



SOAFEE

SOAFEE Update

Robert Day / John Penn, Arm
SOAFEE – MSC chairperson / SOAFEE - Architecture WG Lead

SOAFEE Korea Seminar, Seoul
September 2024

Agenda

Topic	Presenter
1. Introduction	Robert Day SOAFEE - MSC Chairperson ARM - Director Automotive GTM
2. Membership Update	
3. SOAFEE 101 & Technical Update	John Penn SOAFEE - Architecture WG Lead ARM - Director Automotive Software Solutions
4. SOAFEE.next	
5. SDV Alliance	Robert Day SDV Alliance - SOAFEE representative and workstream chair ARM - Director Automotive GTM
6. Q&A	All



SOAFEE

Introduction and Membership Update

Robert Day
September 2024

Robert Day

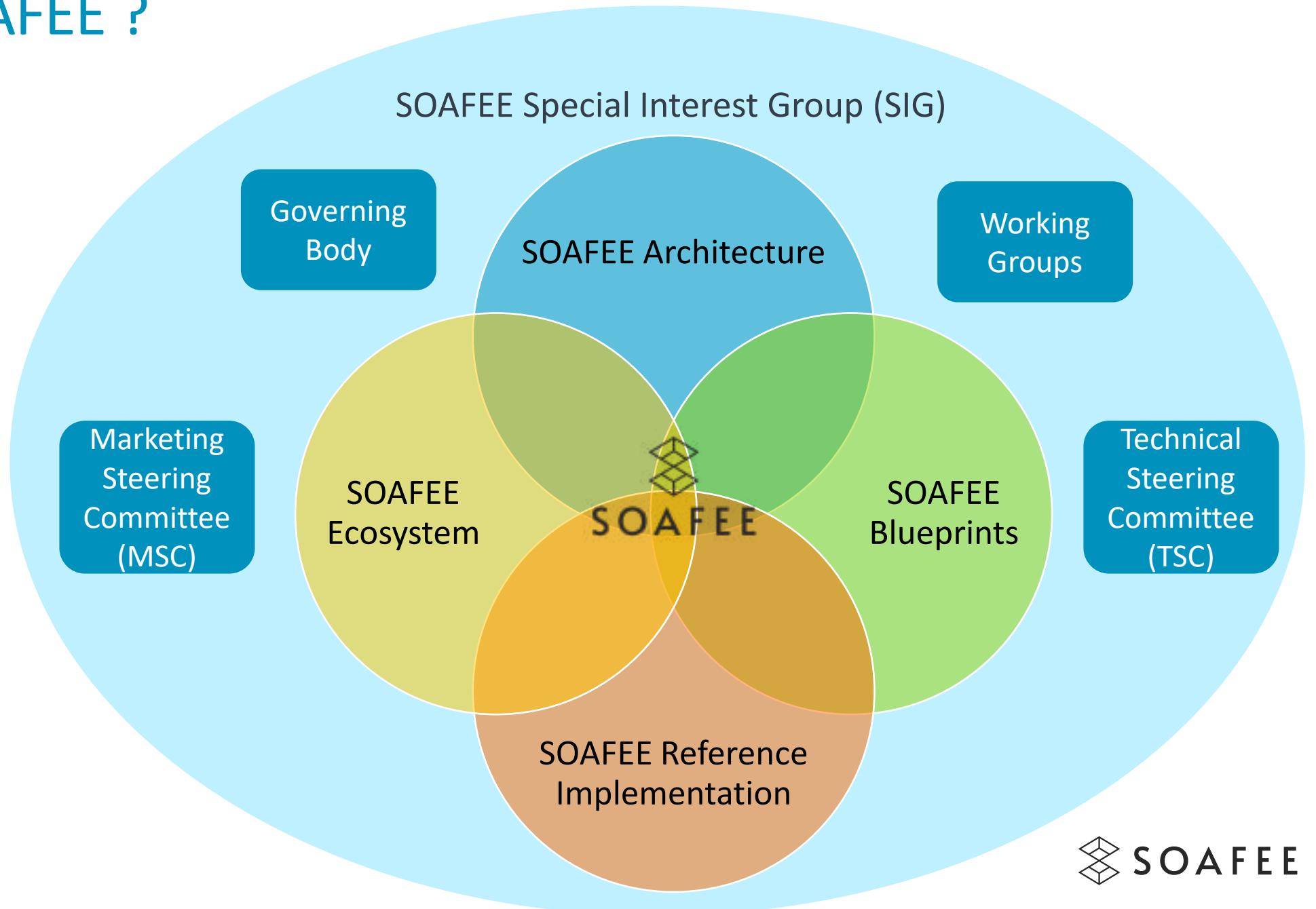
A huge thank you !

To the hosts of the SOAFEE Korea Seminar ..



What is 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

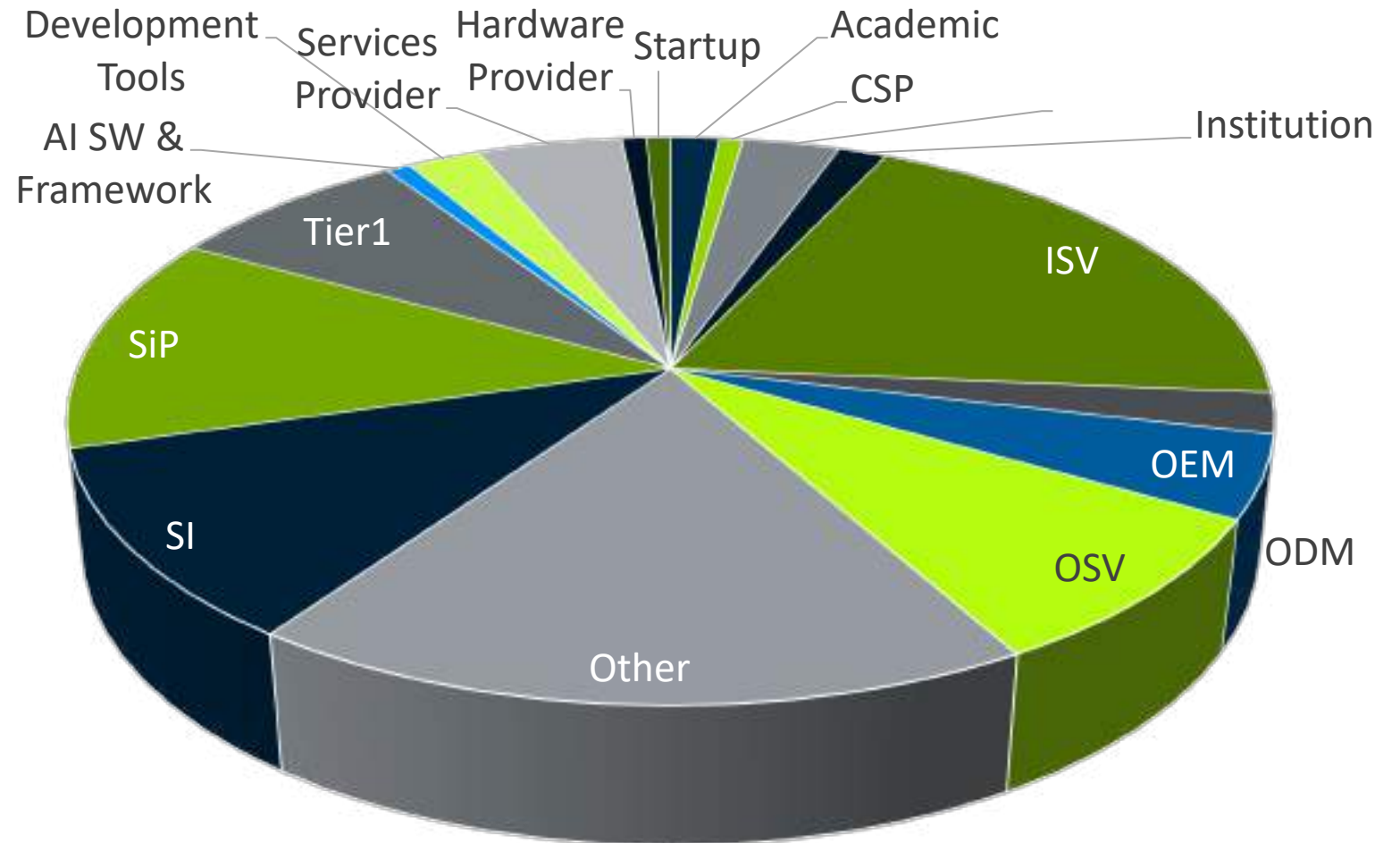


Voting members



SOAFEE Membership by type – Sept 2024

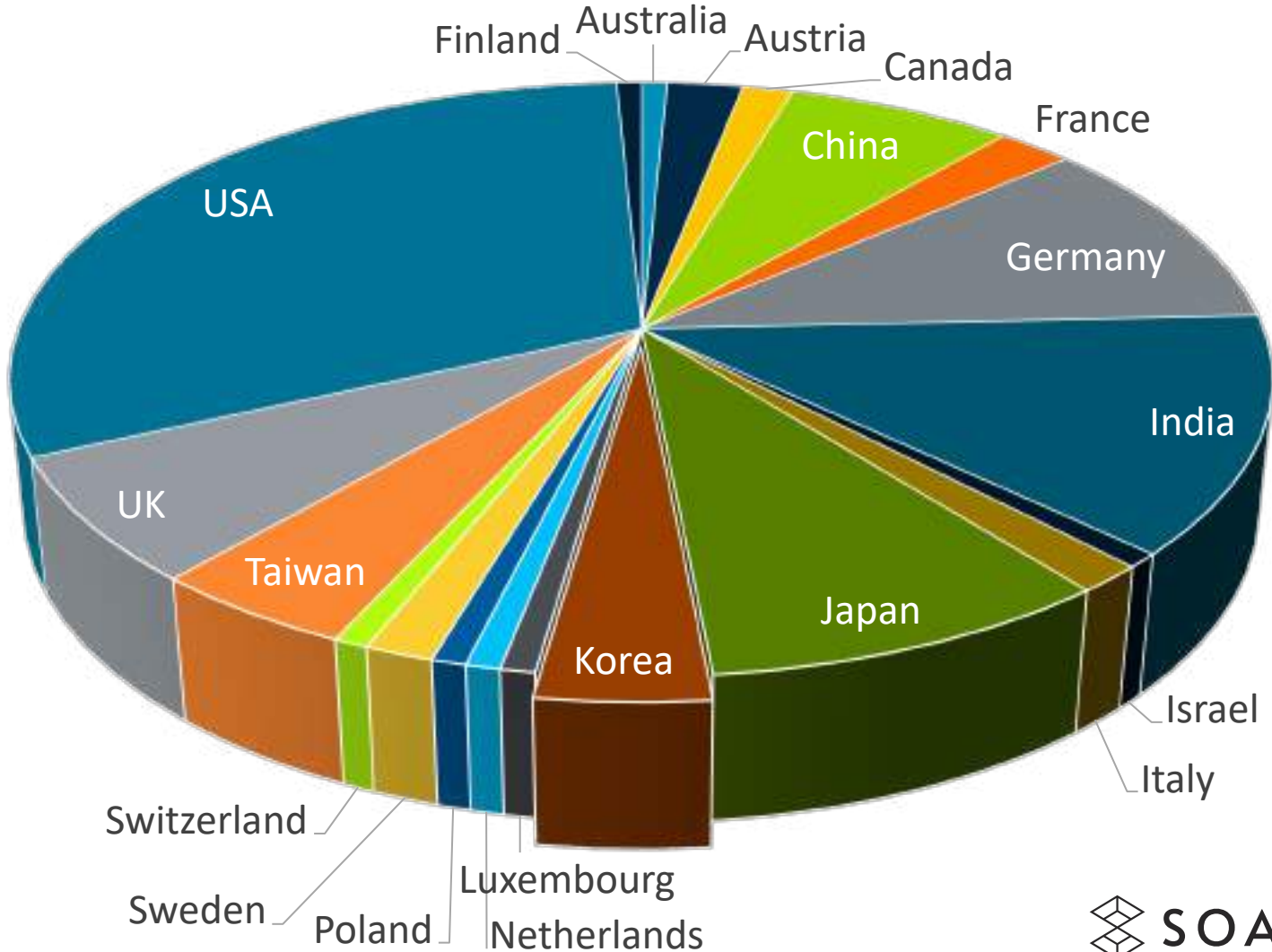
- Strong representation across the automotive, software, hardware, and cloud providers



SOAFEE Membership by country – Sept 2024

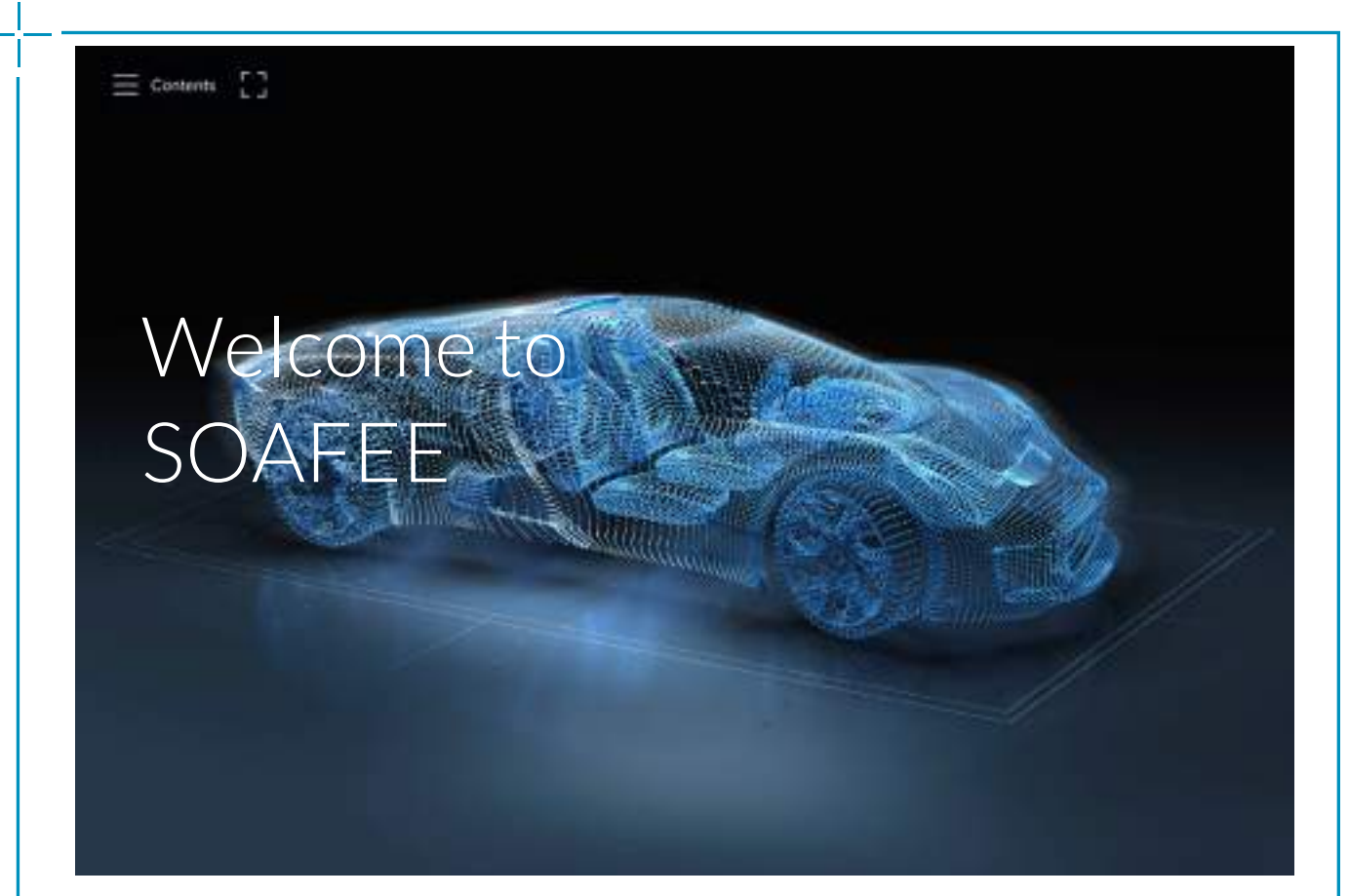
- Membership by geographic region :

- APAC - 38%
- Americas – 33%
- Europe – 29%



SOAFEE Ecosystem

- Tobias McBride is now managing SOAFEE members:
 - New members sign up and onboarding using Turtl doc
 - Existing members check-ins, promotion of SOAFEE activities
 - Member to member introductions
 - Member communications
 - SOAFEE Blueprints



SOAFEE – The Journey So Far

>35 ongoing SOAFEE projects, Blueprints, PoCs & demonstrators

- Different workloads including :
 - ADAS /AD
 - IVI/ Cockpit
 - Connected car
- Based on both EWAOL and commercial software
- Some demonstrators running on vehicle chassis
- Collaboration between SOAFEE and other consortia

Roadmap to mixed critical compute (2025)

- Utilizing member and community projects
- Active workgroup participation
- Demonstration based on existing SOAFEE blueprints



SOAFEE

SOAFEE 101 & Technical Update

John Penn
September 2022

John Penn

SOAFEE: What is it?



Ecosystem

- **Members working together**, in a SIG, to create **Standards based** Commercial or Open-Source offerings for the Automotive world
- May use 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

- Community driven architecture focusing on a broad range of problem domains and technologies for the SDV

- **One way, not the only way!**

Reference Implementation

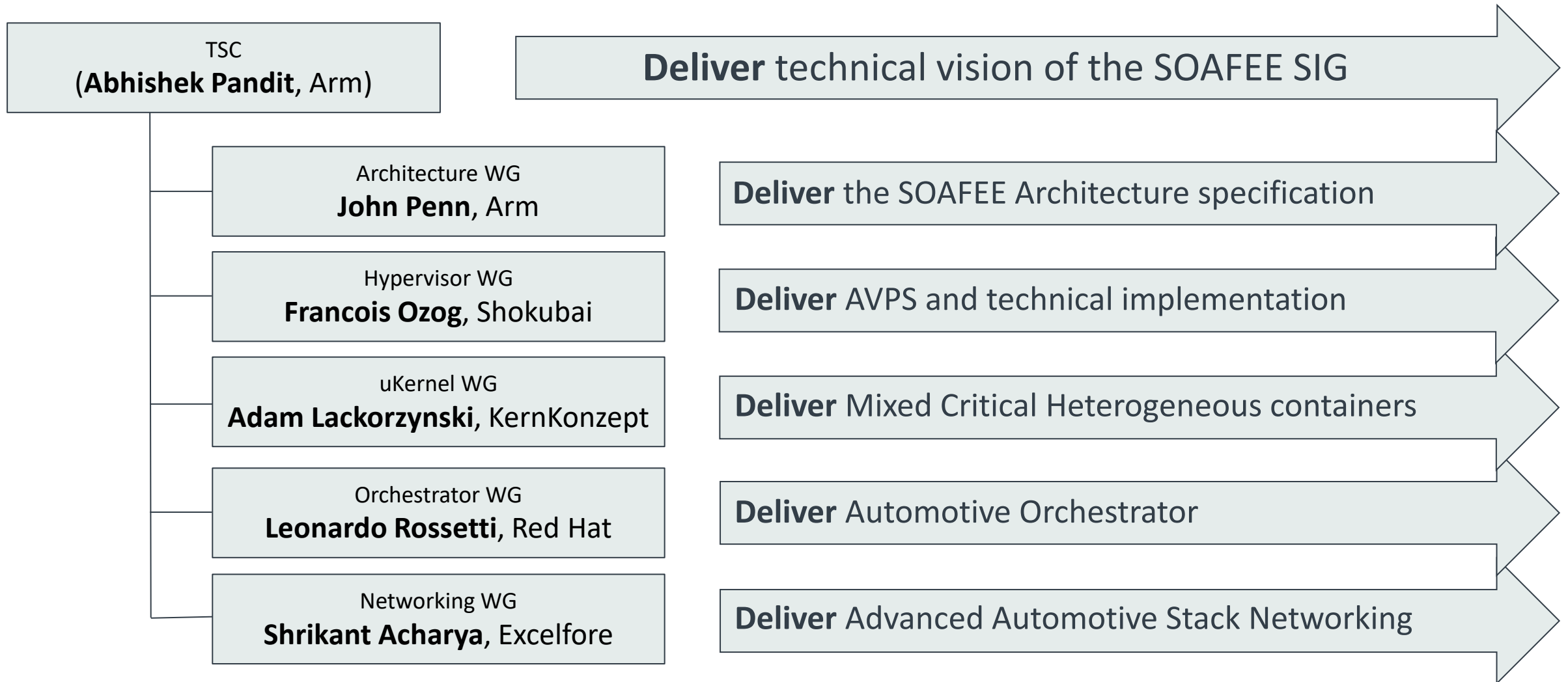
- **Edge Workload Abstraction and Orchestration Layer** is a **reference** implementation for **education** about the SOAFEE Architecture and Vision

- **“OS/Hypervisor layer and above”**.

Blueprints

- **Applications** that **uses**, contributes to or extends the SOAFEE architecture
- May be Commercial or Open-Source
- Example applications, Tool methodologies, new OS components, enhancements, standards-based implementations or ...

SOAFEE TSC- Focus on **Delivery**



SOAFEE Architecture

More than Open Containers Initiative (OCI) containers

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 ... Upcoming Topics

- **AI/ML – 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 WGs: Mixed Critical Blueprint

Workload orchestration and Deterministic Networking

Heterogeneous Containers

- OCI compliant delivery to Real Time and MCU environments
- Enable us to deploy to Cortex-A, R and M

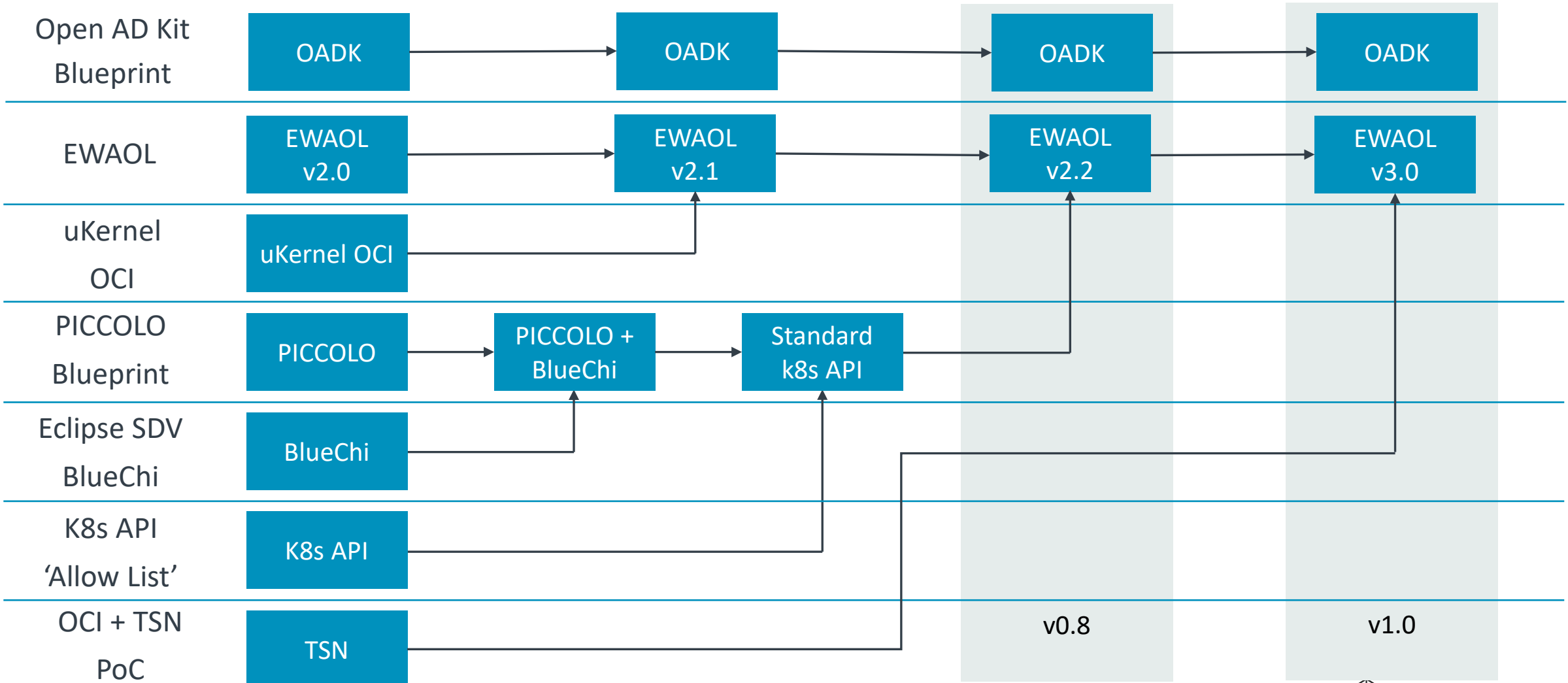
TSN into Containers

- Realtime networking through CNI interface
- How to mitigate non-deterministic behavior through veth and bridge

Orchestrator Namespace

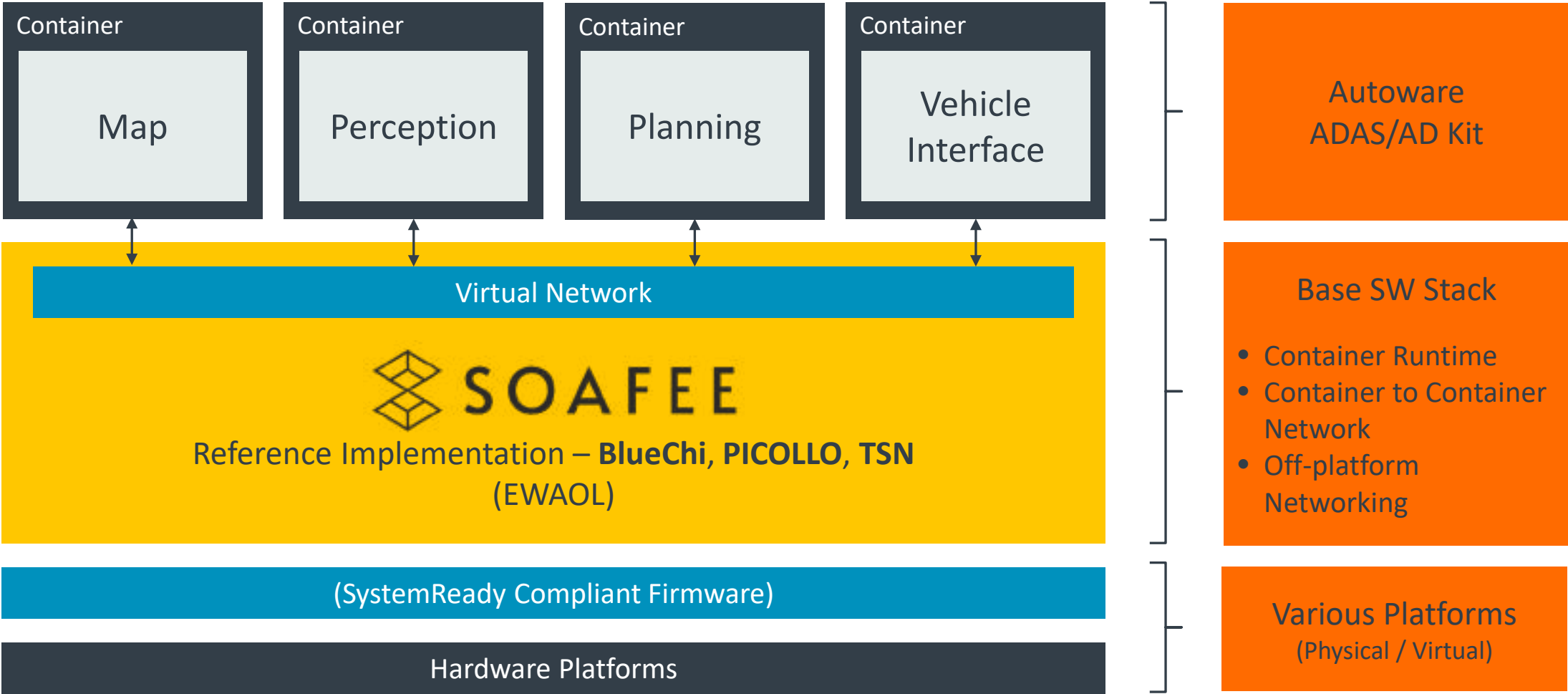
- Define parts of the k8s namespace that are mandatory for automotive
- Enables commercial orchestrators to focus on key functions

The Mixed Critical Plan - Collaboration is Key



SOAFEE Blueprints – Example: Autoware Open AD Kit Blueprint

V2 architecture





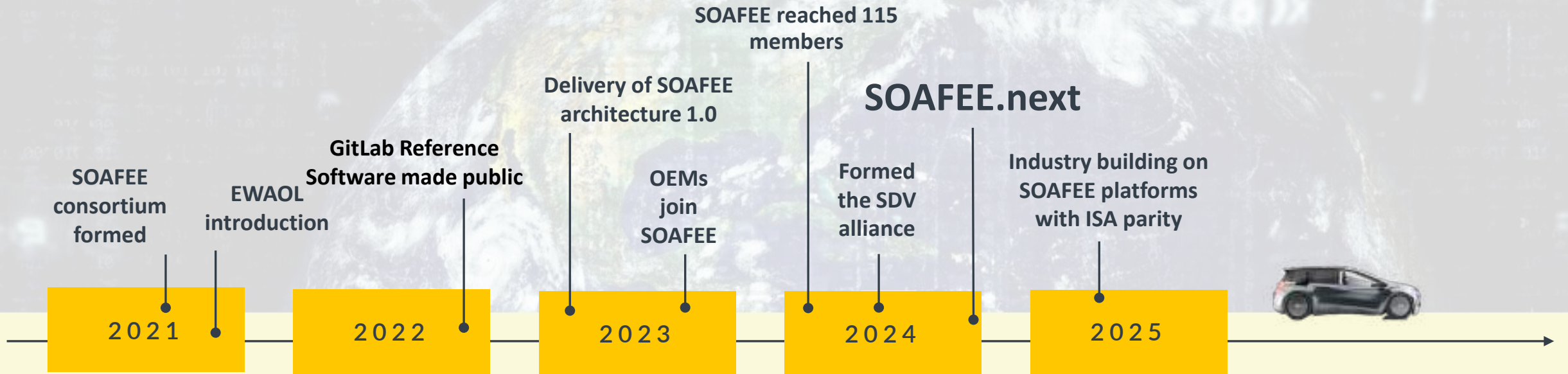
SOAFEE

Enabling SOAFEE.next

Arm's Investment to SOAFEE for the Ecosystem

John Penn
September 2020

SOAFEE Roadmap

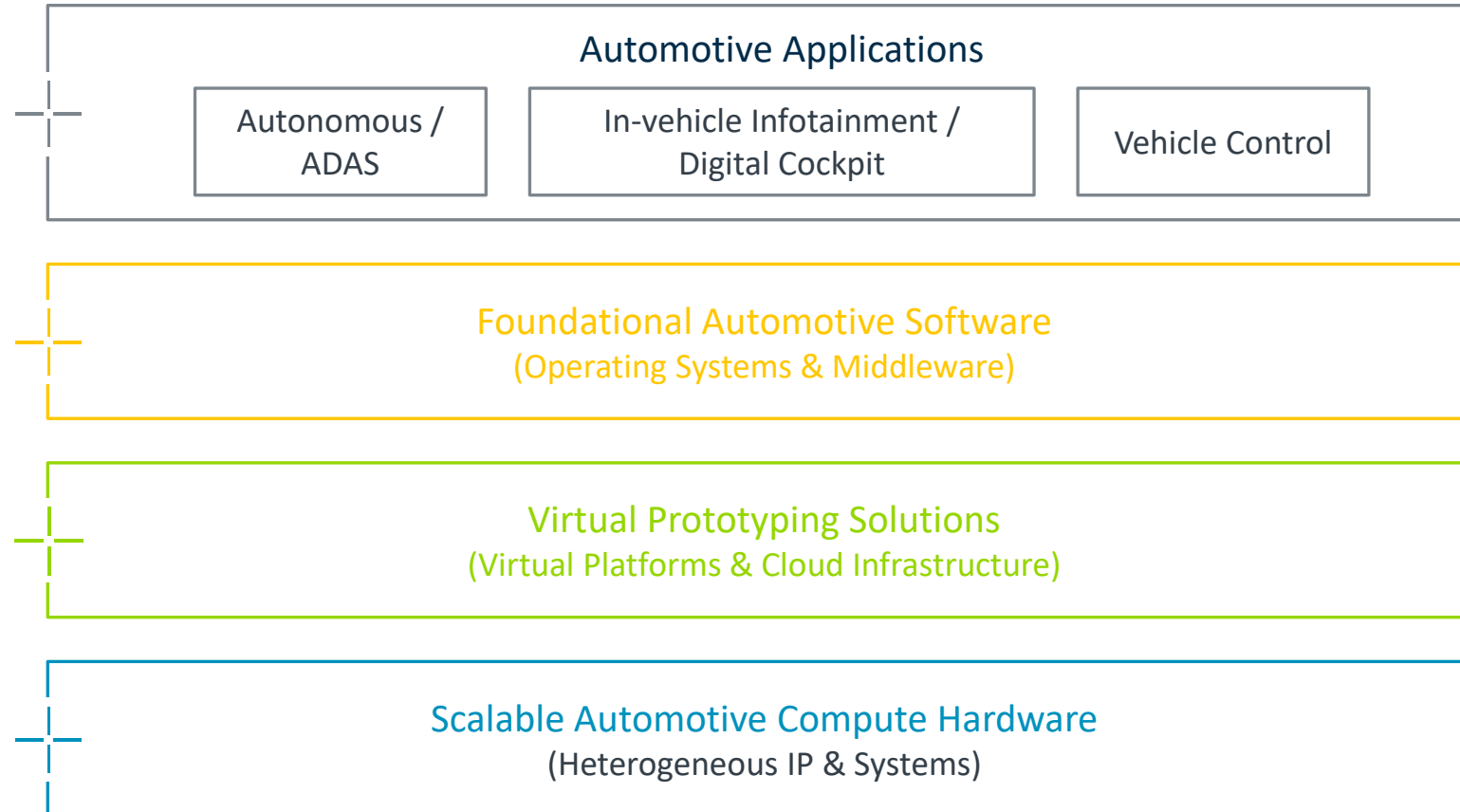


SOAFEE is an industry-led collaboration between companies across the automotive and technology sectors...

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.

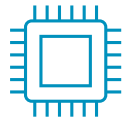
The Automotive “Technology” Stack

A complex landscape that requires collaboration



SOAFEE.next

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



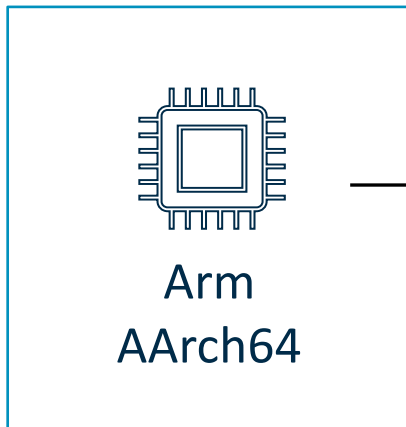
CI/CD & Services

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

Virtual Prototyping Enables “Shift Left” Development

Cloud / ISA Parity

Pre-Design

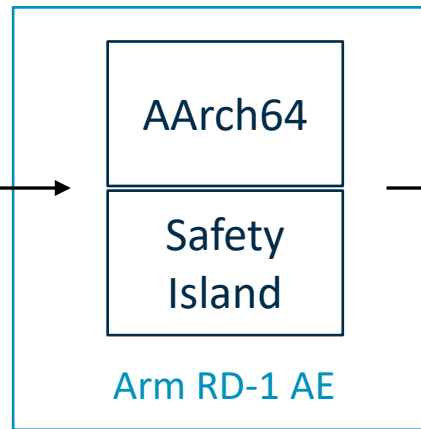


- ✓ Binary Compatibility
- ✓ Register Compliance
- ✓ API Equivalence

Identical ISA

Virtual Prototype

Pre-Silicon

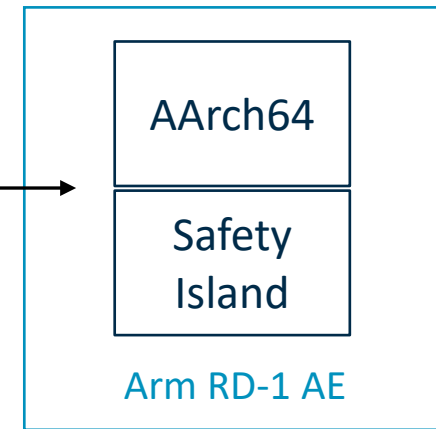


- ✓ Binary Compatible
- ✓ Register Compliant
- ✓ API Equivalence

Identical ISA

Physical Platform

Post-Silicon



SOAFEE Blueprints

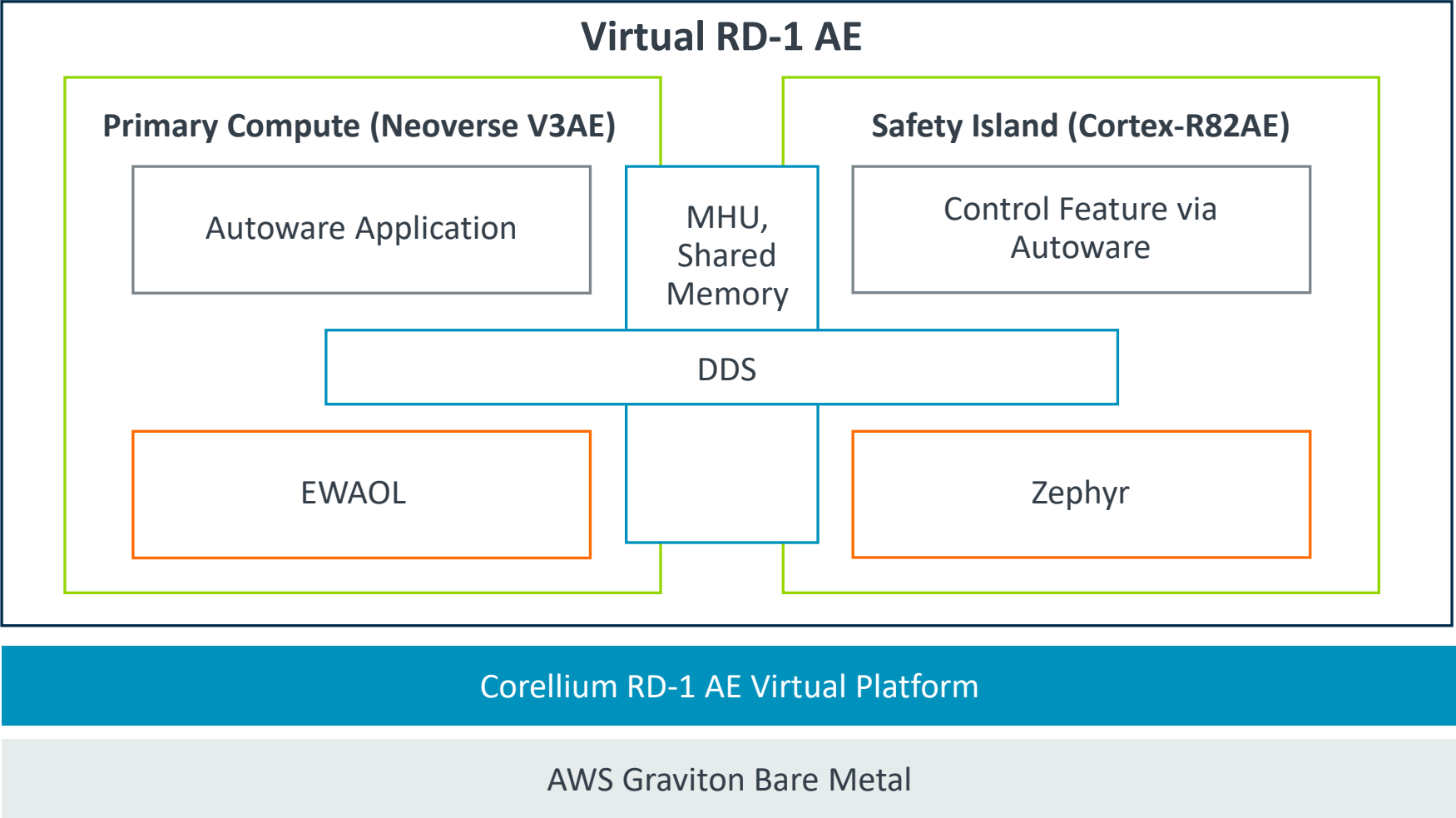
meta-ewaol

Safety Island Applications

Arm RD-1 AE Firmware

Arm RD-1: Mixed Criticality and Virtual Platform

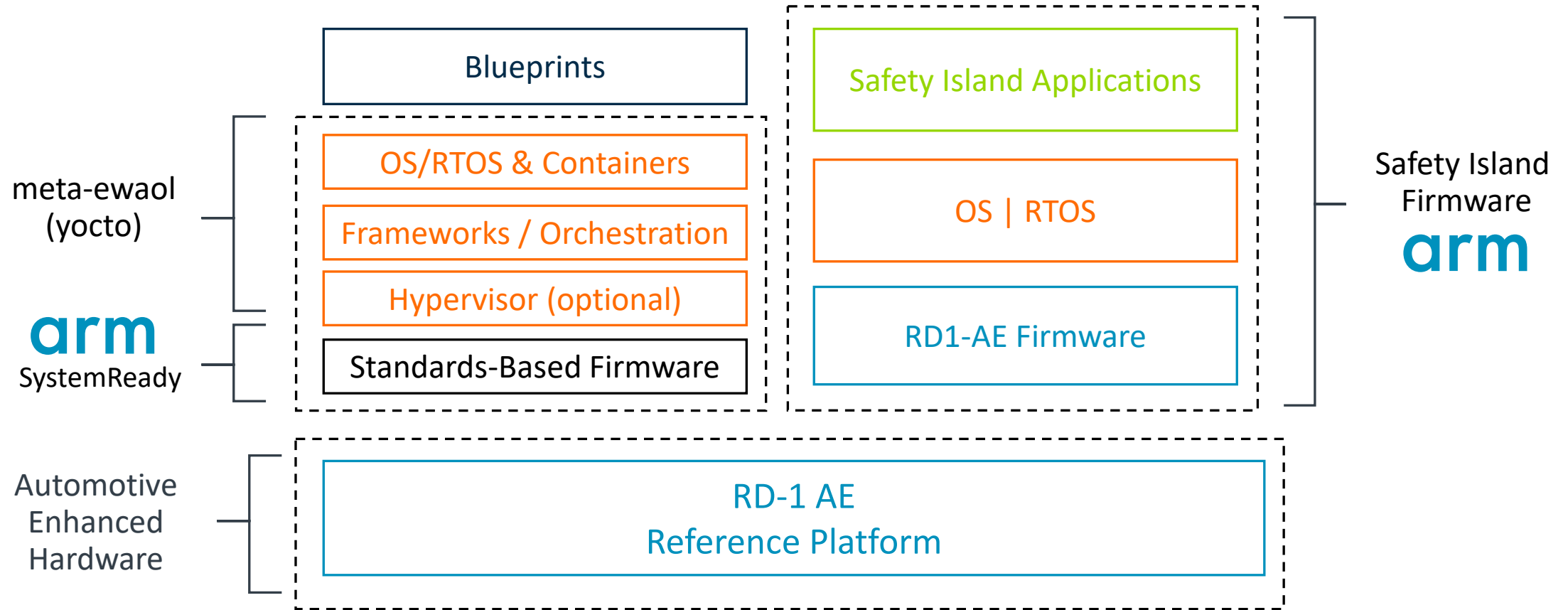
Full cloud-hosted virtual environment – enablement on virtual hardware



EWAOL 2.0

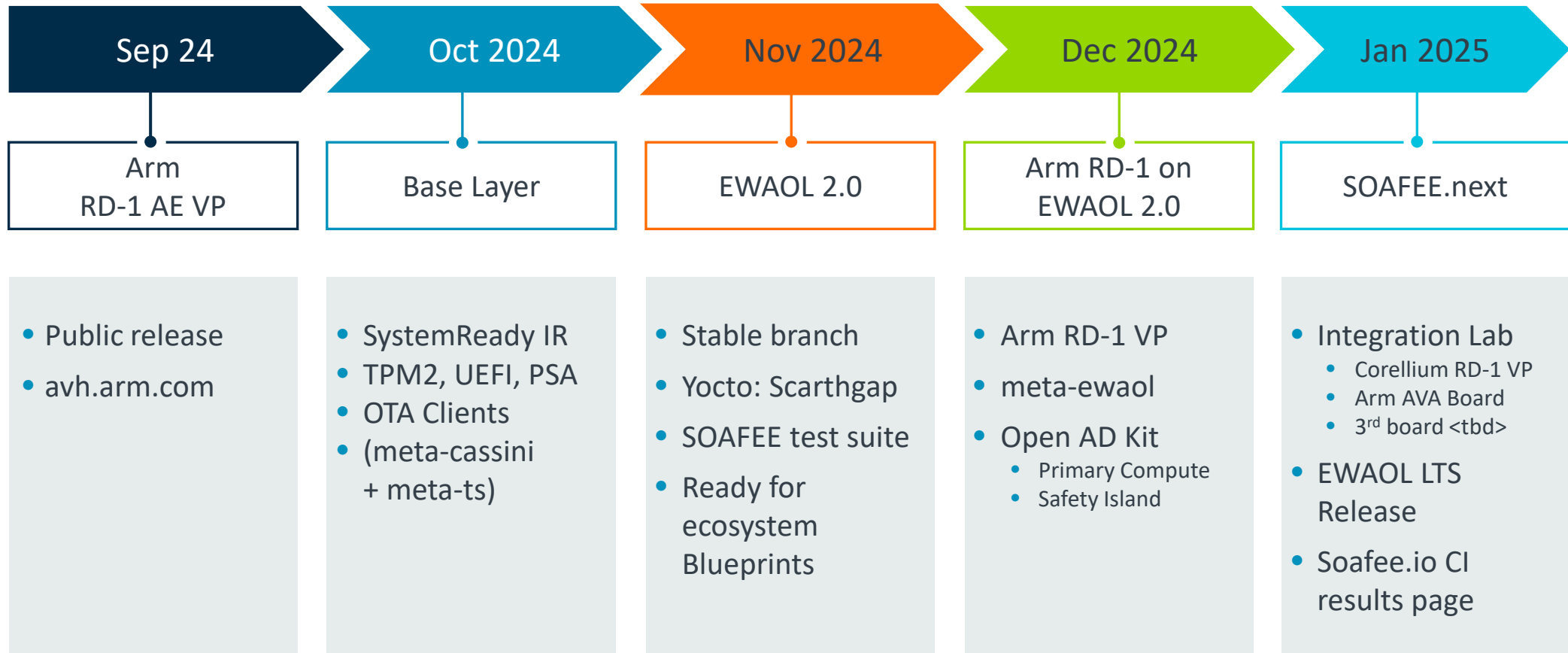
“meta-ewaol” SW + Safety Island FW

Latest Stable
Yocto Version!
(Scarthgap)



SOAFEE.next Roadmap

EWAOL 2.0, RD-1 VP and CI/CD Services



Enhancing the SOAFEE Experience

Arm's SOAFEE.next Part 2

Enable the SOAFEE consortium to discuss, explore, and develop new implementations, architectures, and business partnerships focusing on the SDV, while promoting their SOAFEE activities to the outside world.

Re-energizing SOAFEE

Goals

- Make it clear how members can leverage SOAFEE
- Show members how to be more involved in SOAFEE
- Increase Participation in TSC
- Gather and publicize the SOAFEE Community's efforts

Actions

1. Improve Member Activation
 - “Top down” via GB
 - “Bottom up” via
 - Member Management (Tobias McBride)
 - TSC/WG Management (John Penn)
 - MSC Management (Robert Day)
2. Improve the Blueprint process to energize members & ease consumption/contribution
3. Use the success and proliferation of Blueprints to fuel the TSC and SOAFEE Architecture and EWAOL

Fueling SOAFEE!

How you can be part of the SOAFEE journey.

SOAFEE wants your Blueprints!

- Submit your BP – See SOAFEE website for a very **simple** form!
- Present to the SOAFEE TSC – Inspire new topics of discussion

Work with SOAFEE Ecosystem Partners

- A path to **commercialization!**
- Contact MSC for guidance on Partners who have technologies you are interested in!

Work with the TSC

- **Join a WG or Send your questions / proposals to the TSC**
 - Alternative: Submit them to the TSC or Architecture WG lead (John Penn)

Visit the SOAFEE Website

- The source for Updates, News and Member presentations
- New updated website coming!

Still not sure how?

- Contact **Robert Day, Tobias McBride** or **John Penn** directly for help

SOAFEE Contact and Website Information

Suraj Gajendra – Governing Body – Chairperson	Suraj.Gajendra@arm.com
Robert Day - Marketing Steering Committee – Chairperson	Robert.Day@arm.com
Tobias McBride - SOAFEE Partner Manager	Tobias.McBride@arm.com
Abhishek Pandit - Technical Steering Committee – Chairperson	Abhishek.Pandit@arm.com
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Leonardo Rossetti - Orchestrator WG	lrossett@redhat.com
Shrikant Acharya - Networking WG / TSN	shrikant@excelfore.com
Adam Lackorzynski - uKernel OCI WG	Adam.Lackorzynski@kernkonzept.com
SOAFEE Website	www.soafee.io Calendar - https://www.soafee.io/community/calendar

Making the Software-Defined Vehicle a reality



SDV
ALLIANCE

Robert Day

Why the Software-Defined Vehicle (SDV) ?

The promises of a future software-defined vehicle are great and wide-ranging

- Hardware-based (static) → Software-centric (dynamic)
- Introduction of new features & services
- SW-driven platform-approach across carlines and models
- Tracking/correcting bugs/issues in the field
- Extending lifecycle of the vehicle (and keeping it up-to-date, secure and safe)
- Alignment with the digital world of the vehicle occupants
- Opportunities for new relationships and business between OEM and vehicle user
- And many more...

The SDV Journey is Underway

In 2023, 50% of Top 10 Automakers Will Offer New Features Through Software Updates

SOURCE: GARTNER

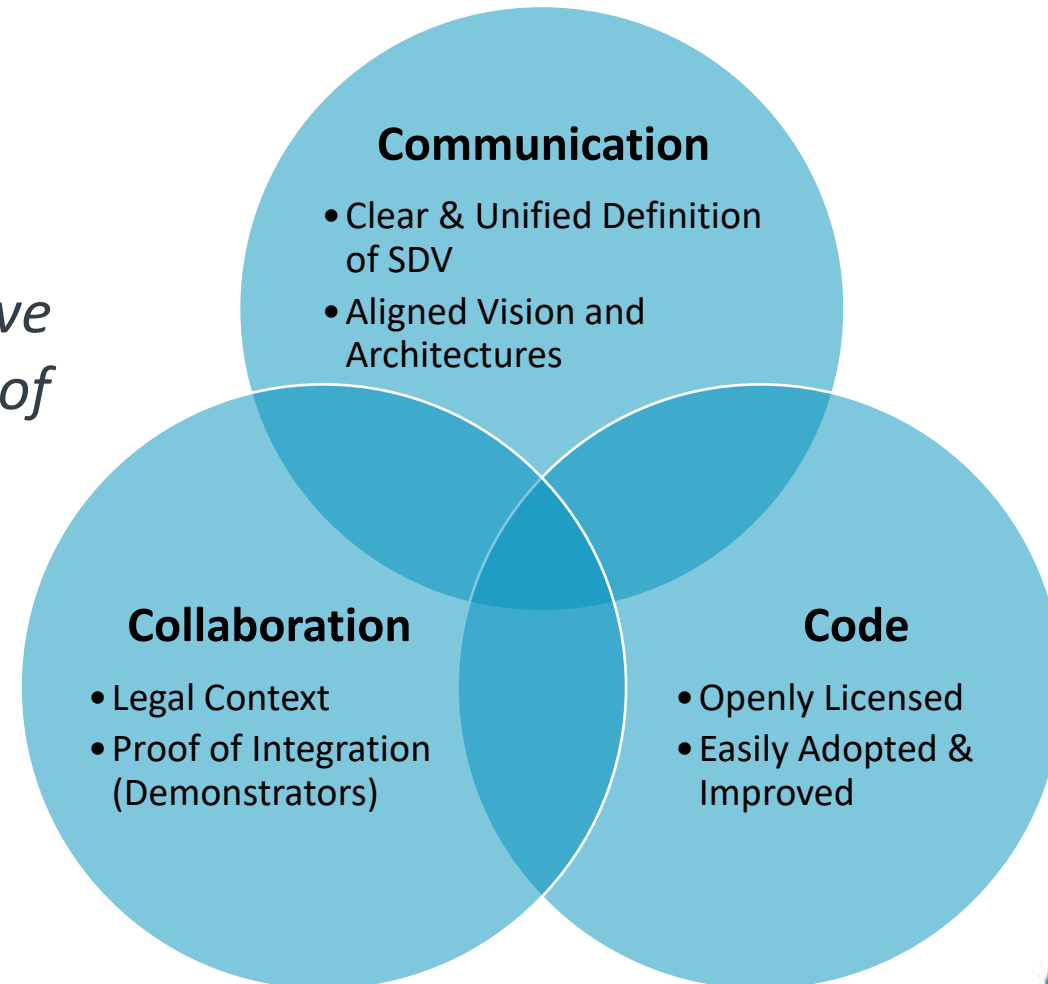
44% of respondents would pay up to \$20 per month for additional services after buying a car; 14% would even pay up to \$50

SOURCE: AURORA LABS/STRATEGY ANALYTICS

SDV is bigger than any one organization

Aligning the Industry Around SDV

*How will the automotive-centric communities, including technology standards and software organizations drive the **change** to realize the **great promises** of the **SDV** in reality?*



The SDV Alliance

Initial collaboration between 4 SDV organizations

- Bringing over 500 automotive and software ecosystem companies to meet the needs of the software-defined vehicle
- Combines cloud to edge, connected car, open source, open standards, safety, and real time



SDV Alliance - Launch

- Launched on January 9th 2024 at CES
- SDV Alliance booth at COVESA networking event (~ 2200 attendees)
- Two demos showcasing technologies from the 4 organizations
- Good interest from automotive industry



SDV Alliance – What does collaboration mean ?



Aligning efforts in the SDV ecosystem



Create clear definition of what constitutes an SDV



Examine the technologies, methodologies, and standards from each of the alliance consortia and show how they can work together for the development of the SDV



Education of SDV market for the artefacts from SDV Alliance consortia members and how they interoperate



Pooling the skills from each consortia to create a joint SDV vision



Focus on architecture, technologies and copyright and IP collaboration

SDV Alliance - FAQ

- SDV Alliance is not a legal entity, it is a collaboration framework for automotive software related consortiums to work together
- SDV is an open alliance and is open to other like-minded consortia to join and collaborate
- Any member of any of the SDV Alliance collaborating consortia can get involved with the SDV Alliance workstreams
- SDV Alliance's purpose is not to produce technology, but to align necessary technologies and plan for integration of those technologies produced by its participating consortia
- When possible, results from the SDV Alliance will be published on a joint and open github instance

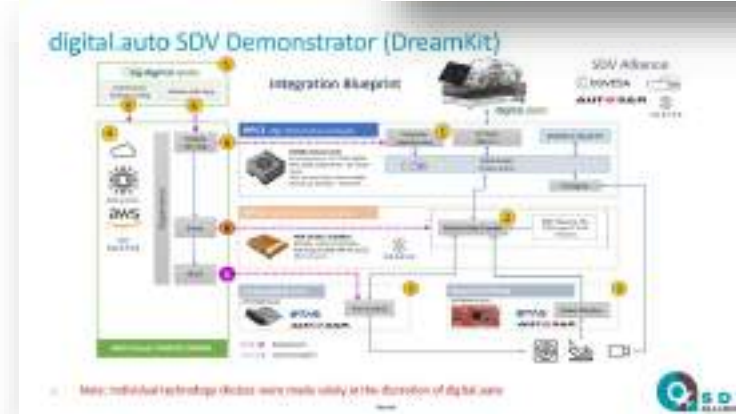
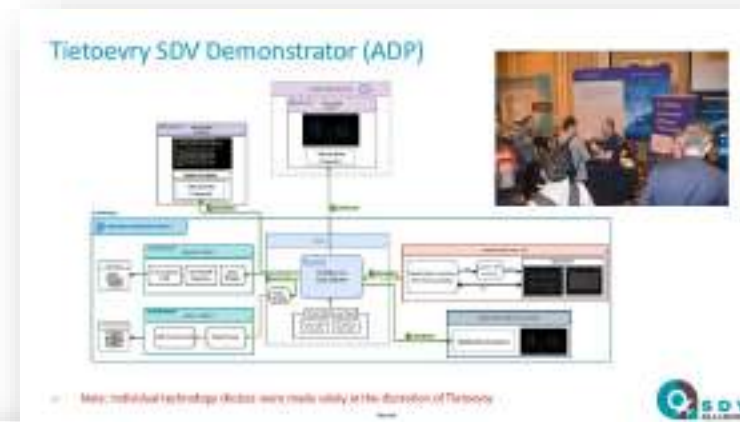


Collaboration in action

Initial PoCs and demonstrators from CES 2024

Demonstrator goals and existing setups

- Mid-Term goal: Show the compatibility of identified and selected SDV related technologies from different consortia
- The technologies will be based on the elaborated joint definition of the SDV alliance of an SDV
- These identified technologies need to work as seamless as possible together
- Until mid-term demonstrator based on the technologies is defined, existing industry demonstrators are extended to show current compatibility



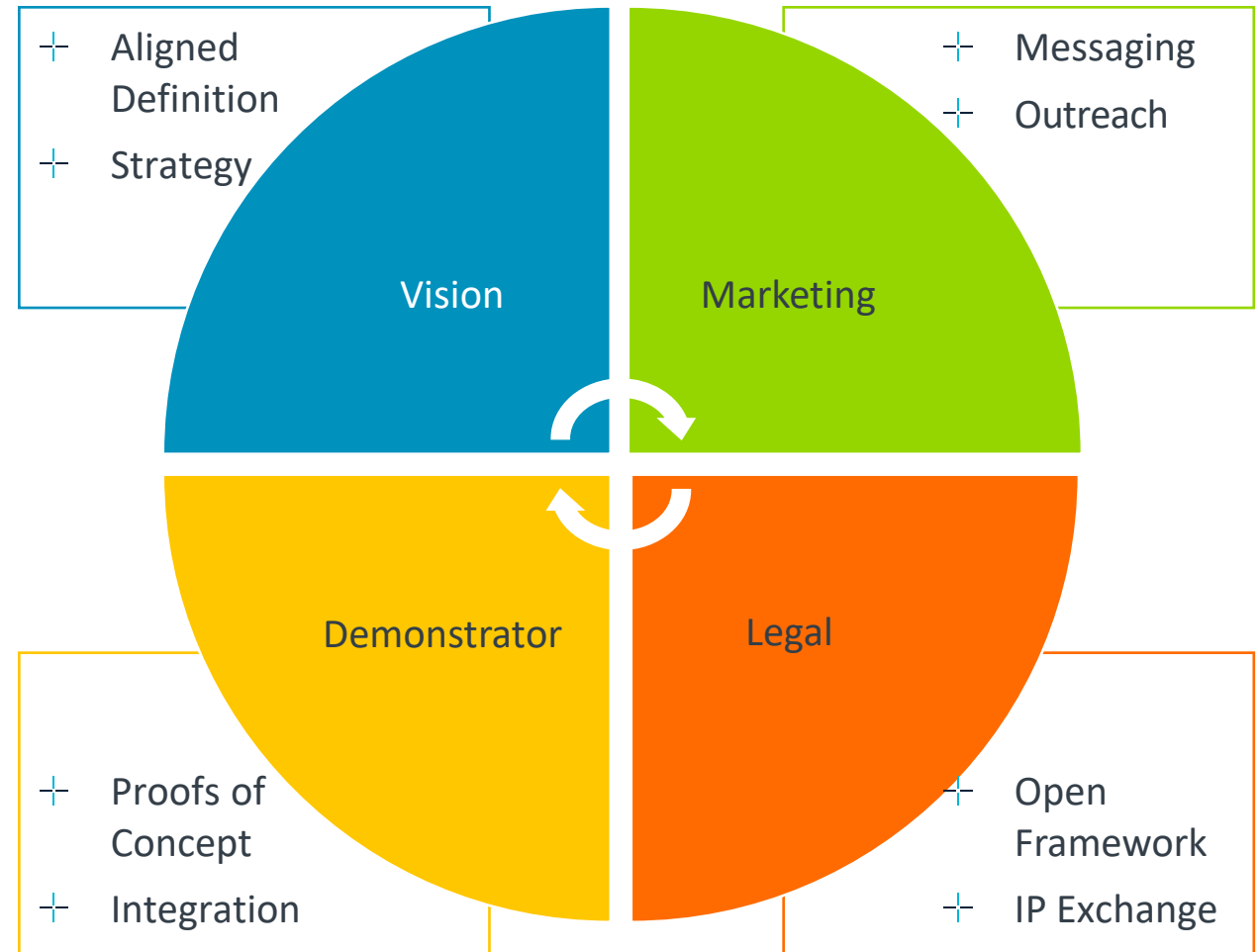


SDV Alliance
What's next ?

What's Next for SDV Alliance

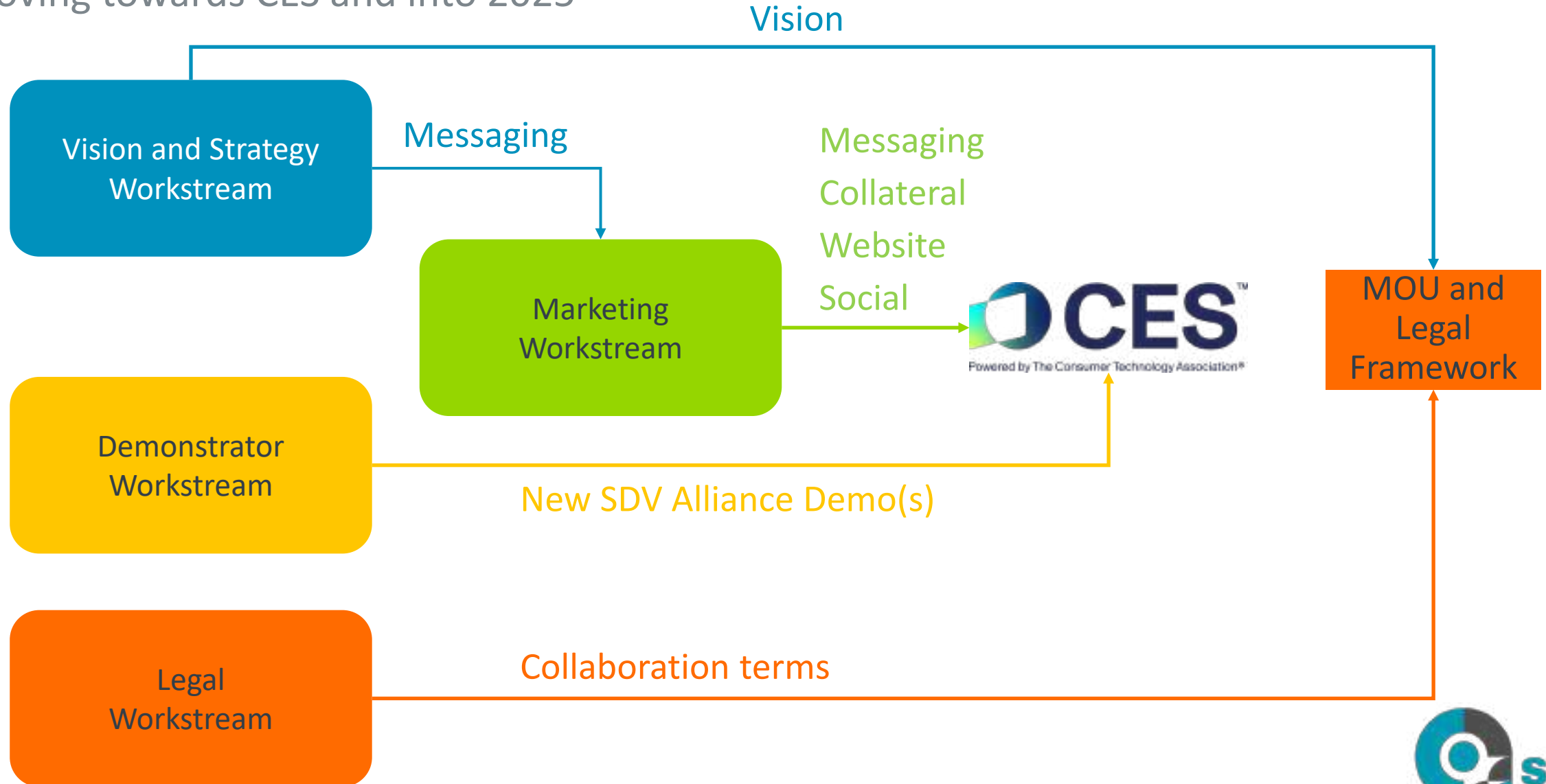
- Four active work streams
- Each workstream led by one of the alliance consortia, and manned by members from all
- Each workstream will have its goal and roadmap for 2025
- Active workstream recruitment starting now

Collaboration MOU in process for existing and new alliance members



Workstream Planning

Moving towards CES and into 2025



How to get involved

- The alliance workstream members will reach out to their consortia members to look for active participation in the workstreams
- Alternatively – please reach out to your consortia’s SDV alliance representative :
 - AUTOSAR : Michael Niklas-Höret - michael.niklas-hoeret@continental-corporation.com
 - COVESA : Steve Crumb - scrumb@covesa.global
 - Eclipse SDV : Michael Plagge - michael.plagge@eclipse-foundation.org
 - SOAFEE: Robert Day – robert.day@arm.com



SOAFEE

SOAFEE Q&A



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