Challenges in Model Based Development
Mathworks Automotive Conference
April, 17th 2018
Outline

› History of Model Based Design at Continental Powertrain Engine Systems
› System Design Automation (SDA) – our MBD tool chain
› Future strategy
› Architecture Centric Development (ACD)
› From V–Cycle to agile development
› Conclusion
MBD at Continental Powertrain Engine Systems
With Close Technical Partnership Since 17 Years…

› First version of System Design Automation (SDA) in 2001
› Through the years feature range was steadily extended
› Strong collaboration with Mathworks


SDA 2.1 (R12)
Simulated OS
AT Block set
SW Services

SDA 5.0 (R14)
FXP Simulation
Embedded Coder
Test Generation
Code Generation
CM / ADD

SDA 6.0 (R14)
Simulation Manager
Project Wizard
SW Library
Diagnosis Templates

SDA 6.3 (R2008b)
Performance
SiL / PiL
Single module
Autosar

SDA 8.1 (R2013a)
Intrinsic SW-Libs
PCLint integration

SDA 10 (R2016b)
Win10- Ready
Units on signals
Autosar features

SDA 11++ (R2018?)
Design Verifier
Polyspace
Data Inspector
Simulink
functions

… to increased efficiency and usability
System Design Automation
Guide Easily From Functional Requirements…

MIL
Model in the Loop

Test cases → Functional Requirements → Modeling → Functional Model → Scaling → Implementation model → ACG → C-Code (s-function) → Result → Expected Values

SIL
Software In the Loop

PIL
Processor In the Loop

C-Code (µC- Target) → Result → Model Coverage

… to validated code in one single integrated environment

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Dr. Marco Kunze, © Continental AG
System Engineering Strategy
Architecture With Processes, Methods And Tools…

... are the pillars of the bridge to our future
The Next Steps
Establish New Methods…

1) ACD Authoring Framework
   - Close the gap from MBSE to MBD

2) Architecture Design Rules
   - Integrate legacy data

3) Optimize From Classical Process…
   - Establish CI/CT already in design phase

… to cope with future challenges
Backbone with Intrinsic ASPICE Capability
System Architecture as...

... connecting element for the entire product description
Agile Model Based Design Process
Use Matlab Simulink Environment …

ACD : Architecture Centric Development
SDA : System Design Automation
MIL : Model in the Loop
SIL : Software in the Loop
PIL : Processor in the Loop
RPT : Rapid Prototyping
HIL : Hardware in the Loop
TVG : Test Vector Generation

Automatic Code Generation

Simulink as Editor for Diagrams and Requirements

“Linked Data” to connect to any Data Source

Git/Jira for agile Infrastructure

… to integrate ACD, MBD and agile development
Conclusion
Feature Extensions And Tool Improvements Needed…

› Seamless tool chain for Model Based Design established

› Future task:
  › Extend area of application to Systems Engineering and architecture
  › Introduce concept of Architecture Centric Development
  › Integrate agile methods for Model Based Design

› For these tasks we need extended and modern features towards
  › System architecture
  › Decentralized CM systems
  › Integration with Continuous Integration (CI) and Test (CT)

… to efficiently master future challenges
Thank you for your attention!