Abstract
This module addresses Scenarios, Story Telling and Use Cases. Scenarios are used to cope with multiple alternatives for specification or design. Story telling is a means to explore customer needs and as a means for communication. Use Cases are used to analyze the design for specific circumstances.
**goal of this module**

Be able to apply story telling technique.

Be able to use scenario analysis.

Be able to use use-cases for design.

**content of this module**

Format and criteria for stories

Elements of scenarios

Role of scenarios in decision making

Quantified use cases

**exercise**

Create a story and translate story via use cases in design
Abstract
A story is an easily accessible story or narrative to make an application live. A good story is highly specific and articulated entirely in the problem domain: the native world of the users. An important function of a story is to enable specific (quantified, relevant, explicit) discussions.
From story to design

**What** does Customer need in Product and **Why**?

Customer **What**

Customer **How**

Product **What**

Product **How**

Customer objectives

Application

Functional

Conceptual

Realization

**Story**

**Case**

**Design**

market vision

a priori solution knowledge

analyze design

analyze design

analyze design

- Story How To
  - Gerrit Muller

version: 1.1

July 31, 2014

SHTfromStoryToDesign
A day in the life of Bob

In the middle of the night he is awake and decides to change the world forever.

The next hour the great event takes place:

This brilliant invention will change the world forever because it is so unique and valuable that nobody believes the feasibility. It is great and WOW at the same time, highly exciting.

Vtables are seen as the solution for an indirection problem. The invention of Bob will obsolete all of this in one incredible move, which will make him famous forever.

He opens his PDA, logs in and enters his private secure unique non-trivial password, followed by a thorough authentication. The PDA asks for the fingerprint of this little left toe and to pronounce the word shit. After passing this test Bob can continue.
Points of attention

- purpose
- scope
- viewpoint, stakeholders
- visualization
- size (max 1 A4)
- recursive decomposition, refinement
Criteria for a good story

- accessible, understandable
  "Do you see it in front of you?"

- valuable, appealing
  attractive, important
  "Are customers queuing up for this?"

- critical, challenging
  "What is difficult in the realization?"
  "What do you learn w.r.t. the design?"

- frequent, no exceptional niche
  "Does it add significantly to the bottom line?"

- specific
  names, ages, amounts, durations, titles, ...
Betty is a 70-year-old woman who lives in Eindhoven. Three years ago her husband passed away and since then she lives in a home for the elderly. Her 2 children, Angela and Robert, come and visit her every weekend, often with Betty’s grandchildren Ashley and Christopher. As so many women of her age, Betty is reluctant to touch anything that has a technical appearance. She knows how to operate her television, but a VCR or even a DVD player is way too complex.

When Betty turned 60, she stopped working in a sewing studio. Her work in this noisy environment made her hard-of-hearing with a hearing-loss of 70dB around 2kHz. The rest of the frequency spectrum shows a loss of about 45dB. This is why she had problems understanding her grandchildren and why her children urged her to apply for hearing aids two years ago. Her technophobia (and her first hints or arthritis) inhibit her to change her hearing aids’ batteries. Fortunately her children can do this every weekend.

This Wednesday Betty visits the weekly Bingo afternoon in the meetingplace of the old-folk’s home. It’s summer now and the tables are outside. With all those people there it’s a lot of chatter and babble. Two years ago Betty would never go to the bingo: “I cannot hear a thing when everyone babbles and clatters with the coffee cups. How can I hear the winning numbers?!”. Now that she has her new digital hearing instruments, even in the bingo cacophony, she can understand everyone she looks at. Her social life has improved a lot and she even won the bingo a few times.

That same night, together with her friend Janet, she attends Mozart’s opera The Magic Flute. Two years earlier this would have been one big low rumbly mess, but now she even hears the sparkling high piccolos. Her other friend Carol never joins their visits to the theaters. Carol also has hearing aids, however hers only “work well” in normal conversations. “When I hear music it’s as if a butcher’s knife cuts through my head. It’s way too sharp!”. So Carol prefers to take her hearing aids out, missing most of the fun. Betty is so happy that her hearing instruments simply know where they are and adapt to their environment.
Value and Challenges in this story

Value proposition in this story:
quality of life:
  active participation in different social settings
usability for nontechnical elderly people:
  "intelligent" system is simple to use
  loading of batteries

Challenges in this story:
Intelligent hearing instrument
Battery life — at least 1 week
No buttons or other fancy user interface on the hearing instrument, other than a robust On/Off method
The user does not want a technical device but a solution for a problem
Instrument can be adapted to the hearing loss of the user
Directional sensitivity (to prevent the so-called cocktail party effect)
Recognition of sound environments and automatic adaptation (adaptive filtering)

source: Roland Mathijssen, Embedded Systems Institute, Eindhoven
Abstract
Good designers keep multiple alternatives open in parallel. This improves the specification and design quality. Scenarios can be used to cope with these alternatives and as a means for communication with stakeholders.
content of this presentation

Decision making

Multiple propositions

Scenarios
Decision Making Process

1. Problem understanding
2. Analysis
3. Decision
4. Monitor, verify, validate

- vague problem statement
- conflicting other decision
- insufficient data
- no satisfying solution
- invalidated solution

Scenario How To

Gerrit Muller

version: 0
July 31, 2014
ADMdecisionFlow
Flow from problem to solution

1. Problem understanding
   by
   exploration and simple models

2. Analysis
   by
   + exploring multiple propositions (specification + design proposals)
   + exploring decision criteria (by evaluation of proposition feedback)
   + assessment of propositions against criteria

3. Decision
   by
   + review and agree on analysis
   + communicate and document

4. Monitor, verify, validate
   by
   + measurements and testing
   + assessment of other decisions

vague problem statement

conflicting other decision

no satisfying solution

insufficient data

invalidated solution

Scenario How To
13 Gerrit Muller
version: 0
July 31, 2014
TORdecisionFlow
### Example of Multiple Propositions

<table>
<thead>
<tr>
<th>Throughput</th>
<th>Cost</th>
<th>Safety</th>
<th>Description</th>
<th>Time</th>
<th>Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 p/m</td>
<td>5 k$</td>
<td></td>
<td>high-performance sensor, high-speed moves, additional pipelining</td>
<td>350 ns</td>
<td>9 m/s</td>
</tr>
</tbody>
</table>

#### low cost and performance 1

<table>
<thead>
<tr>
<th>Throughput</th>
<th>Cost</th>
<th>Safety</th>
<th>Description</th>
<th>Time</th>
<th>Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 p/m</td>
<td>5 k$</td>
<td></td>
<td>high-performance sensor, high-speed moves</td>
<td>300 ns</td>
<td>10 m/s</td>
</tr>
</tbody>
</table>

#### low cost and performance 2

<table>
<thead>
<tr>
<th>Throughput</th>
<th>Cost</th>
<th>Safety</th>
<th>Description</th>
<th>Time</th>
<th>Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 p/m</td>
<td>7 k$</td>
<td></td>
<td>high-performance sensor, high-speed moves, additional collision detector</td>
<td>200 ns</td>
<td>12 m/s</td>
</tr>
</tbody>
</table>

#### high cost and performance
Recursive and concurrent application of flow

scene}

version: 0
July 31, 2014
TORrecursion

system level

subsystem level

component level

atomic level

legend

decision flow
analysis flow

Scenario How To
15 Gerrit Muller
**Graph of Decisions and Alternatives**

**Legend**
- ▲ past decision
- ● most probable decision
- ■ potential alternative
- ◯ less probable alternative

- **Communication**
- **Scope**
- **Now**
- **Time**

**Scenario How To**

16 Gerrit Muller

**Version:** 0  
**July 31, 2014**  
**ADMdecisionTree**
Different Types of Decisions

- Understanding Why
  - basic principles
- Describing What
  - requirements
- Guiding How
  - architecture rules
  - implementation choices
  - f.i. technology

Scenario How To
Gerrit Muller

version: 0
July 31, 2014
ADMdecisions
Elements of a Scenario

scenario: <clear title>

story case design

key specification and design decisions

scenario: <clear title>

story case design

key specification and design decisions

scenario: <clear title>

story case design

key specification and design decisions
Summary of Scenarios

Exploration and analysis require multiple propositions.

Architects continuously work with multiple alternatives.

Scenarios have a clear title, story, use case and design.

Scenarios are differentiated by key specifications and design decisions.
Abstract

Use cases are frequently used in Software Engineering. Use cases support specification and facilitate design, analysis, verification and testing. Many designers, unfortunately, apply use cases in a rather limited way. This presentation provides recommendations for effective use cases.
Why Use Cases?

Supports or is part of specification by providing specific data in user perspective

Facilitates analysis and design

Facilitates verification and testing
Example Time Shift recording

20:00
- start movie
- view
- phone rings
- pause viewing

21:00
- broadcast
- talk
- record
- play
- finish conversation
- resume viewing

22:00
- record
- view
- play

23:00
- end movie
- view
Construction limits intrude in User Experience

- number of tuners
- number of simultaneous streams (recording and playing)
- amount of available storage
- management strategy of storage space
What if?

**Broadcast timeline:**
- **20:00**:
  - Start movie
- **21:00**:
  - Broadcast
- **22:00**:
  - End movie
- **23:00**:
  - Finish conversation

**Events:**
1. **Programmed recording of other station**
2. **Very long phone call**
3. **Dad zaps**

**Actions:**
- **View**
- **Talk**
- **Record**
- **Play**
- **Pause viewing**
- **Resume viewing**
- **Finish conversation**
- **Phone rings**

**Version:** 0.1
**Date:** July 31, 2014

---

*Use Case How To*

Gerrit Muller
Content of a Use Case

- **Use case**
- **(sub)system or component**
- User or system specified functionality, behavior, interfaces, qualities (NFR's)
- **Input data**
  - Format
  - Size
  - Content
- **Output data**
  - Format
  - Size
  - Content
- **Context**
- **Interaction**
Example personal video recorder use case contents

<table>
<thead>
<tr>
<th>typical use case(s)</th>
<th>worst case, exceptional, or change use case(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>interaction flow (functional aspects)</td>
<td>functional</td>
</tr>
<tr>
<td>select movie via directory</td>
<td>multiple inputs at the same time</td>
</tr>
<tr>
<td>start movie</td>
<td>extreme long movie</td>
</tr>
<tr>
<td>be able to pause or stop</td>
<td>directory behaviour in case of</td>
</tr>
<tr>
<td>be able to skip forward or backward</td>
<td>extreme many short movies</td>
</tr>
<tr>
<td>set recording quality</td>
<td>non-functional</td>
</tr>
<tr>
<td>performance and other qualities (non-functional aspects)</td>
<td>response time with multiple inputs</td>
</tr>
<tr>
<td>response times for start / stop</td>
<td>image quality with multiple inputs</td>
</tr>
<tr>
<td>response times for directory browsing</td>
<td>insufficient free space</td>
</tr>
<tr>
<td>end-of-movie behaviour</td>
<td>response time with many directory entries</td>
</tr>
<tr>
<td>relation recording quality and storage</td>
<td>replay quality while HQ recording</td>
</tr>
</tbody>
</table>
Example of Quantification of Typical Use Case

3 examination rooms connected to

1 medical imaging workstation + printer

examination room: average 4 interleaved examinations / hour

image production: 20 1024 ² 8 bit images per examination

film production: 3 films of 4k*5k pixels each

high quality output (bi-cubic interpolation)
Recommendations for working with use cases

+ combine related functions in one use case
- do not make a separate use case for every function
+ include non-functional requirements in the use cases

+ minimise the amount of required worst case and exceptional use cases
- excessive amounts of use cases propagate to excessive implementation efforts
+ reduce the amount of these use cases in steps
- a few well chosen worst case use cases simplifies the design
1. Create a story
   • use the criteria
2. Transform the story into a case
   • functional, as well as quantitative
3. Perform a short design exploration
   • based on the case.
4. Improve the story
   • first iteration based on feedback from case and design.
   • Use time boxes to ensure that you make all the indicated steps.
+ stories make discussions much more specific
+ implicit assumptions are identified

~ creating relevant stories is far from trivial

- too much fun

starting point for generalization: specification and design
Conclusions

Stories help to focus early design discussions

Scenarios help to cope with multiple alternatives

Use cases address integral use: functional and quantitative

Techniques, Models, Heuristics of this module

Story telling, criterias

Scenarios

Quantified use cases

Worst case, exceptional and change use cases