How Data Distribution Service Enhances VSS with a Secure, Full-Stack End-to-End Real-Time Communication for Software-defined vehicles
Enabling Interoperability through a Rich Automotive Ecosystem
The Software-defined Vehicle

Opportunities, Challenges and New Architectures
Continuous innovation
- The vehicle development does not ends at SoP
- Several functionalities can be added once the vehicles are on the street including advanced functionalities such as ADAS

Severe cost saving given the new architectures
- Weight and Cost - EE architectures represents 3rd heaviest part of the vehicle
- Software providing most of the value

Business models opening to new opportunities
- New revenue streams

Competition
- Electric cars have drastically lowered the entry barrier
- MaaS is changing the relationship with the customers
Challenges in Traditional Vehicle Architecture

**Scalability** - Exponential system complexity

**Standardization** – Minimal Reusability between brands in architectural signals and datamodels

**Cost, Liability and Warranty** - The SBOMs are not yet standardized and broadly adopted as the case of Hardware

**Security** - Managing the path to Safety and Cybersecurity

**ADAS** - Building L2+ Sustainable Development

**Updates** - Continuous development and systems updates
Software-defined Vehicle Architectures

- Flexible Deployment
- Standardized Communication
- Decoupled from Platform
- Future Proof
- Safety and Cybersecurity
Decoupled from the platform

C
RTOS
AURIX Tricore

C
AUTOSAR C.
AURIX Tricore

C
AUTOSAR A.
ARM

Java
Android
ARM

Trad. C++
QNX
ARM

C++
Linux
x86

C
Linux / QNX

C++
x86

DATABUS
Shared Global Data Space

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What if you could use a common standard for all your data models?
Why COVESRA VSS?

Benefits of COVESRA VSS
Benefits of COVESA VSS

Flexible Deployment
From in-vehicle, edge and to the cloud

Interoperability
Secure cooperation with AUTOSAR and other standards

Standardized Communication
Common approach for describing vehicle data

Cost Driven
Focus on business value creation

Decoupled from Platform
Protocol Agnostic
COVES A

RTI Involvement in:

• **Vehicle Signal Specification (VSS)**
  Convert VSS into structured IDL for common DDS use

• **AUTOSAR Interoperability**
  Bridging VSS to AUTOSAR

• **Digital.auto**
  Accelerating Vehicle Prototyping
Why Connext Drive? Why DDS?

Benefits of COVESA VSS
The DDS Standard

- DDS is the Proven Data Connectivity Standard for the IoT
- OMG: world’s largest systems software standards org
  - UML, DDS, Industrial Internet Consortium
- DDS: open and cross-vendor
  - Open Standard and Open Source
  - 12+ implementations

**Interoperability between source written for different vendors**

**Interoperability between applications running on different implementations**
Why DDS?

- **Data-centric**: Naturally modular, Naturally scalable
- **Resiliency**: High reliability, Maximum up-time
- **Performance**: Minimum latency, Maximum throughput
- **Faster development**: SOA-like architecture, Code re-use
- **Standards based**: No vendor lock-in, Future proof
Data-Centric Architectures

• Data Centricity Definition:
  – The interface is the data
  – The infrastructure understands that data
  – The system manages the data and imposes rules on how applications exchange data
Common Distributed Application Challenges

Application

Data Rate
Reliability Tuning
Data Coherency
Device Watchdog
Sub Sampling
Filtering
Startup Order
Latency Mgmt
Partitioning
Presentation
Stale Data
Data Caching
Memory Mgmt
Fault Tolerance
BW Shaping
Meta-data
Throughput
Transports
Segmenting Data
Async Sending

Transport

UDP
TCP
Shared Memory

1-1, 1-Many
1 to 1
Low Latency
High Throughput

No Reliability
Reliability
Flow Control
Quality of Service: DDS

**Application**

- Deadline
- Reliability
- Destination Order
- Liveliness
- Time Based Filter
- Content Filtering
- Durability
- Latency Budget
- Partition
- Presentation
- Lifespan
- History
- Resource Limits
- Ownership
- Flow Control
- User, Group, Topic Data
- Batching
- Transports
- Multi-Channel
- Async Publisher

**Transport**

- UDP
  - 1-1, 1-Many
  - No Reliability
- TCP
  - 1 to 1
  - Reliability
  - Flow Control
- Shared Memory
  - Low Latency
  - High Throughput
• Automotive-grade software framework to develop communication networks for the Software-defined vehicle (SdV)

• Based on DDS (Data Distribution Service) Standard

• Complete ECU to Cloud Framework

• Future Proof, data-centric architecture will support industry evolution towards fully autonomous driving

• Supports communication libraries certified for systems up to ISO 26262 ASIL D
COVESVA VSS & DDS
+ Live Demo

VSS leveraging from Data Centricity
Data-Centricity

The data itself is the interface

Data-Centric Connectivity
+ Common Set of Data Types
= Interoperability
+ Multiple Suppliers
+ Expanding Ecosystem of Tools and Capabilities

All of these run on DDS
COVESA VSS on Connext DDS

- C
- C++ / C++11
- C# / .NET
- Java
- Ada
- Python
- JavaScript
- Go, Lua
- MATLAB
- LabVIEW
- SCADE
- RTMaps

Code Generator

AUTOSAR
QNX
INTEGRITY
VxWorks
SafeRTOS
AGL
Android
IOS
Linux
Windows
Bare metal
++
Connext Drive Live Demo
Open Discussion