Astemo’s Virtual Platform aligned with SOAFEE and evolving towards SOAFEE.next

Tasuku ISHIGOOKA

Technology Development Functional Division,

Astemo, Ltd.

May 15, 2025

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Mobility Beyond

Contents

Greetings

Astemo Logo

Astemo

Combining the first letters of the words "Advanced Sustainable Technologies for Mobility" to form "Astemo," the new name clearly describes the mission of the integrated company: To provide a safe, sustainable, and comfortable mobility life through technologies that contribute to an advanced and sustainable society.

Corporate Slogan Logo

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Our slogan reflects Astemo's dedication to realizing a sustainable society and improving the quality of life for everyone. It expresses our commitment to go beyond technological and personal limits, overcome all types of barriers (whether national, cultural, industry, or organizational), and enable all people to realize greater freedom in their lives, by delivering advanced mobility technology and product solutions to the world.

Product Brands

Astemo　KEIHIN　SHOWA　NISSIN

TOKICO　HÜCO　KIT PLUS

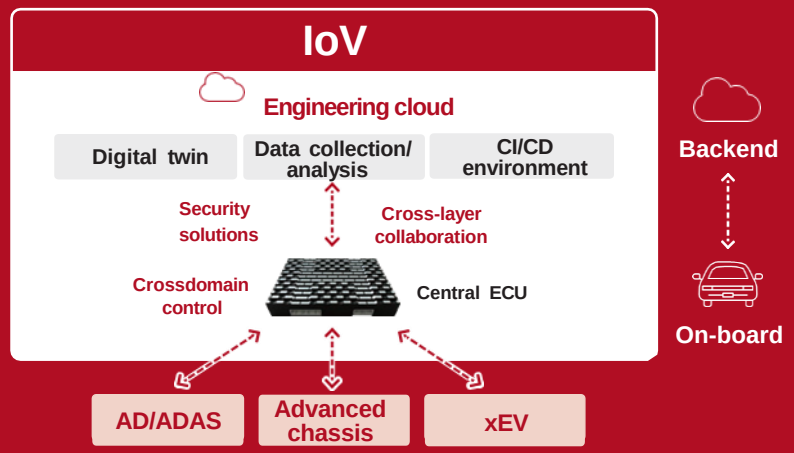
More information
(Web site)

Our business

Astemo
Mobility Beyond

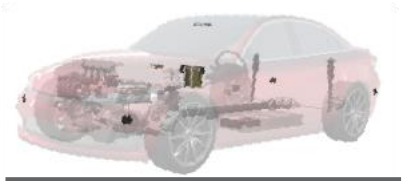
Solutions + Products

Leveraging cloud development environment and high-performance components, cross-domain control provides the ideal solution for the SDV era.



Solutions

Products



Autonomous Driving / Advanced Driver Assistance Systems

Powertrain Systems

Chassis Systems

Motorcycle Systems

Power Products & Industrial Equipment

Aftermarket Products / Maintenance Products

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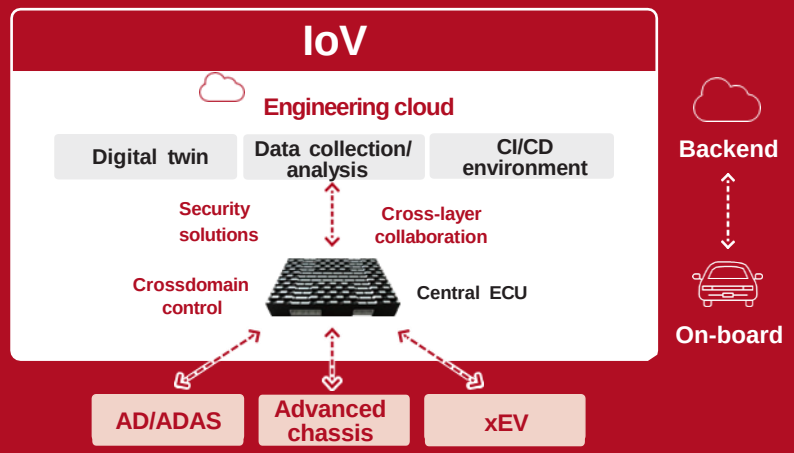

Solutions

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2-1. Market Trend【Architecture】

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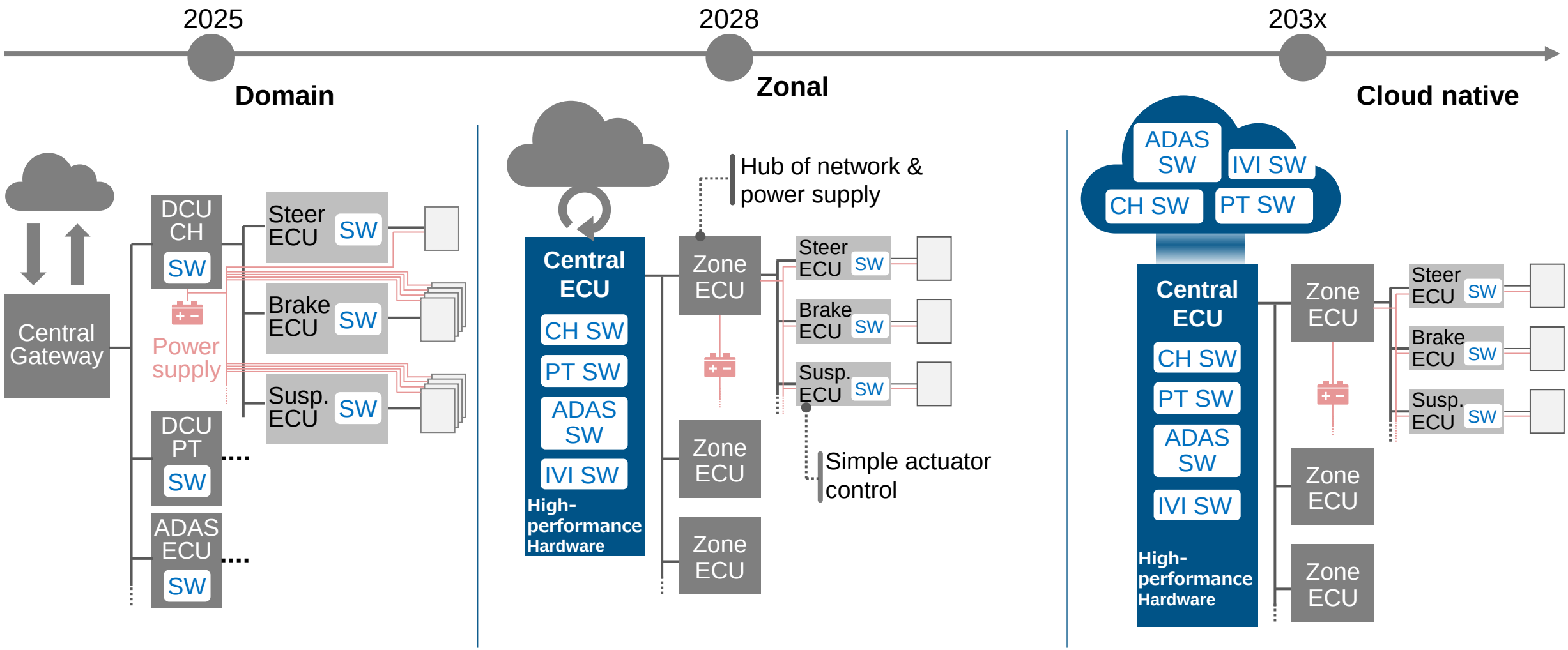
- E/E Architecture is evolving from distributed to **centralized, accelerating HW/SW decoupling.**
- **Evolving performance & functionality by software,** achieving above on **high-performance HW**



2-2. Market Trend【Software-Defined Vehicle】

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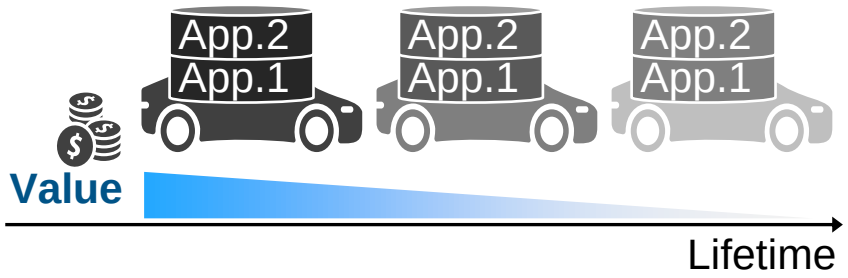
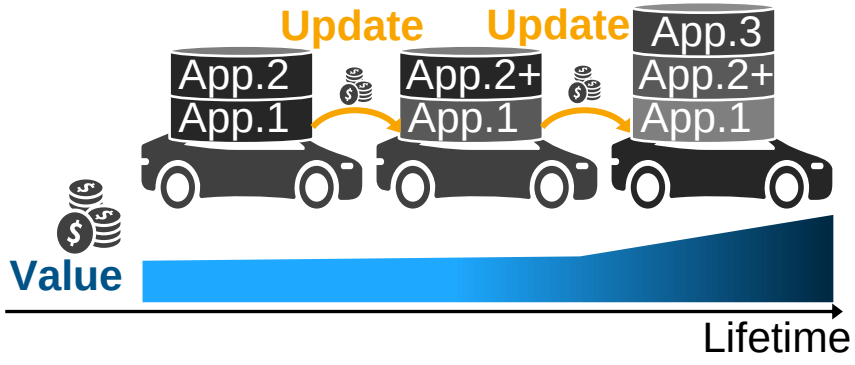
■ As user needs diversify, the business model is **shifting to continuous improvement model.**
■ Monozukuri transforms to DevOps. **Software-Defined Vehicle** is better approach for vehicle evolution.

■Change of automotive business

One-time Sales Business

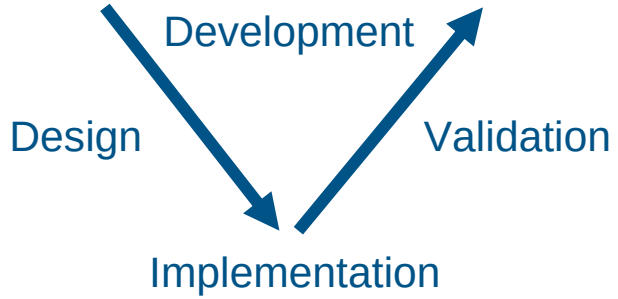


Vehicle Evolution Business

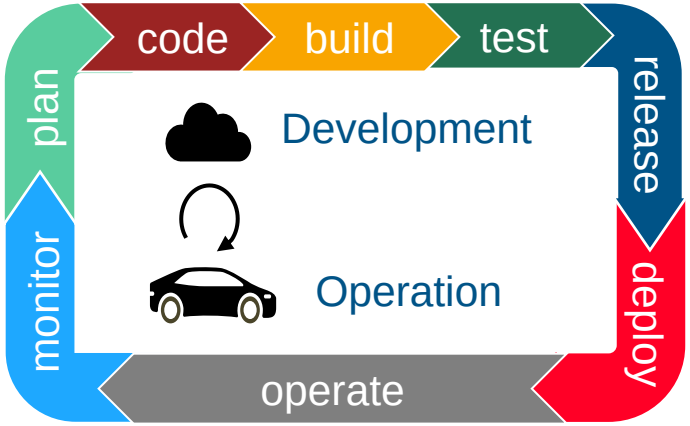


■Transformation of Monozukuri (Development Process)

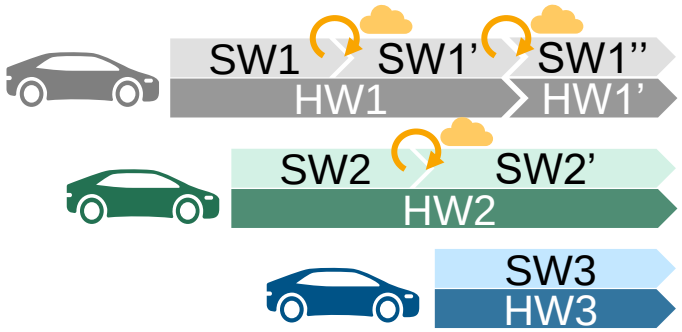
V-process



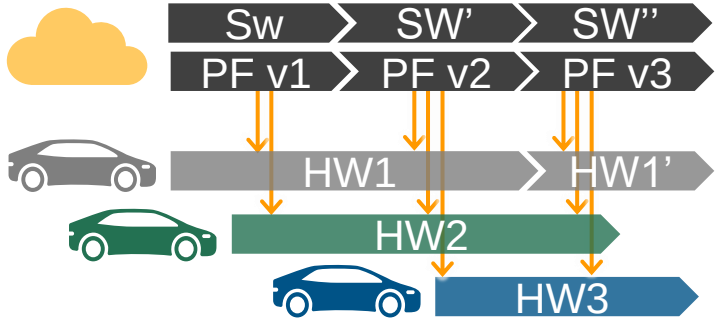
DevOps



Hardware-Defined Vehicle



Software-Defined Vehicle



2-3. Vision: Vehicle Evolution

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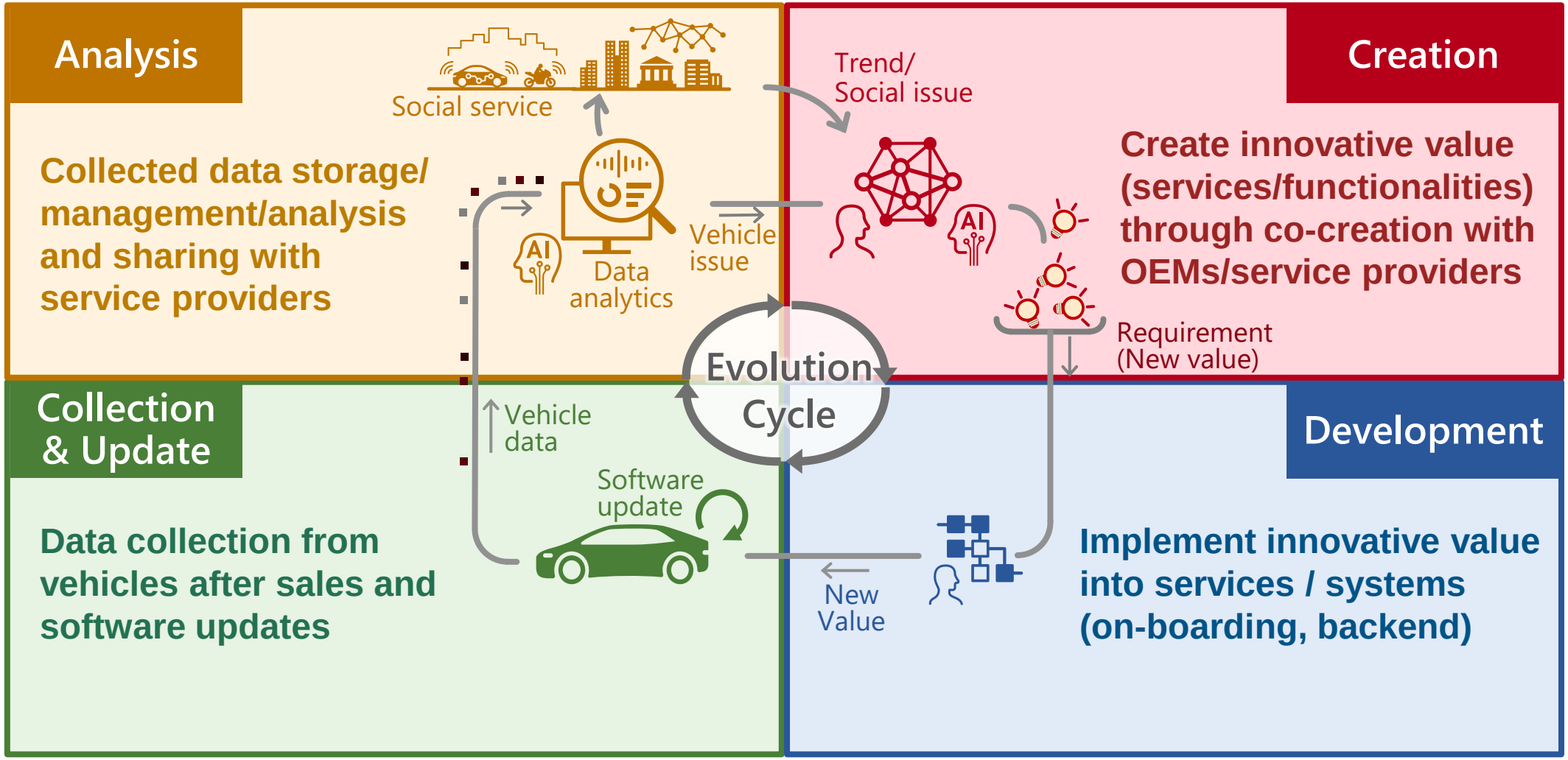
- Defined the **essential functions as: Collection→Analysis→Creation→Development→Update.**
- For following the change of user needs, **a platform that can accelerate this cycle is necessary.**



2-4. Approach: IoV (Internet of Vehicles) Platform

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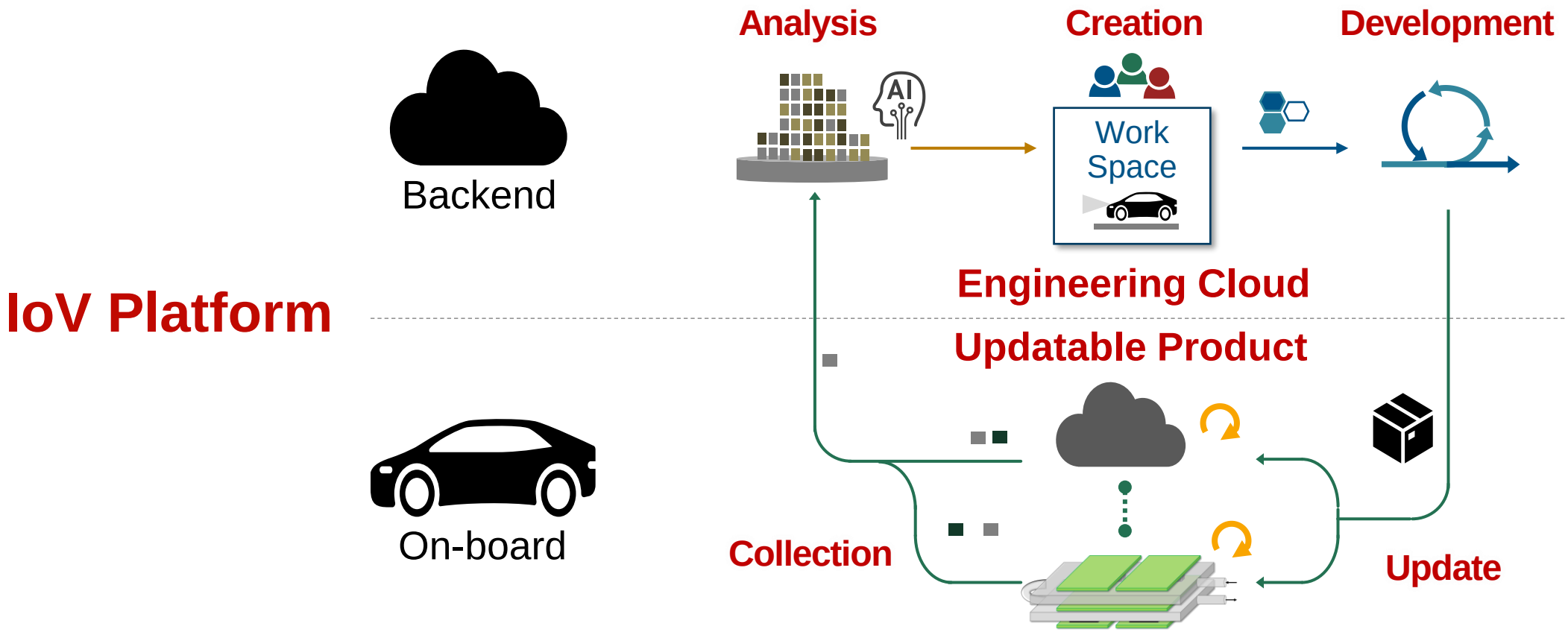
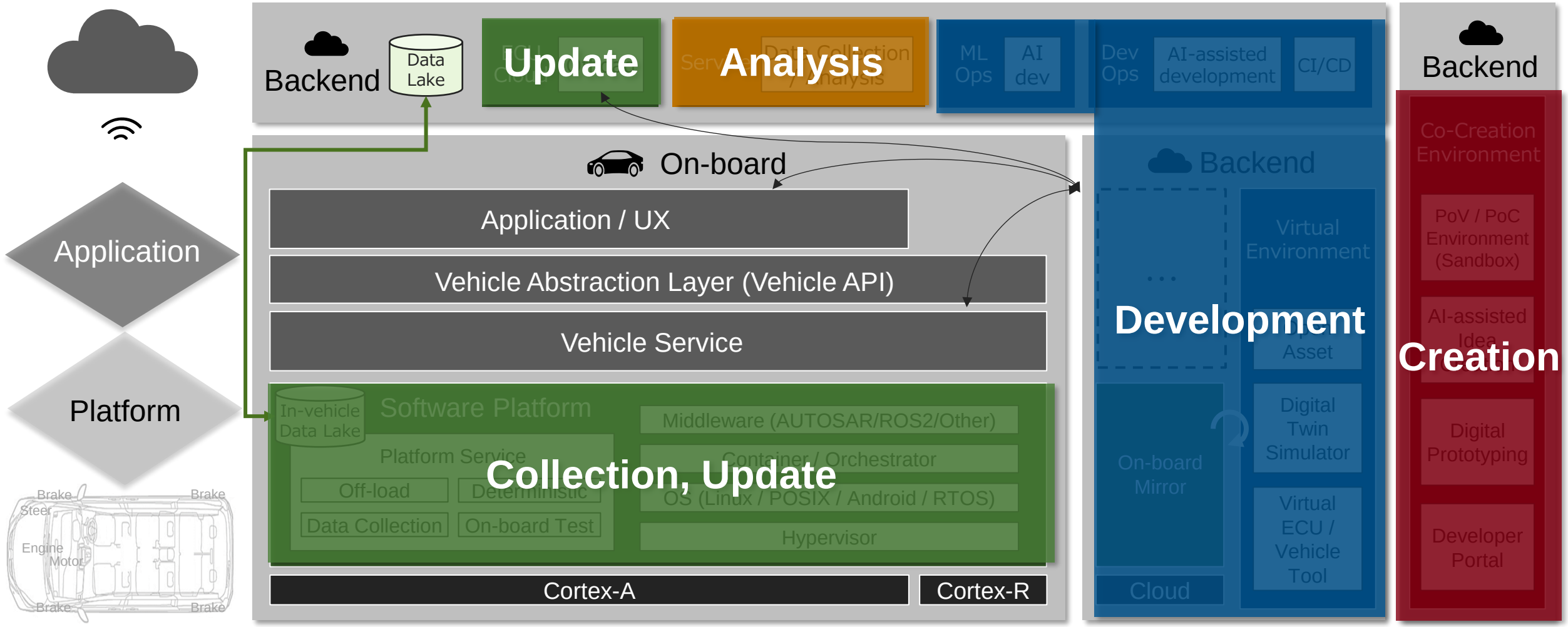
■ **Platform to realize the cycles(collection, analysis, creation, development, update) for vehicle evolution through on-board and backend collaboration**



2-5. IoV Platform: Software Architecture

- **Cloud-native** Software Architecture for SDV to realize Updatable Vehicle
- IoV PF is referring to **SOAFEE / Eclipse SDV** and provides **platform services as extension**.



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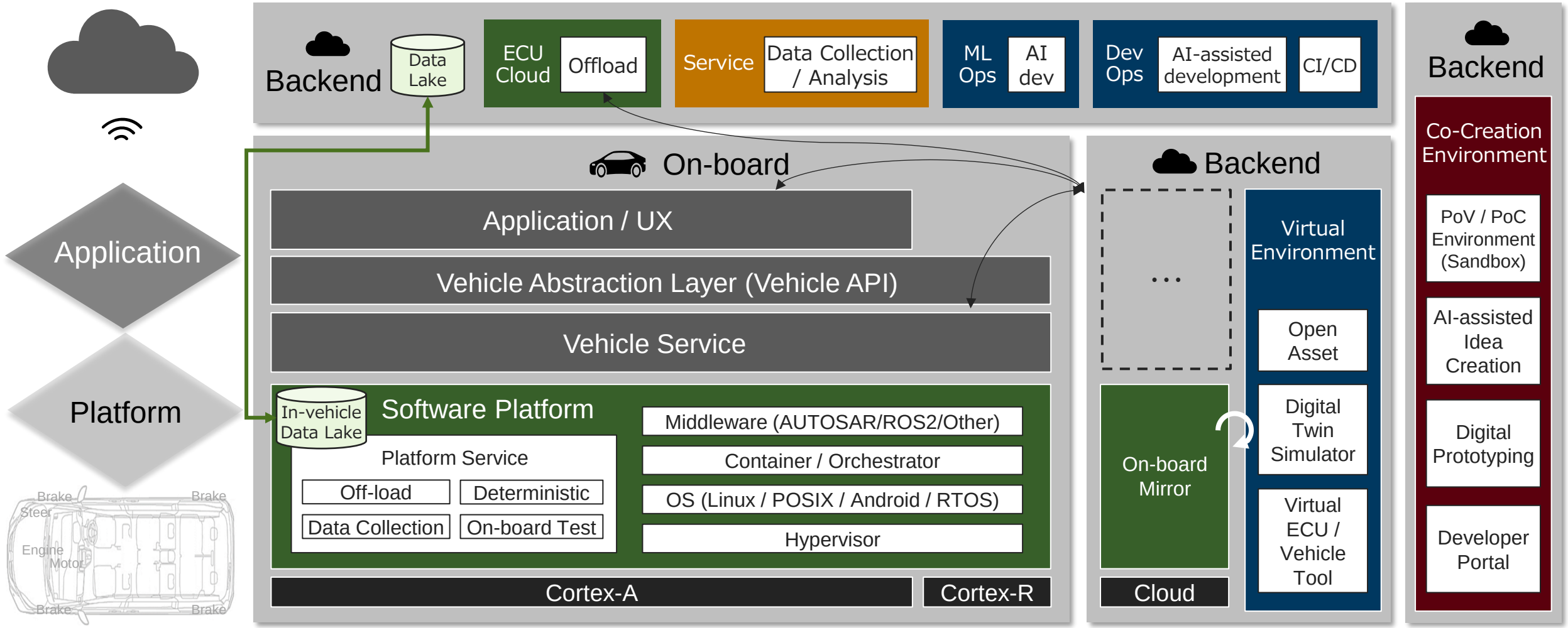

2-7. IoV Platform: Software Architecture

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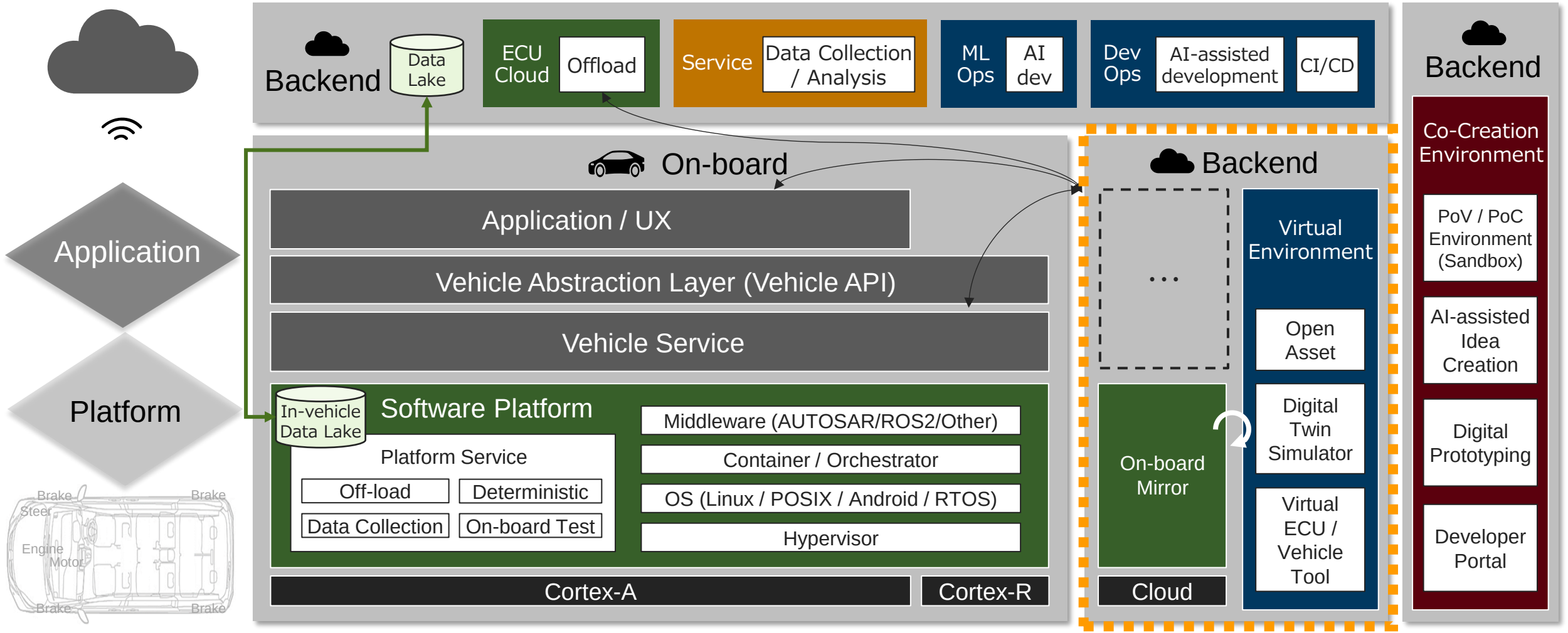

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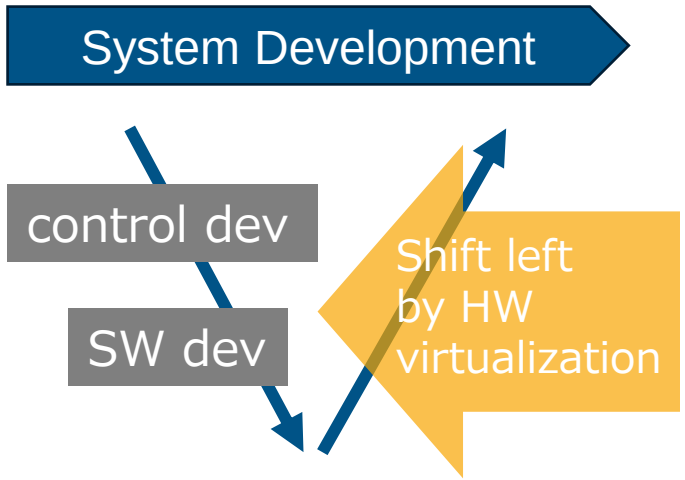
3-1. Main Use-case for Virtual Environment

■ **Traditional use-case** of virtual environment contributes efficient software development.
■ **In value-first development**, virtual environments are also used for **efficient PoV/PoC.**

Software Development Phase

■ Purpose
Accelerate SW development without HW

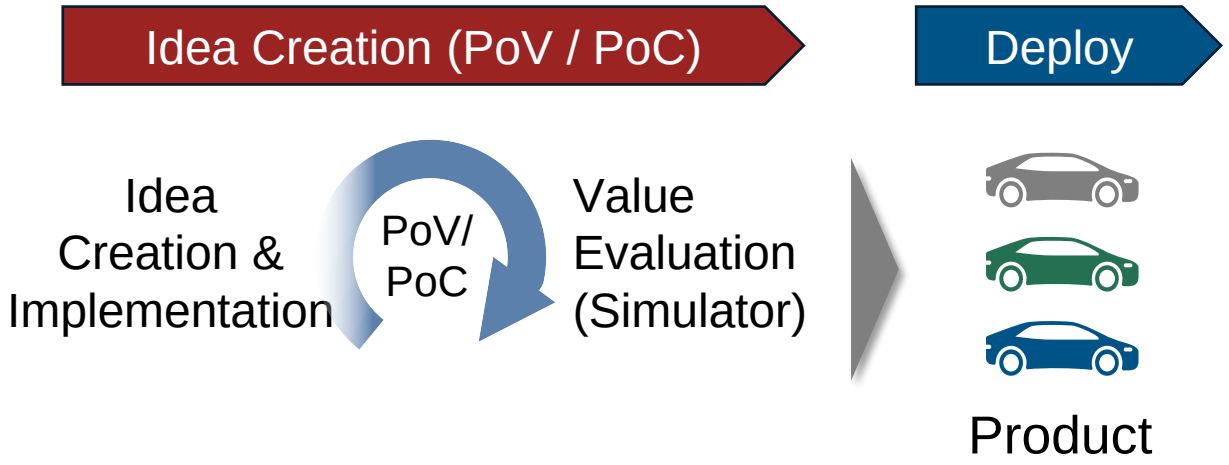
■ Reason
Delay decision on HW selection as much as possible



Idea Creation Phase (Value-First Development)

■ Purpose
Accelerate Idea development by virtual environment

■ Reason
・Evaluate “value” of Idea in virtual environment
・Reduce effort needed for deployment



PoV: Proof of Value, PoC: Proof of Concept

3-2. Major Challenging : Compatibility

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■ **Difficult to find fully compatible HW with both cloud and SoC**, trade off between compatibility (accuracy) & performance, **necessary to select appropriate virtualization level** for virtual vehicle

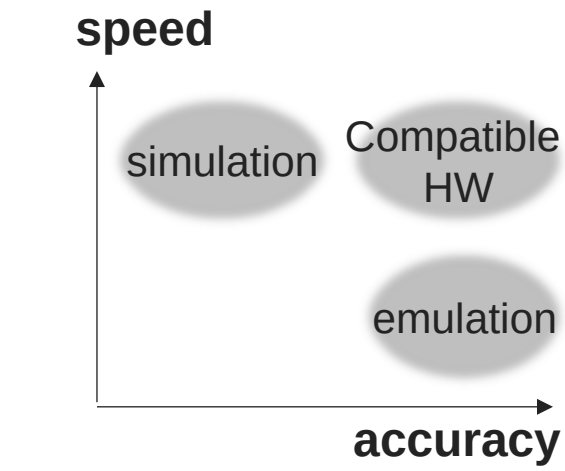
Virtualization Level

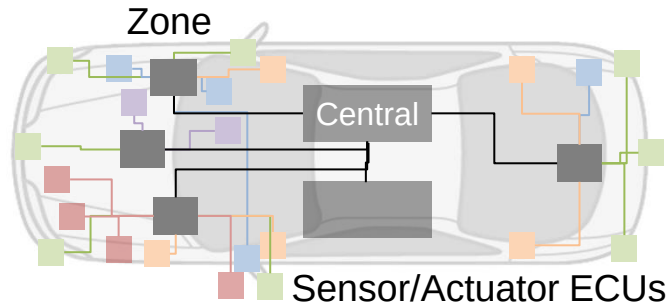
Level	0	1	2	3	4a	4b	Cloud-native		ECU
Method	None	Virtual MW	Virtual OS	Virtual Driver	Virtual HW(Partial)	Virtual HW	Compatible HW(partial)	Compatible HW	None
Structure	Model	App	App	App	App	App	App	App	App
		MW	MW	Mw	MW	MW	MW	MW	MW
			OS	OS	OS	OS	OS	OS	OS
				Drivers	Drivers	Drivers	Drivers	Drivers	Drivers
				Abstract HW	Target HW(Partial)	Target HW	Target HW	Target HW	Target HW
	Host	Host	Host	Host	Host	Host			

Legends: real | simulated | emulated | Bypassed

App: Application, MW: Middleware, OS: Operating System

Trade-off in virtual environment





Reference & custmization：https://www.synopsys.com/content/dam/synopsys/verification/white-papers/virtual-ecu-wp.pdf

3-3. Major Challenging : Cost-Effectiveness

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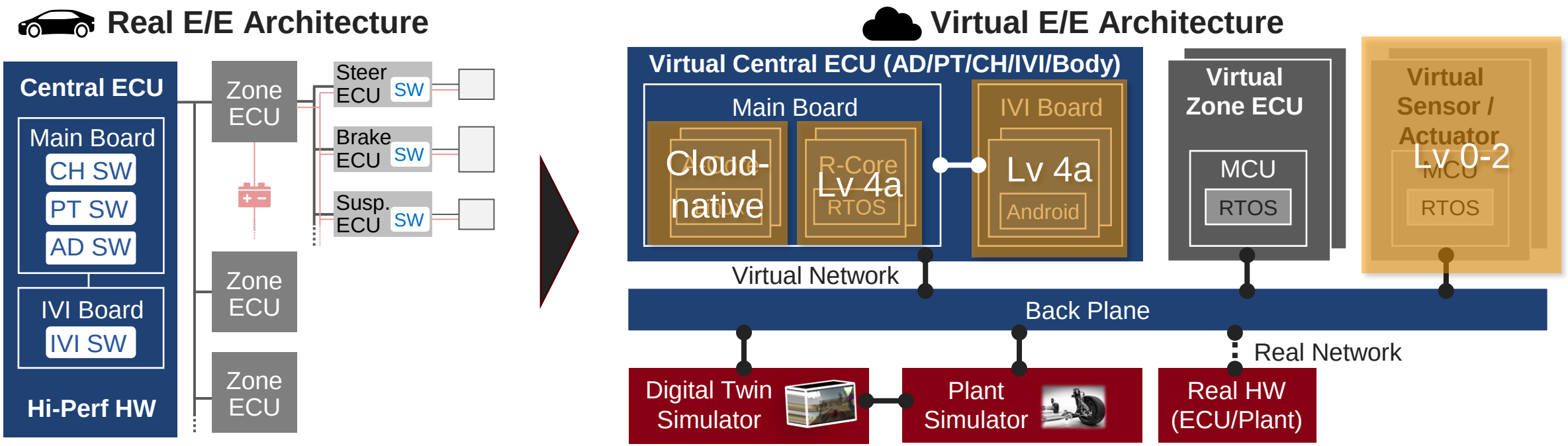
- **Precise virtualization on whole real vehicle causes expensive. Cost-effective way is necessary.**
- Example: network consolidation, zone ECU abstraction, reuse of existing real ECU.



3-4. Example of Virtual Environment (case 1)

- Utilizing **PAVE360** as virtual network and collaborator with driving simulator
- Realizing **ISA Parity** and **precise network virtualization**

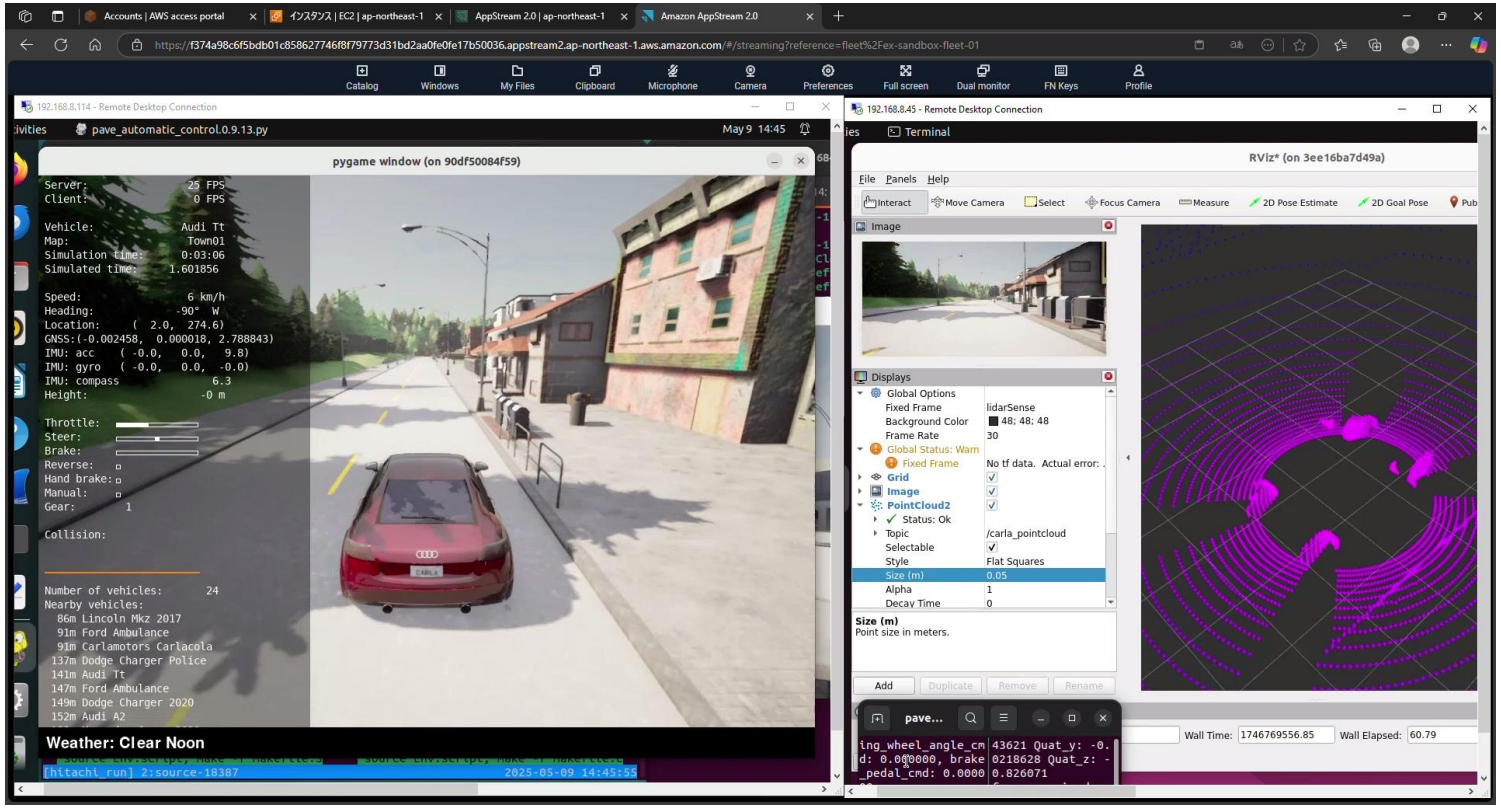
Manual Driving

IoV Platform

EWAOL 1.0 Compatible stack

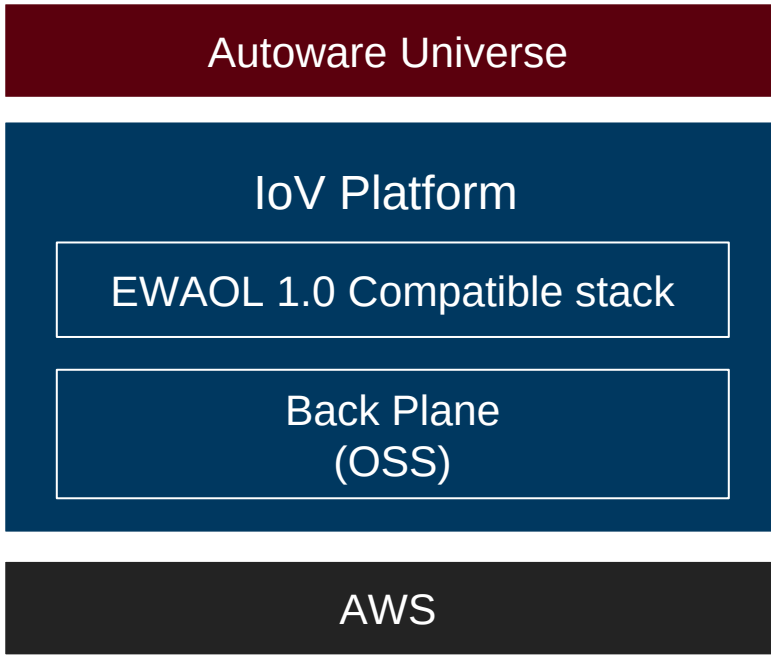
Back Plane
(SiemensEDA PAVE360)

AWS



3-5. Example of Virtual Environment (case 2)

- Utilizing **OSS** as virtual network and collaborator with driving simulator
- Achieving **a certain level of ISA Parity and network virtualization.** However, there are **limitations.**



3-6. Major Challenging : Speed & Scalability

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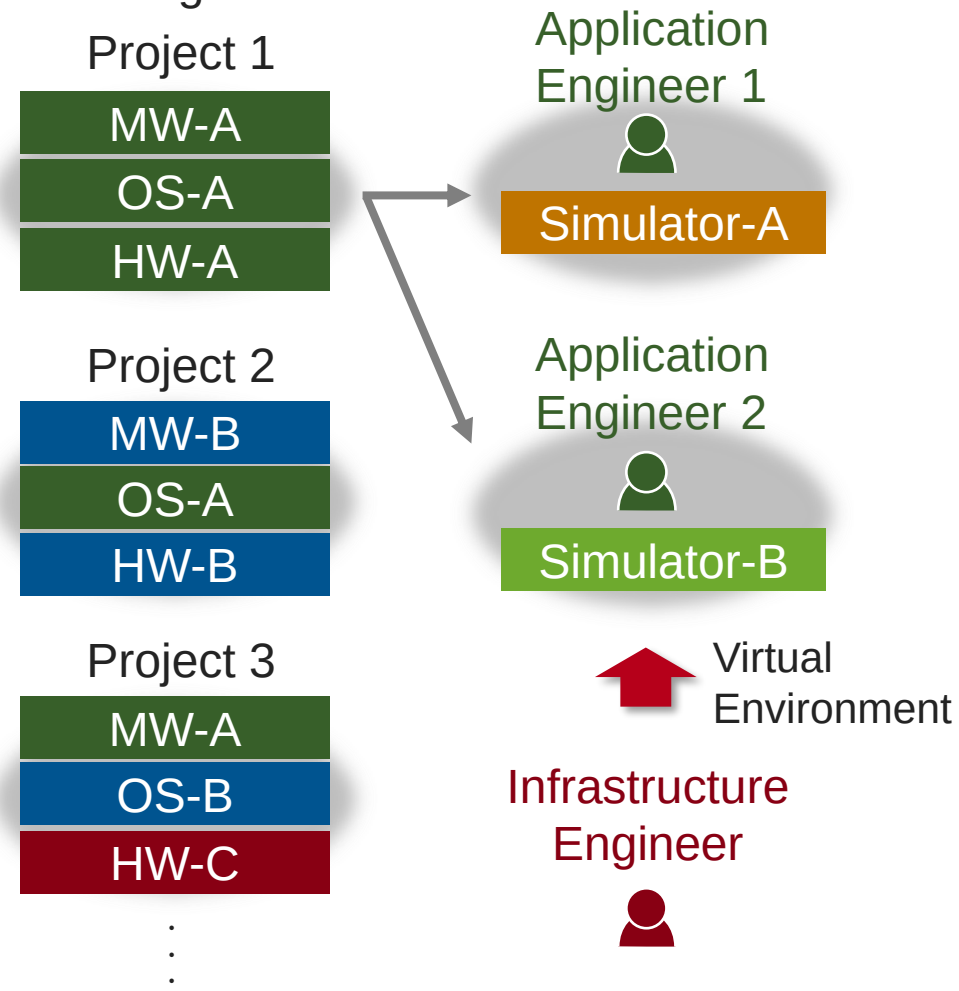
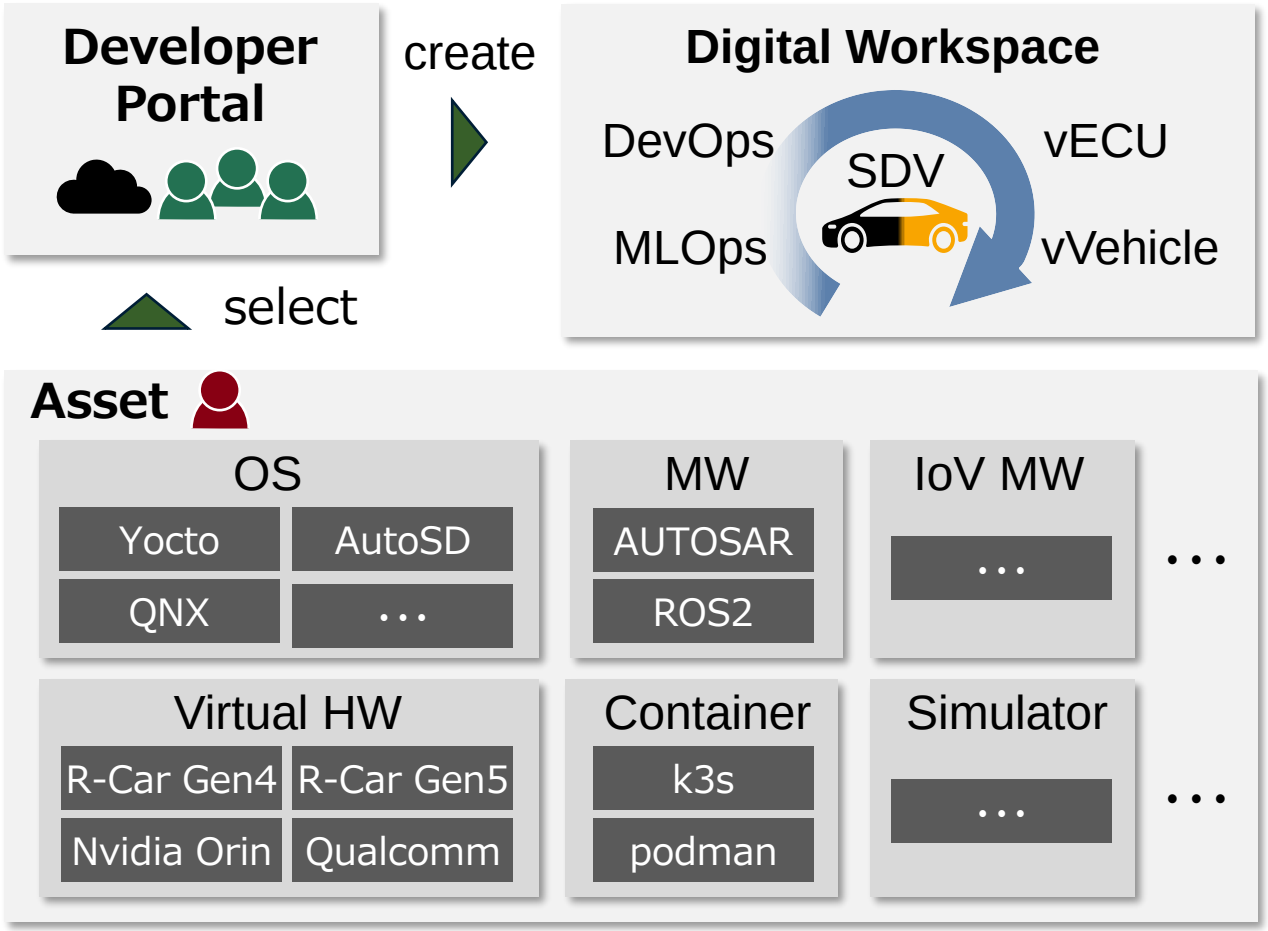
- Who provides virtual environment ? Infrastructure Engineers or Application Engineers?
- **Solution** : **Developer Portal** which enables automatic generation of development environment

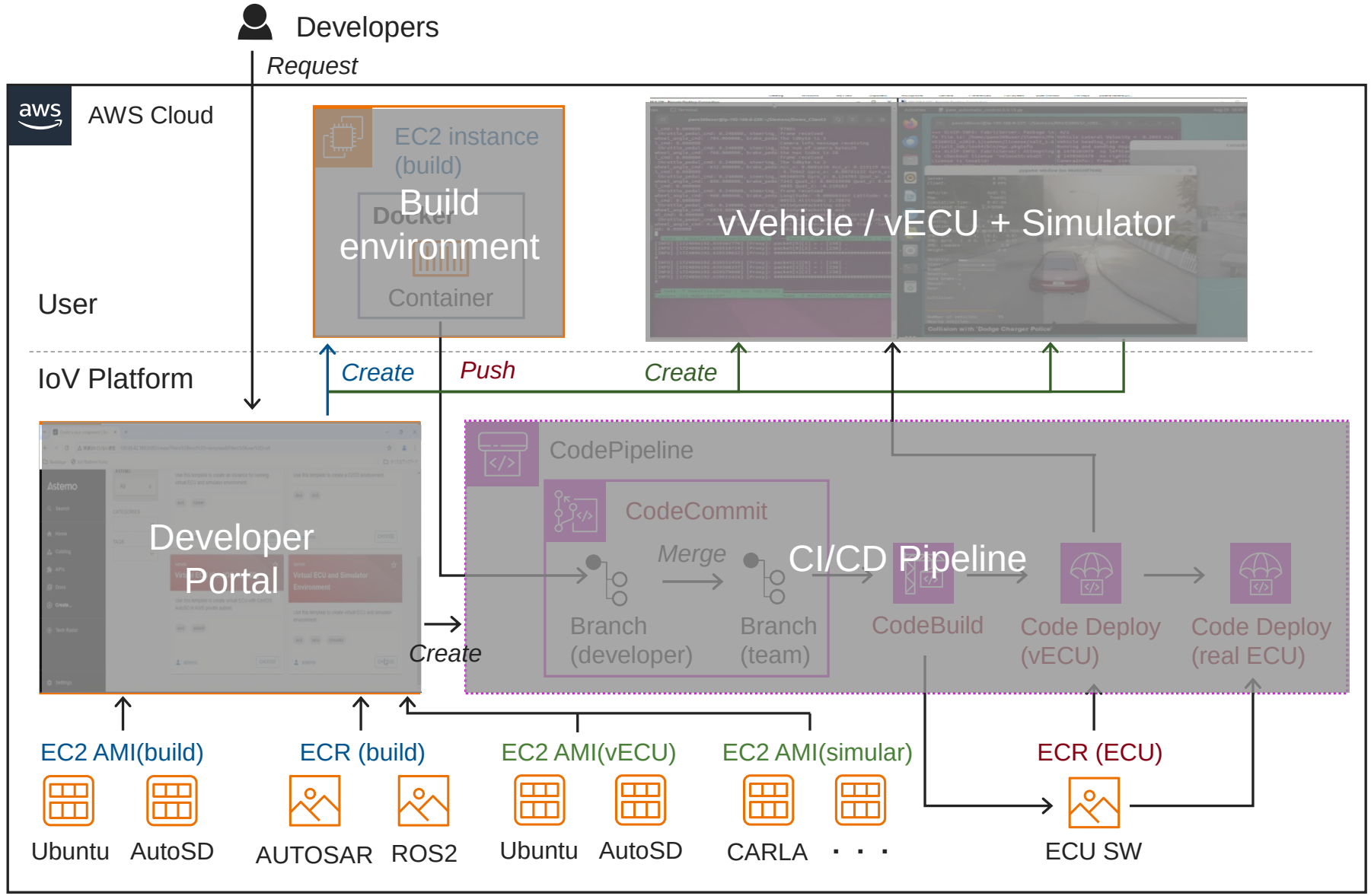
Challenge



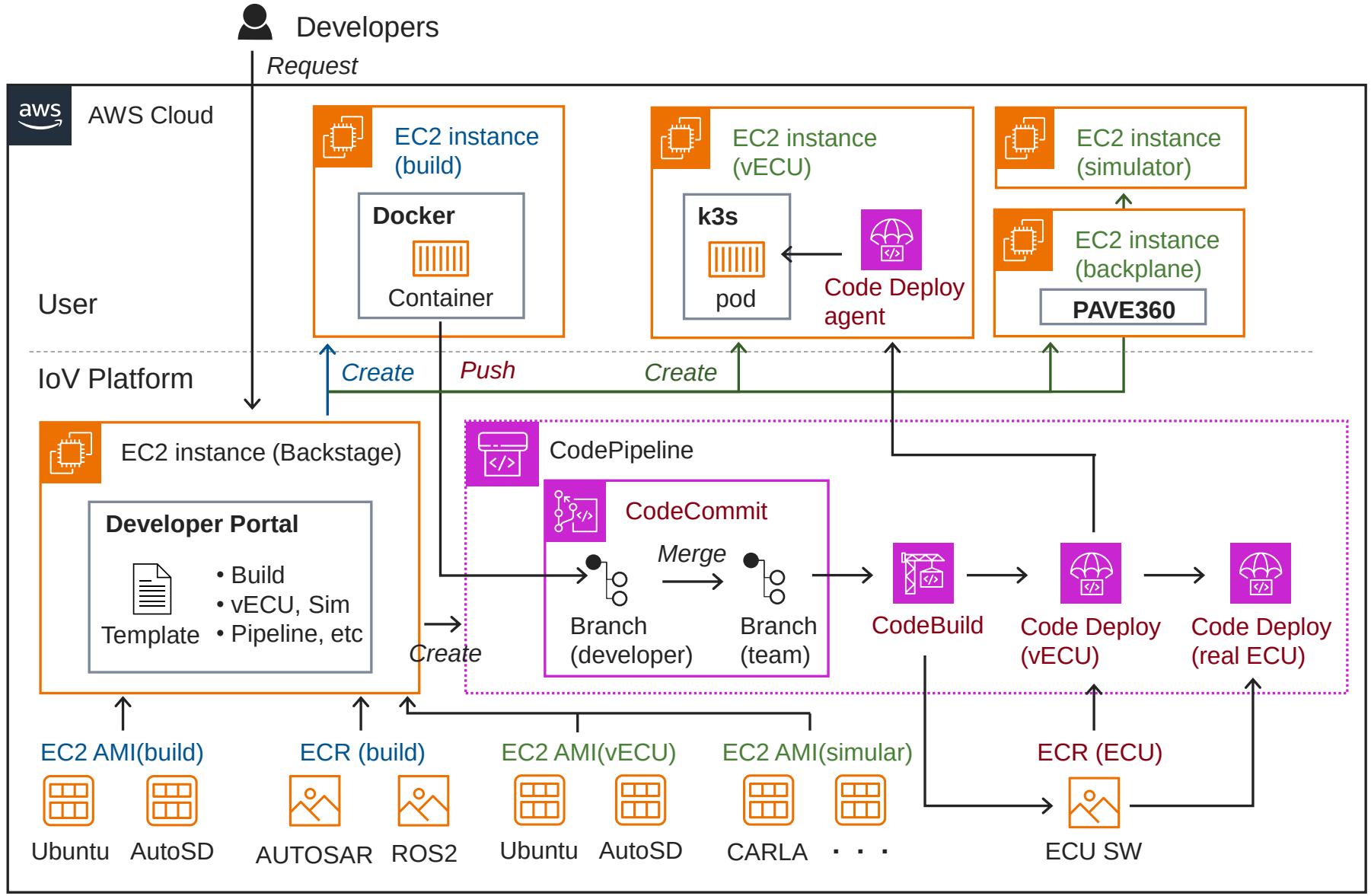
Solution



3-7. Example of Developer Portal



3-8. Example of Developer Portal



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FY2025 Schedule on Virtual Platform

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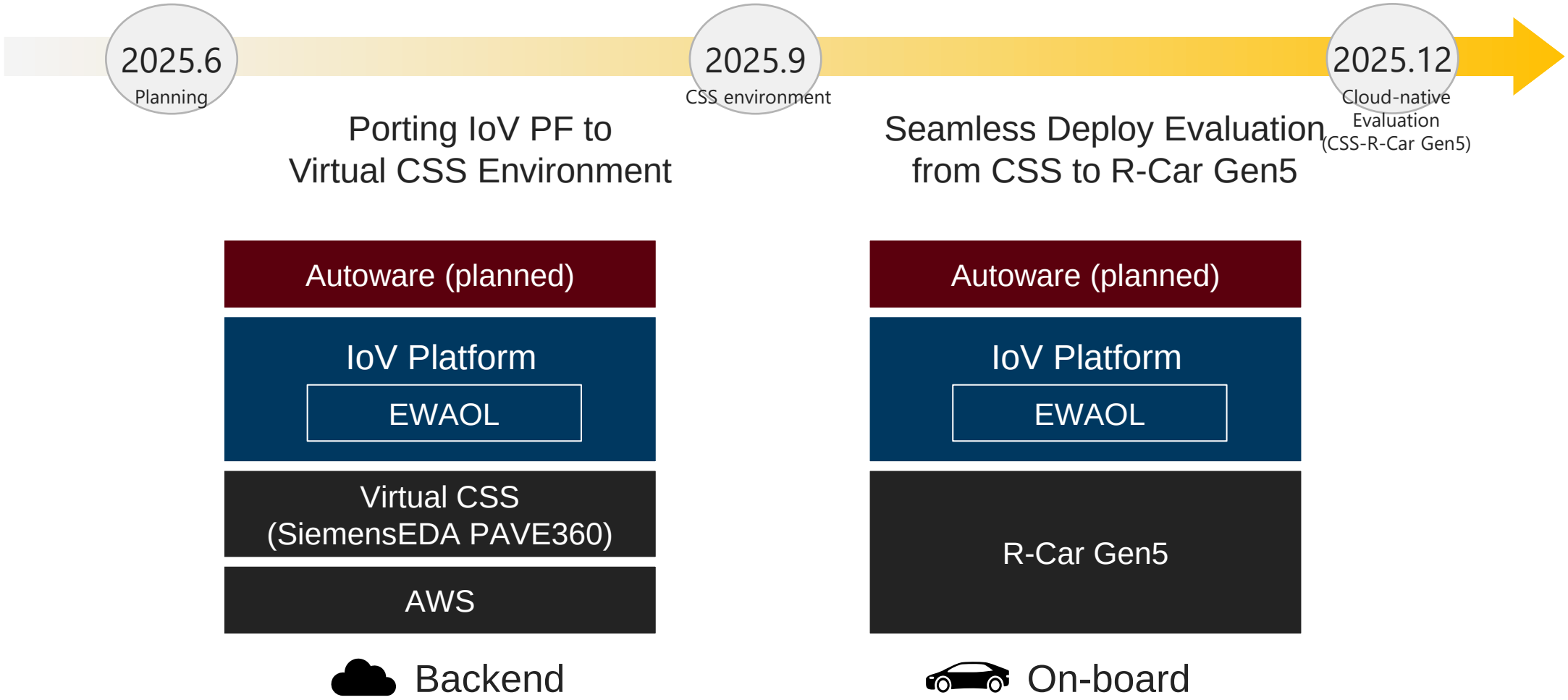
■ Accelerating IoV Platform enhancement for Next generation Central ECU



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5-1. Conclusion

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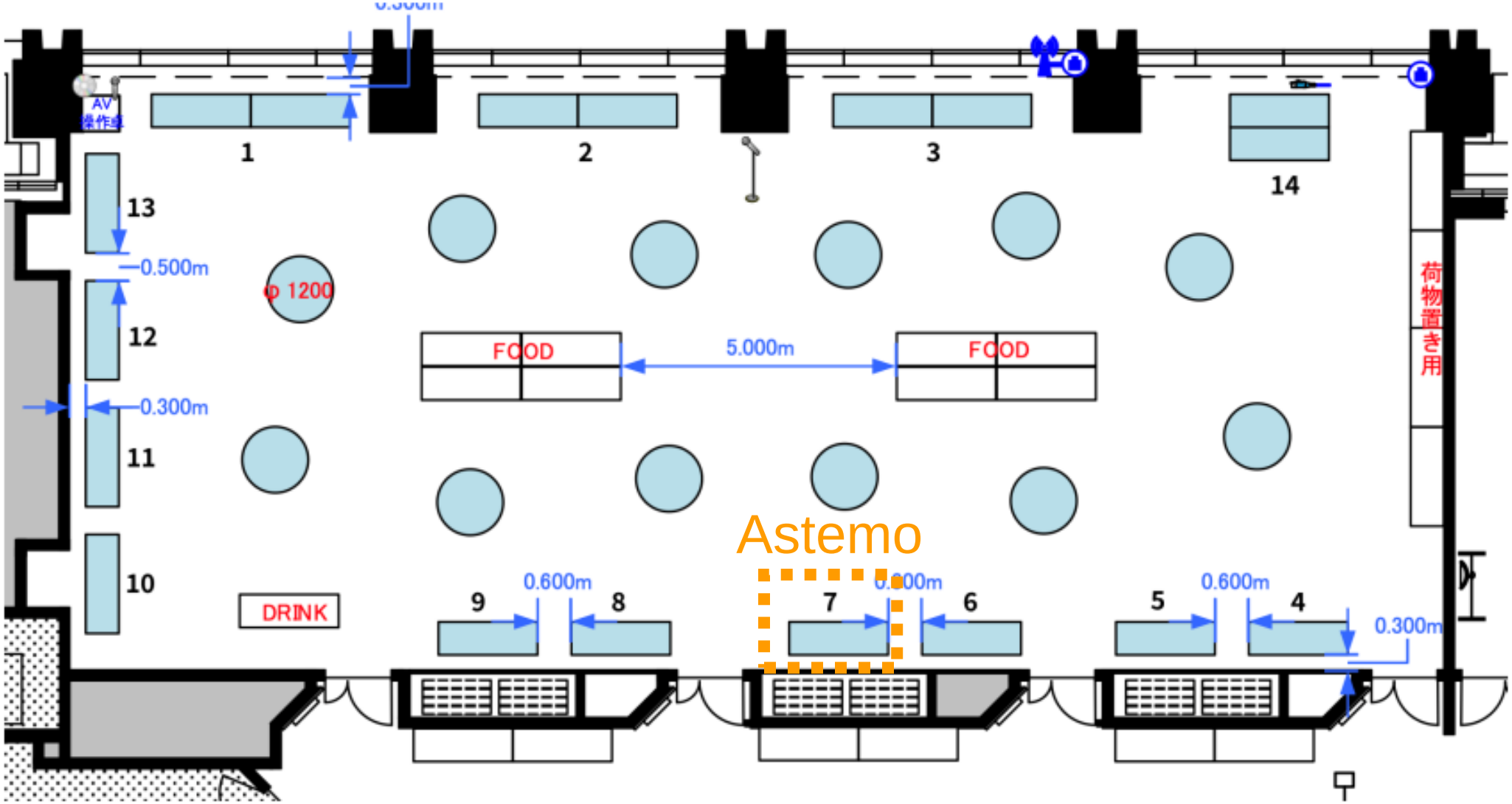
We introduced “Virtual Platform of IoV Platform”.

- Concept of IoV Platform
- Lessons learned : SOAFEE-aligned Virtual Platform
- Schedule towards SOAFEE.next

We welcome further SOAFEE collaboration partner.

5-2. Exhibition



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