

HW1

Tuesday, October 1, 2024 4:34 PM

1. Why using a database? Advantages of databases?

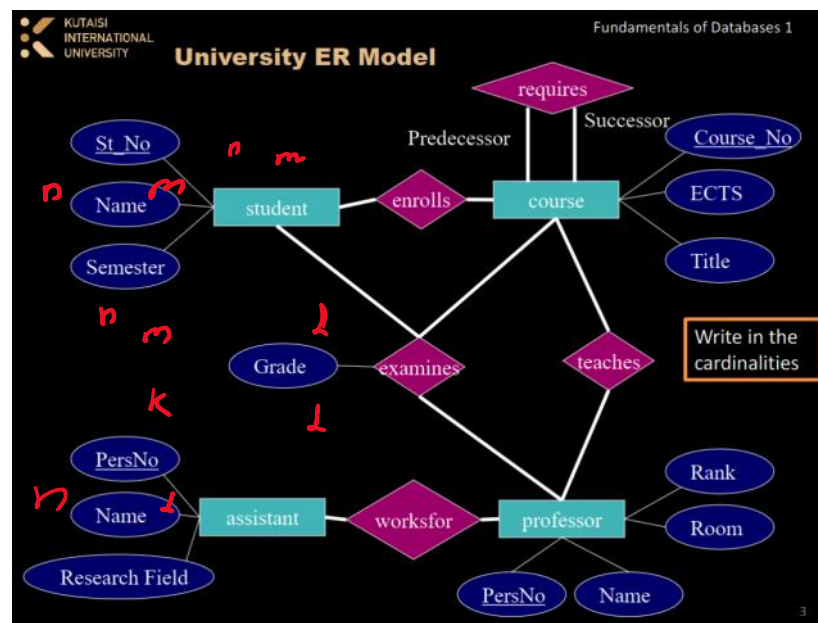
Database unlocks the opportunity to structure the data with predefined schema and flexible constraints, also it supports multi-user access, integrity and controlled permissions of data view.

2. Types of databases?

- Relational (SQL)
 - MySQL, PostgreSQL, MariaDB, etc.
- Non-relational (No-SQL)
 - Graph Databases (neo4j)
 - Key-value store (Redis)
 - Document database (MongoDB)
 - Vector databases, etc...

3. Characteristic of a Relational Database?

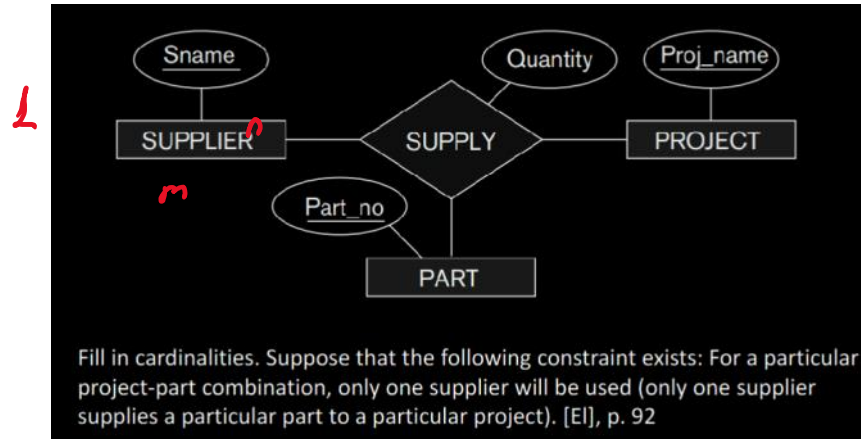
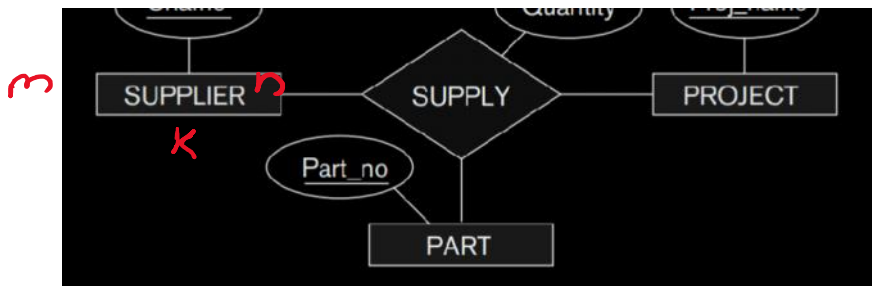
- Database abstracts the access and hides the technical details
- Structural representation data with defined schema
- ACID – Atomicity, Consistency, Integrity, Durability



Substitute Ternary Relationship by Binary Relationships?

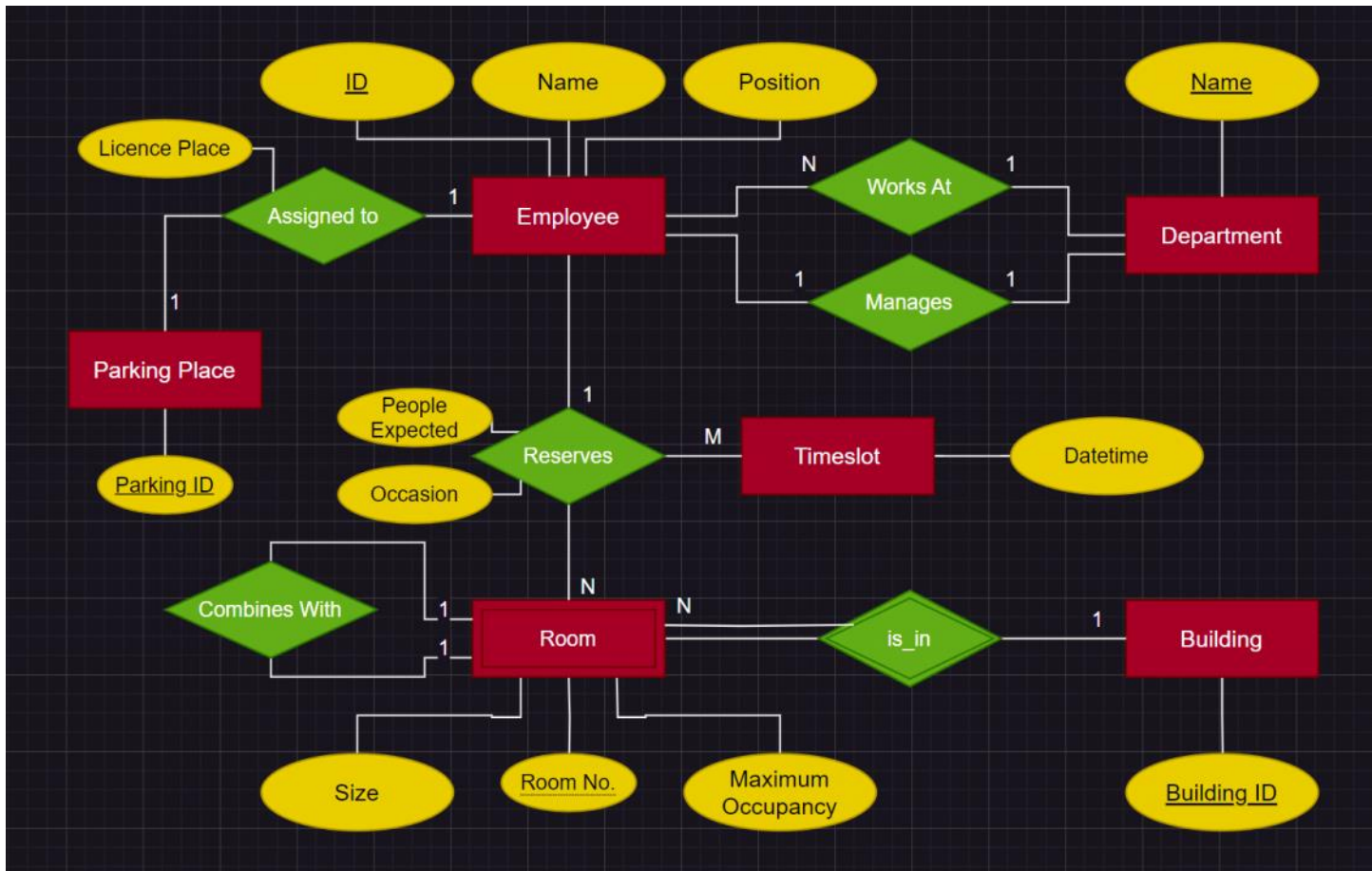
You can substitute and you remain the records, but we lose the connectivity information of doctor/patient via the drug, for example if doctor gave a drug and patient receives the drug, we don't know which doctor gave that drug and vice-versa when there are multiple similar binary relations.





Room Reservation System:

- Develop the ER-model for the following room reservation system for company X (with yEd or Draw.io). Mark primary keys (PKs), add cardinalities and if necessary roles.
1. The database keeps track of the employees with their ID, their name and position.
 2. The database also keeps track of the departments. The department name is stored for each department. Each employee is assigned to one department. Each department has exactly one manager. All managers are employees.
 3. The database keeps track of the meeting rooms that the company has. For each room, size and maximum occupancy is stored. Some meeting rooms can be combined with the neighboring meeting room to render a larger total room. A maximum of two meeting rooms can be combined.
 4. The company occupies several buildings. Room numbers in each building are simply incremented. Meeting rooms are distributed over all buildings.
 5. Employees can reserve meeting rooms for timeslots. (It is enough to have an entity timeslot in the ER model.) The database keeps track of the reservations including the occasion and the information how many people are expected.
 6. Management of the parking spaces is also part of the database: a maximum of one parking space can be assigned to one employee. When an employee is assigned a parking space, the license plate number of the employee's car is stored in the database. All parking spaces are assigned.



Give 3 examples for a total participation constraint in your room reservation ER model:

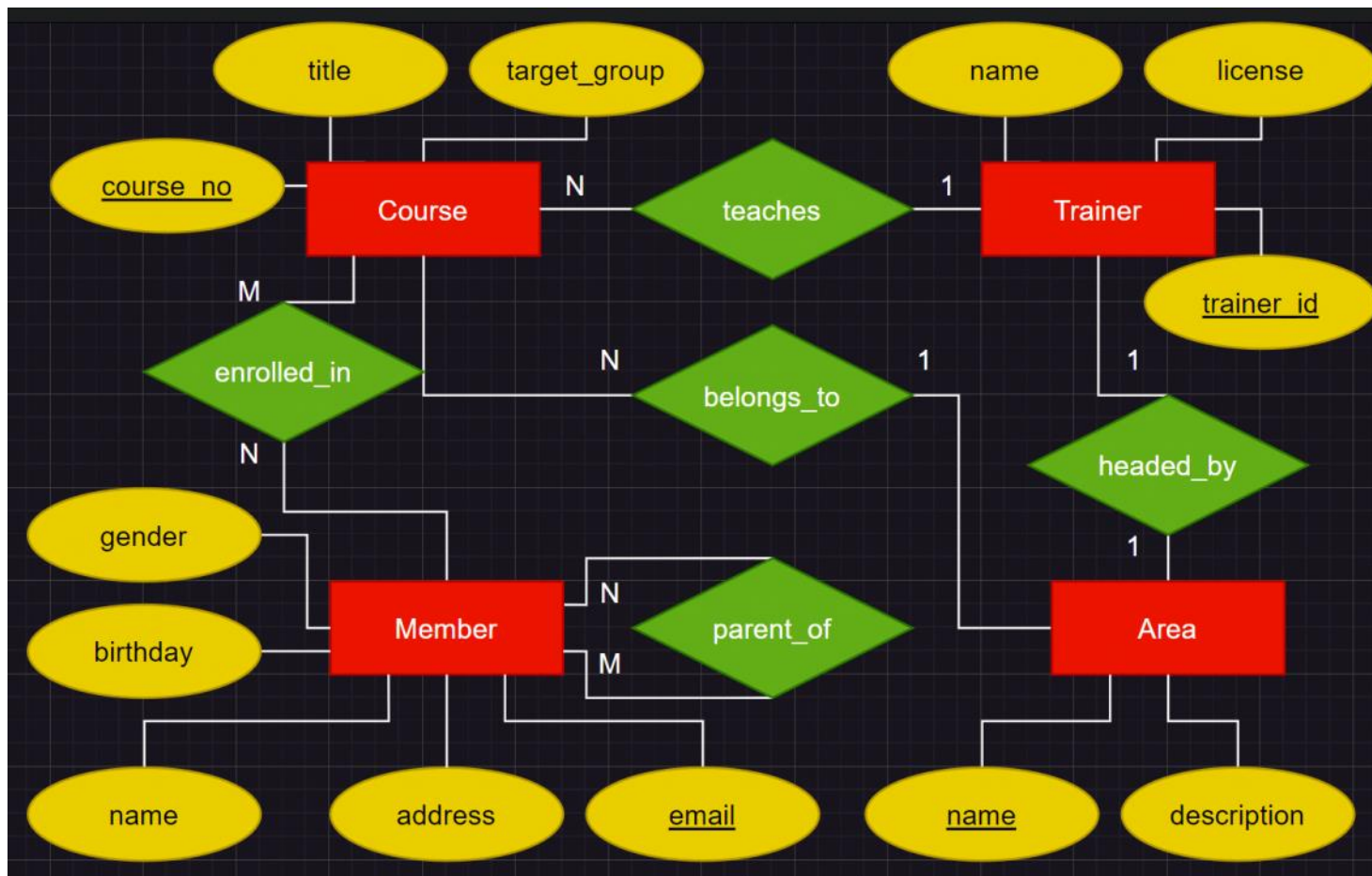
- All rooms must have its building assigned
- All Employee must be assigned to the department
- All Department must be assigned to the manager Employee

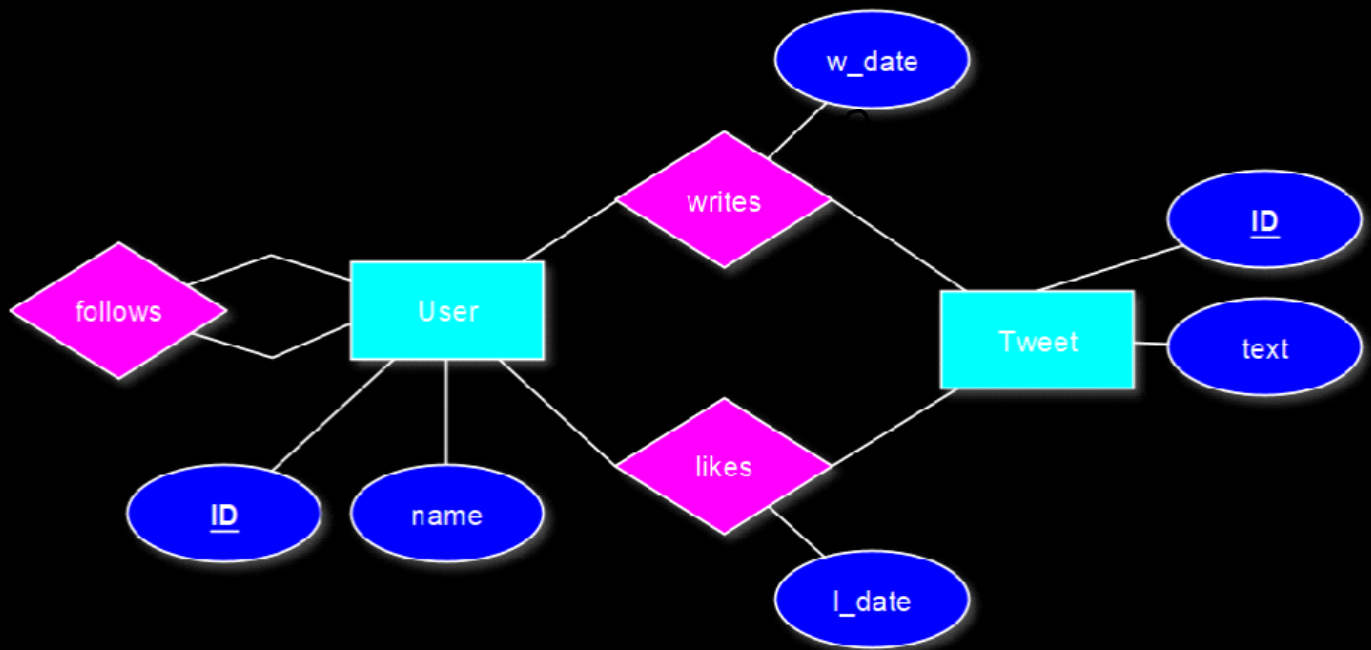
Give 3 examples for a partial participation constraint in your room reservation ER model:

- Not all employee have to be assigned to a parking place (suppose not having a vehicle)
- Not all Employee manage the department
- Room is not mandatory to be combined with another one.

The SportsClub „Fit in Kutaisi“ needs a database for the administration of the club and its data. Develop the ER-model with yEd or draw.io. Mark primary keys (PKs), add cardinalities and if necessary roles.

1. The database keeps track of the members of the club. For each member it stores: name, address, email, gender and birthday.
2. Minors are only allowed as members if at least one parent is also a member. The database keeps track of who is the parent of a minor member.
3. The club offers sports courses. The database keeps track of all courses. The courses are stored with course number, title and target group (e.g. children, juniors, seniors, all, ..)
4. Each course is taught by a trainer. The database keeps track of the trainer name, whether the trainer has a trainer's licence and, of course, all courses that the trainer teaches.
5. The club offers courses in three areas: fitness, wrestling and athletics. The database keeps track of the name of the area and includes a description. All courses belong to exactly one of the areas. Each area is headed by one trainer. The database keeps track which trainer heads which area. One trainer can only head one area.
6. Members can enroll in courses. One member is, of course, allowed to enroll in many courses. Members do not have to enroll in courses.





1. Complete the ER-model with cardinalities and roles.
2. Discuss: Could you assign the attribute w_date (write_date) as an attribute to the entity Tweet instead of an attribute to the relationship write?
3. Discuss: Could you assign the attribute l_date (like_date) as an attribute to the entity Tweet instead of an attribute to the relationship like?

2. It can be assigned to tweet, as one tweet has exactly one "writes" relation from user, where write date can be positioned in Tweet Entity
3. It can't be assigned to Tweet, as Tweet has many relation to user via like, and we can't save all like dates in a tweet.