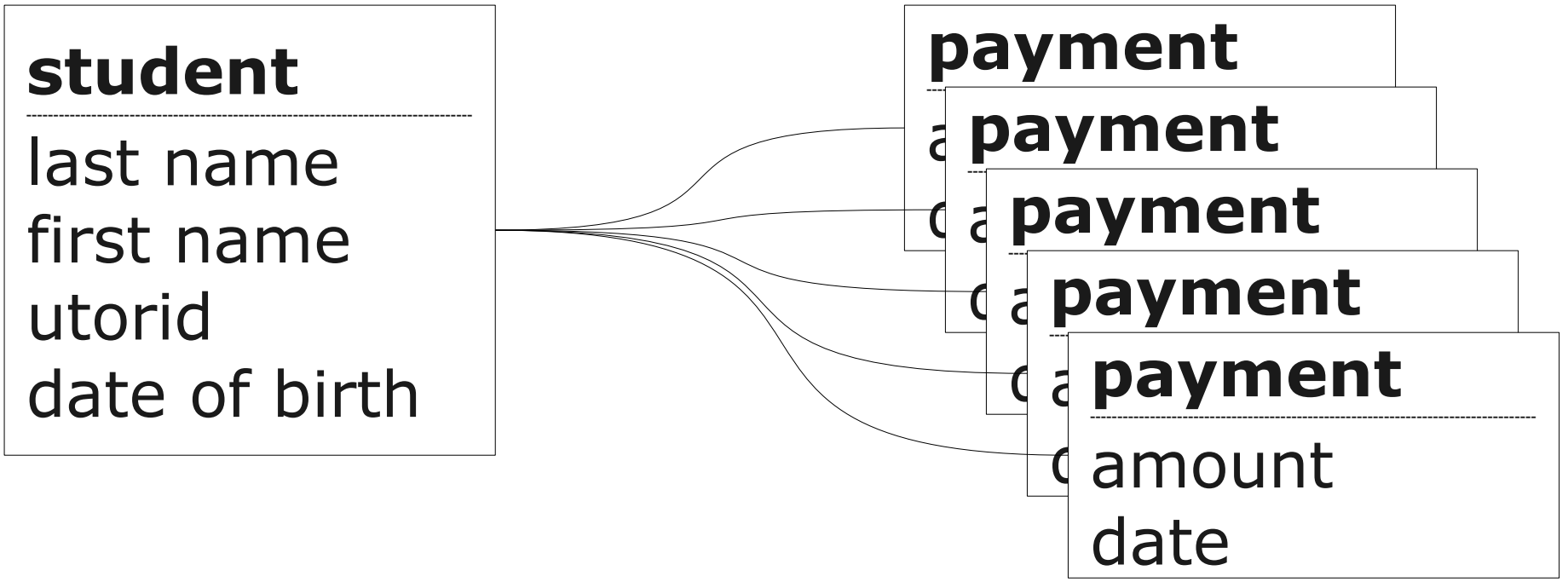


“UML notation”
(simplified)


student
last name
first name
utorid
date of birth
course
...
...
payment
...
...
program
...
...


student
last name
first name
utorid
date of birth
student enrolls in a course
course
code
title
student made a payment
course belongs to a program
student is in a program
course is offered in a session
payment
amount
date
program
name
code
session
code
start date

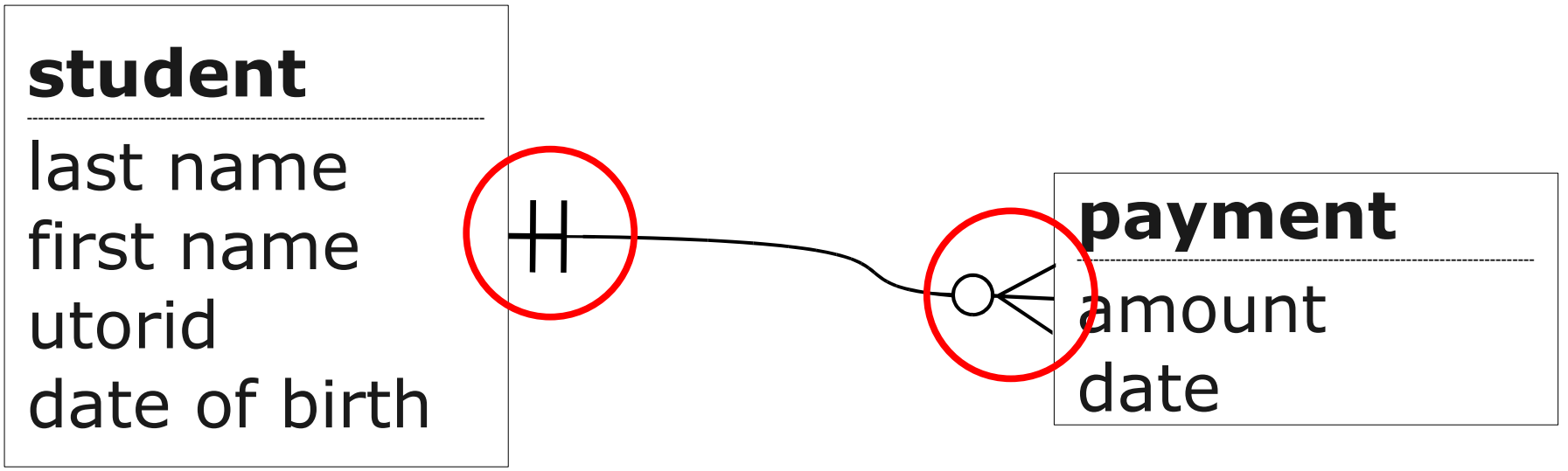
Cardinality



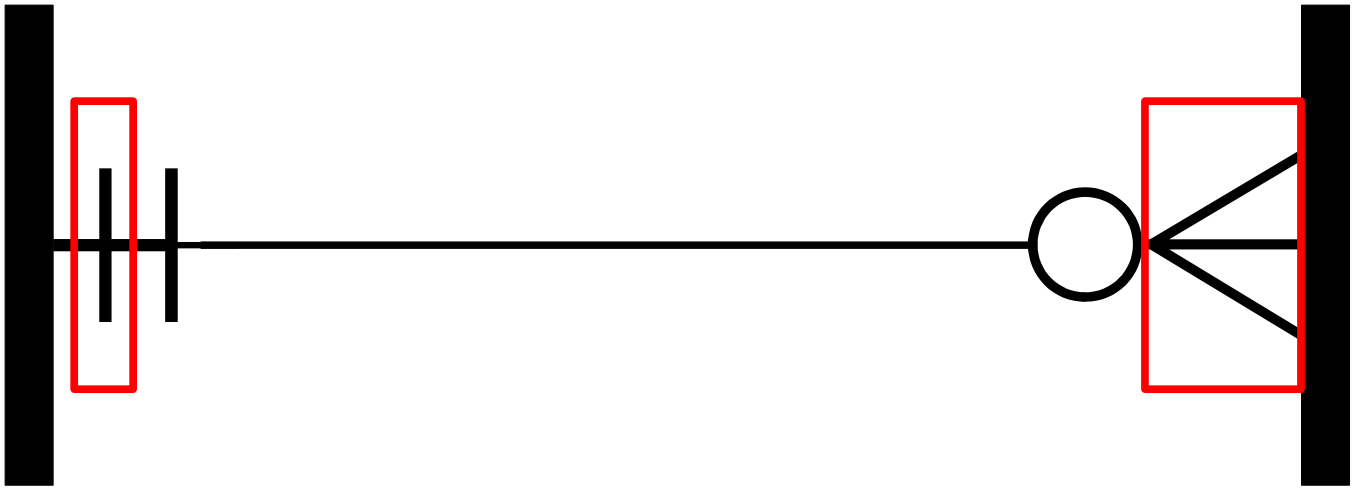
one student, many payments

"one-to-many" relationship

“Crow’s Foot Notation”



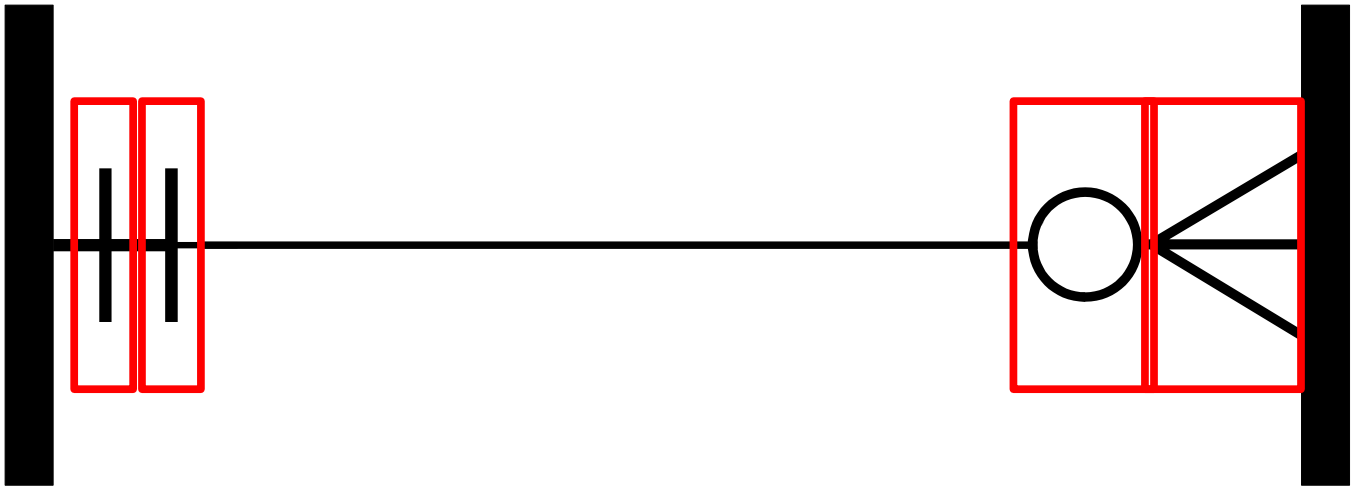
“Crow’s Foot Notation”



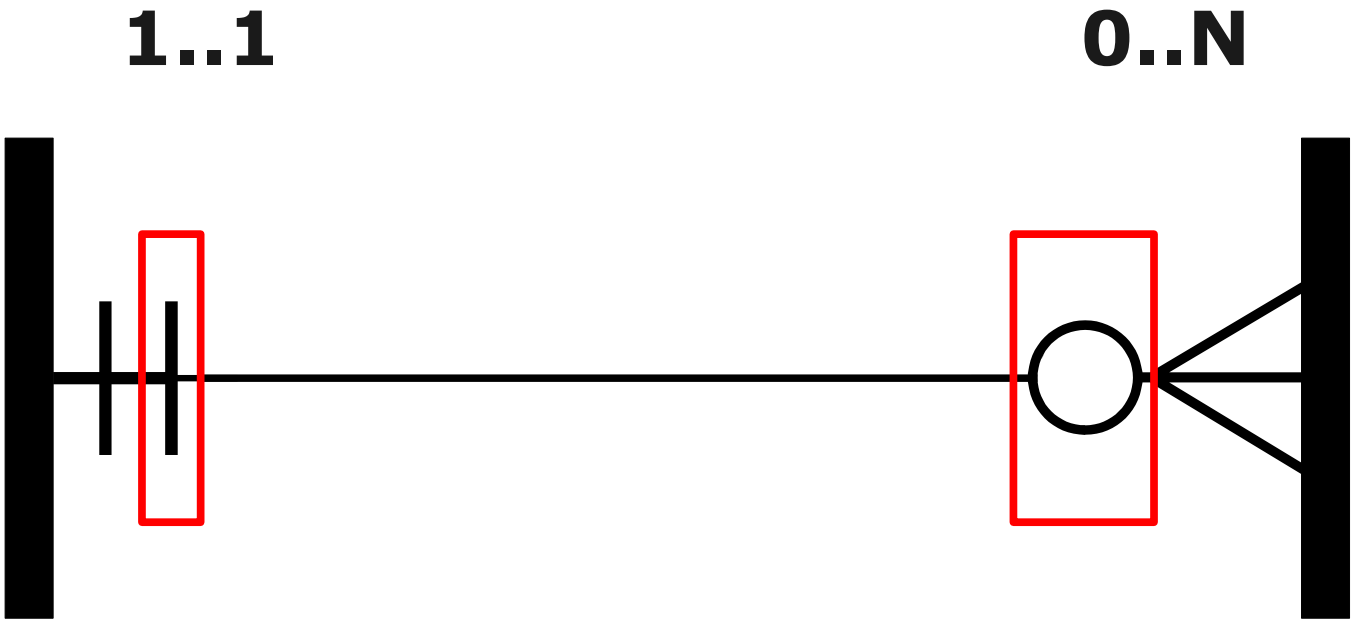
not more than 1

many

“Crow’s Foot Notation”



“Crow’s Foot Notation”



at least 1
(mandatory)

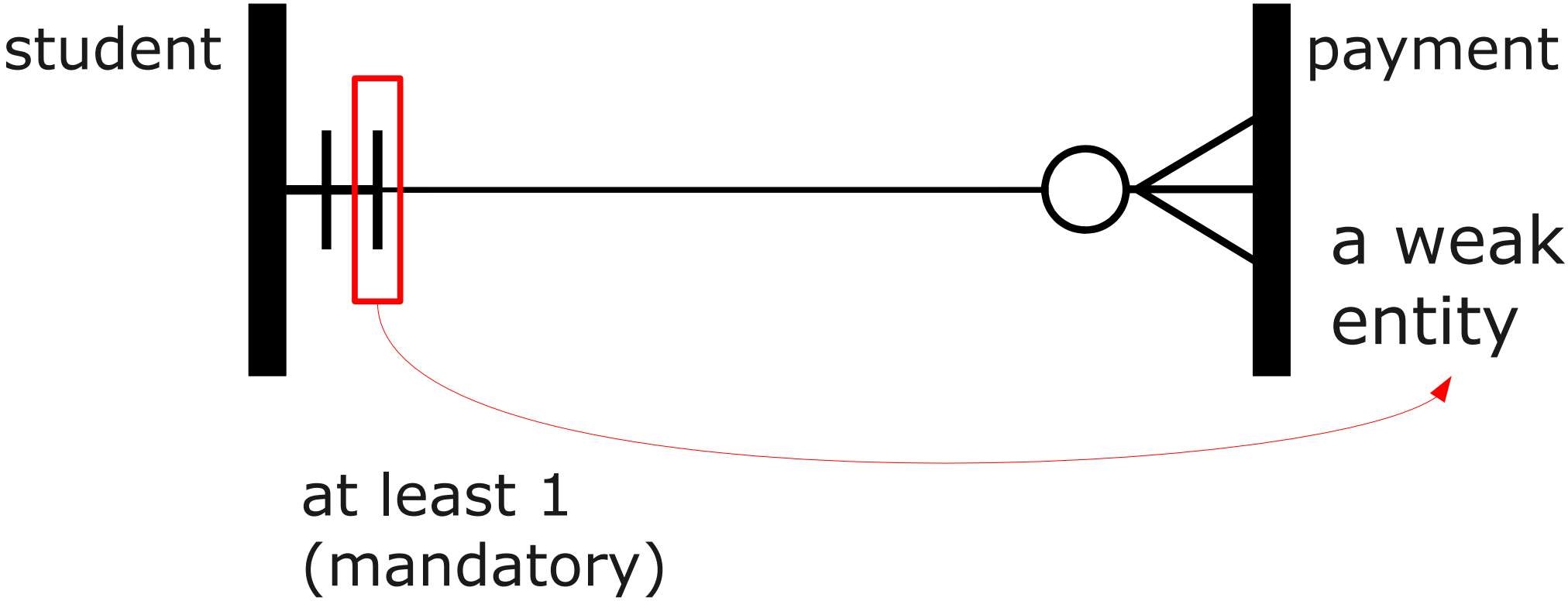
could be 0
(optional)

“UML Notation”

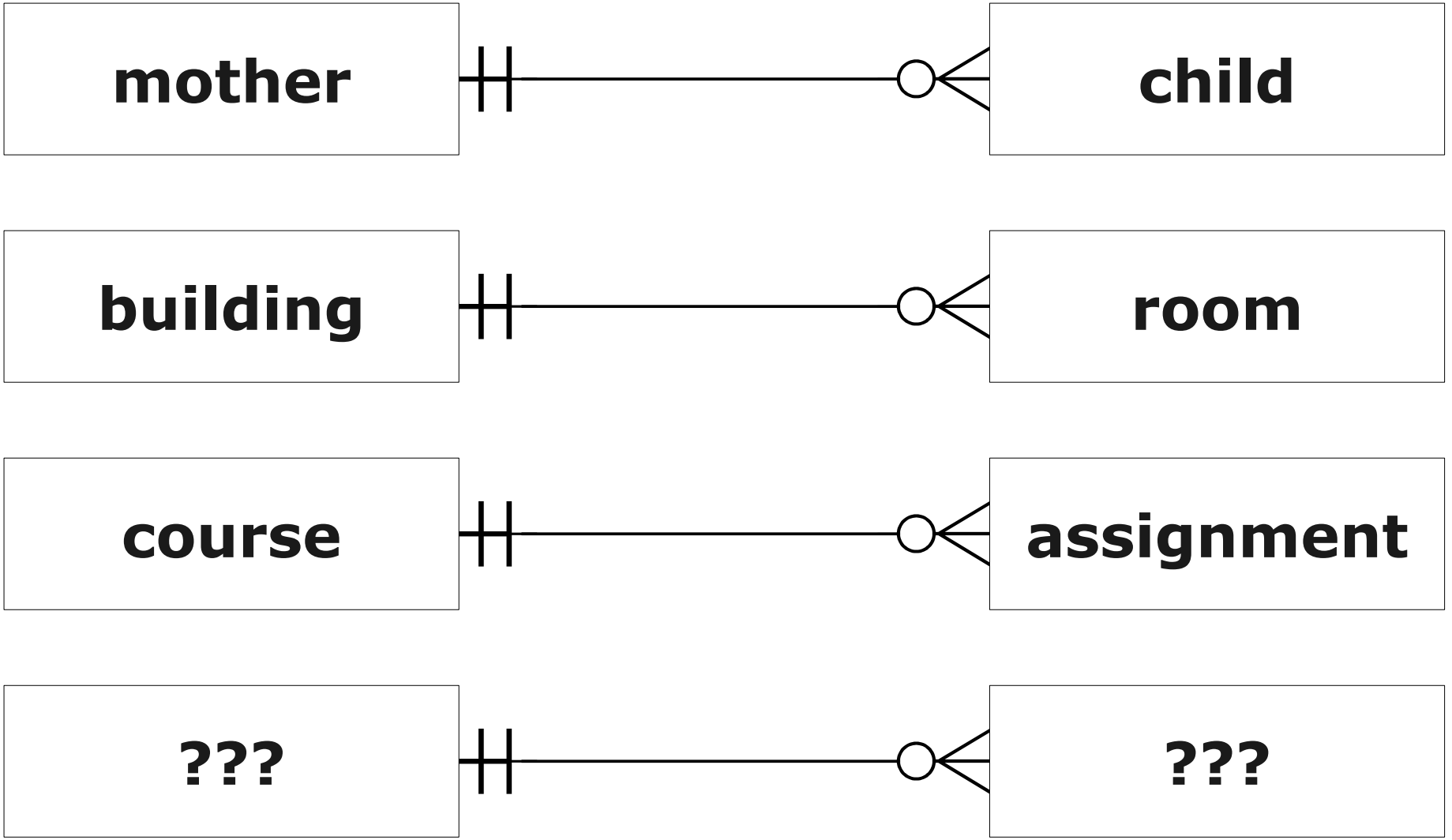
just one

zero or many

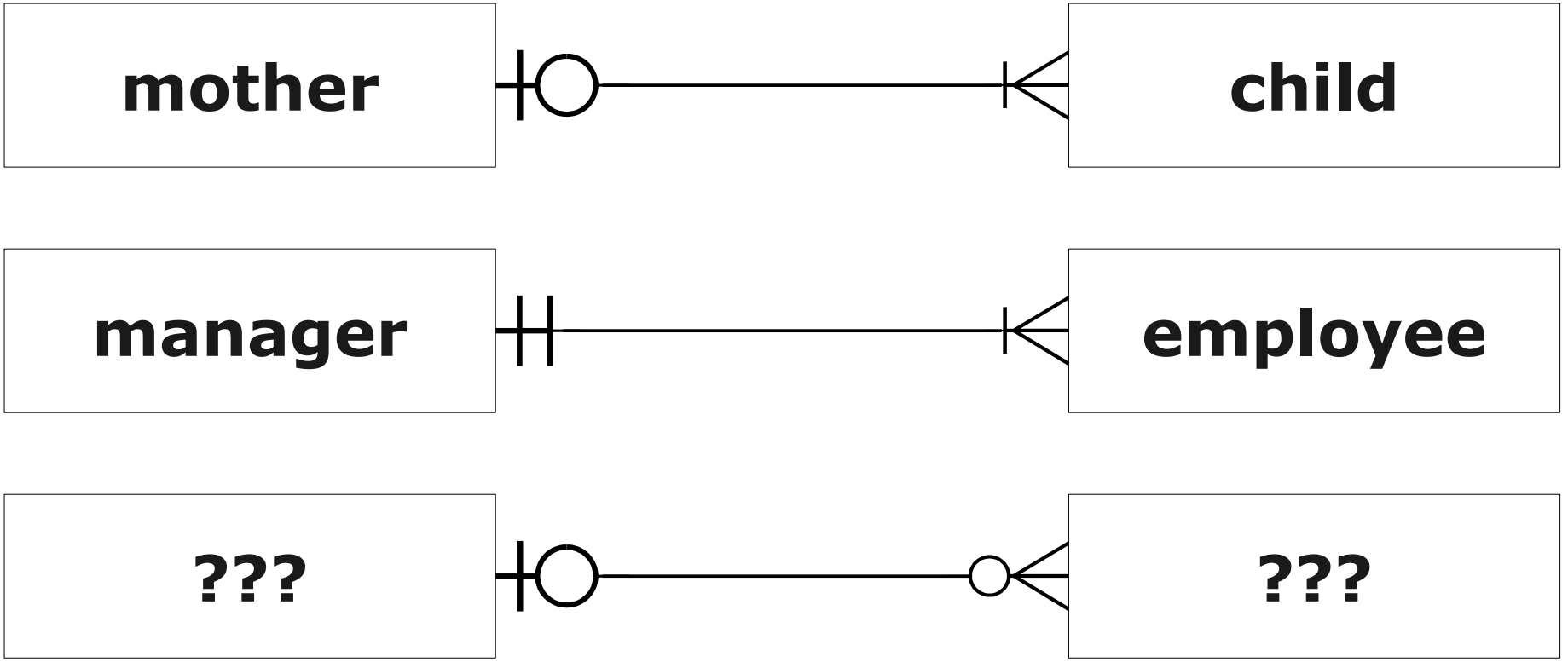
“Weak Entity”



More Examples



Variations

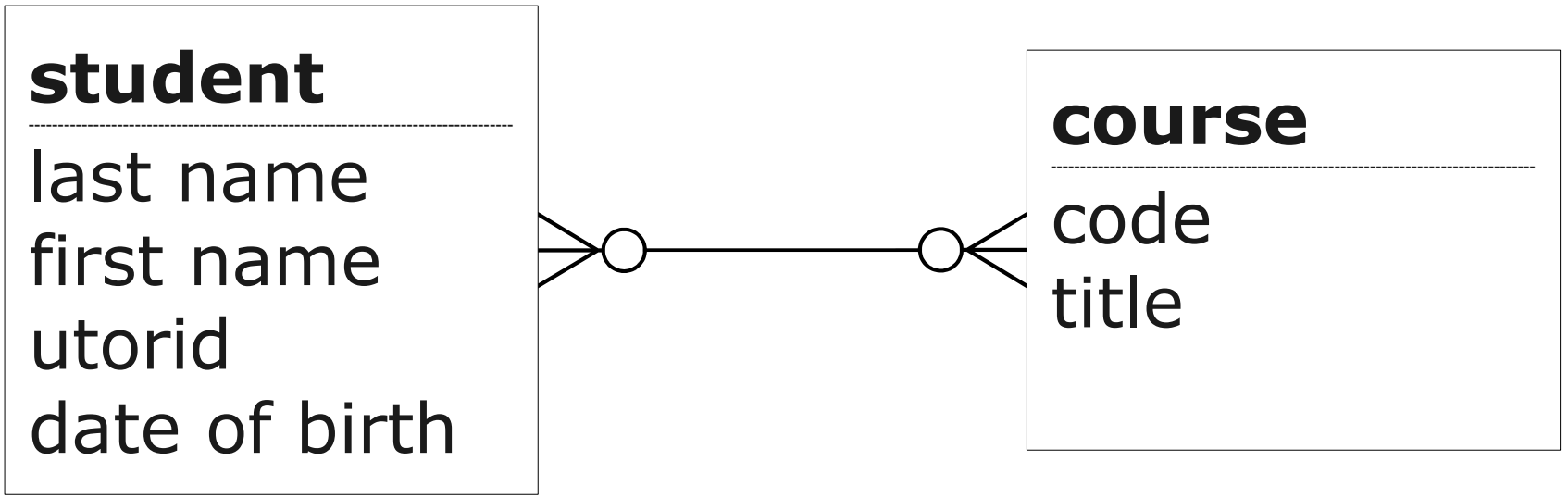


Questions on 1:M?

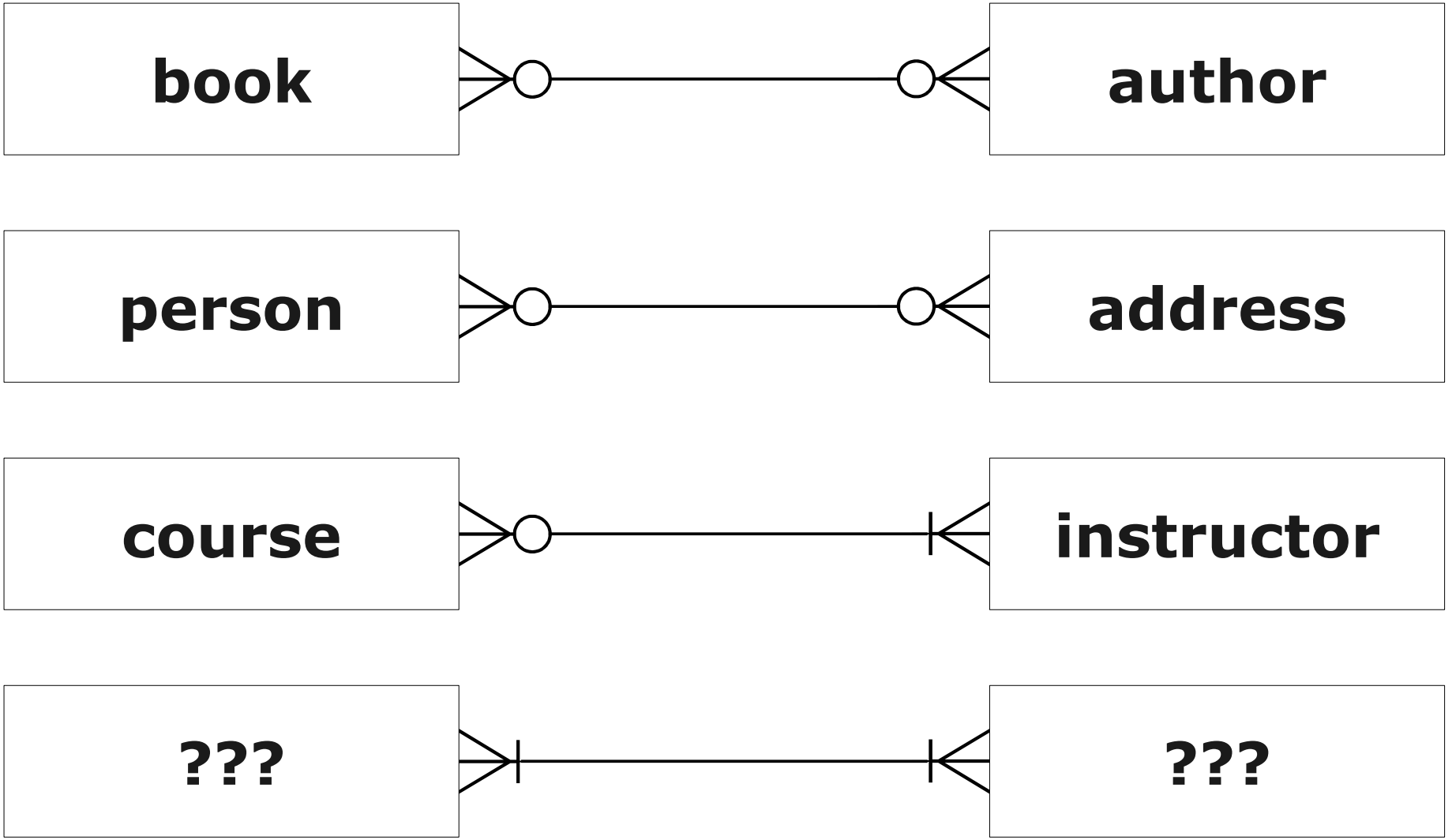
We  1:M

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

Many-to-Many

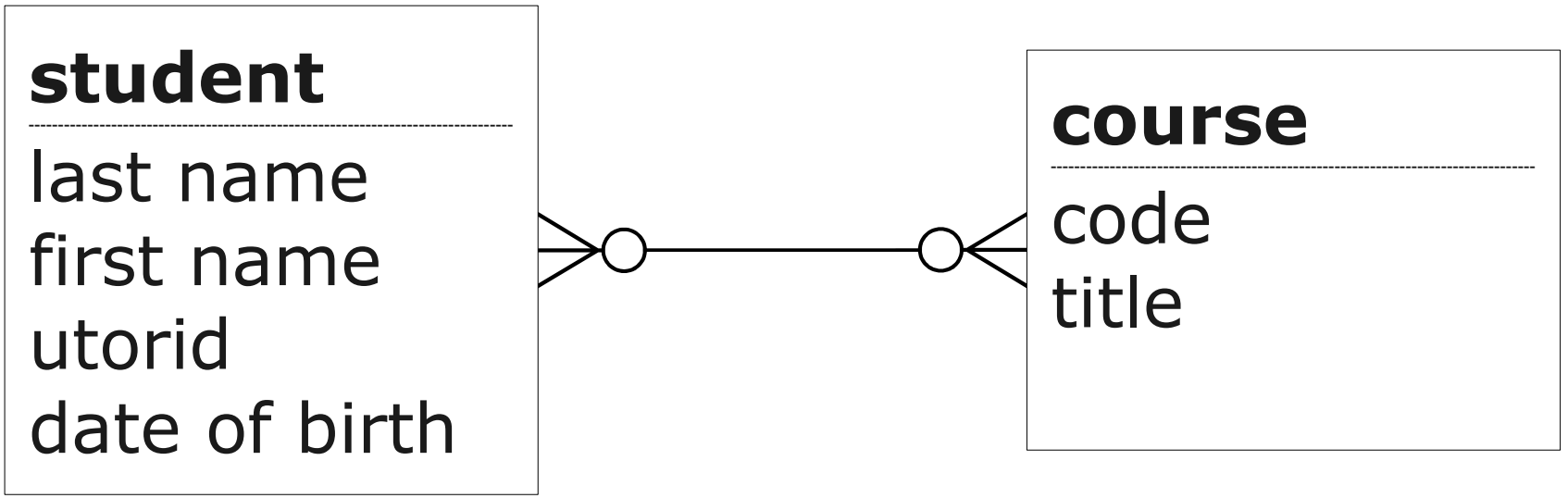

student
last name
first name
utorid
date of birth
course
code
title

Examples

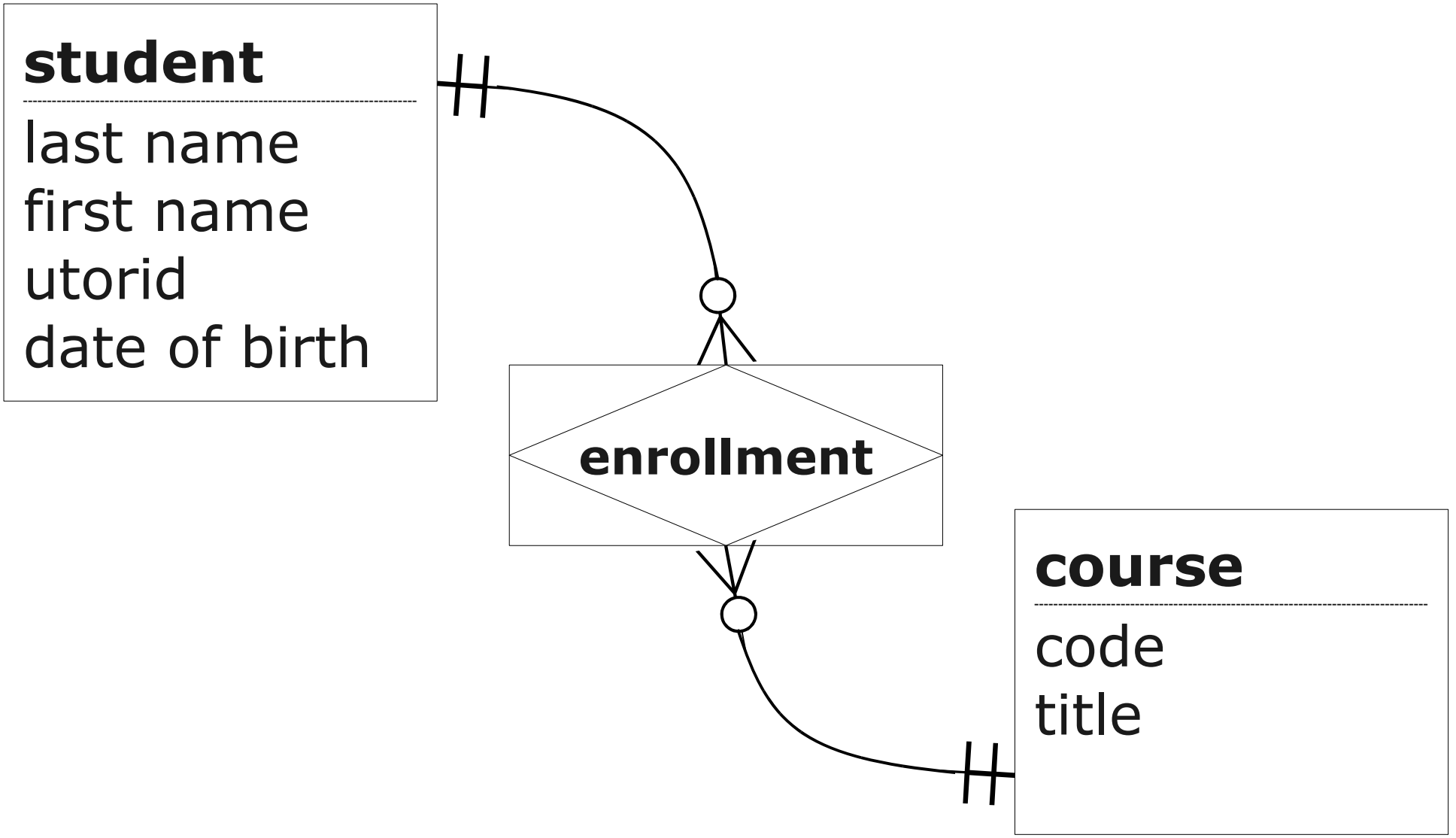


Because they **cannot** be represented in a relational database.

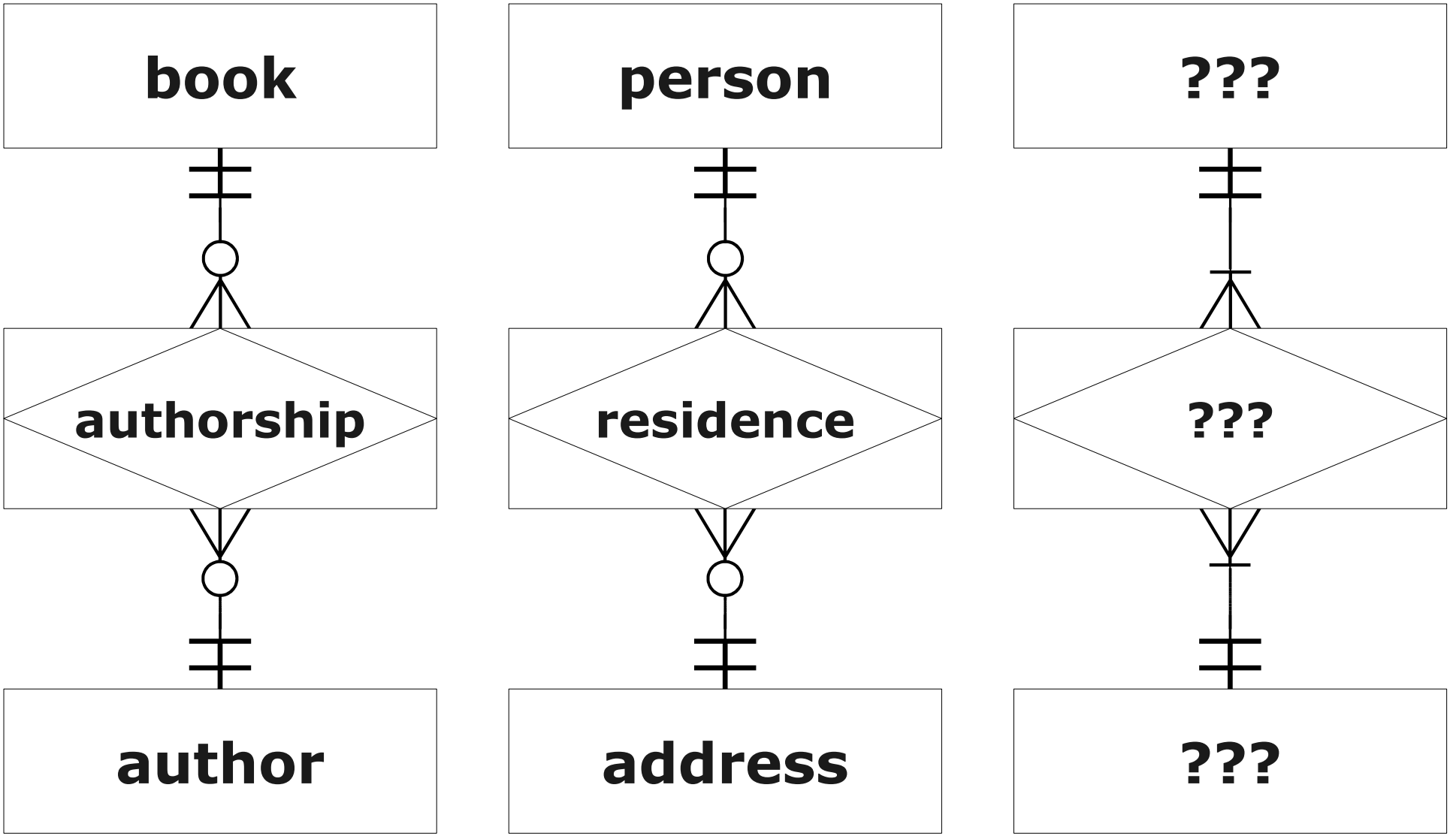
Breaking Up M:M



"Associative Entity"

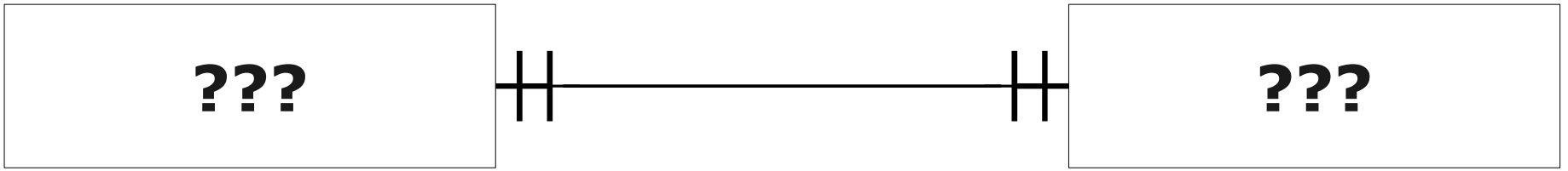


Examples

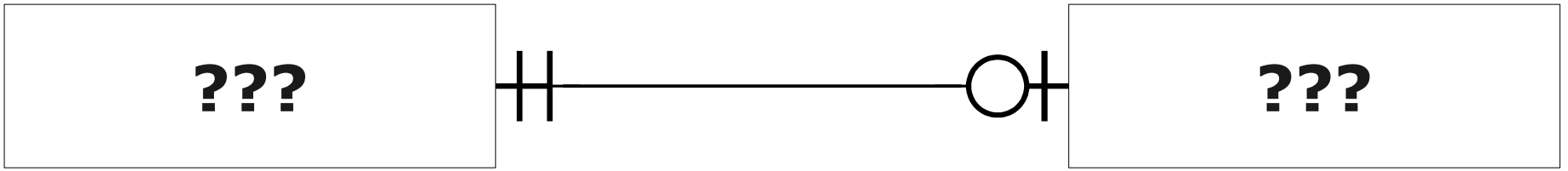


Questions on M:M?

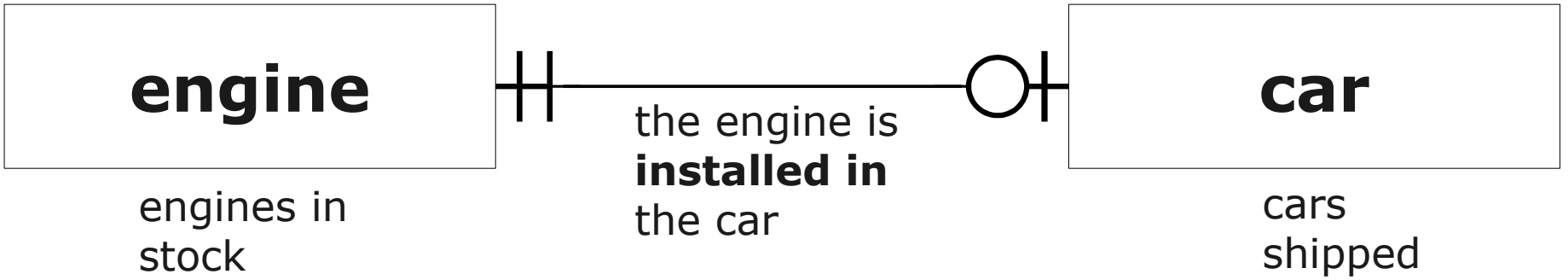
One-to-One



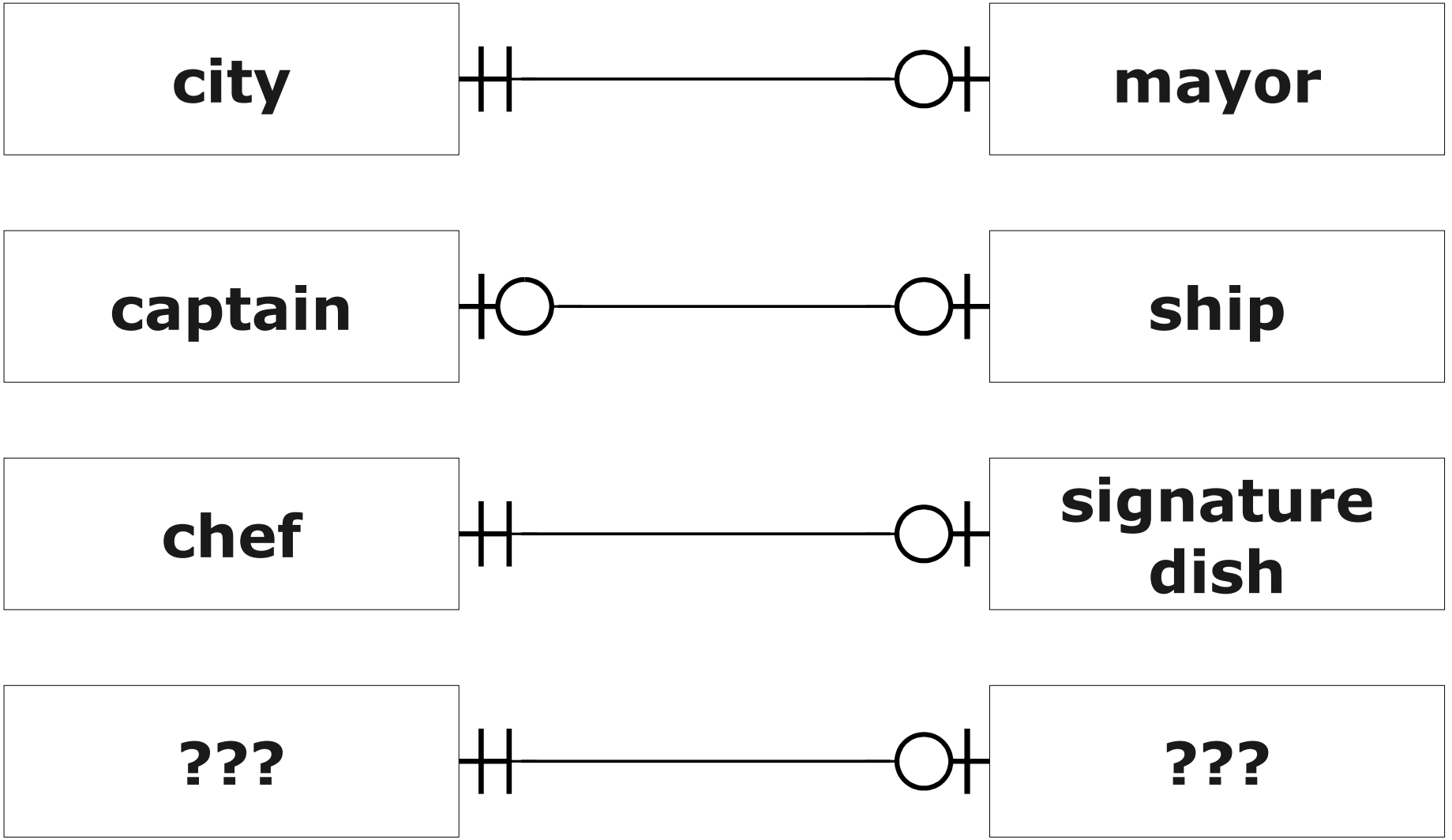
One-to-One



One-to-One

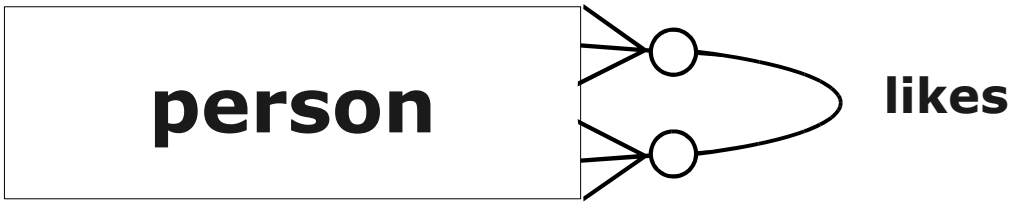

engine
car
the engine is
installed in
the car
engines in
stock
cars
shipped

Examples



Recursive Relationships

Recursive Relationships



Examples

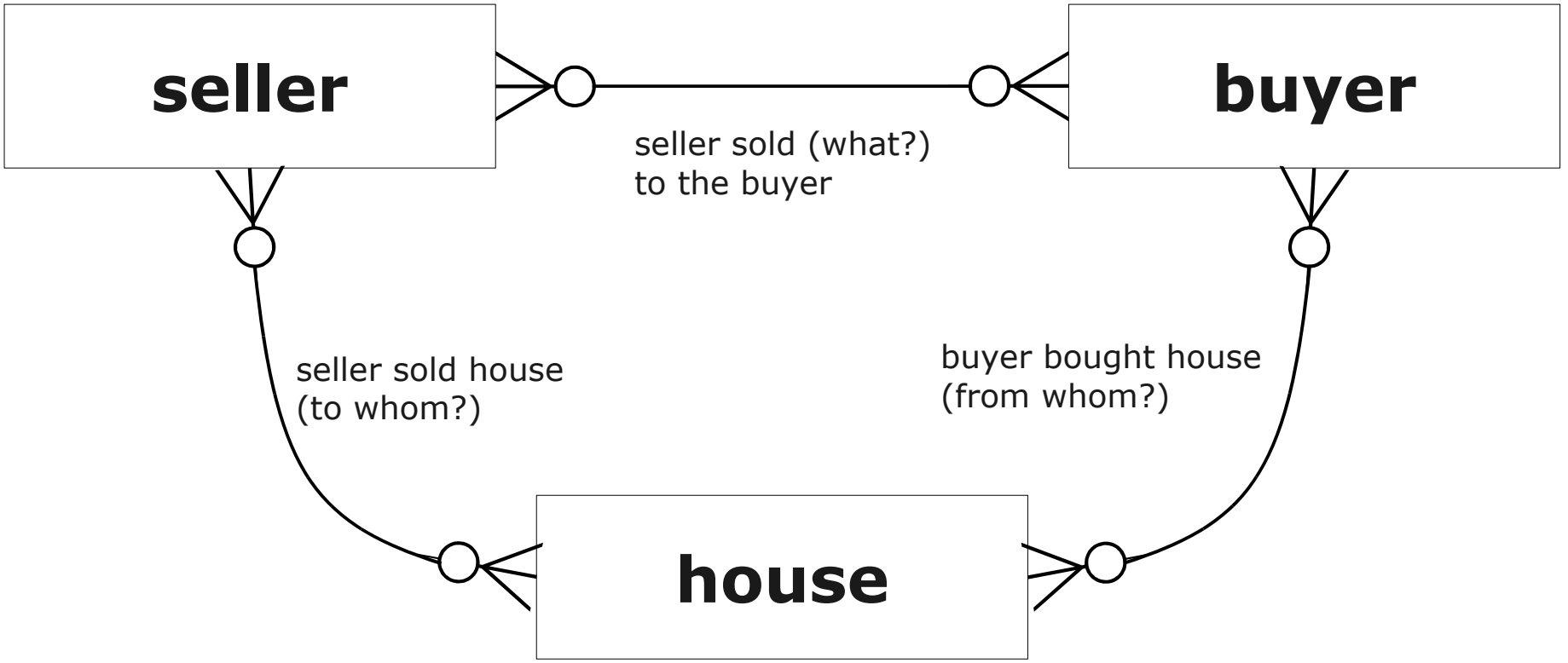
supervises

is filed jointly with

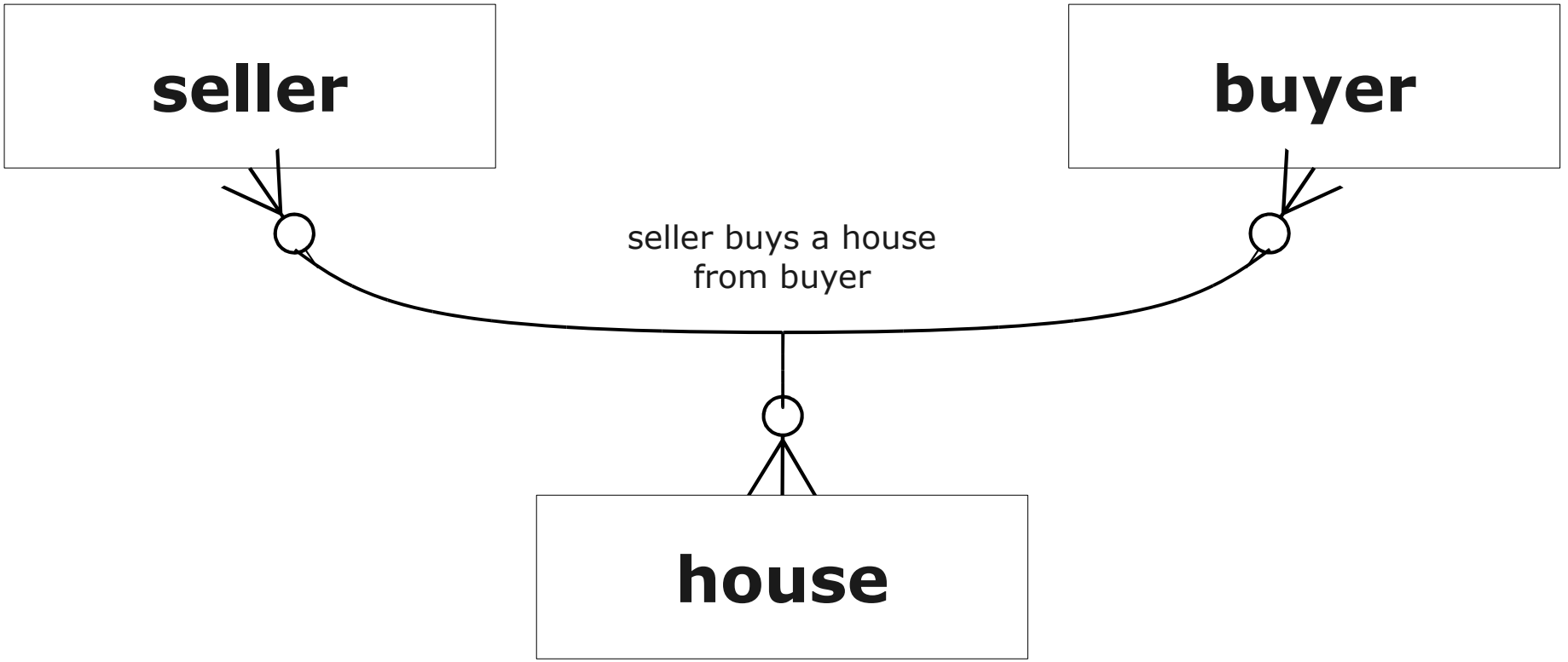
is the flip side of

???

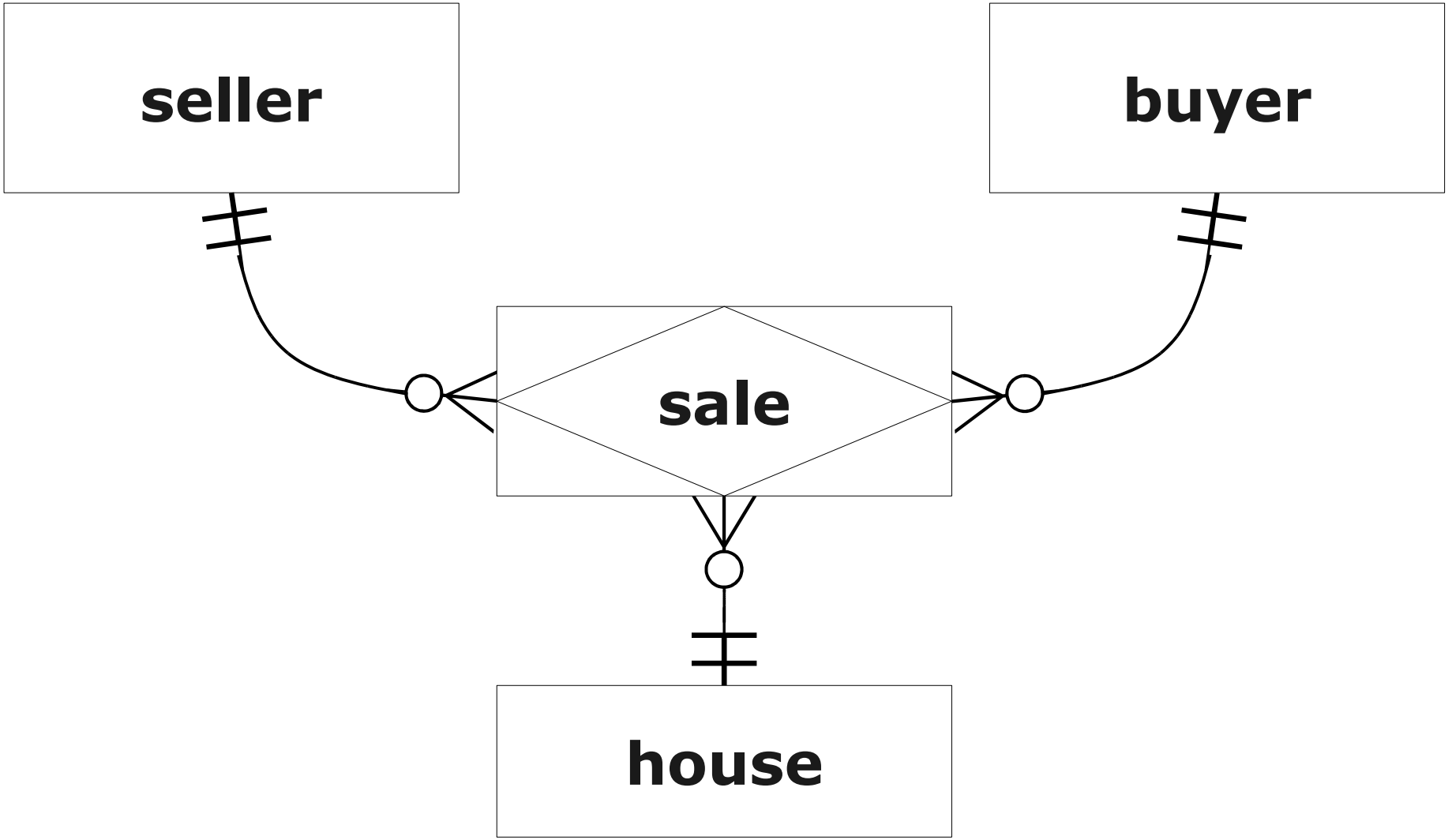
N-nary Relationships



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?