Class Diagram

Class diagram

- A class diagram depicts classes and their interrelationships
- Used for describing structure and behavior in the use cases
- Provide a conceptual model of the system in terms of entities and their relationships
- Used for requirement capture, end-user interaction
- Detailed class diagrams are used for developers

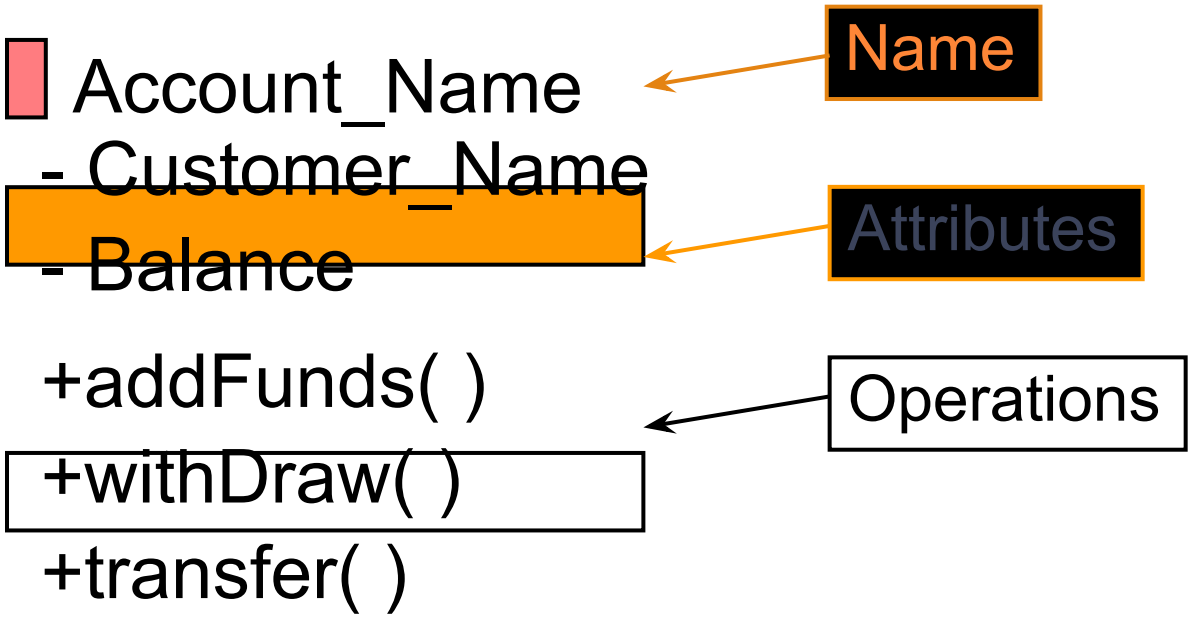
Class diagram

- Each class is represented by a rectangle subdivided into three compartments
  - Name
  - Attributes
  - Operations

- Modifiers are used to indicate visibility of attributes and operations.
  - ‘+’ is used to denote *Public* visibility (everyone)
  - ‘#’ is used to denote *Protected* visibility (friends and derived)
  - ‘-’ is used to denote *Private* visibility (no one)

- By default, attributes are hidden and operations are visible.

Class diagram

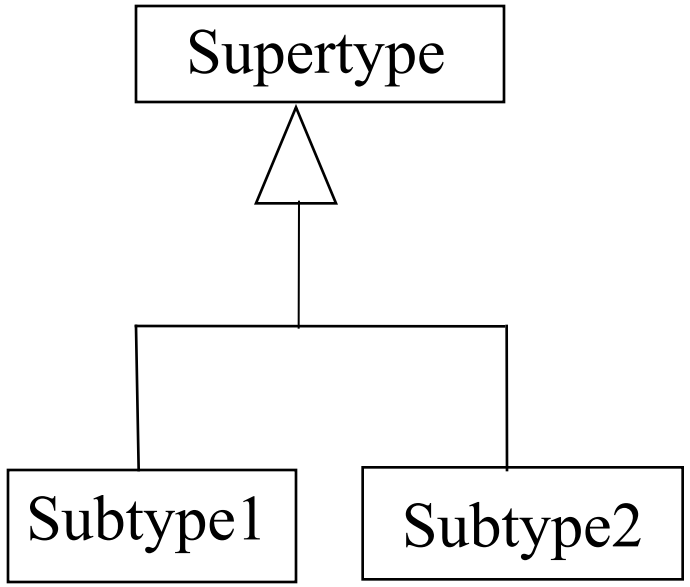


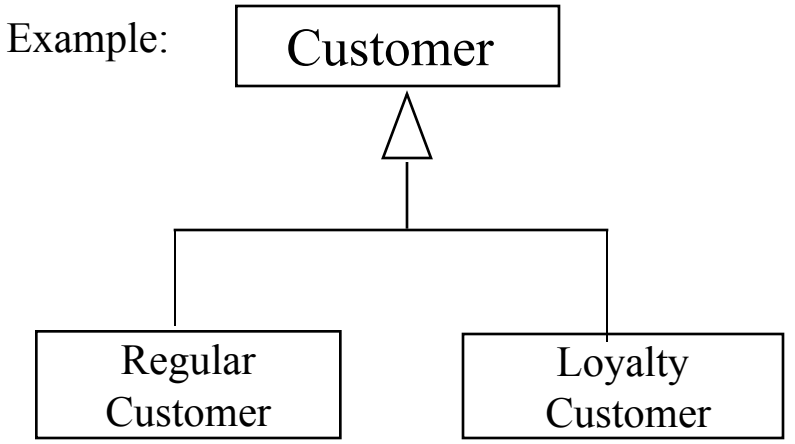
OO Relationships

- There are two kinds of Relationships
  - Generalization (parent-child relationship)
  - Association (student enrolls in course)

- Associations can be further classified as
  - Aggregation
  - Composition

OO Relationships: **Generalization**





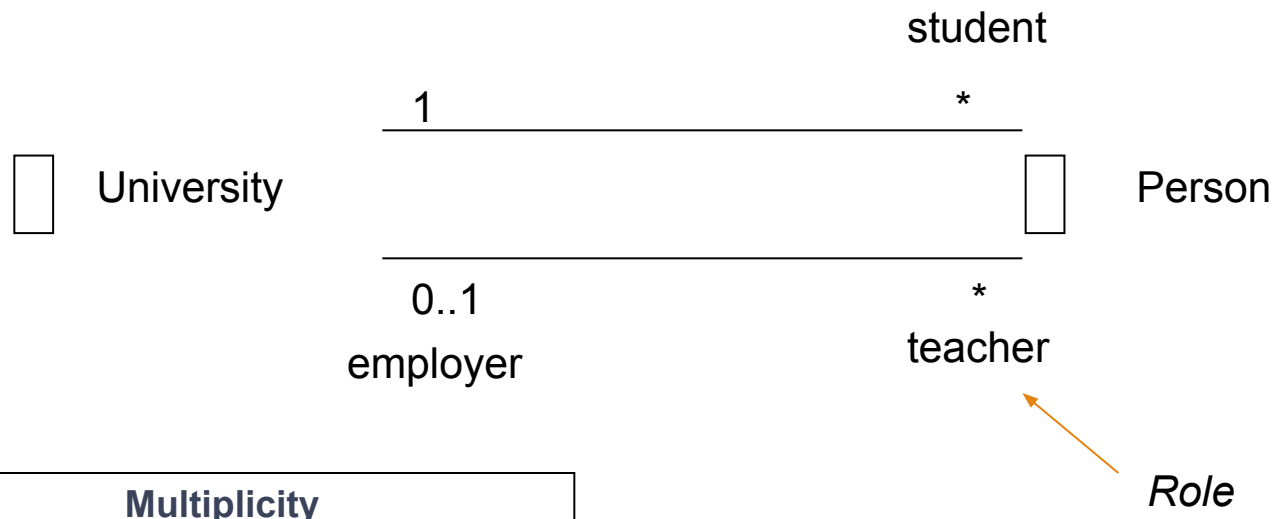
- Inheritance is a required feature of object orientation
- Generalization expresses a parent/child relationship among related classes. Used for abstracting details in several layers

OO Relationships: **Association**

- Represent relationship between instances of classes
  - Student enrolls in a course
  - Courses have students
  - Courses have exams
  - Etc.

- Association has two ends
  - Role names (e.g. enrolls)
  - Multiplicity (e.g. One course can have many students)
  - Navigability (unidirectional, bidirectional)

Association: Multiplicity and Roles



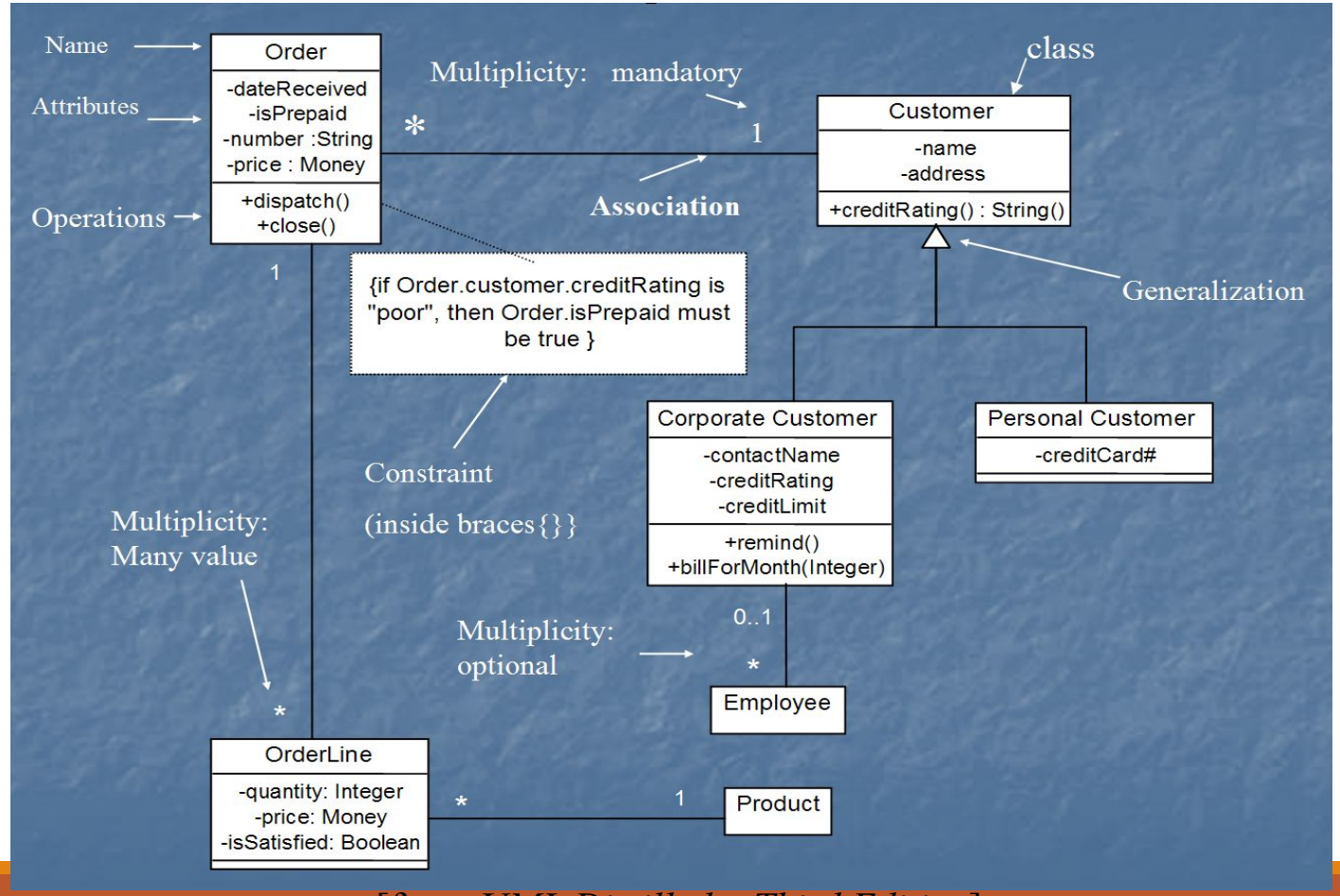
Multiplicity

Symbol	Meaning
1	One and only one
0..1	Zero or one
M..N	From M to N (natural language)
*	From zero to any positive integer
0..*	From zero to any positive integer
1..*	From one to any positive integer

Role

"A given university groups many people; some act as students, others as teachers. A given student belongs to a single university; a given teacher may or may not be working for the university at a particular time."

Class diagram



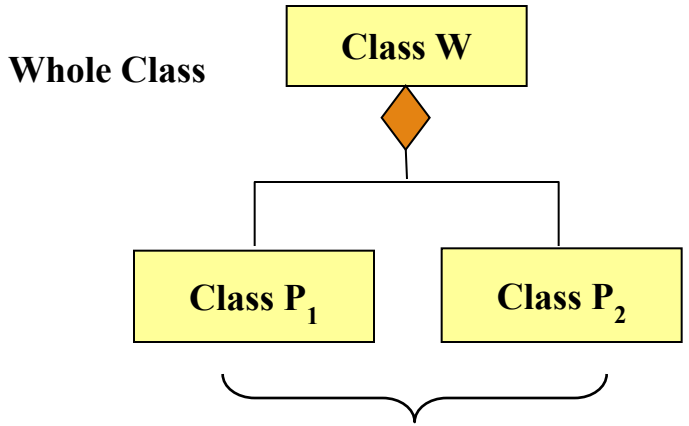
[from *UML Distilled Third Edition*]

Association: Model to Implementation


```
Class Student {
    Course enrolls[4];
}

Class Course {
    Student have[];
}
```

OO Relationships: **Composition**



[From Dr.David A. Workman]

Example

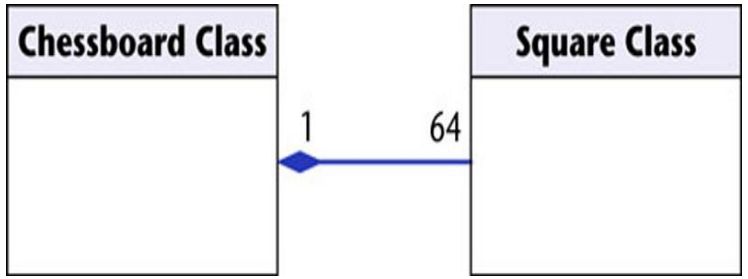


Figure 16.7

Association

Models the part–whole relationship

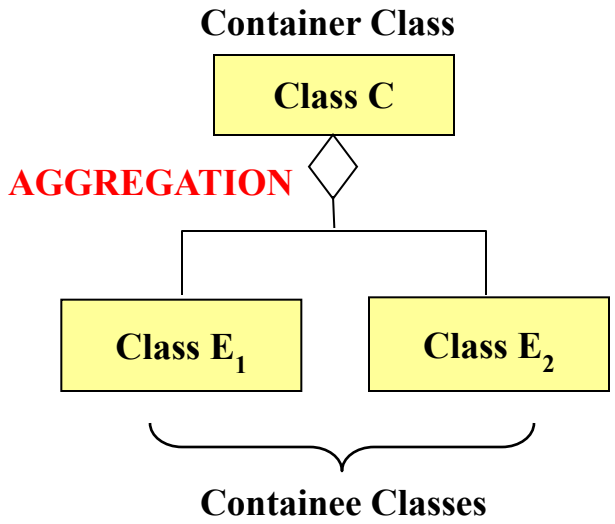
Composition

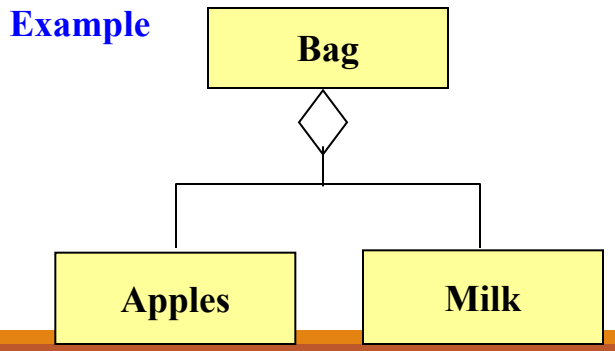
Also models the part–whole relationship but, in addition, Every part may belong to only one whole, and If the whole is deleted, so are the parts

Example:

A number of different chess boards: Each square belongs to only one board. If a chess board is thrown away, all 64 squares on that board go as well.

OO Relationships: **Aggregation**





Aggregation:
expresses a relationship among instances of related classes. It is a specific kind of Container-Containee relationship.

express a more informal relationship than composition expresses.

Aggregation is appropriate when Container and Containees have no special access privileges to each other.

[From Dr.David A. Workman]

Aggregation vs. Composition

- **Composition** is really a strong form of **association**
  components have only one owner
  components cannot exist independent of their owner
  components live or die with their owner
  e.g. Each car has an engine that can not be shared with other cars.
- **Aggregations**
  may form "part of" the association, but may not be essential to it. They may also exist independent of the aggregate. e.g. Apples may exist independent of the bag.

Lab Practical 5: Class Diagram

- Group 1: E-commerce company
- Group 2: Online transport system
- Group 3: Online social media and social networking service company
- Group 4: Global online marketplace
- Group 5: Online marketplace and hospitality service

References

S No.	Link	Description
1	Use case Diagram (https://www.youtube.com/watch?v=zid-MVo7M-E&t=640s)	Details and making of Use Case Diagrams
2	Class Diagram (https://www.youtube.com/watch?v=xiUFTLIU-lw)	Details and making of Class Diagrams
3	Sequence Diagram (https://www.youtube.com/watch?v=pCK6prSq8aw&t=1s)	Details and making of Sequence Diagrams
4	Activity Diagrams (https://www.youtube.com/watch?v=XFTAIj2N2Lc)	Details and making of Activity Diagrams

Thank You