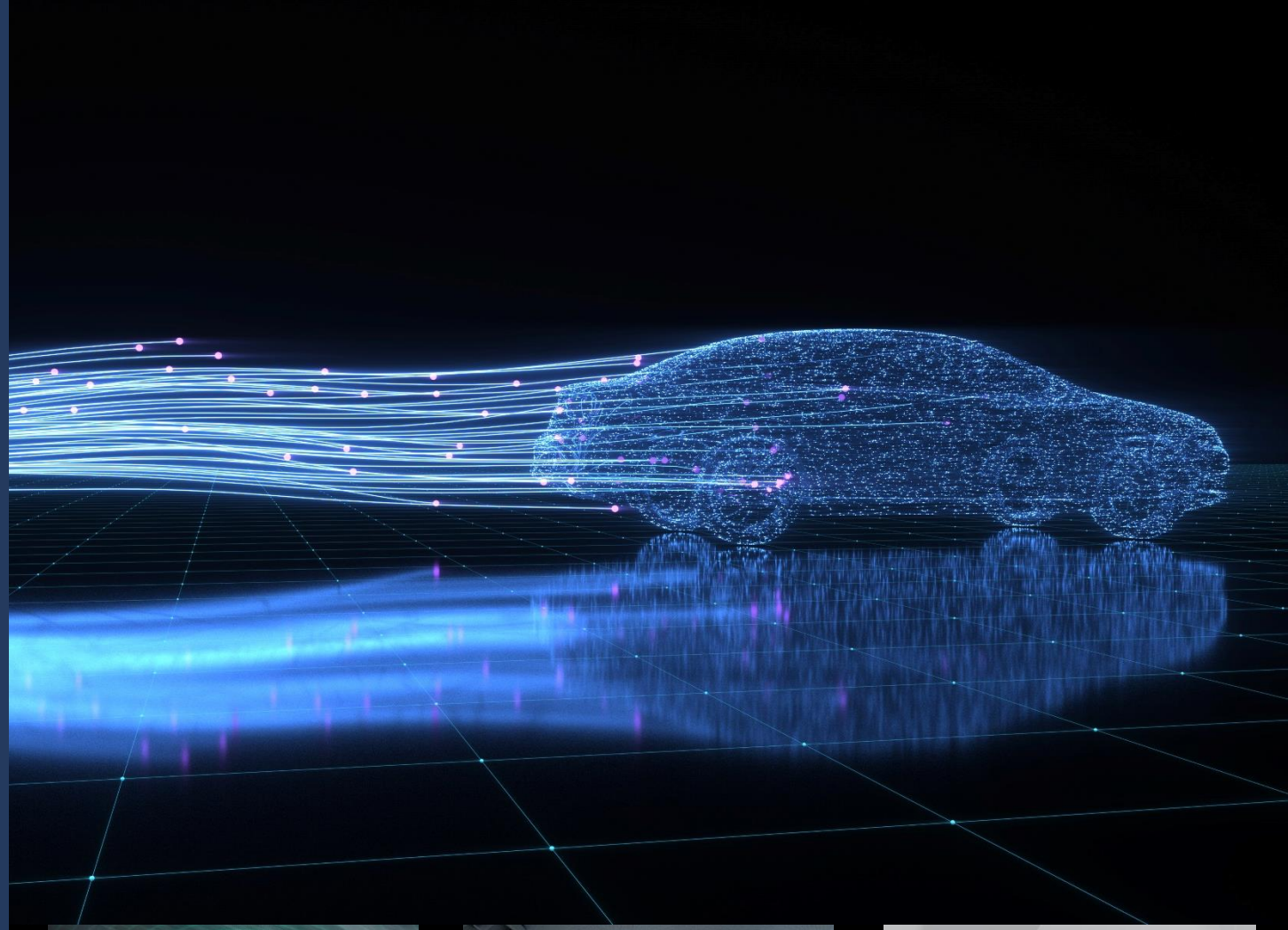
SOFTWARE-DEFINED VEHICLE
Open Eco-System for Automotive Software

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"

VentureBeat

"Why Microsoft's self-driving car strategy will work"

Automotive News

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

Manufacturing

"Microsoft & PwC develop ZF's digital manufacturing platform"

"Bosch, Microsoft join forces to develop vehicle software platform"

REUTERS

"Mercedes-Benz Virtual Remote Support at-a-glance"

Automotive World est. 1992

"Microsoft sets sights on 'auto connectivity'"

FINANCIAL TIMES

"Microsoft to talk about 'the future of mixed reality' at Ignite conference next week"

ZDNet

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**.

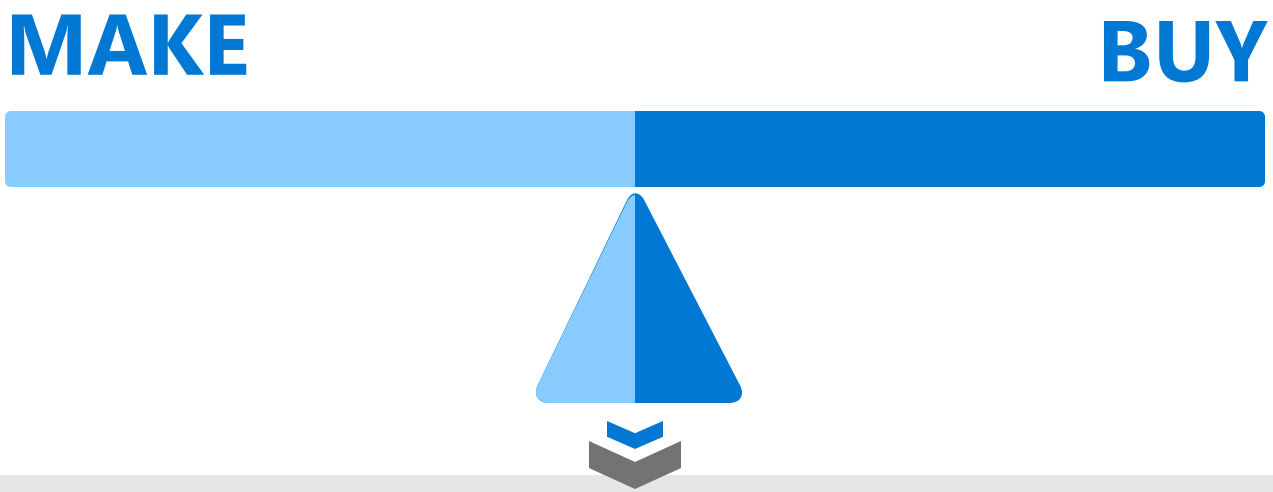
THE NEED

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

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



- 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

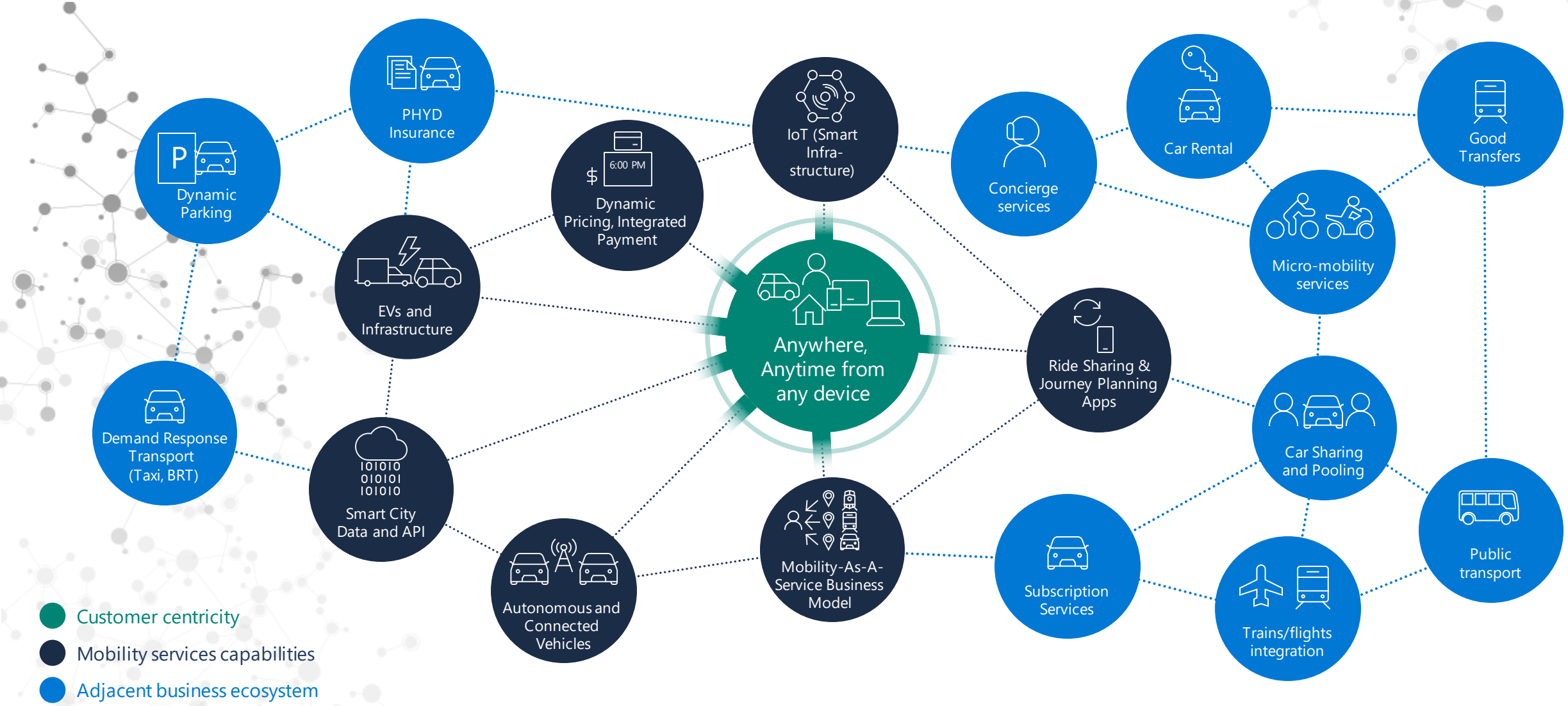
There is a 3rd option!

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

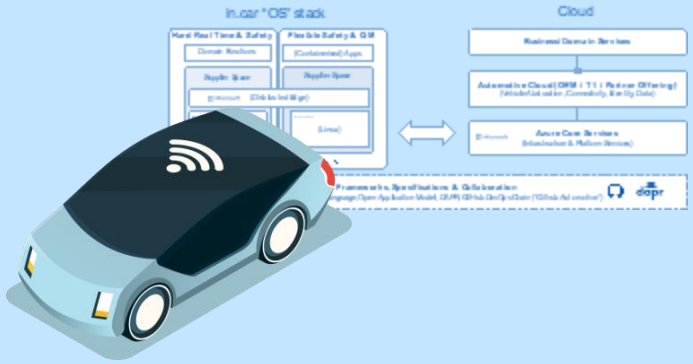
Integrate and Collaborate in our SDV open ecosystem

Harness the power of open eco systems to collaborate to enable digital transformation in automotive, mobility and transport

Ecosystem expansion benefits from vehicle innovation

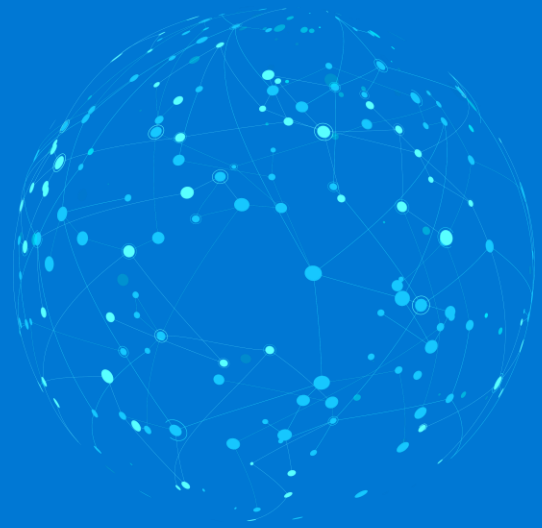


Digital Vehicle : Enabling Elements to become the digital company with our “Developer First” approach



DIGITAL VEHICLE

DIGITAL COMPANY



DIGITAL ECO SYSTEM

- Software Development
- Collaborative Engineering

- Software
- Collaborate across companies

DATA (DATA SPACES)

Connected, Autonomous, Shared, Electric, Personalized are all based on Software-defined Vehicle (incl. Automotive Standards)

Connectivity

Autonomous

Shared

Electric

Personalized

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

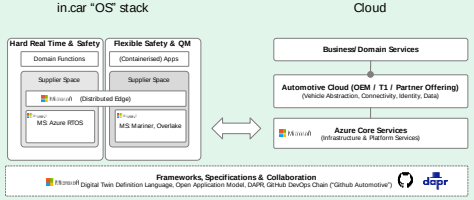
The Operating System for the Software Defined Car

SDV.OPS

Data-Driven deployment, operation and computing platform

SDV.DEV

Collaborative automotive DevOps & tracing platform



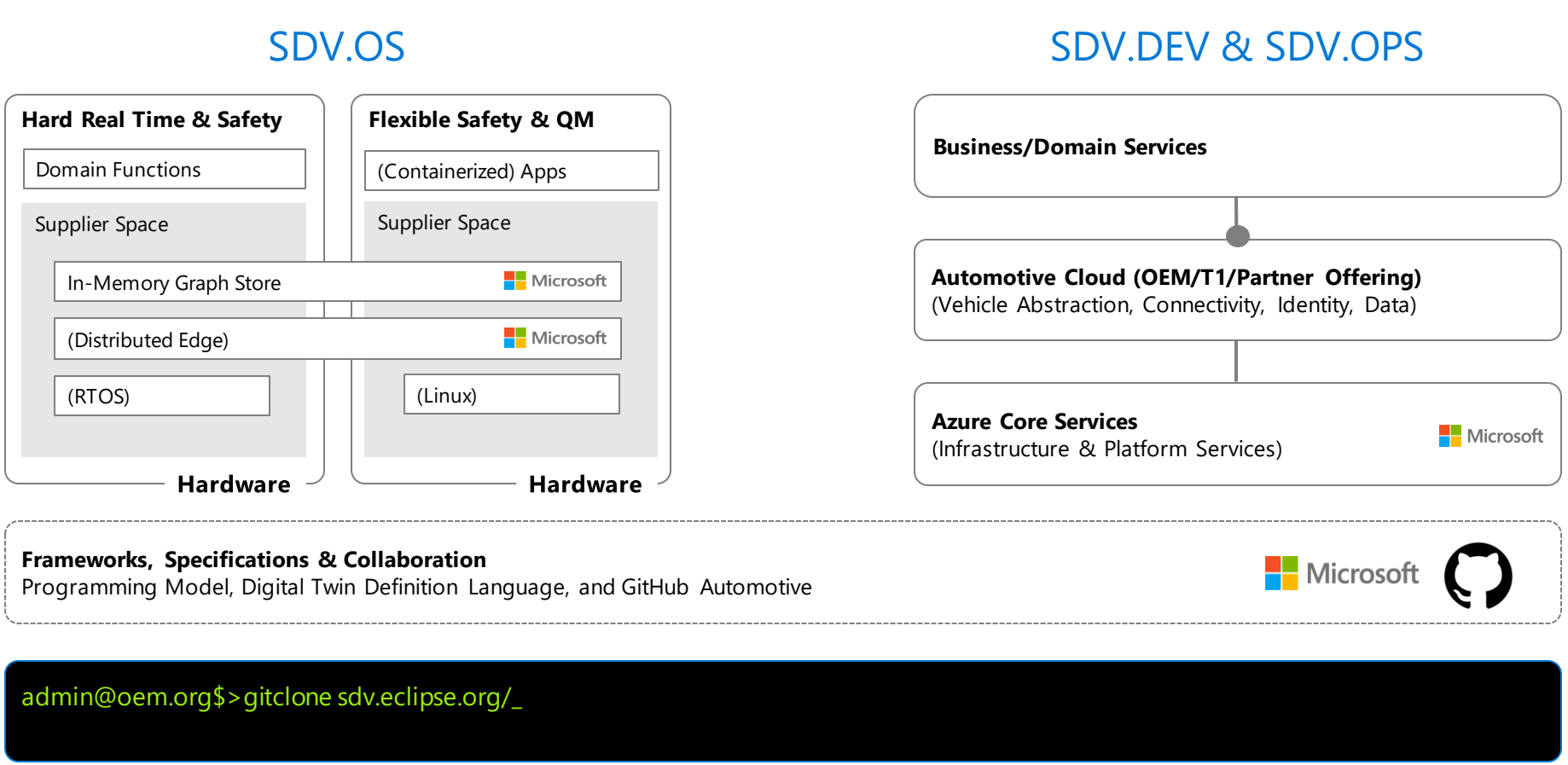
Foundation of the SDV Open Ecosystem

Enabling "requirements to car" (code-to-cloud approach)

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.




```
admin@oem.org$>gitclone sdv.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.

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

2 **REDUCE OPERATIONAL COSTS**

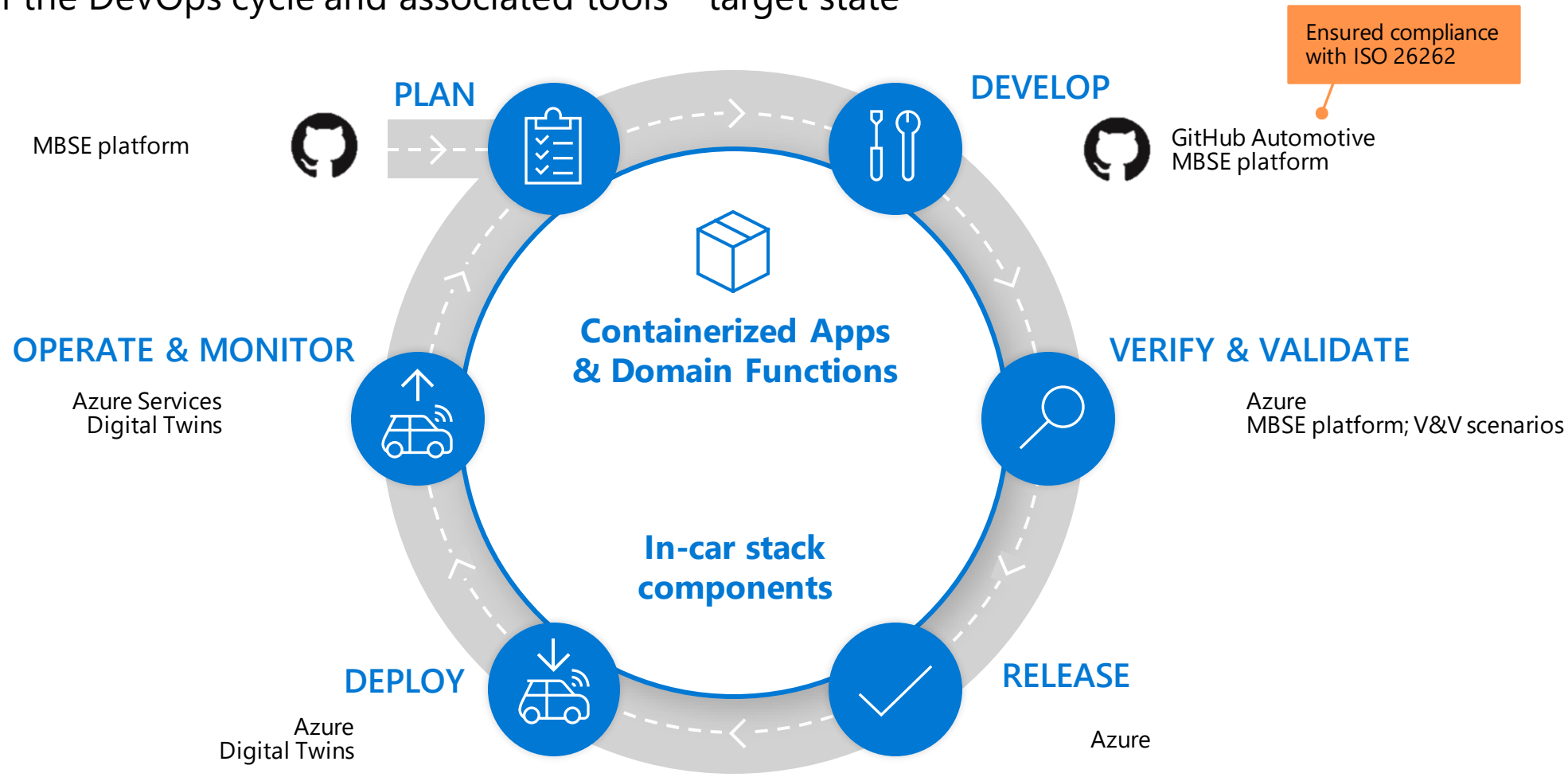
- Encapsulate with containers
- Let control plane automate the configuration

1 **REDUCE DEVELOPMENT, TEST, AND RELEASE COSTS**

- New apps on QM Edge Runtime
- Refactor existing apps to composite apps

Bringing all components together to allow a “from requirements to [illegible] approach

Overview of the DevOps cycle and associated tools – target state



SDV* EcoSystem
“Your customer – your data – your customer experience”

Enabling collaboration and future business End-to-End for all Automotive Software Developers
Digitally transform your Software Development – Platform EcoSystem – Data Estate

„*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!