Experiences in using a seamless process from specification to test

Dr. Frank Houdek | E/E & eDrive | Daimler AG
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Trend: Functional Innovations

- Increasing product portfolio
- Increasing functional complexity
- Decreasing number of vehicle prototypes
- Shortening development cycles
- Quality requirements remain constant
Key lever: System orientation

Vehicle

Component

Function

- Lane keeping
- Detect track
- Steer vehicle
- Brake vehicle
Functional Mapping in the development process

DISTRONIC PLUS with Steering Assist

- Control speed
- Control distance
- **Lane keeping**
  - Detect track
  - Steer vehicle
  - Brake vehicle

Functional structure

Mapping to components

Technical view/Component view
Implementation in the Vehicle Development Process

List of systems
System specification
e.g. DISTRONIC PLUS
(approx. 130 pages)

Handover-Process
Component specification
e.g. Radar decision unit
(approx. 120 pages)

Test concept
Test specification
e.g. DISTRONIC PLUS
(approx. 340 test cases)

SiL/MiL-Test
Vehicle level test
System test
Component test
Vehicle testing

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Insight into Handover-Process ... (excerpt)
Implementation in the Tool Landscape (Excerpt)

- Many needs for tool integration
- Often proprietary ways for coupling
- So far no global approach
Implementation in the Tool Landscape (Excerpt)

Communication information (CAN, ...)

System specification
Component specification
Test specification

Product data management (amongst others: specs (PDF))

Implementation models

Test specification
Test planning
Defects

Data exchange with suppliers

Defects (vehicle level)

Test automation

Tool specific services
Experiences

- Engineers demand it
  - Often „Pull“, no „Push“
  - Some implementations are just prototypes

- Co-Evolution of Interfaces and Processes

- Reliability
  - Many „hard coded“ assumptions
  - Sensitive with respect to modification
Challenges Beyond Technical Issues (1)

Managing product variants

Specification negotiation process

Project staffing

Different methods for similar problems

Different implementations of standards

Different project characteristics
### Challenges Beyond Technical Issues (2)

<table>
<thead>
<tr>
<th>Information Classification</th>
<th>Example</th>
<th>Some requirements according to information security policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>External brochures</td>
<td>- none -</td>
</tr>
<tr>
<td>Internal</td>
<td>General e-mail notes, training material</td>
<td>■ One means of authentication</td>
</tr>
<tr>
<td>Confidential</td>
<td>Component specifications</td>
<td>■ “Confidential” on first page</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Enhanced Authentication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ No unencrypted storage or transfer</td>
</tr>
<tr>
<td>Secret</td>
<td>Strategies for pricing, Early design drawings</td>
<td>■ “Secret” on every page (printout and electronically)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Two-factor authentication</td>
</tr>
</tbody>
</table>

A seamless process often covers different information classes (→ infrastructure, granting access, etc.)
Challenges Beyond Technical Issues (3)

New and improved working models

A) On-site, collaborative working (internal and others)
B) Traditional customer – supplier division of work
C) Internationally distributed projects and working groups
D) Working in cooperations with OEMs or joint ventures
E) Law conform working with external companies

New roles are upcoming due to new working models
Our Needs (1)

- Contribution to implement ISO 26262
  (e.g. documenting traceability, transparent change management)

- Ability to map different local implementation of standards
Our Needs (2): „Magic“ Triangle

- Working across organizational boundaries: Access to released information only
- Necessary: Integrated approach for using information: version + configuration + variability information