A Lean Automotive E/E-System Design Approach with Open Toolbox Access

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Motivation

- Automotive E/E-System design models usually created with UML-Based techniques (wide-spread example of UML2 profile → SysML)
- UML-Based methodologies valuable for projects with emphasis on software, for the embedded automotive system design, sometimes they are too powerful
- E.g. for domain experts who have no or limited knowledge about software development, the high number of elements available for modelling, turns the system architectural design into an awkward task
Research Question

How to support small project teams in easily creating consistent System Architectural Designs for Automotive Mechatronics-based Systems?
Our Contribution

Domain-Specific Modelling (DSM) for the particular needs at the embedded automotive mechatronics-based system development

- Facilitate the architectural design process of embedded mechatronics systems for UML-Non-Natives (focus on structural description)
- Provide a comfortable integration of requirements management at the different design abstraction levels
- Established SysML approaches shall not be ignored or decried (fully automated M2M-Transformation between DSM and SysML)
Definition of the Domain-Specific Modeling Language

EMS-DSM Component
{abstract}

- ID
- Name
- Mask
- Requirement <<Link>>
- Verification Criteria <<Link>>
- Specification <<Link>>

Mechanical C. located at Compartment C.

- Mechanical C.
- Compartment C.

E/E Item C.
{abstract}

- ASIL

Hardware C.
{abstract}

- 1..*
- 0..*
- HSI

Software C.
{abstract}

- Timing

- Basis Software C.
- Application Software C.

Signal Interface

Sensor C.

Control Unit C.

Actuator C.

External Control Unit C.
Creating new EMS-DSM Objects (Open Toolbox Access)
Creating the System / Software Architectural Design (Tool Support → EASy Design)
Link to Other Design Artifacts – RQs & TCs
Link to Other Design Artifacts – RQs & TCs (Aligned to Automotive SPICE)
## Link to Other Design Artifacts – RQs & TCs
(RM Tool Support → Redmine)

### System Requirement #52

**Customer Requirement #53**: Control of CNG-High Pressure Regulator

#### Control of CNG-High Pressure Regulator (Flow Control Valves)

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**Description**

**Subtasks**

- Software Development - **Software Requirement #54**: Driver Stage Control of CNG-High Pressure Pump (Flow-Control Valve)

**Related Issues**

- 

*Harald Sporer*

01 October 2015
Transformation to wide-spread SysML designs has to be available.
Conclusion

- Domain-Specific Modelling (DSM) approach for the *Automotive E/E-System Design*
- Facilitates the architectural design process of embedded mechatronics systems for UML-Non-Natives (focus on structural description)
- Easy adaption of modelling library through *Open Toolbox Access*
- Provides a comfortable integration of requirements management at the different design abstraction levels with bidirectional traceability
- Established SysML approaches are not ignored (fully automated M2M-Transformation between DSM and SysML)
Thank you!

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