

Entity-Relationship Models: Good Design and Constraints

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September 27, 2007

Guidelines

- ▶ Be faithful to the specification of the application.
- ▶ Avoid redundancy.
- ▶ Keep the entities and relationship simple.
- ▶ Select the right relationships.
- ▶ Select the right type of element.

Be Faithful

- ▶ Do not use meaningless or unnecessary attributes.
- ▶ Define the multiplicity of a relationship appropriately.
 - ▶ What is the multiplicity of the relationship *Take* between *Students* and *Courses*?
 - ▶ What is the multiplicity of the relationship *Teach* between *Professors* and *Courses*?

Avoid Redundancy

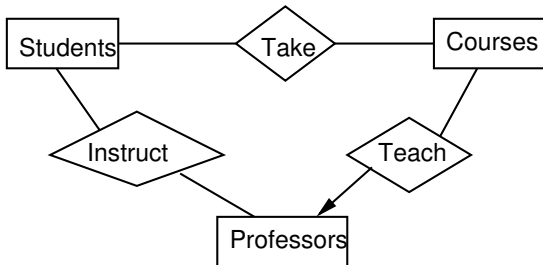
- ▶ Redundancy occurs when we express the same fact in two or more ways.
- ▶ Redundancy wastes space.
- ▶ Redundancy can lead to inconsistency if we change one instance but not the other.

Select the Right Relationships

- ▶ Do not add unnecessary relationships.
- ▶ It may be possible to deduce one relationship from another.

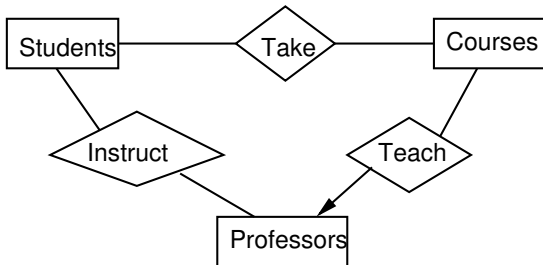
Select the Right Relationships

- ▶ Do not add unnecessary relationships.
- ▶ It may be possible to deduce one relationship from another.
- ▶ Do we need the relationship *Instruct* between *Professors* and *Students*?



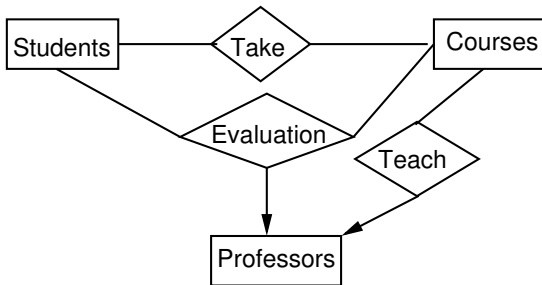
Select the Right Relationships

- ▶ Do not add unnecessary relationships.
- ▶ It may be possible to deduce one relationship from another.
- ▶ Do we need the relationship *Instruct* between *Professors* and *Students*?
 - ▶ No. We can deduce this relationship from *Take* and *Teach*.



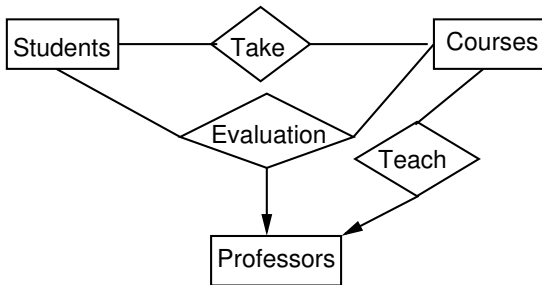
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- ▶ Do we need the relationships *Take* and *Teach*?



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- ▶ Do we need the relationship *Instruct* between *Professors* and *Students*?
 - ▶ No. We can deduce this relationship from *Take* and *Teach*.
- ▶ Do we need the relationships *Take* and *Teach*?
 - ▶ Yes. Why?

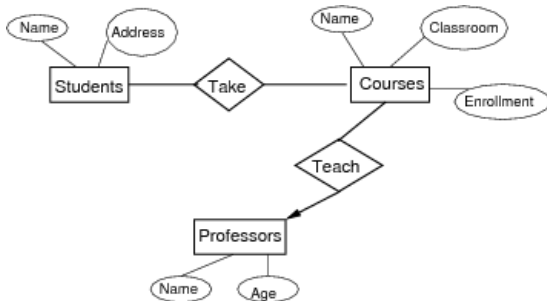


Select the Right Type of Element

- ▶ Attribute or Entity or Relationship?

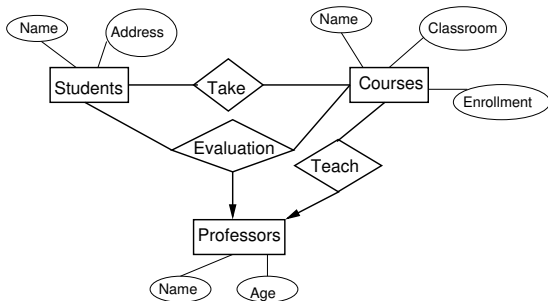
Select the Right Type of Element

- ▶ Attribute or Entity or Relationship?
- ▶ Can we make *Professor* an attribute of *Courses* and remove the relationship *Teach*?



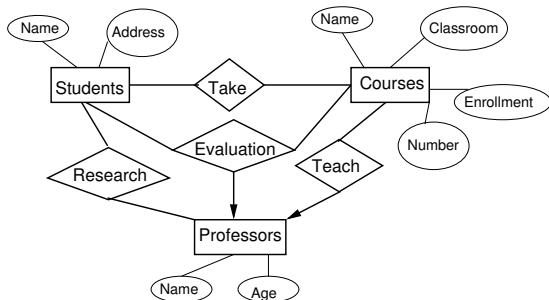
Select the Right Type of Element

- ▶ Attribute or Entity or Relationship?
- ▶ Can we make *Professor* an attribute of *Courses* and remove the relationship *Teach*?
- ▶ What if we add the relationship *Evaluation*?



Select the Right Type of Element

- ▶ Attribute or Entity or Relationship?
- ▶ Can we make *Professor* an attribute of *Courses* and remove the relationship *Teach*?
- ▶ What if we add the relationship *Evaluation*?
- ▶ What if we add the relationship *Research* signifying a research project the student is working on with a professor?



Converting an Entity Set into an Attribute

- ▶ If an entity set E satisfies the following properties:
 1. All relationships involving E have arrows entering E .
 2. The attributes of E collectively identify an entity (i.e., no attribute depends on another).
 3. No relationship involves E more than once

- ▶ then we can replace E as follows:
 1. If there is a many-one relationship R from an entity set F to E , remove R and make the attributes of E be attributes of F .
 2. If there is a multiway relationship R with an arrow to E , make the attributes of E be new attributes of R and remove the arrow from R to E .