

EER Diagram

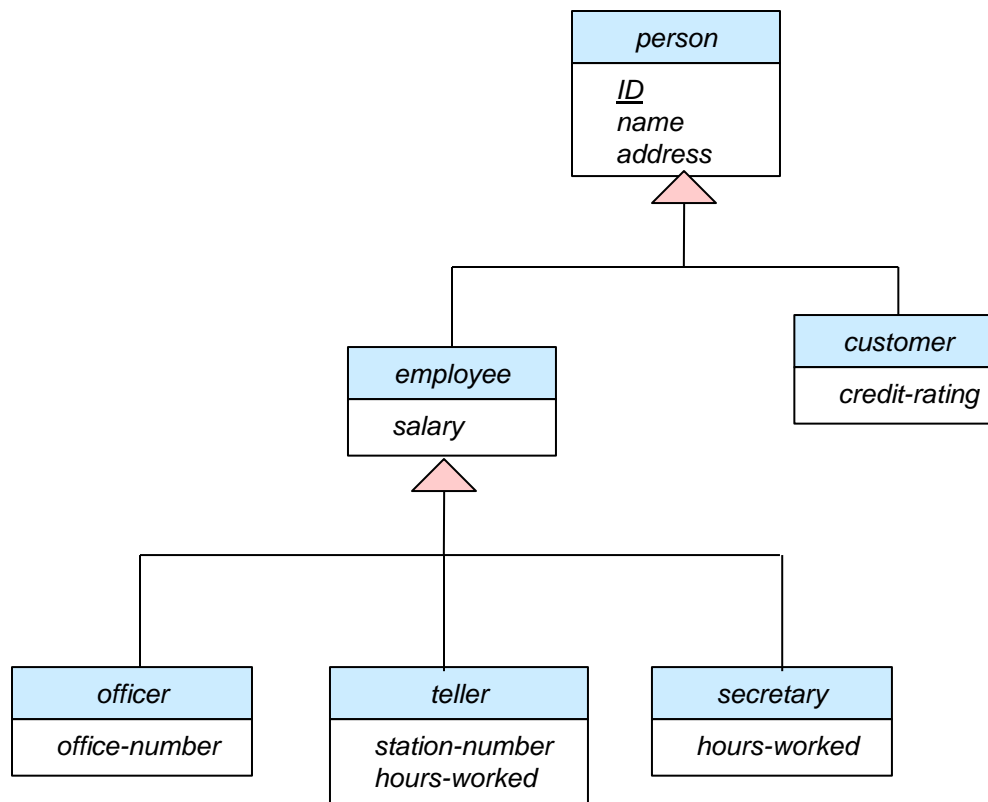
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VIT Chennai

Extended ER features

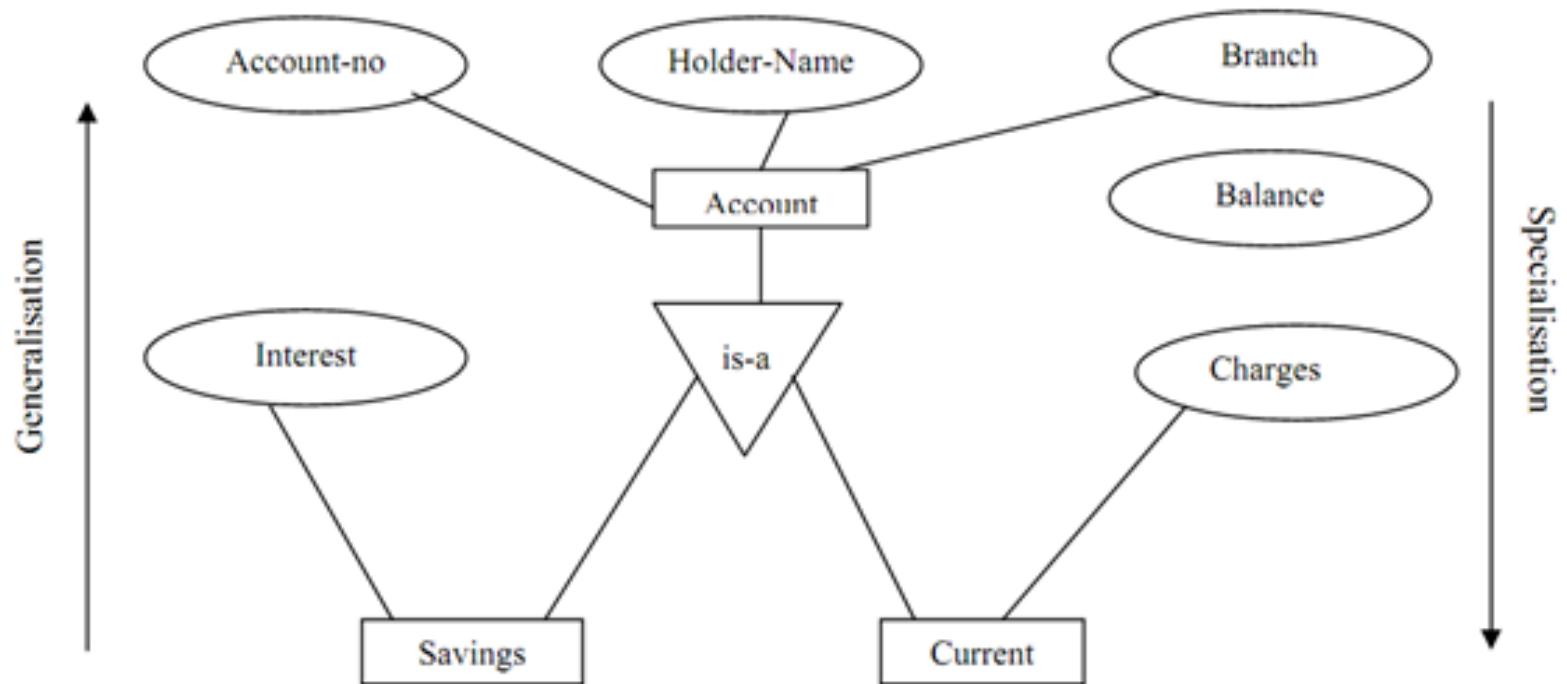
- Specialization and Generalization – Inheritance
- Aggregation

Specialization and Generalization - Inheritance

In terms of an E-R diagram, specialization is depicted by a hollow arrow-head pointing from the specialized entity to the other entity



Specialization and Generalization -Chen Notation



- Inheritance relationships also referred to as a *superclass-subclass* relationships.
- Lower-level entity sets:
 - Have attributes that do not apply to the higher-level entity set.
 - Participate in relationships that do not apply to the higher-level entity set, e.g., airline employees, pilots, crew, agents, etc., but only pilots are certified to fly certain aircraft types.
- **Attribute inheritance** – Lower-level entity sets are said to ***inherit*** all the **attributes** and relationships from the higher-level entity sets to which they are linked.

Specialization vs. Generalization

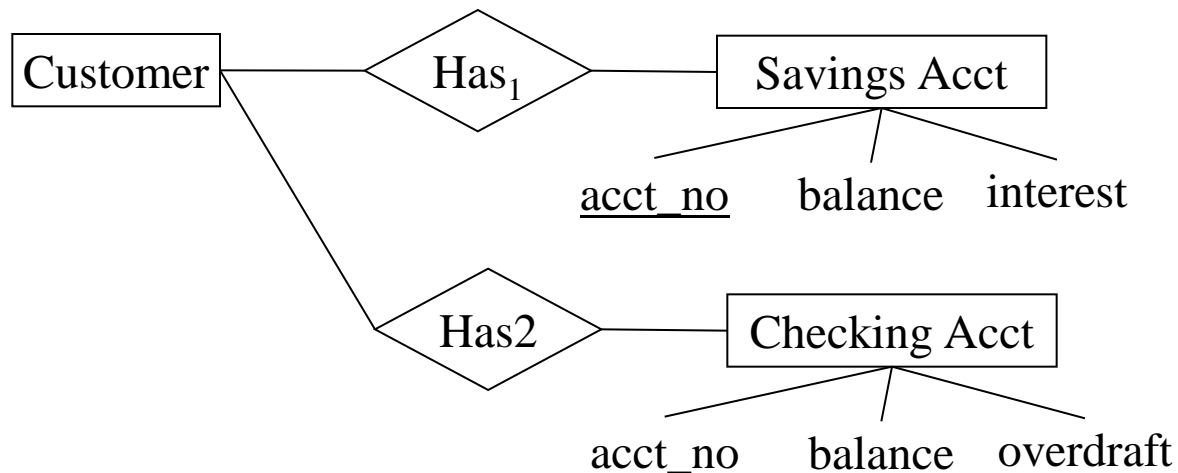
- **Top-down design process (Specialization);** we designate sub-groupings within an entity set that are distinctive from other entities in the set.
- **Bottom-up design process (Generalization):** combine a number of entity sets that share the same features into a higher-level entity set.
- The terms specialization and generalization are used interchangeably, for the obvious reasons.

Specialization and Generalization

■ An Example:

- Customers can have checking and savings accts
- Checking ~ Savings (many of the same attributes)

■ Old Way:

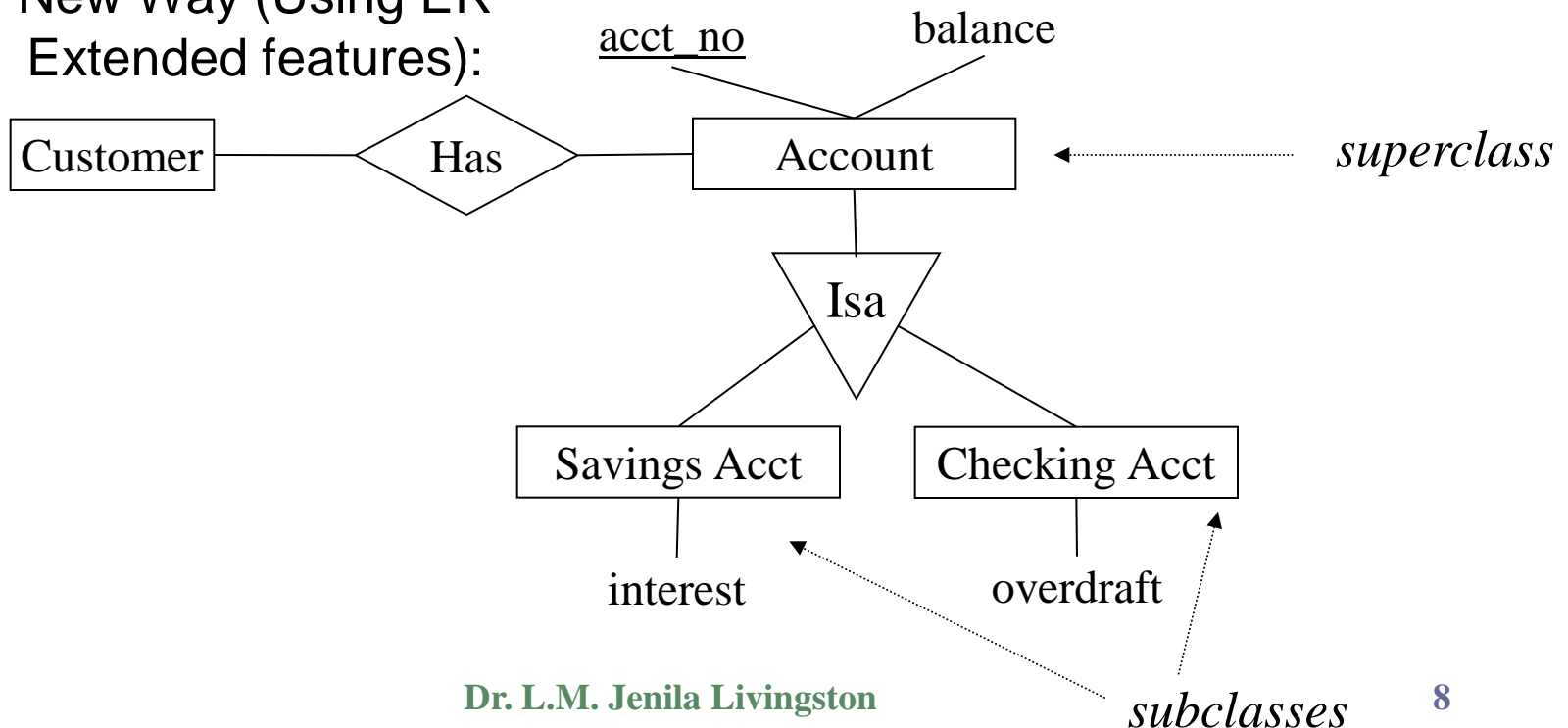


Specialization and Generalization

■ An Example:

- Customers can have checking and savings accts
- Checking ~ Savings (many of the same attributes)

■ New Way (Using ER Extended features):

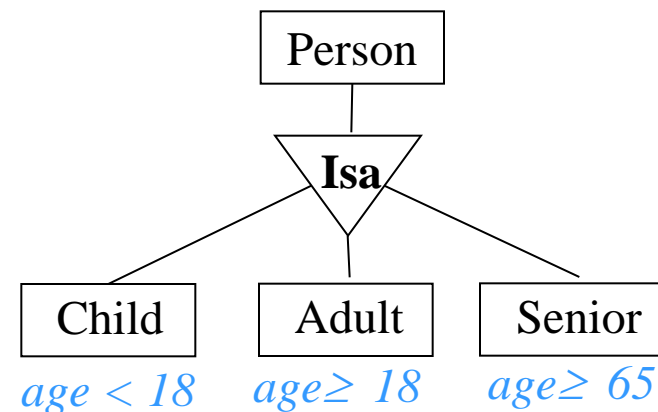
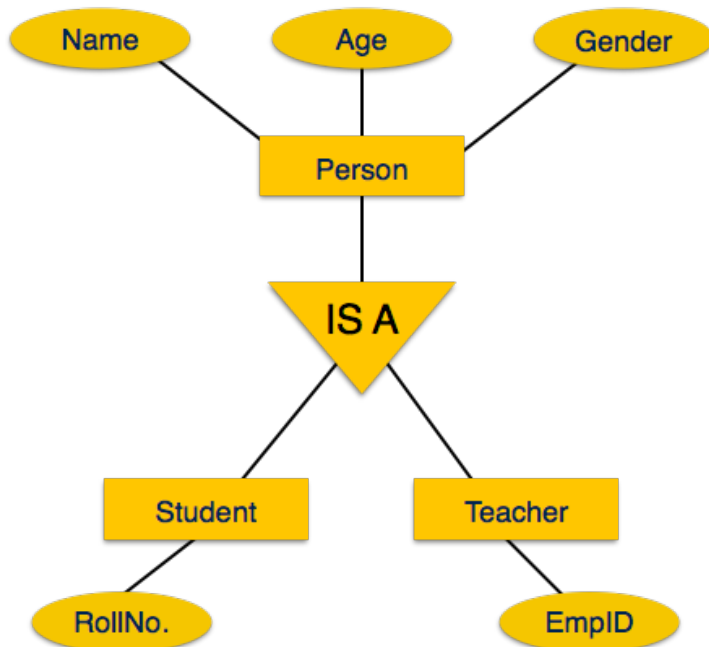


- A specialization/generalization relationship can be:
 - User Defined vs Condition Defined
 - disjoint vs. overlapping
 - total vs. partial

Specialization and Generalization

■ Subclass Distinctions:

- 1. **User-Defined** vs. **Condition-Defined**
 - **User:** Membership in subclasses explicitly determined (e.g., Person, Student, Teacher)
 - **Condition:** Membership predicate associated with subclasses - e.g: given below

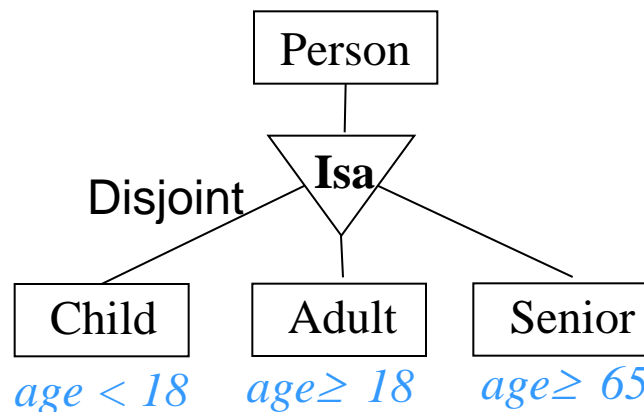


Specialization and Generalization

■ Subclass Distinctions:

□ 2. **Overlapping** vs. **Disjoint**

- **Overlapping:** Entities can belong to >1 entity set (e.g., Adult, Senior)
- **Disjoint:** Entities belong to exactly 1 entity set (e.g., Child)

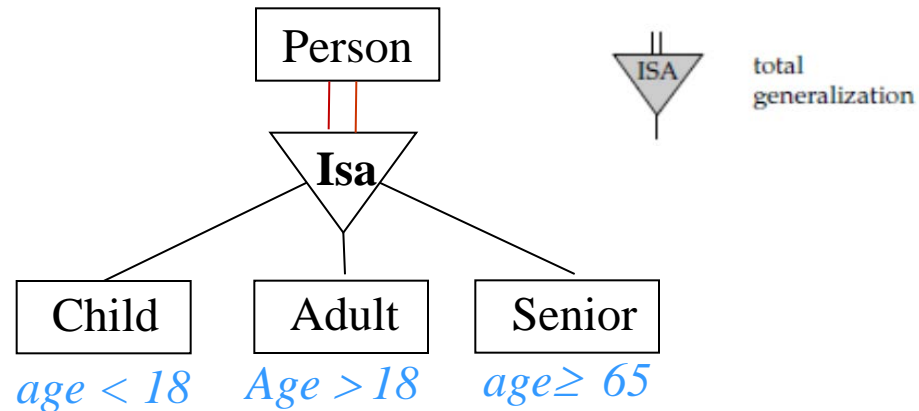


Specialization and Generalization

■ Subclass Distinctions:

□ 3. Total vs. Partial Membership

- **Total:** Every entity of superclass belongs to a subclass

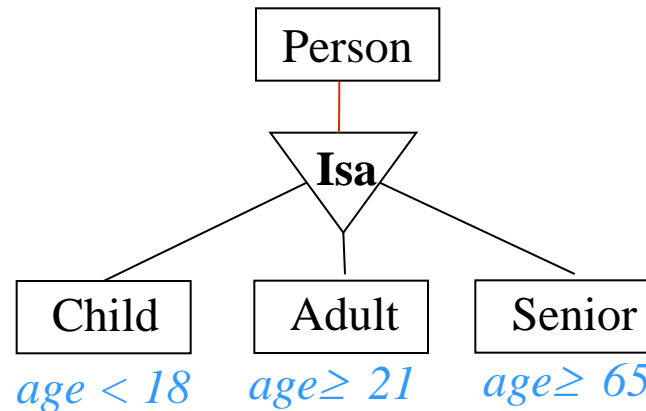


Specialization and Generalization

■ Subclass Distinctions:

□ 3. Total vs. Partial Membership

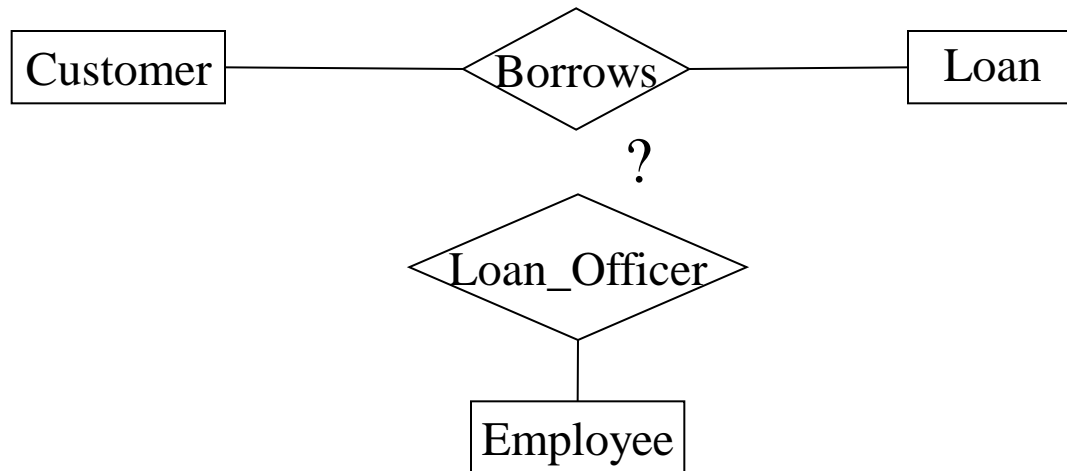
- **Total:** Every entity of superclass belongs to a subclass



- **Partial:** Some entities of super class do not belong to any subclass (e.g., if Adults condition is $age \geq 21$, which is not belonging to child subclass)

Aggregation

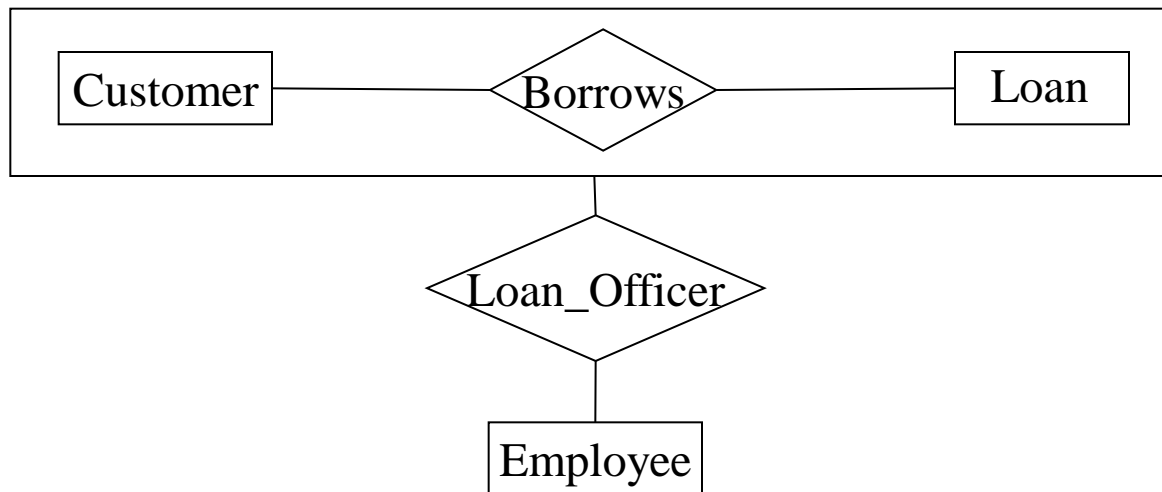
- E/R: No relationships between relationships
- E.g.: Associate loan officers with Borrows relationship set



- Associate Loan Officer with **Loan**?
- What if we want a loan officer for every (customer, loan) pair?

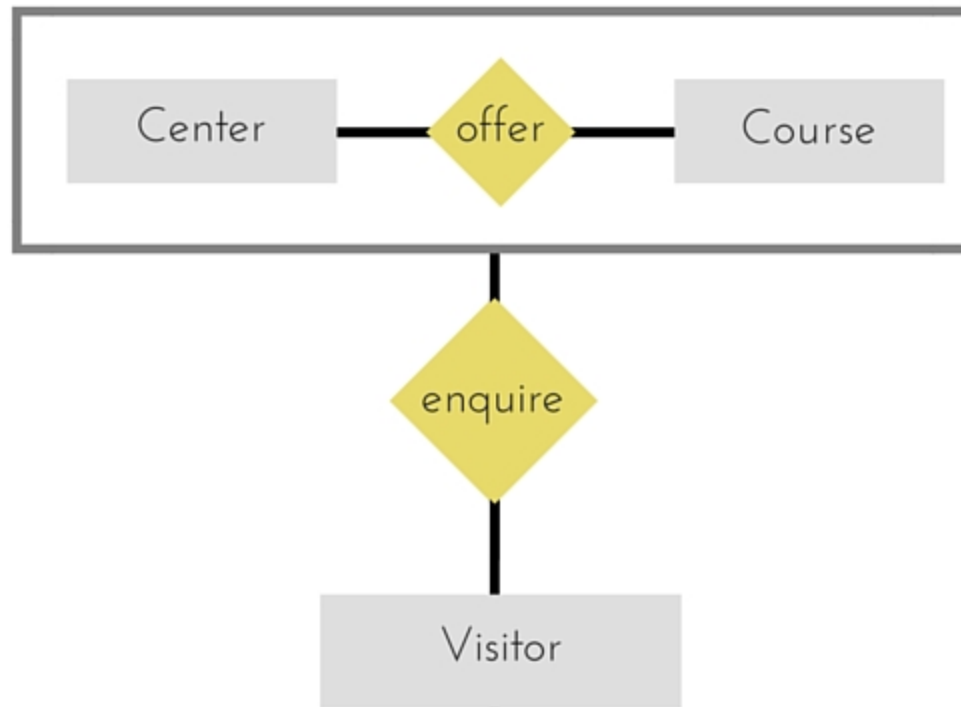
Aggregation - Binary

- E/R: No relationships between relationships
- E.g.: Associate loan officers with Borrows relationship set

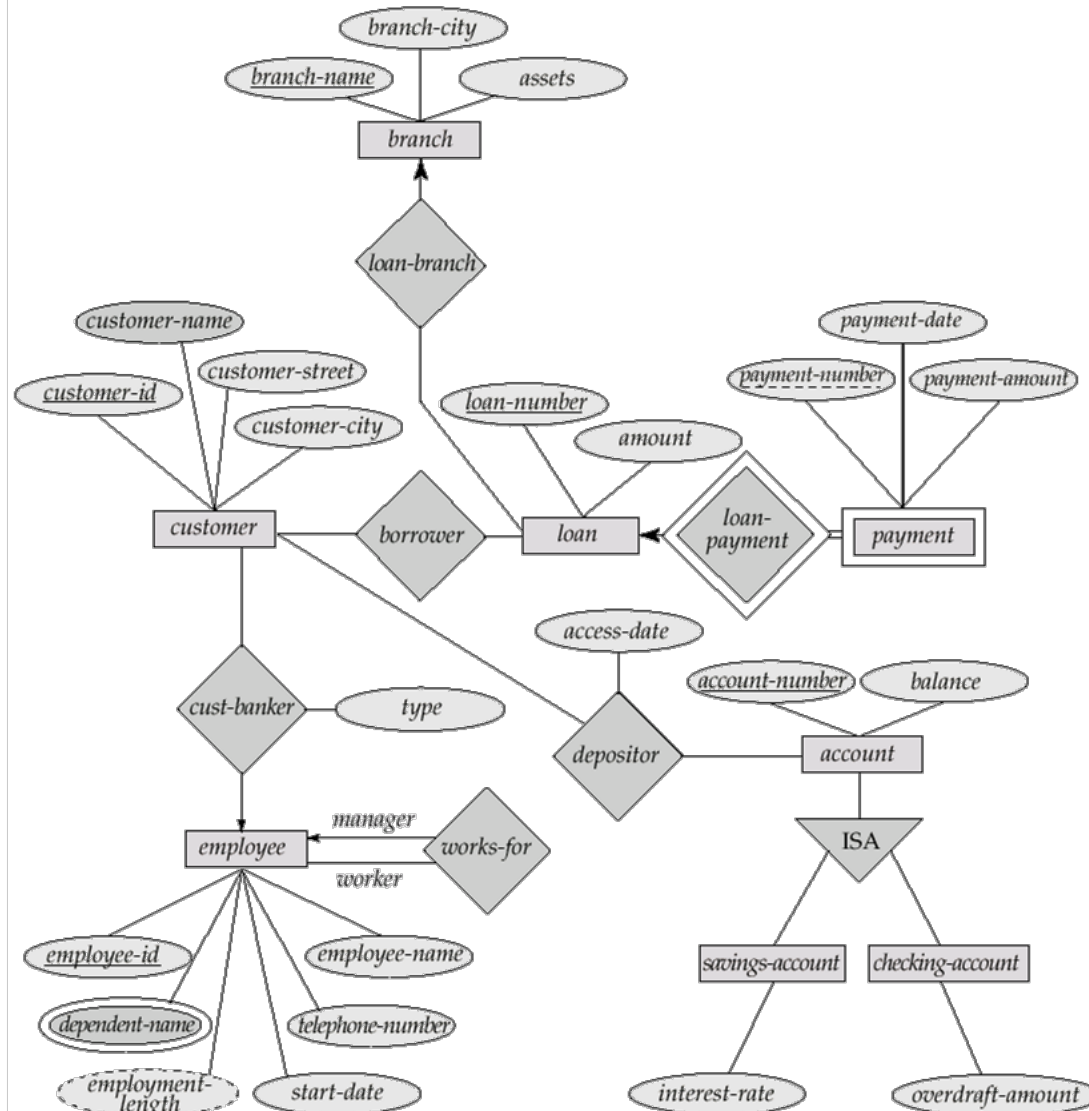


- Associate Loan Officer with **Borrows**?
- Must First Aggregate

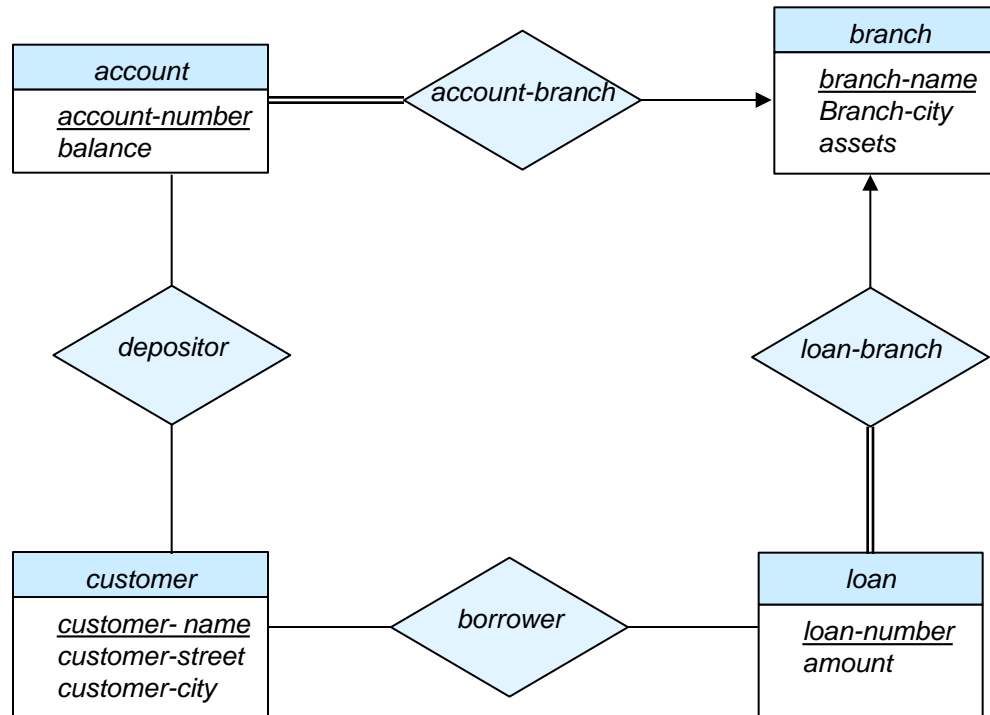
Aggregation



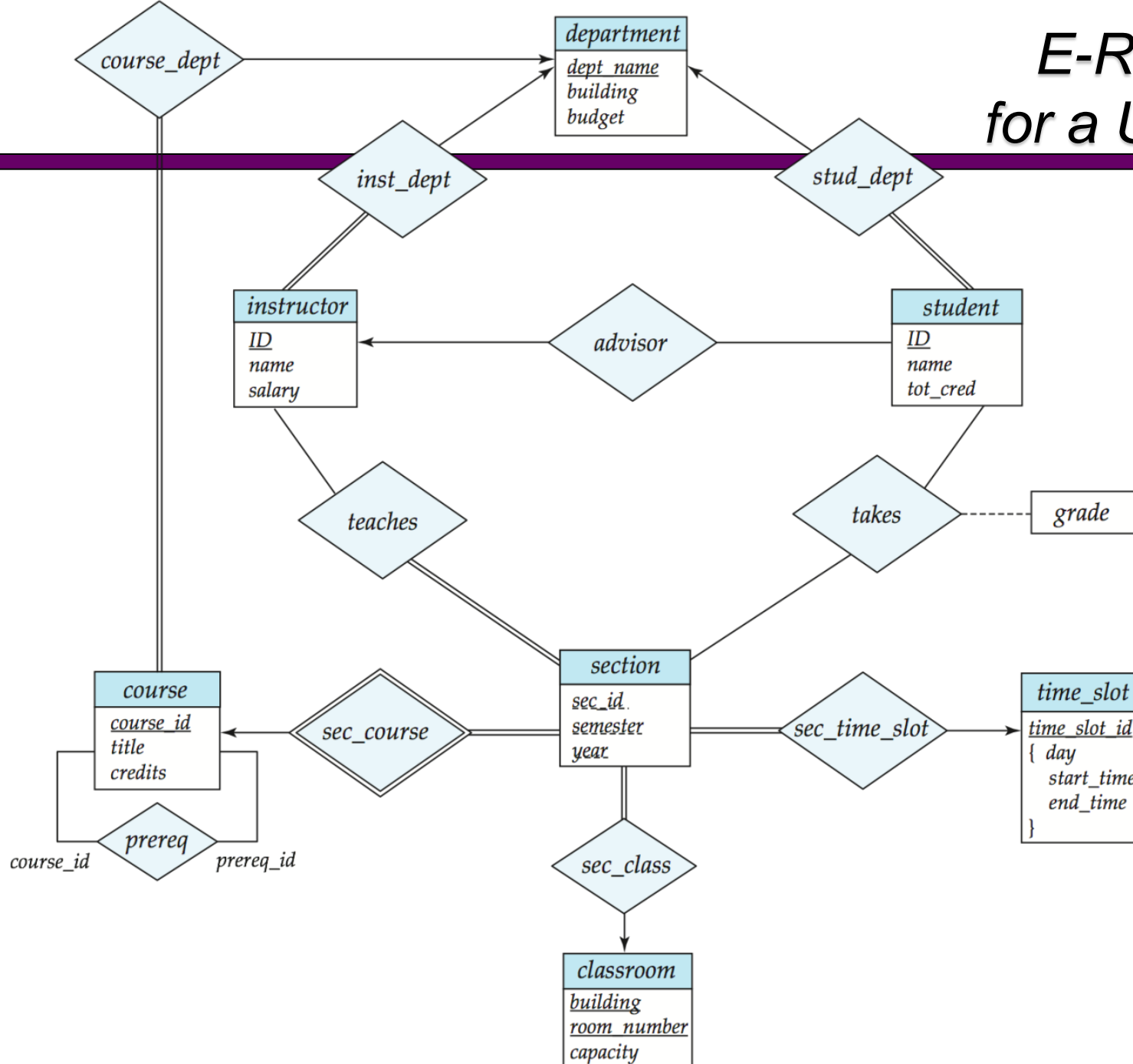
E-R Diagram for a Banking Enterprise (Chen's Notation)



E-R Diagram for the Banking Enterprise



E-R Diagram for a University



Lets Try an Example!

Construct an ER diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.

Lets Try an Example!

From the 6th edition...

Construct an ER diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time, and has an associated due date, and the date when the payment was received.

Thank You!