KPIT

22nd October 2019

Re-thinking diagnostics, scaling for the autonomous future

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BMW Group enlists KPIT and TTTech as software development partners for autonomous driving. Strong partnerships serve as enablers for Autonomous Driving Platform.

24.10.2018 Press Release ARCHIVE

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The BMW Group has once again selected expert software development partners, further consolidating its partner network in the process. The aim of the collaboration with KPIT and TTTech is to press ahead with the scalable Autonomous Driving Platform and to work together on the development of Level 3 and Level 4/5 functions (Highway Pilot and Urban Pilot).

Technology · Mobility of the future · Autonomous Driving · Driver Assistance

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Outline

- ❑ Progression of Autonomous Driving Features
- ❑ System Engineering View of Autonomous Driving
- ❑ Generic Architecture of Level 3 – Level 4 Features
- ❑ Use Cases in Autonomous Driving – requirements for Advanced Diagnostics

Progression in Autonomous Driving Features

Levels of Automation

SAE J3016 →

What it means ↓

SAE Levels	Name	
5	Full Automation	Driver Off
4	High Automation	Brain Off
3	Conditional Automation	Eyes Off, Hands Off and Feet Off
2	Partial Automation	Hands Off and Feet Off
1	Driver Assistance	All On
0	Warnings	All On

AD

ADAS

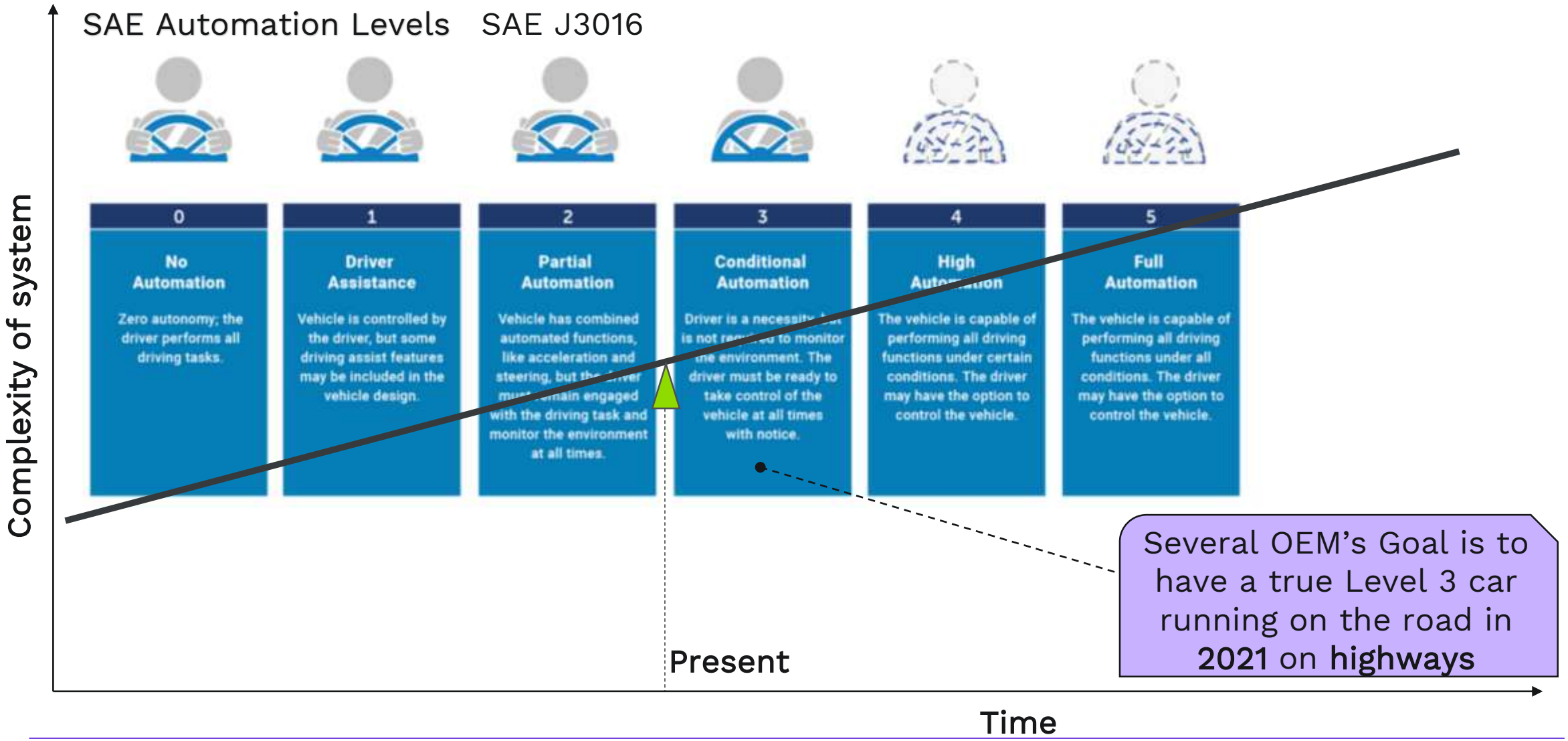
As the Automation Levels increase, so are the following responsibilities on the SYSTEM:

Monitoring **of Driving Environment**

Fallback Performance of *Dynamic Driving Task*

System Capability *(Driving Modes)*

Progression on Features



Key challenges for Autonomous Driving

Developing Specifications

- ❑ Features are new
- ❑ Transition of responsibilities from driver to machine (system) had to be defined and traced

Safety Criticality

- ❑ Availability of the system is safety critical for L3 and beyond (Fail-safe is replaced with Fail-operational)
- ❑ The system needs to be operating safely in the open and uncertain environment

Quick Development Timeline

- ❑ Need iterations to quickly define and understand the feature
- ❑ Multiple features and interactions are all interlinked (not discrete in nature)

Complex Software Functions and its Validation

- ❑ Many software functions and decisions
- ❑ New development techniques involving AI Based, Data Driven Functions etc

All these Challenges bring new Monitoring and Diagnostic requirements for the system

System Engineering View of Autonomous Driving

Systems Engineering for AD

The Basis for Systems Engineering

- Based on standards like INCOSE, IEC-15288 and ISO-26262
- Based on Lessons-Learned in Past Projects
- Borrowed concepts from safety critical system development in cross-domains like aerospace

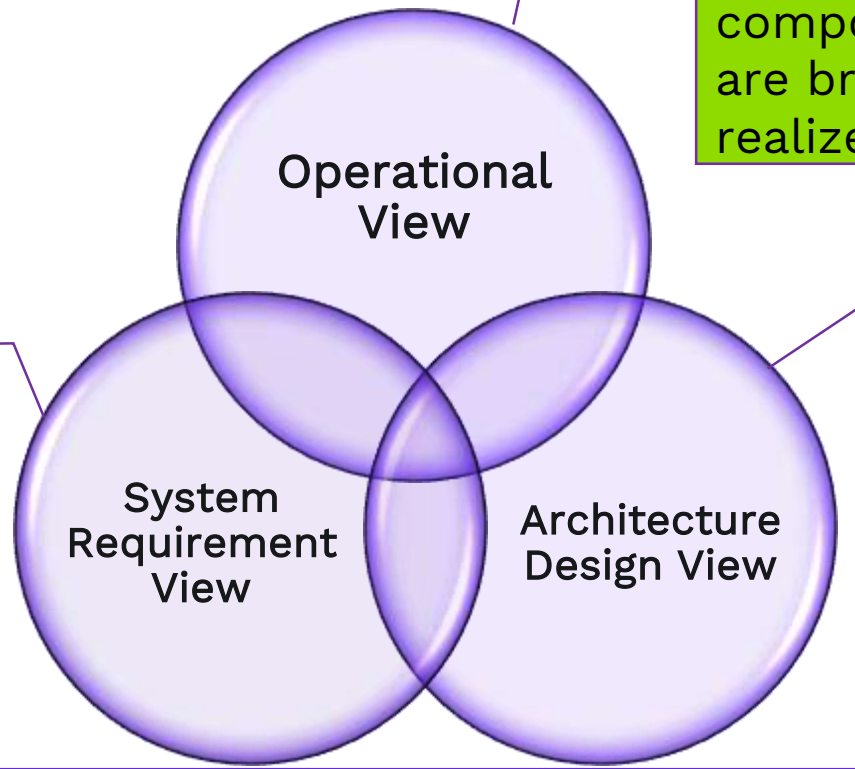
To Apply in Practice

The Method with Three Views

Defines WORK that User needs to accomplish with AD Feature

Defines HOW the components and interfaces are brought together to realize the system

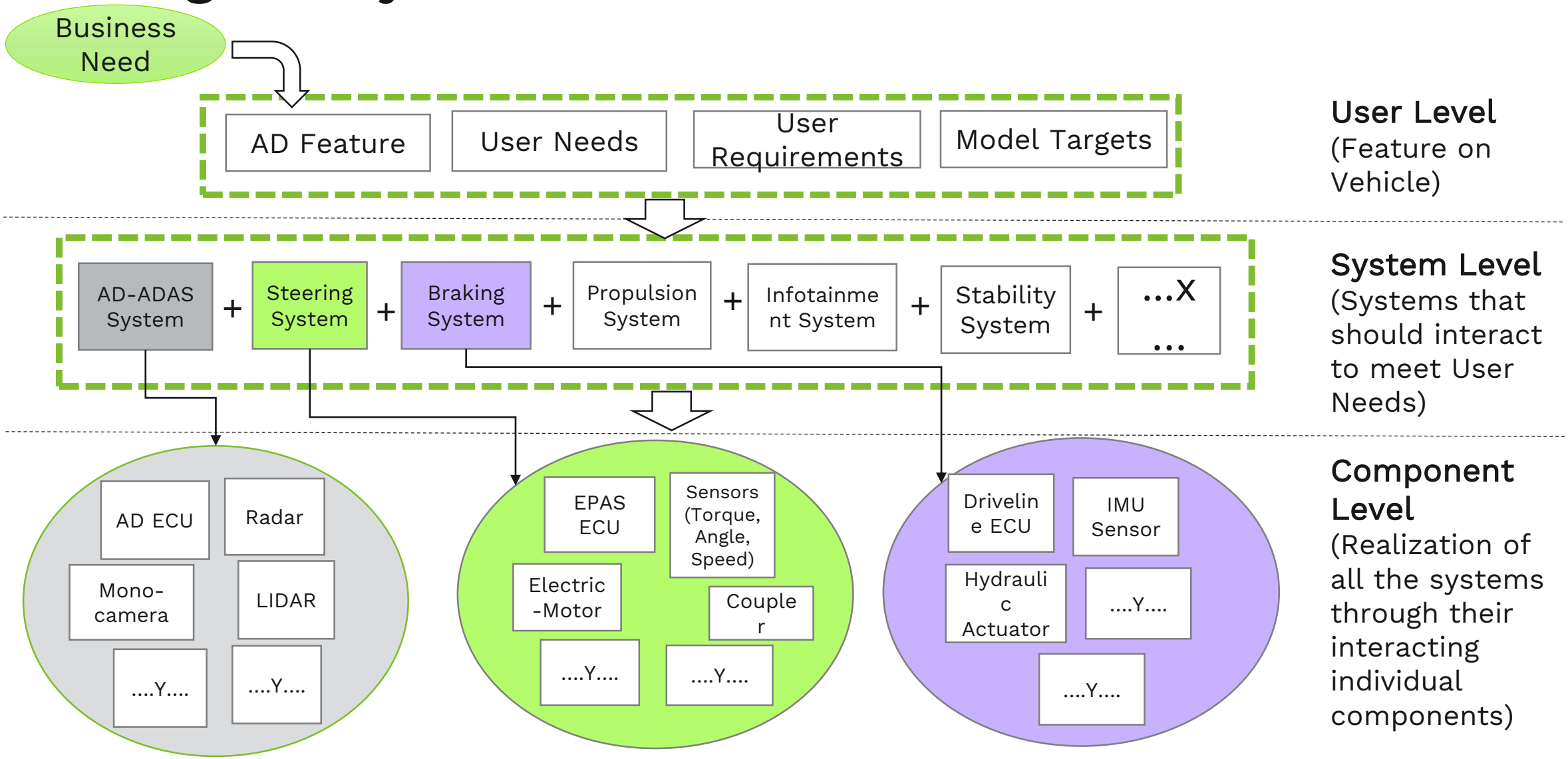
Defines WHAT the system must do to accomplish the AD Feature needs



All Three Bounded Together By

Functional Safety

Viewing the System



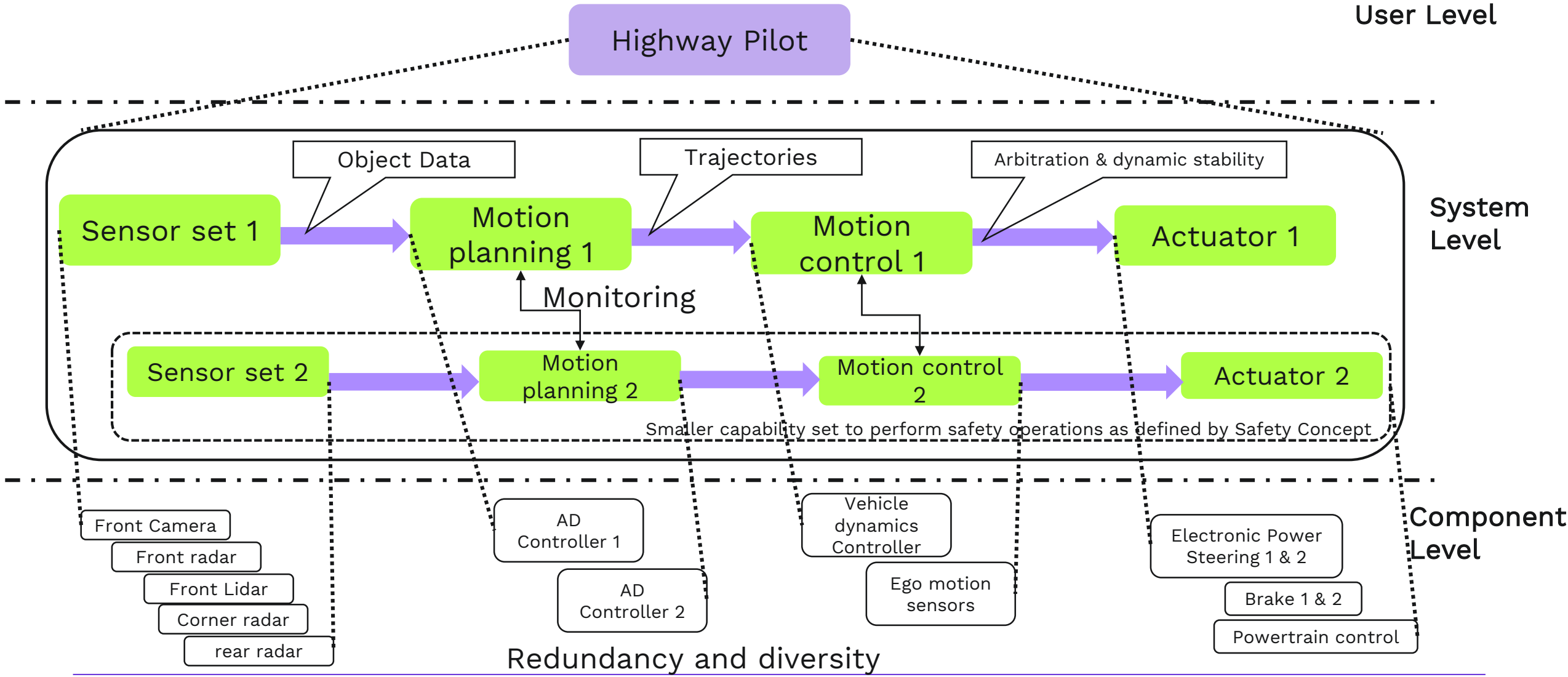
Generic Architecture of L3 and L4 Features

Highway pilot

High level feature specification

- Highway pilot feature drives vehicle autonomously on Highway (from entry to exit)
- Highway pilot can only be activated on approved Highways
- Highway pilot when active controls both longitudinal and lateral motion for the vehicle
- Highway pilot will raise take-over-request before exit of highway
- After take-over-request highway pilot must keep safe driving active until driver takes over
- Highway pilot shall allow a minimum of Ts (20-40s) for driver to takeover
- Highway pilot shall be able to drive during all weather conditions

Levels of Architecture for L3 – L4



Conclusion

Autonomous driving is bringing new challenges not only because of **complex software**, But also because of **reduced human supervision**.

This means **not only Driving** but **Monitoring and Diagnostics MUST** also evolve and take supervision from humans to become autonomous.

At KPIT, we are brining AD/ADAS and Diagnostics together!