Powertrain Strategies for the 21st Century: Designing Global Powertrains

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Management of Global Powertrain Requirements

Embedded System Advancement

Challenges:

- Management of global customer platforms
- IP/Know-how protection
- System level testing, FMEA, FTA
- Software maintenance
- Innovation management
- Validation and Verification

Increased Customer Demands  

Increased Reuse & Cooperation
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AUTOSAR

Software Sharing
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Standardization

Architecture Basic Software
- Specification of a complete basic software layer as integration platform for hardware independent application software.

Application Interfaces
- Specification of standardized interfaces of mature automotive applications from all domains as bases for application software.

Methodology
- Common exchange formats or description templates to enable seamless co-operation during the complete development process.
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Bosch PT-ECU Roadmap to AUTOSAR

Legacy Base SW:
• SW sharing based on AUTOSAR
• AUTOSAR SW from Bosch and OEM

Interim Product:
• Stepwise migration to AUTOSAR based on customer request
• BSW from CUBAS
• “Mixed Mode” in ASW

Future Product:
• AUTOSAR compliant ECU based on CUBAS
• “Mixed Mode” in Application SW

CUBAS = Common Base SW
RTE = Run-time environment
CDD = Complex Device Driver
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AUTOSAR

Software Sharing
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SW Sharing (w/o AUTOSAR)

OEM Specs

- Requirements Analysis ECU Project
- Requirements Analysis Subproject SW
- Requirements Analysis Change Request
- Requirements Change Analysis
- Reference Architecture Development
- Concept Development
- Architecture Development
- Component/Function Design
- Coding
- Tier1 Interface
- OEM Codes

Supplier:
- Interface adapter
- SW integration
- SW system testing
- SW system testing
- System testing

OEM:
- Source/Obj code
- Interface description
- Integration test cases
- SW system test cases
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SW Sharing (w/ AUTOSAR)

CODE SHARING

OEM:
- AUTOSAR BSW/App interface, & Interface descriptions
  - Integration test cases
  - SW system test cases

Supplier:
- Interface adapter
- SW integration/testing
- SW system testing
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Model Exchange (w/o AUTOSAR)

Challenges:
- Different tool chains @ OEMs with specific adaptations
- Different modeling guidelines
  ⇒ Model Conversion

Approach:
- Increase model compatibility by industrialization of Sw based on AUTOSAR
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Model Exchange (w/ AUTOSAR)

- Common guideline
- Standardized libraries, efficient usage or resources
- Independence of tool version/supplier
- No dependency on supplier’s modeling style

⇒ Win-Win for OEM-Suppliers-Tool Provider
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VeMotionSAR - Architecture based development

- Definition of **software structure** according to functional and non-functional (e.g. reuse, distributable) requirements
- Driver for **functional unification** by one common SW architecture
- Specification of **interfaces** and **task orders**

![VeMotionSAR Diagram]

http://www.bosch-vemotionsar.com/
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Managing Global Powertrain Development

- Standardization inter/intra systems
- Modular Design / Reuse
- Flexibility
- Cooperation

Dev Tools

- Vehicle Simulator
- MCD Tools
- MiL/HIL/SiL

Hardware

- Peripherals
- Dig Control
- Diagnostics
- OnBoard Diagnostics

Software

- Auto Code
- Modeling
- Rapid Prototyping
- Analysis

Calibration

- Test
- Software
Thank you for your attention!