Lab 1. ER Model Design

Outline

- Examples Together
- Split into groups or individually and perform two exercises (20- 30 min)
- Feedback on the performed exercises
- Discussion, reflection, questions

Example 1 Simple ER design

- Draw an ER diagram for the following application from the hospital:
  - A doctor has one or more patients to treat
  - Each doctor has an unique Doctor ID
  - Each patient has a name, phone number, address and date of birth
  - Patient entity is a weak entity
  - Age is a derived attribute

Entity	Attribute	Attribute Type

Exercise 1 ER model for Hospital database

Example 2 Company database

- Draw an ER diagram for the following application from the ABC Company:
  - Employees work for many projects and each project has many employees
  - Each employee has an unique Emp_No
  - Each employee has a name and name consists of first name, and last name
  - Each project has an unique number and name

Entity	Attribute	Attribute Type

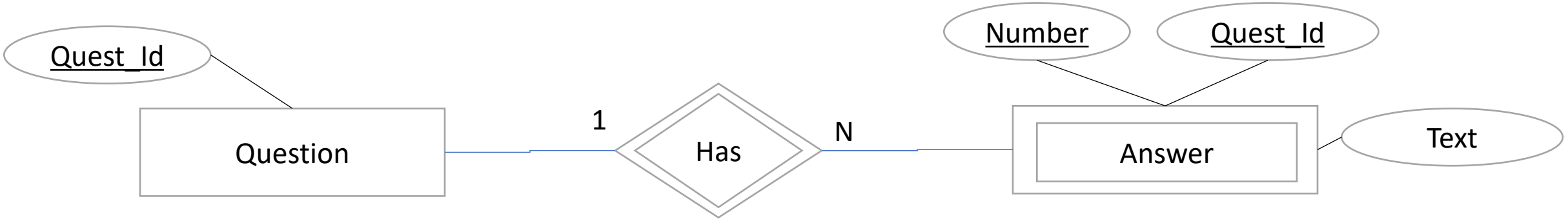
Example 2 ER diagram for ABC Company

Example 2 Weak Entity Types

Question (id, text) and ***Answer (number, question_id, text)*** entities.

Why is the Answer is a weak entity?

- ***Dependence to the question entity***. Every answer is connected to one question (assumption) and so it cannot be on its own.
- ***Identification from the owner key of the question entity.*** One would not be able to identify an answer (assuming that its id is a number identifier) because a question might be answered by answers whose identifier might exist in other questions too. The unique key of the answer entity: is number and *question_id*.



Example 3 Cardinality rations

Entity Type 1	Cardinality Ration	Entity Type 2	Assumptions/Justification
STUDENT		PERSONAL_NUMBER	Student can have one personal number
STUDENT		TEACHER	Student can have one or more teacher. Teacher can have one or more students.
CLASSROOM		WALL	Classroom can have 4 walls
COUNTRY		CURRENT_PRESIDENT	Country can have only one current president
COURSE		BOOK	Course can have one or more books. Book can be used in one or more courses.
STUDNET		CLASS	Student can attend one or more classes. Class can have one or more students
CLASS		INSTRUCTOR	Instructor can have one or more classes, class can have one instructor
INSTRUCTOR		OFFICE	Instructor has one office. But office can have one or more instructors.
PRODUCT		ORDER	Product can be one or more times in order. Order can have one or more products

Example 4 Web Shop

Draw an ER diagram for the following application from the Web Shop:

- A SUPPLIER (ID,name) processes many purchase ORDERs (ID, product_ID, date) and sells a number of PRODUCTs (ID,name). A product is sold by only one supplier.
- Each of the purchase orders that a supplier may process includes several products.
- A CUSTOMER (ID, name) may place one or more purchase orders. A purchase order may be placed by only one customer

Entity	Attribute	Attribute Type

Example 4 ER diagram for Web Shop

Example 5 Gym Fitness Database

The following are the requirements for the Gym Fitness Database:

- For each MEMBER we keep track of the unique MemdID, a well as Name, Zip, and the Date the membership was paid
- For each MEMBERSHIP type we keep track of the unique Mid, as well as MName and Price
- For each PASS CATEGORY we keep track of the unique PassCatID, as well as PCName and Price
- For each ONE DAY PASS we keep track of the unique PassID and Date
- For each MERCHANDISE item we keep track of the unique MrchID, as well as Name and Price
- For each sale TRANSACTION we keep track of the unique Tid and Date

Relationships:

- Each member pays for exactly one membership type; each membership type has at least one member but can have many members
- Each member can buy many day passes but does not have to buy any, each day pass was bought by exactly one member
- Each day pass belongs to exactly one pass category; a pass category can have many individual day passes issued for it but does not have to have any
- Each sale transaction involves exactly one member; each member can be involved in many sale transactions but does not have to be involved in any
- Each merchandise item is sold via at least one sale transaction but it can be sold via many sale transactions; each sale transaction involves at least one merchandise item but can involve many merchandise items
- Every time a merchandise item is sold via a sale transaction, we keep track of the quantity (how many instances of that particular merchandise item were sold via that particular sale transaction)

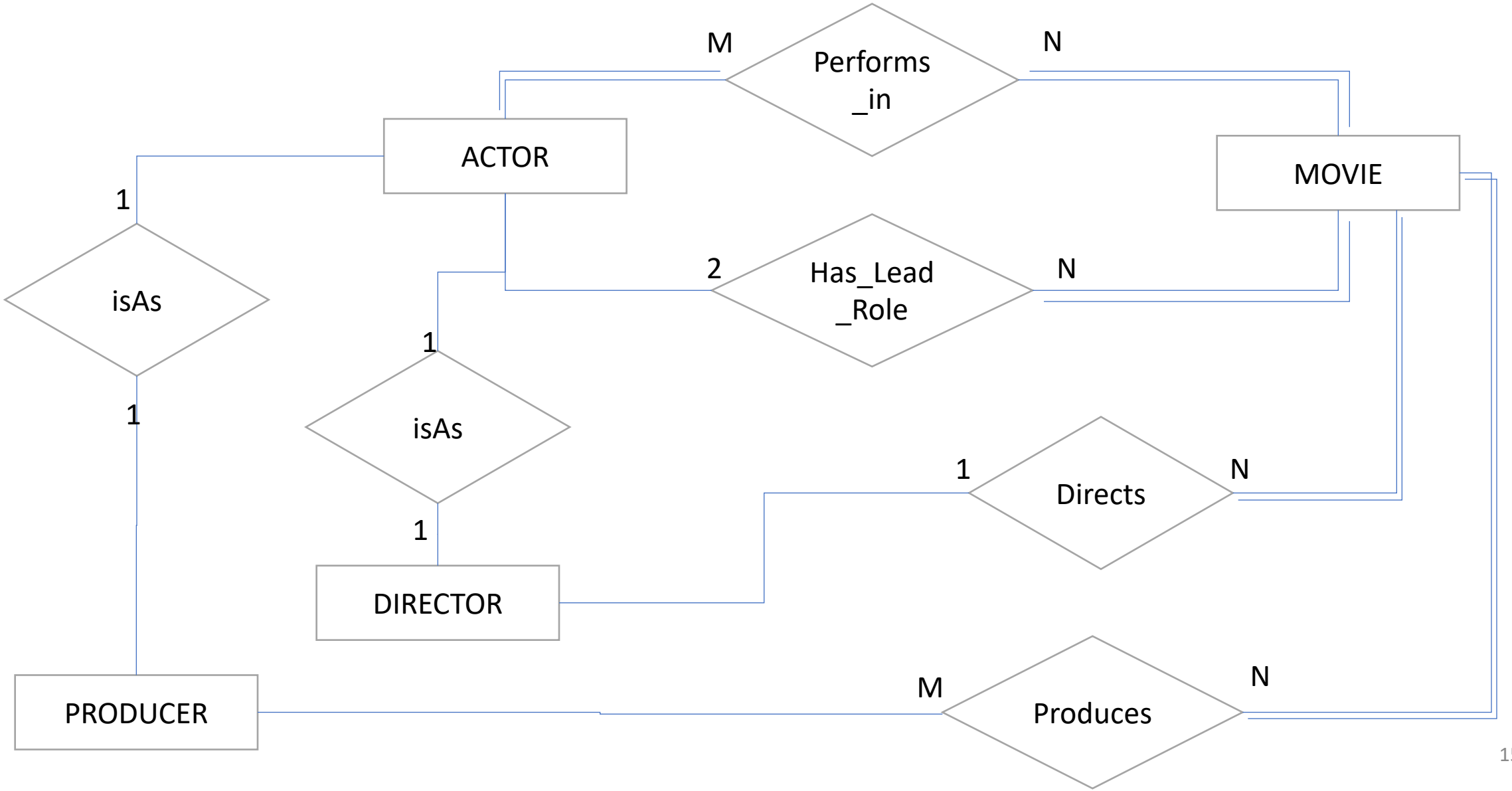
Example 5 ER Diagram for Gym Fitness Database

Split into groups or work individually and perform few exercises (20- 30 min)

Task 1 Movie Database

- Given the constrains shown in ER diagram respond to the following statement with *True*, *False*, *Maybe.* Assign a response of *Maybe* to statements that not explicitly shown to be *true*, can not be proven *False* based on the ER diagram. Discuss and explain your answer:
    1. There are no actors in this database that have been in no movies
    2. A movie can have only one director
    3. A movie can have one or more producers
    4. A movie can have only a maximum of two lead actors
    5. It might be that a director has been an actor in some movie
    6. It can be that no producer has ever been an actor
    7. A producer can not be an actor in some other movie
    8. There are can be movies with more than a dozen actors
    9. Some producers have been a director as well
    10. There are movies which have one director and one producer
    11. Some movies have one director but several producers
    12. There are can be some actors who have done a lead role, directed a movie , and produced a movie

ER Diagram Movie Database



Task 2 Mail order

- Consider a MAIL_ORDER database in which employees take orders for parts from customers. The data requirements are summarized as follows:
  - 1. The mail order company has employees, each identified by a unique employee number, first and last name, and Zip code.
  - 2. Each customer of the company is identified by a unique customer number, first and last name, and Zip code.
  - 3. Each part sold by the company is identified by a unique part number, a part name, price, and quantity in stock.
  - 4. Each order placed by a customer is taken by an employee and is given a unique number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.
- Design an ER (Entity-Relationship) diagram for the mail order database