
شُروع اَللہ کے پاک نام سے جو بڑا مہر بان نہایت رحم والا ہے


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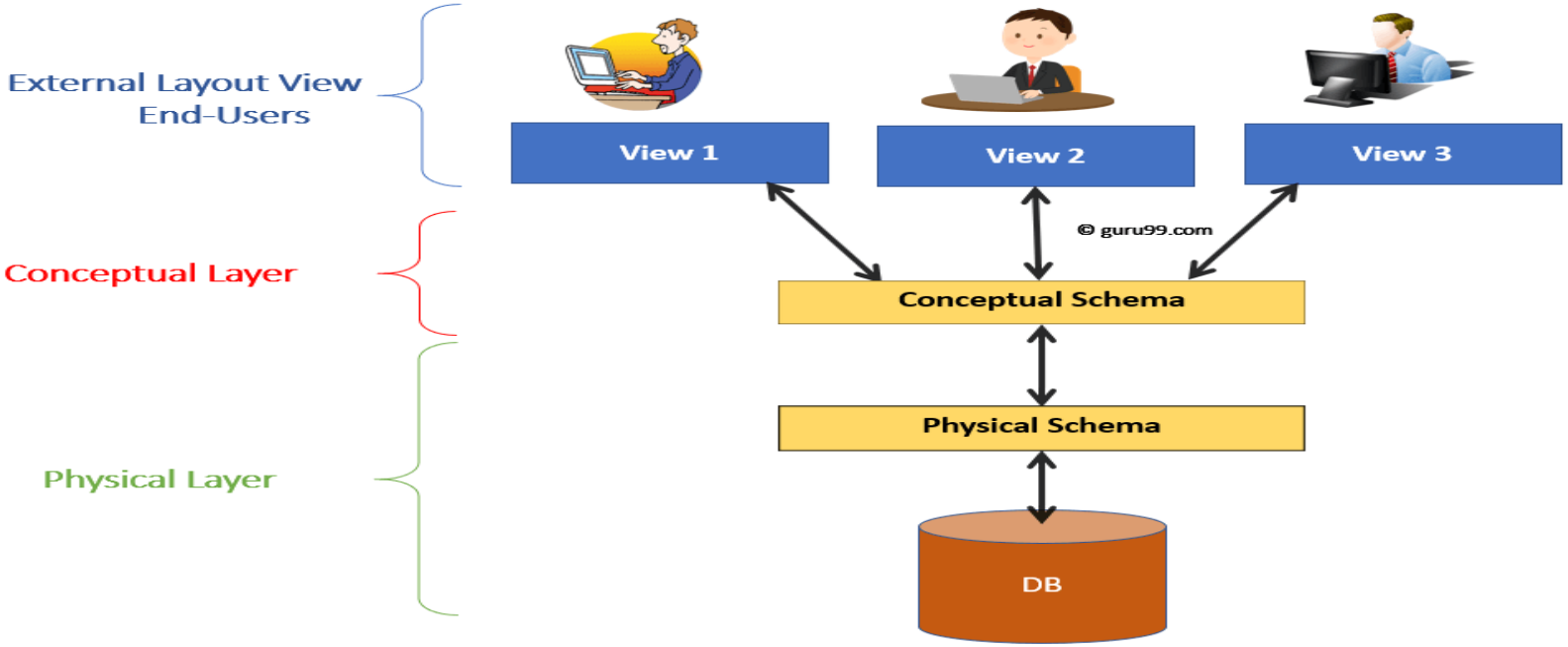
# Database Systems

## Lecture 12

Conceptual Schema Design Basics -1
(ER-D, Entity Relationship Diagram)

# Recall Lecture 11

- Creation of Subschemas using Views
  - SQL Views (External Design)
- SQL Indexes (Physical Design )



# Database Schema Design (Steps)

- Requirements Analysis
  - User needs; what must database do?
- **Conceptual Design**
  - **High level descriptions (often done w/ER model)**
- Schema Refinement
  - Consistency, normalization
- Logical Design
  - Translate ER into DBMS data model
- User Interfaces design
  - External schema (User Views )
- Physical Design - Indexes, disk layout
- Security Design - Who accesses what, and how



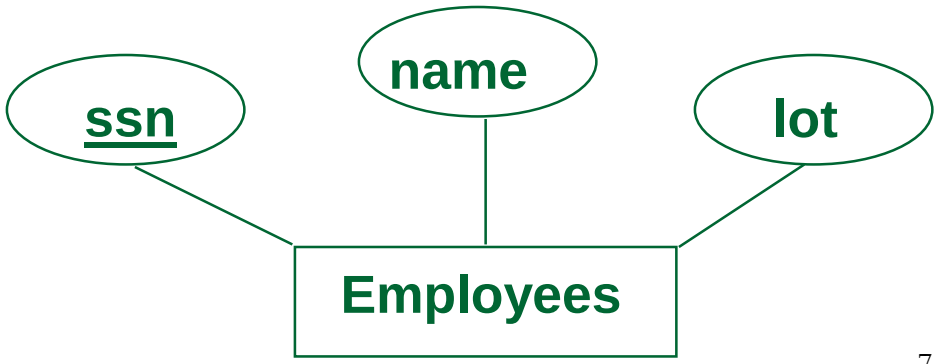
# Conceptual schema modeling

- What are the *entities* and *relationships* in the enterprise?
- How to define the characteristics of and entity ?
- What information about these entities and relationships should we store in the database?
- What are the *integrity constraints* or *business rules* that hold?
- A database `schema' in the ER Model can be represented pictorially (*ER diagrams*).
- Can then map an ER diagram into a relational schema. Conceptual Design



# ER Model Basics (Entity, Entity Set)

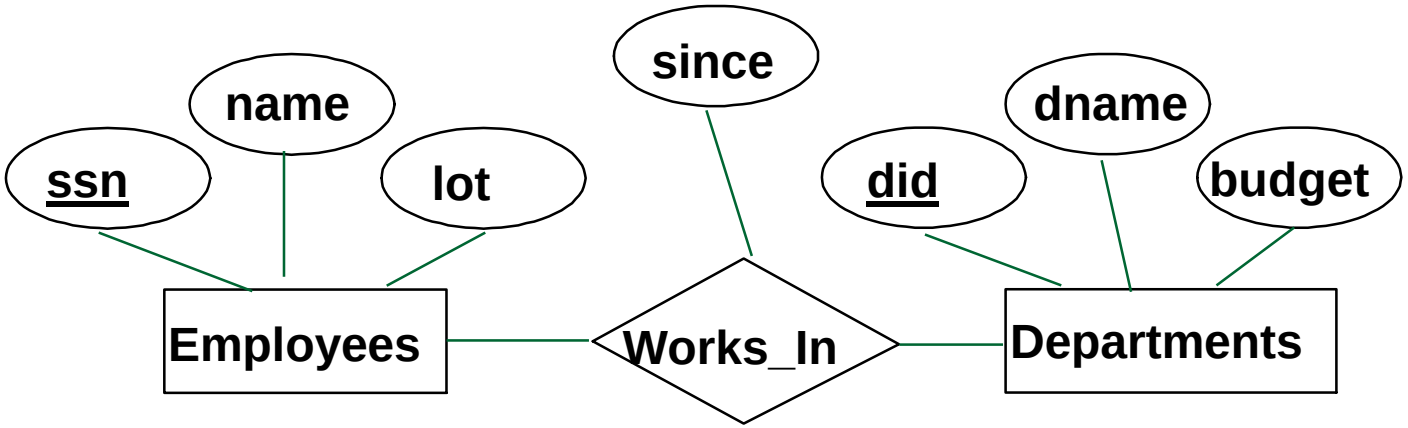
- *Entity:* Real-world object, distinguishable from other objects.
  - An entity is described using a set of *attributes*.
- *Entity Set*: A collection of similar entities. E.g., all employees.
  - All entities in an entity set have the same set of attributes. (Until we consider hierarchies, anyway!)
  - Each entity set has a *key (underlined)*.
  - Each attribute has a *domain*.






# Relationships in conceptual modeling

Association among two or more entities. E.g., Dominic works in Pharmacy department.



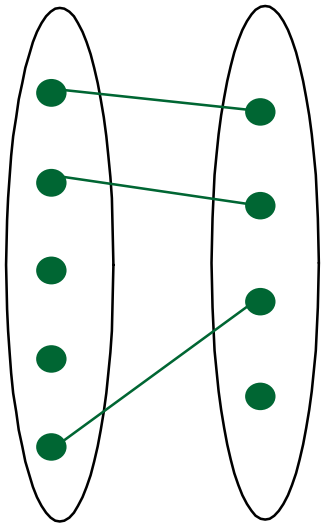



# Relationship (Continue.. )

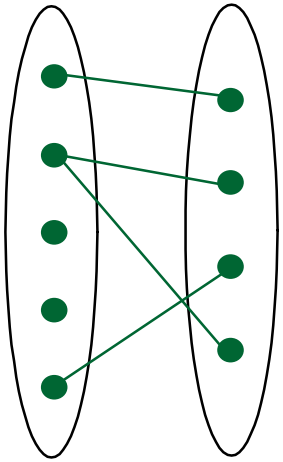
- Association between entities
- Connected entities are called participants
- Operate in both directions
- Connectivity describe relationship
  - 1:1, M:1, M:N
- Cardinality
  - Expresses number of occurrences associated with one occurrence of relaxed entity



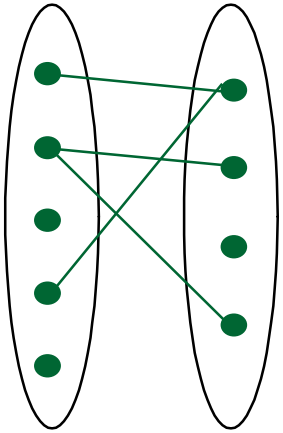
# Relationship (Continue.. )



1-to-1



1-to Many

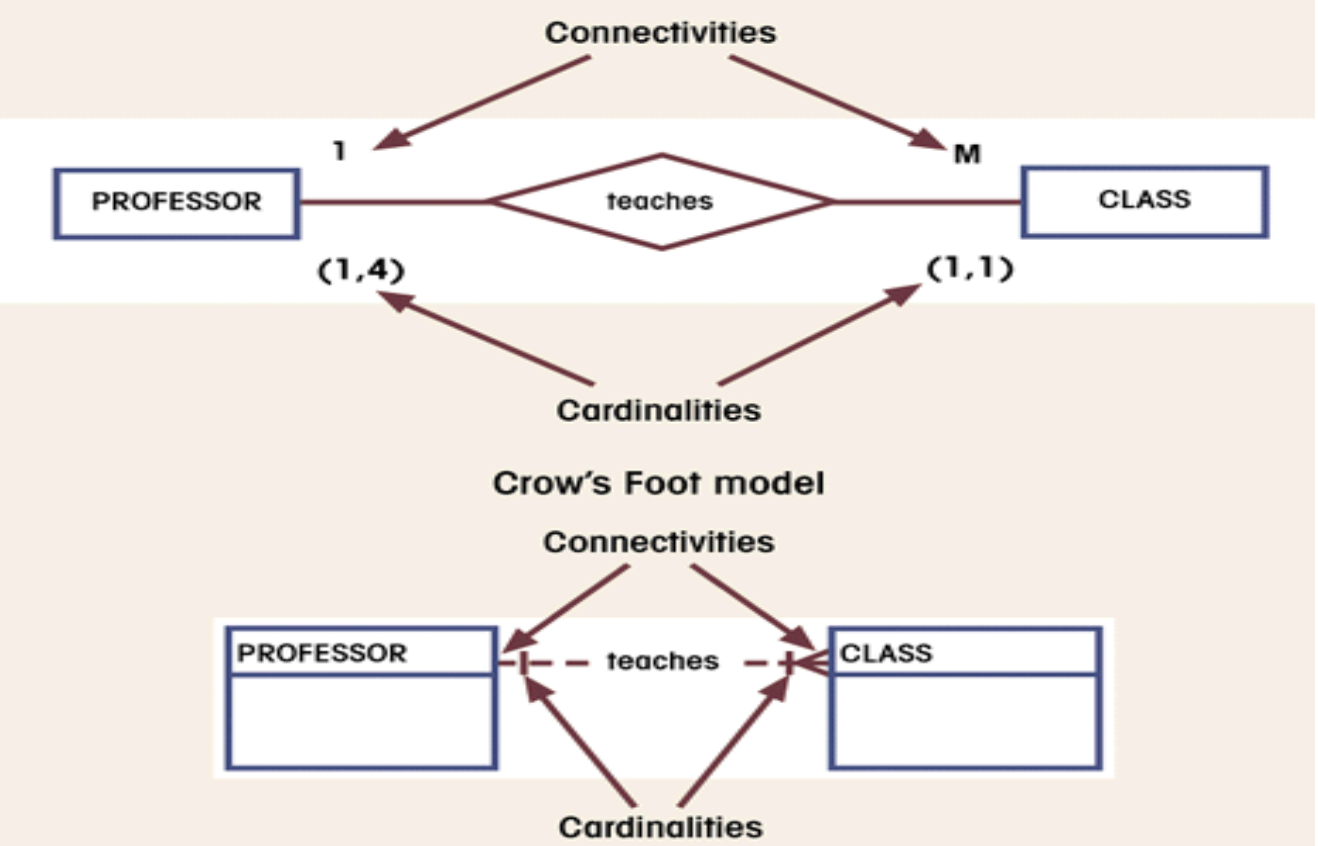


Many-to-Many



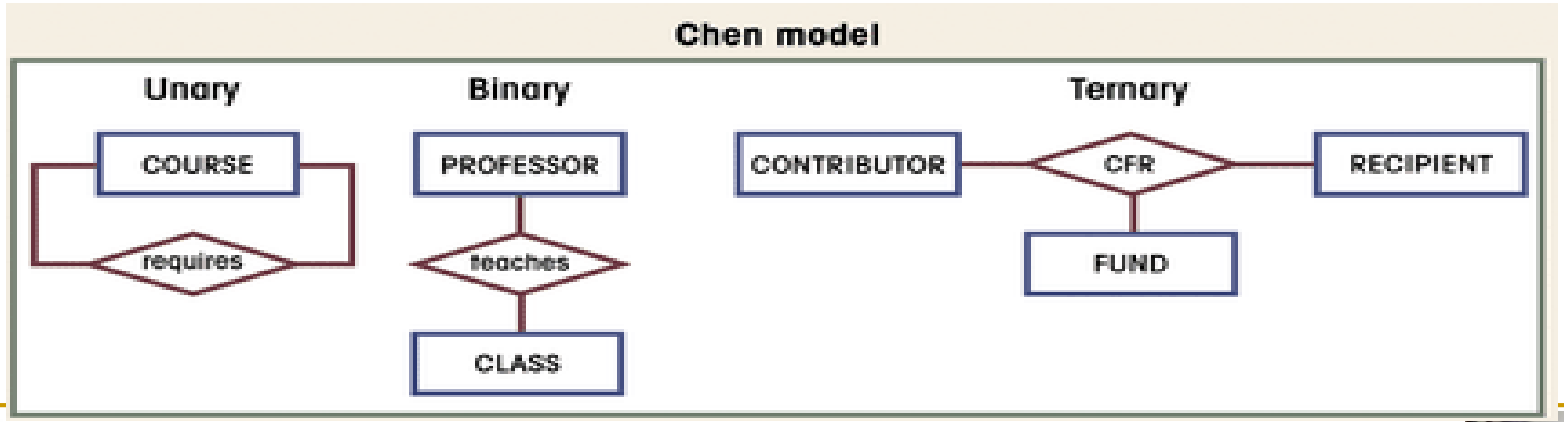
# Relationships cardinalities

- Optional relationship
- Mandatory relationship

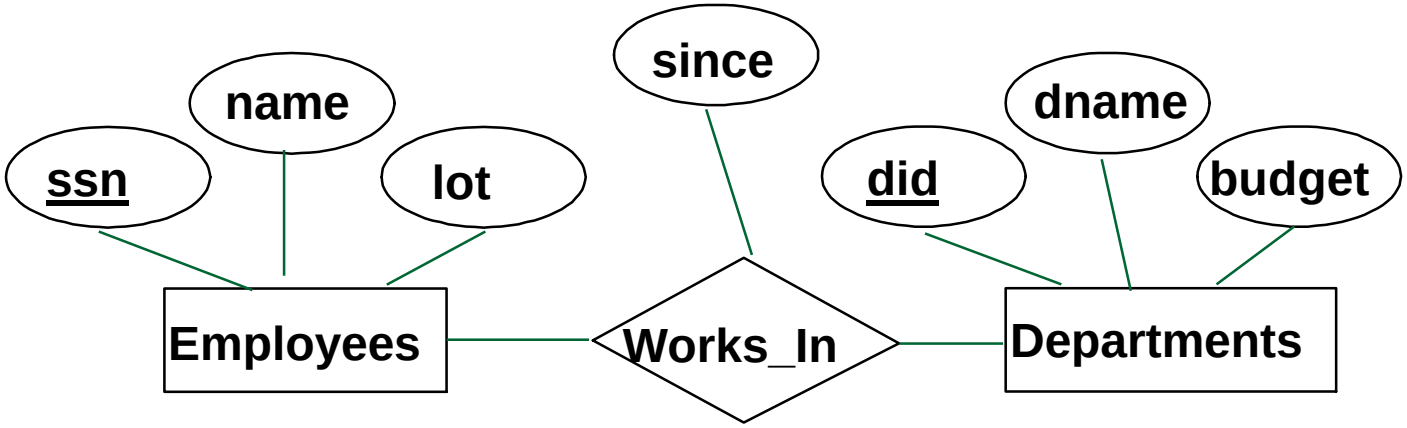


# Types of relationships

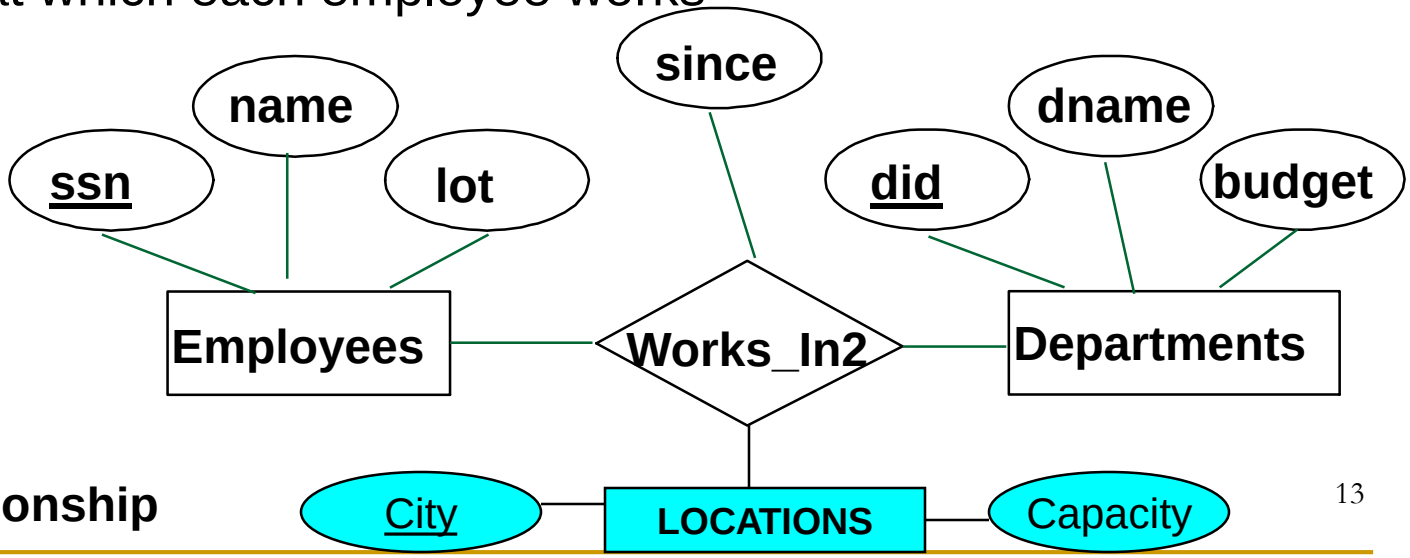
- Unary
  - Single entity, recursive, exists between occurrences of same entity set
- Binary
  - Two entities are associated
- Ternary




# Types of relationships(Contd.)

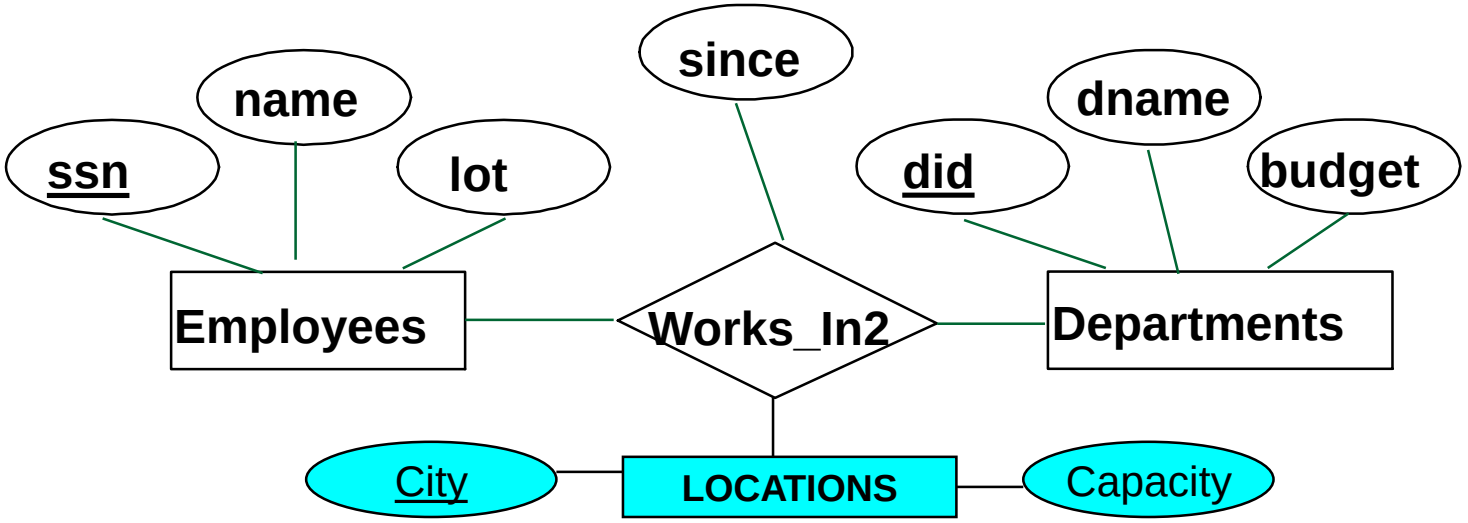



- Each department has offices in several locations & we want to record the locations at which each employee works




**Ternary relationship**

# Ternary relationship




```
CREATE TABLE Works_In2(
  ssn  CHAR(1),
  did  INTEGER,
  city CHAR(20),
  since  DATE,
 PRIMARY KEY (ssn, did, city),
 FOREIGN KEY (ssn) REFERENCES Employees,
 FOREIGN KEY (did) REFERENCES Departments,
 FOREIGN KEY (city) REFERENCES Locations)
```

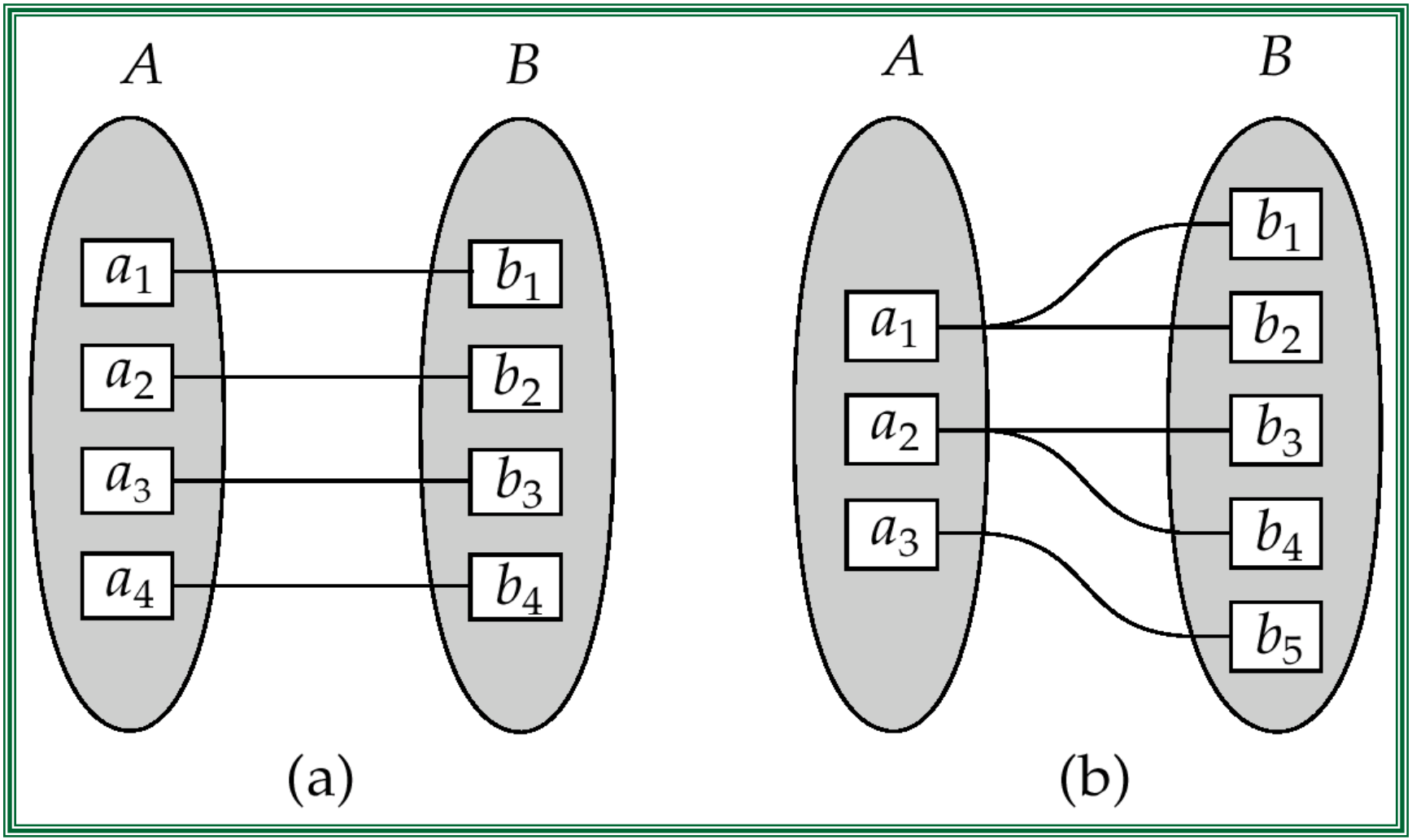


# Relationship

- The degree of a relationship = the number of entity sets that participate in the relationship
  - Mostly binary relationships
  - Sometimes more
- Mapping cardinality of a relationship
  - 1 –1
  - 1 – many
  - many – 1
  - Many-many

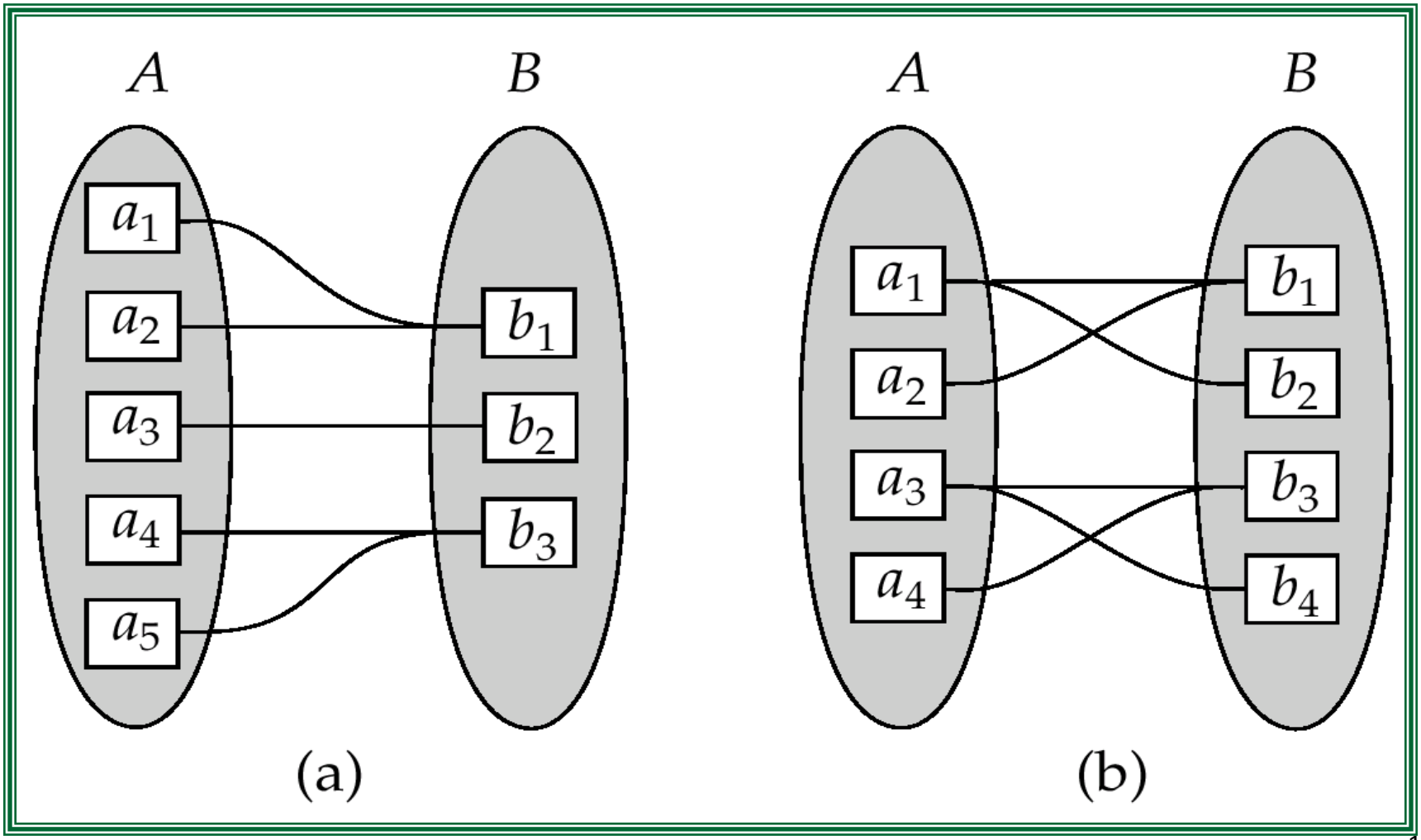


# One-One and One-Many

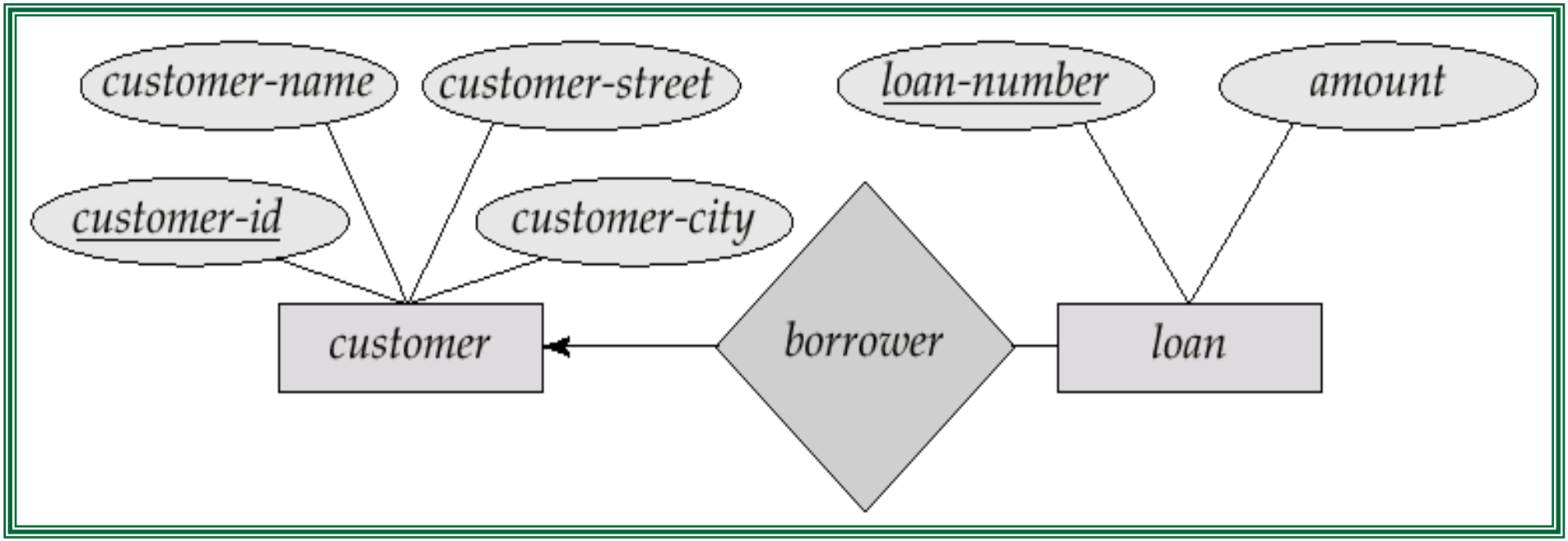





# Many-one and many-many

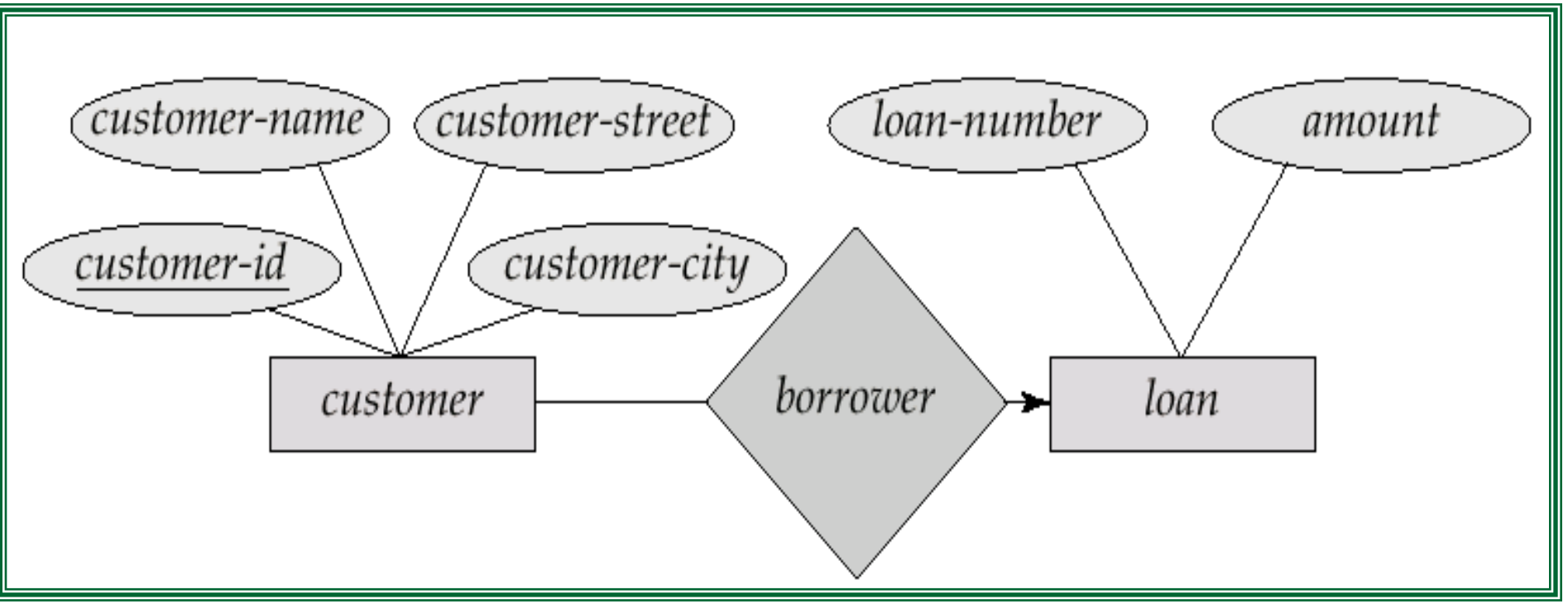


# 1- many


customer-name
customer-street
loan-number
amount
customer-id
customer-city
customer
borrower
loan

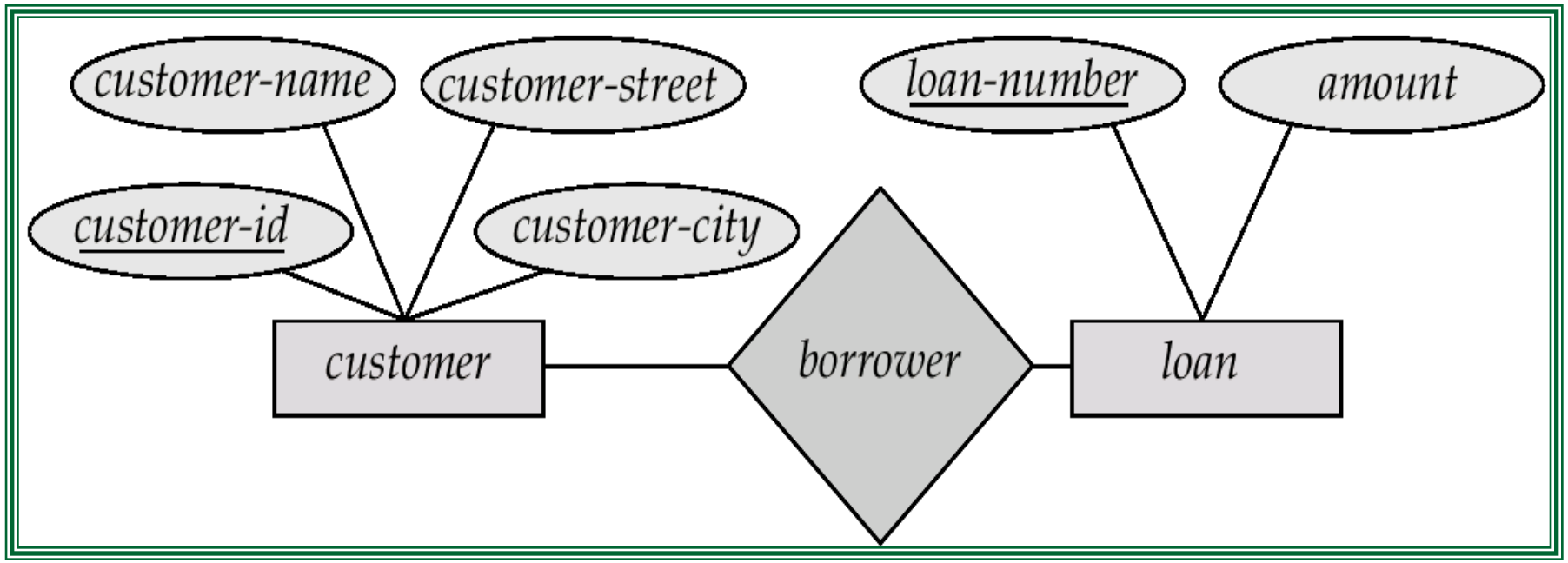


# Many - 1


customer-name
customer-street
loan-number
amount
customer-id
customer-city
customer
borrower
loan



# Many - many


customer-name
customer-street
loan-number
amount
customer-id
customer-city
customer
borrower
loan



# In Next Lecture

- Database Schema Designing
  - Types of attributes
  - Types of Entities
  - Entities VS Attributes
  - Entity Relationship Diagram (ER-D)
  - How to Design an ERD

# Thanks