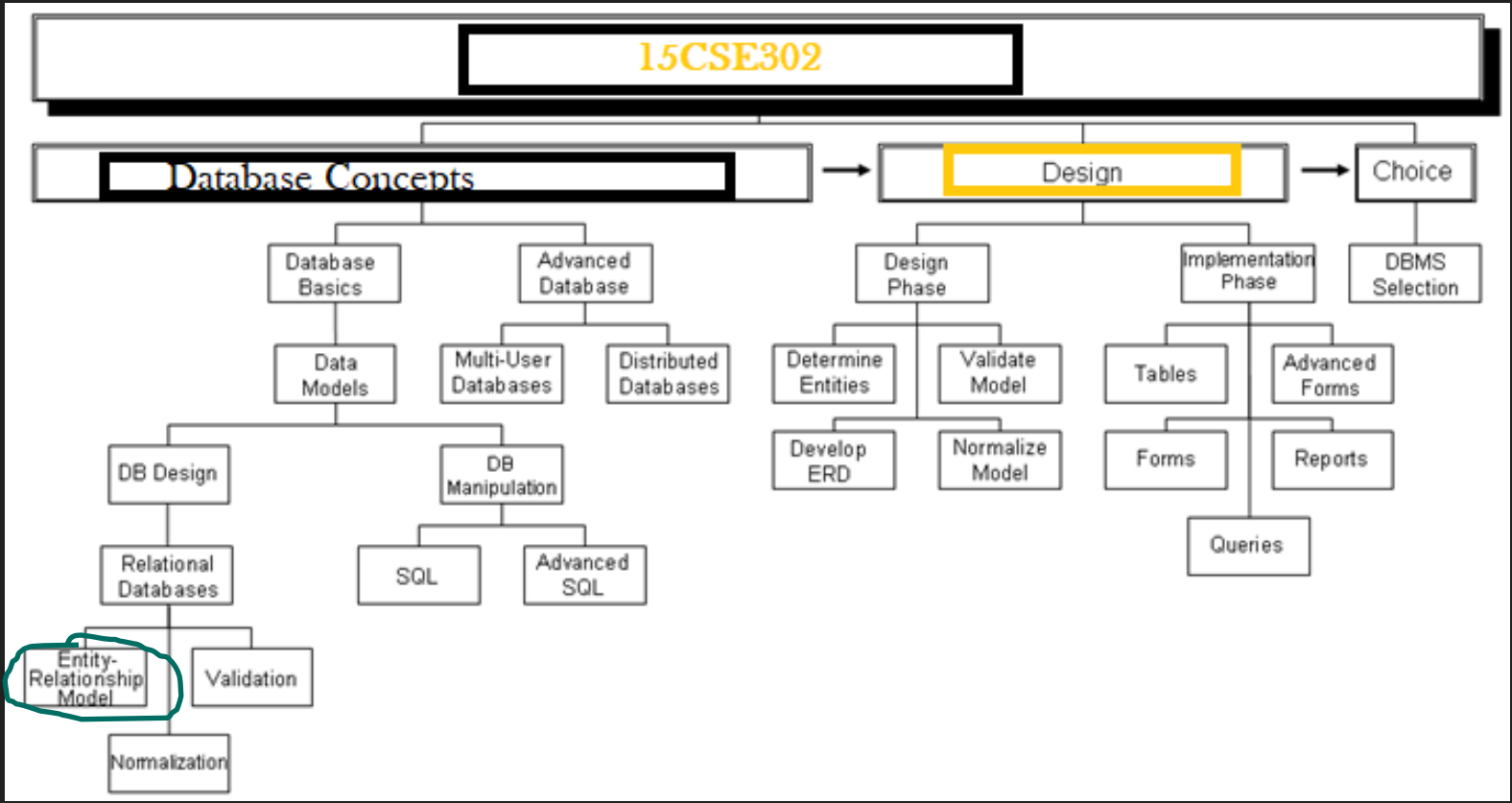
15CSE302 Database Management Systems

Lecture 7 Entity Relationship Diagram

B.Tech /III Year CSE/V Semester L T P C 2 0 2 3

DBMS Team
Dr G Jeyakumar
Bindu K R
Dr Priyanka Kumar
R. Manjusha
Department of CSE
Amrita School of Engineering

Syllabus


15CSE302
Database Concepts
Design
Choice
Database Basics
Advanced Database
Design Phase
Implementation Phase
DBMS Selection
Data Models
Multi-User Databases
Distributed Databases
Determine Entities
Validate Model
Tables
Advanced Forms
DB Design
DB Manipulation
Develop ERD
Normalize Model
Forms
Reports
Relational Databases
SQL
Advanced SQL
Queries
Entity-Relationship Model
Validation
Normalization

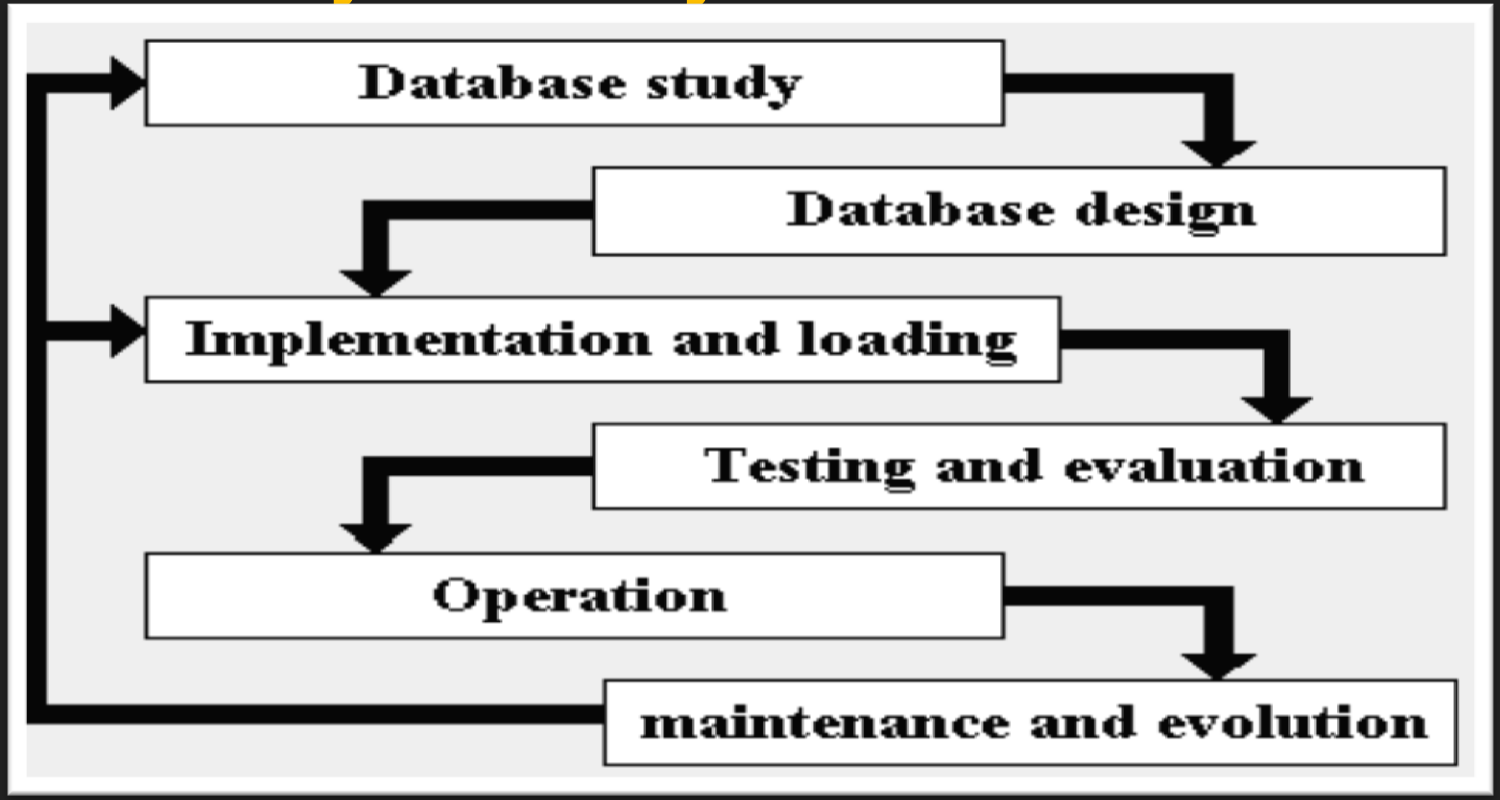
Brief Recap of Previous Lecture

- SQL Basics
- Single Table Queries
- Functions
  - Single value Functions
  - Group Value Functions

Today's Lecture

- ER Diagram

Database Analysis Life Cycle



Entity Relationship Model

Entity Relationship (ER) model conceptual level data model proposed by **Peter P Chen in 1970s**

- Design tool
- Graphical representation of the database system
- provides a high-level conceptual data model
- supports the user's perception of the data
- is DBMS and hardware independent
- had many variants
- is composed of entities, attributes, and relationships

Entities

- An entity is any object in the system that we want to model and store information about
- Individual objects are called entities
- Groups of the same type of objects are called entity types or entity sets
- Entities are represented by rectangles (either with round or square corners)

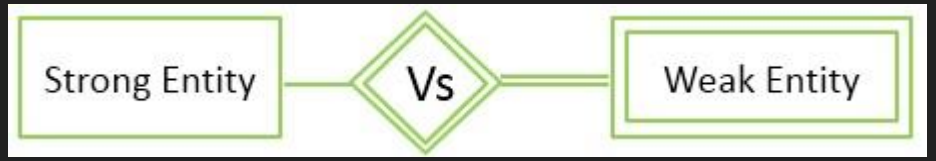
Entities

Entity types

Two types of entities

- Weak entity
- Strong entity

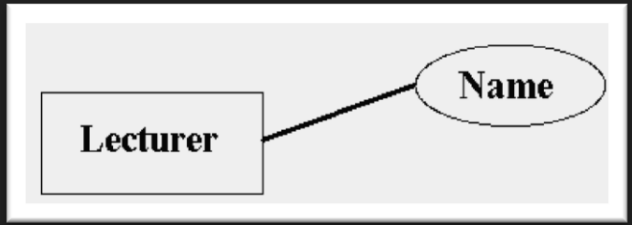
Entity types



Basis for comparison	Strong Entity	Weak Entity
Depends	The Strong entity is independent of any other entity in a schema.	Weak entity depends on the strong entity for its existence.
Denoted	Strong entity is denoted by a single rectangle.	Weak entity is denoted with the double rectangle.
Relation	The relation between two strong entities is denoted by a single diamond simply called relationship.	The relationship between a weak and a strong entity is denoted by Identifying Relationship denoted with double diamond.
Participation	Strong entity may or may not have total participation in the relationship.	Weak entity always has total participation in the identifying relationship shown by double line.

Attribute

- All the data relating to an entity is held in its attributes.
- An attribute is a property of an entity.
- Each attribute can have any value from its domain.
- Each entity within an entity type:
  - May have any number of attributes.
  - Can have different attribute values than that in any other entity.
  - Have the same number of attributes.
- They appear inside **ovals** and are **attached to their entity**.



Attribute

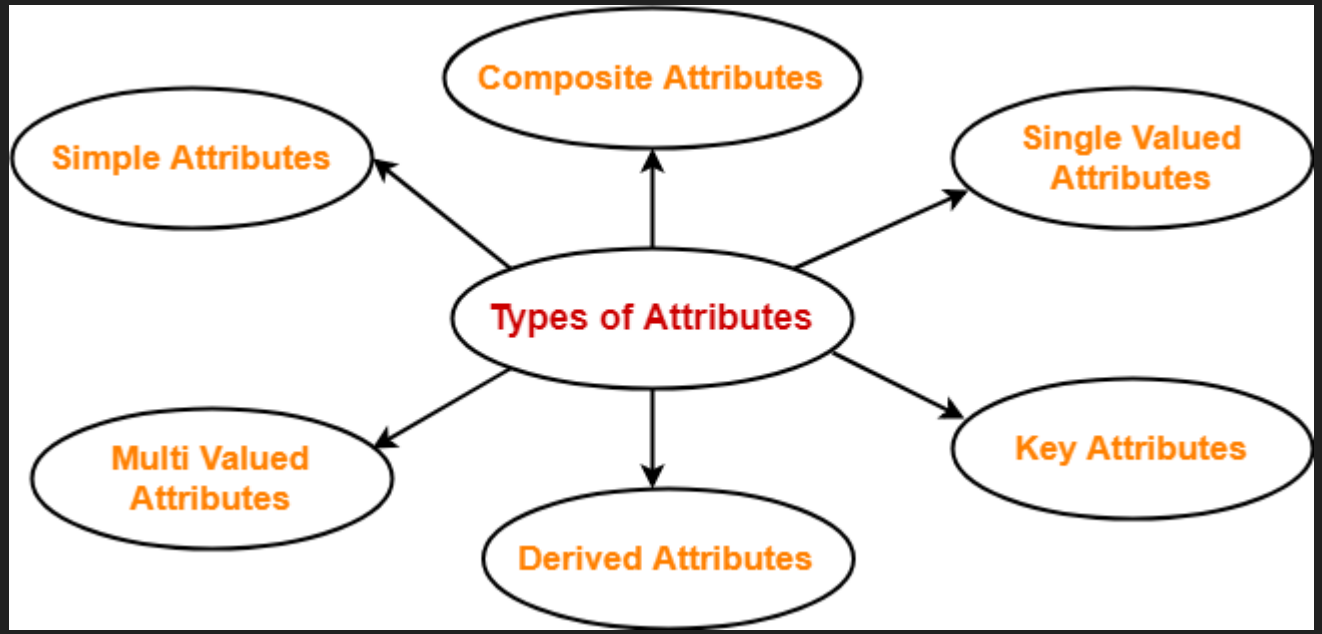


Image courtesy: https://www.gatevidyalay.com/types-of-attributes/

Attribute

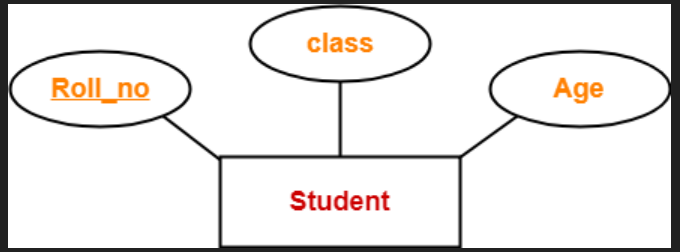
Attributes can be

- **Simple Attributes** atomic or indivisible values

E.g. Dept–string

PhoneNumber–number

- **Single value attribute**



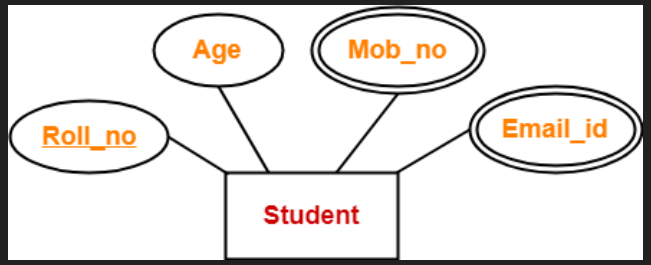
Attribute

Attributes can be

- **Multi valued attribute**

Multiple values for an attribute

e.g Mobile number,Email ids



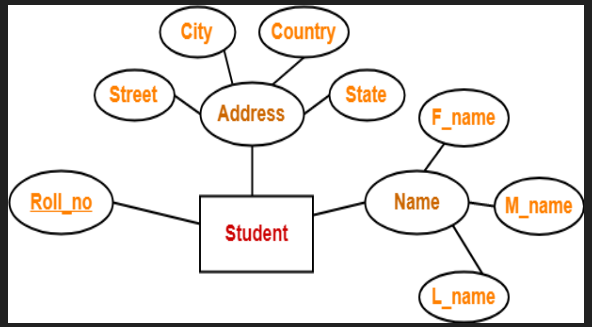
- **Composite Attributes** - several components in the value.

E.g. Address

Name

Qualification with components

(DegreeName, Year, UniversityName)



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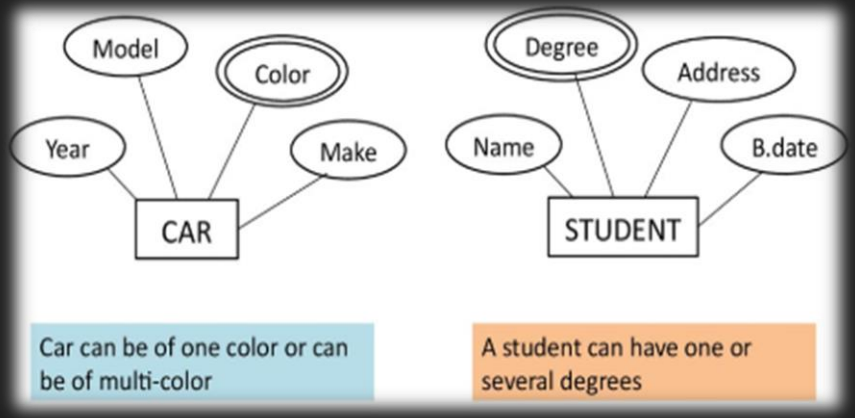
Attribute

Attributes can be

- **Multi valued attribute**



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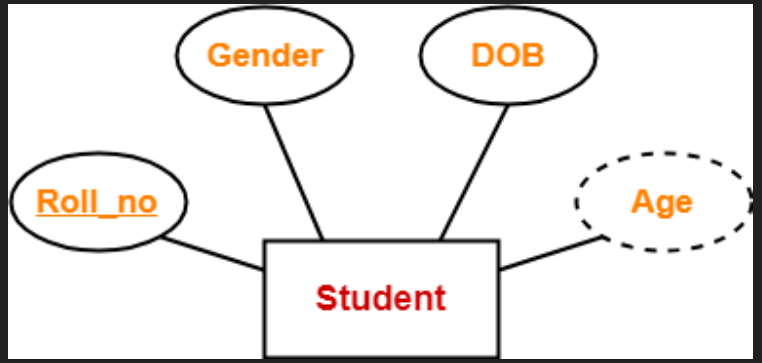
Attribute

Attributes can be

- **Derived Attributes** -Attribute value is dependent on some other attribute.

E.g: Age depends on DateOfBirth. age is a derived attribute.



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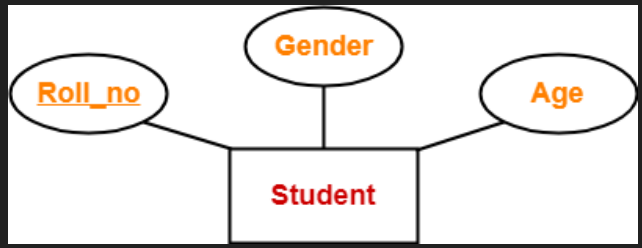
Keys

Attributes can be

- A **key** is a data item that allows us to uniquely identify individual occurrences or an entity type.
- A **candidate key** is an attribute or set of attributes that uniquely identifies individual occurrences or an entity type.
- An **entity type** may have one or more possible **candidate keys**, the one which is selected is known as the **primary key**.
- A **composite key** is a **candidate key** that consists of **two or more attributes**
- The **name of each primary key** attribute is **underlined**.



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Relationships

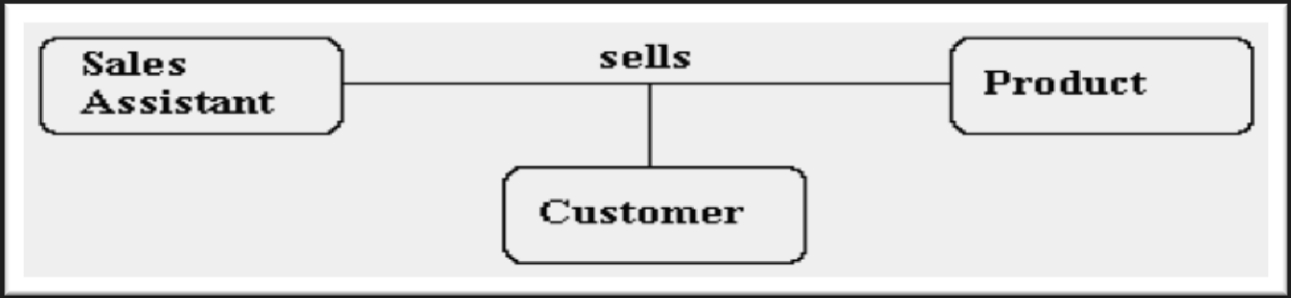
- A ***relationship type*** is a meaningful association between entity types
- A ***relationship*** is an association of entities where the association includes one entity from each participating entity type.
- Relationship types are represented on the ER diagram by a **series of lines**.
- In the original Chen notation,

the relationship is placed **inside a diamond**

e.g. **managers** manage **employee**

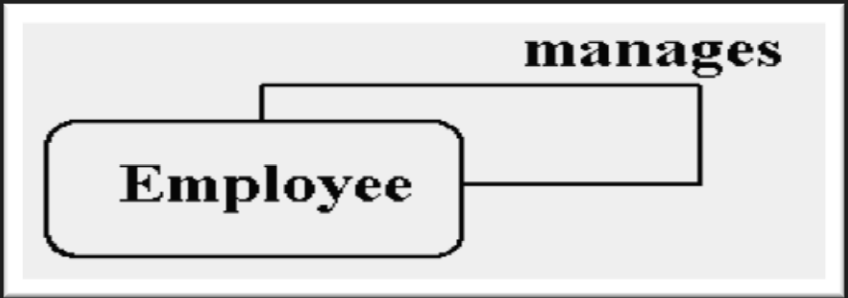
Degree of a Relationship

- The **number of participating entities** in a relationship is known as **the degree of the relationship.**
- If there are **two entity types** involved it is a **binary relationship type**
- If there are **three entity types** involved it is a **ternary relationship type**



Recursive relationship

- It is possible to have a n-ary relationship (e.g. quaternary or unary).
- **Unary relationships are also known as a *recursive* relationship**



Degree of a Relationship

- It is also possible to have entities associated through two or more distinct relationships.

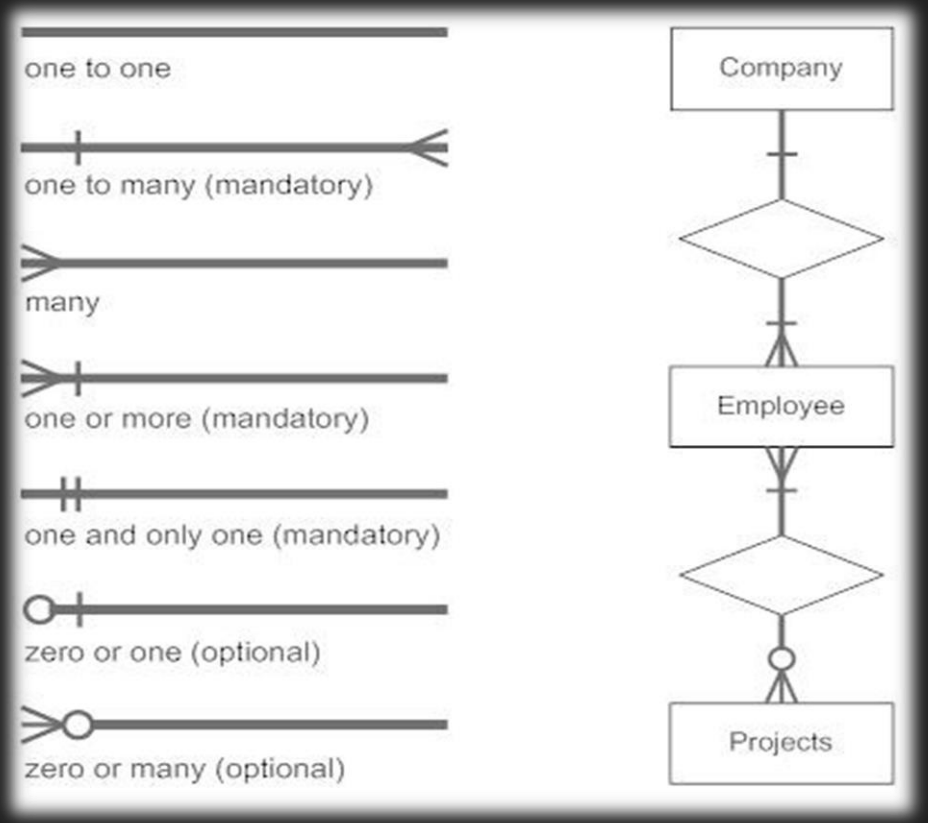
Cardinality

- Relationships are rarely one-to-one
- For example, a manager usually manages more than one employee
- This is described by the *cardinality* of the relationship,

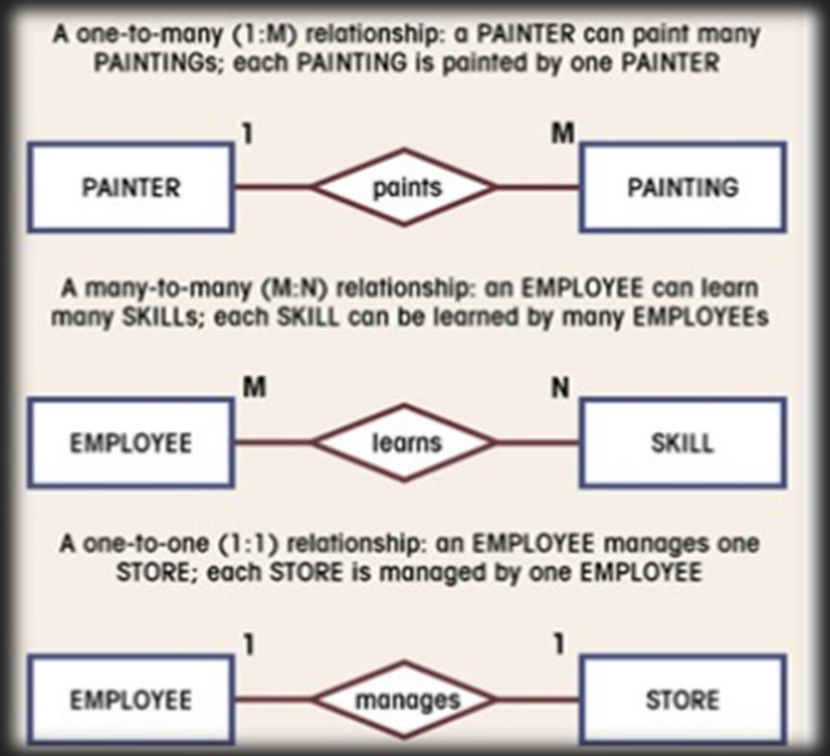
Cardinality

- Four possible categories.
  - **One to one (1:1) relationship**
  - **One to many (1:m) relationship**
  - **Many to one (m:1) relationship**
  - **Many to many (m:n) relationship**
- On an ER diagram, if the end of a relationship is straight, it represents 1, while a "crow's foot" end represents many.

Relationships



Relationships



Country Bus Company

A Country Bus Company owns a number of busses.

- Each bus is allocated to a particular route, although some routes may have several busses.
- Each route passes through a number of towns.
- One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route.
- Some of the towns have a garage where busses are kept and each of the busses are identified by the registration number and can carry different numbers of passengers, since the vehicles vary in size and can be single or double-decked.
- Each route is identified by a route number and information is available on the average number of passengers carried per day for each route.
- Drivers have an employee number, name, address, and sometimes a telephone number.

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Entities

- Bus - Company owns busses and will hold information about them.
- Route - Buses travel on routes and will need described.
- Town - Buses pass through towns and need to know about them
- Driver - Company employs drivers, personnel will hold their data.
- Stage - Routes are made up of stages
- Garage - Garage houses buses, and need to know where they are.

Summary

- E R Model
  - Entity
  - Attributes
  - Relationship

Next Lecture

- E R Model session 2

References

https://www.db-book.com/db6/index.html

Thank You

Happy to answer any questions ! ! !