UML Class Diagrams

EECS 348 Lab 5 — 2/27/2025

Harlan Williams

Electrical Engineering and Computer Science
University of Kansas

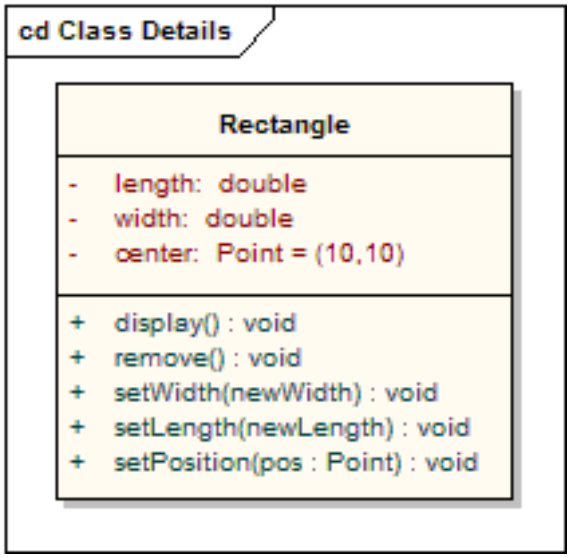
What are class diagrams for?

- Typically for object-oriented code
  - Straightforward in languages with syntax for explicitly designing classes
  - In languages such as C, what counts as a class is more up to the programmers
- Documents the *structure* of a program—specifically what classes there are and how they are intended to interact with each other
  - A class diagram should roughly correspond one-to-one with class definitions and interactions written in actual code
- Intended for communicating to other programmers

Classes

Classes are drawn as boxes with lines separating the **name** of the class, the names of its member **variables**, and the names of its member **functions**

- If a class is **abstract**, *i.e.,* it is never instantiated, but it defines an interface that other classes inherit from, its name is in italics
- If a class member is **public**, it is prefixed with a '+'
- If a class member is **private**, it is prefixed with a '-'

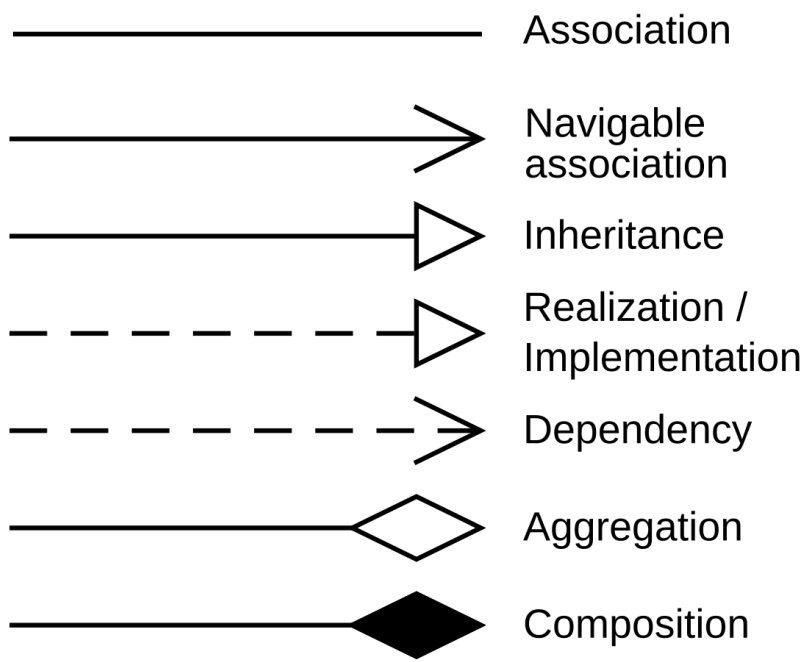


Source: https://sparxsystems.com/resources/tutorials/uml2/class-diagram.html

Relations

Lines are drawn between classes based on their **relations** to each other, and are read from **tail** to **tip**

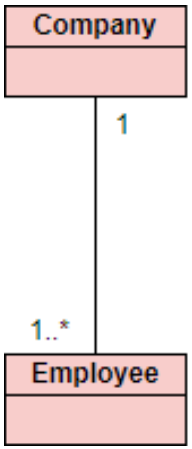
- An association means broadly that objects of the two classes interact
- Inheritance means that the tail specializes the class at the tip
- Aggregation and composition mean the tail class is contained within objects of the tip class
- A realization means that the tail class is a concrete implementation of the tip class



Source: https://commons.wikimedia.org/wiki/File:Uml_classes_en.svg

Multiplicities

- A multiplicity gives how many occurrences of one class relate to another
- In composition or aggregation, this means how many of the tail class are contained in the tip class
- In the diagram below, a company has one or more employees **and** an employee has exactly one company

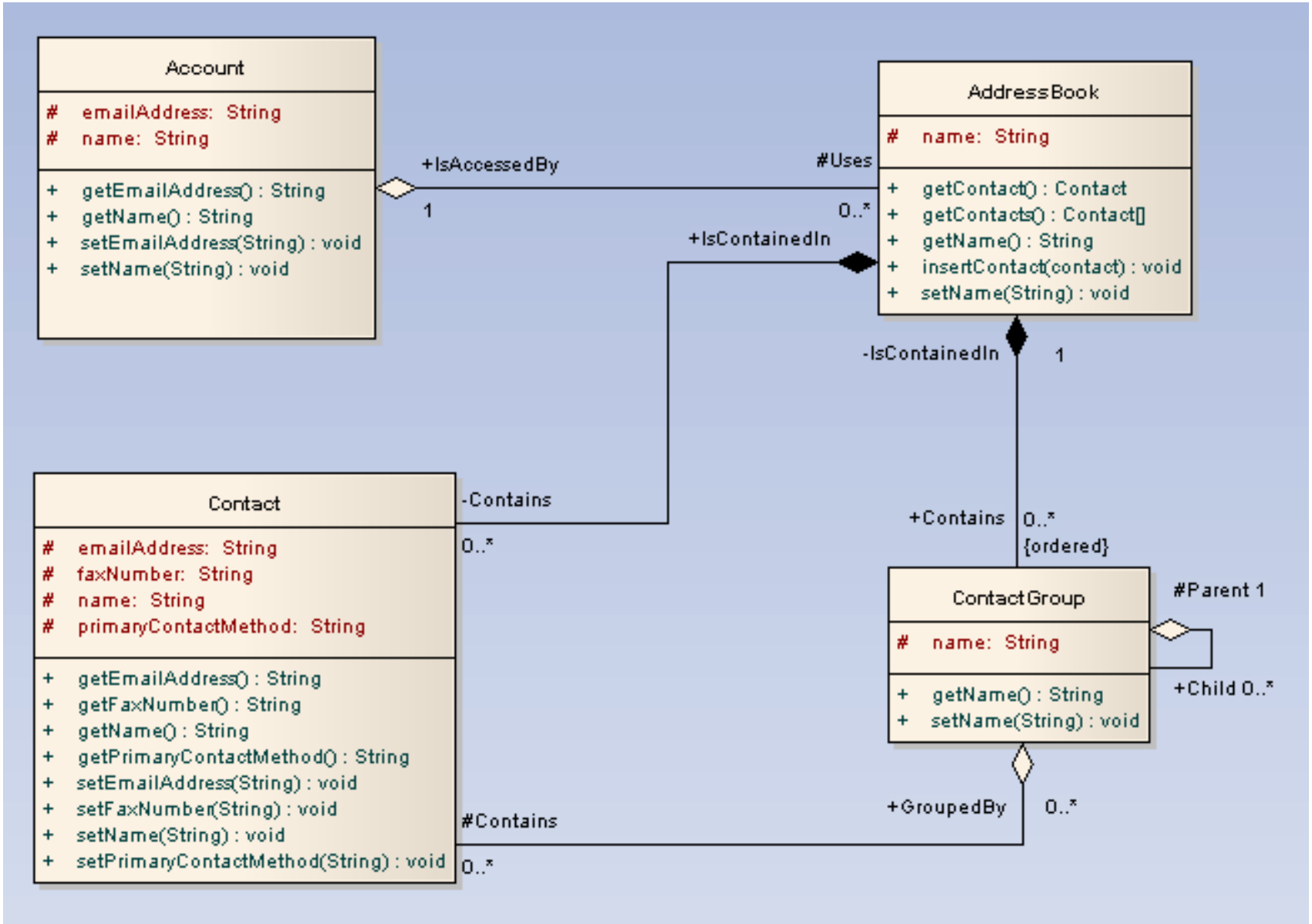


Multiplicities examples:

1	Exactly one, no more and no less
0..1	Zero or one
*	Many
0..*	Zero or many
1..*	One or many

Source: https://blog.visual-paradigm.com/what-is-multiplicity/

Composites and aggregates example



Source: https://sparxsystems.com/resources/tutorials/uml2/class-diagram.html

Lost? See...

- https://sparxsystems.com/resources/tutorials/uml2/class-diagram.html
- https://online.visual-paradigm.com/