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Analytical Class Diagram

PB007 Software Engineering I

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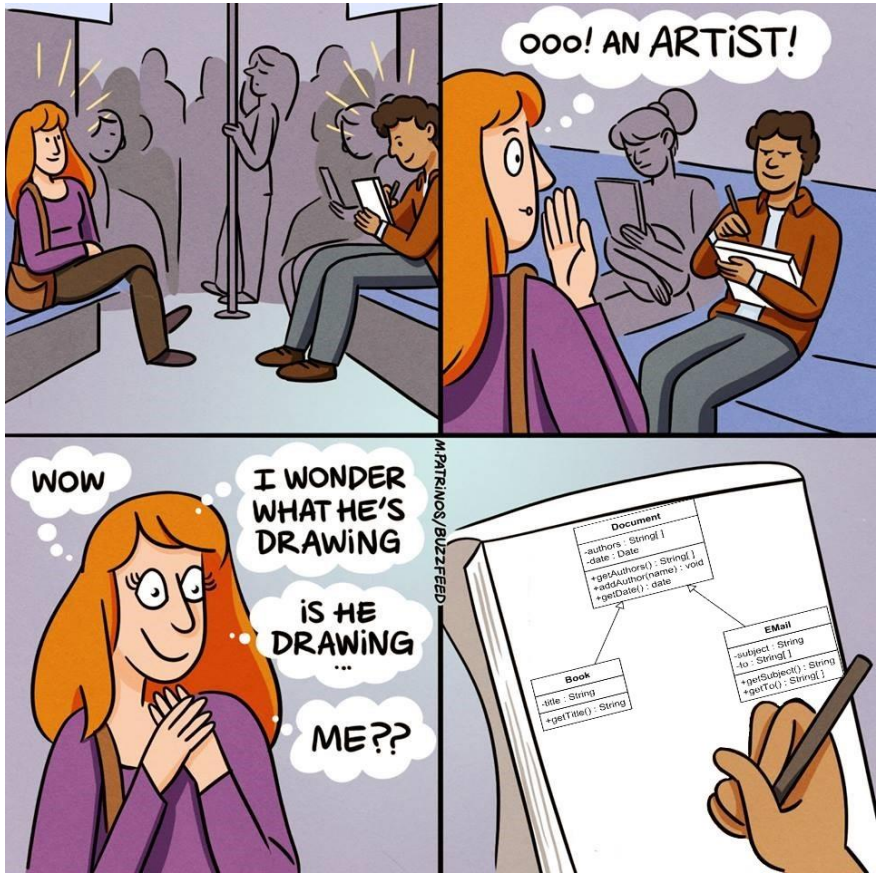
Class Diagram

In general

- Static view

- Modelling of:
  - Classes
  - Attributes
  - Operations
  - Relationships



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Analytical Class Diagram

- Depicts **concepts**, abstractions, not pieces of code
  - Relationships
  - Attributes
- It helps us to grasp the domain, make a sense of it
- Specify terminology, relationships, dependances, …
- ADVANCED: Patterns (Analysis Patterns)
  - Reusable models – solution to a concrete repeating problems
  - See this book: **Martin Fowler: Analysis Patterns - Reusable Object Models**

Analytical Class Diagram

- Do not delve into implementation details. ~~Forget about programming~~
  - Types
  - Constructors
  - Boilerplate methods and classes
  - Properties (getters, setters)
  - Language-specific constructs
  - Etc.

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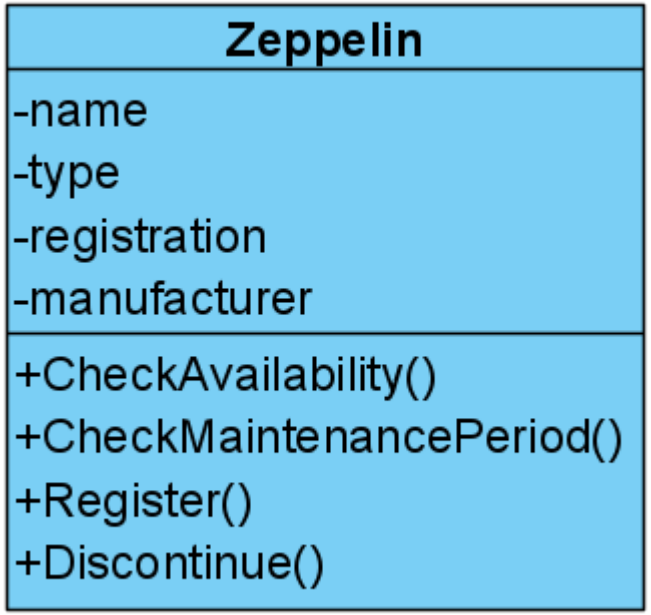
Analytical Class Diagram

How should it look like?

- Representative name
- Small number of responsibilities (operations)
  - ~3-5
- It is not isolated – A part of a system
- Low coupling – No spaghetti classes
- High cohesion
  - Operations have **MUCH** in common
  - Zeppelin class has operations related to its operation:
    - CheckAvailability()
    - CheckMaintenacePeriod()
    - Discontinue()
    - Register()



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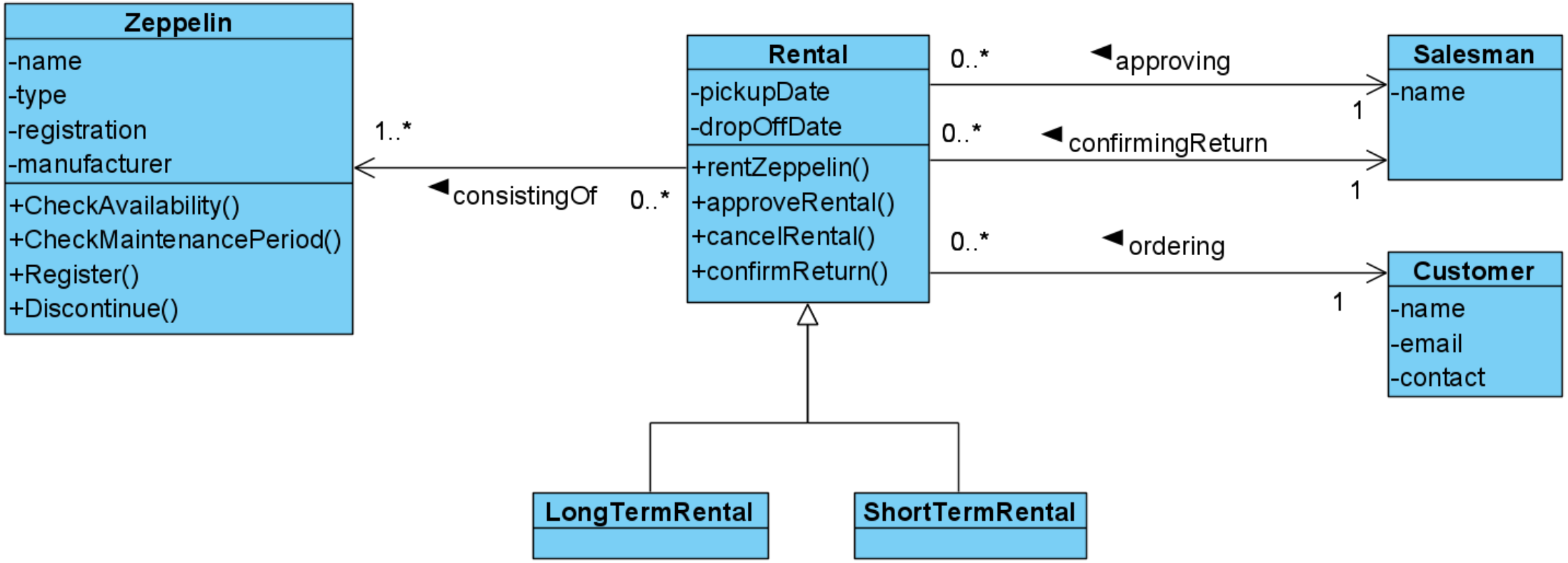
Analytical Class Diagram

Do's and Dont's

- Lots of small classes
- Few big classes
- Service/managers/builders/boilerplate classes
  - Implementational details, not important for the concept
- Try not to think so much about how would you code it
  - We are not there yet
- Complex inheritance hierarchy
- Functoids
  - Classes representing a function or procedure
- No interfaces
  - Again, implementational details

Analytical Class Diagram – Example



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How to find analytical classes

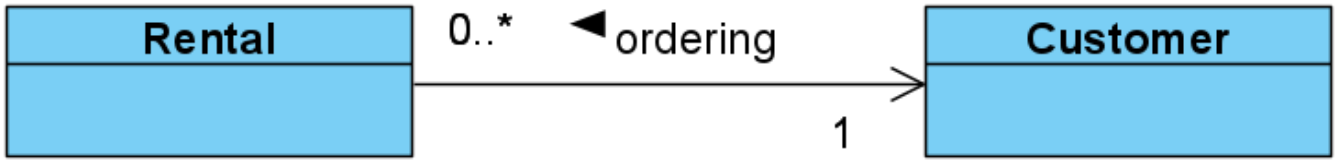
For example…

- Textual analysis
  - Use specification, use cases, or any other material available to you
  - Nouns (Podstaná jména) are often classes or attributes
  - Verbs (Slovesa) are often relationships or operations
  - Watch out for “hidden” classes – only implied in the text

- Brainstorming
  - Records candidate classes on sticky notes
  - Write down their responsibilities
  - Search for collaborations between them

Relationships between classes

- Association
  - Semantic relationship – from domain
  - It implies an attribute in one (or both) of the classes – usually
  - Long-term relationship
  - It contains:
    - Name, or name or roles
    - Multiplicity
    - Navigability



- Multiplicity
  - How many “partners” can the class have (1:1, 1:N, M:N)
- Navigability
  - Can we effectively “get” from one class to another

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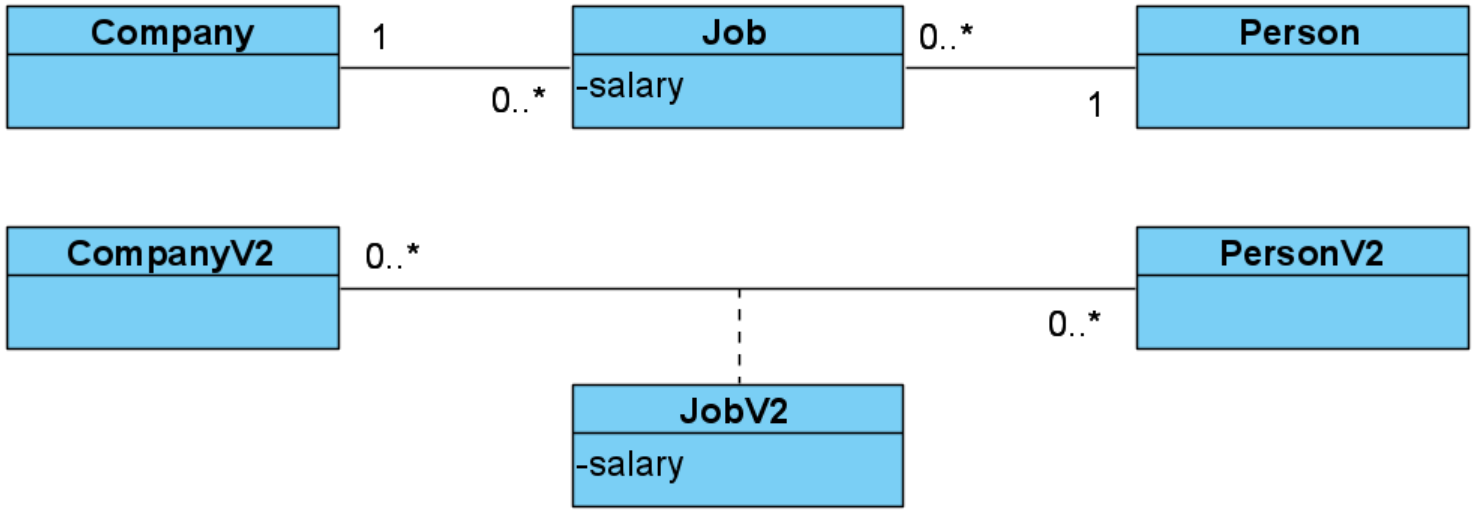
Relationships between classes

- Association M:N
  - All fine in analytical class diagram, it is decomposed later in design class diagram
- But, if the relationship is complex, you need to decompose it now
  - Or use association class, there is at **most one relationship** between two instances

These two diagrams **are not equivalent**



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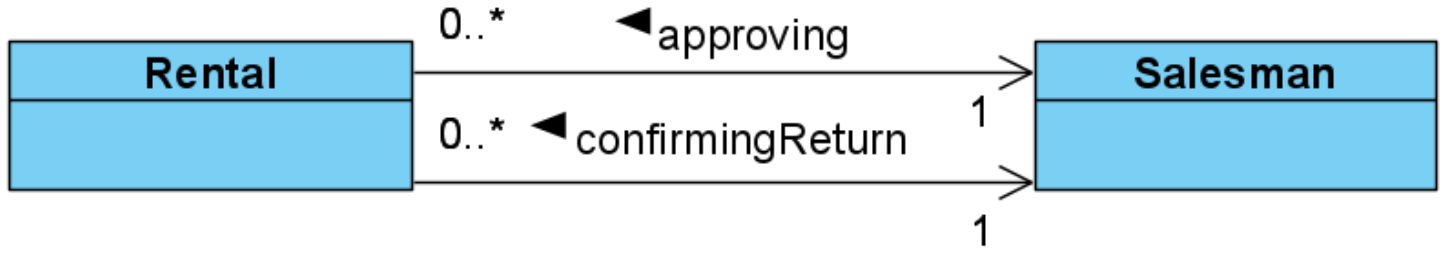
Relationships between classes

- Multiple associations
  - Different relationships



- Reflexive association

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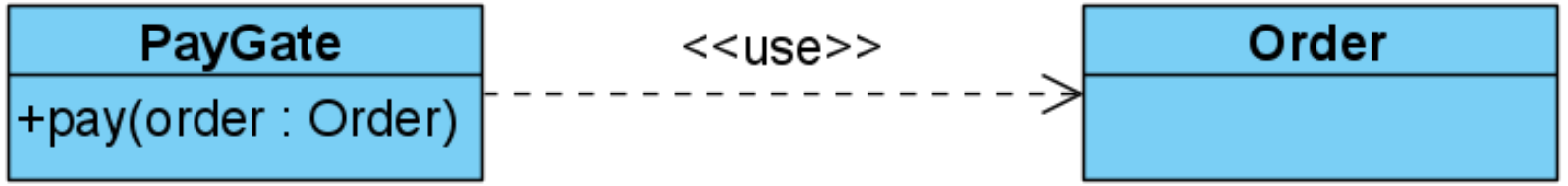
Relationships between classes

- Dependency
  - „Weak association“
  - Represents a relationship where a change on one class might affect the other
  - One class *somehow* depends on the other

- The exact meaning is specified by stereotypes
  - The most common is «use», meaning that some operation uses the other object as attribute or return value. But it does not have it as attribute.



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Task for this week

You gotta do what you gotta do

- Process the feedback
- Using the specification and Use Case Diagram, identify analytical classes, their attributes, association, and operations
- Don’t forget inheritance and multiplicity
- BONUS: Navigability
  - You will have to do it someday

Task for next week

You gotta do what you gotta do

- Process the feedback
- Update the Use Case Diagram. They must describe the same system.
- Consider the interaction between objects when fulfilling use cases. Are they represented by your Analytical Class Diagram?
- Do your part in peer review
  - Link to roster is in study materials