Abstract

This module introduces Customer Space Sampling as part of the course Architectural Reasoning using Conceptual Modeling.
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.
What does Customer need in Product and Why?

Customer What  Customer How  Product What

Customer objectives  Application  Functional  Conceptual  Realization

story  analyze  design  market vision  a priori solution knowledge

case  analyze  design  design
A day in the life of Bob

bla blah bla, rabarber music
bla bla composer bla bla
qwwwety30 zeps.
nja nja njet njippie est quo vadis? Pjotr jaleski bla bla
bla binee ffg gsg hgrg
momm bas engel heeft een
interessant excuss. lex stelt
voor om vanavond door te
werken.

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 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, ...

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Customer objectives

Application

Conceptual

Realization

Functional
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 to 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
Create a story

as tekst + sketch or as cartoon

Use the criteria

be highly specific!

envision the future value proposition

Enjoy!
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 21:00 22:00 23:00

start movie

broadcast

end movie

record

view

talk

phone rings

pause viewing

play

finish conversation

resume viewing

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?

20:00

start movie

21:00

broadcast

22:00

end movie

23:00

1. programmed recording of other station

2. very long phone call

3. Dad zaps

phone rings

pause viewing

view

talk

play

record

view

play

finish conversation

resume viewing

view

Use Case How To

version: 0.1

February 3, 2015

ETexampleTimeShiftingWhatIf
Content of a Use Case

- **user or system**
- **specified functionality**
- **behavior**
- **interfaces**
- **qualities (NFR's)**

- **(sub)system or component**

- **input data**
  - format
  - size
  - content

- **context**

- **output data**
  - format
  - size
  - content

- **interaction**

Use Case How To

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### Typical Use Case(s)

**Interaction Flow (Functional Aspects)**
- Select movie via directory
- Start movie
- Be able to pause or stop
- Be able to skip forward or backward
- Set recording quality

**Performance and Other Qualities (Non-Functional Aspects)**
- Response times for start / stop
- Response times for directory browsing
- End-of-movie behaviour
- Relation recording quality and storage

### Worst Case, Exceptional, or Change Use Case(s)

**Functional**
- Multiple inputs at the same time
- Extreme long movie
- Directory behaviour in case of extreme many short movies

**Non-Functional**
- Response time with multiple inputs
- Image quality with multiple inputs
- Insufficient free space
- Response time with many directory entries
- Replay quality while HQ recording
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)
Timing of this Use Case

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MICAFTypicalTiming
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
Use Case Exercise

Make specification overview with ~10 SMART Key Performance Parameters (or functions or interfaces)

determine at least one use case

system seen as black box
functions
quantified characteristics
restrictions, prerequisites
boundaries, exceptions
standards, regulations

interfaces

inputs

outputs

use case
typical use with relevant context data (quantified!)

• **Specific** quantified
• **Measurable** verifiable
• **Achievable** (Attainable, Action oriented, Acceptable, Agreed-upon, Accountable)
• **Realistic** (Relevant, Result-Oriented)
• **Time-bounded** (Timely, Tangible, Traceable)
Story and Use Case Summary

Customer Language

What does Customer need in Product and Why?

- Customer objectives
- Application
- Functional
- Conceptual
- Realization

How

Use Cases include Quantification

<table>
<thead>
<tr>
<th>Examination Rooms</th>
<th>Medical Imaging Workstation + Printer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 exam room 1</td>
<td>1 examination room 2</td>
</tr>
<tr>
<td>3 exam room 3</td>
<td>1 medical imaging workstation + printer</td>
</tr>
</tbody>
</table>

- Examination room: average 4 interleaved examinations / hour
- Image production: 20,1024² 8-bit images per examination
- Film production: 3 films of 4k*5k pixels each

Accessible and Specific to Learn

- 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, ...

Typical and Worst case

Typical use case(s)

- Interaction flow (functional aspects)
  - select movie via directory
  - start movie
  - be able to pause or stop
  - be able to skip forward or backward
  - set recording quality

- Performance and other qualities (non-functional aspects)
  - response times for start / stop
  - response times for directory browsing
  - end-of-movie behavior
  - relation recording quality and storage

Worst case, exceptional, or change use case(s)

- Functional
  - multiple inputs at the same time
  - extreme long movie
  - directory behavior in case of extreme many short movies

- Non-functional
  - response time with multiple inputs
  - image quality with multiple inputs
  - insufficient free space
  - response time with many directory entries
  - replay quality while HQ recording

Summary Module Architectural Reasoning Customer Space Sampling

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