The beauty of collaboration
How Open Source can help to build a sustainable Software Ecosystem

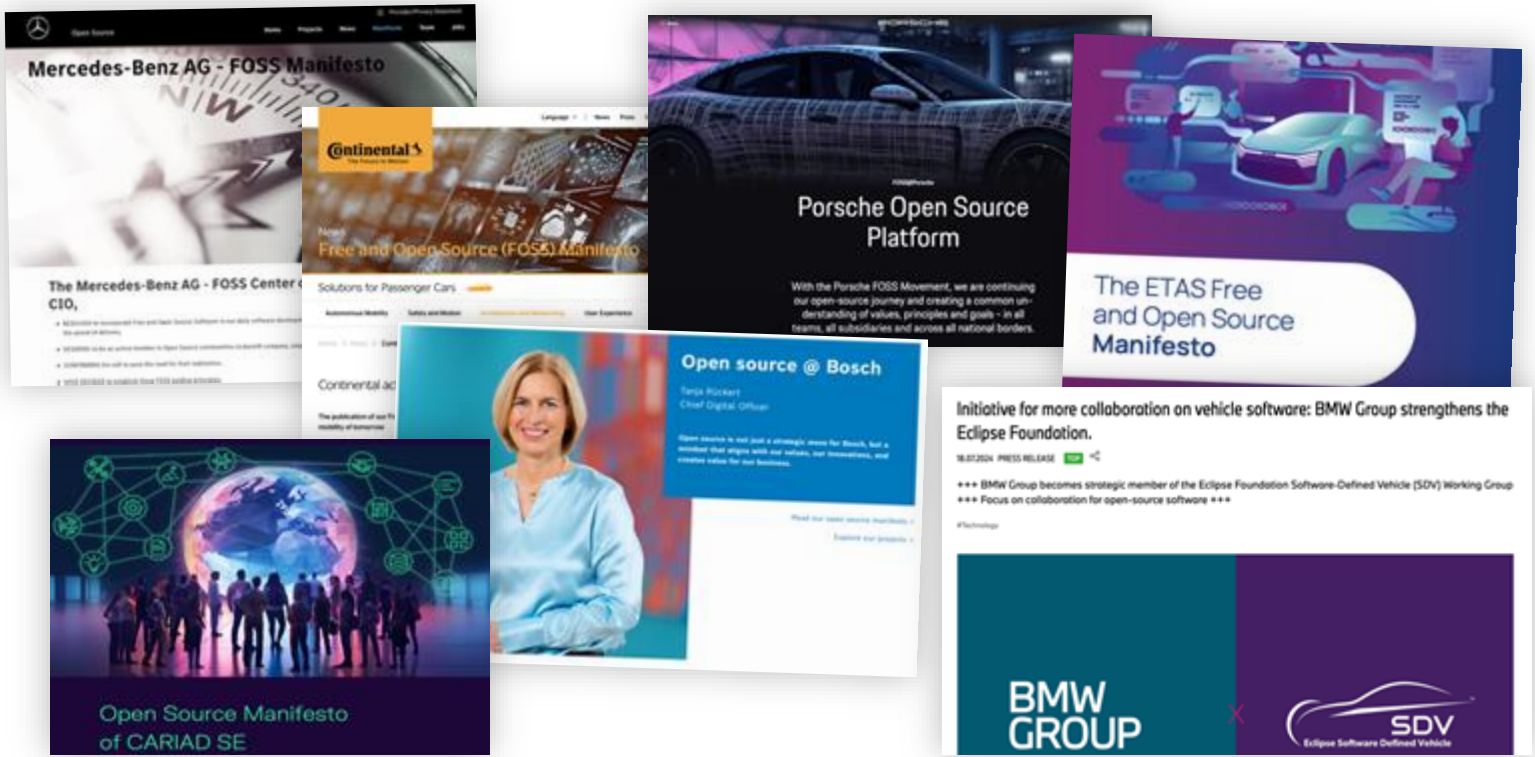
Michael Plagge
VP Ecosystem Development, Eclipse Foundation
Oct 17th, 2025

The Leading
Open Source
Foundation in Europe

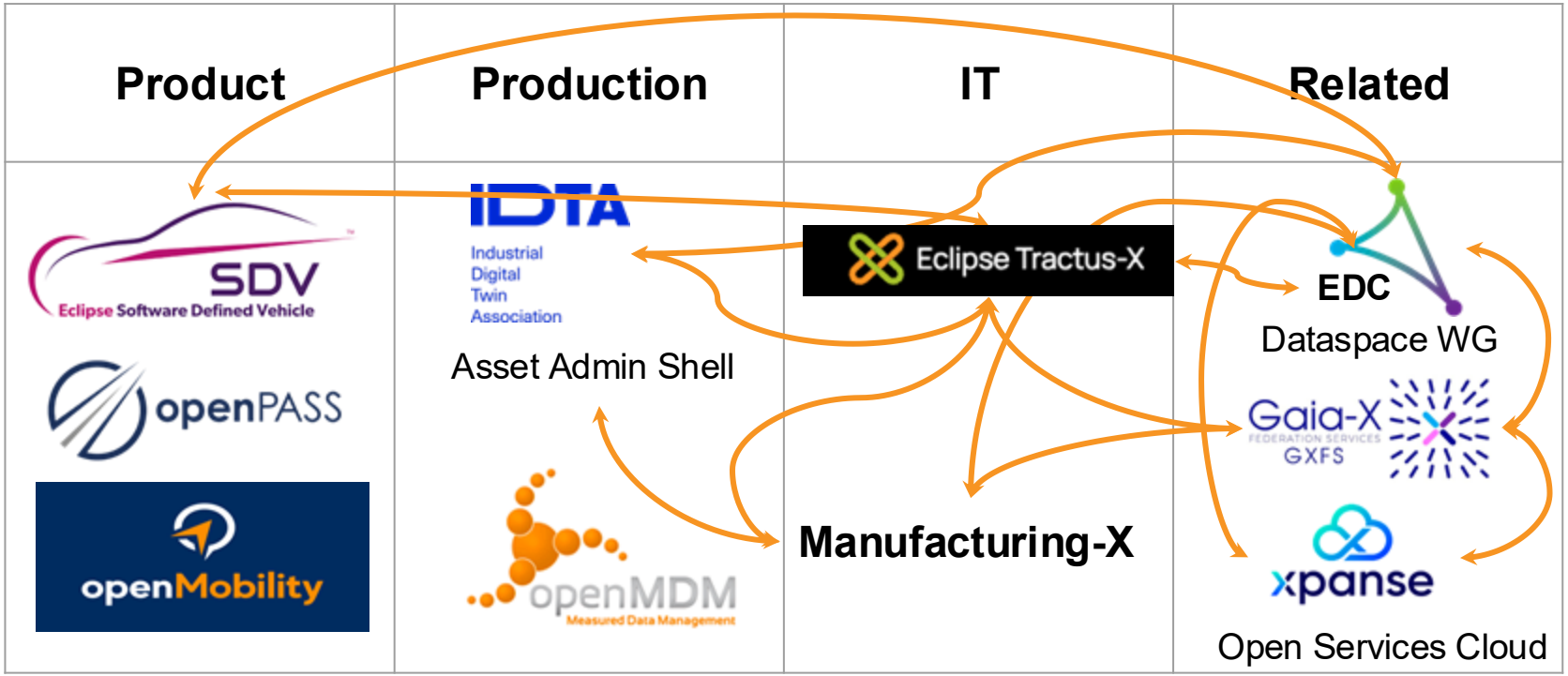
Community Driven.
Code First.
Commercial-Friendly.

The Community for
Open Collaboration
and Innovation

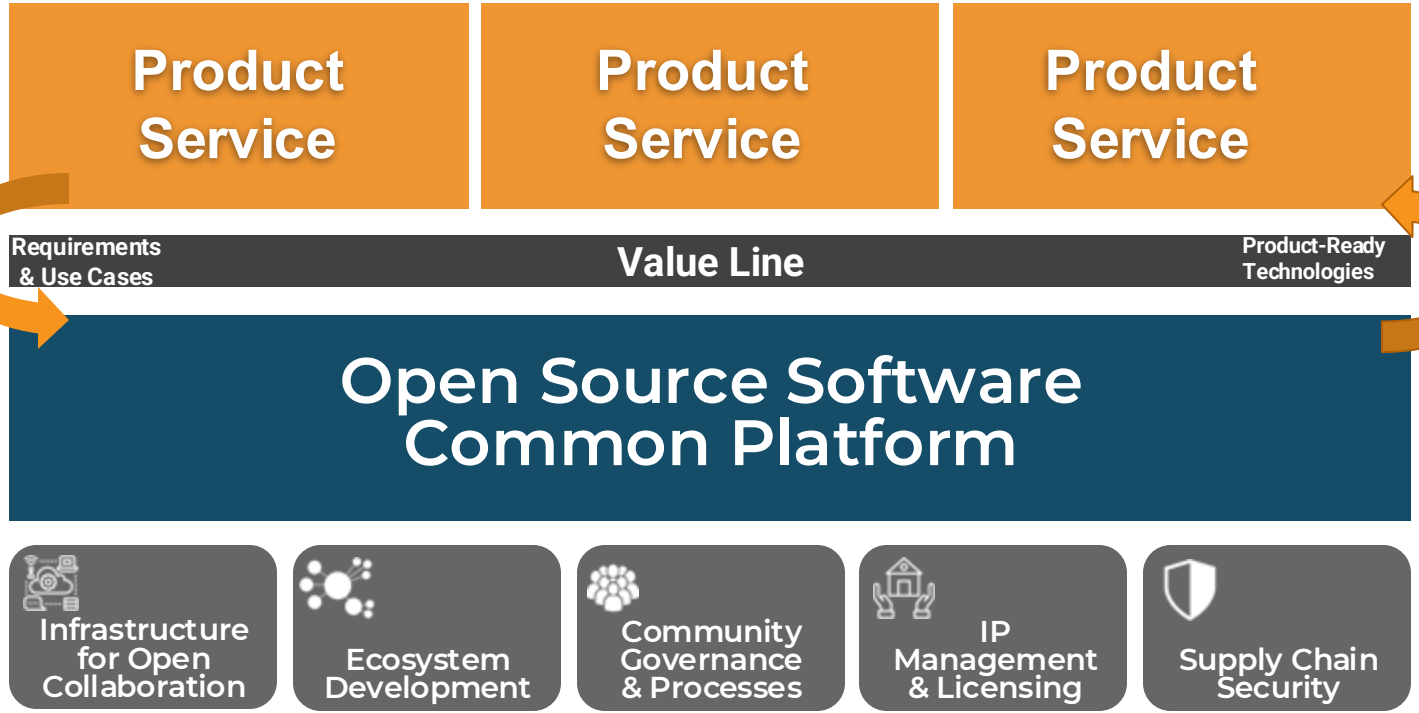
Open Source in the Automotive Industry



One Governance adds value



Open Collaboration: a business-friendly ecosystem



Compete on products & services

Working with your competitors based on **meritocracy**

Open, **Transparent**, **Vendor-neutral,** Collaboration platform

Why Open Source may not be enough

Open Collaboration

Contribution

- Transfer of IP rights
- Future influence

Collaboration

- Rules for collaboration (Governance)
- Predictability
- Sustainability

Open Source

Adoption

- Open Source License
- Four Freedoms

VDA News Topics Press Members Association EN

Automotive industry signs Memorandum of Understanding

Automotive industry signs Memorandum of Understanding for joint software development based on open source

Press release

Ludwigsburg, June 24, 2025

Collaboration for more speed, efficiency, and security in software development and the basis for an open and collaborative ecosystem

German auto industry unites for open-source software development

software development.

A corresponding Memorandum of Understanding (MoU) was signed today at the 29th International Automotive Electronics Congress (AEK).

2nd iteration MoU unveiled during CES 2026

Eclipse SDV Executive Breakfast

👨💻 7th January 2026

👨💻 Location: Conrads Resort World Las Vegas, Blossom Ballrom

Central topic: unveil the 2nd iteration of the OSS MoU

https://luma.com/ow2rhqeg

SDV WG members (Nov 2025)

Strategic Members

Participant Members

Participant Members

SDV WG members (Nov 2025)

Supporting Members

Brightskies
ekxide
HYUNDAI MOBIS
KIMMOVIA
KPIT Technologies Ltd
LIEBHERR
OpenTier
RT-RK
UL Solutions
Valtech Mobility

Guest Members

Associação 101010
Ferdinand-Steinbeis-Institut
UNIVERSITY OF OULU
ZIUR

The SDV Projects Landscape

Tooling DevOps

Design:

Development: Autowrx, Dev Console, Velocitas, Open Vehicle API

Testing & Validation: OpenXilEnv, openDuT

Deployment: muto

Process & frameworks: TSF

Service Fabric and Communication

Middleware & Frameworks: Heimlig, p3com, eCAL, KUKSA, Chariott, Zenoh

Comm protocol: CANought, iceoryx

Service Mesh: OpenSOVD, uProtocol

Digital Twin: Ibeji

Runtime and Orchestration

Workload & Container Orchestration: Pullpiri, ANKAIOS, Symphony, BlueChi

Distributions and Frameworks

OpenBSW

API AUTO FRAMEWORK

Leda

Blueprints

S-CORE

RTOS

ECLIPSE THREADX

Example Applications

Ambient Light Serv., muto

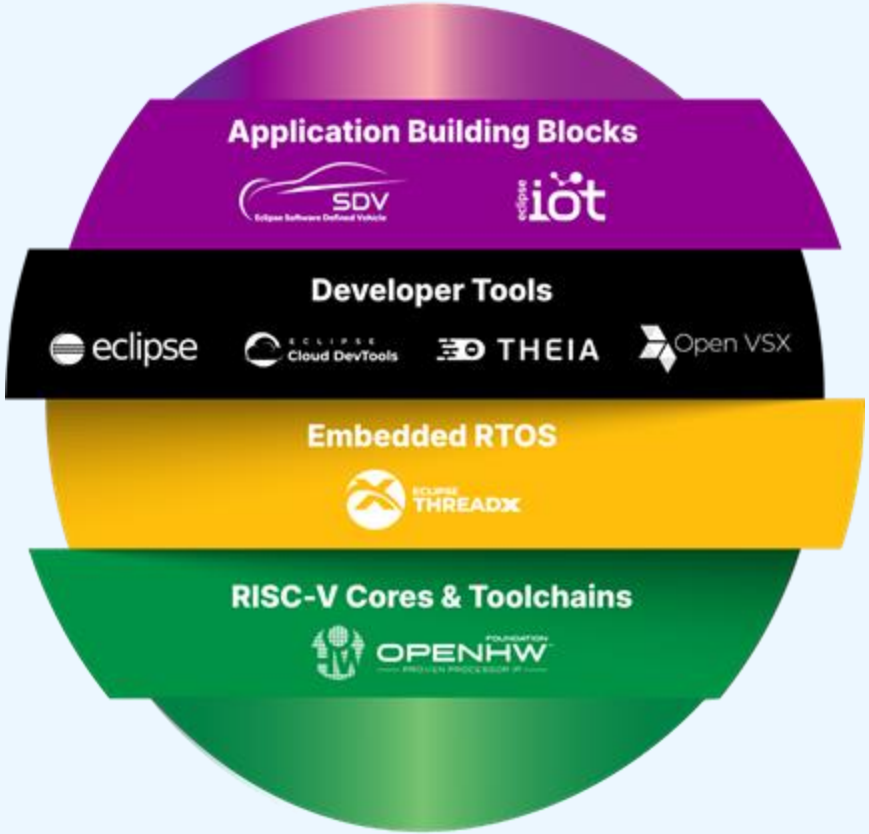
Taxonomy FW

SDV-LVL

AI tools

LMOS

Beyond the SDV Ecosystem



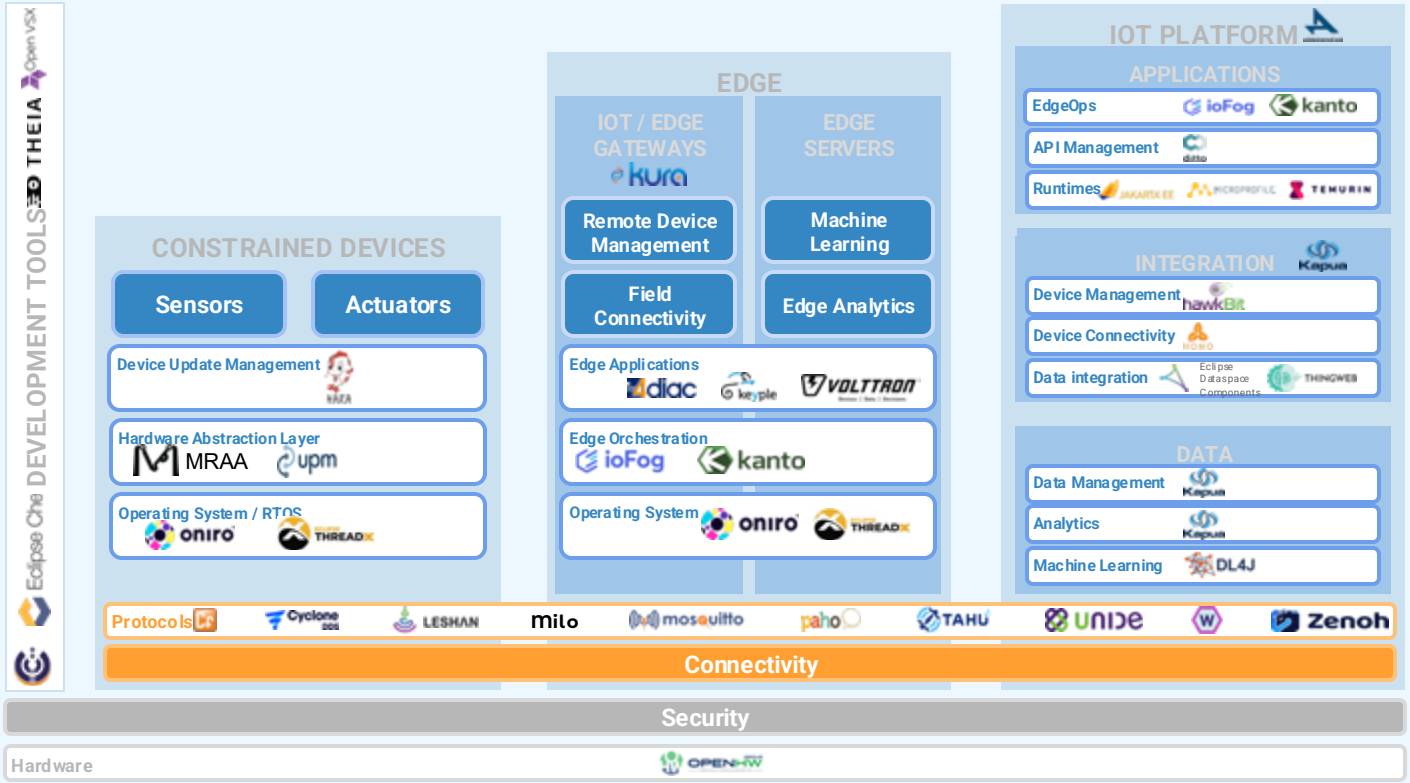
Application Building Blocks

There are many projects at Eclipse you can use to build Embedded and IoT applications for various verticals and industries

Eclipse IoT provides building blocks to implement commercial IoT solutions. It covers the full device-to-edge-to-Cloud continuum

Eclipse SDV builds open technology platform for the software defined vehicle of the future; accelerating innovation of automotive software stacks

Eclipse IoT Architecture



Future-proof Embedded Applications

Eclipse ThreadX is the open source real-time operating system of choice for safety-certified applications

It is available in 32-bit 64-bit RISC-V versions and
also supports a wide variety of Arm Cortex-A and Cortex-M SOCs and microcontrollers

ThreadX was formerly known as Microsoft Azure RTOS

Safety Certifications

Eclipse ThreadX

SGS TÜV SAAR — FUNKTIONALE SICHERHEIT GEPRÜFT — FUNCTIONAL SAFETY APPROVED

MISRA

cULus

Certified by SGS-TÜV Saar for use in safety-critical systems, according to

- IEC 61508 SIL 4
- IEC 62304 SW Safety Class C
- ISO 26262 ASIL D
- EN 50128

Compliant with all "required" and "mandatory" rules of MISRA-C:2004 and MISRA C:2012

Certified by UL for compliance with

- UL 60730-1 Annex H
- CSA E60730-1 Annex H
- IEC 60730-1 Annex H
- UL 60335-1 Annex R
- IEC 60335-1 Annex R
- UL 1998

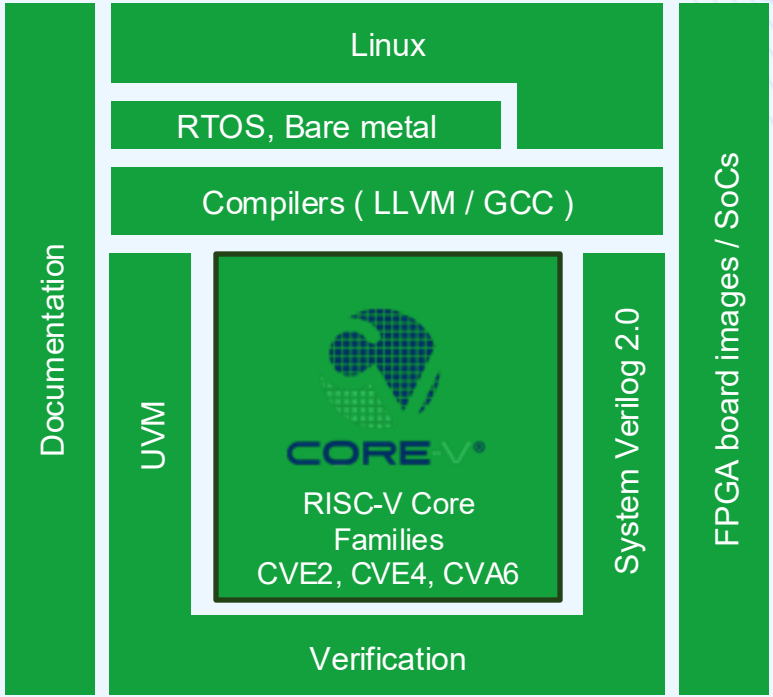
RISC-V Cores and Toolchains

OpenHW Foundation is the world's only non-profit organisation dedicated to providing verified, industrial-grade open source processor cores.

Through our ecosystem of members and partners, we are the largest open community focused on developing, verifying, and delivering open source RISC-V cores and processor IP that are ready for commercial-grade System-on-Chip (SoC) production

OpenHW Foundation IP

- Cores (System Verilog)
- Test benches (UVM, System Verilog)
- Tools (Siemens Mentor Questa, Cadence, Synopsys, Imperas, ...)
- Support software
- Compilers (LLVM, GCC)
- RTOSes (FreeRTOS, Eclipse ThreadX)
- Documentation



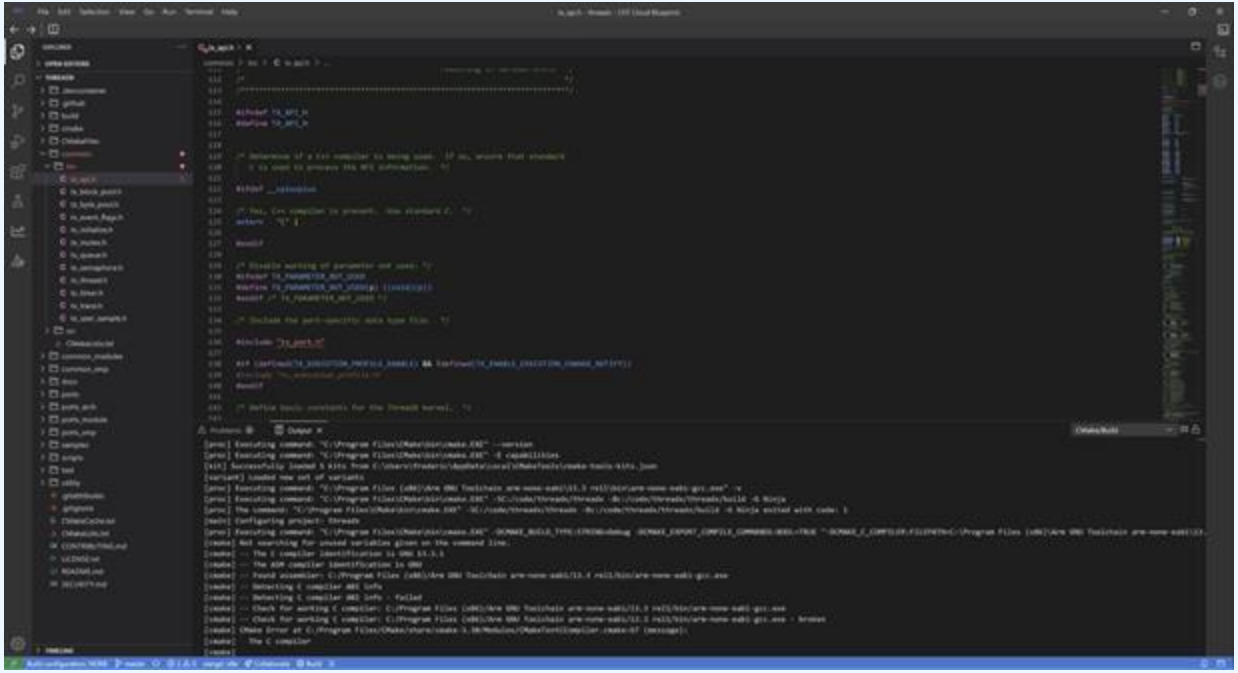
Developer Tools

After celebrating its 20th anniversary last year, Eclipse IDE is still going strong with millions of users

The Eclipse Theia project provides technology building blocks for next-generation IDEs. It shares its underpinnings with Visual Studio Code (VS Code), and can leverage its vibrant extension ecosystem

Open VSX provides a vendor-neutral, community-owned repository for these extensions

Theia IDE and CDT Cloud Blueprint



Bring your own AI...

... or no AI at all!

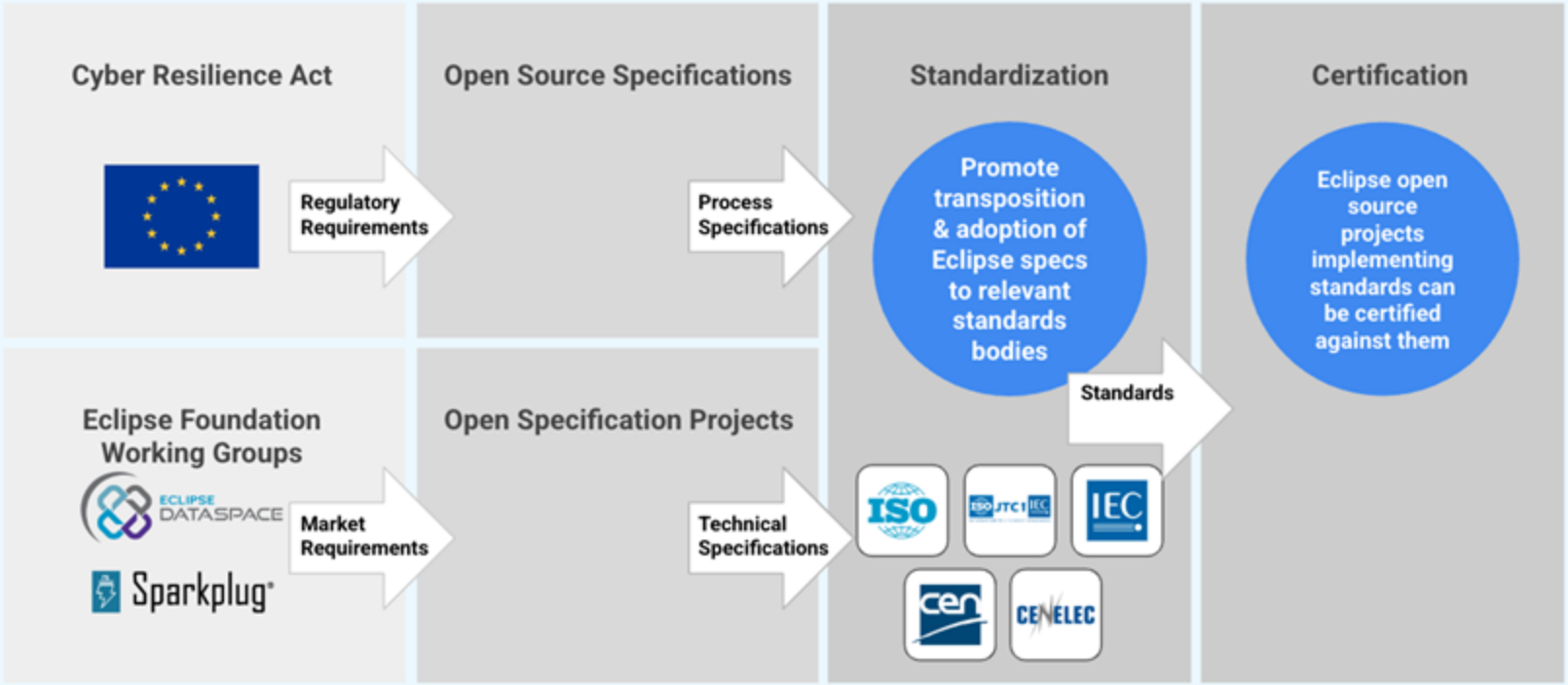
Beyond Code: Specifications and Standards

Since 2018, the Eclipse Foundation has been hosting open specification projects

The Foundation gradually got involved in international standards afterwards. It is now recognised as a publicly available specification submitter at ISO/IEC JTC 1, for example

The Cyber Resilience Act (CRA) brings new regulatory expectations for the software industry, including open source. The Eclipse Foundation helped open source communities to come together and respond through education, thought leadership, and process specifications. This lead to increased engagement with regulators and standardisation bodies in Europe and worldwide

Eclipse Specifications and International Standards



INDUSTRIAL ACTION PLAN
for the European automotive sector

European Connected and Autonomous Vehicle Alliance (ECAVA)

State of Play

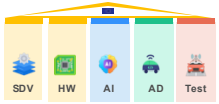
European Commission

The Automotive Action Plan ensures a close collaboration between several actions related to the vehicle of the futrue

Chapter on Innovation and Digitalisation

Strategic direction and pre-competitive dialogue

Focus on innovation for the vehicle of the future



Connected and Autonomous Vehicle Alliance (ECAVA)

Deployment of Autonomous vehicles

3+ Large-scale cross-border test beds /regulatory sandboxes

R&I investments

Chips JU

Automotive JU

IPCEI Automotive candidates

Current and future Automotive R&I investments on EU and MS level

Harmonised regulatory rules for the single market

Harmonised rules for testing and deployment across public roads

European Commission

Automotive Action Plan: Key achievements since March (1/2)

Digital Innovation and Data sharing

1 Digital Innovation

Digital Vehicle Funding in Horizon Europe

- The Union and Member States industry through **the Chips Joint Undertaking** are investing in 2025 around **EUR 400 million** in **public funding** under Horizon Europe, to be **matched by industry**, to develop **a European computing and software architecture for a future autonomous vehicle.**

AI computing infrastructure

- **Infrastructure:** During 2025-2026, at least **15 AI Factories** are expected to be operational. A noteworthy site is HammerHai in Stuttgart, which focuses on developing AI models for the Automotive sector

AI models

- The Commission will publish in **this week an Apply AI strategy**, with mobility and automotive identified as a priority sector
- Among the announced actions are ...

IPCEI

- The Commission is advancing with Member States discussions on IPCEI candidates, including on Clean, Connected, Autonomous Mobility, and AI
- However, on-going discussion on (i) scope, (ii) overlaps, and (iii) need for an IPCEI instrument (market failure exists between MSs)
- The aim is to achieve an „endorsement“ by MS in Q4 2025

European Commission

Automotive Action Plan: Key achievements since March (2/2)

Data, cybersecurity and 5G Corridors

2 Data Sharing

Guidance on in-vehicle data

- The Commission published a g**uidance on In-Vehicle Data** at start of application of Data Act
- The Commission is committed to exploring ways to **simplify the relevant data acquis** in our upcoming Digital Omnibus initiative

3 Cybersecurity

Risk assessment on CAVs

- All vehicles on the EU market must follow **international UN standards** for cybersecurity. Connected and Automated Vehicles (CAV) are identified as **critical subsector** under the NIS 2 Directive. Manufacturers have to have appropriate cybersecurity measures.
- The Member States, and the European Commission (CNECT, with support of GROW, MOVE and ENISA) are conducting a on connected and automated vehicles. **risk assessment**
- The report is currently being finalised.
- It is important for the Commission to continue working with the United States and other likeminded partners to **enhance cybersecurity measures** of connected vehicles.

4 5G corridors

5G corridor deployments

- The EU is continuing to support the deployment of **5G corridors along major transport paths** with EUR 300 million from 2021-2027.
- The Working Group 5G for Connected and Automotive Mobility (5G4CAM) of the Smart Networks and Services Joint Undertaking (SNS JU) will publish in September 2025 **guidance on investments for 5G connectivity infrastructure along motorways**

European Connected and Autonomous Vehicle Alliance (**ECAVA**)

Tasks and focus areas

Tasks

Foster collaboration
Define strategic objectives, targets, technology roadmaps, collaboration agreements

Identify investment
Identify and promote synergies for the joint development and deployment of next-gen automotive technologies

Comparative Analyses
Of technological advances between Europe and other regions to address main EU gaps

Recommendations
To the EU regulatory framework on barriers for connected and autonomous vehicles in Europe

Suggestions for Working Groups of the Alliance

The **Steering Committee** Members of ECAVA may establish Working Groups of the Alliance, working on specific **industrial priority topics of the automotive industry**

Candidates:

- A — SDV
- B — Hardware Platform
- C — Autonomous Driving

Horizontal topics covered within and across WGs

- AI models and solutions
- Distributed testing
- Regulatory barriers and recommendations

Timeline

Meeting
Delivery

AUG 28	SEPT 8	SEPT 12	Oct 6-7	Oct TBC	Oct 28	DEC TBC	Q1 25 TBC
TOR published	**SDV Roadmap published**	**Strategic Dialogue** *Comm Pres, CEOs, Brussels*	**SDV Conv. Conference** *Brussels*	**WG Prep meetings** *SDV, HW, Autonomous driving*	**ECAVA Steering Comm.** Brussels	**1st ECAVA Delivery** *First reports, roadmaps, etc.*	**ECAVA Alliance Forum**

Note: 1. Focus areas as mentioned in Automotive Action Plan

Software-Defined Vehicles
Automotive Action Plan

1

HW/SW Abstraction

Abstraction layer ensures efficient integration of various hardware platforms while **maintaining compatibility** with the evolving software stack.

Modular and scalable to build SDV systems while **reducing dependencies** and vendor lock-in

2

Middleware and API framework

Middleware layer that bridges the hardware/OS and application layers.

Standardized middleware stack provides essential services such as **communication protocols, security mechanisms, and data management**

3

Automated DevOps tools

Integrated DevOps toolchain simplifies the adoption and use of new software layers, streamlining processes such as continuous **integration, testing, deployment, and monitoring**

Chips JU

HAL4SDV
Systems Safety Security Software

Hardware Abstraction

€ 64m (*18m EU*)

Shift2SDV

Service oriented Framework

€ >60m (*20m EU*)

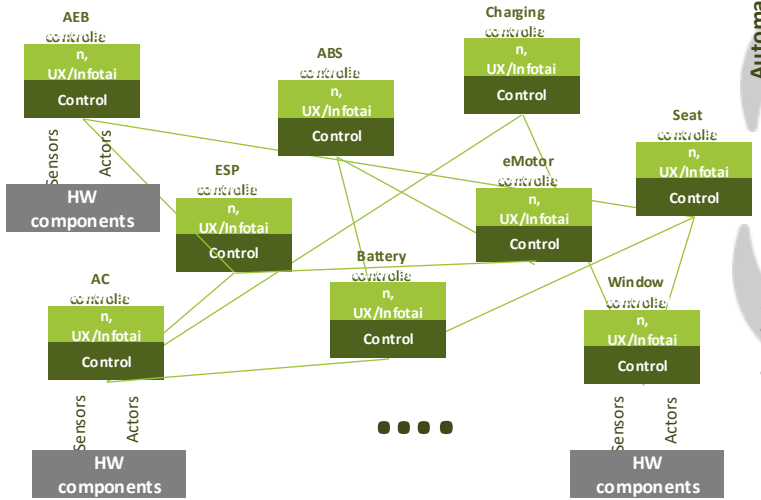
AI Tools

AI Dev Tools for SDV

€ >60m (*20m EU*)


FEDERATE
Software-Defined Vehicle Support and Coordination Project.
FEDERATE 2nd Review Meeting
Overview

Automation, UI, … moves to Central HPC

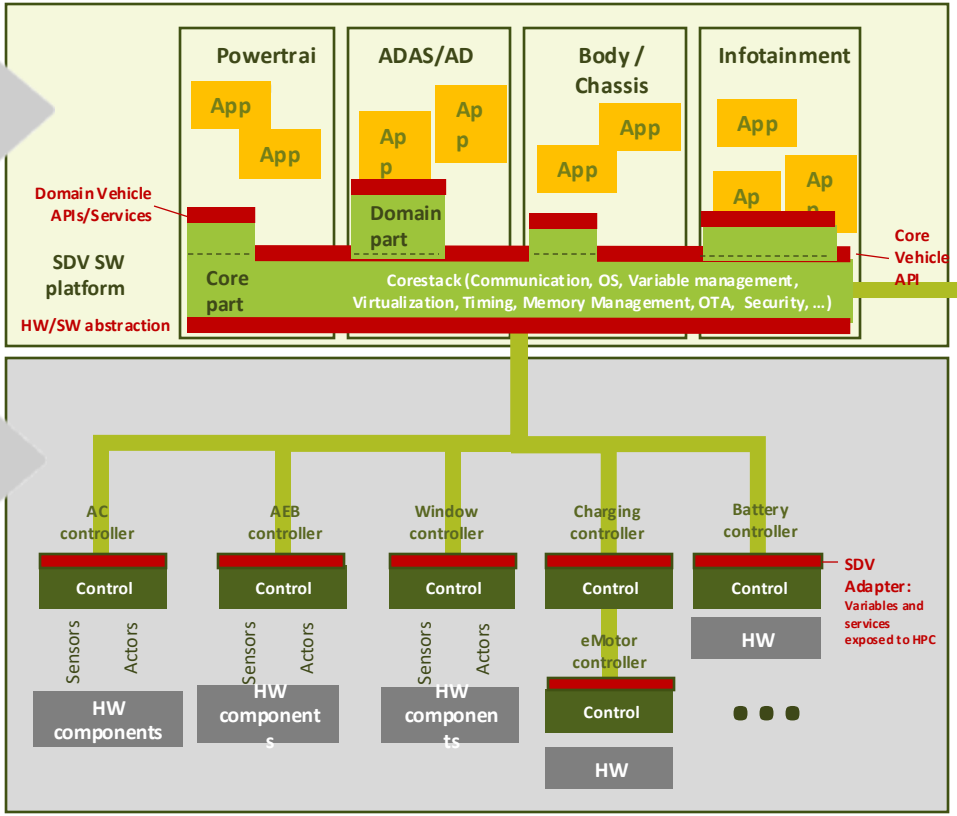


Automation, UI, soft-real-time control

SDV

Hard real-time

Control

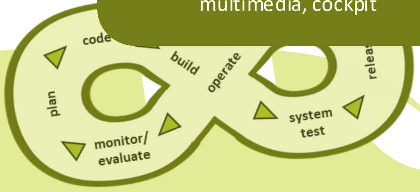


Two Speed Software Delivery Model

SDV-SW

„Software first“

- Automation, UI-rich
- Soft real-time, agile, SW only
- ADAS/AD, body comfort, chassis, multimedia, cockpit



Fast Cycle

Vehicle Cloud solutions
Backend feature

In-Vehicle intelligent solutions
HPC SW-features

SDV-Feature Development

- Organization structured around main **customer journeys** and **core applications** (e.g. music player, voice assistant, …)
- High degree of autonomy and fast pace for development and delivery
- **Agile methodologies** and automated **CI/CT/CD**

Slow Cycle

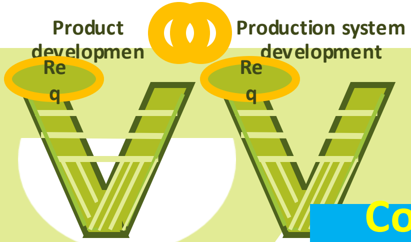
Vehicle hard-RT software
eCU specific control SW, OS, drivers

Vehicle Electric / Electronics
eCU specific control SW, OS, drivers

Vehicle Mechanics
Vehicle mechanical platform

Control SW Development

- **Co-development of mechatronic component and software**
- Mechatronics components (and their production) influence development methodology strongly
- **V-Process** (for mechatronics component dev., production system dev. and SW dev) is mandatory
- SW releases synchronized with mechatronics- and HW- schedules in vehicle program
- SW platforms well established as AUTOSAR classic



Controller-SW

+ Mechantronics HW

„SOP driven“

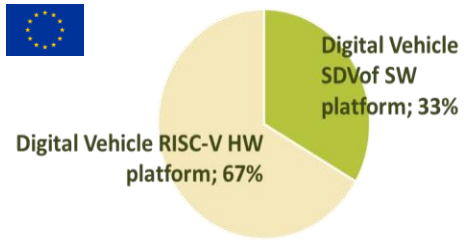
- Closed loop control, Hard real-time,
- Mechatronics + SW devel.
- Powertrain, battery, chassis

Sources:

- *Two Sp eed Delivery M odel; Au gustin Friedel, MHP (P orsch e); https://www.sdv.gu ide/s dv101/ part-a-ess en tials/mhp-expert-opinion ; 2024*
- NXP: Eur opean Co nference on EDGE AI Techno logies and Applications (21-23 Oct 2024, Cagliari, Sardin ia Italy; Pres entation by Patrick Pype)
- Oj o Yos hida-Rep ort: https://zoom.us/rec/play/JRkjpoyPYX4p8jO4V6lCHonPiwQQY6MPE_UcUyDv_bnp6w2EJXajjubVRxMEeN5QGmiwiVOxEQrlfLv9.wjhbUJn2CPrkLuW6 hasValidToken=false&canPlayFromShare=true&from=share_rerding_detail&continueMode=true&componentName=recplay&originRequestUrl=https%3A%2F%2Fzoom.us%2Frec%2Fshare%2FOqoCVhcHx0tt_OVQl2vt3jeJGZM8rrTA65uEcMq2wzGHrv2294eTBu0HNyNSTDxm.PQ7DG5rW-tppTeT

What happened in the last 12 months in SDVoF and DV?

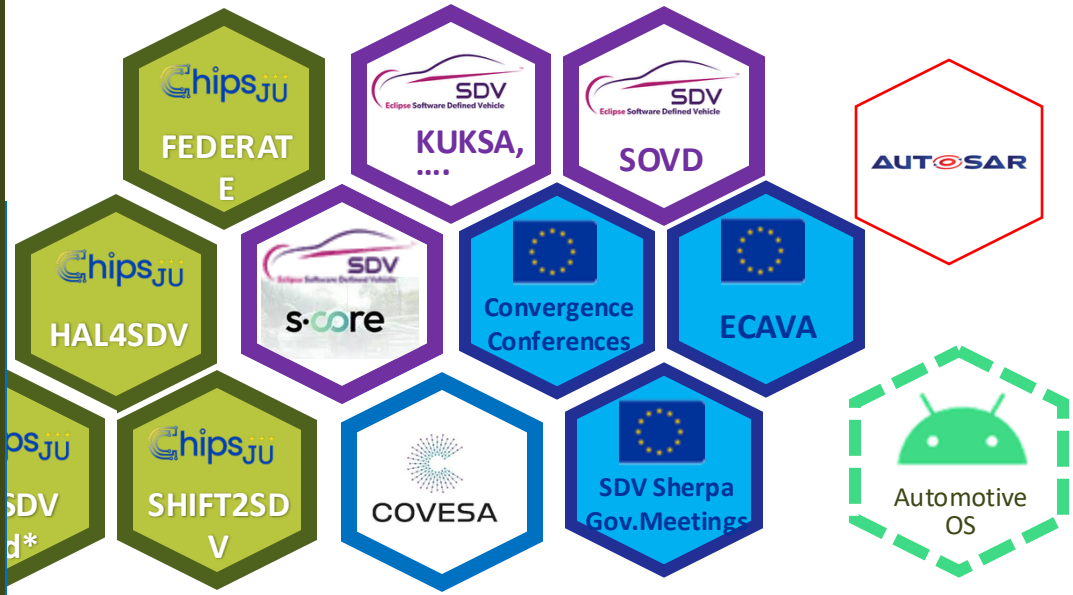
2025 Oct



Digital Vehicle (DV) ≈ **687 Mill €** investment 2023 - 2025 calls by EC+Partic.states, Industry, Academia in EU projests

plus estimated amount in OSS projects (≈ **145 Mill €)**

Total 832 M€



Public funded projects collaborating with OSS initiatives

Projects in OSS initiatives

** Proposal under evaluation*

Projects are working on all layers of the Digital Vehicle of the Future

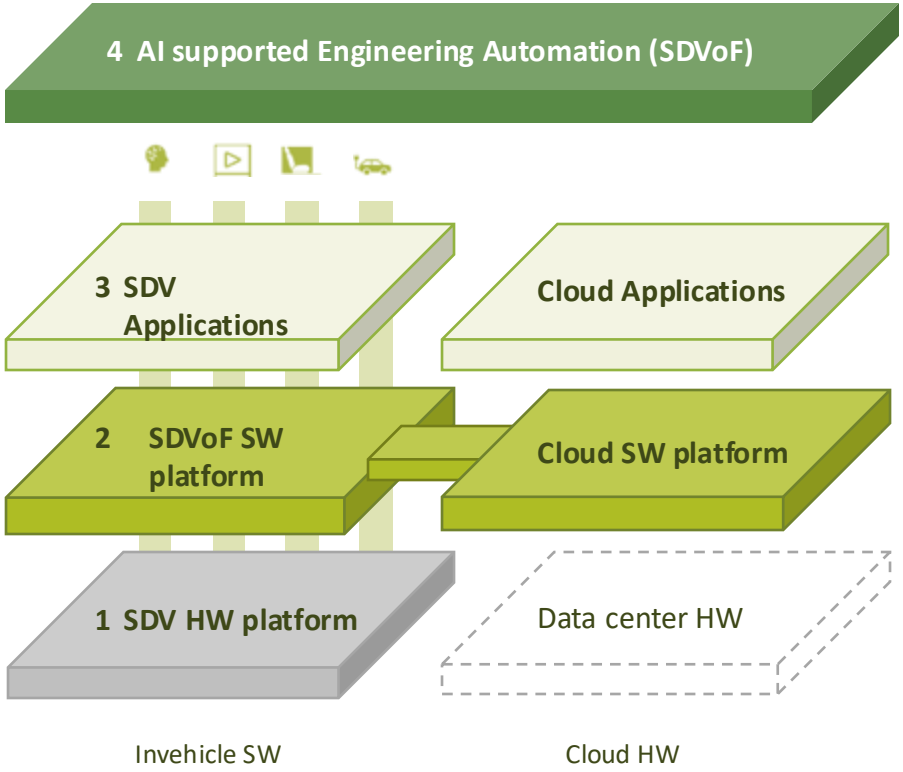
Eclipse S-CORE
SHIFT2SDV
AI4SDV *)

CODE4EC
TWINLOOP
UPT2DATE4SDV
EEA4CCAM

FEDERATE
SHIFT2SDV
HAL4SDV

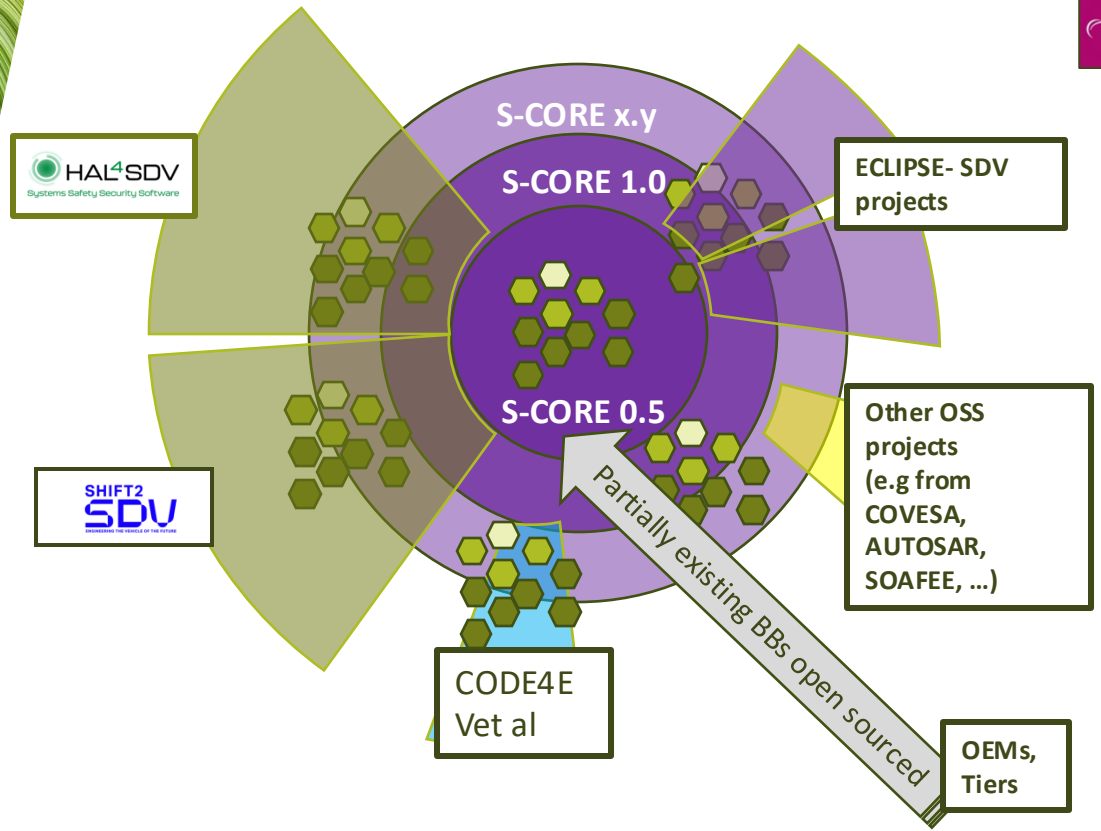
Eclipse S-CORE
Eclipse SOVD
Other Eclipse-SDV projects
COVESA VSS/VISS

TRISTAN
ISOLDE
RIGOLETTO
TURANDOT *)
Autom. Chiplets *)



*) proposals under evaluation

Grow SDV Reference Stack(s) Collaboratively



- S-CORE is first integration project for a SDV reference stack
- S-CORE stack is open-source (ECLIPSE-SDV project)
- S-CORE has a roadmap
- EU SDV projects contribute to the reference stack
  - Many BB-tasks are also new Eclipse-SDV projects (or in another OSS initiative)
  - Other BB-tasks is working in an existing Eclipse-SDV project (or in another OSS initiative)

OCX 26
OPEN COMMUNITY EXPERIENCE

Be part of the future of open source at

Open Community Experience

21-23 April 2026 | Brussels, Belgium

OCX is a vibrant, cross-industry gathering where diverse communities come together to shape the future of open source. It's where developers, industry leaders, and open source champions converge to exchange ideas that move technology forward.

Beyond the Main Track, OCX features five collocated events:

OCT
OPEN COMMUNITY FOR TOOLING

OPEN COMMUNITY FOR AUTOMOTIVE

OSAI
OPEN COMMUNITY FOR AI

OCC
Open Community for Compliance

OCR
OPEN COMMUNITY FOR RESEARCH

OPEN COMMUNITY EXPERIENCE

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Thank you