Webinar: Service Oriented Architectures & Ethernet

SOA and Ethernet in PREEvision, 2018
Why Service Oriented Architectures?

- PREEvision at a glance
- Service Oriented Architectures
- SOA & Ethernet in PREEvision 9.0
- Summary
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)
PREEvision at a glance

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
PREEvision at a glance

Supported Use Cases

- Architecture Design
- Requirements Engineering
- AUTOSAR System, Service and Software Design
- Communication Design (AUTOSAR and Legacy Formats)
- Hardware Component Development
- Wiring Harness Design
- Function-Driven Design System Design
- Design of Safety Relevant Systems
- E/E Backbone Collaboration Platform File Management
- Product Line Engineering
- Test Data Management

(VECTOR)
The complete Vector AUTOSAR Tool Chain

**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

**AUTOSAR ECU/System**
- SWC1
- SWC2
- SWC3

**AUTOSAR ECU**
- SWC1
- SWC2

**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.
Service Oriented System Design Workflow

- Service definition and service interface design
- Virtual function bus (derived from service definition)
- Switched topology definition
- Deployment of service provider and service consumer
- Communication design
  - VLAN configuration
  - Switch configuration
  - Socket communication
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 Participant 2
Service Contract
Service Provider Port

Service Participant 3
Service Consumer Port

SOA Diagram in PREEvision
Technology Mapping of Services

Service Oriented Architectures

AUTOSAR Adaptive ECU/System

Service Participant 2
- Service Provider Port
- Service Consumer Port
- Service Interface
  - Method
  - Fire&Forget Method
  - Property
  - Event
- Technology Mapping

SWC1
- Service Discovery
- Serialization/Deserialization

SWC2
- Service Consumer
- Technology Mapping

SWC3
- Service Provider
- Switch

AUTOSAR Classic ECU/System

Service Participant 3
- Service Provider Port
- Service Consumer Port
- Service Contract
- Technology Mapping

SWC1
- Service Discovery
- Serializing/Deserialization
- Switch
- Ethernet

SWC2
- Receiver, Sender, Client, Server Ports
- Technology Mapping

SWC3
- Receiver, Sender, Client Ports
- Switch
- Ethernet
Service Oriented Architectures

Service Interface and Technology Mapping to AUTOSAR Classic

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

Service Participant 2
- Service Provider Port
- Service Contract
- Service Consumer Port

Service Participant 3
- Technology Mapping

AUTOSAR Classic ECU/System
- Service Discovery
- Serialization/Deserialization

SWC1
- Switch

SWC2

SWC3

Service Interface
- Methods
- F&F Methods
- Properties
- Events
- Event Groups

Technology Mapping
- Application SW Component (Service Provider)
  - Client Server Interface
  - Sender Receiver Interface
  - Client Server Interface with GET_ and SET_ operation
  - Sender Receiver Interface

1: Fire and Forget Method = Method without return
2: Property = Field = Attribute
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

Manifest
Service Oriented Architectures

SOA Design Workflow

Software Architecture

Service Definition

`Service`

- Service Provider
- Service Consumer

Speed Calculation

- Current Speed (Property)
- Speed Limit Exceeded (Event)
- Update Speed (Method: fire & forget)
- Calculate Speed (Method)

Software Design

- Speed Calculator (SW Component)
- Speed Display (SW Component)
- Cruise Control (SW Component)

1. Method Call: Calculate Speed()
2. Return: Speed = 85 km/h

Network Architecture

Cluster View

- ECU 1
- ECU 2
- ECU 3
- ECU 4

Switched Topology

- ECU 1
- ECU 2
- Switch 1
- VLAN 1
- Switch 2
- VLAN 2

Signal Router

Signal Path

- ECU 1
- ECU 2
- ECU 3
- ECU 4
- Switch 1
- Switch 2
- Socket

= Socket Address
= Socket Connection Bundle
= Socket Connection
PREEvision supports service oriented system and Ethernet design with dedicated editors.

PREEvision comes along with a guided design workflow.

Detailed presentation: Webinar 25th of June 2018
Agenda

Why Service Oriented Architectures?
PREEvision at a glance
Service Oriented Architectures

- **SOA & Ethernet in PREEvision 9.0**

Summary
AUTOSAR Adaptive Workflow in PREEvision

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

PREEvision inbuilt logical and physical layer modelling

Available in PREEvision 9.0
Data Interfaces

- Model State Machines as „closed system“
Data Interfaces

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

State Machine

EventInterface1

DataInterface1

DataInterface2

EventInterface2

Guard

Set Data

keyOff

DataInterface3

DataInterface4

Trigger

accelerate

releaseBrake

stop

releaseBrake

setData

BrakeLightsOn

engageBrake

start (DE1 > 2) /
resetTimer

shutOff /
safeKM

DataInterface2
SOA & Ethernet in PREEvision 9.0

Transformer and End to End Protection

Sending App

Signal S1

Transformer Chain

Transformer 1 (SOME/IP)

Transformer 2 (E2E)

ECU1

Frame 1 0 1 1 0 1 1 1 0 1

Receiving App

Signal S1

Transformer Chain

Transformer 1 (SOME/IP)

Transformer 2 (E2E)

ECU2
End to End Protection and Transformation

- Support for SOME/IP, E2E and generic transformer
- Comforable Design Explorer
- Build up reusable transformer chains
- Detailed attributes for each kind of transformer
- Assigning transformer chains to signals or signal groups
A Simple Network... to be diagnosable
Transport Protocol and Diagnostics communication

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

Comforable Design Explorer
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)
Global Time Synchronization

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

www.vector.com

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