



Lecture 3: Class Diagrams

- **Advanced Class Diagrams**
- **Uses of UML**
- **Relationship between UML and program code**



Capturing the Structure of the Design

Division of Responsibility

Operations that objects are responsible for providing

Subclassing

Inheritance, generalization

Navigability / Visibility

When objects need to know about other objects to call their operations

Aggregation / Composition

When objects are part of other objects

Dependencies

When changing the design of a class will affect other classes

Interfaces

Used to reduce coupling between objects





Uses of UML

As a sketch

Very selective - informal and dynamic

Forward engineering: describe some concept you need to implement

Reverse engineering: explain how some part of the program works

As a blueprint

Emphasis on completeness

Forward engineering: model as a detailed spec for the programmer

Reverse engineering: model as a code browser

Roundtrip: tools provide both forward and reverse engineering to move back and forth between program and code

As a Programming language

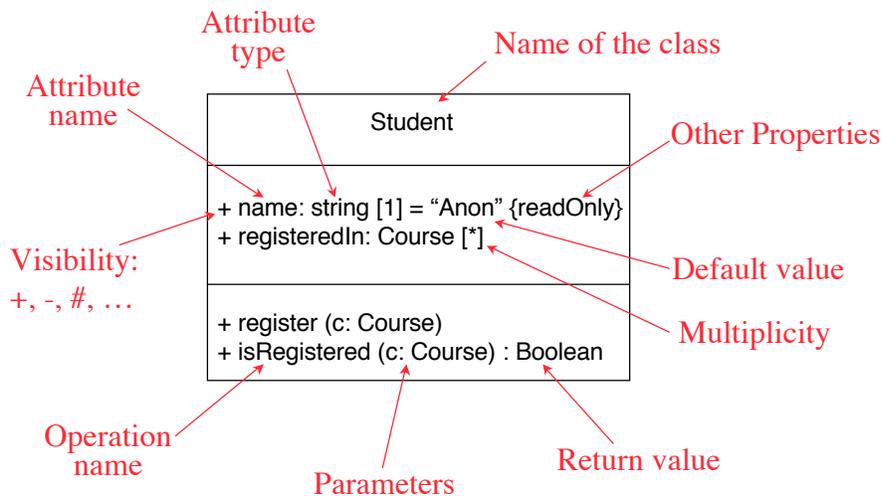
UML models are automatically compiled into working code

Requires sophisticated tools

“tripless”



Anatomy of a class

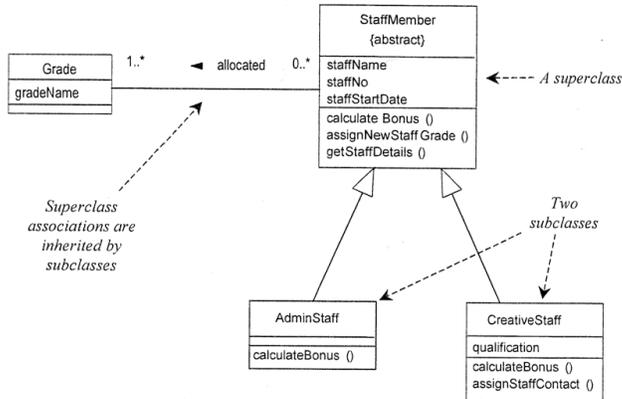




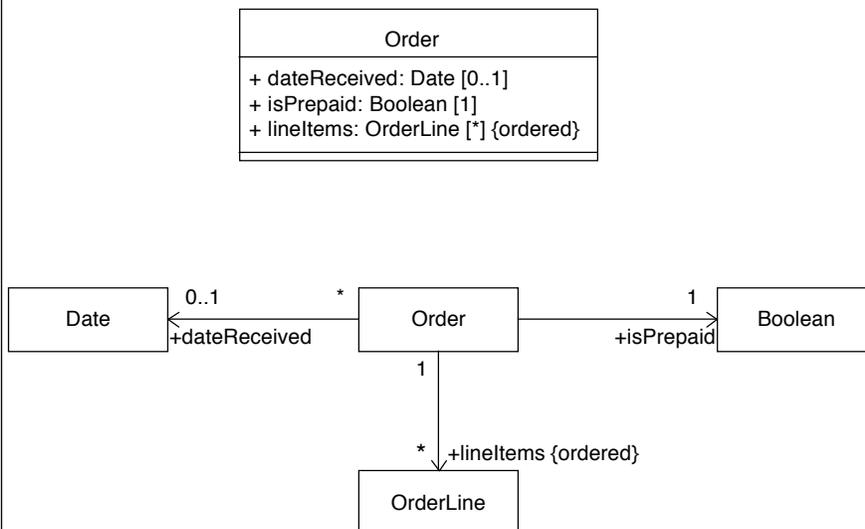
Subclassing (refresher)

Note: Used for generalization, not instantiation

All attributes, operations and associations are inherited

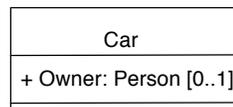
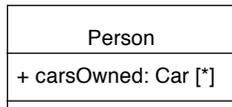
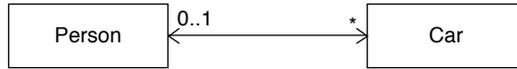


Navigability / Visibility





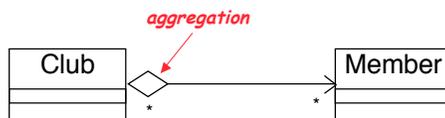
Bidirectional Associations



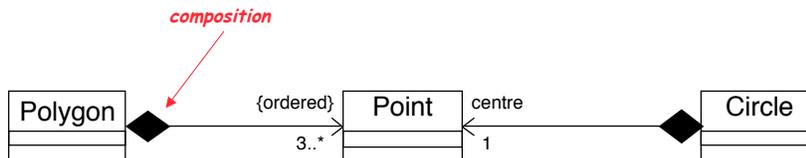
Hard to implement correctly!



Aggregation / Composition (Refresher)



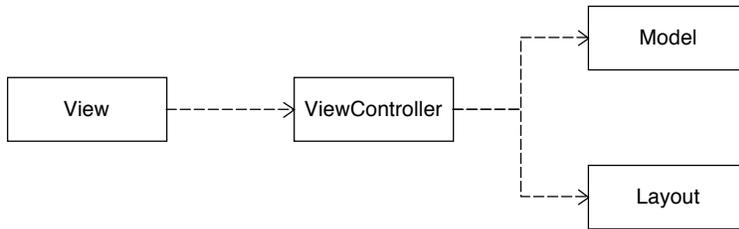
What does this mean??



Note: No sharing - a point can be part of a polygon or a circle, but not both



Dependencies

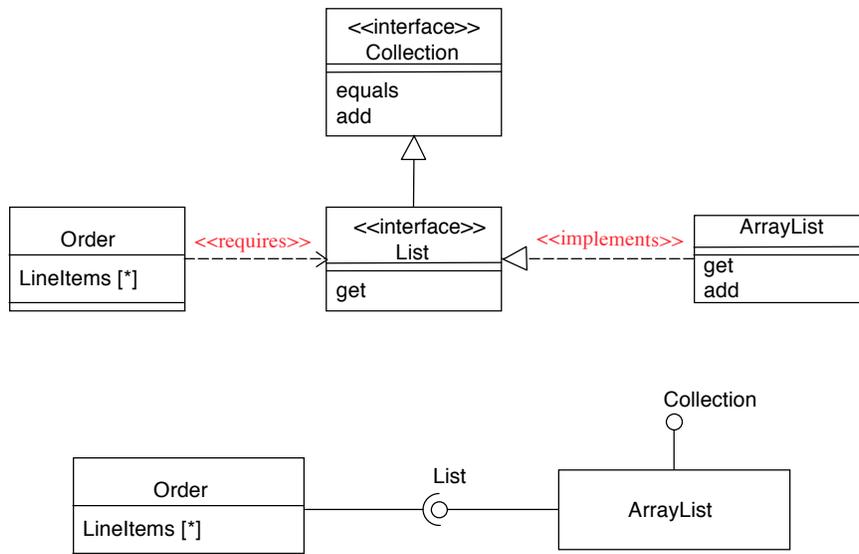


Example Dependency types:

- <<call>>
- <<use>>
- <<create>>
- <<derive>>
- <<instantiate>>
- <<permit>>
- <<realize>>
- <<refine>>
- <<substitute>>
- <<parameter>>



Interfaces



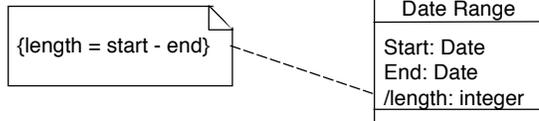


Annotations

Comments

-- can be used to add comments within a class description

Notes



Constraint Rules

Any further constraints {in curly braces}

e.g. {time limit: length must not be more than three months}