Database Management Systems (DBMS)

Lec 10: Entity-Relationship Model (cont.)

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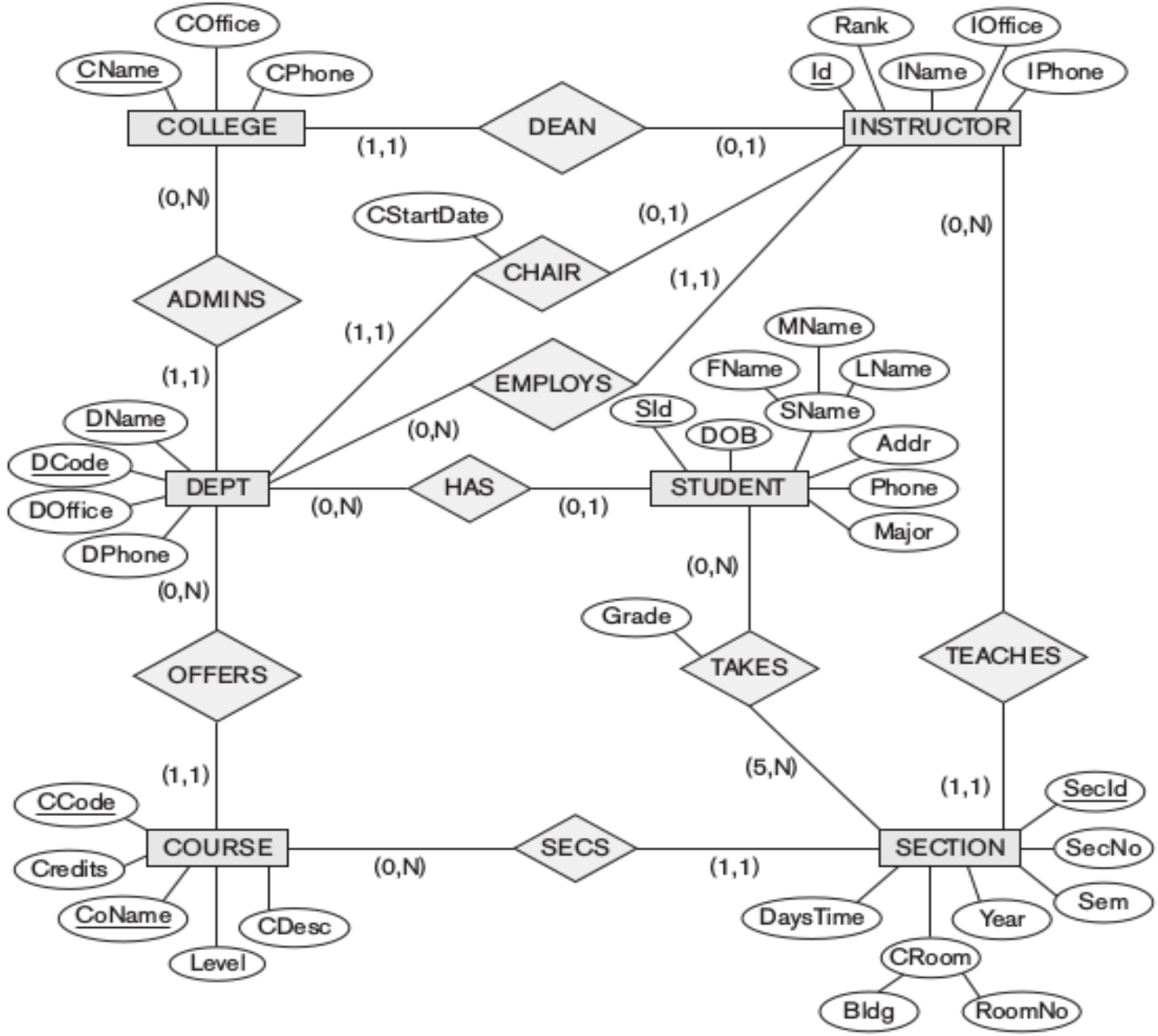
Recap

- Relationship sets
- Structural constraints
- Identifying relationships

Today's plan

- Two more examples
  - University database
  - Bank database
- Relationship types of higher degree
- Common mistakes in designing ER diagrams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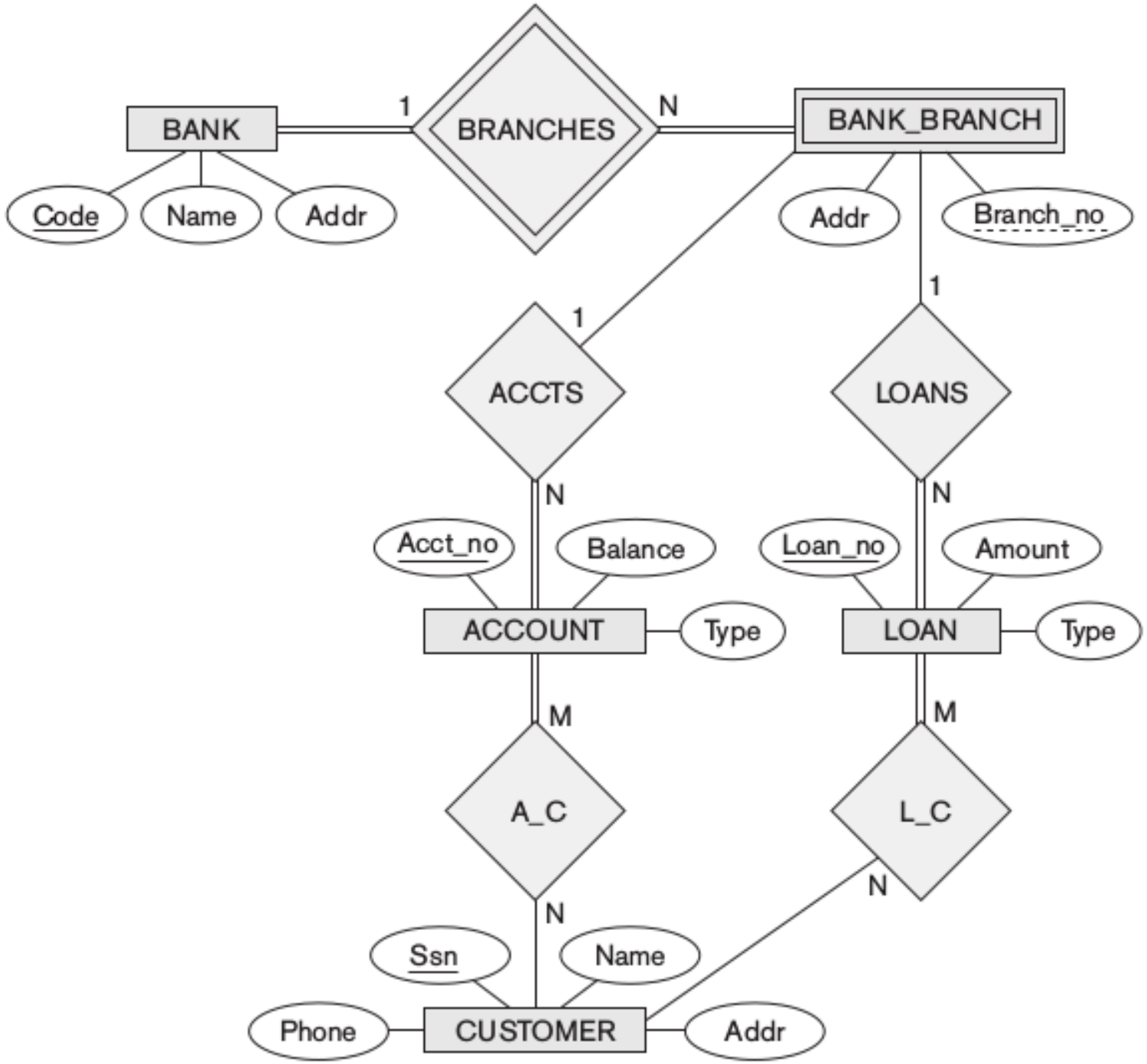
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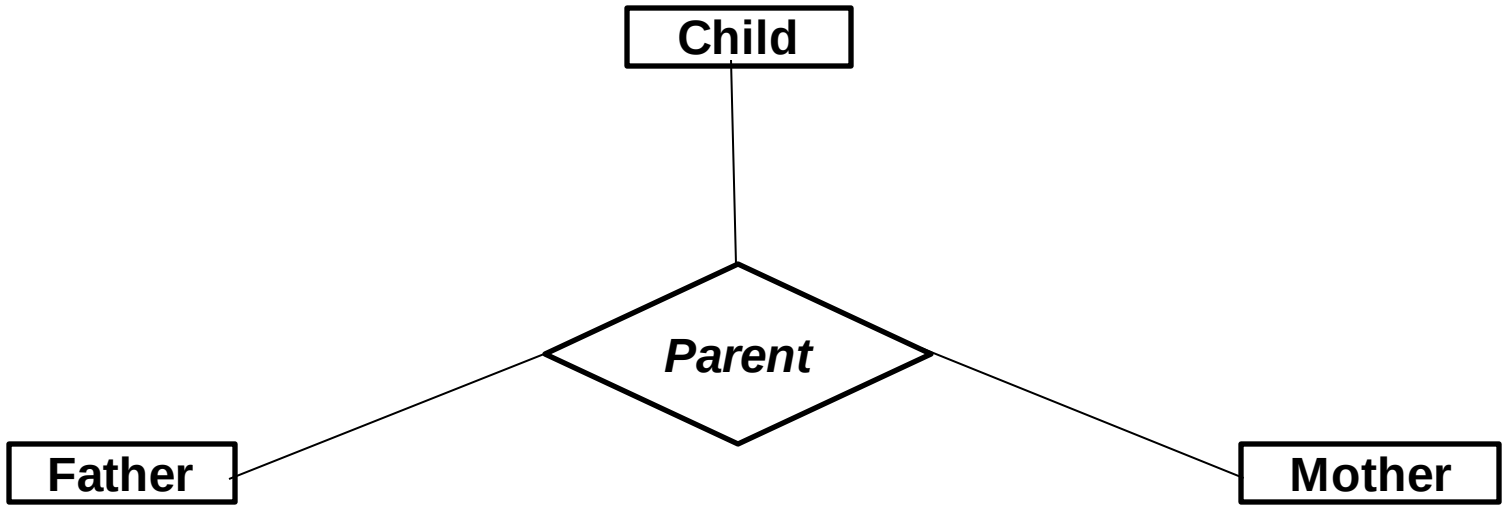
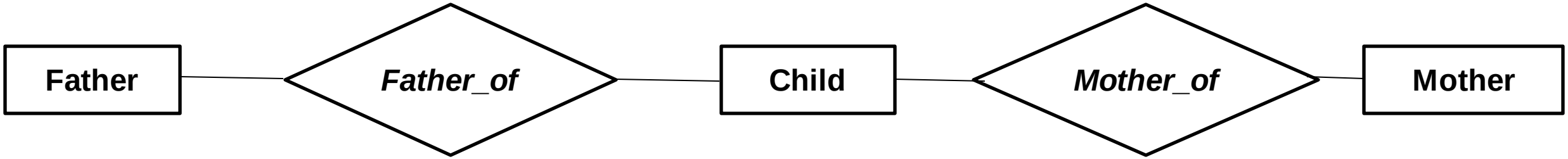
Binary vs *n*-ary relationships

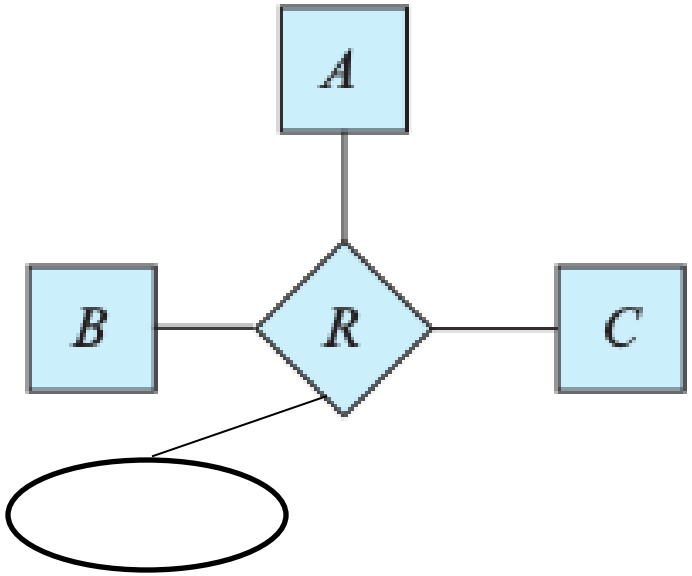
- Some relationships that appear to be nonbinary could actually be better represented by several binary relationships

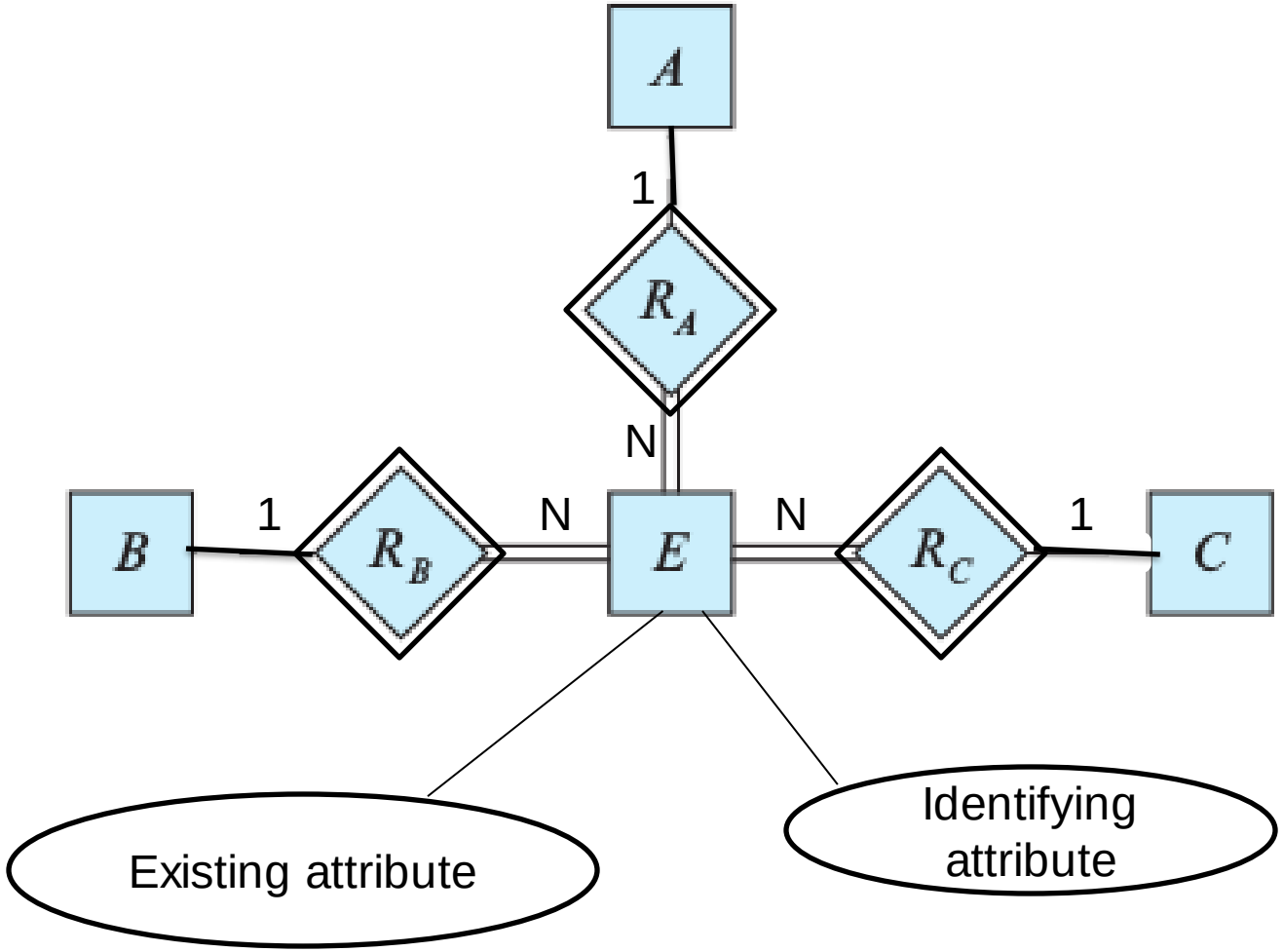


Binary vs *n*-ary relationships



Converting an *n*-ary relationship to a set of binary relations





Rules for converting

- We replace the relationship set R with an entity set E, and we create three relationship sets
  - R_A, R_B, and R_C are many-to-one relationships from E to A, E to B, and from E to C, resp.
- E is required to have total participation in each of R_A , R_B , and R_C
- If R had any attributes, these are assigned to entity set E; further, a special identifying attribute is created for E

Rules for converting (Cont.)

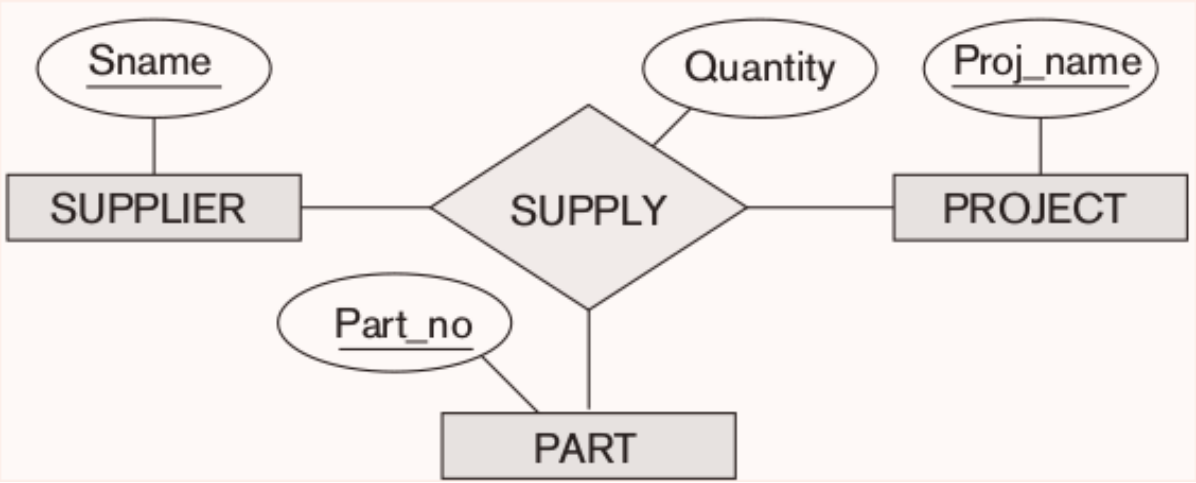
- For each relationship (a_i, b_i , c_i) in the relationship set R, we create a new entity e_i in the entity set E
- In each of the three new relationship sets, we insert a relationship (e_i, a_i) in R_A , (e_i, b_i) in R_B, and (e_i, c_i) in R_C
- We can generalize this process in a straightforward manner to n-ary relationship sets
- Thus, conceptually, we can restrict the ERmodel to include only binary relationship sets

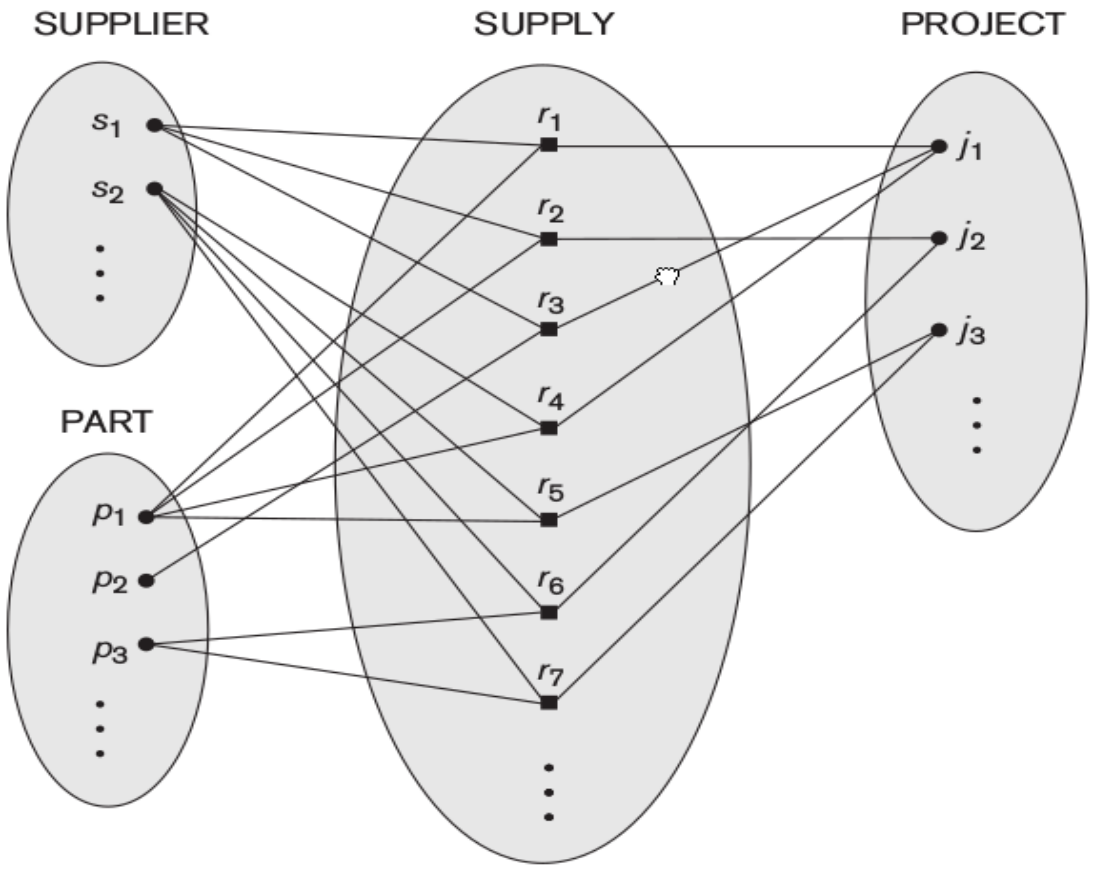
Not always desirable

- An identifying attribute may have to be created for the entity set created to represent the relationship set. This attribute, along with the extra relationship sets required, increases the complexity of the design

- An *n*-ary relationship set shows more clearly that several entities participate in a single relationship.
- There may not be a way to translate constraints on the ternary relationship into constraints on the binary relationships. For example, consider a constraint that says that R is many-to-one from A, B to C; that is, each pair of entities from A and B is associated with at most one C entity. This constraint cannot be expressed by using cardinality constraints on the relationship sets R_A, R_B, and R_C.

Relationship types of degree higher than two





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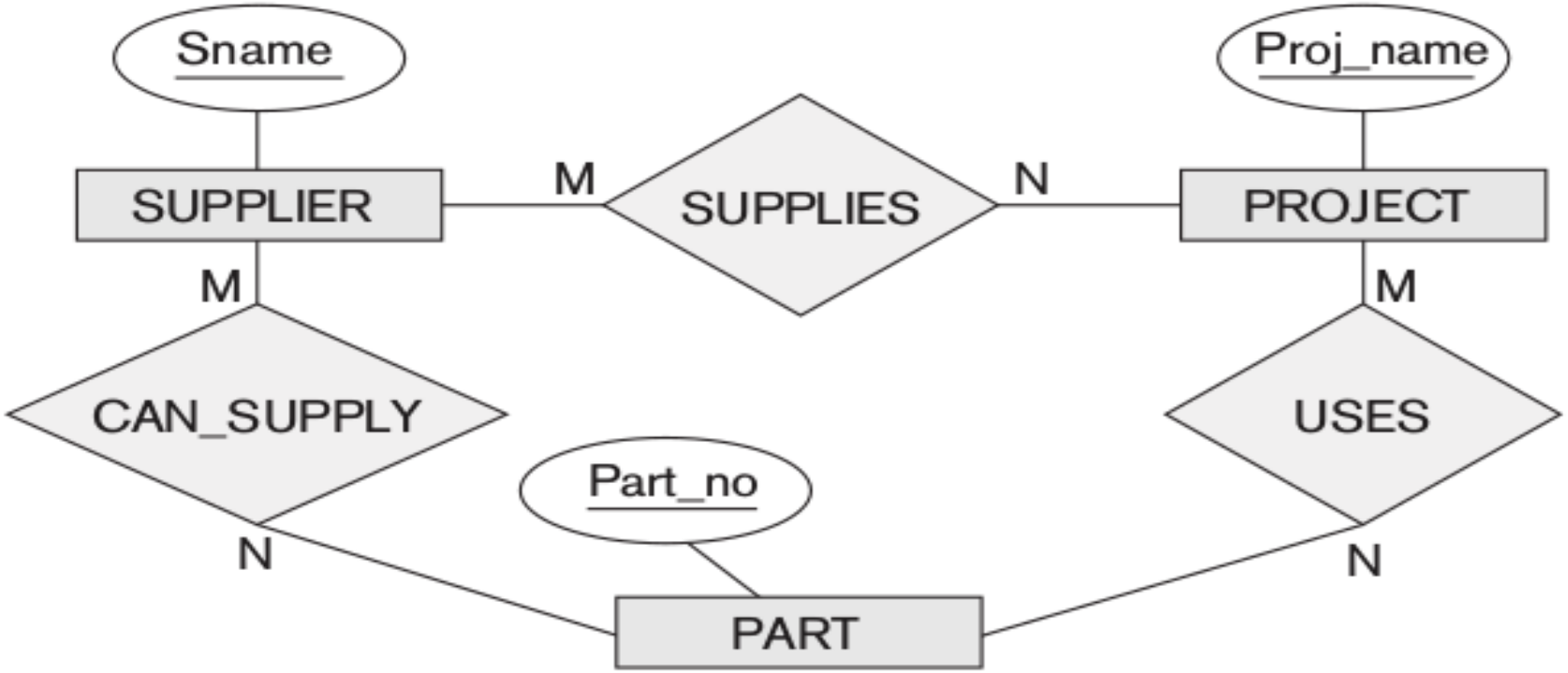
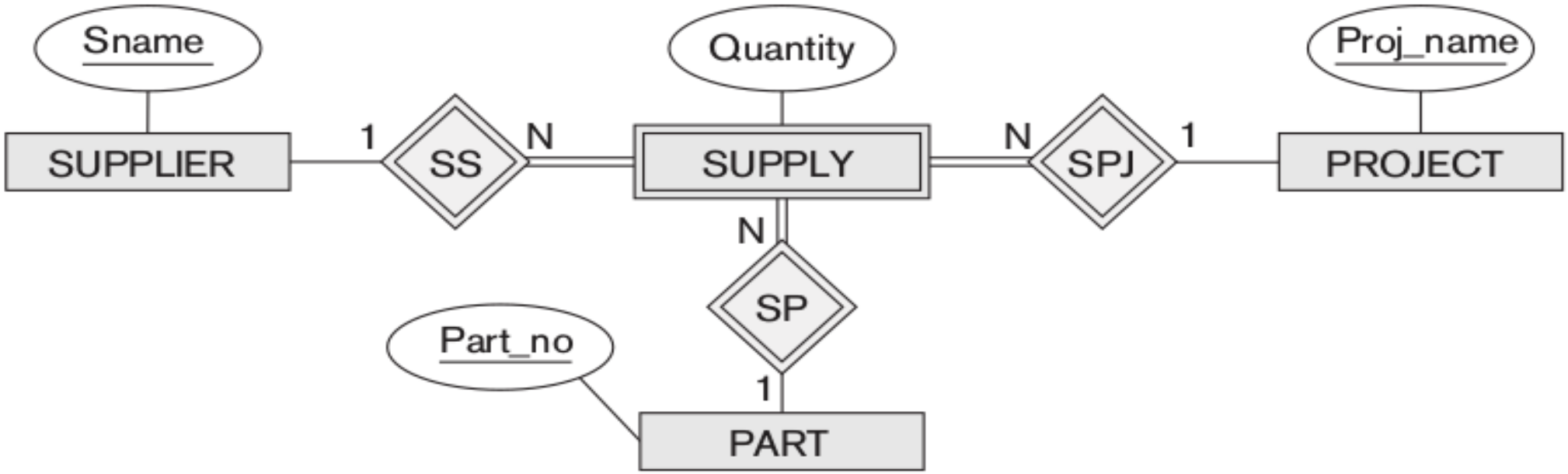


Example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Key points

- It is often tricky to decide whether a particular relationship should be represented as a relationship type of degree *n* or should be broken down into several relationship types of smaller degrees
- The designer must base this decision on the semantics or meaning of the particular situation being represented
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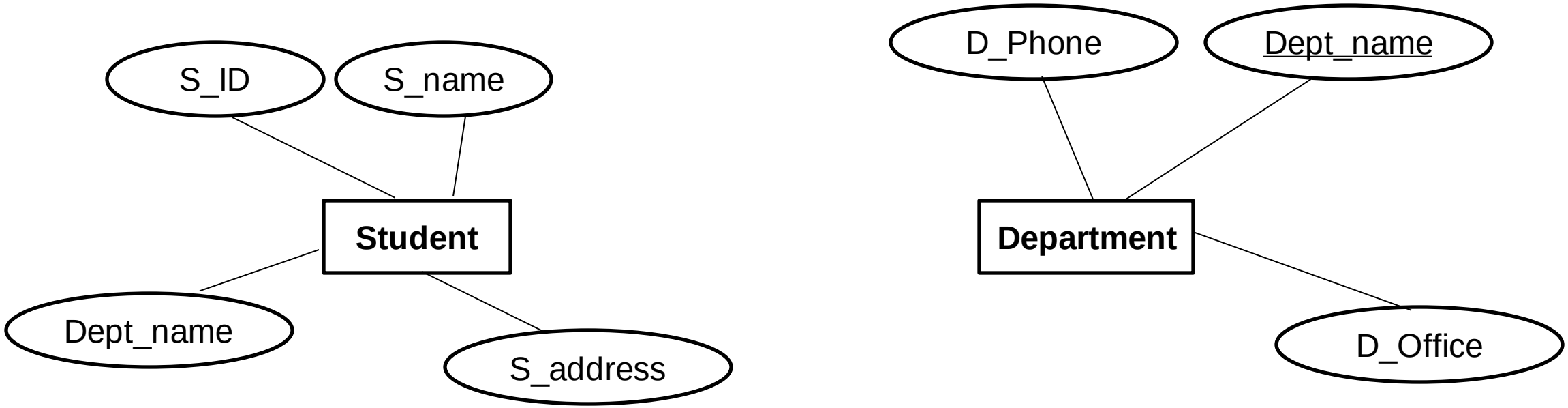
- If the ER model that permit only binary relationships, a ternary relationship must be represented as a weak entity type, with no partial key and with three identifying relationships

Common mistakes in ER diagrams

- Use of the primary key of an entity type as an attribute of another entity type, instead of using a relationship



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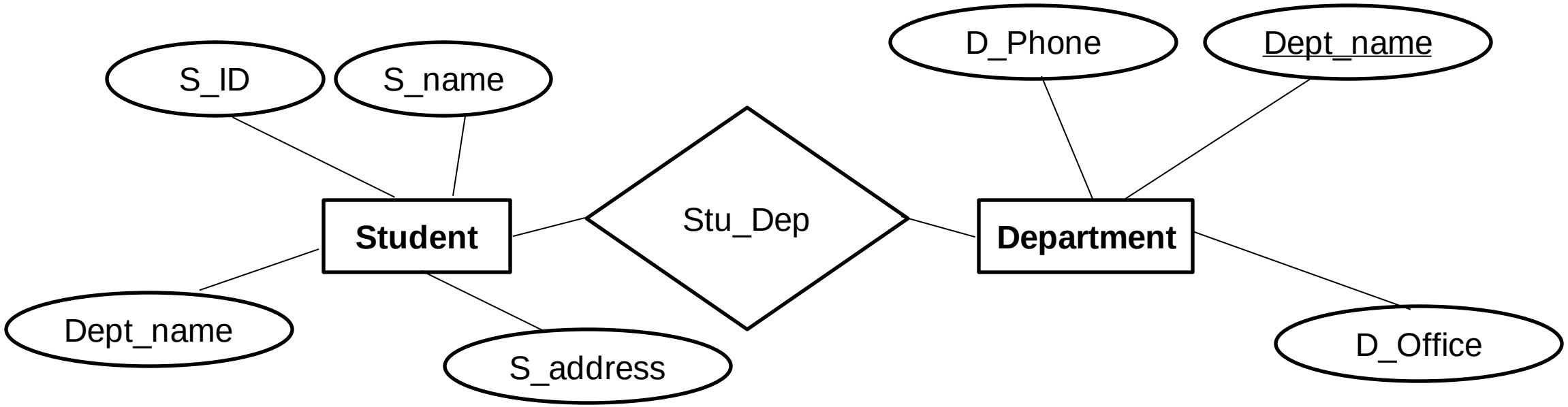
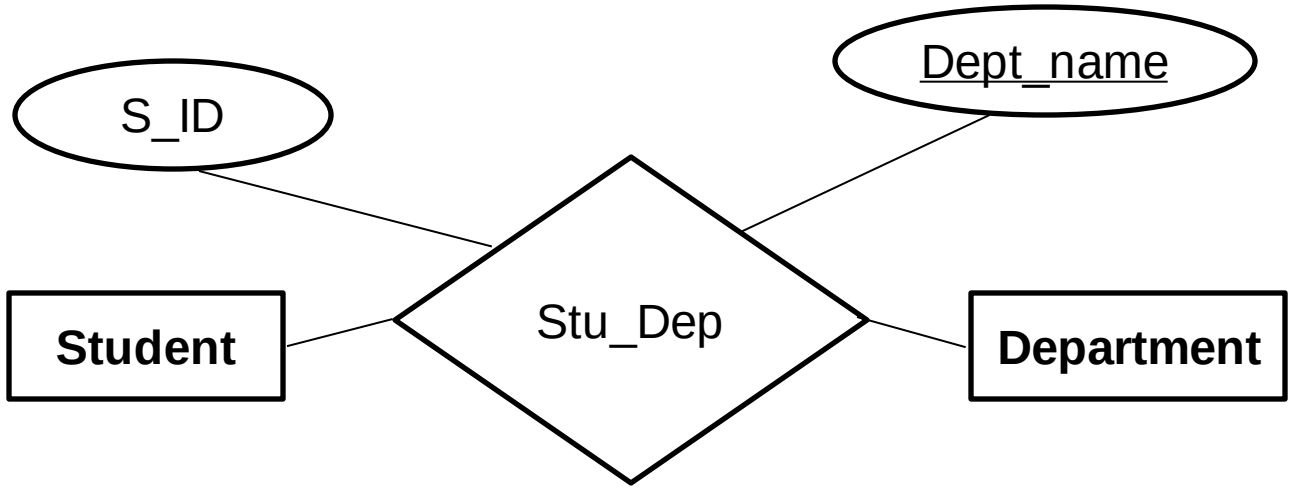


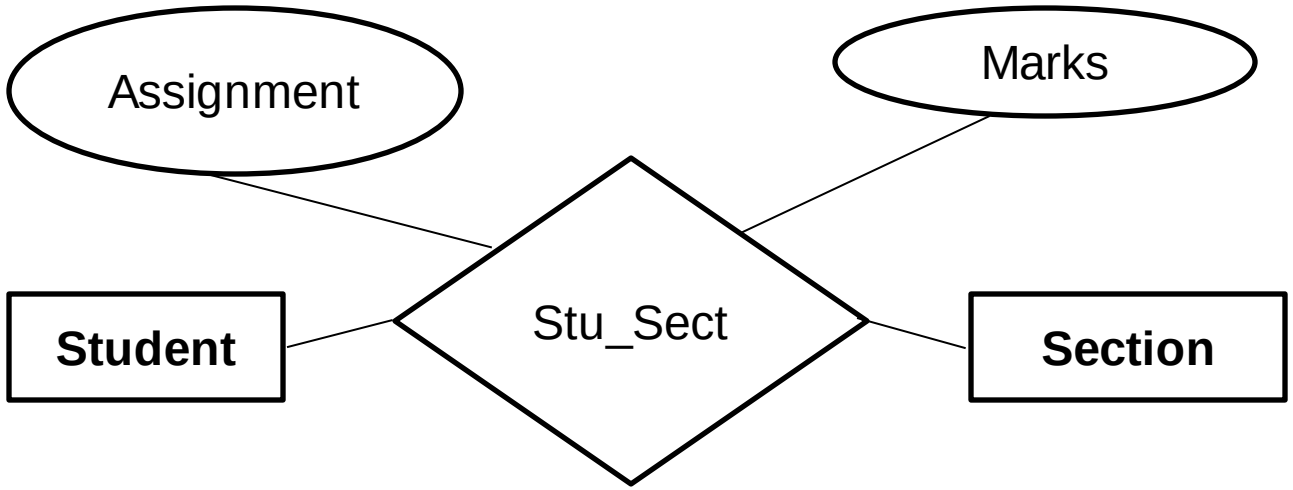
Common mistakes in ER diagrams

- To designate the primary key attributes of the related entity sets as attributes of the relationship



Common mistakes in ER diagrams

- To use a relationship with a single-valued attribute in a situation that requires a multivalued attribute
  - e.g., store the marks that a student gets in different assignments of a course



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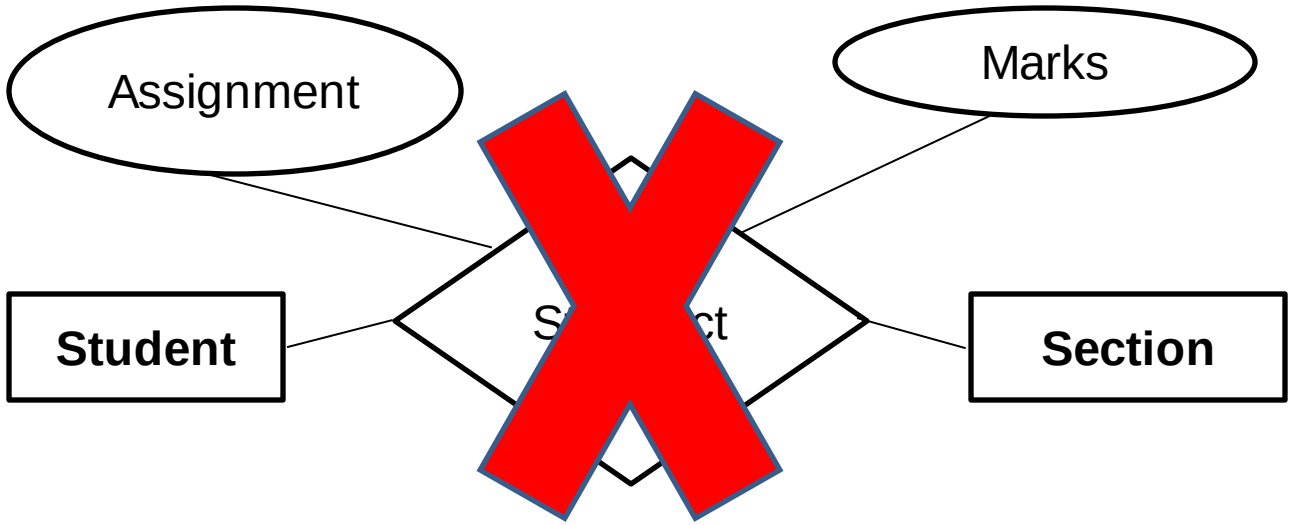

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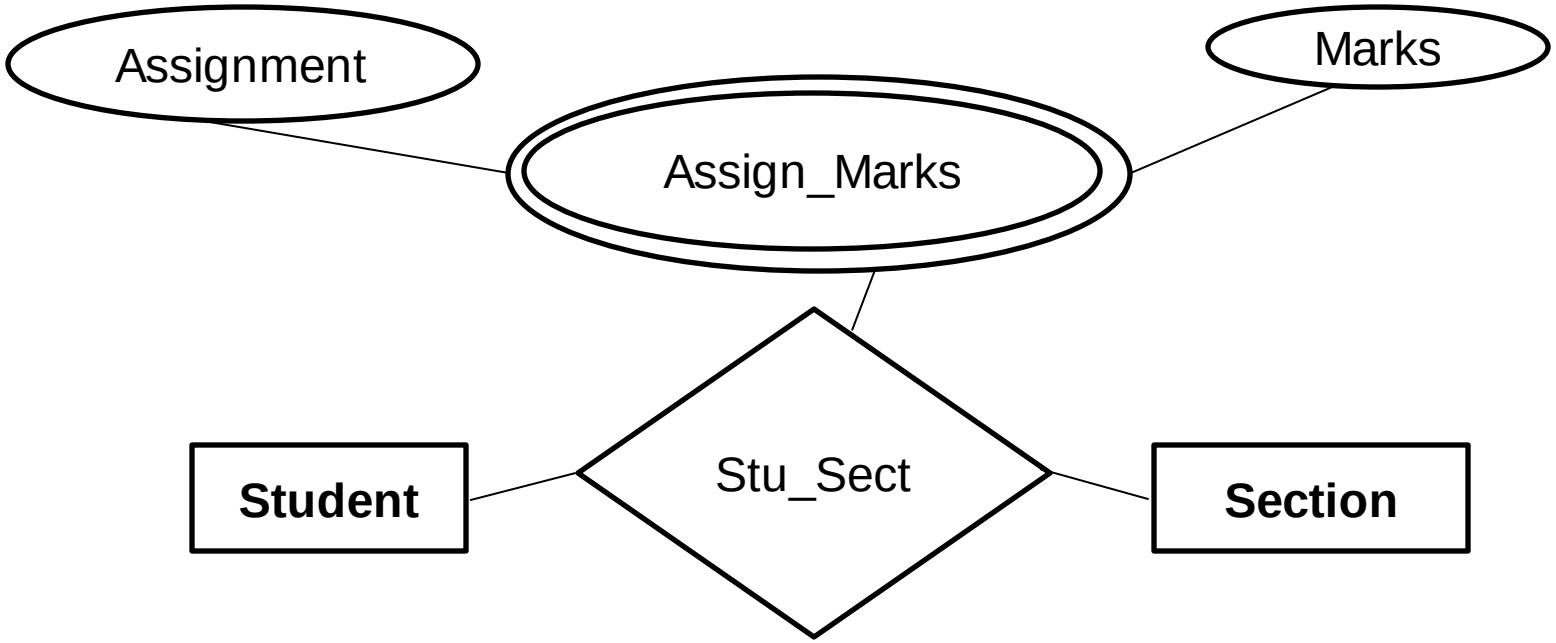

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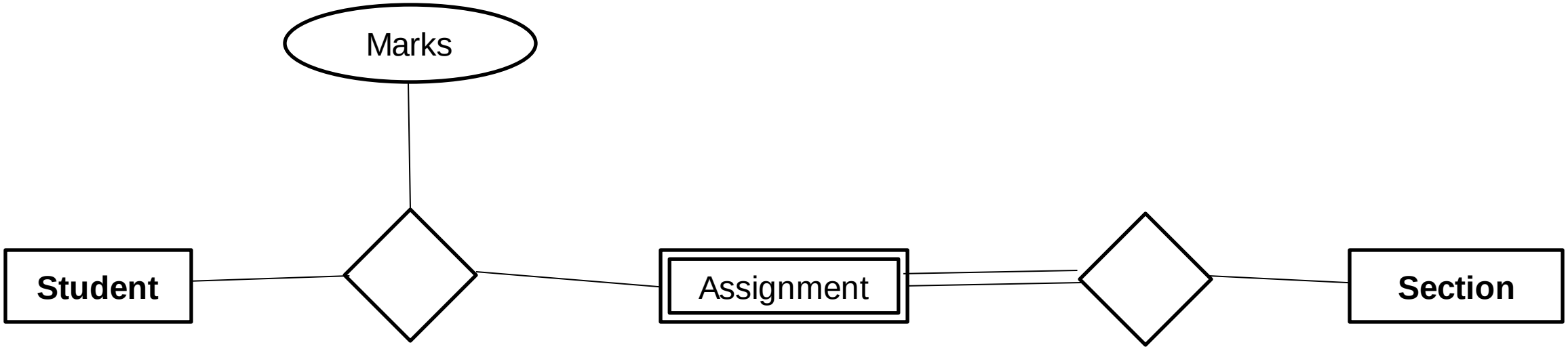
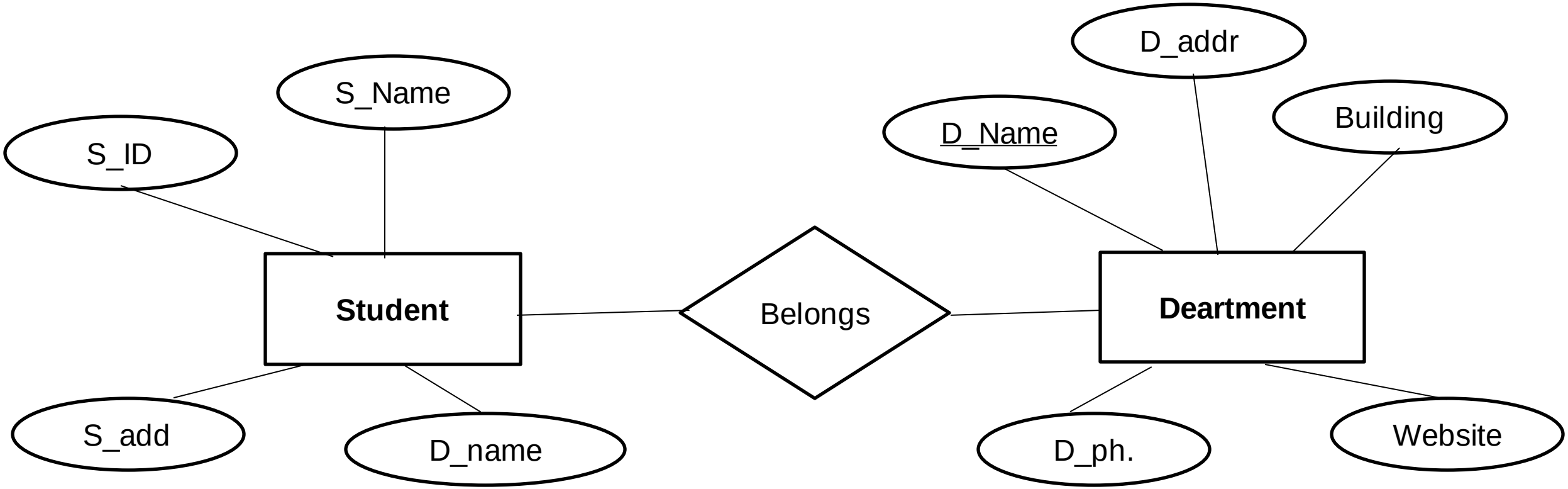


Removing redundant attributes

- The attribute D_name in **Student** replicates information present in the relationship, and is therefore redundant and needs to be removed



Thank you!