Comp-304 : Class Diagrams
Lecture 9

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Classes vs Objects

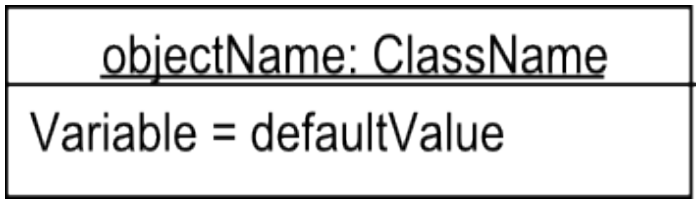
- An object is an instance of some class
- Many objects may be instances of the same class
- Classes are static, depict the design and structure at design-time
- Objects are dynamic and are instantiated (from a class) at run-time, they have state

Attributes vs Variables

- Attributes are considered at design-time, are some abstractly defined property
- Variables are considered at implementation-time, are concretely defined properties
- An attribute may be known as date at design-time, but at implementation-time, it must be decided if the date variable will be a series of integers or a string

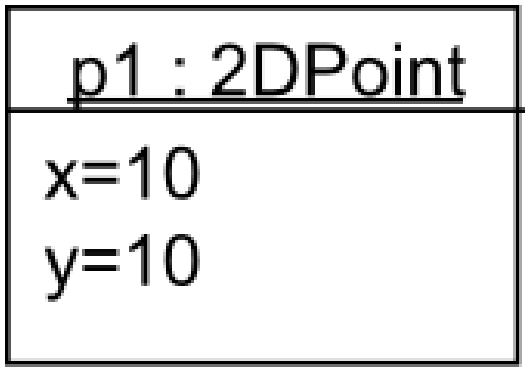
Objects

- Objects consist of an object name (underlined with the class name of the class it is an instance of) and its variables (and their values if they have default values)
- Object names are written in lowerCamelCase.
- Why is there not method names?

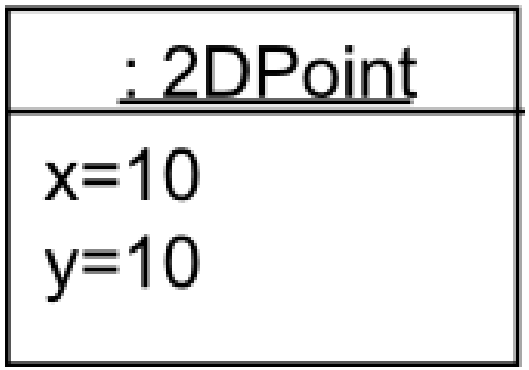


Example

- Here is a concrete example of an object called o1, an instance of class 2DPoint.
- When the object is instantiated, the default value of x and y is 10.

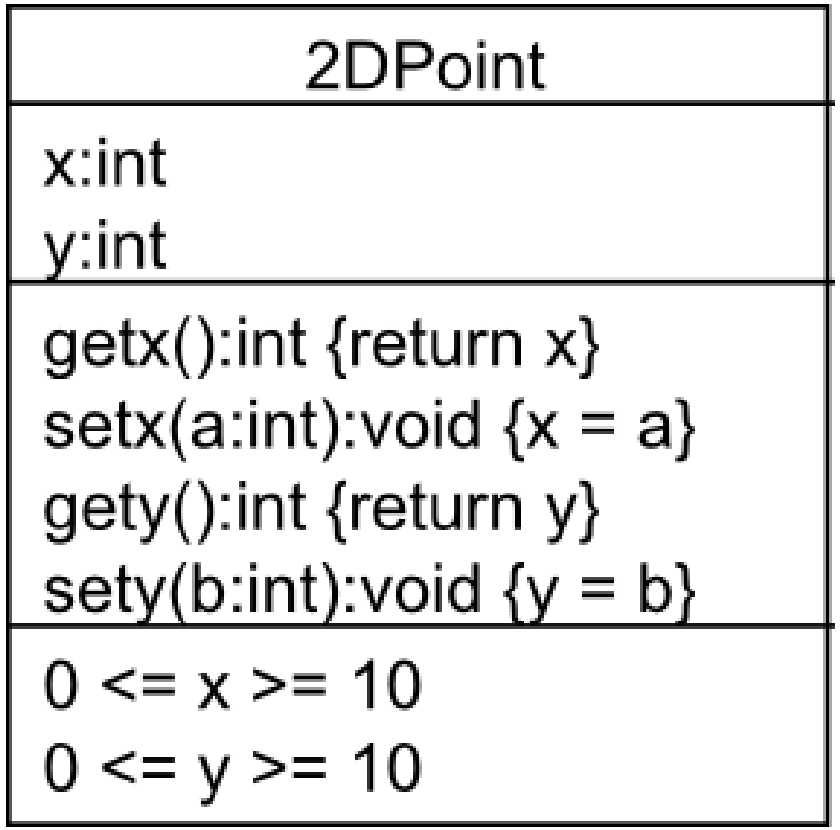


- An object with no names is anonymous.



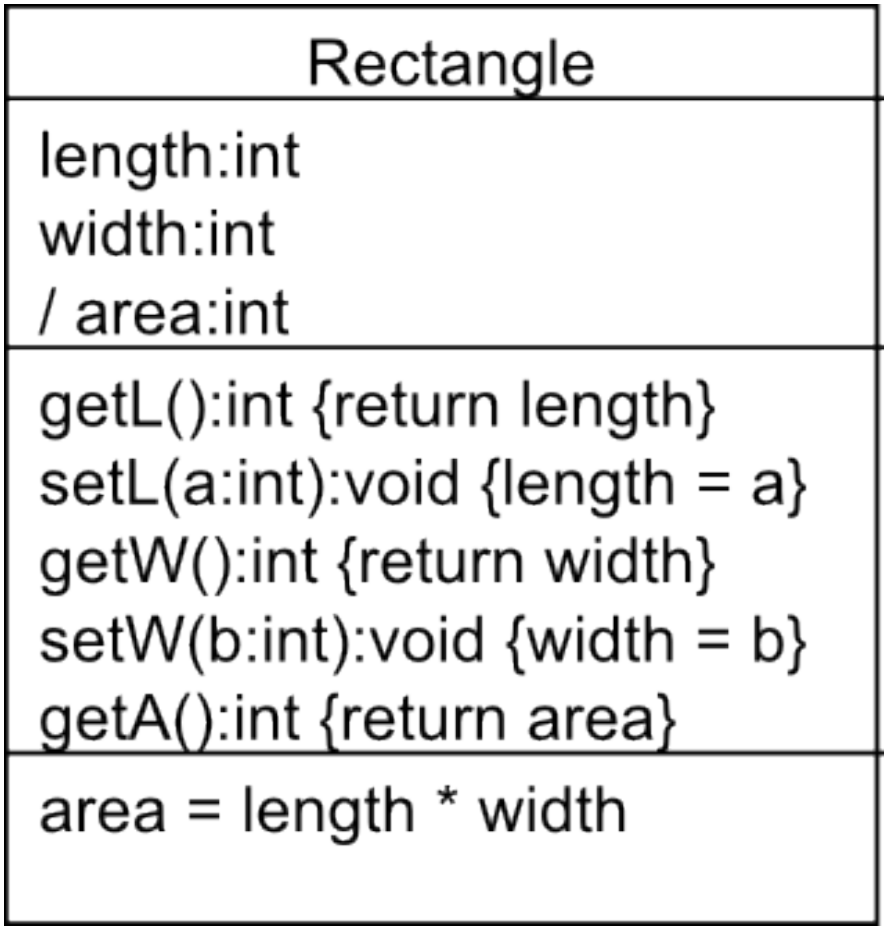
Constraint

- Now, suppose ALL our 2D points must have an (x,y) coordinate such that both x and y are between 0 and 10
- This is a constraint.



Derived Attributes

- Some attributes are known as derived attributes.
- They depend on other attributes and are calculated by some formula.
- Derived attributes are written with a / in front.
- Derived attributes cannot have set methods.

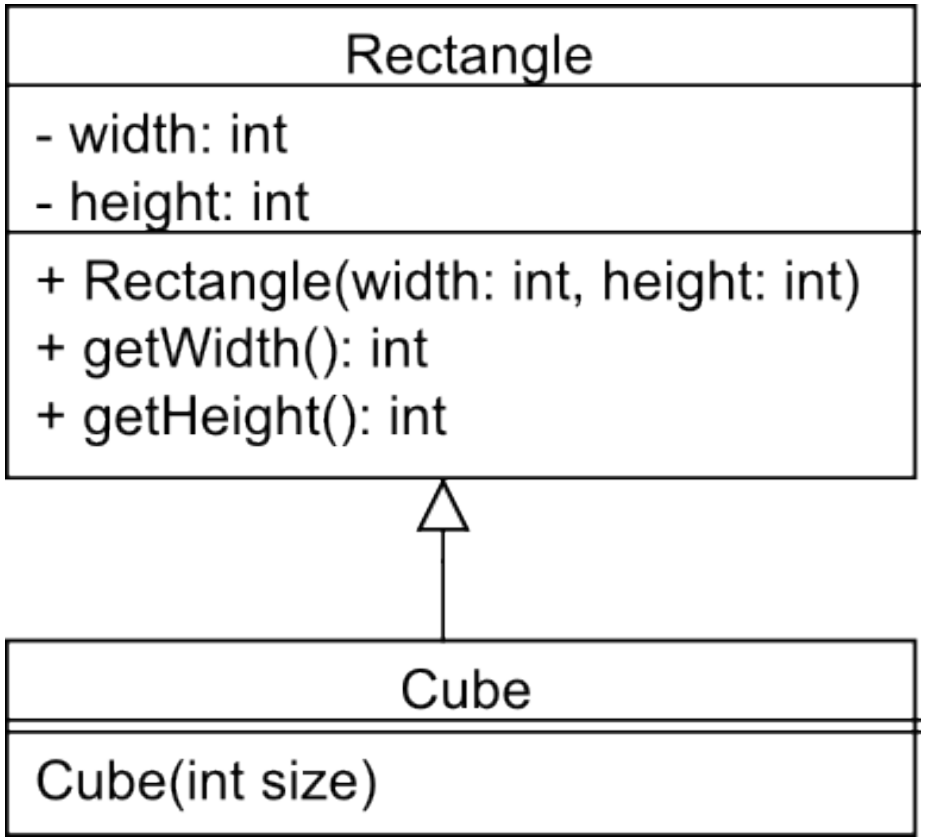


Visibility

- A set of prefixes for attributes and methods
  - \+ public – visible to any class
  - # protected – visible to any subclass
  - – private – visible only to class itself
  - ~ package – visible to any class within enclosing package
- Visibility is a class feature. It is found only in class diagrams.

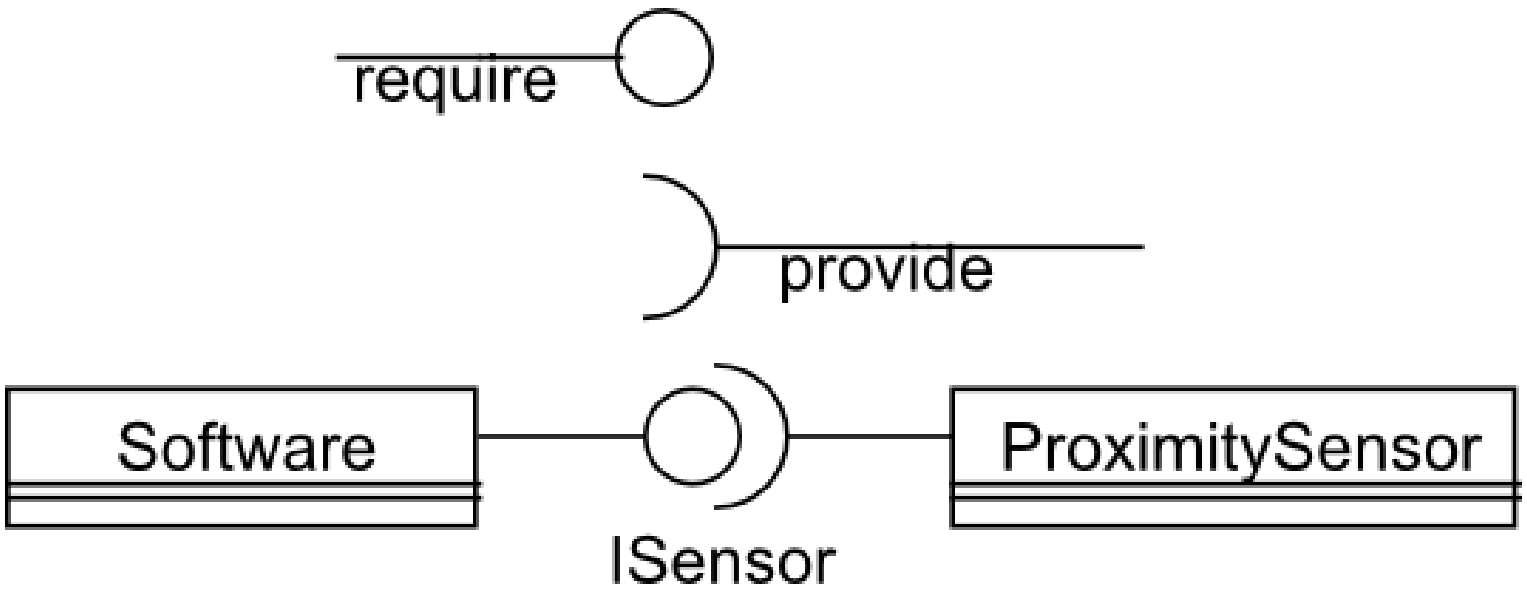
Inheritance

- We discussed Inheritance extensively the last classes.
- In UML, inheritance is illustrated using a line with a white arrow.
- In this case, Cube ***is a*** Rectangle.



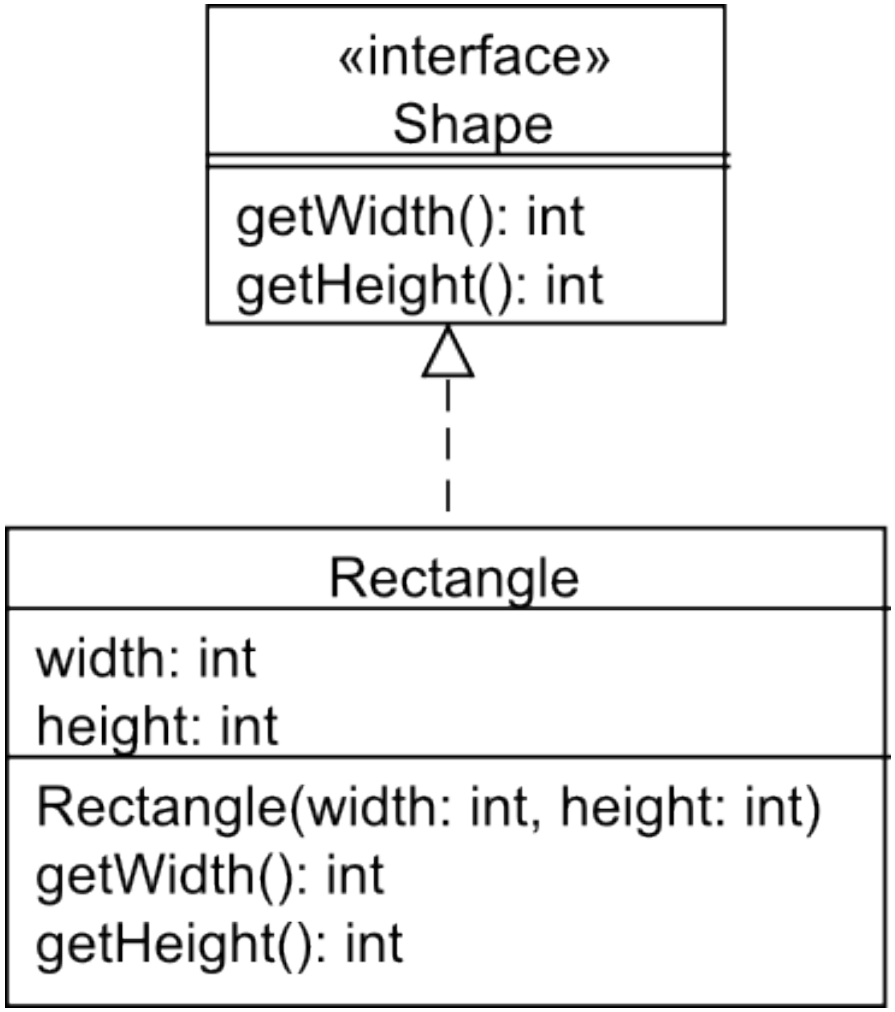
Interfaces in UML

- In UML, interfaces are often used to represent hardware that needs to interact this software.
  - The ball sign is used to illustrate the require relation.
  - The arc sign is used to illustrate the offered service.



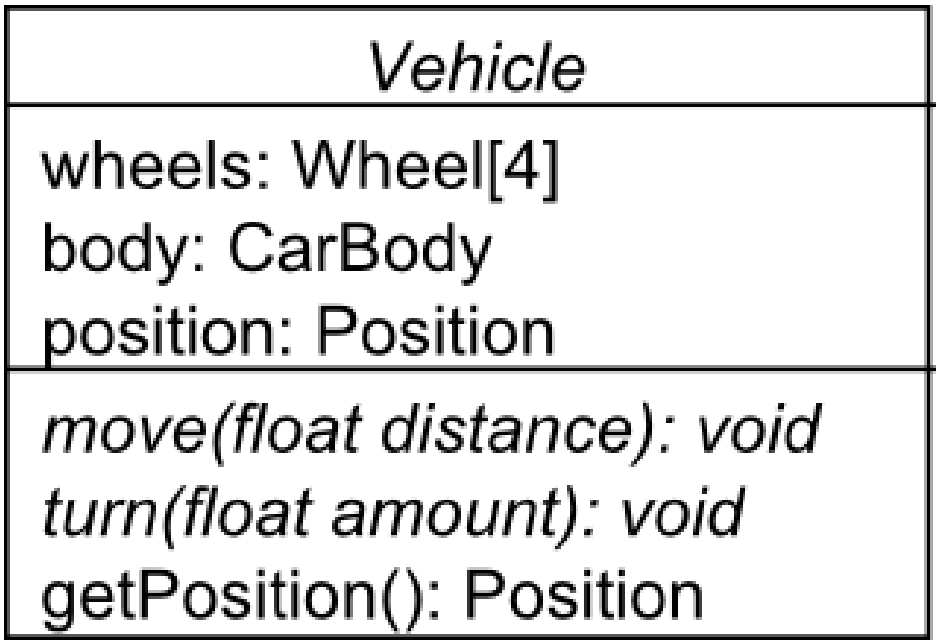
Java-Style Interfaces

- In Java, interfaces form a contract between the class and the outside world.
- This contract is enforced at build time by the compiler.
  - all methods defined by that interface must be implemented by the class.
- In UML, these interfaces are described using <<stereotypes>>.



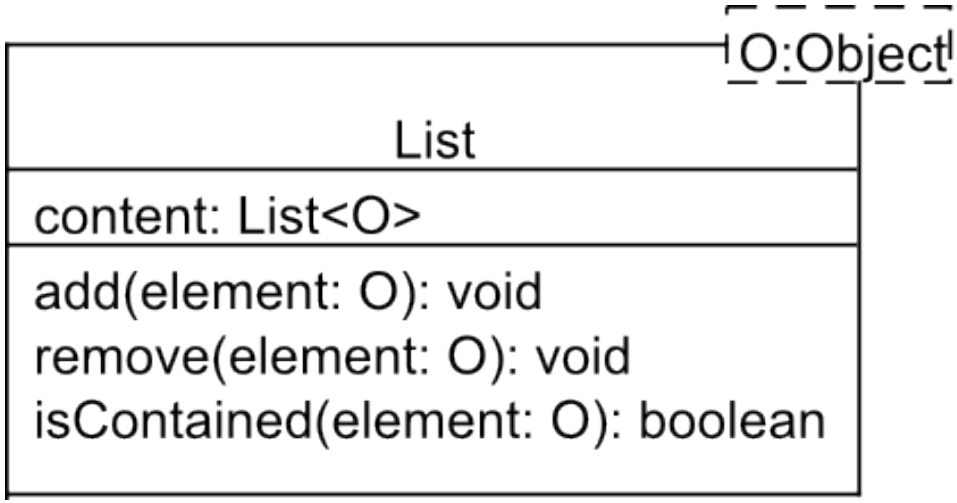
Abstract Members

- Abstract methods of written in italic.
- If a class is abstract, it's name is written in italic.
  - Any class with an abstract method is considered abstract.
- Abstract methods cannot be implemented because they are missing part of their implementation.
  - Abstract method are inherited and the missing methods are implemented.



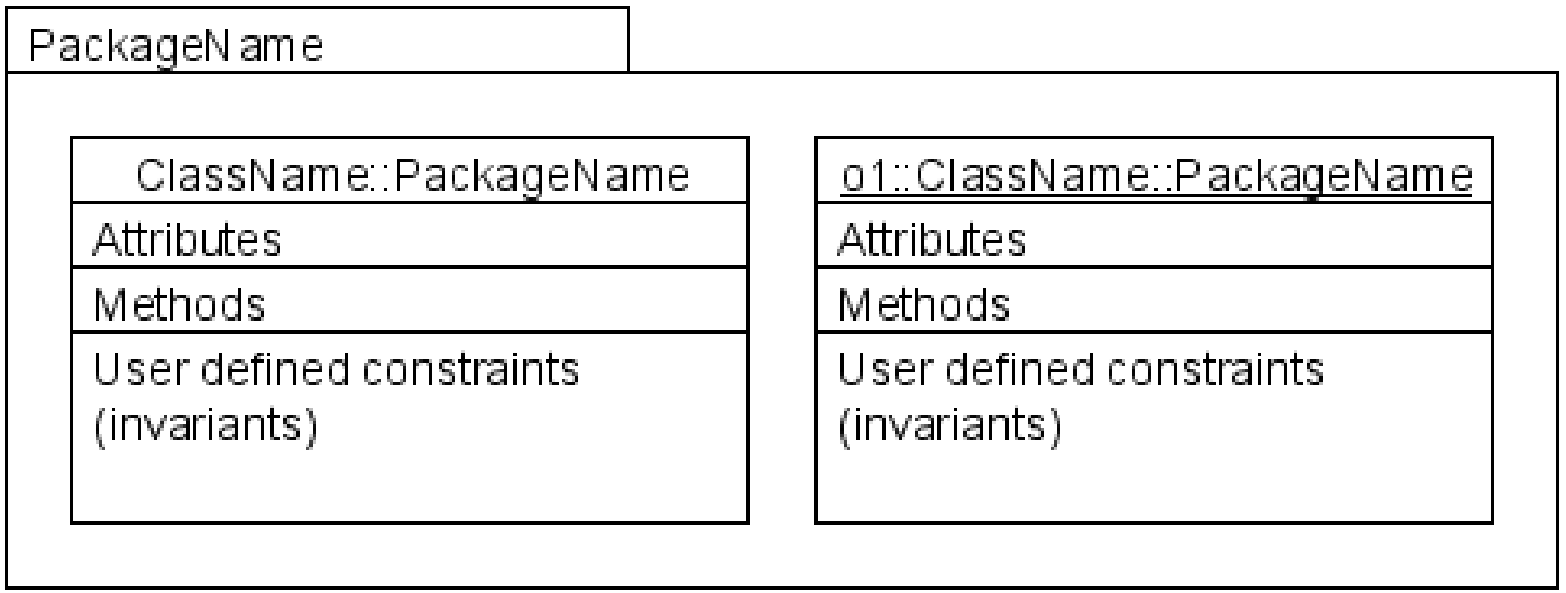
Templates

- As we saw with generacity, Templates are a mechanism to specify the types of objects in a class at declaration time.
- In UML, they are defined with a box in the upper left corner of the class.



Package

- A package is a collection of classes that, together, perform a certain task.
- Classes and objects in package have a prefix:
  - ClassName::PackageName
  - objectName:ClassName::PackageName
- A package may contain other packages.



Static Members

- Static members of a class (either attributes or methods) exist at the class level.
- They can be used without instantiated an object.
- In UML, these are underlined.