Analytical class diagram

PB007 Software engineering I

Marián Macik
originally by Stanislav Chren

Week 05

Analytical class diagram

Class diagram represents a static view of classes, their attributes, operations and relationships.

Analytical class diagram depicts analytical classes, which represent concepts from the business domain, i.e. it does not capture implementation details

Properties of analytical classes

Well-designed analytical class should have the following properties:

- a name that clearly represents the purpose
- it has a small number (3-5) of responsibilities/operations
- it is not isolated from other classes
- it has high cohesion
  Example: class *ShoppingCart*, operations *addItem()*, *removeItem()*, *displayContents()*, *acceptPayment()*,*printInvoice()*
- it has low coupling

Be careful about:

- a large number of very small classes
- a low number of very large classes
- functoids - functions/procedures, which are represented by a separate class.
- complex classes that manage other classes. They are often called as *system*, *controller* or *manager*.
- complex inheritance hierarchy (over 2 levels).

Analytical class discovery

Analysis of noun and verbs:

- gather available resources (specifications, use case documentation, ...)
- nouns are candidates for classes or attributes
- verbs or verb forms are candidates for operation/responsibilities of classes
- watch out for „hidden“ classes/attributes/operations

CRC (class, responsibilities, collaborators) analysis

- group activity involving brainstorming
- cards represent candidate classes. They consist of - class name, responsibilities and collaborators (other classes that are related to the class).

Relationships between classes

The basic relationships include:

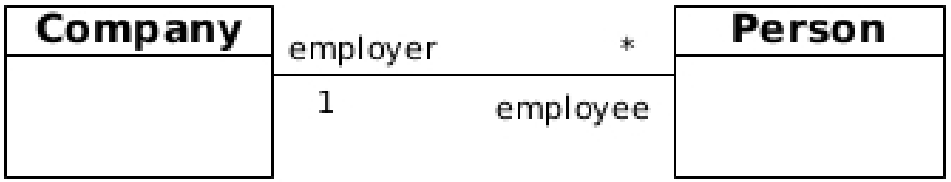
- Generalization
- Association
- Dependency

Association is the semantic relationship between classes.
It can have the following **attributes**:

- name
- name of roles
- multiplicity
- navigability

Relationships between classes II

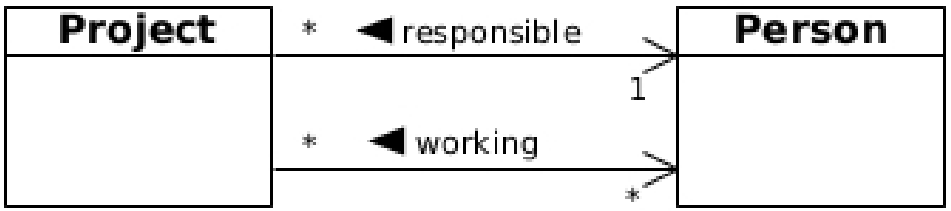
Name of association and names of roles

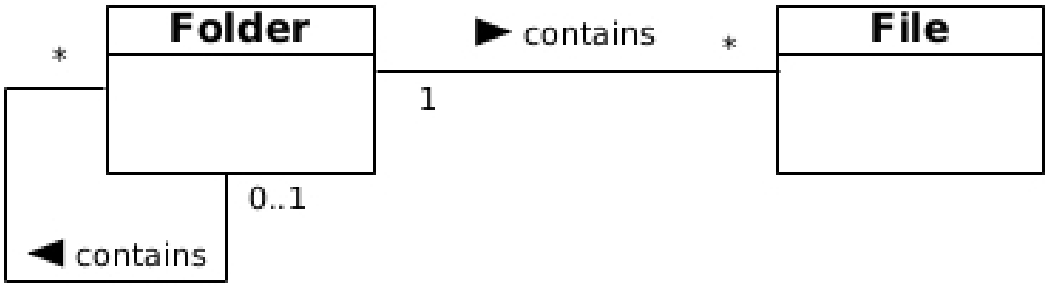


Note: You should use only one option, not both for the given association.

Relationships between classes III

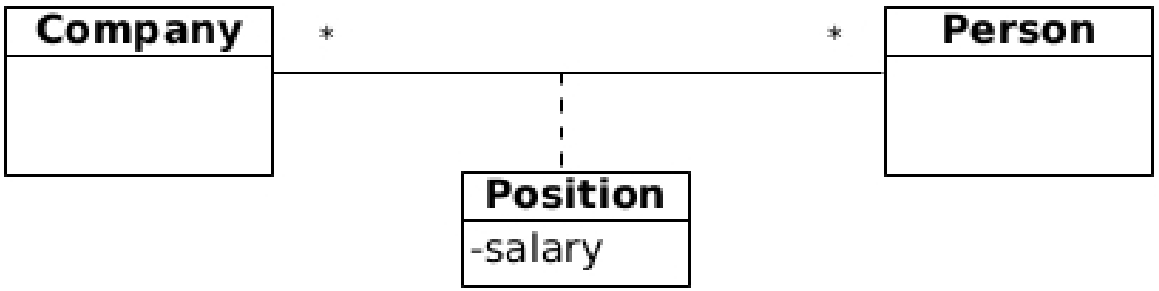
Multiple and reflexive associations:

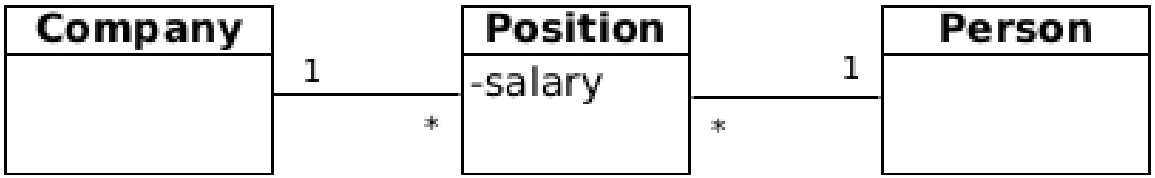




Relationships between classes IV

Association class:





Procedure for creating aclass diagram

1. **Find classes, attributes, operations and collaborators**
2. **Determine inheritance between the classes**
3. **Capture relationships with associations**
4. **Name the associations or roles**
5. **Determine the multiplicities of associations**
6. Determine navigability of the associations
7. Specify dependencies
8. Add additional attributes and operations that a part of the domain.

Information sources

- www.uml.org.cn/umlapplication/pdf/crcmodeling.pdf
- www.agilemodeling.com/artifacts/classDiagram.htm
- sourcemaking.com/uml/modeling-it-systems/structural-view/class-diagram
- http://sourcemaking.com/uml/modeling-it-systems/structural-view/constructing-class-diagrams

Catalogue of common mistakes

- Available in the interactive syllabus

Tasks

- Fix the issues from previous week
- Based on the project assignment, look for analytical classes, attributes, operations and relationships
- Create an analytical class diagram, including the inheritance, multiplicities and association names/roles.
- Bonus: specify also the navigability of associations.
- Generate a **PDF report** and upload it to the homework vault (**Week 05**).

Rules for report submission

1. Submit the PDF report, not the VP source file and not an exported image.
2. PDF report must be created using the procedure shown on the seminars including the report settings.
3. The name of the PDF report file should be *lastname1-lastname2-lastname3* of the team members.
4. PDF report must contain all diagrams modelled until now.
5. PDF report must be uploaded to the homework vault by the specified deadline.
6. PDF report must be uploaded to the correct homework vault. The name of the homework vault is always specified on the slides.
7. Each team uploads only a single PDF report for the whole team.
8. Submitted diagrams must be clear and readable.
9. Submitted diagrams should not contain serious mistakes. At least, they should not contain mistakes mentioned in the *Catalogue of common mistakes*.

VP report settings