Adaptive MICROSAR Solution

Ready for High Performance ECUs
Agenda

- Automotive Trends
  - Introduction
  - Fundamentals
  - Products and Tools
Automotive Trends

User Experience

Connectivity

Electrification

Automated Driving

Enablers

Connectivity

Offboard Eco Systems

Supercomputers On Board
Automotive Trends

Cloud / Backend

- support of high performance processors
- high bandwidth
- service based architectures
- open source, agile development
- dynamic and updatable
- internet

Embedded Systems

- safe
- secure
- embedded integration and debugging
- automotive supply chain
- automotive communication protocols
- automotive diagnostics

AUTOSAR Classic
Adaptive – best of two worlds

**Cloud / Backend**
- system and mobility strategies
- deep learning

**On board Supercomputers**
- multipurpose computing servers
- head unit, infotainment
- automated driving
  - mastered by OEM

**Embedded Systems**
- intelligent sensors and actuators
- basic functions
- fallback computing

**Adaptive AUTOSAR**
- high bandwidth
- service based architectures
- open source, agile development
- dynamic and updatable
- internet

**Classic AUTOSAR**
- safe
- secure
- embedded integration and debugging
- automotive supply chain
- automotive communication protocols
- automotive diagnostics
Agenda

Automotive Trends

- **Introduction**
  - Fundamentals
  - Products and Tools
Introduction

Adaptive MICROSAR - Being Prepared for the Next-Generation of ECUs

Adaptive MICROSAR is a complete basic software solution up to ASIL D

Seamless interoperability with classic AUTOSAR ECUs

Additional, high performance ECUs hosting applications for upcoming use cases

Applications installed and started during runtime

Development of applications in the ecosystem of POSIX-based OS (Linux, PikeOS, QNX, Integrity, ...)

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Central Computing Platform

- Integrates cross-domain functions with many communication technologies
- Central point of innovation
- Same platform for many car-lines and generations

Commodity sensors and actuators

Integrate high-level S/A functions

- Mechatronic ECU: signal oriented only
- Integration ECU: signal and service oriented
- Computing Platform: service oriented only
Introduction

Statically connected HW Resources

- Hardwired video lines between ECUs
- Pre-defined CAN messages on bus
- Exclusive camera usage
Flexible use of HW Resources

- Smart sensors/actuators provide HW over service interface
- All ECUs connected via Ethernet
- Compound service, using base services as lower layer
- Applications can provide services for e.g. HMI integration
- No function oriented wiring
Drivers for Adaptive AUTOSAR

**Infotainment**
- 2D/3D acceleration support in POSIX systems
- Video Codecs, Streaming support, multi-media library, etc. ...

**Highly Automated Driving**
- Image- and preprocessing of Camera/Radar/LIDAR
- Sensor Fusion and Machine Learning

**Connectivity**
- Car-2-X (LTE, Wi-Fi, GPS, etc.)
- Multimedia (USB, SD-Card, NFC, etc.)

**Dynamic Software Platform**
- “App-Store” for automotive applications
- Installation and update over the air
Use Cases for POSIX/Virtualization in Automotive Systems

Introduction

POSIX besides MICROSAR (current QM set-up)

POSIX besides MICROSAR (current safety set-up)

POSIX besides MICROSAR (previous set-up)

POSIX besides MICROSAR (upcoming perspective)
Agenda

Automotive Trends
Introduction

- Fundamentals
Products and Tools
### AUTOSAR Platform Comparison

#### AUTOSAR Classic Platform - CP

- Operating system based on OSEK
- All AUTOSAR modules completely specified
- Developed in C, whole stack compiled and linked in one piece
- Applications share single address space (MPU possible)
- Optimized for signal-based communication (CAN, FlexRay)
- Configuration compiled into binary

#### AUTOSAR Adaptive Platform - AP

- Operating system based on POSIX
- Less modules, only API specification
- Developed in C++, applications are separately installable
- Applications use their own virtual address space (MMU)
- Focus on service oriented communication (Ethernet)
- Configuration loaded from manifest files
AUTOSAR Platform Comparison

AUTOSAR Classic Platform - CP

AUTOSAR Adaptive Platform - AP

Real Time Requirements

Safety Critical

Computing Power

Startup/Shutdown Time
Adaptive Applications

- **Application**
  - Multi-threaded
  - Execution states
  - Manifest contains platform related information (recovery action, dependencies to services or libraries)
  - Instance configuration contains application specific static information (variant, options, ...)

- **Interfaces**
  - `ara::com` for communication with adaptive services (basic services and user applications)
  - PSE51 is the usable OS API subset
  - The Adaptive AUTOSAR Foundation clusters (Execution Management, Persistency, etc.) are available via direct APIs
Agenda

Automotive Trends
Introduction
Fundamentals

Products and Tools
Cluster Availability in Adaptive MICRO SAR
Vector Adaptive AUTOSAR Tool Chain – from System Design to Code

Products and Tools

Adaptive System Design
- System Architecture
- Sys Diag Design
- Service Instance

Application Design
- App Design
- App Diag Design
- App Manifest

Deployment Configuration
- Platform Service Deployment
- Machine Manifest

Simulation/Test
- CANoe

Application Code
- DaVinci Adaptive IDE

SW Platform
- App. Code (Service Impl)
- Manifests

Generators
- Manifests

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Products and Tools

Tools and Workflow

**Service Description (ARXML)**

- AppSWCTypes
  - Port
  - ServiceInterface
  - SOME/IP Config

**Application Code**

- Logic
- libara
- libsomeip
- Proxies / Skeletons
- SOME/IP Serializer
- E2E Serializer
- POSIX IPC

**Deploy Package**

```
/opt/myApp/
```

- BIN
  - ./bin/myApp
- Instance Manifest
  - ./etc/exec_config.json
- Instance Manifest(s)
  - ./etc/instance1.json
  - ./etc/instance2.json

**Vehicle**

- Installed APP
  - BIN
- Executable Config.
  - JSON
- Instance Config.
  - JSON
- Execution Management
- Diagnostics
  - POSIX IPC
  - SOME/IPd
  - BSD Sock

**Software Configuration Management**

- Authoring Tool
- Generators
- Compiler
- Deploy Package
Tooling: DaVinci Adaptive Tool Suite

1. Assistants for various tasks like creation of SOME/IP deployment
2. Easy to understand DSL to represent ARXML models. With linting support
3. Auto-completion for references and model elements
4. Built-in CFG-5 generators. Direct modelling feedback and resolution suggestions
5. Cheat Sheets guide through the process of service creation
Quickstart with the Adaptive MICROSAR Evaluation Bundle

- Test your application directly in native environment
- Implement your services
- Adaptive MICROSAR source included
- Prepared build scripts for native Linux

Bundle is available off-the-shelf and includes:

- 2 day training at Vector for one person
- Application Developer Guide
- DaVinci Adaptive Tool Suite (1 year license)
For more information about Vector and our products please visit

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