Panel-Discussion on Networking Features [CTRQ, COCORA, PESARO]; Tuesday, April 19

Capturing Non-Operational Requirements for Telecommunications Systems

Panelists:
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Introduction and Presentation by Wolfgang Leister, Norsk Regnesentral:

Definition of Operational requirements; from thefreedictionary.com:
1. A formatted statement containing performance and related operational parameters for the proposed concept or system.
2. Qualitative and quantitative parameters that specify the desired capabilities of a system and serve as a basis for determining the operational effectiveness and suitability of a system prior to deployment.

Derivation of Non-operational requirements:
• Requirements beyond the core operation of a telecommunication system; that is
  ◦ Beyond necessary functionality
  ◦ Beyond necessary performance (non-functional)

Non-functional and Non-operational are not identical; e.g., performance of a telecommunication system is non-functional (in the sense that it defines the system's function), but operational.¹

The following mindmap defines aspects of the terms functional vs. non-functional, and operational vs. non-operational:

¹ Note that during the discussion the term “functional” was partly used as being able to “define a function”.

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How can non-operational requirements be captured?

• Definition of metrics\(^2\)? Metrics for performance (compromises necessary).
• OpenBRR – QualOSS – software quality measures
• Labs – Living Labs – Testlabs
• Simulation – Model checking – Testing
• Protocol analysis – for security, privacy, etc.
• Compliance tests

Some examples from projects at the Norwegian Computing Center (NR) as illustrations:

• EUX2010 SEC project; example from Buskerud County Administration
  ○ Is Open Source Software secure?
  ○ Maturity of Open Source Software?

• (Biomedical) Sensor Networks:
  ○ Security, QoS
  ○ Use of standards (e.g., MPEG-21)
  ○ Modelling, model checking, simulation, testing

• Universal Design vs. Security?
  ○ Universal Design mandatory (regulations)
  ○ Security – usability
  ○ How can persons with disabilities use public services?

\(^2\) Metrics can be used to define **functions** that can be used to evaluate requirements.
More requirements

- Commercial requirements
- Price
- Payment time
- Guarantee
- Costs for deployment of bug-fixes
- Documents
- Block drawings
- Test reports
- Delivery of Software
- Media type (CD, E-Mail, Master-EPROM)
- Level (executable, source code)
What requirements are necessary for operation?

- None
- Just for technical operation
- For technical and profitable operation
- All

Distinction to TSI (technical specification for interoperability for railways)

- Systems
  - Structural subsystems
    - Infrastructure
    - Rolling stock
    - Energy
  - Functional subsystems
    - Control, command and signalling
    - Operation
    - Maintenance

Functional requirement is a superset of operational requirements:
- Non-operational requirement is the conjunction of
  - requirements for maintenance
  - requirements for structural systems

Weighting
Cupholder discussion

Is a reformulation of a non-functional requirement into a functional one always possible and preferable?

Cup-holder discussion

requirement for US cars:
cup-holder shall be installed

Requirement based on
reason:
Americans shall be able
to drink coffee while
driving

classification:
Non-functional requirement
classification:
functional requirement

Possible solutions
Install a coffee automata
Install a cup-holder

...
**Discussion Elements**

- Which non-operational requirements do we find in telecommunication systems?
- Where are the borders?
- How to specify?
- How to model?
- How to evaluate?
- How to simulate / test?
- Are these functional or non-functional?

**Discussion**

- How to prioritize the non-operational requirements?
- Functional and non-functional requirements are related.
- What is the scope of the operation? This defines the (non-)operational requirements.

<table>
<thead>
<tr>
<th>functional</th>
<th>operational</th>
<th>Non-operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>After closing the doors the LED shall blink</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>non-functional</td>
<td>The weight of a train must be less than $w$</td>
<td>Color of the phone</td>
</tr>
</tbody>
</table>

- Execution quality vs. Evolution quality
- Non-operational requirements are important for the future maintenance
- Non-operational requirements as expressed as functions (cf. Metrics), and are thus functional
- Functional requirements are easy to capture;
- non-functional requirements represent the system as a whole
- recapture the cup-holder discussion: What is the function of a car? Are these essential? Functional requirements are different. It depends also on the use-case.
- Living-labs
- tools: analysis, usability testing, experts, humanities; user feedback is very important when analysing; most accurate: experimental way
- unknown requirements (not visible when engineering) are a challenge.