



SOAFEE

SOAFEE in an OSS World

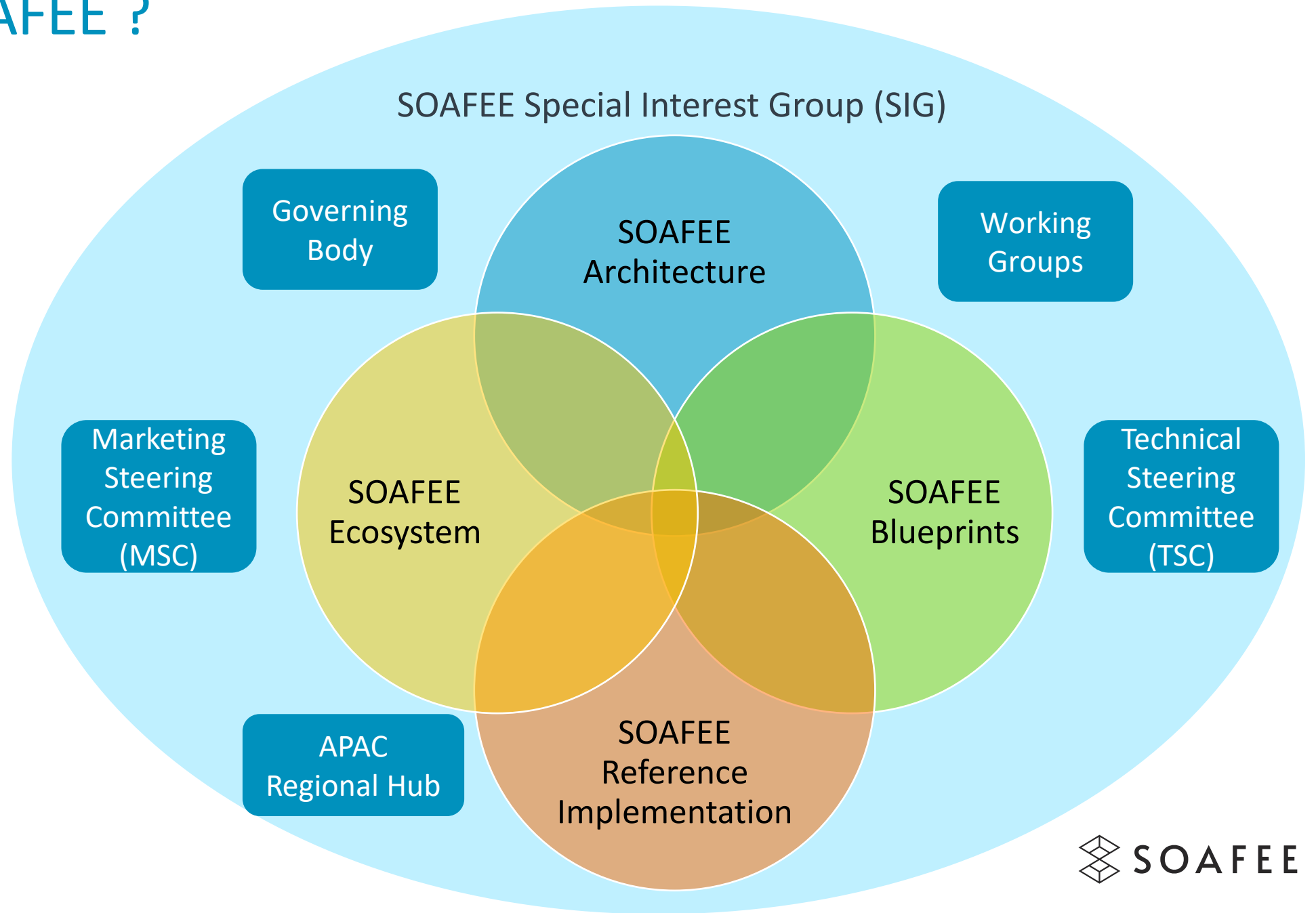
Bernhard Rill
May 2025

What is SOAFEE ?



SOAFEE

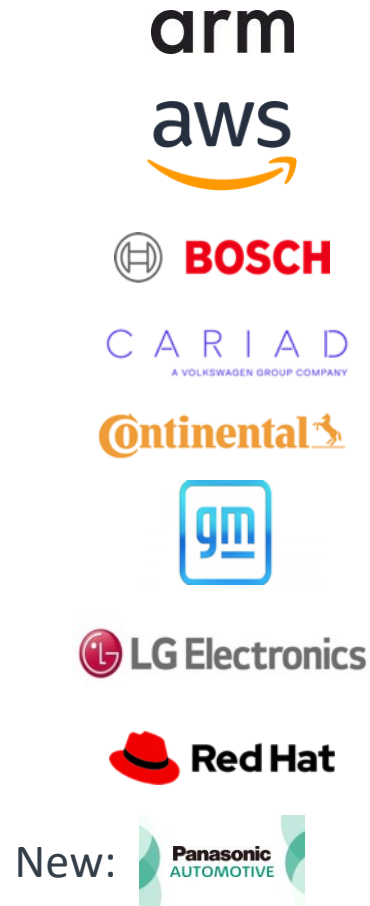
Scalable
Open
Architecture
For the
Embedded
Edge



SOAFEE Ecosystem

Bringing automotive, software and cloud providers together for the development of the SDV

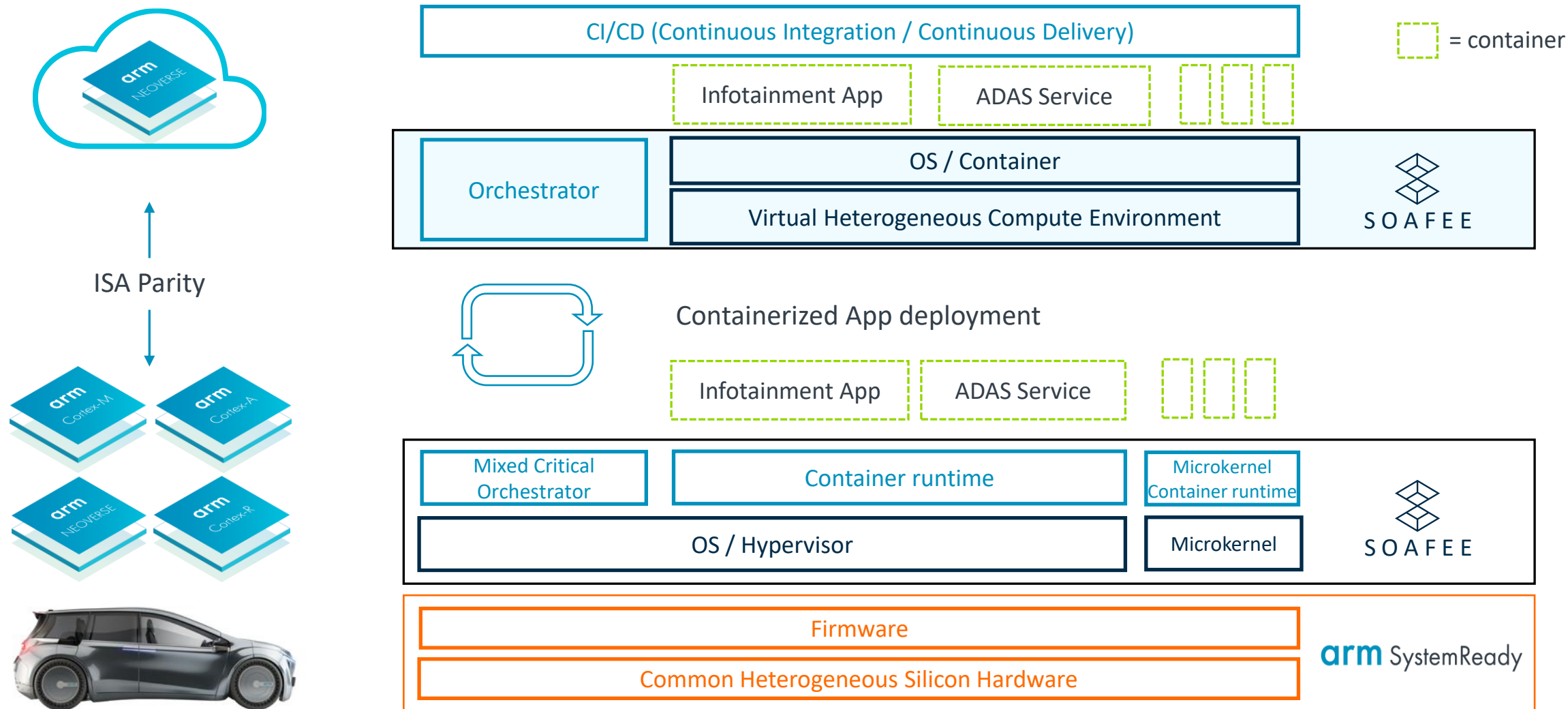
Governing Body



Voting members



SOAFEE Architecture Methodology



SOAFEE: The fundamentals



Ecosystem

- **Members working together**, in a SIG, to create Standards based Commercial and Open-Source offerings for the Automotive world
- May belong to COVESA, EclipseSDV, AUTOSAR or other Automotive based technology organizations

SIG

- Governing Body
- Marketing Steering Committee
- Technical Steering Committee
- Working Groups
- **Discussing, Exploring and Promoting** technologies & standards for the SDV in the SOAFEE Ecosystem

Architecture Methodology

- Community driven architecture methodology focusing on a broad range of problem domains and technologies for the SDV
- **One way, not the only way!**

Reference Implementation

- Edge **Workload Abstraction and Orchestration Layer** is a reference implementation for education about the SOAFEE Architecture and Vision
- “OS/Hypervisor layer and above”.

Blueprints

- **Applications** that use, contributes to or extends the SOAFEE architecture
- i.e. Example applications, Tool methodologies, new OS components, enhancements, standards-based implementations or ...

SOAFEE Architecture

From cloud-native technologies to SDV development and deployment

The beginning



Prove that Cloud Native technologies have a place in Automotive

- Containers (OCI Compliant)
- Orchestrators
- Hypervisors

Building the SDV Today



Delivering End-to-End Software Solutions for Automotive

- **AI – Standardize APIs for Workload scheduling**
- Heterogenous & Mixed Criticality
- Data Traffic Determinism (TSN)
- Functional Safety & Security
- **Standard APIs for Automotive HW**
- Secure Over-The-Air Update
- Multi-Tenant code repositories
- Multi-Project/Company CI

Software Portability and Hardware Abstraction!

SOAFEE Blueprints

Contributions from the SOAFEE community to forward the SOAFEE initiative



What is a SOAFEE Blueprint?

- A SOAFEE Blueprint is any use of, or contribution to, the SOAFEE architecture including, but not limited to, example reference applications.
- A SOAFEE Blueprint:
 - Can compromise work from multiple member companies.
 - Can involve members work/components as a part of their membership of other SDV Alliance Members (e.g. COVESA, AUTOSAR, and Eclipse SDV).
 - Should help advance the SOAFEE architecture through the technical working organization.
 - Will be promoted externally as part of ongoing SOAFEE marketing.

SOAFEE Blueprints in Action

- Recently submitted/published SOAFEE Blueprints
 - Open AD Kit v2 – Autoware
 - ADAS application – Leddartech
 - Orchestration (BlueChi) – Red Hat
 - Orchestration (Piccolo) – LGE
 - Orchestration (AosEdge) – EPAM
 - Determinism (Lingua Franca) – Denso
 - Virtual IVI (vSkipgen) – Panasonic
 - Hypervisor (Virtio) – Panasonic
- For blueprint demonstrations visit :
 - www.soafee.io
- For information on submitting blueprints visit :
 - www.soafee.io/blueprint_form

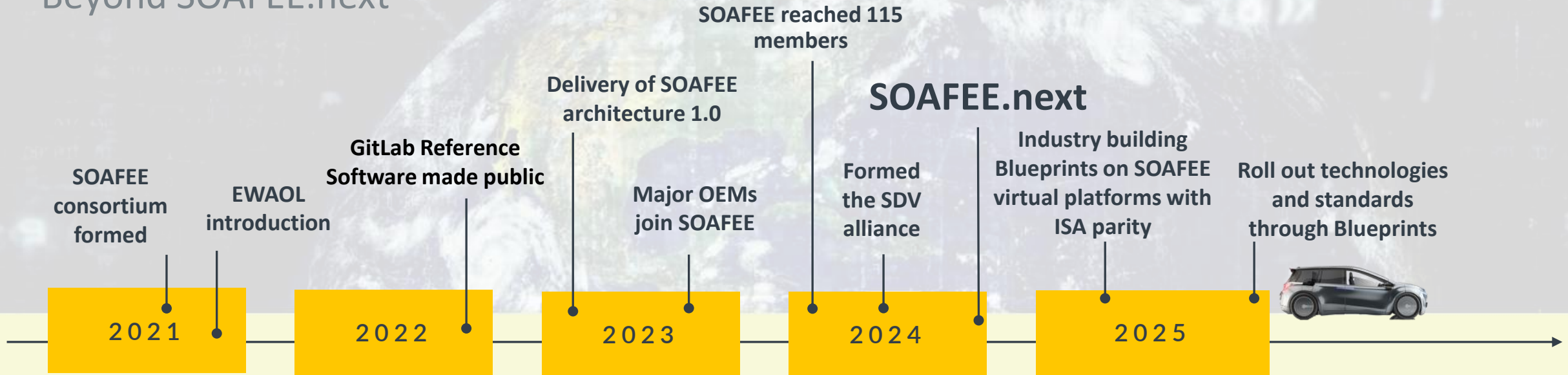


SOAFEE

SOAFEE Year 4 – the year of execution and scaling

SOAFEE Journey

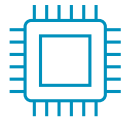
Beyond SOAFEE.next



SOAFEE is an industry-led collaboration between companies across the automotive and technology sectors...

Working together to build open-source architecture for software-defined vehicles. Together we have one single goal - to create a shared platform for vehicles using cloud-native architecture that accommodates multiple hardware configurations. By making SOAFEE hardware agnostic, we plan to simplify vehicle software solutions radically.

3 key introductions moving the initiative forward using EWAOL 2.0



RD-1 AE

- Functional Safety and Mixed Critical Orchestration Hardware and Software
 - Arm's new Automotive focused Reference Design 1 hardware solution for automotive.
 - Strong alignment through firmware abstraction (RD-1 AE) APIs to EWAOL 2.0 moving forward.
 - "Firmware and below" for all compute cores.



Virtual Platforms

- + Development without silicon
 - Delivered through community members such as **Siemens, Cadence and Corellium**
 - Integrated with **SOAFEE SIG** for open-source development
 - Take advantage of environmental compute parity of the ISA in the Cloud and in the Car

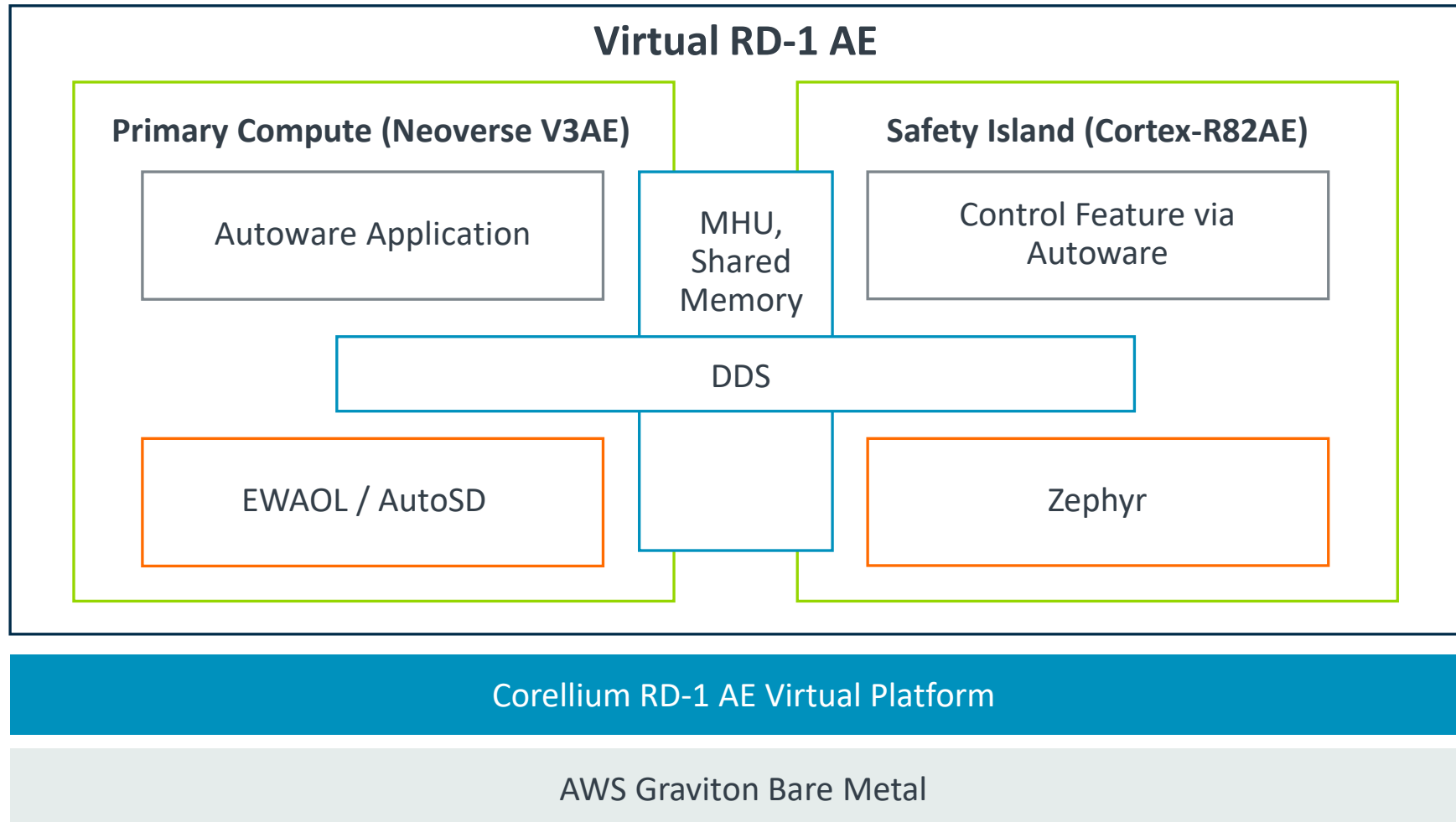


CI/CD & Services

- + Software Assurance and services
 - **Linaro** – SOAFEE Integration Lab
 - Enabling the software stack SOAFEE validation

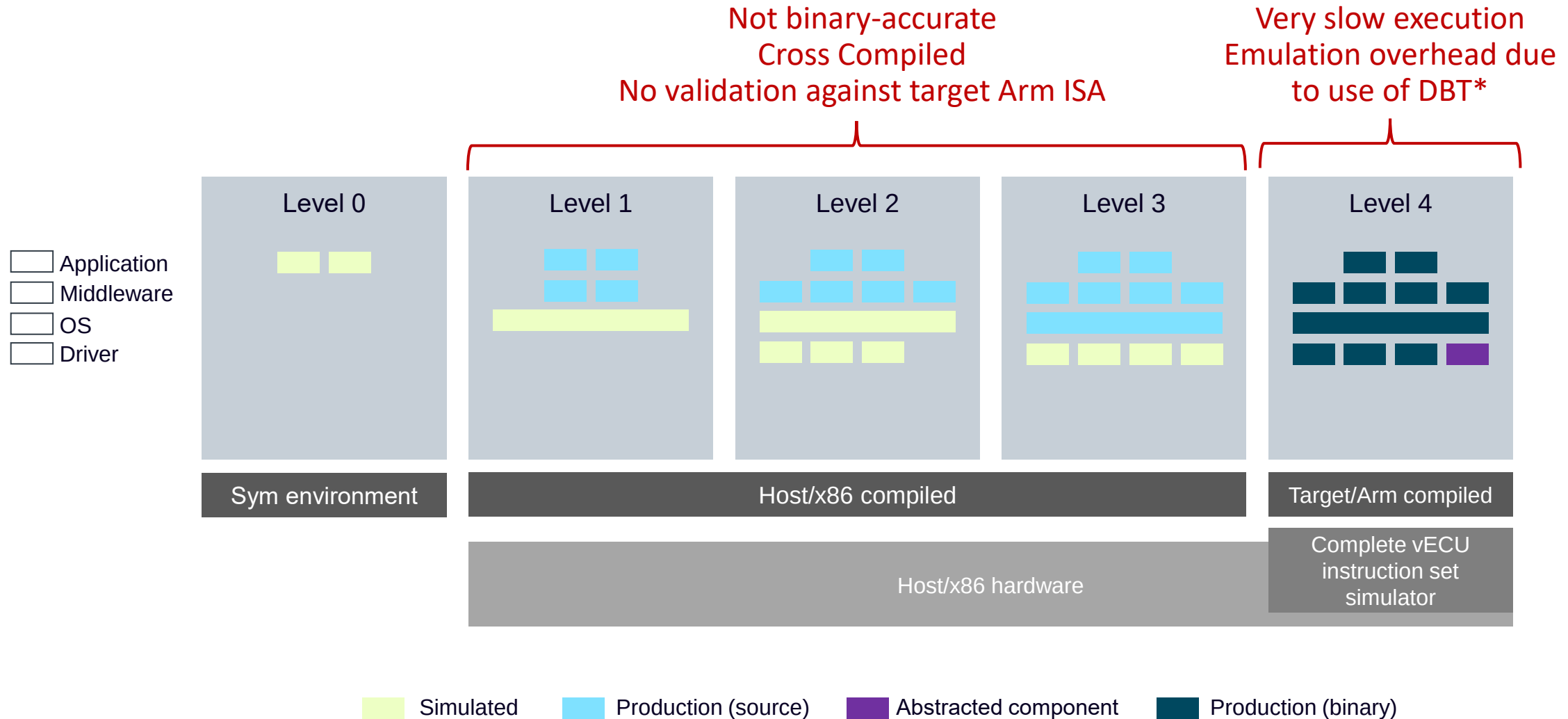
Arm RD-1: Mixed Criticality and Virtual Platform

Full cloud-hosted virtual environment – enablement on virtual hardware



Traditional Virtual Platforms Shortcomings

Too Slow, Binary Incompatible, Too Abstract and Complex



References: adapted from prostep 2020 – *Requirements for the Standardization of Virtual Electronic Control Units (V-ECUs)*

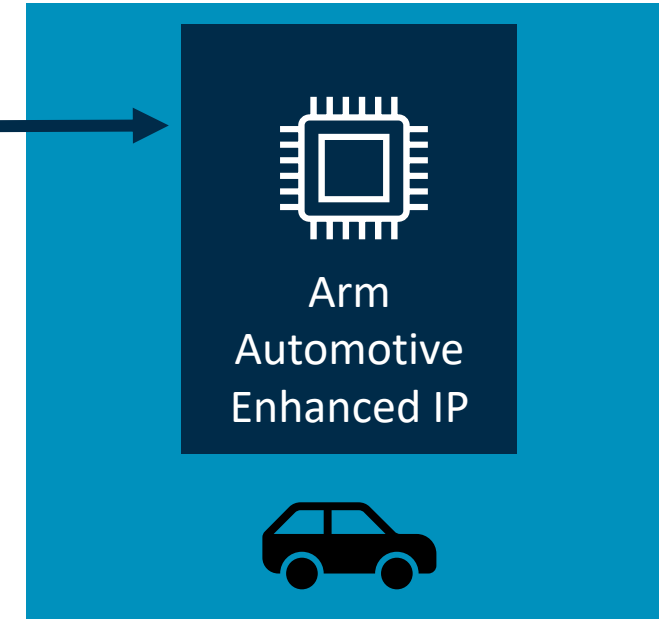
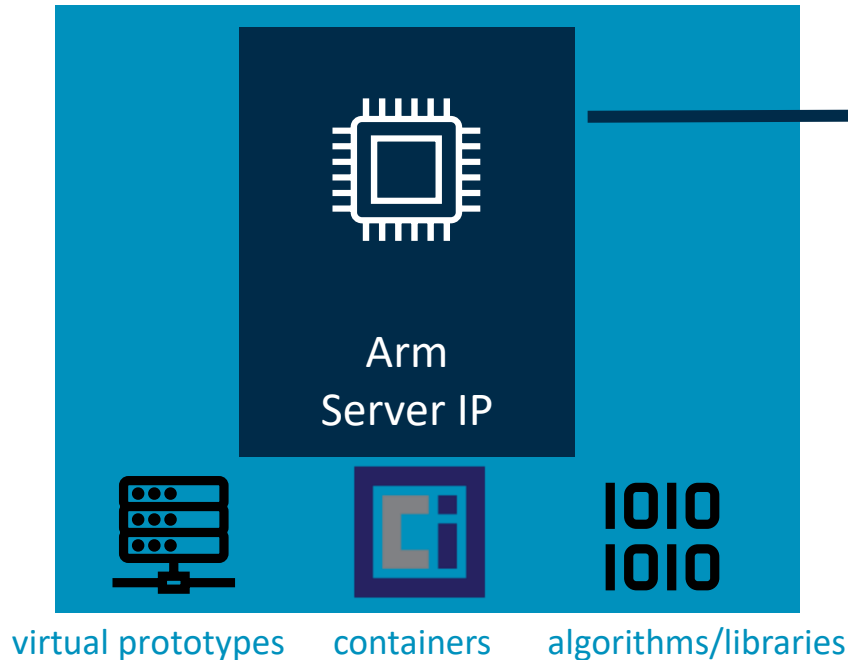
ISA Parity Enables Cloud-to-Car Software Portability

Unique, Arm Only Capability

Cloud/OnPrem Platform

Car Platform

Identical ISA



Functional target software is
validated continuously
Native execution
No cross-compilation

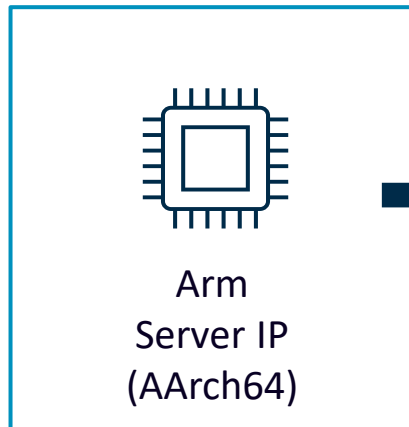
Build once, test everywhere — the same
artifacts run natively from virtual
platforms to edge deployments

Virtual Prototyping Solutions

Enables “Shift-Left” development

CLOUD / ISA PARITY

Pre - Design



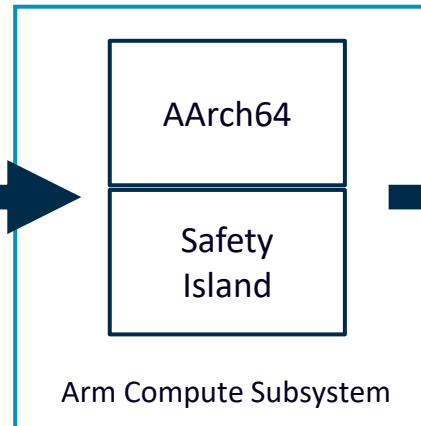
- ✓ Binary Compatibility
- ✓ Register Compliance
- ✓ API Equivalence

Identical ISA



VIRTUAL HARDWARE

Pre - Silicon



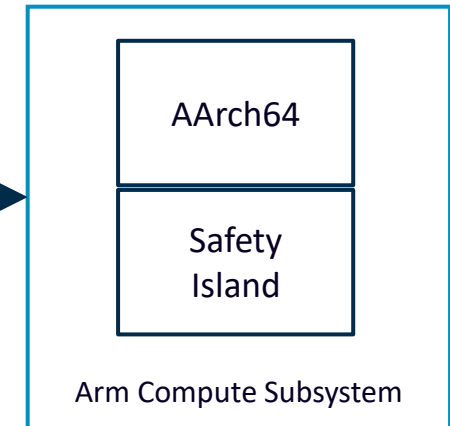
- ✓ Binary Compatible
- ✓ Register Compliant
- ✓ API Equivalence

Identical Binary



CAR PLATFORM

Post - Silicon



Automotive Applications



SOFTWARE & FIRMWARE
Applications, OS/RTOS, Middleware & FW Vendors

arm STL

VIRTUAL PROTOTYPING SOLUTIONS

SYNOPSYS®

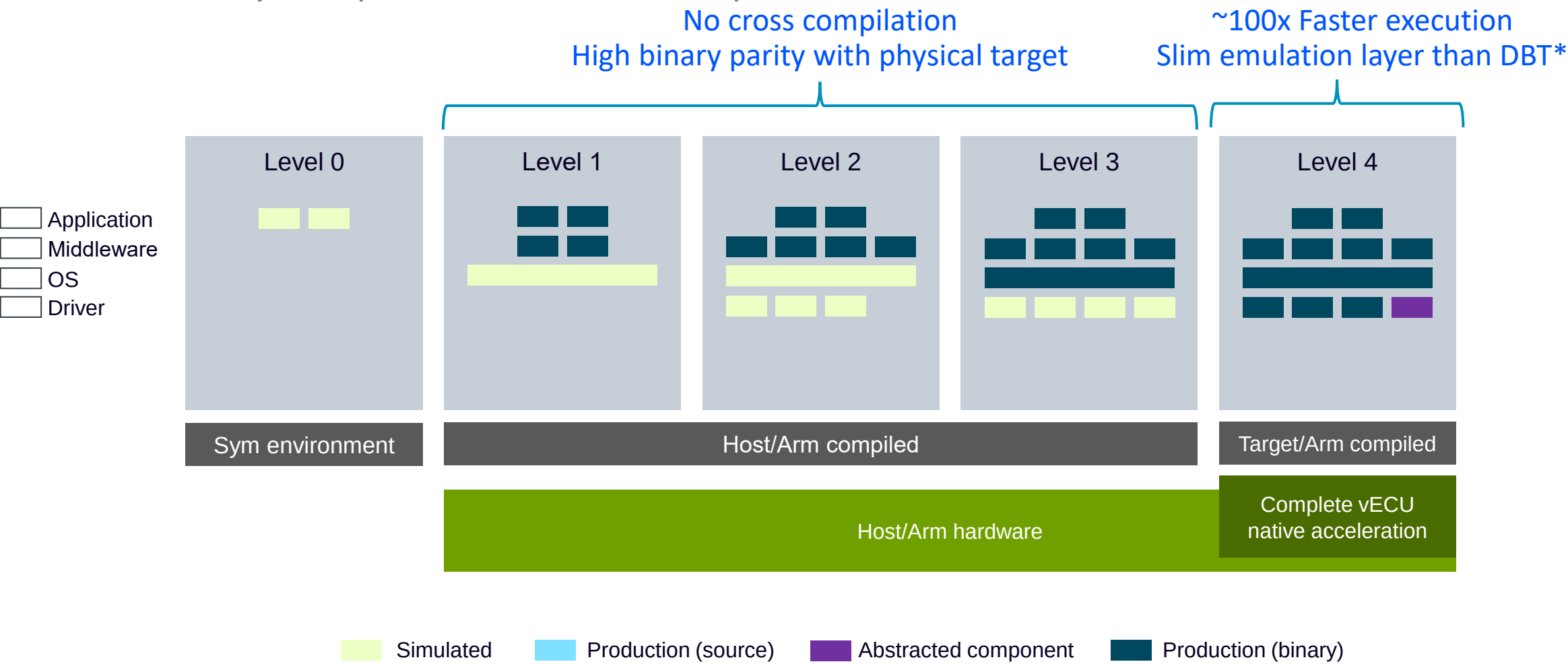
SIEMENS

cadence®



Arm Native Execution Advantages

Faster, Binary compatible, No cross compilation



References: adapted from prostep 2020 – *Requirements for the Standardization of Virtual Electronic Control Units (V-ECUs)*



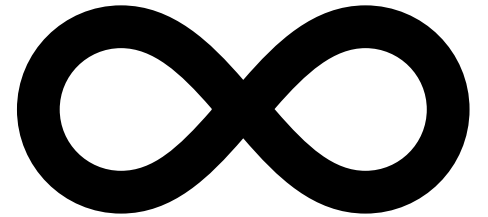
SOAFEE

AUTOSAR/SOAFEE Joint Group (JG)

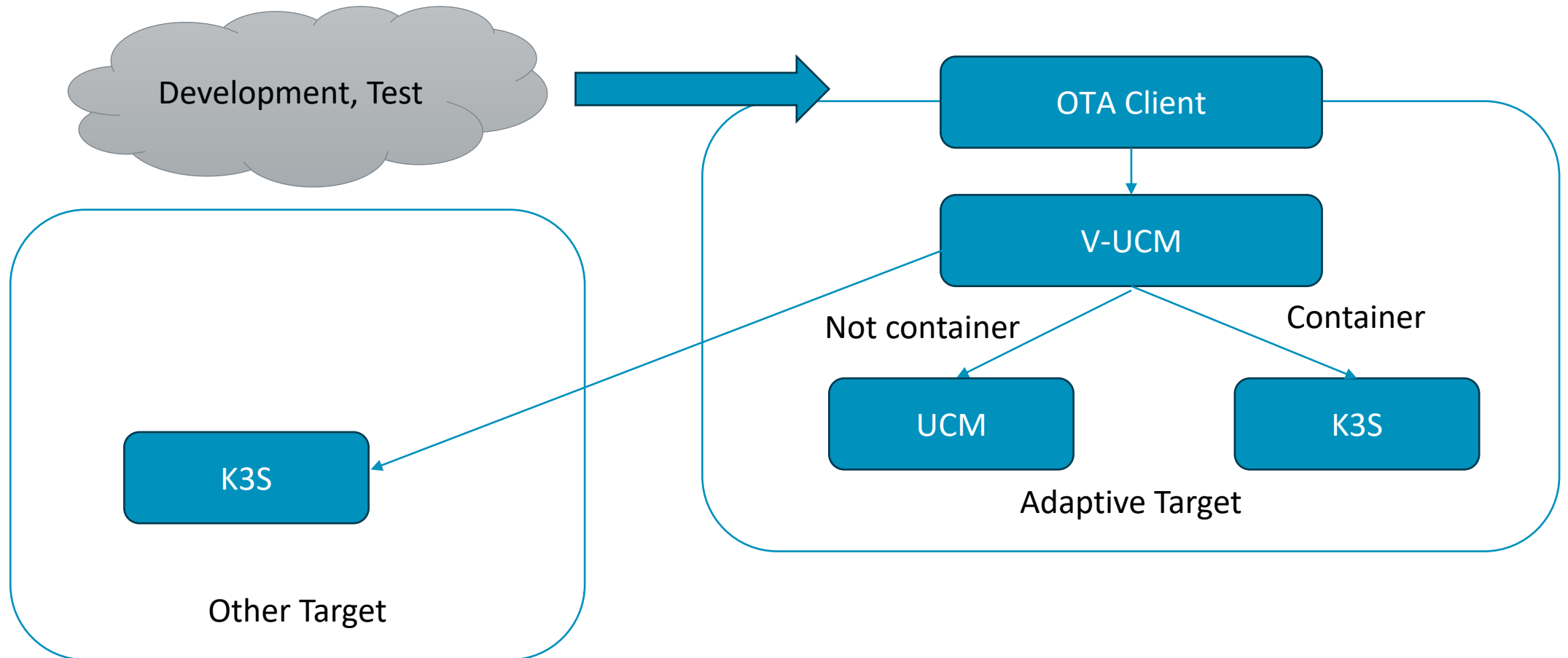
Primary use case for SOAFEE/Adaptive AUTOSAR

Cloud native development

- Development of software for SDV requires typical devops lifecycle
- Big advantage comes from:
 - Develop in cloud
 - Test in cloud
 - Deploy to vehicle
- Including
 - Shift-left (develop before silicon is available)
 - Develop anywhere
 - No limit to number of developers
 - Faster regression testing
 - CI/CD
 - Environmental parity means more accurate testing



Workflow

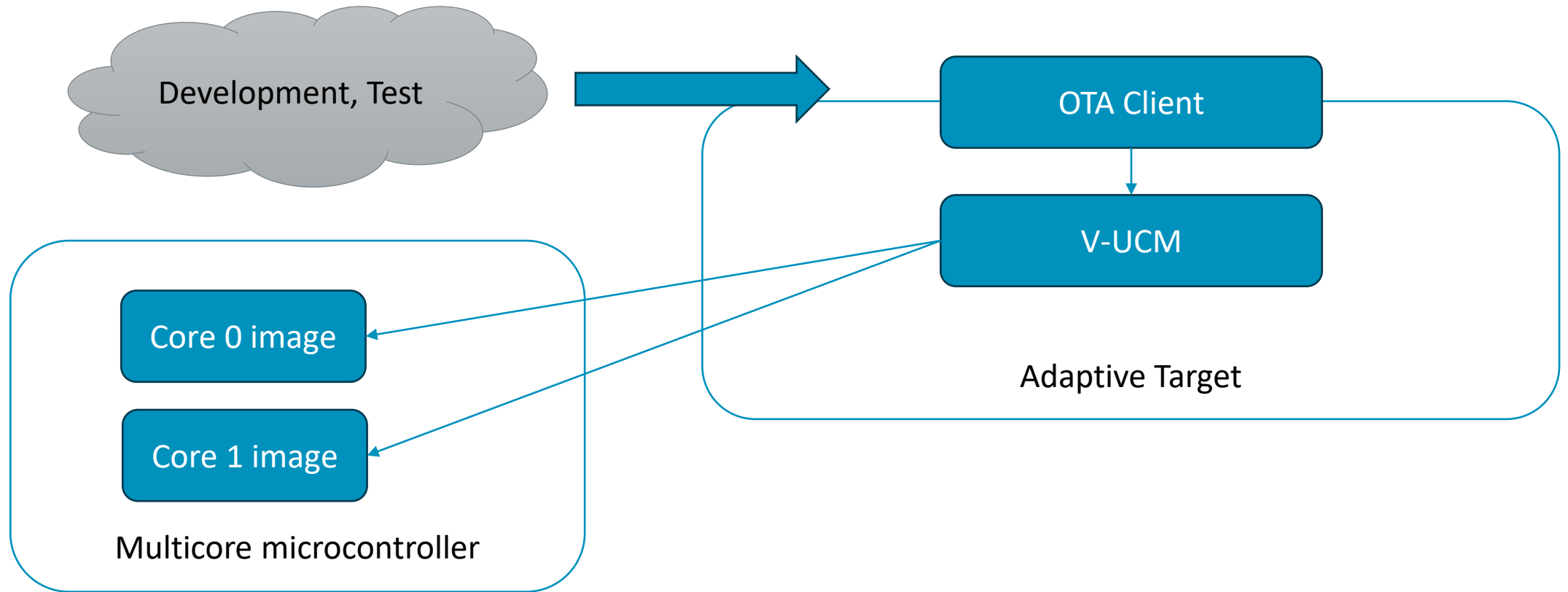


Primary use case for SOAFEE/Classic AUTOSAR

Image deployment to many-core microcontrollers

- Many core microcontrollers represent a good fit for zonal controllers
 - Each core hosts a single, separate Classic AUTOSAR stack
 - Each stack could be developed in the cloud, deployed to a core
- Advantage comes from:
 - Develop in cloud with some testing
 - Deploy to vehicle

Workflow





Thank You
Danke
Gracias
谢谢
ありがとう
Asante
Merci
감사합니다
धन्यवाद
Kiitos
شكراً
ধন্যবাদ
תודה

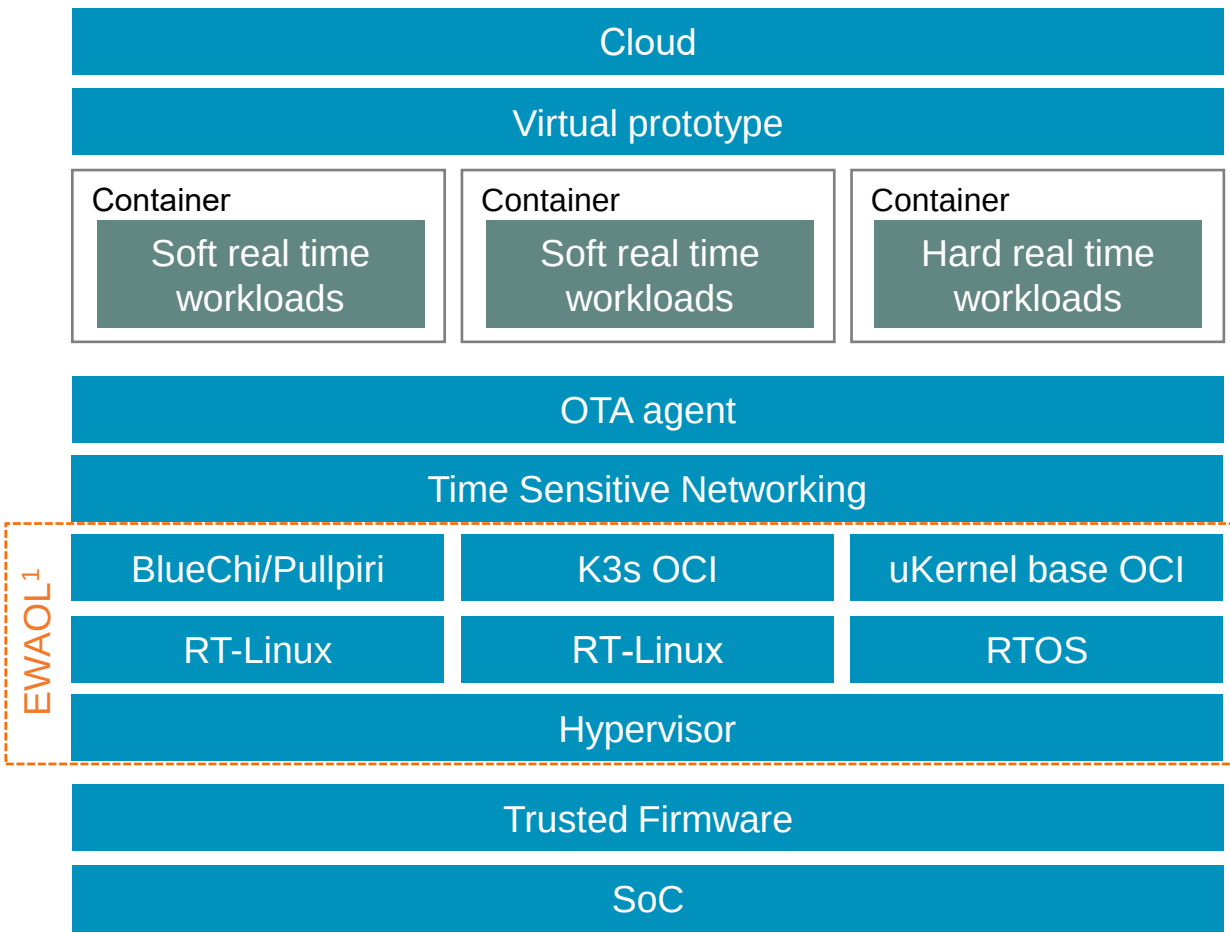
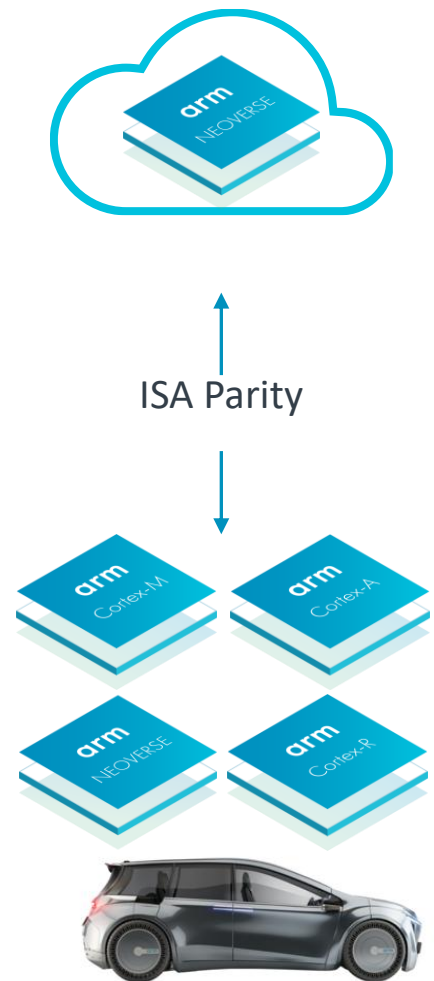


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SOAFEE Architecture

Industry Collaboration to Standardize Automotive Software



1. Edge Workload Abstraction and Orchestration Layer; 2. As of Mar. 2025