An Efficient Scenarios-Based Solution to Ensure Completeness and Consistency of Functional Specifications.

Airbus Operation SAS - EYDT5
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Functional Specifications … What for?

One of my mottos could be:

"Make things simple & easy!"

But we work in a world of Huge Complexity.

“Simplicity is the ultimate sophistication”

Leonardo Da Vinci
Functional Specifications … What for?

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"Make things simple & easy!"

"True simplicity is derived from so much more than just the absence of clutter and ornamentation. It's about bringing order to complexity...

You have to deeply understand the essence of a product in order to be able to get rid of the parts that are not essential."

Jony Ive  (Chief Design Officer at Apple)
How to address Complexity?

→ Break complexity into sets of simpler parts.

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Jony Ive (Chief Design Officer at Apple)

www.apple.com
Functional Specifications … What for?

How to address Complexity?

- Break complexity into sets of simpler parts.
- Design each elementary part …
- manage integration.

How to ensure that this giant puzzle will answers global need?
Functional Specifications … What for?

Through **Model based design**, using
- Simulation,
- Prototyping,
- Software In the Loop,
- Hardware In the Loop.

How to ensure that this giant puzzle will answer global need?

Through **System Engineering** and **Requirements** cascading… using, **Model based System Engineering**
How to capture and specify user needs, at any level?
How to capture and specify user needs, at any level?

Capture intended behaviour, telling stories of use.

- **Natural way** to formalise expected behaviour.
- At the **right level** (without constraining to a foreseen design solution)
- Allows focusing on **some simple cases**, for some given conditions
  - no need to formalise all potential cases

But each scenario is only a part of the global image!
How to capture and specify user needs, at any level?

- Scenarios of use
  - Build global functional descriptions from scenarios.
  - Provide the **global image**, to support **requirements identification** and specification building.

- Global functional description
- Stakeholder Functional Requirement

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How to capture and specify user needs, at any level?

Let’s consider a **simple example** of interactive User Interface:

- Control command using the mouse to interact with a slider, with 3 types of interactions:
  - Drag & drop of the cursor widget
  - Using the mouse wheel
  - Clicking on + / - button
How to capture and specify user needs, at any level?

Stakeholder Functional Requirement

- Model actions done by user.
- Model associated functions.
- Model functions’ triggers & data exchanges.

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How to capture and specify user needs, at any level?

Scenarios of use
→
Global functional description
→
Stakeholder Functional Requirement

Automatically build a Simulink model that merges scenarios.

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How to capture and specify user needs, at any level?

Scenarios of use

Global functional description

Stakeholder Functional Requirement

Automatically build a textual specification.

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How to capture and specify user needs, at any level?

Stakeholder Functional Requirement → Global functional description → Scenarios of use → Modifications → Simulation → Executable model

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How to capture and specify user needs, at any level?

Model functional constraints

Formal proof

Simulation

Executable model

Modifications

Global functional description

Scenarios of use

Stakeholder Functional Requirement

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Conclusion

✅ **Scenarios** modelling:
  - Easy & natural way of representation (simple *user stories*)
  - Stops decomposition at the right level
  - Data formalization & data capitalization (share, re-use…)

✅ **Automatic** generation of functional architecture:
  - Auto-structures the specification
  - Auto-formalizes part of the requirements

✅ **V&V** improved:
  - Validation through enlarged *simulation* capabilities
  - Formal verification of behavior against requirements

Let’s make this Proof of Concept, an *Industrial reality.*
Q&A