Analysis Workflow

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Analysis Workflow

- The aim of the analysis workflow is to produce the *Analysis Model*.
- The Analysis Model focuses on *what* the system needs to do, but leaves the details of *how* it will do it to the design workflow.
- The Analysis Model defines and models:
  - **Analysis classes** - which model key concepts in the problem domain.
  - **Use case realizations** - which illustrate how instances of analysis classes can interact to realize system behavior specified by a use case.

Analysis Modeling

- **Rules of thumb:**
  - expect about 50 to 100 analysis classes in the analysis model of an average system
  - only include classes that model the vocabulary of the problem domain
  - do *not* make implementation decisions
  - focus on classes and associations - minimize coupling
  - use inheritance where there is a natural hierarchy of abstractions
  - keep it simple

Objects

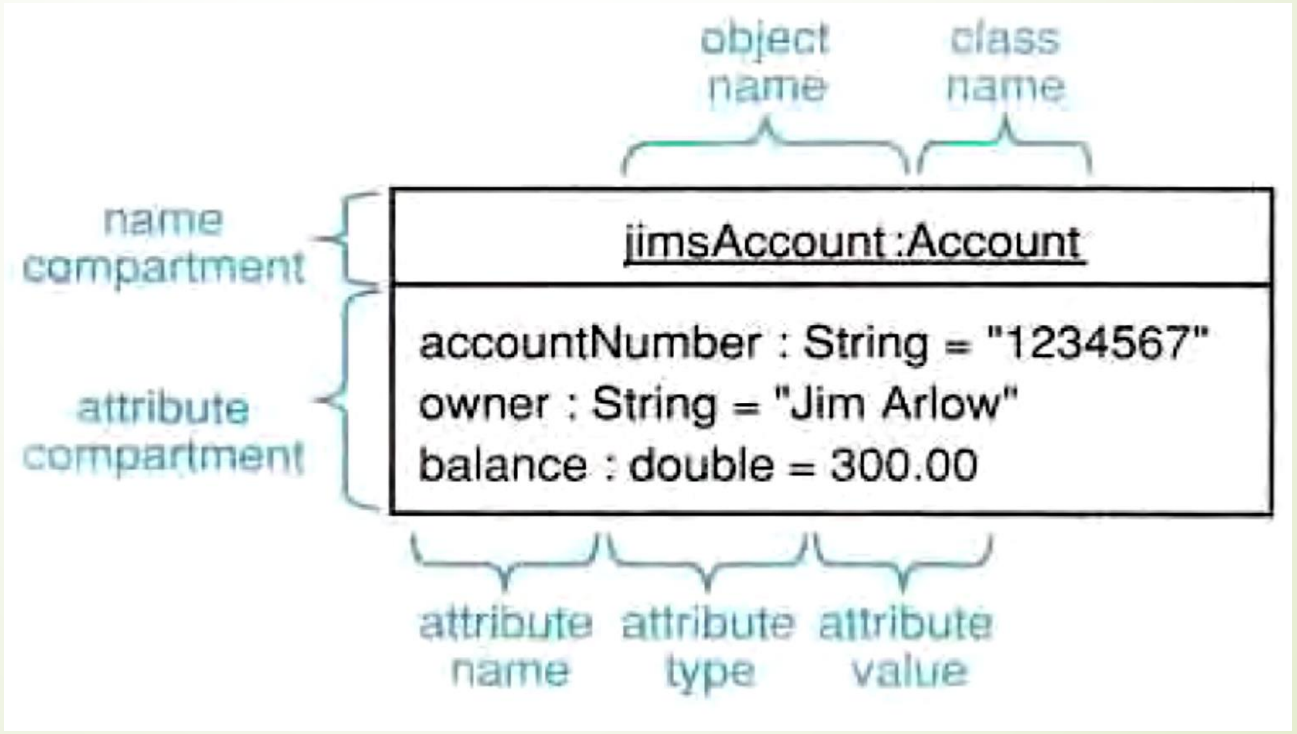
- Object: "A discrete entity with a well-defined boundary that encapsulates **state** and **behavior**; an instance of a class."
- Objects are cohesive units that combine data and function.
- Encapsulation - the data inside an object is hidden and can only be manipulated by invoking one of the object's functions.
  - ***operations*** are specifications for object functions created in analysis
  - ***methods*** are implementations for object functions created in implementation

Objects: Features

- Every object has the following features:
  - ***Identity*** - its unique existence - you use object references to uniquely refer to specific objects.
  - ***State*** - a meaningful set of attribute values and relationships for the object at a point in time.
    - Only those sets of attribute values and relationships that constitute a semantically important distinction from other possible sets constitute a state.
    - State transition - the movement of an object from one meaningful state to another.
  - ***Behavior*** - services that the object offers to other objects:
    - modeled as a set of operations;
    - invoking operations *may* generate a state transition.

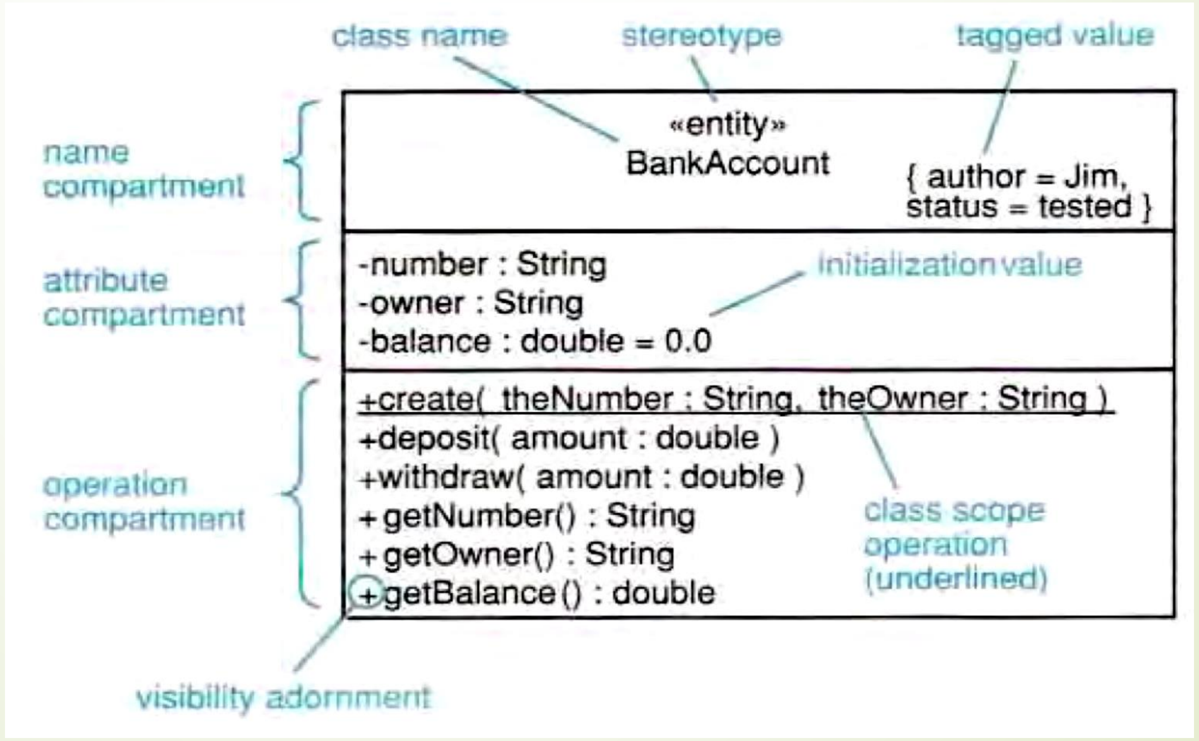
UML Object Notation

- No special symbols, punctuation marks, or abbreviations in *object/class* names.



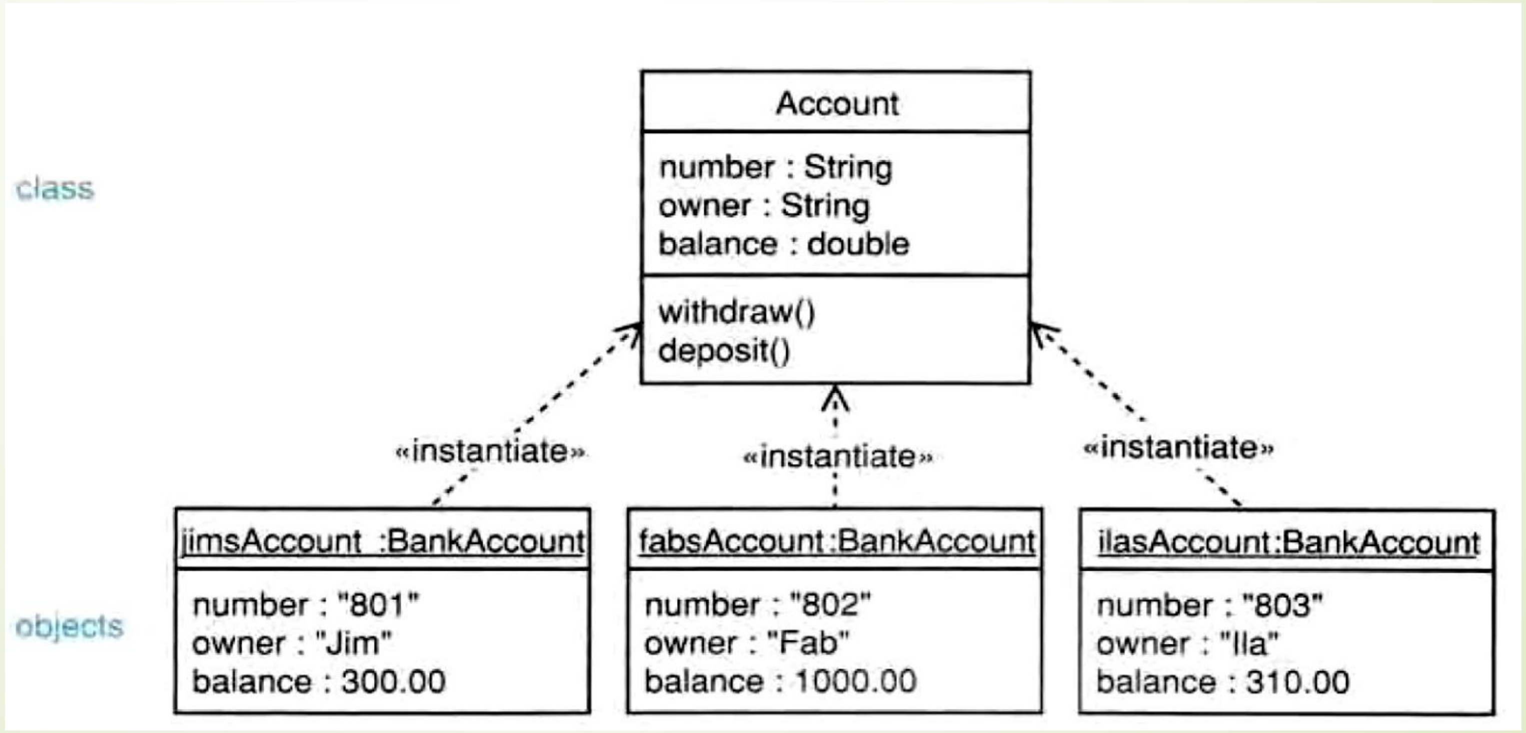
Classes and UML Class Notation

- Class: "The descriptor for a set of objects that share the same attributes, operations, methods, relationships, and behavior.“

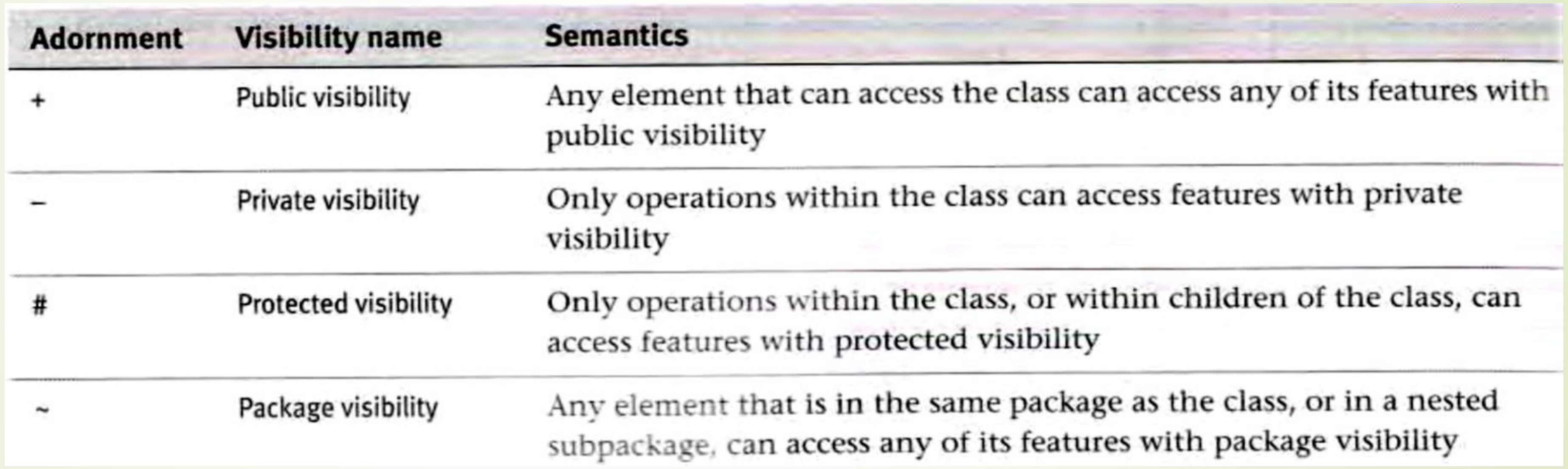


Instantiate Relationship

- You can show the instantiate relationship between a class and one of its objects by using a dependency stereotyped as **«instantiate»**:



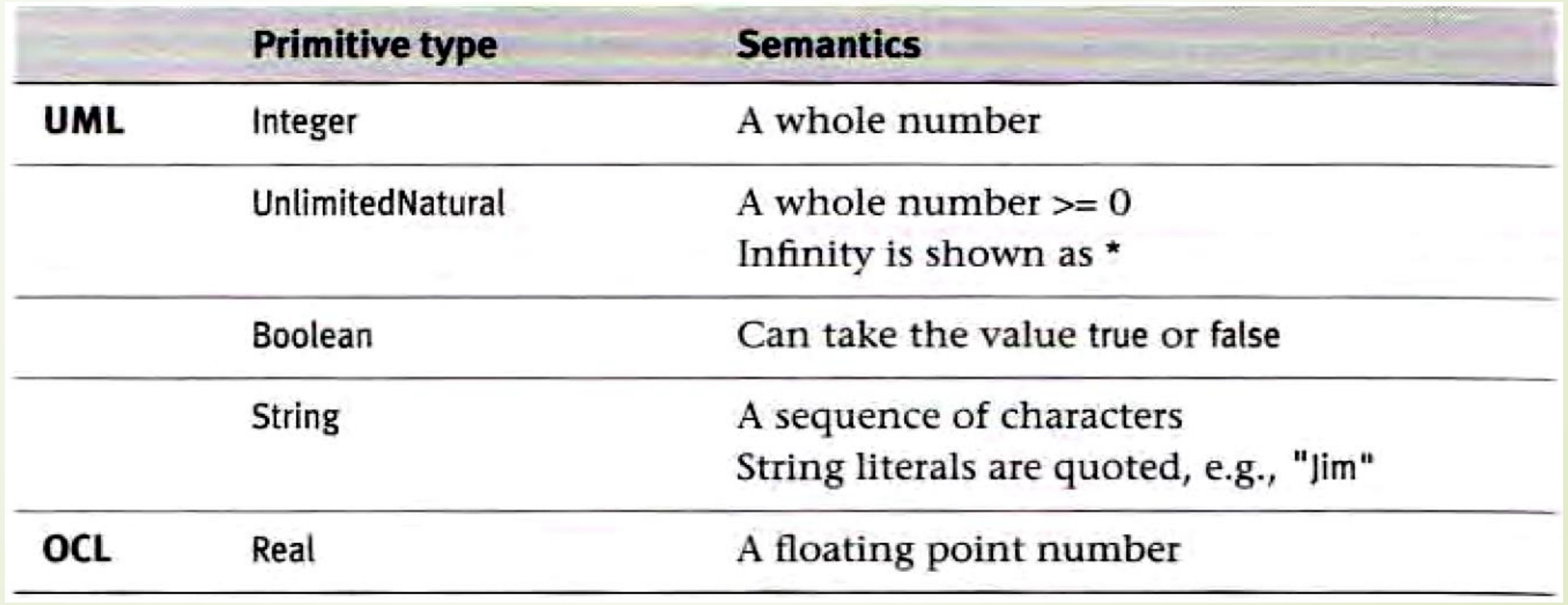
Visibility



Adornment	Visibility name	Semantics
+	Public visibility	Any element that can access the class can access any of its features with public visibility
–	Private visibility	Only operations within the class can access features with private visibility
#	Protected visibility	Only operations within the class, or within children of the class, can access features with protected visibility
~	Package visibility	Any element that is in the same package as the class, or in a nested subpackage, can access any of its features with package visibility

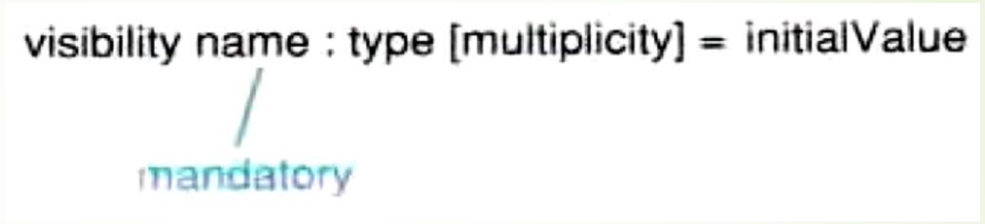
Type

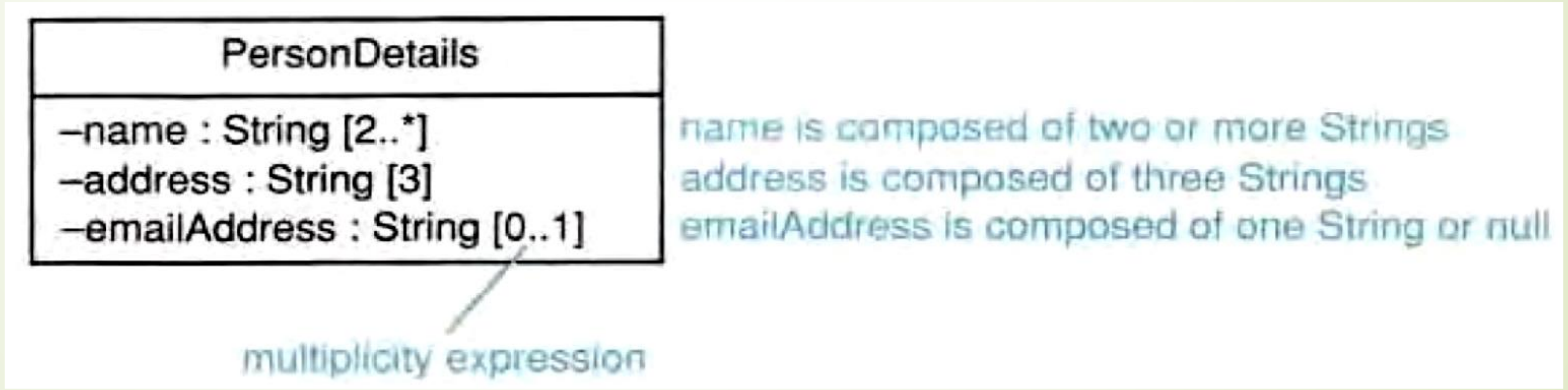
- The Object Constraint Language (OCL) is a formal language for expressing constraints in UML models.



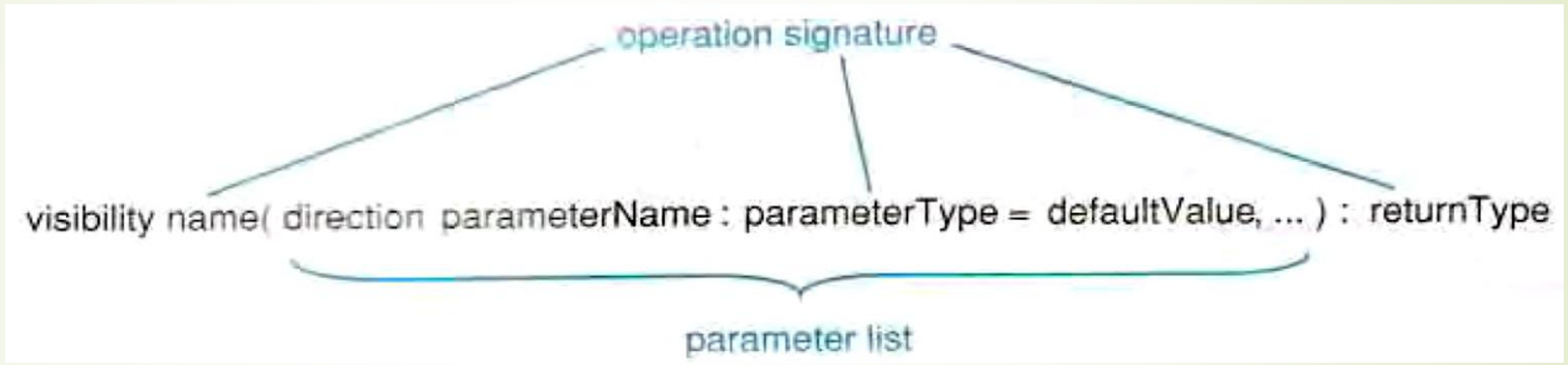
	Primitive type	Semantics
UML	Integer	A whole number
	UnlimitedNatural	A whole number >= 0 Infinity is shown as *
	Boolean	Can take the value true or false
	String	A sequence of characters String literals are quoted, e.g., "Jim"
OCL	Real	A floating point number

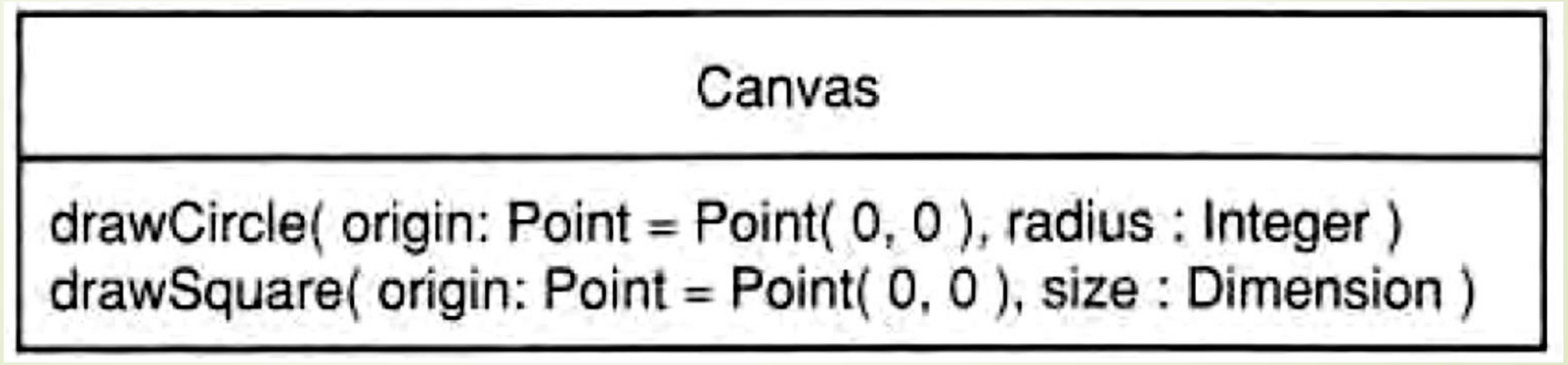
Attributes


visibility name : type [multiplicity] = initialValue
mandatory


PersonDetails
–name : String [2..*]
–address : String [3]
–emailAddress : String [0..1]
name is composed of two or more Strings
address is composed of three Strings
emailAddress is composed of one String or null
multiplicity expression

Operations: Signatures


operation signature
visibility name(direction parameterName : parameterType = defaultValue, ...) : returnType
parameter list


Canvas
drawCircle(origin: Point = Point(0, 0), radius : Integer)
drawSquare(origin: Point = Point(0, 0), size : Dimension)

References

- Arlow, J., Neustadt, I., *UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design*, 2nd Ed. Addison-Wesley, 2005.
- Ramsin, Raman. "Home." Department of Computer Science and Engineering, Sharif University of Technology. Accessed February 15, 2025. https://sharif.edu/~ramsin/index.htm.