SOFTWARE-DEFINED VEHICLE
Open Eco-System for Automotive Software
Building the 3rd Automotive Revolution

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Microsoft as a Partner to the Industry

**THE WALL STREET JOURNAL**

“Microsoft Bets Bigger on Driverless-Car Space With Investment in GM’s Cruise”

**VW, Microsoft partner to develop self-driving car software**

**Manufacturing**

“Microsoft & PwC develop ZF’s digital manufacturing platform”

**VentureBeat**

“Why Microsoft’s self-driving car strategy will work”

“Bosch, Microsoft join forces to develop vehicle software platform”

**Automotive News**

“Mercedes-Benz Virtual Remote Support at-a-glance”

“Microsoft sets sights on ‘auto connectivity’”

**Automotive World est. 1992**

“Microsoft to talk about ‘the future of mixed reality’ at Ignite conference next week”

**REUTERS**

“Mercedes-Benz Virtual Remote Support at-a-glance”

“Microsoft sets sights on ‘auto connectivity’”

**FINANCIAL TIMES**

“VW, Microsoft partner to develop self-driving car software”

“Microsoft to talk about ‘the future of mixed reality’ at Ignite conference next week”
The Challenge of Automotive Software Development

**THE CHALLENGE**

Consumer expectations have changed dramatically by shifting from hardware features to software features.

As a result, the industry needs to manage the increasing software complexity of vehicles for the last 10+ years.

As technology as well as development processes are currently not setup for this change, it leads to extremely high development and integration costs, as well as delayed SOPs.

**THE NEED**

Technologies, processes and toolchains that allow for developing, operating and maintaining software-defined vehicles.

Provided as an open industry approach that leverages open-source and that builds a strong community for software-defined vehicles. Avoiding potential lock-ins and giving the needed flexibility.
Integration & Collaboration as key to the SDV Open Ecosystem

MAKE

- Expensive in development and operations
- Rare & diverse skills & competencies required

BUY

- Lock-in by vendors or technology
- Reduced possibilities to differentiate

Available building blocks for the groundwork **free up resources** to create **differentiating products and services** on top to build your own OEM.OS

Create and enhance the building blocks for the **Software-defined Vehicle groundwork** as an industry shared effort

There is a 3rd option!

Integrate and Collaborate in our SDV open ecosystem
Harness the power of open eco systems to collaborate to enable digital transformation in automotive, mobility and transport.
Ecosystem expansion benefits from vehicle innovation

- Dynamic Parking
- PHYD Insurance
- Dynamic Pricing, Integrated Payment
- IoT (Smart Infrastructure)
- Concierge services
- Car Rental
- Good Transfers
- EVs and Infrastructure
- Macro-mobility services
- Micro-mobility services
- Smart City Data and API
- Ride Sharing & Journey Planning Apps
- Car Sharing and Pooling
- Public transport
- Demand Response Transport (Taxi, BRT)
- Dynamic Pricing, Integrated Payment
- Mobility As A Service Business Model
- Subscription Services
- Trains/flights integration
- Autonomous and Connected Vehicles
- Car Rental
- Car Sharing and Pooling
- Public transport
- Smart City Data and API
- Ride Sharing & Journey Planning Apps
- Subscription Services
- Trains/flights integration
- Customer centricity
- Mobility services capabilities
- Adjacent business ecosystem
Digital Vehicle: Enabling Elements to become the digital company with our “Developer First” approach
Connected, Autonomous, Shared, Electric, Personalized are all based on the Software-defined Vehicle (incl. Automotive Standards).

Transformation: Software enabling Car Companies and approaching “Developer first”

**Culture – Technology – Value-Chains – Organization**

Software – Defined Vehicle (In-Car Full Stack, Cloud Stack, DevOps Toolchain)

**SDV.OS**
The Operating System for the Software Defined Car

**SDV.OPS**
Data-Driven deployment, operation and computing platform

**SDV.DEV**
Collaborative automotive DevOps & tracing platform
Enabling “requirements to car” (code-to-cloud approach)

Foundation of the SDV Open Ecosystem

SDV Open Ecosystem (Eclipse based Apache v2)

Building core OEM.OS components in an ecosystem with the major T1s and OEMs. Definition and integration with open interfaces between all modular components.

Building a strong open source community for the software-defined vehicle.

SDV.OS

- **Hard Real Time & Safety**
  - Domain Functions
  - Supplier Space
  - In-Memory Graph Store
  - (Distributed Edge)
  - (RTOS)

- **Flexible Safety & QM**
  - (Containerized) Apps
  - Supplier Space

Hardware

SDV.DEV & SDV.OPS

- **Business/Domain Services**
- **Automotive Cloud (OEM/T1/Partner Offering)**
  - (Vehicle Abstraction, Connectivity, Identity, Data)
- **Azure Core Services**
  - (Infrastructure & Platform Services)

Frameworks, Specifications & Collaboration
Programing Model, Digital Twin Definition Language, and GitHub Automotive

admin@oem.org$>gitclone svd.eclipse.org/_
Enabling the Ecosystem – Roadmap of SDV.OS Application Development or “The simple path to a SDV”

Our Software-defined vehicle approach accelerates the innovation cycle and reduces complexity along the whole operational model and across multiple devices.

1. REDUCE DEVELOPMENT, TEST, AND RELEASE COSTS
   - New apps on QM Edge Runtime
   - Refactor existing apps to composite apps

2. REDUCE OPERATIONAL COSTS
   - Encapsulate with containers
   - Let control plane automate the configuration

3. LONG-TERM OUTLOOK: REDUCE HARDWARE COSTS
   - Let schedulers take care of finding free resources on the devices
   - Move in-car functions to the cloud with 5G technology
Bringing all components together to allow a “from requirements to car” approach

Overview of the DevOps cycle and associated tools – target state

Containerized Apps & Domain Functions

In-car stack components

PLAN

DEVELOP

VERIFY & VALIDATE

RELEASE

DEPLOY

OPERATE & MONITOR

Ensured compliance with ISO 26262

Azure MBSE platform; V&V scenarios

GitHub Automotive MBSE platform

MBSE platform

Azure Services Digital Twins

Azure Digital Twins

Azure

DEVELOP

GitHub Automotive MBSE platform
**SDV* EcoSystem**

“Your customer – your data – your customer experience”

- **“Software defined vehicle Eco-System” (SDV)** is the future for a sustainable great business in automotive software based on Open-Source Business Models.
- **Current complexity in Automotive Software** is not under control. The ecosystem relies on API-first, modular end-to-end full-stack, and a joint business & operational model.
- We believe in **partnerships** & open networks - incl. providing (OEMs) own control points for **data and ecosystems** beyond current alliances.
- We strive to change/transform the complete vehicle and SW lifecycle (pre/post/lifecycle) to an agile approach.

- **“Developer first”** is one of our key principles. We therefore focus on the needed flexibility in SW Development.
- **Cross-company collaboration** will deliver outstanding results. We leverage OSS communities for broad collaboration.
- Enablement by providing **in-car full stack, cloud stack** and **programming model**; all enabled by end-to-end **DevOps chain**.
- We invest in **Industry Thought Leadership** for the SDV and enabling broader business for our partners.
Benefits & Contributions for Partners

- Faster time to market
- Access to Software (Tool )Marketplace
- Can contribute Code and APIs to the SDV EcoSystem
- Broader Access to a range of customers/partners
- Non-differentiating software elements available and no need to maintain on own staff (and/or costs)
- Non-automotive players are willing to provide value-added services as open-source
- Various new models for business (providing commercial versions, support, operations and APIs)
- SDV EcoSystem already has elements to be used by new partners (Azure RTOS, vehicle edge, Edge analytics; all available as OSS)

This is an open Approach!
Please reach out to join the Revolution.
Thank you!