IETF-120 OPSAWG

An Intent-Based Management Framework for Software-Defined Vehicles in Intelligent Transportation Systems

https://datatracker.ietf.org/doc/draft-jeong-opsawg-intent-based-sdv-framework/

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Outline

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  - Life Cycle of IBS for SDV in ITS
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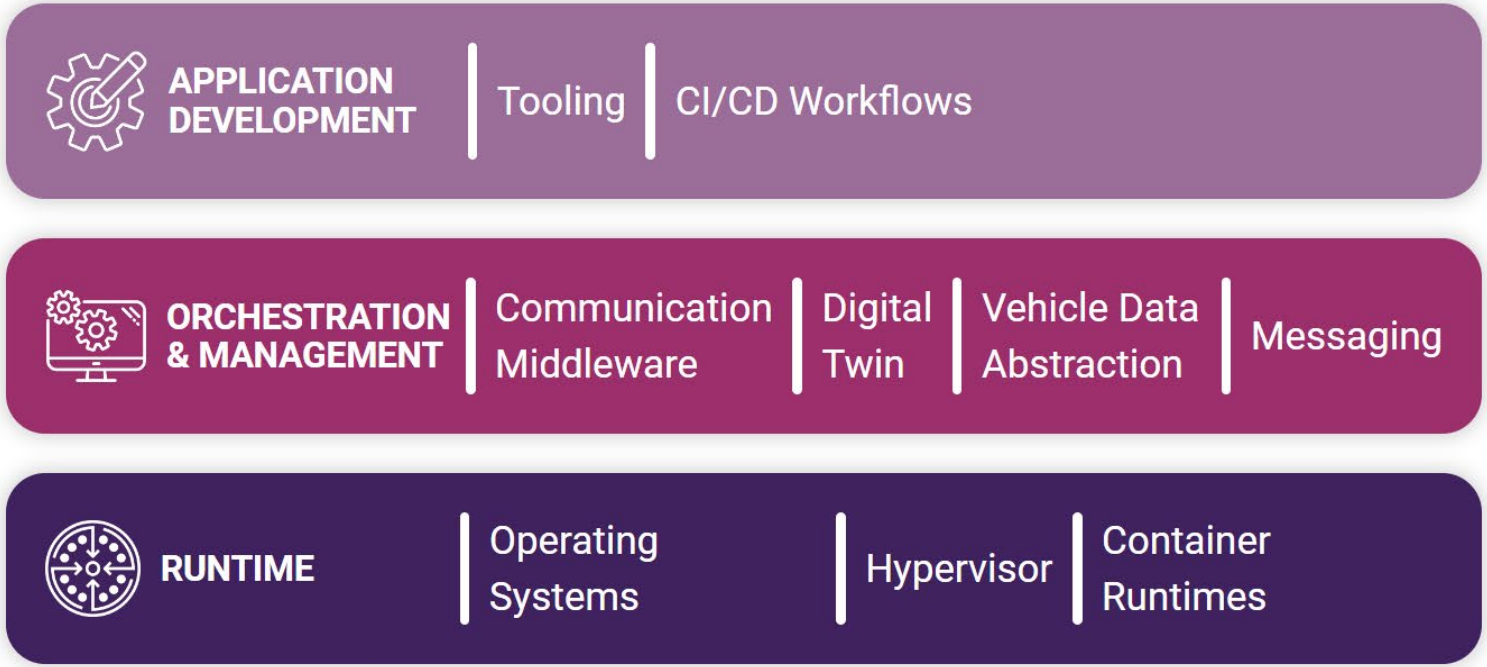
  - Applications of IBM for SDV
- **Proof-of-Concept by Hackathon Project**
- **Next Steps**

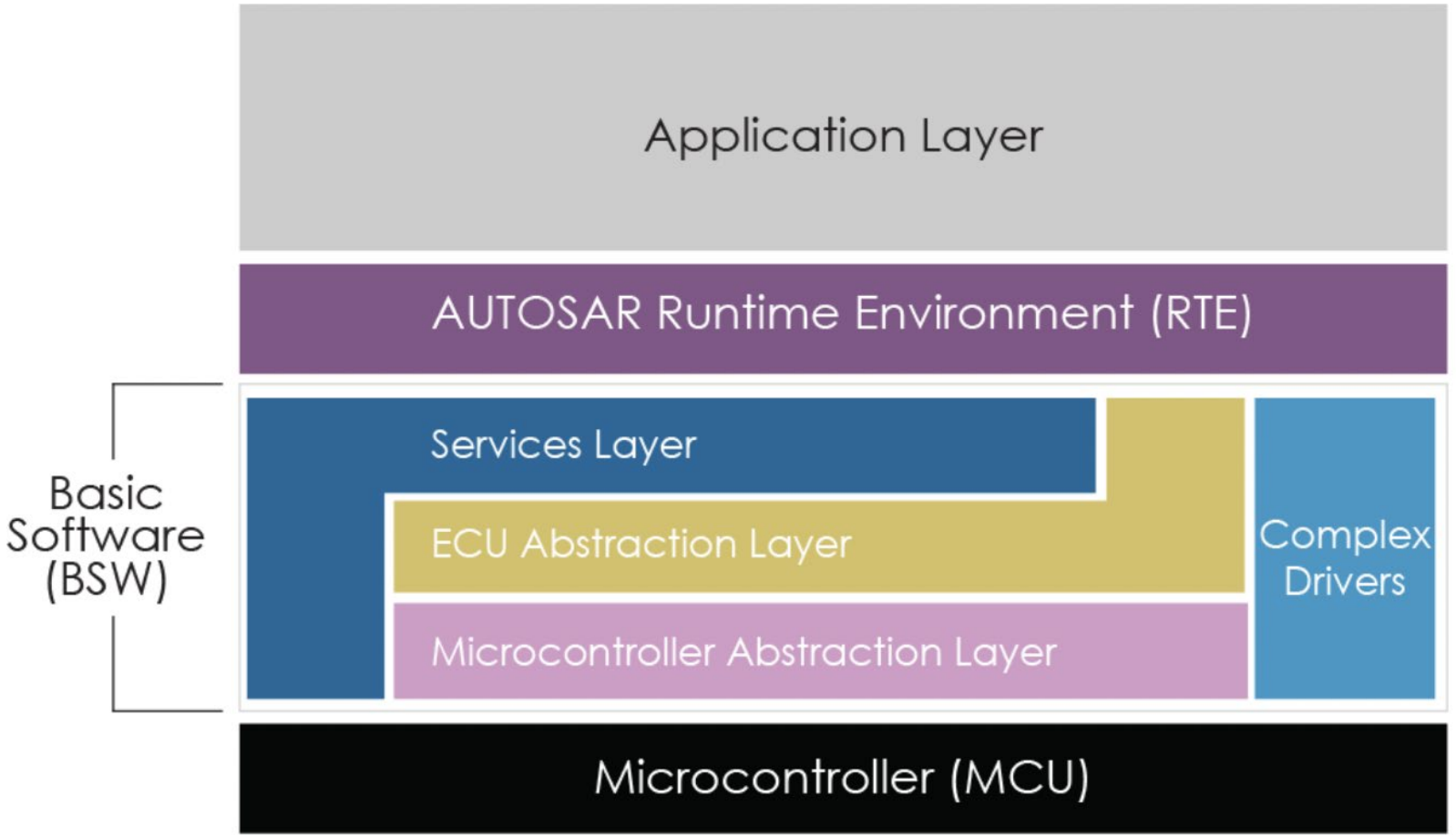
Background: Eclipse Software-Defined Vehicle (SDV)

- Continuous Integration and Deployment (CI/CD)



https://www.eclipse.org/org/workinggroups/sdv-charter.php

Background: AUTOSAR Platform



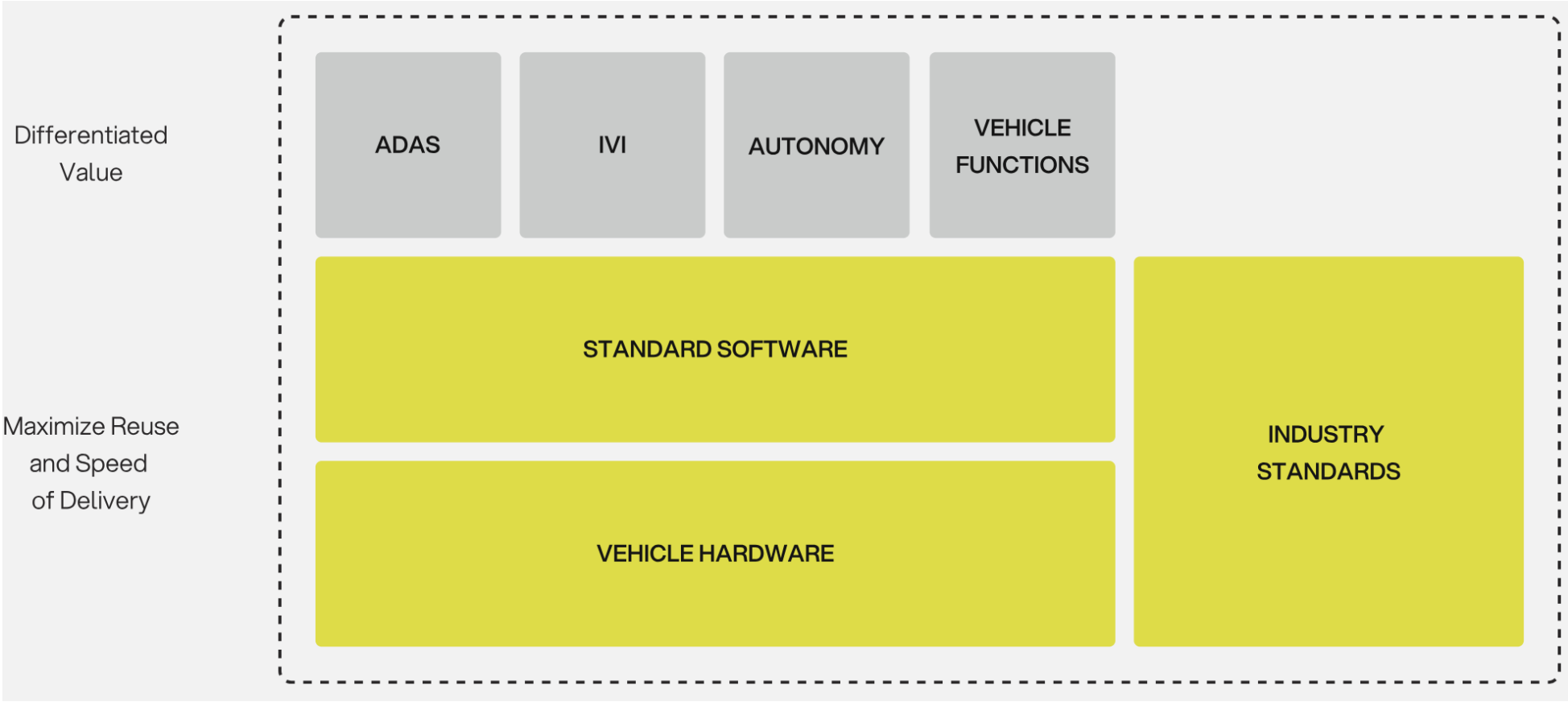
AUTOSAR Architecture

[AUTOSAR Classic Platform]
https://www.autosar.org/standards/classic-platform

[AUTOSAR Adaptive Platform]
https://www.autosar.org/standards/adaptive-platform

Background: SOAFEE Building Blocks

- The Scalable Open Architecture for Embedded Edge (SOAFEE)



https://www.soafee.io/

Motivation

- **Intent-Based Networking (IBN) driven by**
  - Complexity of networks,
  - Scale,
  - Cost and efficiency,
  - Dynamic environments, and
  - Security.
- **Automotive industry also having a fundamental transformation:**
  - Traditional distributed → **Central/Zone architecture**.
  - **Ethernet-based IP backbone in-vehicle networks**.
  - **Managing applications and network functions** in SDV become a challenge.
- **Integrating IBN and SDV for a better management**

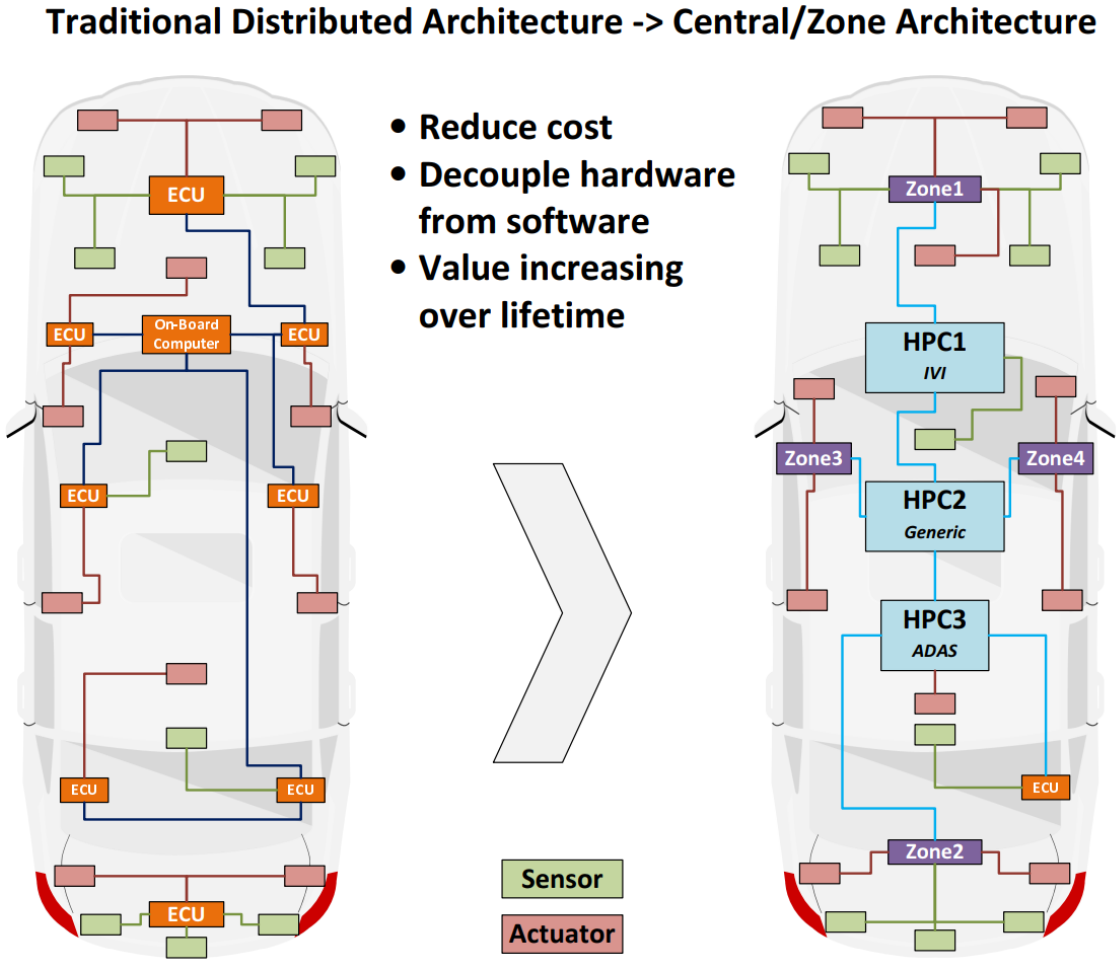


Figure: Transition of Vehicular Architecture

SDV in ITS

- Shifting to SDVs is also a new paradigm in Intelligent Transportation Systems (ITS).
- The SDVs can interact with each other via Vehicle-to-Vehicle (**V2V**) and Vehicle-to-Infrastructure (**V2I**) communications (e.g., Edge Servers) for **safe driving** and **infotainment services**.
- Figure 1 shows an architecture of vehicular networks for SDVs. They can communicate with **Edge Servers** and **Vehicular Cloud** by IP Road-Side Unit (IP-RSU), e.g., gNodeB in 5G [TS-23.501].

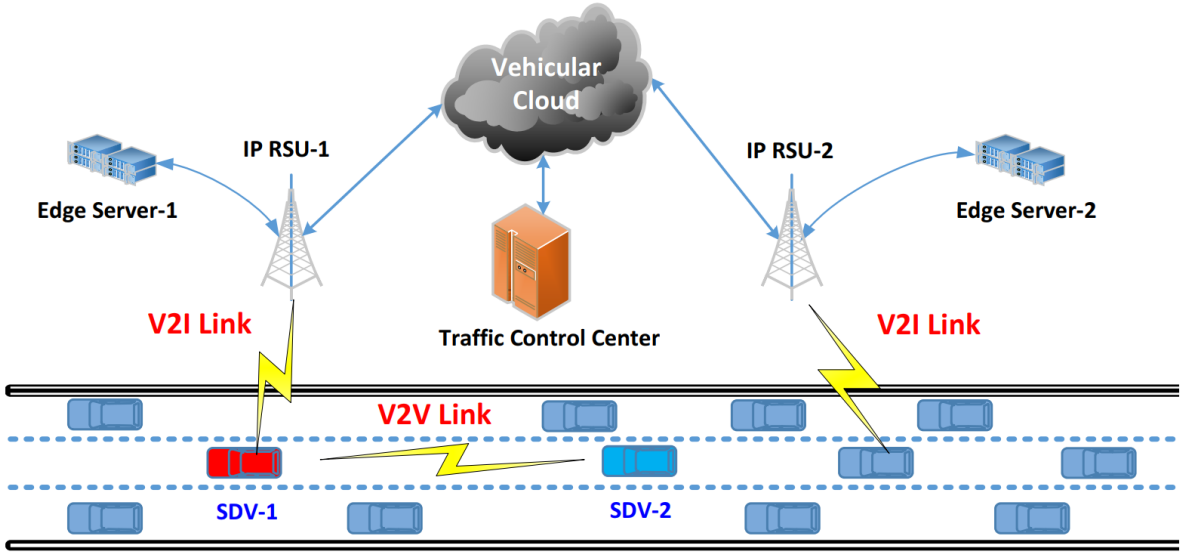


Figure 1: Vehicular Networks for Software-Defined Vehicles

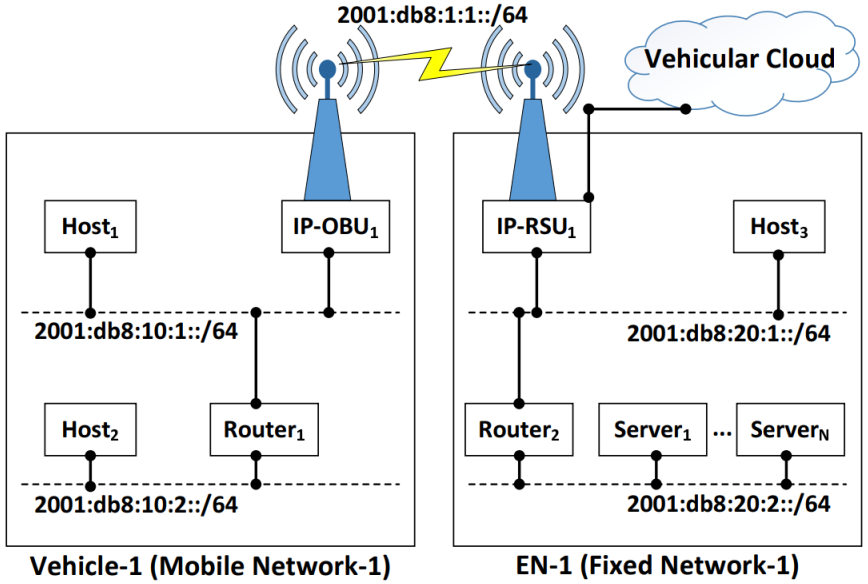


Figure 5: V2I Networking with Edge and Cloud Networks

An Example of an SDV Platform

- **Automotive Apps:**
  - ADAS (Advanced Driving Assistant System),
  - LKA (Lane Keep Assistant),
  - AEB (Automatic Emergency Brake), etc.
- **Network Functions**
  - Routers
  - Switches
  - Hubs, etc.

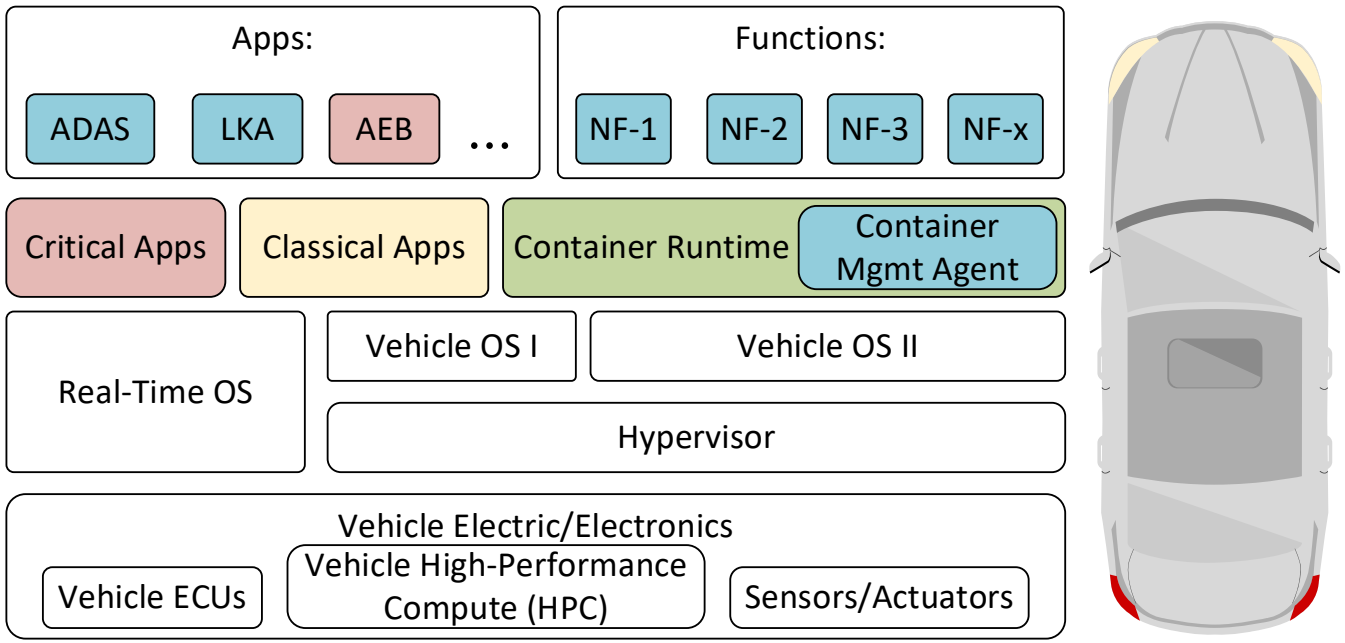


Figure 2: A Vehicular Platform for SDV

Life Cycle of IBS for SDV in ITS

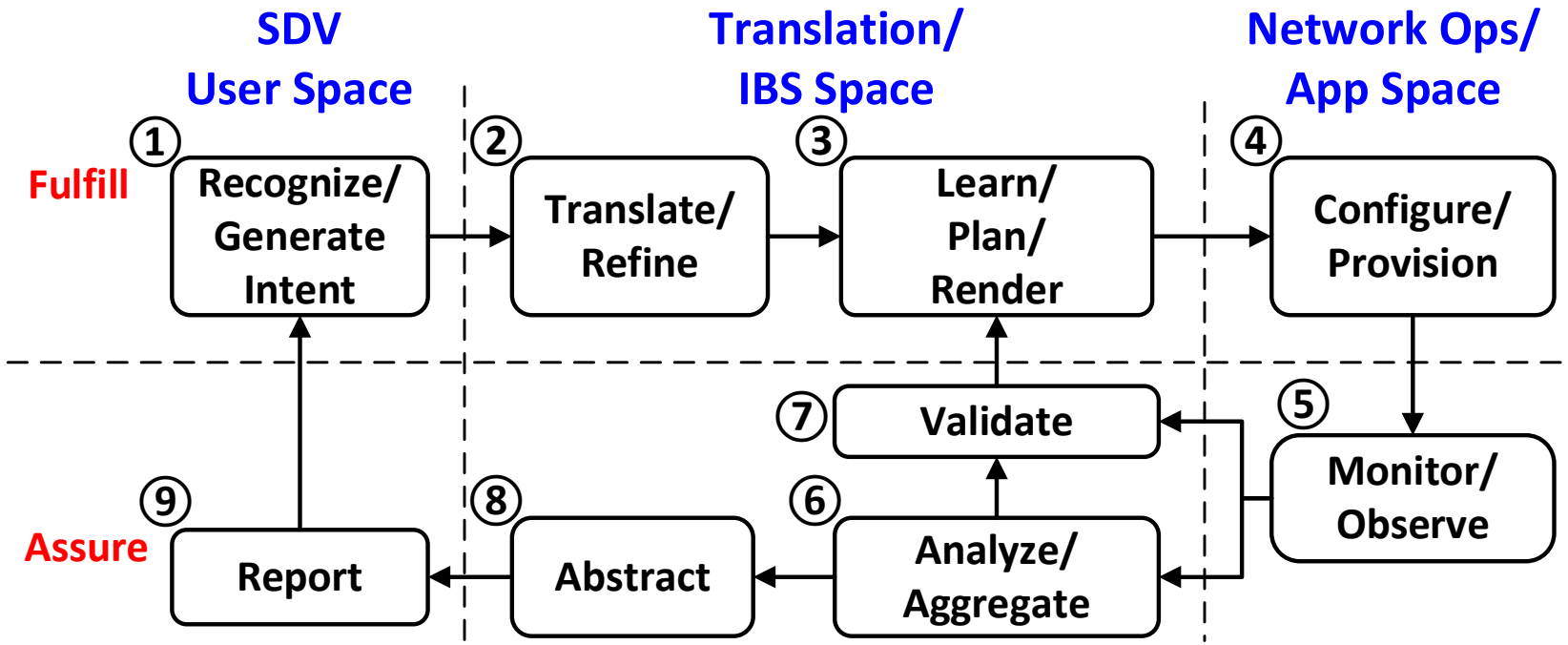


Figure 3: The Life Cycle of IBS for SDV Management

- **Integrating IBN and SDV for a better management**
- According to **the Life Cycle of IBN [RFC9315]**, we show **the Life Cycle of an Intent-Based System (IBS) for SDV management**.
- Each space is further divided into two sections, **Fulfillment** and **Assurance**.

Intent-Based Management (IBM) for SDV

- **Intent-Based System (IBS)** is designed for SDV, as shown in Figure 6.
- Vehicular Cloud (VC) receives an **intent** from SDV User and translate into a **high-level policy**.
- The Cloud Controller in VC sends the translated **high-level policy** to the SDV Controller in a target SDV.
- The SDV Controller converts the high-level policy into the **low-level policy** for SDV.
- Eventually, **Service Functions (SF)** are the selected entities for a particular service.

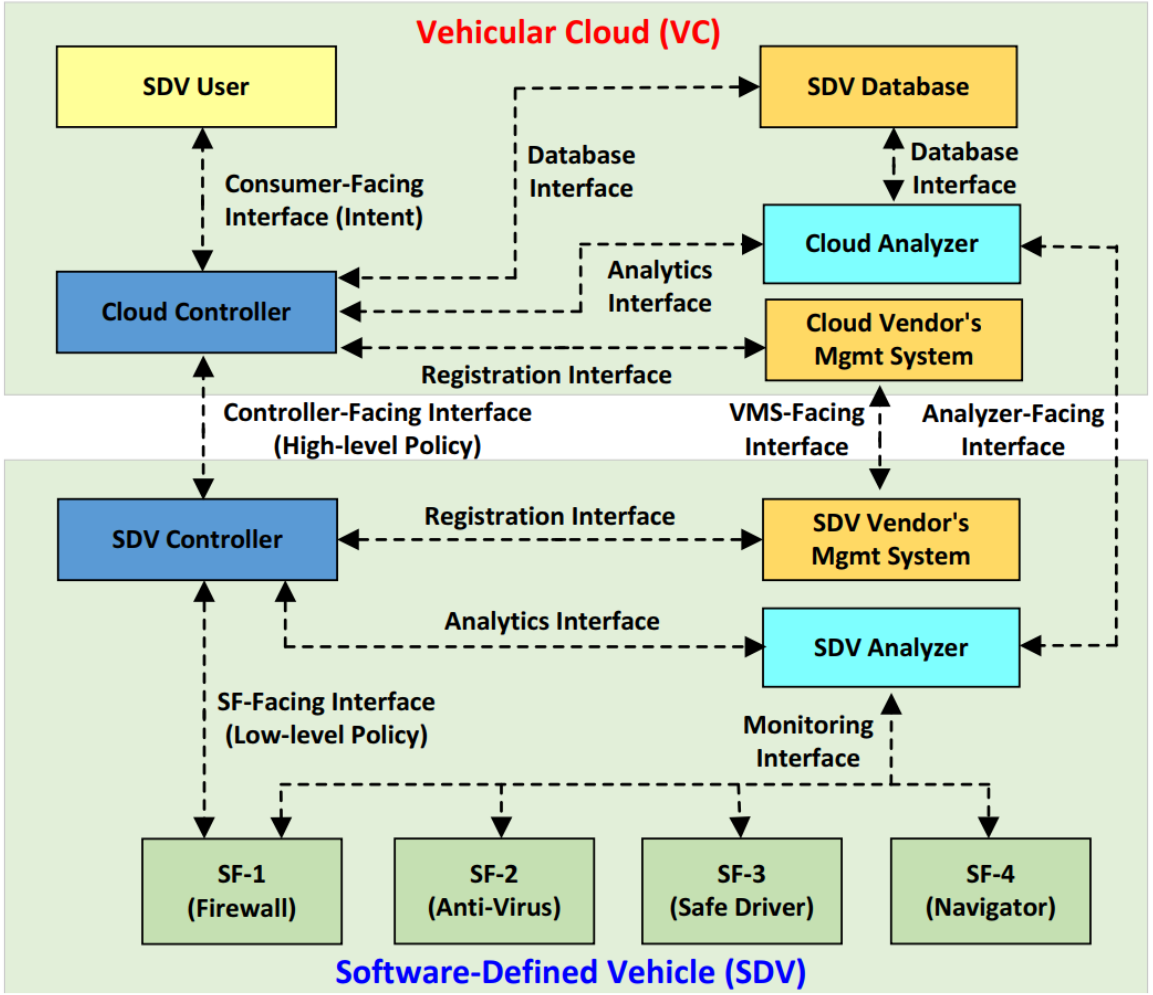


Figure 6: Intent-Based Management (IBM) Framework for SDV

Interfaces in the IBM Framework for SDV

- **Interfaces between a pair of system components in the Vehicular Cloud and SDV:**
  - Consumer-Facing Interface
  - Controller-Facing Interface
  - SF-Facing Interface
  - Registration Interface
  - Monitoring Interface
  - Analytics Interface
  - Analyzer-Facing Interface
  - VMS-Facing Interface
  - Database Interface
- **The interfaces can be designed by YANG.**

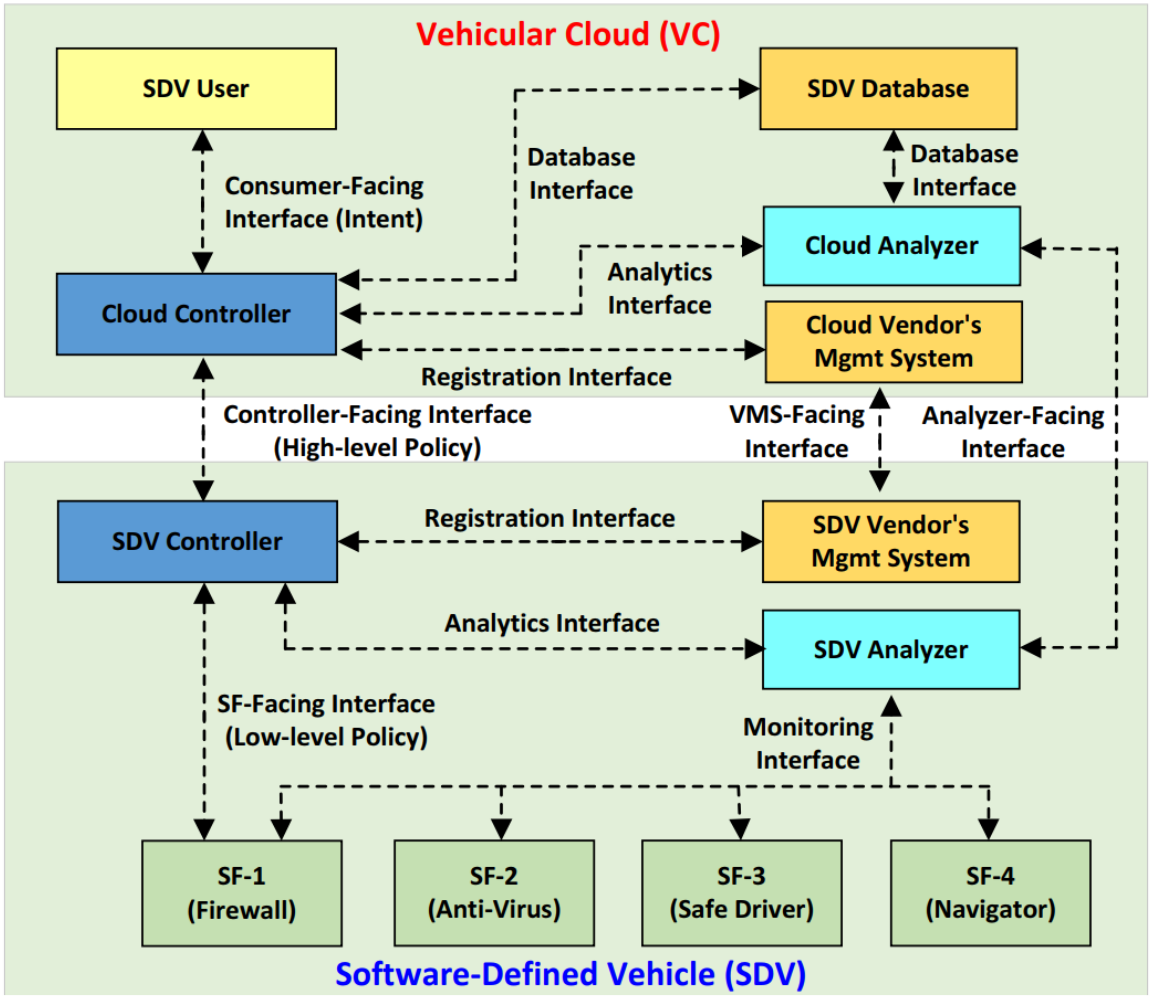


Figure 6: Intent-Based Management (IBM) Framework for SDV

Applications of IBM for SDV

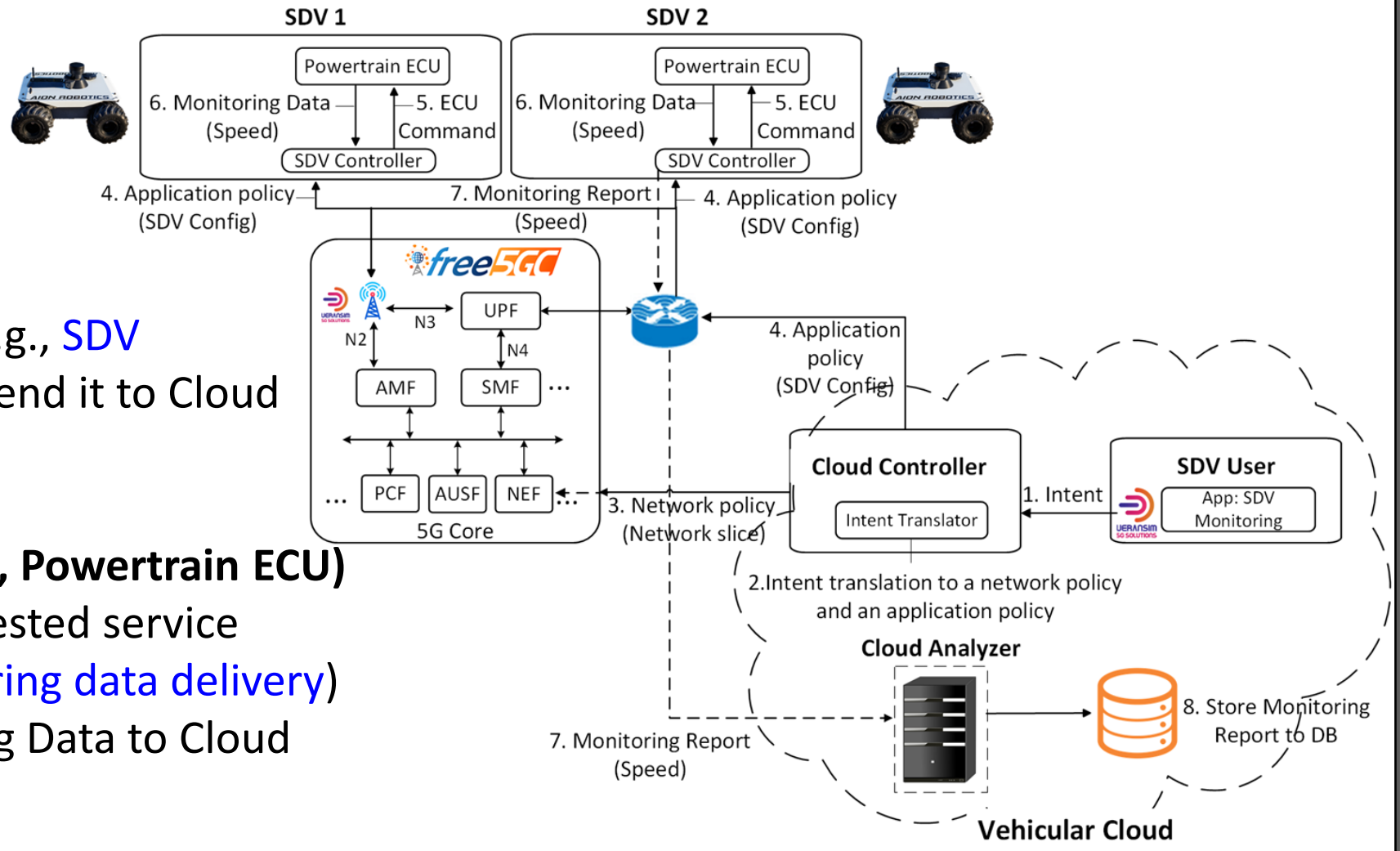
- **IBS for Applications in SDVs**
  - SDV applications can include **safe driver** (e.g., AI driver) for an autonomous vehicle and **navigator** for a human driver.

- **Examples:**
  - An automotive company needs to **upgrade and install new applications** on a group of automobiles sold to customers, i.e., **over-the-air (OTA) update**.
  - An SDV Intent User in the automotive company can issue a request like **"Please upgrade and install <application A> to the cars."**

Proof-of-Concept by Hackathon Project

ietf120-hackathon-interface-to-in-network-functions-i2inf/

- **SDV User**
  - Make an intent (e.g., SDV monitoring) and send it to Cloud Controller.
- **Service Function (e.g., Powertrain ECU)**
  - Perform the requested service (e.g., SDV monitoring data delivery)
  - Deliver Monitoring Data to Cloud Analyzer



Next Steps

- **Polishing the Document**
  - The authors will polish up the text with the comments from the OPSAWG in terms of both description and maturity.

- **Enhancement of the Document**
  - The authors will technically enhance the Sections through the IETF Hackathon Project.

- **Adoption Call**
  - If the OPSAWG think this draft to be a timely appropriate topic with interests, may I ask for Adoption Call for the development of this draft in the OPSAWG?