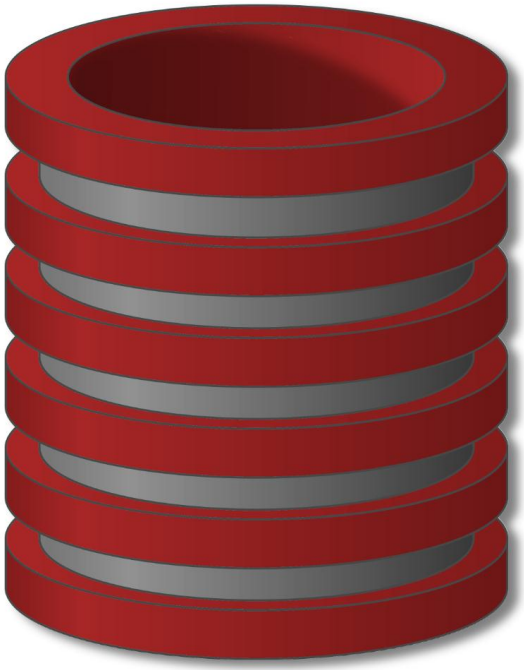


UML

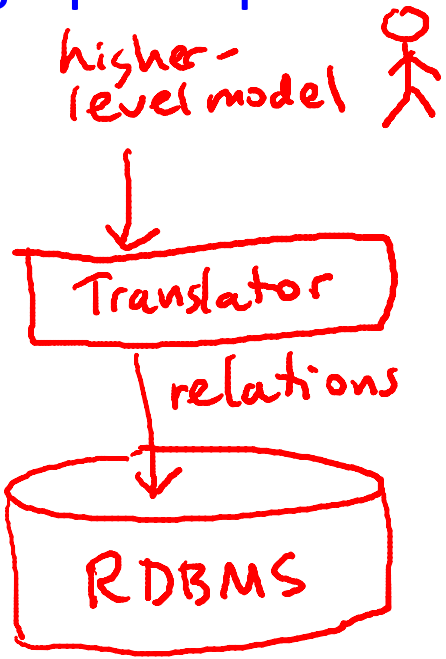
UML Data Modeling

Jennifer Widom

Data Modeling

How to represent data for application

- Relational model – with design principles
- XML
- Database design model
  - Not implemented by system
  - Translated into model of DBMS



Higher-Level Database Design Models

- *Entity-Relationship Model* (E/R)
- *Unified Modeling Language* (UML)

  Data modeling subset

- Both are graphical
- Both can be translated to relations automatically

  Or semi-automatically

UML Data Modeling: 5 concepts

(1) Classes

(2) Associations

(3) Association Classes

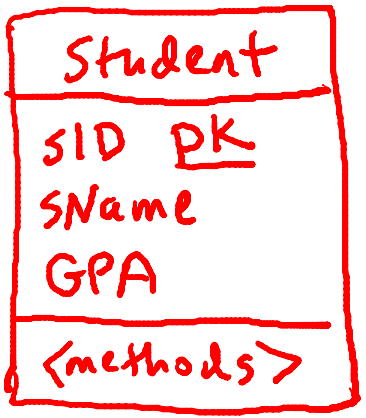
(4) Subclasses

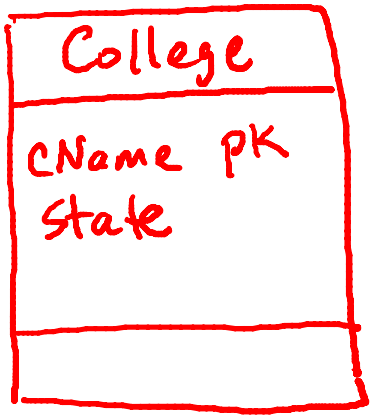
(5) Composition & Aggregation

UML Data Modeling: **Classes**

Name, attributes, methods

For data modeling: add "pk", drop methods





UML Data Modeling: 5 concepts

(1) Classes

(2) Associations

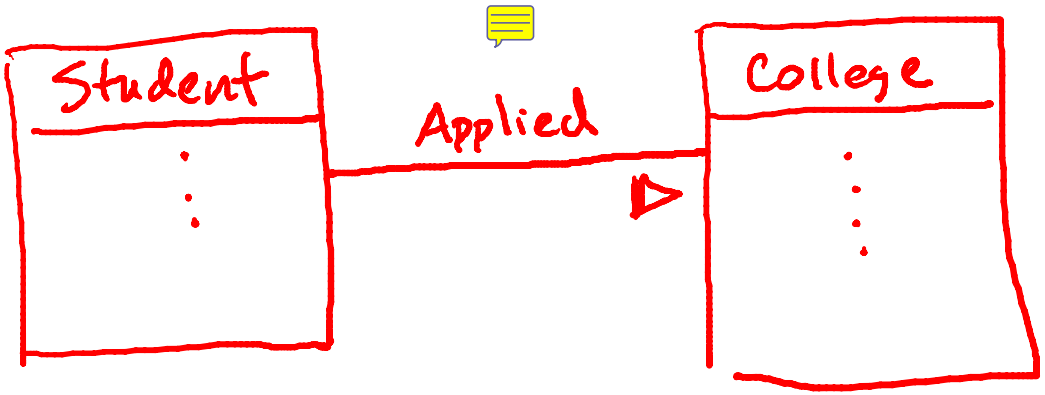
(3) Association Classes

(4) Subclasses

(5) Composition & Aggregation

UML Data Modeling: **Associations**

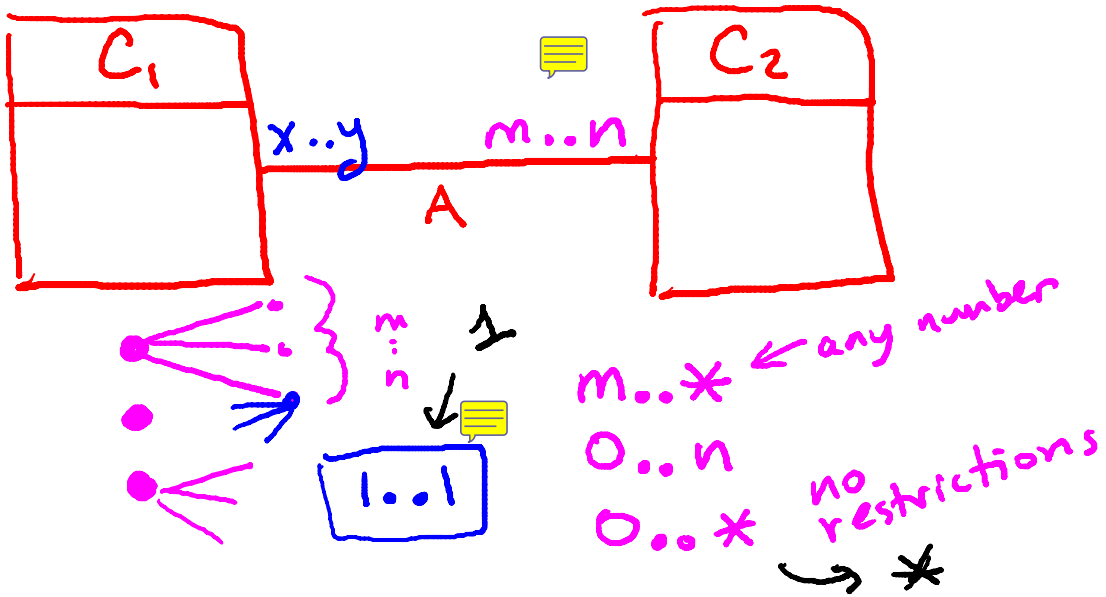
Relationships between objects of two classes



Multiplicity of Associations

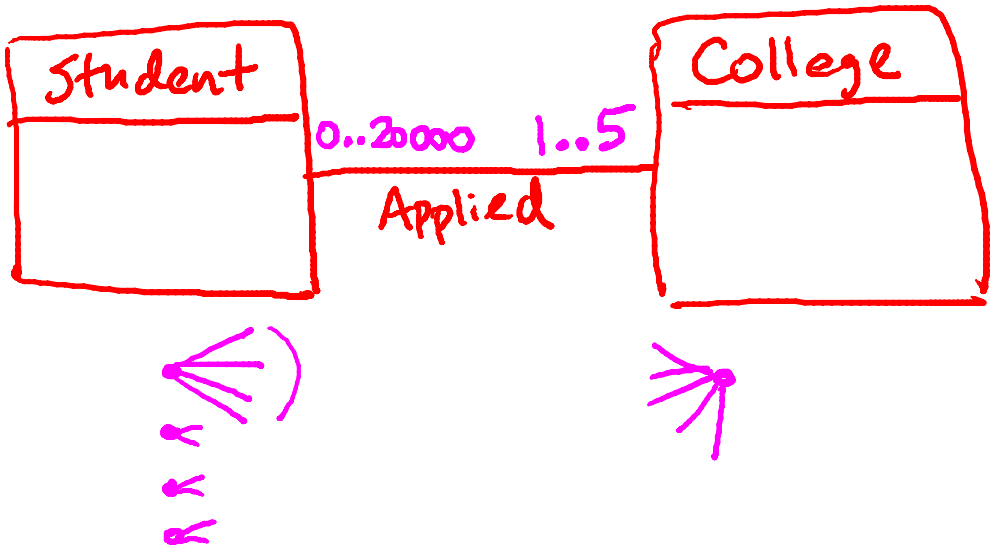
Relationships between objects of two classes

Each object of class C_1 is related to at least m and at most n objects of class C_2



Multiplicity of Associations: Example

Students must apply somewhere and may not apply to more than 5 colleges. No college takes more than 20,000 applications.

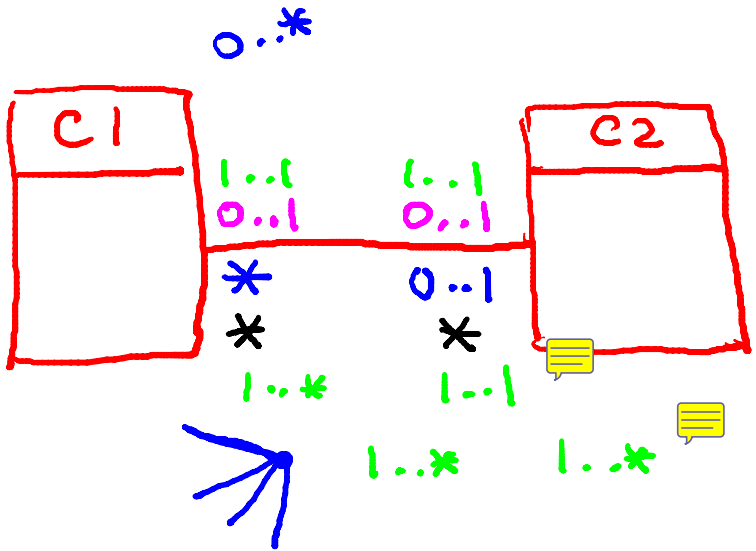


Multiplicity of Associations: Types of Relationships

- One-to-One
- Many-to-One
- Many-to-Many
- Complete

Complete

Default 1..1



UML Data Modeling: 5 concepts

(1) Classes

(2) Associations

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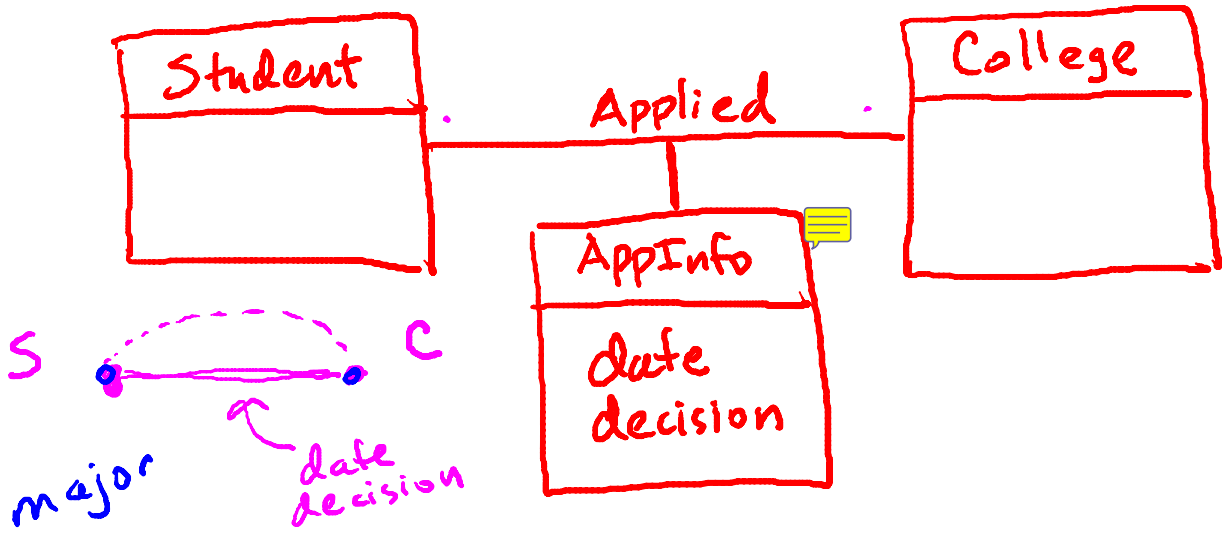
(5) Composition & Aggregation

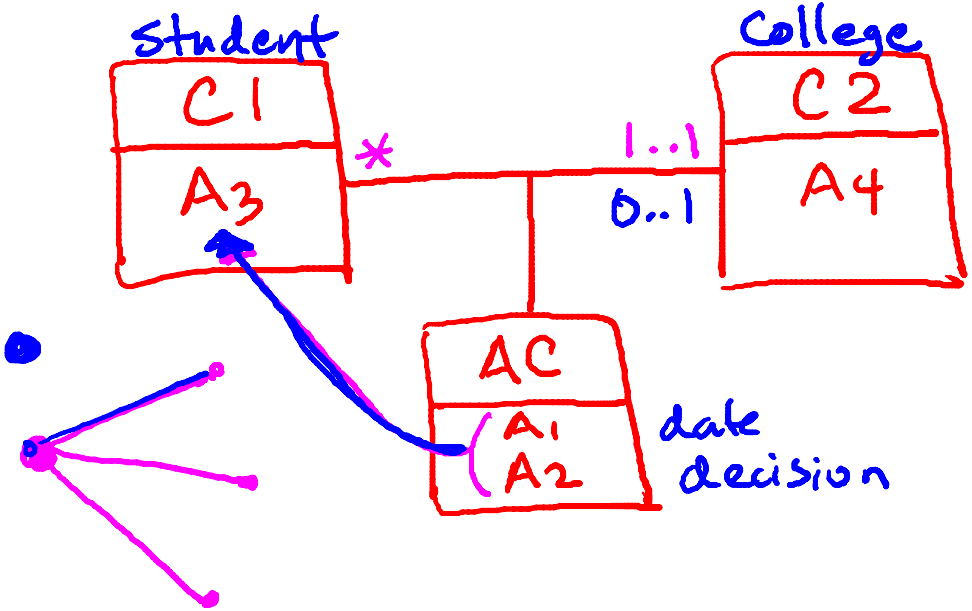
UML Data Modeling: **Association Classes**

Relationships between objects of two classes,
with attributes on relationships



Eliminating Association Classes

Unnecessary if 0..1 or 1..1 multiplicity

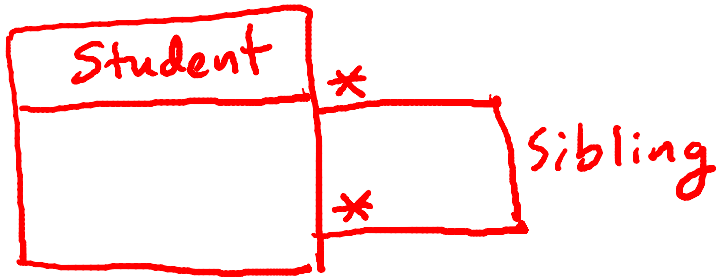


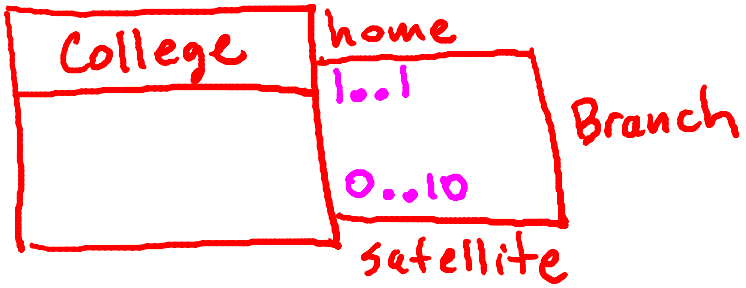
Self-Associations

Associations between a class and itself

Self-Associations

Associations between a class and itself





UML Data Modeling: 5 concepts

(1) Classes

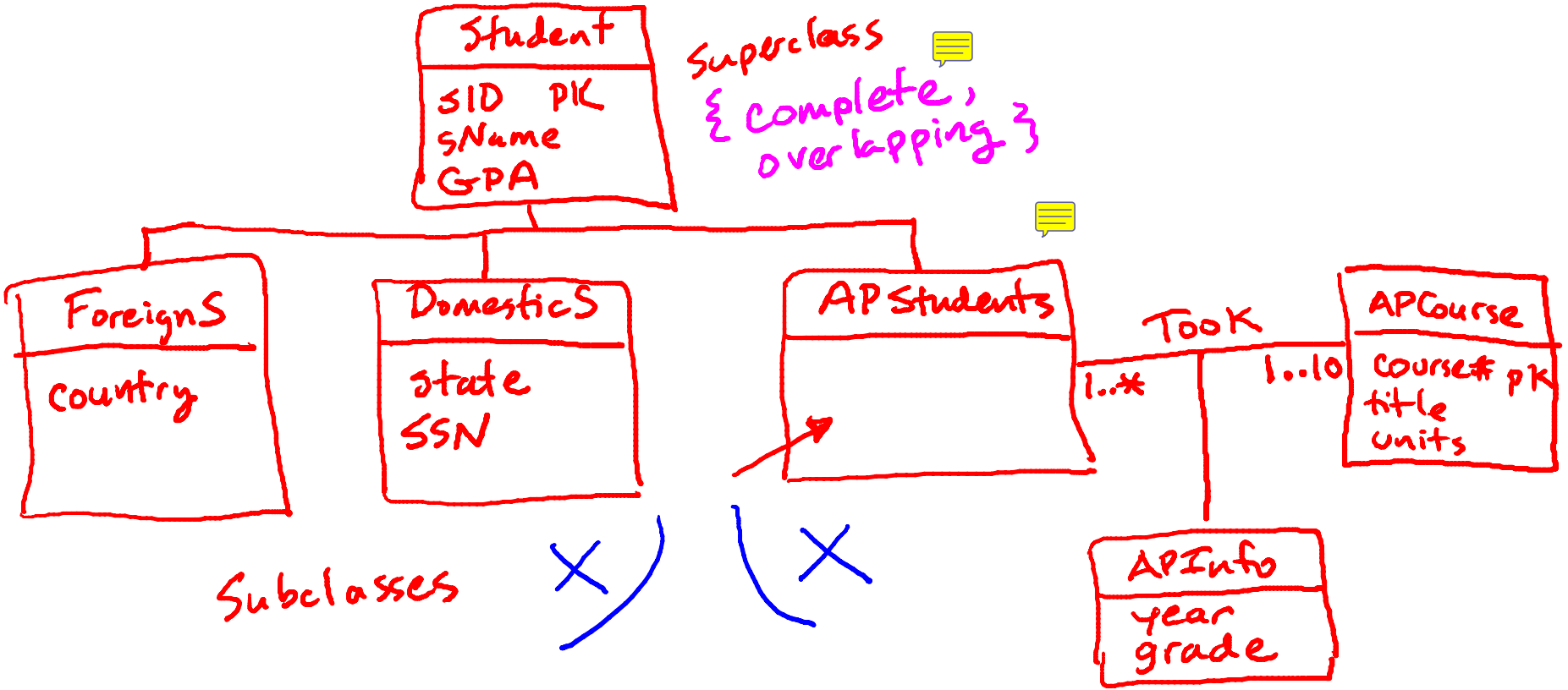
(2) Associations

(3) Association Classes

(4) Subclasses

(5) Composition & Aggregation

UML Data Modeling: **Subclasses**



Subclass Terminology & Properties

- *Superclass = Generalization* ✓
- *Subclass = Specialization* ✓
- *Incomplete* (*Partial*) vs. *Complete*
- *Disjoint* (*Exclusive*) vs. *Overlapping*

every obj. in at least subclass

↳ .. at most ..

UML Data Modeling: 5 concepts

(1) Classes

(2) Associations

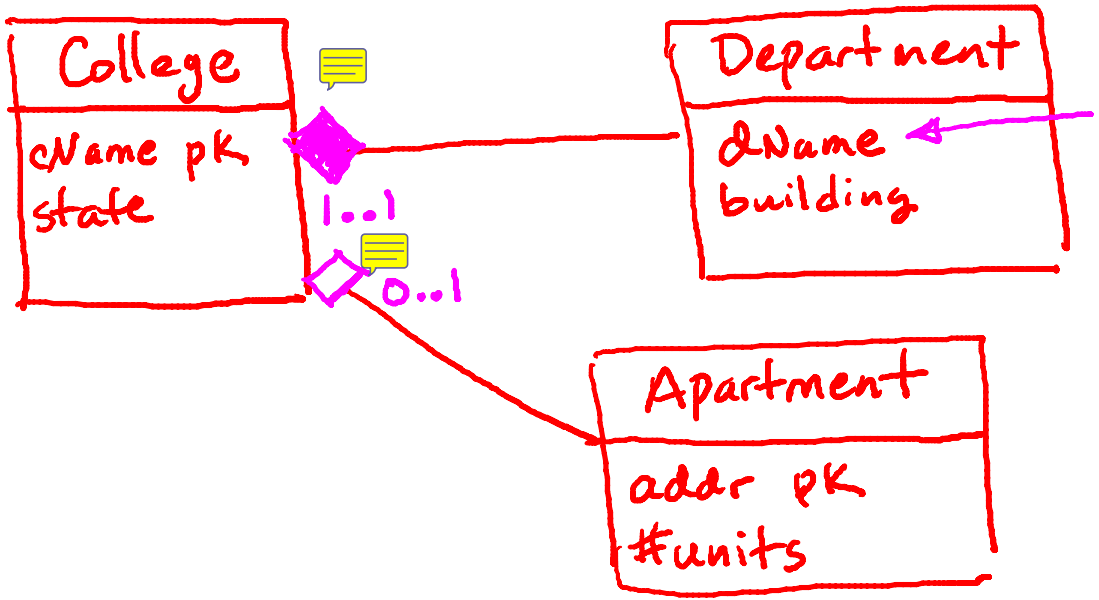
(3) Association Classes

(4) Subclasses

(5) Composition & Aggregation

UML Data Modeling:
Composition & Aggregation

Objects of one class belong to objects of another class



Higher-Level Database Design

- *Unified Modeling Language* (UML)

  Data modeling subset

- Graphical
- 5 concepts
  (1) Classes
  (2) Associations
  (3) Association Classes
  (4) Subclasses
  (5) Composition & Aggregation

❖ Can be translated to relations automatically