AUTOSAR Ethernet Design and SoA

PREEvision Webinar, 2019
Agenda

- **PREEvision at a glance**
  - Service oriented Architectures
  - Tool Demo
  - SOA & Ethernet in PREEvision 9.0
  - Summary
PREEvision is the market leading product for architecture design and management.
PREEvision is the established engineering platform for the series development of distributed embedded systems.
PREEvision at a glance

From a Fragmented Tool Landscape to an Integrated Solution

- Tool Landscape Approach: Multiple Tools and Interfaces
- Integrated Tool Approach: PREEvision E/E Engineering Environment
PREEvision at a glance

Model Based Development

- Domain specific language and data model
- Single source model across all Automotive E/E development Use Cases:
  - The model is the Single Point of Truth
  - Mappings ensure full traceability
  - The model can be analyzed by metrics
- All data objects have a semantic meaning
  - Base for various model checks e.g. for Correctness, Completeness, Consistency
- Automated algorithms for synthetization, scheduling, signal routing, etc.
PREEvision at a glance

Model Based Development in large groups

- Multi User – Single Source → Multiple users work collaboratively, supported by Lock&Commit, Life Cycles, Rights&Role Management and Ticket System
- Multiple projects are handled in one system, supported by Productline Management, Variant Management, etc.
- Import and export with industry standard exchange formats (AUTOSAR, DBC, LDF, FIBEX, RIF, ReqIF, KBL, CSV)
- The model is the Single Point of Truth
Supported Use Cases

- **Architecture Design**
- **Requirements Engineering and Requirements Management**
- **AUTOSAR System, Service and Software Design**
- **Communication Design (AUTOSAR and Legacy Formats)**
- **Hardware Component Development**
- **Function Driven Design System Design**
- **Test Engineering and Test Management**
- **Change and Release Management**
- **Design of Safety Relevant Systems**
- **E/E Backbone, Collaboration Platform, File Management**
- **Variant Management and Product Line Engineering**
- **Wiring Harness Design**
The complete Vector AUTOSAR Tool Chain

PREEvision at a glance

**System Design**
- Architecture and Communication Design: PREEvision
- Diagnostics Design: CANdelaStudio

**Application Software Development**
- SWC Design: PREEvision, DaVinci Developer
- SWC Execution and Test: vVIRTUAltarget pro

**ECU SW Integration**
- BSW/RTE Configuration: DaVinci Configurator Pro
- Virtual Integration: vVIRTUAltarget basic

**System Verification**
- ECU Calibration: CANape
- Verification of Network Communication and Diagnostic Behavior: CANoe & CANoe.DiVa

**Application Software Verification**
- SWC Verification within Real ECU: CANoe & VT System
- SWC Verification in Virtual Environment: vVIRTUAltarget pro

**ECU SW Verification**
- ECU Monitoring and Debugging: CANoe.AMD
PREEvision at a glance

Bottom Line – The PREEvision Assets

Rich model-based **Automotive Data Model.**

Professional **Engineering Functionality** to work with this data model (MBSE).

**Collaboration** of many users at many sites on **one Single Point of Truth.**

**Product Line Engineering** to manage the complexity of many variants.

**Customizable** → Tailoring to customers process by **configuration.**
Agenda

PREEvision at a glance

- **Service oriented Architectures**
  - Tool Demo
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Service oriented Architectures are Enablers ...

- **... for Connectivity**
  - Completely new functions by flexible integration of services in the IT backend

- **... for Autonomous Driving**
  - Communication from the vehicle to the IT backend and vice versa
  - Creation of precise maps
  - Predictive assistants based on precise maps
  - Routing for vehicle fleets in the IT backend
  - ...

- **... for SW Update, SW Upgrade and Service for Vehicles in the Field**
  - SW update of single services
  - SW update and upgrade for vehicles in the field over the air
  - Remote diagnostics
  - ...

- **... for Variant and Building Set Strategies**
  - SW options can be implemented as services (base service ... premium service)
Example of a Service Oriented Architecture

Service oriented Architectures

I know the weather for a city code

Want to know the weather of my current position!

I can inform you the weather for your position but I need help...

I know the city code of one specific position

Service orchestration
A **method** represents a function that is executed by a provider on request of one or more consumer(s).

An **event** represents an update to a piece of data. The provider decides when to send this update and the occurrence of it is transmitted from a to one or more consumer(s).

A **property** (field, attribute) represents a piece of data hosted by a provider that exposes to one or more consumer(s) a get and/or a set method. Consumers can optionally receive notifications of changes of the field’s value.
Service oriented Architectures

Service and SOA Design

- Graphical diagrams to design and understand Service oriented Architectures
  - Service Architecture Diagram
  - Service Diagram
- Definition of the Service Interface and derivation of the Software Architecture for AUTOSAR Classic
What is a Service?

Service oriented Architectures

Service Interface:
- Method
- Fire&Forget Method
- Property
- Event

Service Contract:
Service Participant 2
Service Participant 3

Service Provider Port
Service Consumer Port

SOA Diagram in PREEvision
Service oriented Architectures

Software synthesis

AUTOSAR Adaptive

AUTOSAR Classic
Service oriented Architectures

Implementation of Services

PREEvision Layers

- Requirements
- Logical Function Architecture
- Software/Service Architecture
- Hardware Architecture
- Wiring Harness

Software/Service Architecture

1. Service Oriented Architecture
2. SW Library
3a. SWC Instances
   - AUTOSAR Classic
3b. SWC Instances
   - AUTOSAR Adaptive

Import/Export:
- AUTOSAR Classic
- AUTOSAR Adaptive

SWC Instances

AUTOSAR Classic

AUTOSAR Adaptive

Manifest
Service oriented Architectures

SOA Design Workflow (AUTOSAR Classic)
Agenda

PREEvision at a glance
Service oriented Architectures

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Workflow:
- Small SoA Design
- Technology mapping to AUTOSAR Classic
- Hardware Architecture
- Software Design – Service instantiation
- Signal Routing

Based on PREEvision 9.0 SP8
- Perspective: “Service and Ethernet Design”
- SoA & Ethernet Explorer

Content:
- Calculator Service with a Method, an Event and a Field
- Ethernet network with three ECU’s (one provider, two consumers)
- Three service instances
Agenda

PREEvision at a glance
Service oriented Architectures
Tool Demo

» **SOA & Ethernet in PREEvision 9.0**

Summary
SOA & Ethernet in PREEvision 9.0

Focus SysML – PREEvision as SysML-Tool for Automotive E/E Engineering

Available in PREEvision 9.0

PREEvision inbuilt logical and physical layer modelling
Data Interfaces

- Model State Machines as „closed system“

State Machine

- EventInterface1
- DataInterface1
- DataInterface2
- EventInterface2
- DataInterface1
- DataInterface2
- EventInterface3
Data Interfaces

- Connect State Machine to model data through
  - Event Interfaces
  - Data Interfaces

State Machine
**Transformer and End to End Protection**

### Sending App
- **Signal S1**
- **Transformer Chain**
  - Transformer 1 (SOME/IP)
  - Transformer 2 (E2E)
- **ECU1**

### Receiving App
- **Signal S1**
- **Transformer Chain**
  - Transformer 1 (SOME/IP)
  - Transformer 2 (E2E)
- **ECU2**

Frame: 1 0 1 1 0 1 1 1 0 1
End to End Protection and Transformation

Support for SOME/IP, E2E and generic transformer

Comforable Design Explorer

Detailed attributes for each kind of transformer

Build up reusable transformer chains

Assigning transformer chains to signals or signal groups
A Simple Network... to be diagnosable
SOA & Ethernet in PREEvision 9.0

Transport Protocol and Diagnostics communication

1. Find valid diagnosis paths automatically
2. Create unique path information automatically
3. Result posted to information view
Global Time Synchronization

- Relevant Artifacts
  - Global Time Domain
    - And Sub Domains
  - Time Master (TM)
  - Time Gateway (TG)
    - Connecting
      - Master Domain to
      - Sub Domain
  - Time Slave (TS)
SOA & Ethernet in PREEvision 9.0

Global Time Synchronization

- Diagram Configuration + Highlights available
- Main Global Time Synchronization Table
- Additional tables for artifact details
- PDU-Synthesis for CAN
- Comfortable, context-specific editing options
- Selection specific Artifact Picker
- Filtered Model View
Agenda

PREEvision at a glance
Service oriented Architectures
Tool Demo
SOA & Ethernet in PREEvision 9.0

Summary
Service oriented Architectures (SOAs) provide flexible, open and dynamic distributed systems.

- They are enablers for
  - Connectivity and Autonomous Driving
  - SW Update, SW Upgrade and Vehicle Service in the field
  - New Building Set Strategies and Handling of Variants.

- Future E/E Architectures will combine the strengths of Signal Oriented and Service oriented Architectures.

- AUTOSAR Adaptive and AUTOSAR Classic will be deployed in the same vehicle, even in the same ECU.

- PREEvision already supports the introduction of SOAs, the migration to SOAs and their implementation in
  - AUTOSAR Classic
  - AUTOSAR Adaptive

- Enhanced Ethernet and AUTOSAR capabilities coming with PREEvision 9.0
  - AUTOSAR Adaptive
  - DoIP & Diagnostic Communication Infrastructure
  - Global Time Synchronization
For more information about Vector and our products please visit

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