IETF-118 IPMON Side Meeting

Software-Defined Vehicles (SDV)

Nov. 9th, 2023

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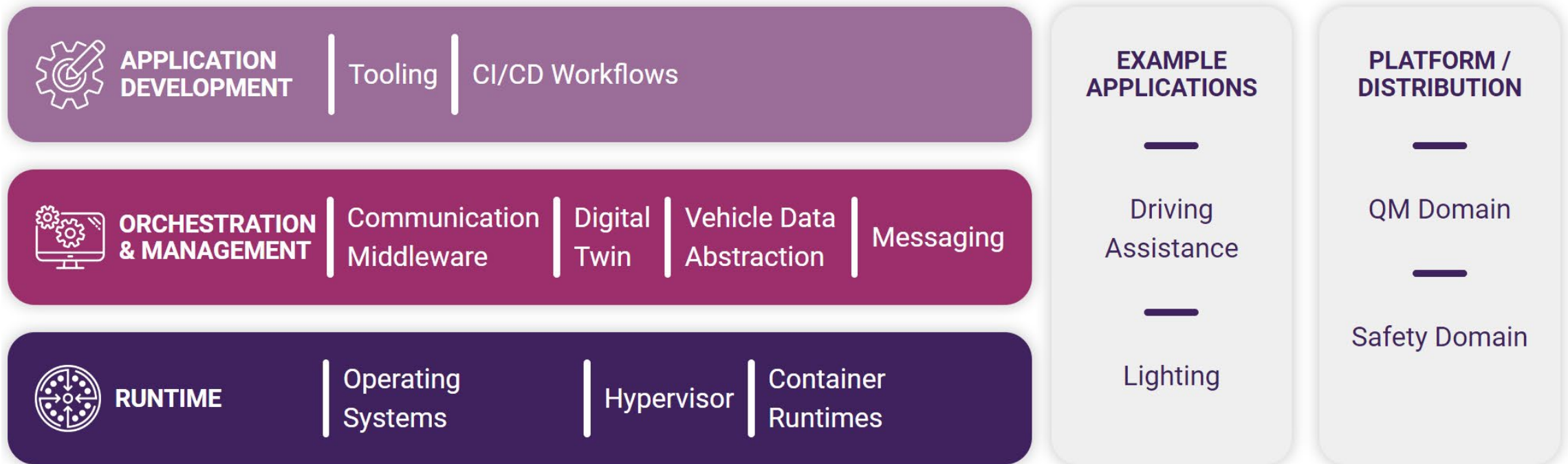Sungkyunkwan Univ.

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Outline

- **Architectures from Different Organizations:**
  - Eclipse
  - Autosar
  - SOAFEE
  - IBM
  - Blackberry
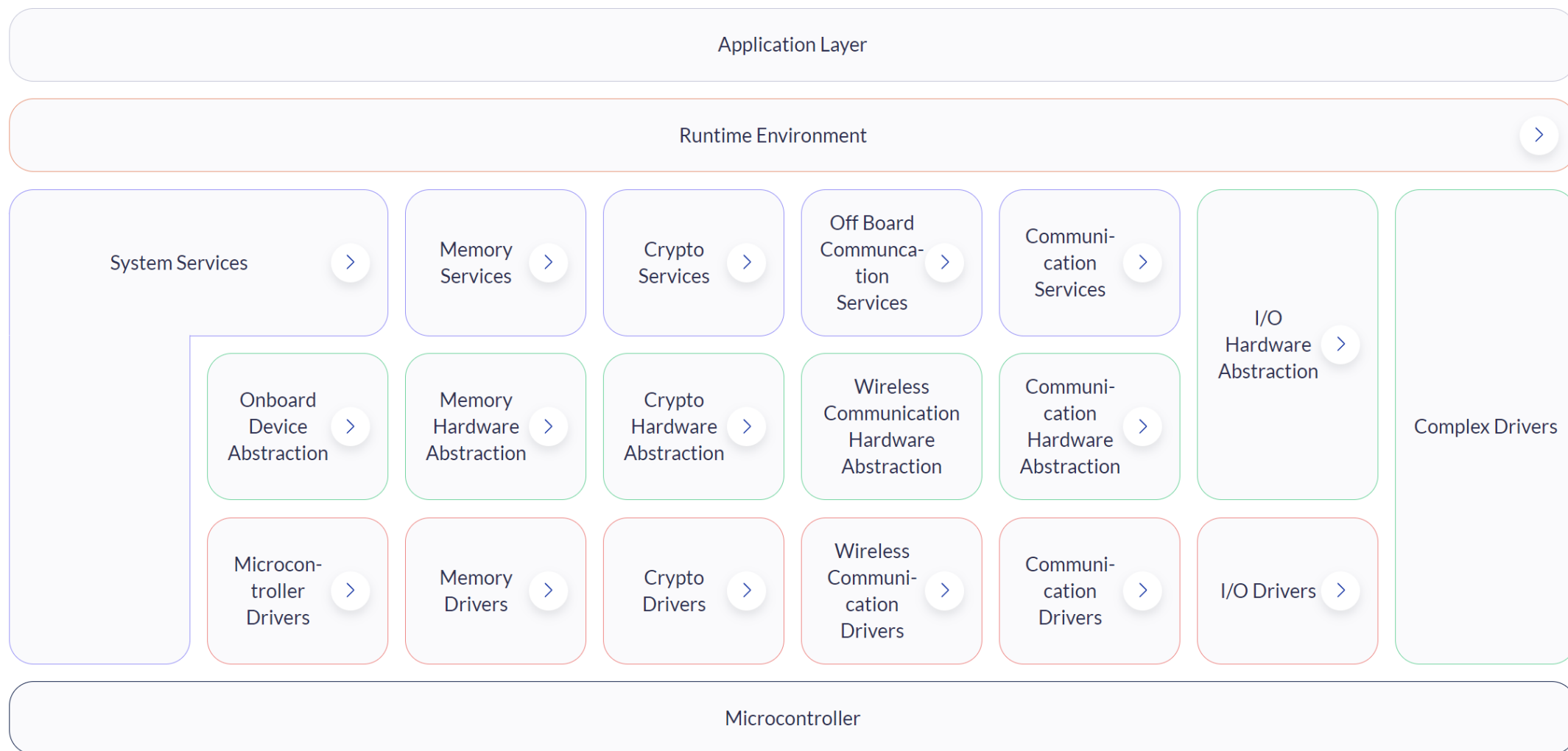 - Bosch

- **Discussion on Work Items with SDV**

Software-Defined Vehicle in Eclipse

- **Continuous Integration and Deployment (CI/CD)**

APPLICATION DEVELOPMENT	Tooling	CI/CD Workflows

ORCHESTRATION & MANAGEMENT	Communication Middleware	Digital Twin	Vehicle Data Abstraction	Messaging

RUNTIME	Operating Systems	Hypervisor	Container Runtimes

EXAMPLE APPLICATIONS

Driving Assistance

Lighting

PLATFORM / DISTRIBUTION

QM Domain

Safety Domain

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

Autosar Classic Platform

Application Layer

Runtime Environment ❯

System Services ❯	Memory Services ❯	Crypto Services ❯	Off Board Communcation Services ❯	Communication Services ❯	I/O Hardware Abstraction ❯	Complex Drivers
	Onboard Device Abstraction ❯	Memory Hardware Abstraction ❯	Crypto Hardware Abstraction ❯	Wireless Communication Hardware Abstraction ❯	Communication Hardware Abstraction ❯	
	Microcontroller Drivers ❯	Memory Drivers ❯	Crypto Drivers ❯	Wireless Communication Drivers ❯	Communication Drivers ❯	I/O Drivers ❯

Microcontroller

https://www.autosar.org/standards/classic-platform

SOAFEE Building Blocks

- **The Scalable Open Architecture for Embedded Edge (SOAFEE)**

[Source] https://www.soafee.io/
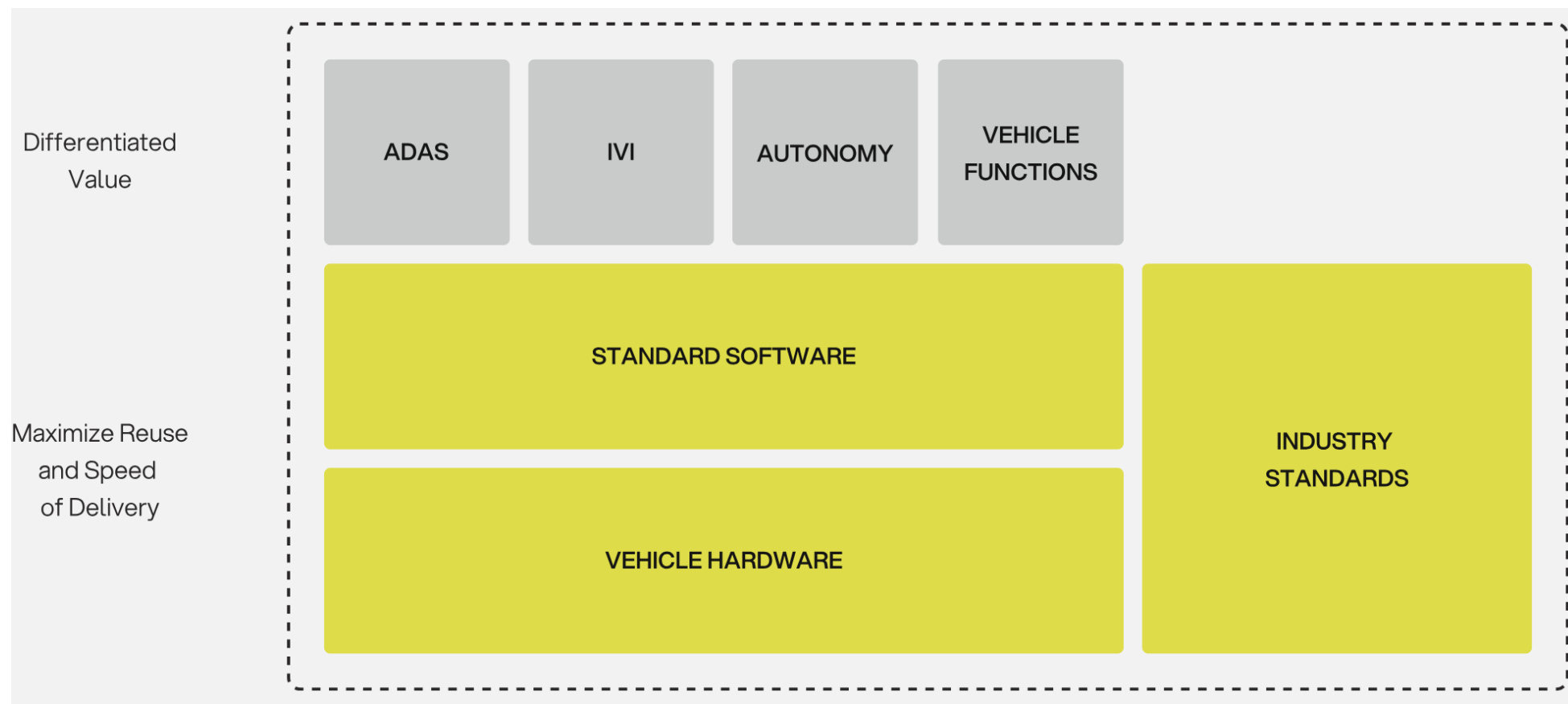
Vehicle Onboard Architecture

	Vehicle Offboard - DevOps Environment / Container Platform			
ASIL-D	ADAS / AD ASIL-B	Infotainment ASIL-B or non-critical	Quality Management non-critical	

OTA   OTA   OTA

Vehicle Onboard	Autosar CP App	Autosar - AP Applications	Hardened Posix Apps	Java Apps	Android Apps	Non hardened Linux apps
		Autosar Adaptive Runtime (ARA API)				Linux Wrapper
	Safety RTOS	Vehicle OS (incl. container runtime)				
		ASIL-B hypervisor (optional depending to architecture decisions) / ASIL-B bootloader				
	Safety uC (micro-controller)	ECUs / Standard HW Platforms e.g. ARM / x86 / GPU				

Service Oriented Communications via Ethernet, SOME/IP or different backbones

Red Hat   Integrator or Partner

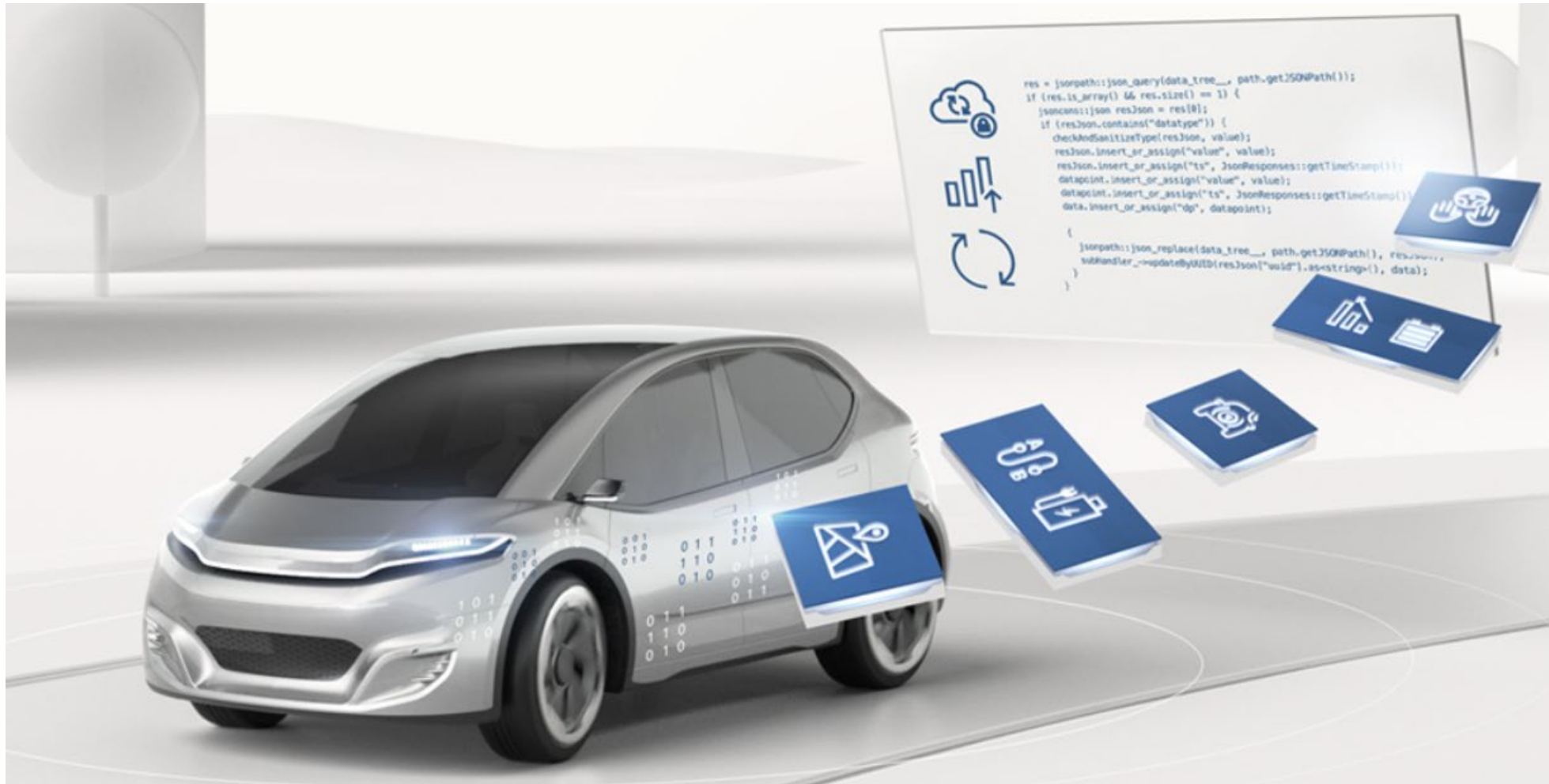[Source] https://www.ibm.com/blogs/digitale-perspektive/2023/06/the-software-defined-vehicle/

Software-Defined Vehicle (SDV) in Blackberry

**EMBEDDED SYSTEMS**
- ADAPTIVE CRUISE CONTROL
- AIRBAG
- COLLISION SENSORS
- CLIMATE CONTROL
- ANTI-LOCK BRAKES
- TRACTION CONTROL

USER EXPERIENCE
- INFOTAINMENT SYSTEMS
- VEHICLE CONTROLS
- DIGITAL COCKPITS
- ADVANCED DRIVER ASSISTANCE SYSTEMS
- ACOUSTICS MANAGEMENT

HARDWARE
- SYSTEM ON CHIP
- ELECTRONIC CONTROL UNITS
- DOMAIN CONTROLLERS
- HIGH-PERFORMANCE COMPUTERS

TELEMETRY
- SOFTWARE UPDATES
- DATA COMMUNICATION

[Source] https://blackberry.qnx.com/en/ultimate-guides/software-defined-vehicle

Software-Defined Vehicle (SDV) in Bosch

[Source] https://www.bosch-mobility.com/en/solutions/software-and-services/automotive-device-driver-library/

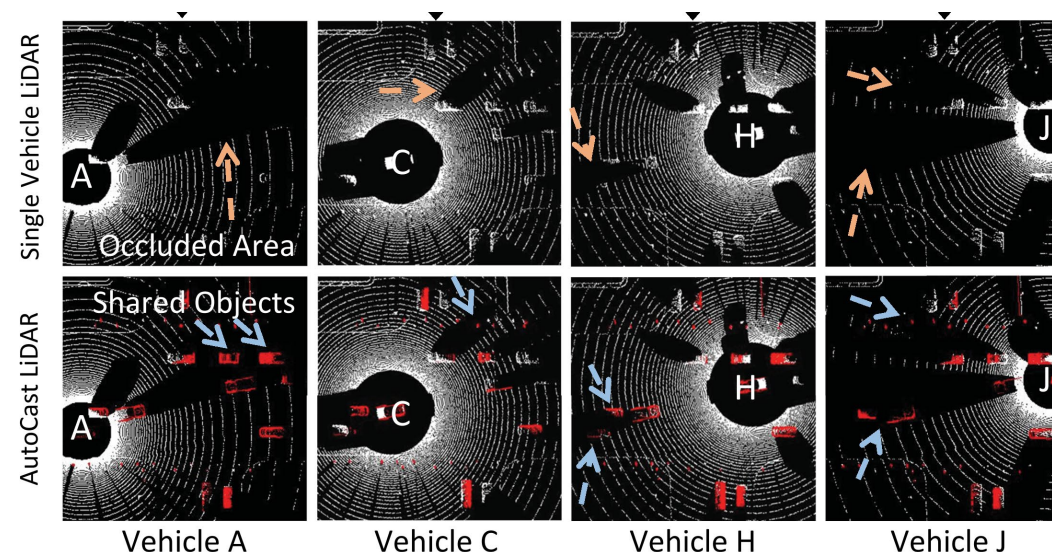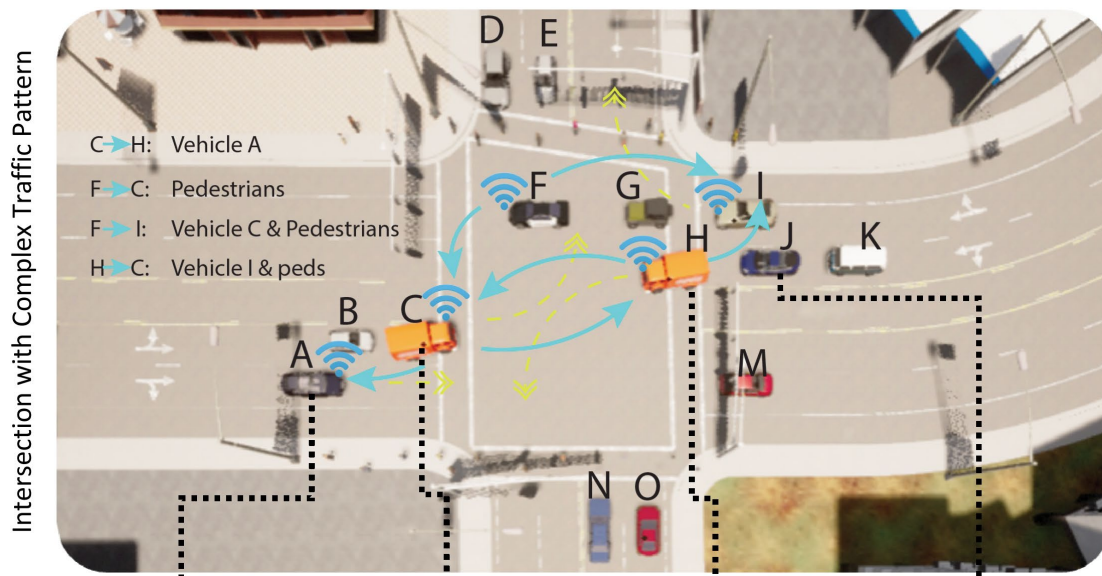# Discussion on Work Items with SDV (1)

- **Defining YANG data model for network configuration in vehicle, edge, and cloud.**
  - Does the current NETCONF work well in the scenario?
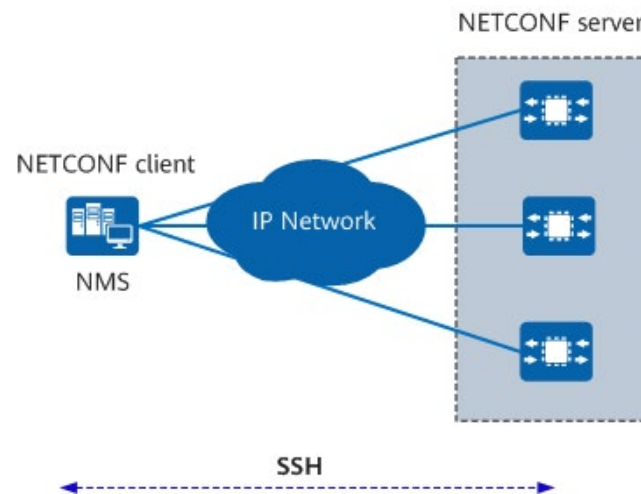
  - It also involves different components (e.g., actuators and sensors) in vehicles, requiring expertise in those areas.

Discussion on Work Items with SDV (2)

- **Considering VANET, scenarios may require to update network configurations for a group of vehicles.**
  - For example: cooperative road intersections -> large data transmission in a short time -> networks need to be re-configured.

H. Qiu, et al, AUTOCAST, ACM MobiSys 2022.

Thank you!