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Enabling safe & secure modular UPdates, UPgrades and DynAmic Task reallocation & Execution for SDVs

Software-Defined Vehicles (SDV) and Connected, Cooperative and Automated Mobility (CCAM) are key technological paradigms for enabling the European automotive sector to regain strategic competitiveness.

Emerging Challenges

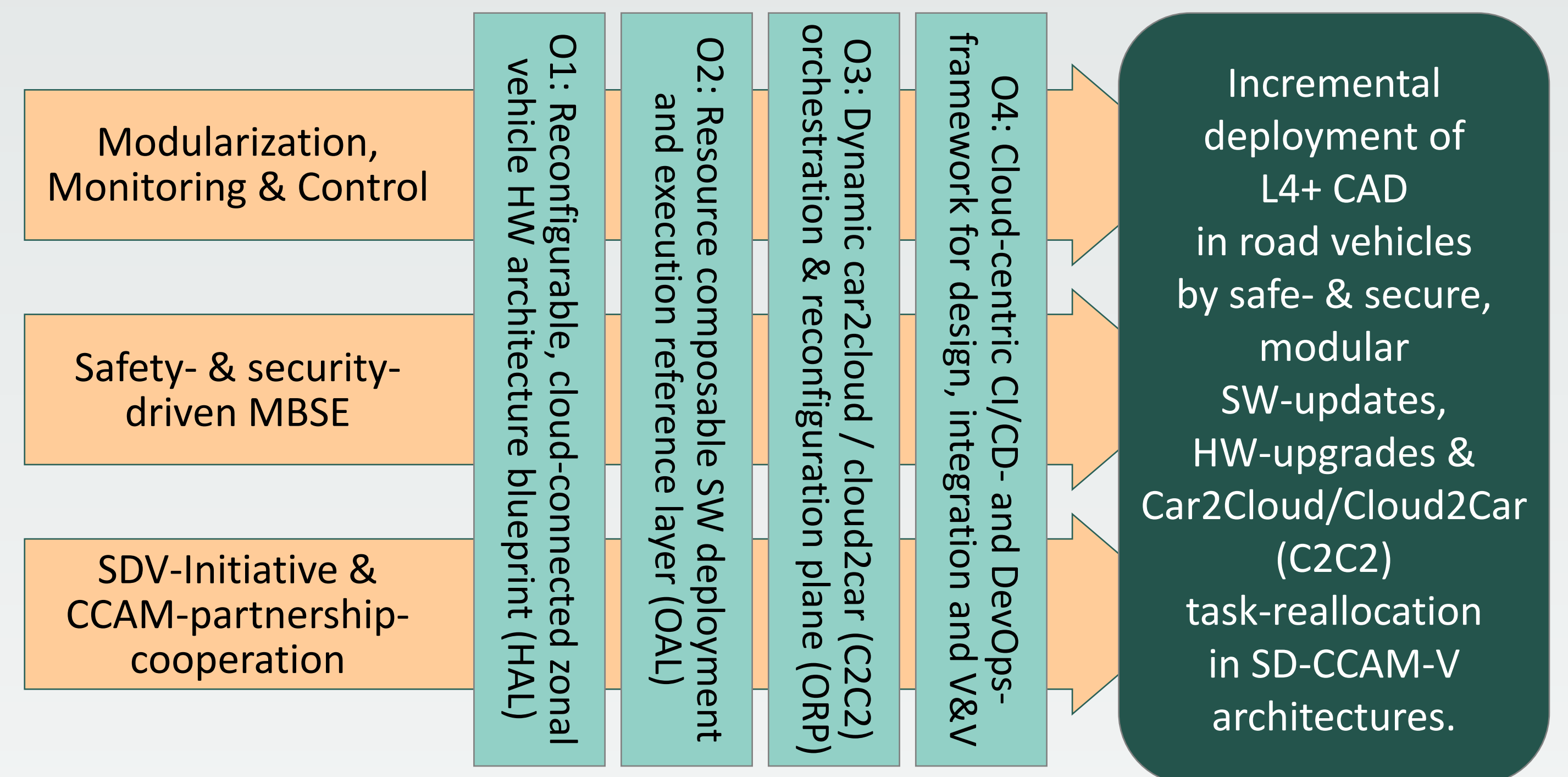
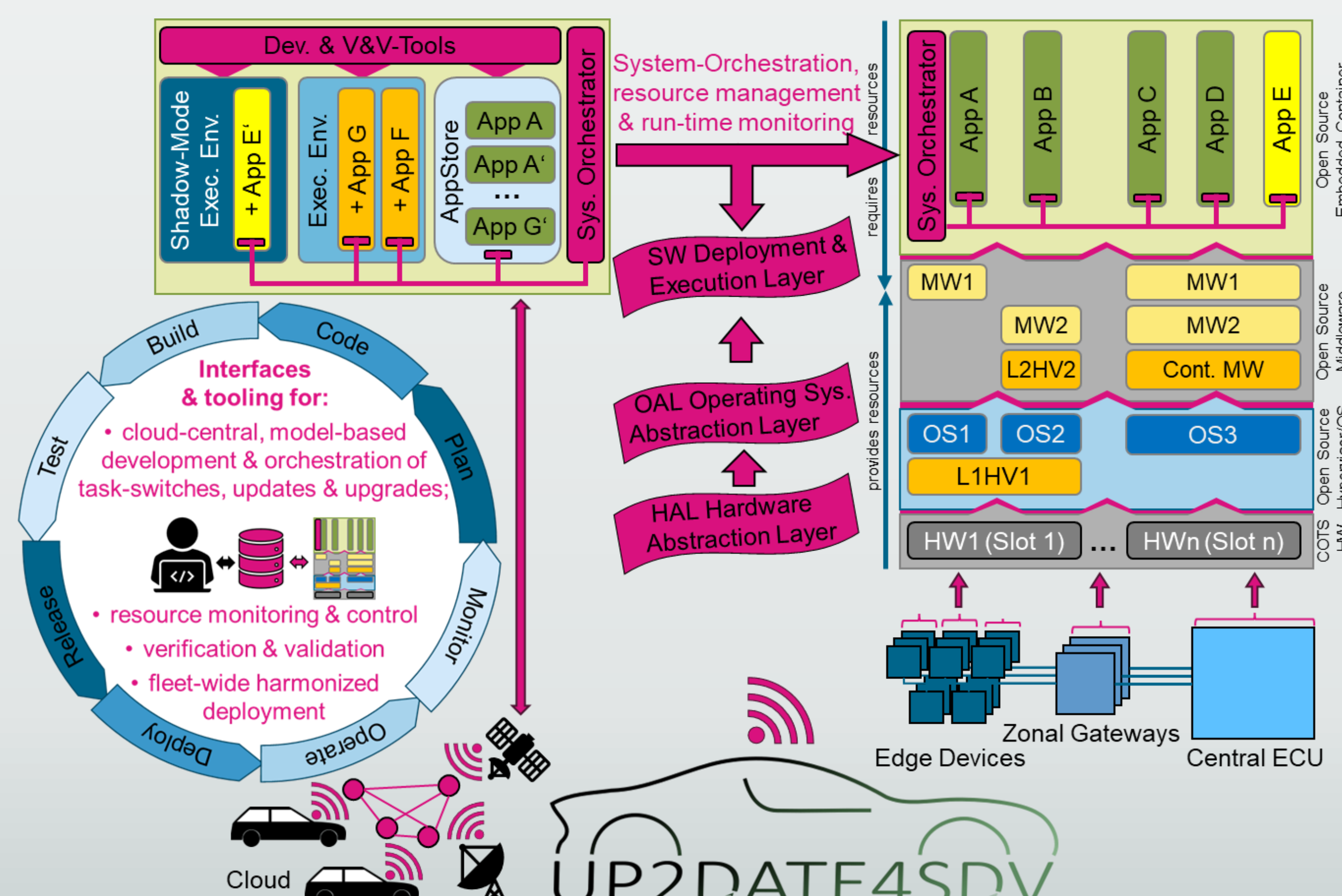
Enabling comprehensive system updates, upgrades, and re-configurations on SDV architectures poses critical challenges:

- **Heterogeneity:**
Evolving SW/HW across vehicle, cloud, and infrastructure.
- **Updateability**
Safe independent updates of any HW/SW component.
- **Synchronization**
Coordinated multi-node updates with consistency assurance.
- **Safety and Security Preservation:**
Maintaining safety & security under continuous change.

UP2DATE4SDV aims to develop a comprehensive ecosystem for seamless, efficient, safe, and secure software updates, hardware upgrades, and situation-dependent reconfigurations of SDVs.

Technological Pillars

- **Unified Hardware Abstraction Layer (HAL)**
Exposing the hardware-level safety and security properties, monitoring and configuration controls of each node to the higher software layers
- **OS & Middleware Abstraction layer (OAL)**
Wrapping HAL concepts and assessment to inform system-level orchestration mechanisms for scheduling, updates and reconfiguration
- **Orchestration and Reconfiguration Plane (ORP)**
Exploiting HAL/OAL to safely coordinate runtime scheduling, OTA updates, fallback strategies and cross-node reconfiguration
- **Joint Safety and Security (SASE) Assessment**
Ensuring trustworthy operation and compliance with current and emerging standards with a set of combined safety-security mechanisms across HAL, OAL and ORP



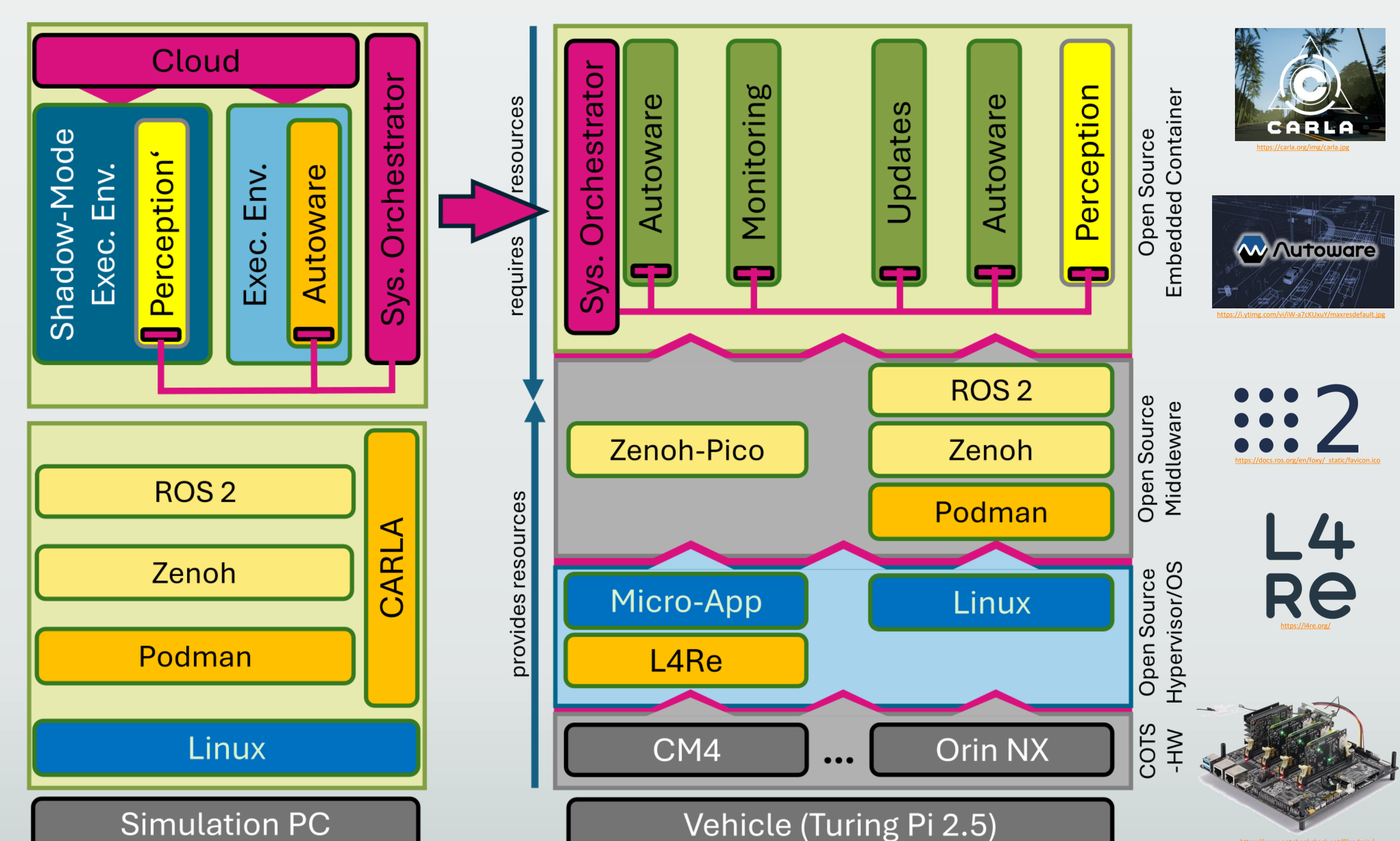
Innovation Potential

UP2DATE4SDV ecosystem for updatable, upgradable, and reconfigurable SD-CCAM-V combines the HAL, the OAL, and the ORP together with development, validation- and verification- functions for the update development in the cloud

- R1 — Unified Interface- & Service-Definition (HAL / OAL / ORP)
- R2 — Reconfigurable Zonal HW Architecture
- R3 — Resource-Composable SW Deployment Layer
- R4 — Dynamic Orchestration & Reconfiguration Plane
- R5 — Safety & Security Pattern for Certification
- R6 — DevOps-Enabled Continuous V&V Toolchain
- R7 — Demonstrator for Collective & Adaptive Perception
- R8 — Alignment and Contributions to SDV WG & Standards
- R9 — Open-Source Contributions to the SDV Ecosystem

Use Cases & Demonstrators

- **CCAM based collective and adaptive perception**
Dynamic redistribution of workloads across heterogeneous nodes based on real-time load, faults and resource availability, ensuring safe and secure operation at all times
[ADAS HiL test system with **SeL4**, **STM32MP2** and **Stellar MCU**]
- **Research demonstrator**
Seamless OTA update of distributed compute nodes with Safety/Security-based validation, safe update windows, coordinated fallback/rollback, and continuous service availability
[**Turing Pi 2.5**, **L4Re**, Raspberry Pi **CM4**, NVIDIA **Orin Nano** | **NX**]



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