Softwaretechnik

Lecture 03: From Requirements to Definition

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Requirements Engineering

comprises methods, means of description, and tools to discover, analyze, and formulate requirements of software systems

- **requirements analysis** (*Systemanalyse*)
- **requirements specification** (*Produktdefinition*)

Requirements

- **Functional requirements**
  - inputs and their constraints
  - functions of the system
  - outputs (reactions)
- **Nonfunctional requirements**
  - runtime
  - memory
  - standards

Requirements

- **Requirements on realization**
  - software / hardware
  - devices
  - interfaces
  - facilities (OS, computers, . . .)
  - documentation
- **Requirements on testing, installation, support**
- **Requirements on construction of the system**
  - approach
  - resources (personal, cost, deadlines)
  - rules, standards

Systematic Investigation of Functional Requirements

- Inside-out methods
  modeling starts from product internals
  (rarely applicable for new products)
- Outside-in methods
  modeling starts from environment of product
  - actors and use cases (use case diagram, UML)
  - interfaces and data flows (context diagram)

Use Cases and Use Case Diagrams

Jacobson, UML

Actor 

- participates directly in a process
- stands for a role
  - natural person
  - unit of organization
  - external system

Use Cases

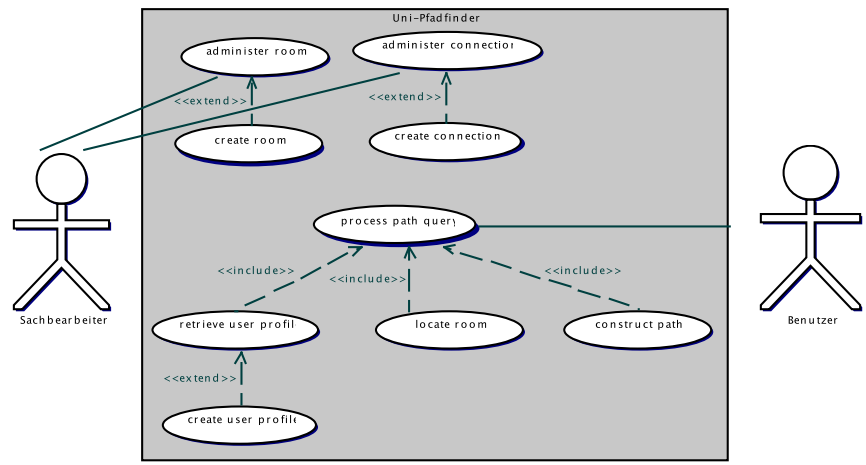
Use case [Definition]

- a sequence of actions
- performed by one actor
- to achieve a particular goal

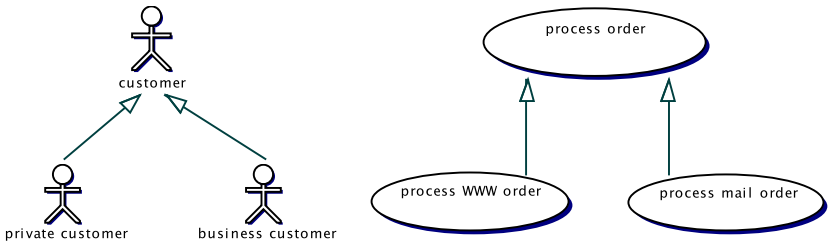
two forms:

- graphical (UML diagram)
- textual (with templates)

Example Use Case Diagram



Generalization



- generalization
- concrete and abstract use cases
- concrete and abstract actors

Use Case Textual Template

Use case:	name
Goal:	achieved by successful execution
Category:	primary, secondary, optional
Precondition:	
Postcondition/success:	
Postcondition/failure:	
Actors:	
Trigger:	
Description:	numbered tasks
Extensions:	wrt previous tasks
Alternatives:	wrt tasks

Use Case Guidelines

- Outside view — System as black box
- No implementation specifics
- No UI specifics
- **Primarily text**

Tools

- `http://www.umlet.com/`
  UML diagram drawing — standalone and in Eclipse
- `http://yuml.me/`
  online drawing of use case and class diagrams (UML)
- `http://www.gliffy.com/flowchart-software/`
  flowcharts and DFD

Related Approaches

User Stories

A user story is a very high-level definition of a requirement, containing just enough information so that the developers can produce a reasonable estimate of the effort to implement it. [Scott Ambler `http://www.agilemodeling.com/artifacts/userStory.htm`]

- Very slim, very high-level, often just one sentence.
- Informal, but proposed formal style [Mike Cohn]:
  As a (role) I want (something) so that (benefit).

Example User Stories

- Students can purchase monthly parking passes online.
- Parking passes can be paid via credit cards.
- Professors can input student marks.
- Students can obtain their current seminar schedule.
- Students can order official transcripts.
- Students can only enroll in seminars for which they have prerequisites.

- As a student I want to purchase a monthly parking pass so that I can drive to school.
- As a student I want to obtain my current seminar schedule so that I can follow my classes.

User Stories Guidelines

- Authors
- Tools
- Size
- Priority
- Traceability

Related Approaches

Usage Scenarios

A usage scenario, or scenario for short, describes a real-world example of how one or more people or organizations interact with a system. They describe the steps, events, and/or actions which occur during the interaction. Usage scenarios can be very detailed, indicating exactly how someone works with the user interface, or reasonably high-level describing the critical business actions but not the indicating how they are performed. [Scott Ambler `http://www.agilemodeling.com/artifacts/usageScenario.htm`]

- Further elaboration of a use case.
- Scenario $\sim$ path through a use case.

Example High-Level Scenario

Example Detailed Scenario

Interfaces and Data Flows

interfaces:

- information sources
- information sinks
- should specify origin of information

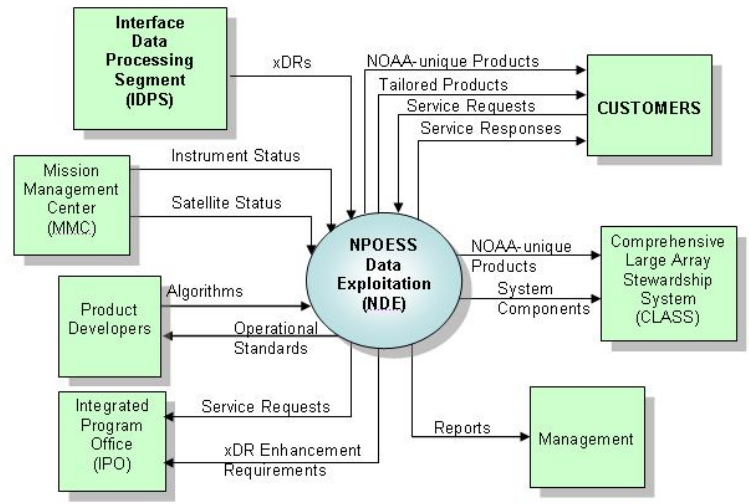
data flow:

- all input and output data
- arrows with markings
- markings should be informative

representation by **context diagram**

origin: Tom DeMarco's structured analysis

Example Context Diagram



http://upload.wikimedia.org/wikipedia/commons/8/8e/NDE_Context_Diagram.jpg

Perspective on Changing Requirements

- Produce high quality requirements (see checklist in CC2)
- Advertize the cost of requirements changes
- Establish a change-control procedure
- Anticipate changes
- Consider the business value of requirements
- Cancel a project with bad or frequently changing requirements