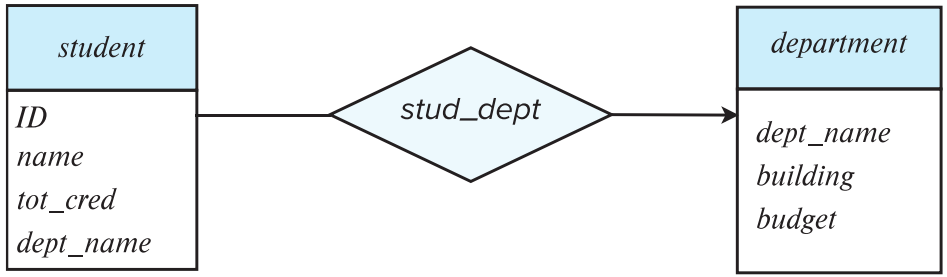
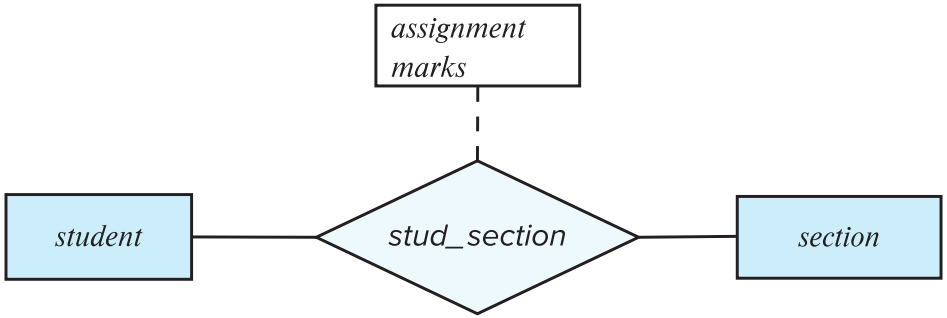
ER Design Issues

Common Mistakes in ER Diagrams

- Example of erroneous ER diagrams

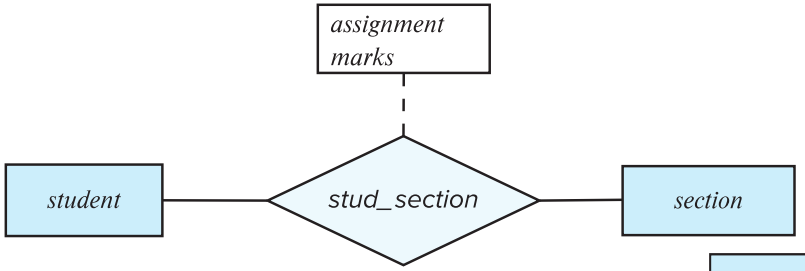


(a) Incorrect use of attribute

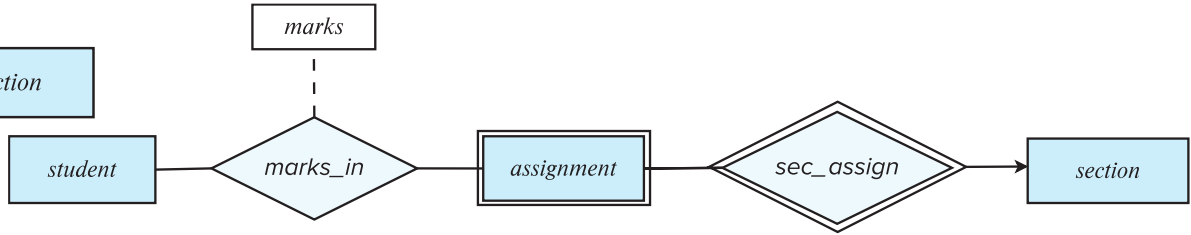


(b) Erroneous use of relationship attributes

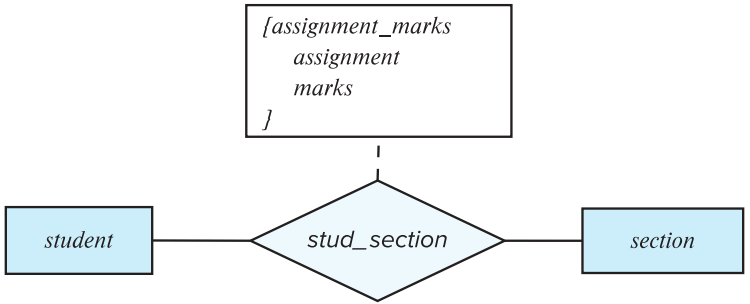
Common Mistakes in ER Diagrams



(b) Erroneous use of relationship attributes



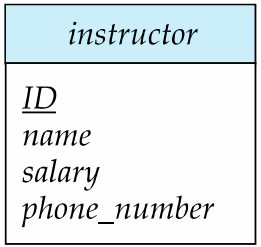
(c) Correct alternative to erroneous E-R diagram (b)

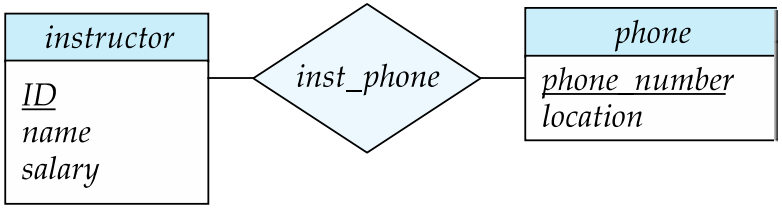


(d) Correct alternative to erroneous E-R diagram (b)

Entities vs. Attributes

- Use of *entity sets* vs. *attributes*

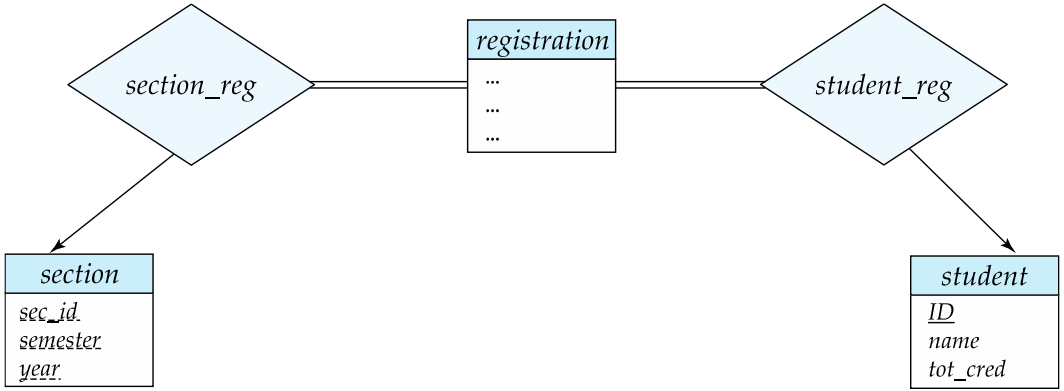




- Use of ***phone*** as an entity allows extra information about ***phone numbers*** (plus multiple ***phone numbers***)

Entities vs. Relationship Sets

- Use of *entity sets* vs. *relationship sets*
  - Possible guideline is to designate a relationship set to describe an action that occurs between entities



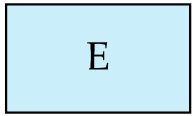
- Placement of *relationship attributes*
  - For example, attribute *date* as attribute of ***advisor*** or as attribute of ***student***

- Binary Vs. Non-Binary relationships and conversions

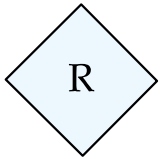
ER Design Decisions

- The use of an attribute or entity set to represent an object
- Whether a real-world concept is best expressed by an entity set or a relationship set
- The use of a ternary relationship versus a pair of binary relationships
- The use of a strong or weak entity set
- The use of specialization/generalization: Contributes to modularity in the design
- The use of aggregation: Can treat the aggregate entity set as a single unit without concern for the details of its internal structure

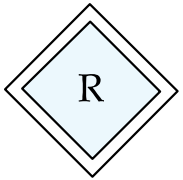
Summary of Symbols Used in ER Notation



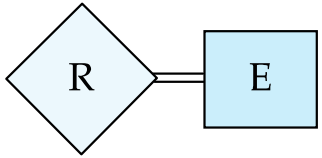
entity set



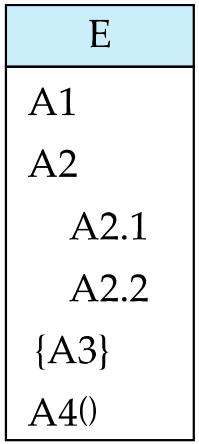
relationship set



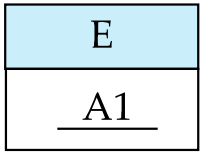
identifying relationship set for weak entity set



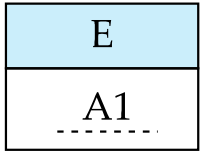
total participation of entity set in relationship



attributes:
simple (A1),
composite (A2) and
multivalued (A3)
derived (A4)

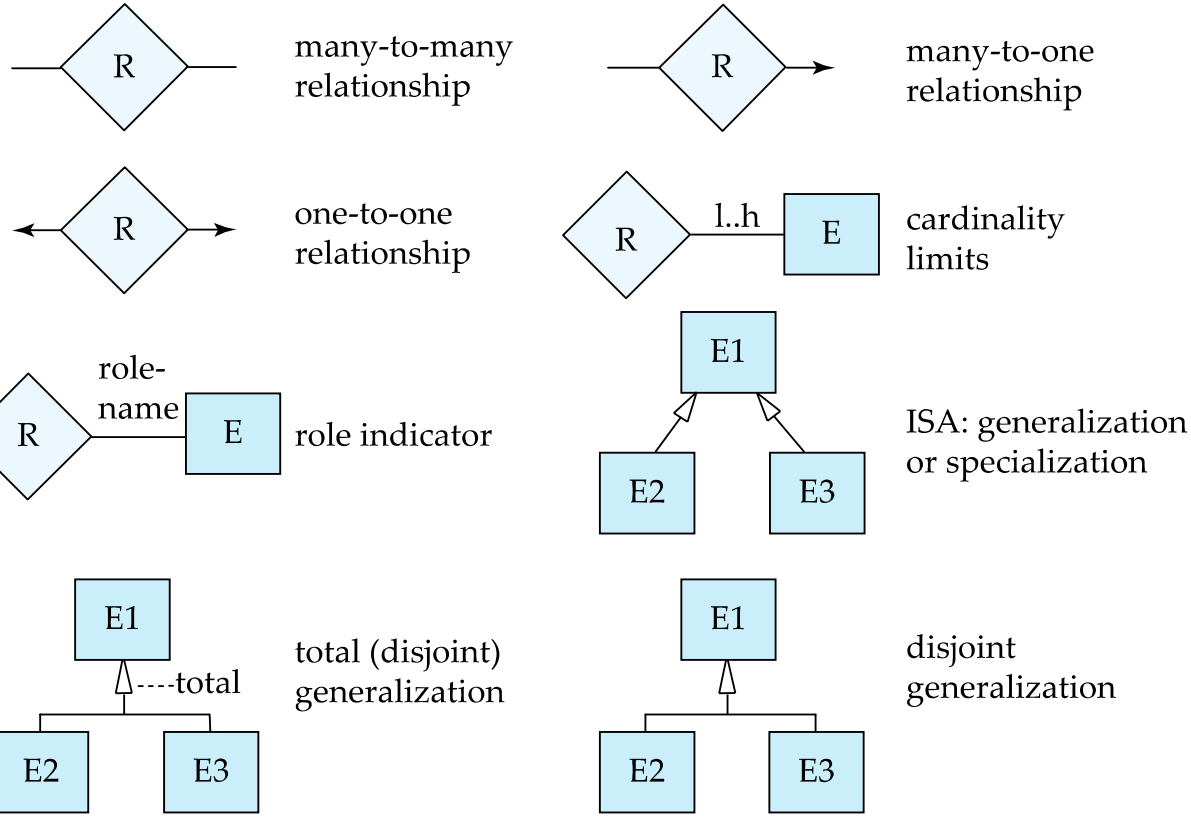


primary key



discriminating attribute of weak entity set

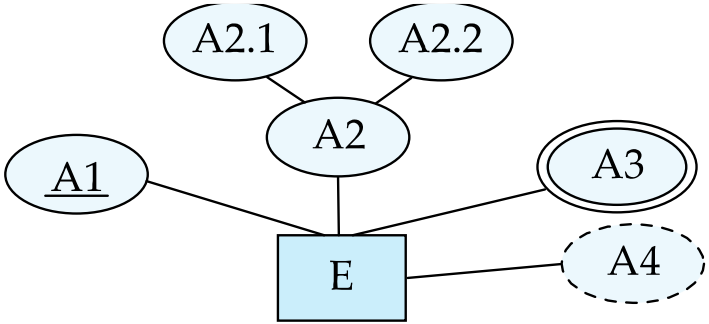
Summary of Symbols Used in ER Notation

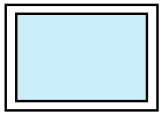


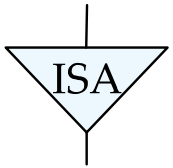
Alternative ER Notations

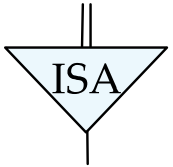
- Chen, IDE1FX, …

entity set E with
simple attribute A1,
composite attribute A2,
multivalued attribute A3,
derived attribute A4,
and primary key A1

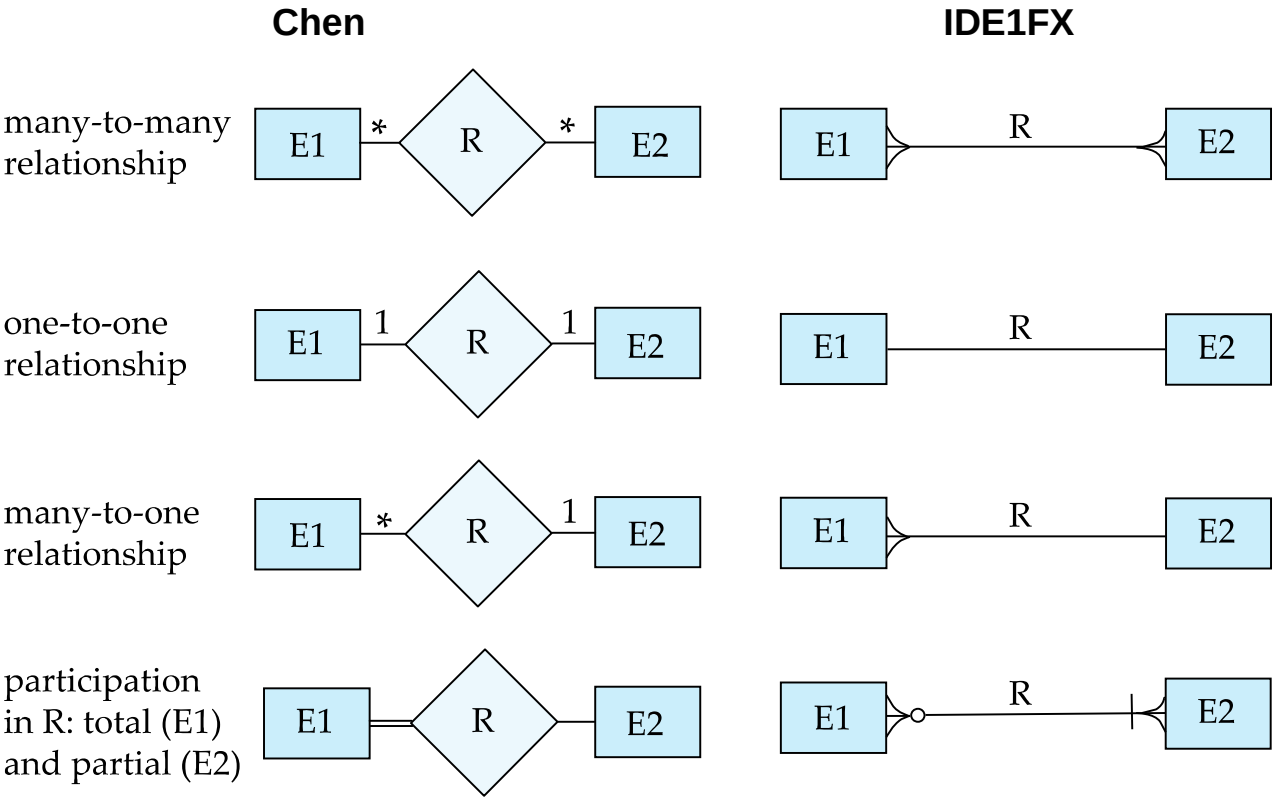


weak entity set 

generalization 

total
generalization 

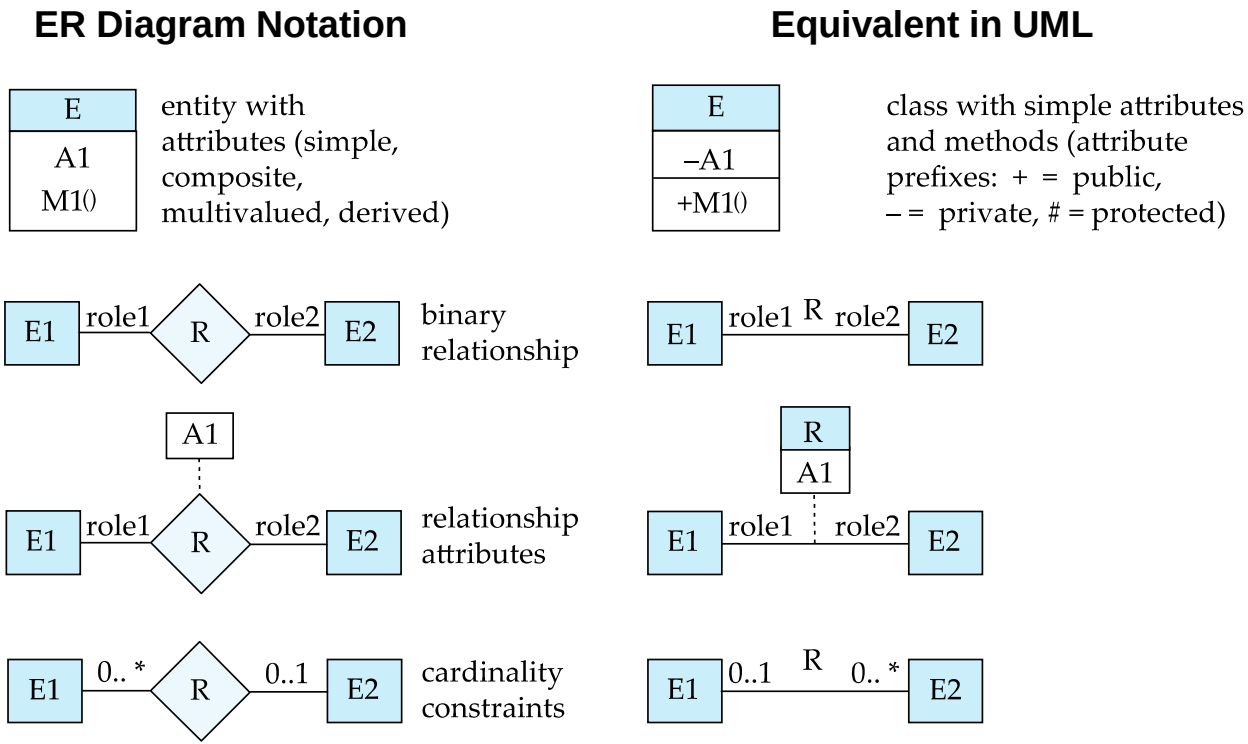
Alternative ER Notations



UML

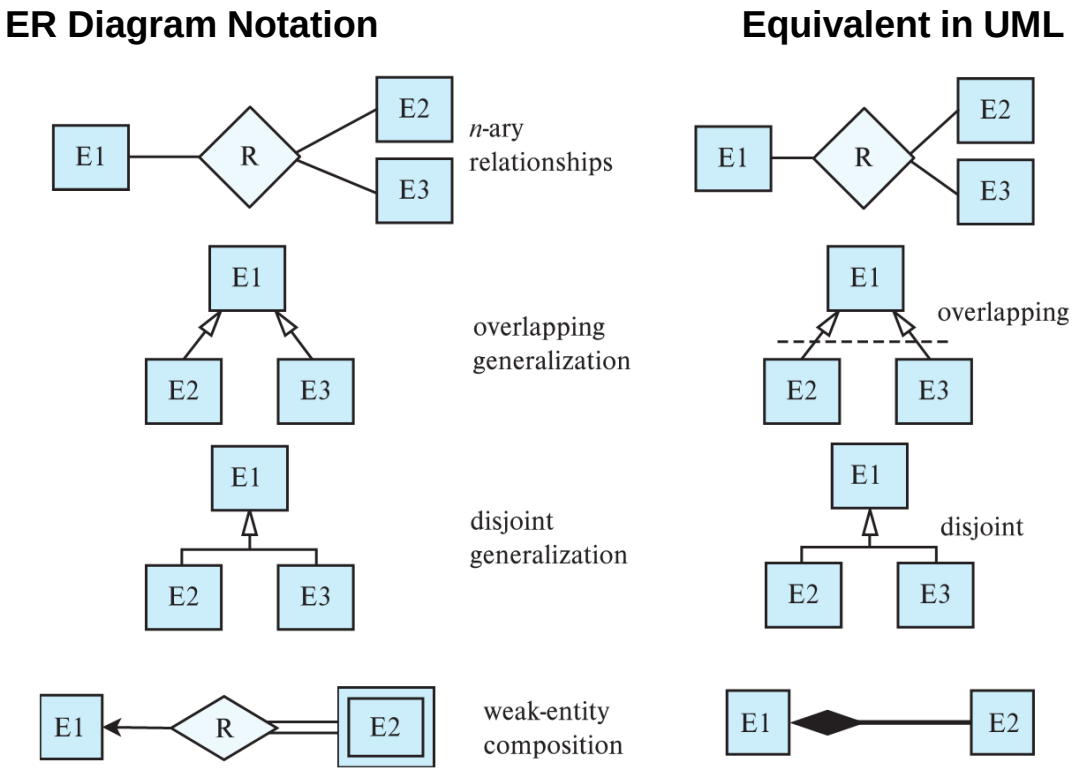
- **UML:** Unified Modeling Language
- UML has many components to graphically model different aspects of an entire software system
- UML Class Diagrams correspond to ER Diagram, but several differences
  - Entity sets are shown as boxes, and attributes are shown within the box, rather than as separate ellipses in ER diagrams
  - Binary relationship sets are represented in UML by just drawing a line connecting the entity sets
  - The relationship set name is written adjacent to the line
  - The role played by an entity set in a relationship set may also be specified by writing the role name on the line, adjacent to the entity set
  - The relationship set name may alternatively be written in a box, along with attributes of the relationship set, and the box is connected, using a dotted line, to the line depicting the relationship set
  - Non-binary relationships drawn using diamonds, just as in ER diagrams

ER vs. UML Class Diagrams



* Note reversal of position in cardinality constraint depiction

ER vs. UML Class Diagrams



* Generalization can use merged or separate arrows independent of disjoint/overlapping

UML Class Diagrams

- Cardinality constraints are specified in the form ***l..h***, where ***l*** denotes the minimum and ***h*** the maximum number of relationships an entity can participate in
- ***Beware:*** The positioning of the constraints is exactly the reverse of the positioning of constraints in ER diagrams
- The constraint ***0..**** on the ***E2*** side and ***0..1*** on the ***E1*** side means that each ***E2*** entity can participate in at most one relationship, whereas each ***E1*** entity can participate in many relationships, in other words, the relationship is many to one from ***E2*** to ***E1***
- Single values, such as ***1*** or ******* may be written on edges, the single value ***1*** on an edge is treated as equivalent to ***1..1***, while ******* is equivalent to ***0..****
- Binary relationship sets are represented in UML by just drawing a line connecting the entity sets, the relationship set name is written adjacent to the line
- The role played by an entity set in a relationship set may also be specified by writing the role name on the line, adjacent to the entity set
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Next Lecture

Introduction to Relational Model

Thank you for your attention...

Any question?

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