Metrics for Object-Oriented Programs

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POO Metrics

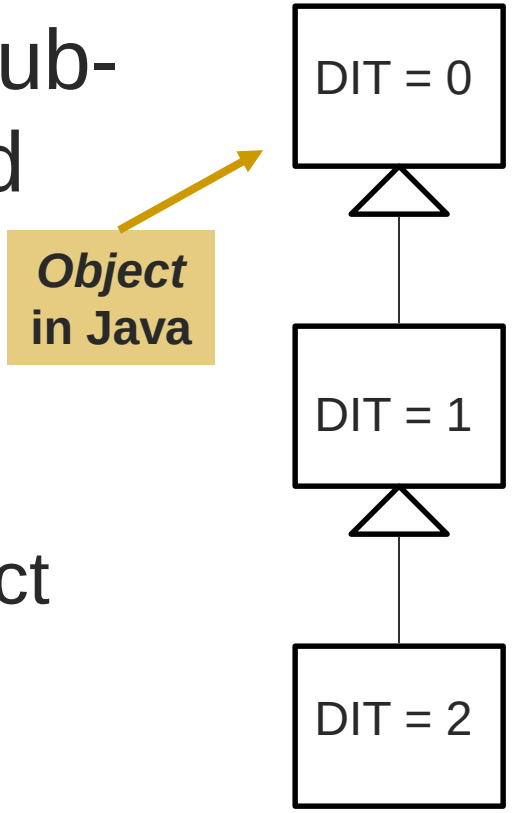
- The most widely used OO metrics are in the Chidamber and Kemerer (CK) suite
  - Weighted Methods per Class (WMC)
  - Depth of Inheritance Tree (DIT)
  - Number of Children (NOC)
  - Coupling between Object Classes (CBO)
  - Response for a Class (RFC)
  - Lack of Cohesion of Methods (LCOM)

Weighted Methods per Class (WMC)

- WMC counts the number of (weighed) methods in each class
- There are several ways to give weights to methods in a class
  - Lines of Code (length), Cyclomatic Complexity (complexity), number of parameters, etc.
- High WMC values may indicate a more complex code

Depth of Inheritance Tree (DIT)

- It counts the number of levels in an inheritance tree that sub-classes inherit methods and attributes from

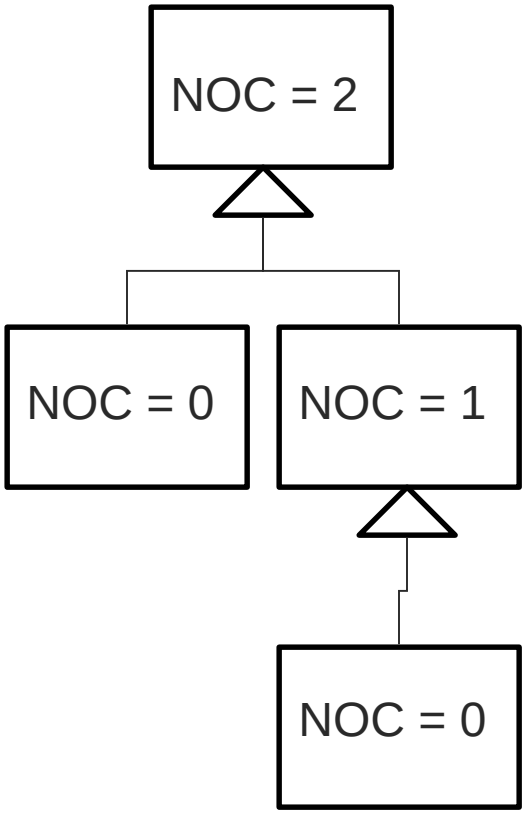


- The deeper the tree
  - The more complex the project
  - The harder to understand its deepest sub-classes

Number of Children (NOC)

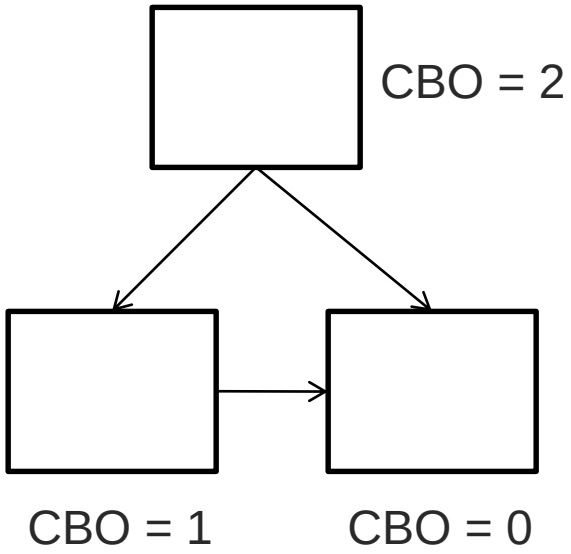
- It counts the number of direct sub-classes
  - It measures how wide an inheritance tree is

Higher values may indicate high reuse



Coupling between Objects (CBO)

- Similar to Fan-out
  - It counts the number of classes called by a class



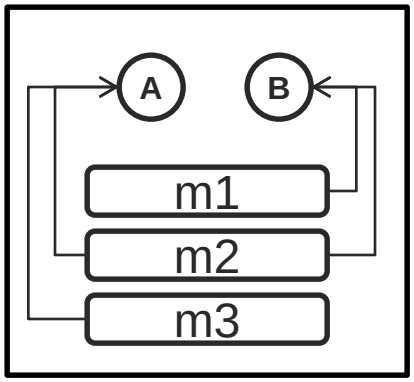
- Classes with high coupling may be harder to understand and evolve

Response for a Class (RFC)

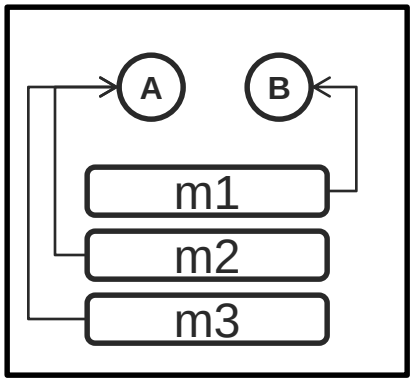
- RFC counts the number of methods that could potentially be executed when an object receives a message
  - It wants to find for each method of the class, the methods that it will call, and repeat this for each called method
  - Ideally, it calculates the transitive closure of the method calls graph
- RFC indicates complexity of a class

Lack of Cohesion (LCOM)

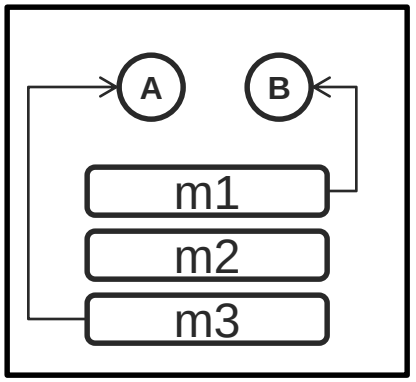
- It measures how frequent methods in a class access common attributes
  - More common attributes, more cohesion, less lack of cohesion (LCOM)



LCOM = 0 (1 - 2)



LCOM = 1 (2 - 1)



LCOM = 3 (3 - 0)

Bibliography

- Ian Sommerville. **Software Engineering**, 10th Edition. Pearson Education, 2016.
  - Section 24.5: Software Measurement (Section 24.5.1: Product metrics)