Projektowanie złożonych systemów telekomunikacyjnych

UML – Introduction

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Agenda:

- What is the Modelling and UML
- Understanding the basics of UML
- UML diagrams
  - Structural diagrams
  - Behavioral diagrams
    - Interaction diagrams

- UML Modeling tools
  - OpenSource Tool - PlantUML

Modelling

Describing a system at a high level of abstraction

- A model of the system
- Used for requirements and specifications

Why do we model software systems?

- A model is a simplification, that helps in better understanding of the system

UML – Unified Modelling Language

- UML is a pictorial language for specifying, visualizing, constructing, and documenting the artifacts of software systems

- It is a simple modeling mechanism to model all possible practical systems

- UML is not a programming language but there are tools that can be used to generate code in various languages basing on UML diagrams

- UML is not dependent on any language or technology

Diagrams

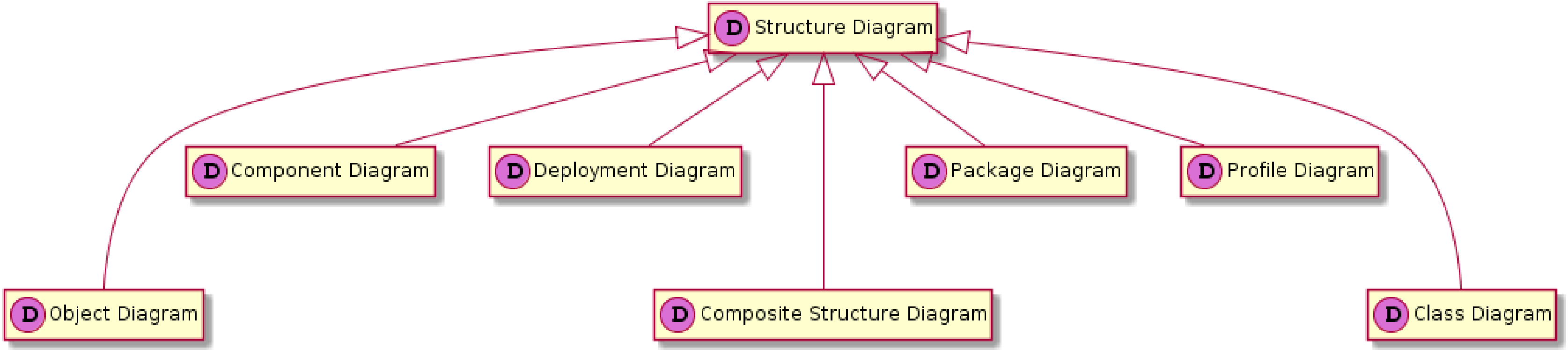
Structural Diagrams – describe static aspects of the software system using :

- Objects
- Attributes
- Operations and relationships

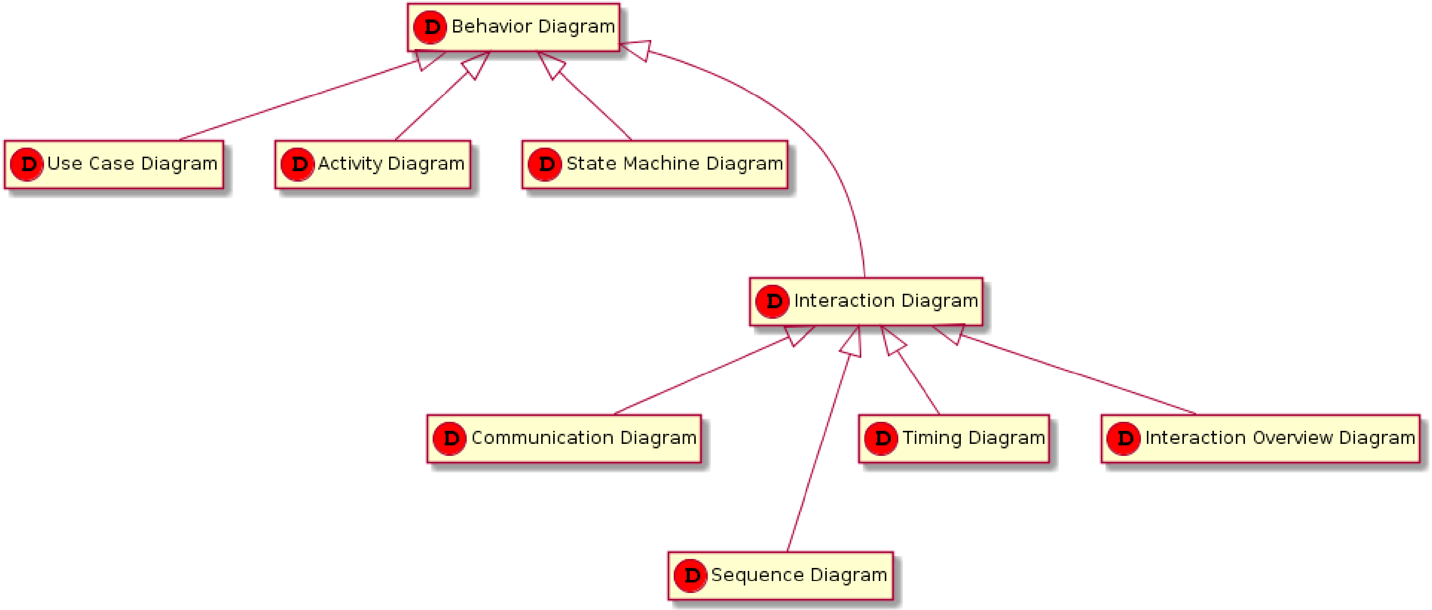
Behavioral (or Dynamic) Diagrams – describe dynamic aspects of the software system by showing collaboration among objects and changes to the internal states of objects:

- Use-case
- Interaction
- State Chart
- Activity

Structure Diagrams Hierarchy (Static)



Behavioral (Dynamic) Diagrams Hierarchy



Structure Diagrams

Class Diagram

Class Diagram describes static structure of a system using:

- Classes/Interfaces
- Attributes
- Operations (or methods)
- Relationships between classes

Class

Describes a set of objects having similar:

- Attributes (status)
- Operations (behavior)
- Relationships with other classes

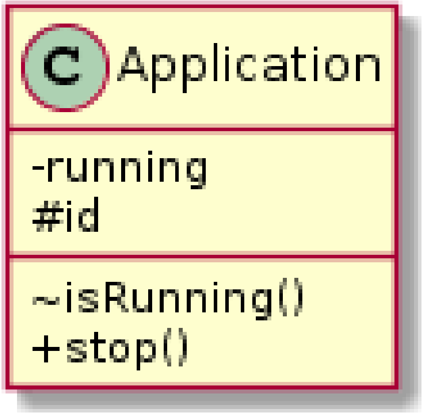
Attributes and operations may have their visibility marked:

"+" for public

"#" for protected

"−" for private

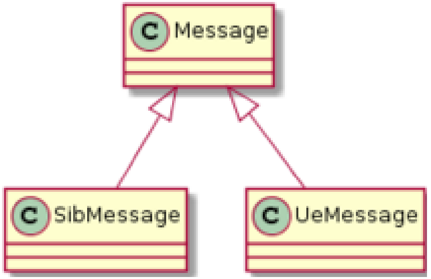
"~" for package



Class diagram – replationships between classes

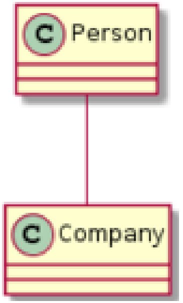
Generalization:

- Indicates that objects of the specialized class (subclass) are substitutable for objects of the generalized class (super-class)
- Generalization expresses a parent/child relationship among related classes
- Used for abstracting details in several layers



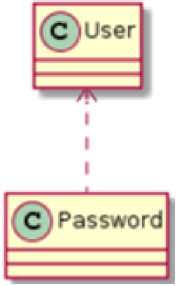
Association:

- Indicates that there is a relationship between objects, however the objects are independent



Dependency:

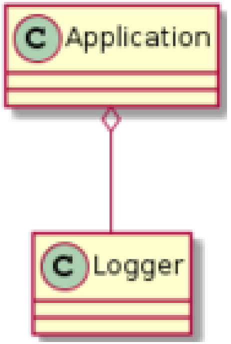
- An element, or set of elements, requires other model elements for their specification or implementation



Class diagram – replationships between classes

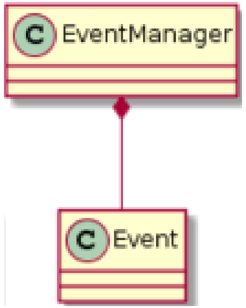
Aggregation:

- It can be treated as variant of the "has a" association relationship.
- It represents a part-whole or part-of relationship.



Composition:

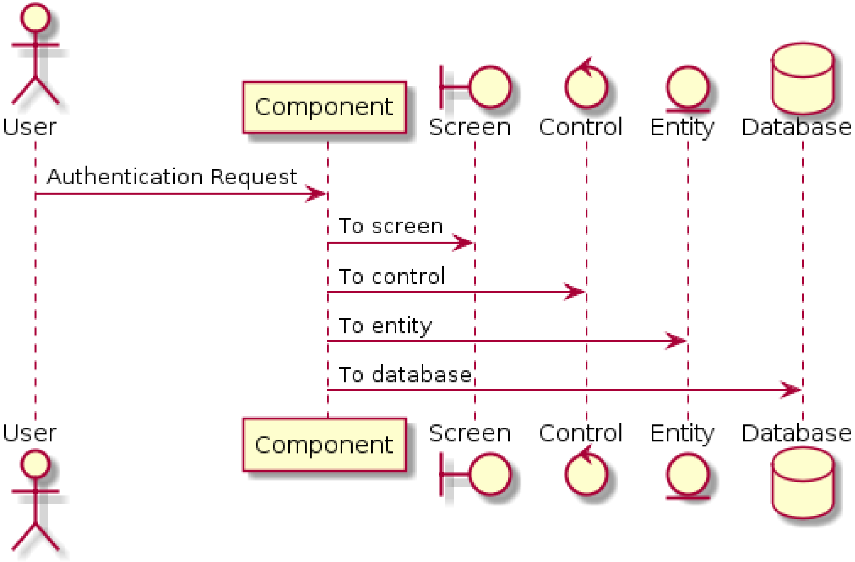
- A strong form of aggregation
- Whole/part relationship -> The whole is the sole owner of its part
- If a composite (whole) is deleted, all of its composite parts are also deleted



Behavioral Diagrams

Sequence Diagram

- Describes the interactions between objects in the sequential order
- The diagram conveys this information along the horizontal and vertical dimensions:
  - the vertical dimension shows, top down, the time sequence of messages/calls as they occur, and the horizontal dimension shows, left to right, the object instances that the messages are sent to.



Sequence Diagram

Lifeline:

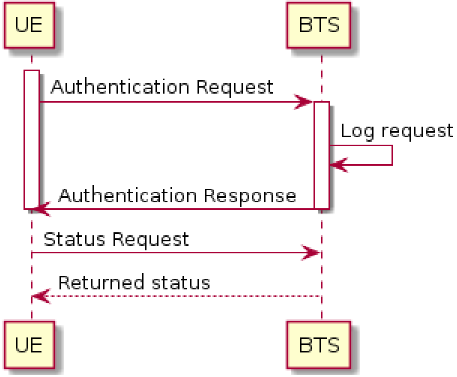
- A vertical line that represents the sequence of events that occur in a participant during an interaction, while time progresses down the line. This participant can be an instance of a class, component, or actor.

Messages:

- Messages are arrows that represent communication between objects. Half-arrowed lines are used to represent asynchronous messages. Asynchronous messages are sent from an object that will not wait for a response from the receiver before continuing its tasks.

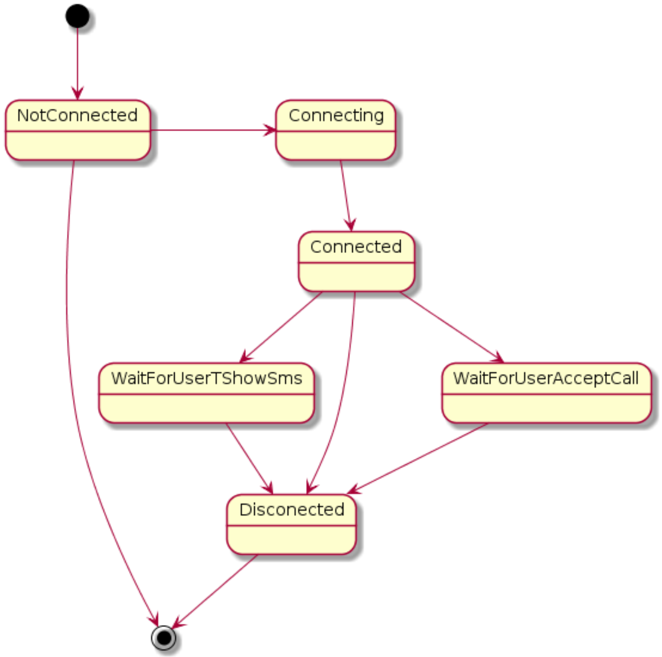
Activation boxes:

- Represent the time an object needs to complete a task. When an object is busy executing a process or waiting for a reply message, use a thin rectangle placed vertically on



State (Machine) Diagram

- Describes the behavior of a single object and the flow of control from one state to another
- Specifies a sequence of events that an object goes through during its lifetime in response to events.

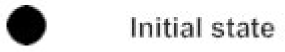


State (Machine) Diagram

State is defined as a condition in which an object exists and it changes when some event is triggered

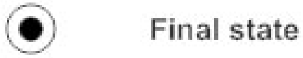
Initial State:

- A filled circle followed by an arrow represents the object's initial state



Final State:

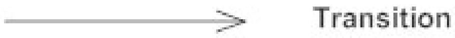
- An arrow pointing to a filled circle nested inside another circle represents the object's final state



Transition:

- A solid arrow represents the path between different states of an object. Label the transition with the event that triggered it and the action that results from it. A state can have a transition that points back to itself

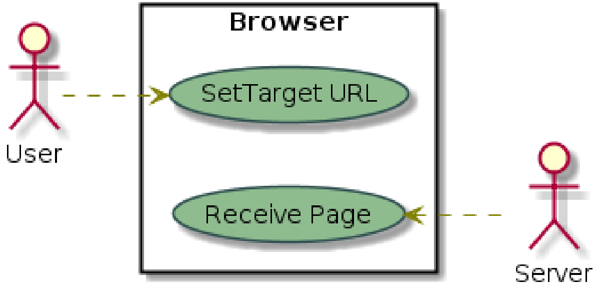
Decision points:



- A decision point models a choice that must be made within the sequence of states

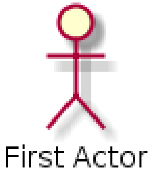
Use case diagram

- Ilustrates a unit of functionality provided by the system.
- Visualizes the different types of roles in a system and how those roles interact with the system.
- Identify functions and how roles interact with them
- High level view of the system
- Identify internal and external factors



Use Case Diagram objects

Use case diagrams consist of 4 objects:

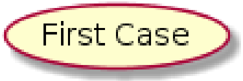


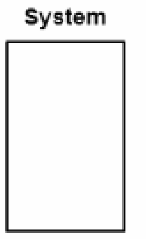
Actor:

- Any entity that performs a role in one given system. This could be a person, organization or an external system

Use case:

- Represents a function or an action within the system.



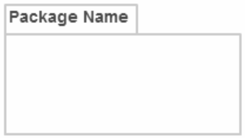


System (optional):

- Defines the scope of the use case, an optional element but useful when your visualizing large systems.

Package (optional):

- Used to group use cases together.



PlantUML

PlantUML is an Open Source project used to draw UML diagram, using a simple and human readable text description.

It's more a *drawing* tool than a *modeling* tool.

http://plantuml.com/

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