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The impact of new Gateways and busses

- are these the answers for further innovations?

Podiums Discussion "embedded systems week"
Salzburg, Congress Center, 3 October 2007

Prof. Dr.-Ing. Gernot Spiegelberg,
Executive Vice President Strategy and Technology

Requirements in Automotive Business
- What´s about the car of the future ?

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Global Megatrends: Urbanization and Demographic Change

challenges

- Increasing mobility
- Shortening of natural resources
- Growing need for environmental care
- Growing demand for safety and security, information & communication
- Shift of economic gravity among regions

challenges

Automotive-Specific Trends

"Sustainable Mobility" | "Increasing Safety & Comfort" | "Seamless Connectivity"

"Managed Complexity"

Vision of the Car of the Future/ Typical Applications

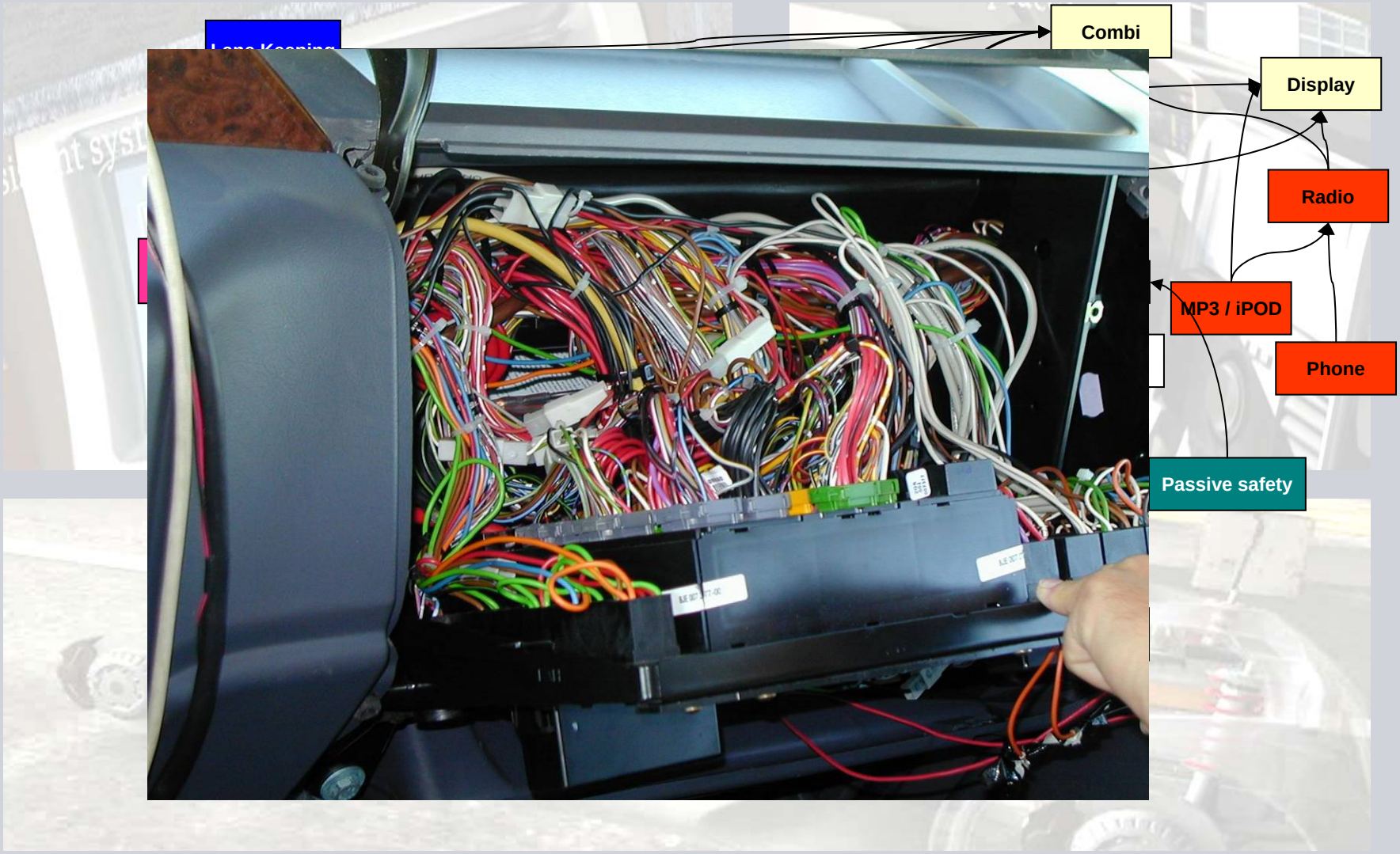
"Zero Emission"
e.g. Piezo Injection
e.g. Hybrid Drives
e.g. eCorner
"Drive-by-wire" Concept

"Zero Accidents"
e.g. pro.pilot Network or Driver Assistance
e.g. Electronic Wedge Brake

"Always On"
e.g. Car-to-Car Communication
e.g. Integration of Nomadic Devices via Wireless Hub

"Always Easy"
e.g. 5 Module Approach for E/E-Network
e.g. Platform-based BCU
e.g. CESAR Cockpit

It makes no sense to define busses and gateways without a sensefull architecture based on data flow



Perceive, Analyze and Act with optimized data flow

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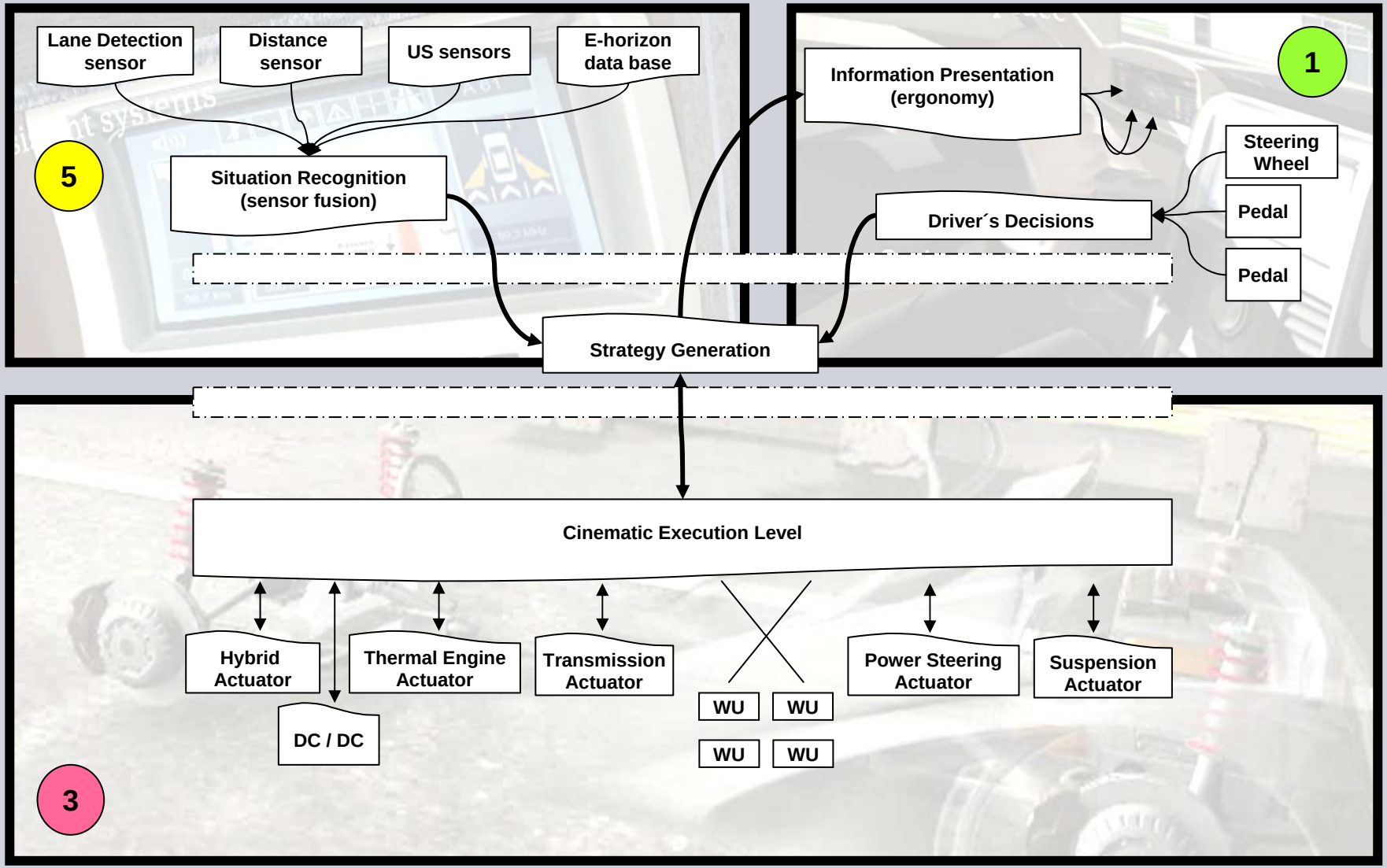

Application Interfaces

Functions have to be bundled based on data flow

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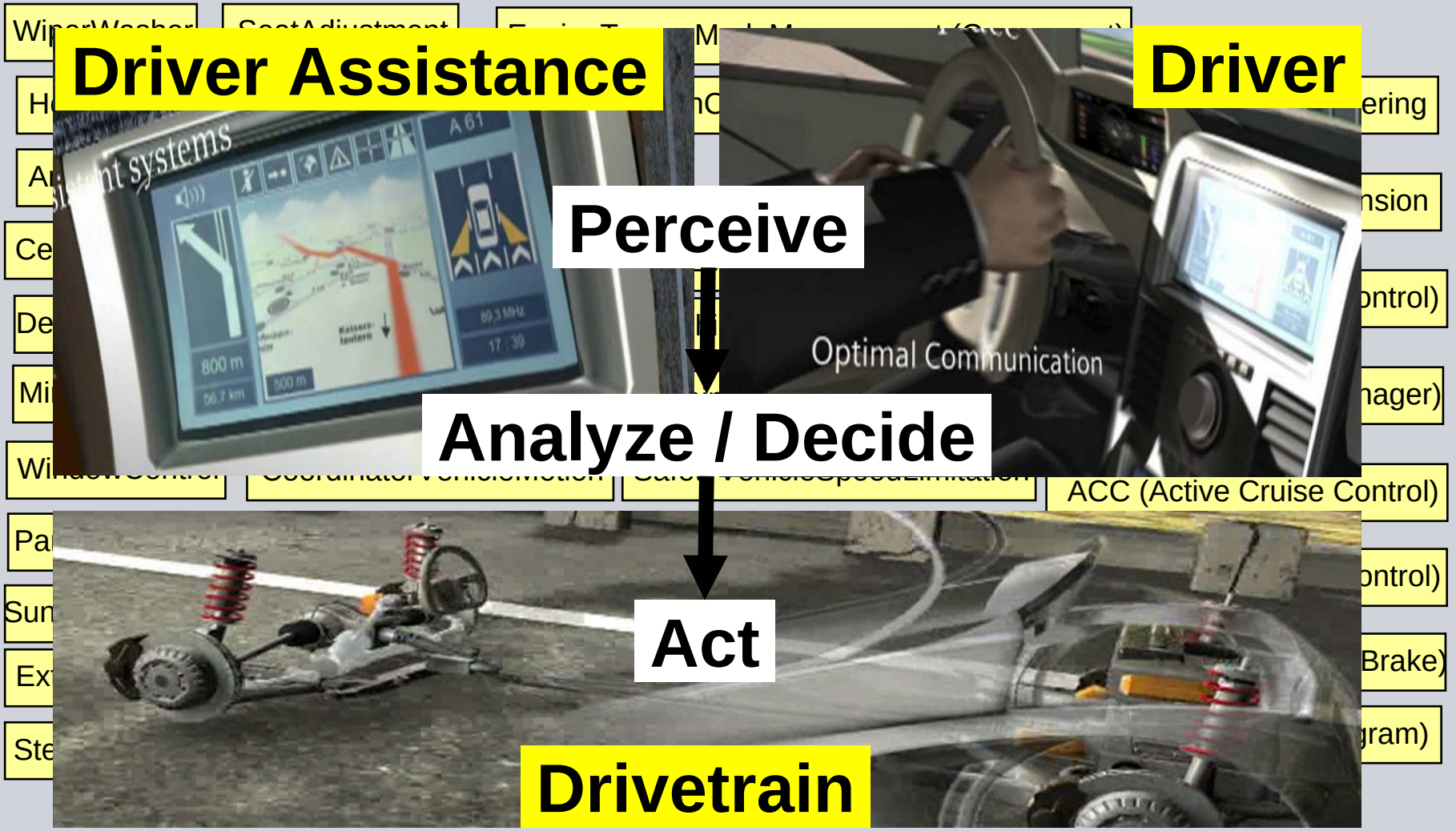

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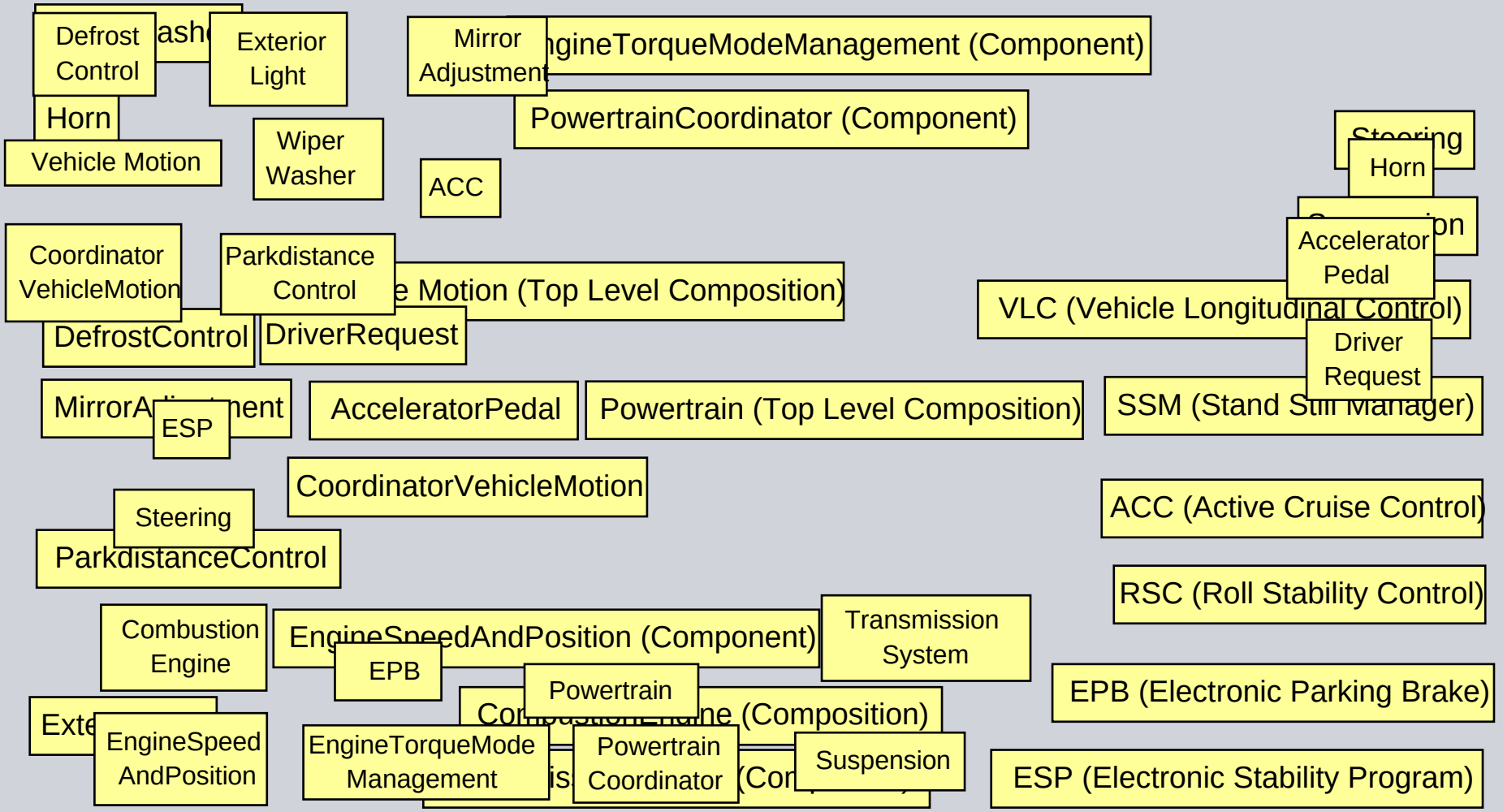
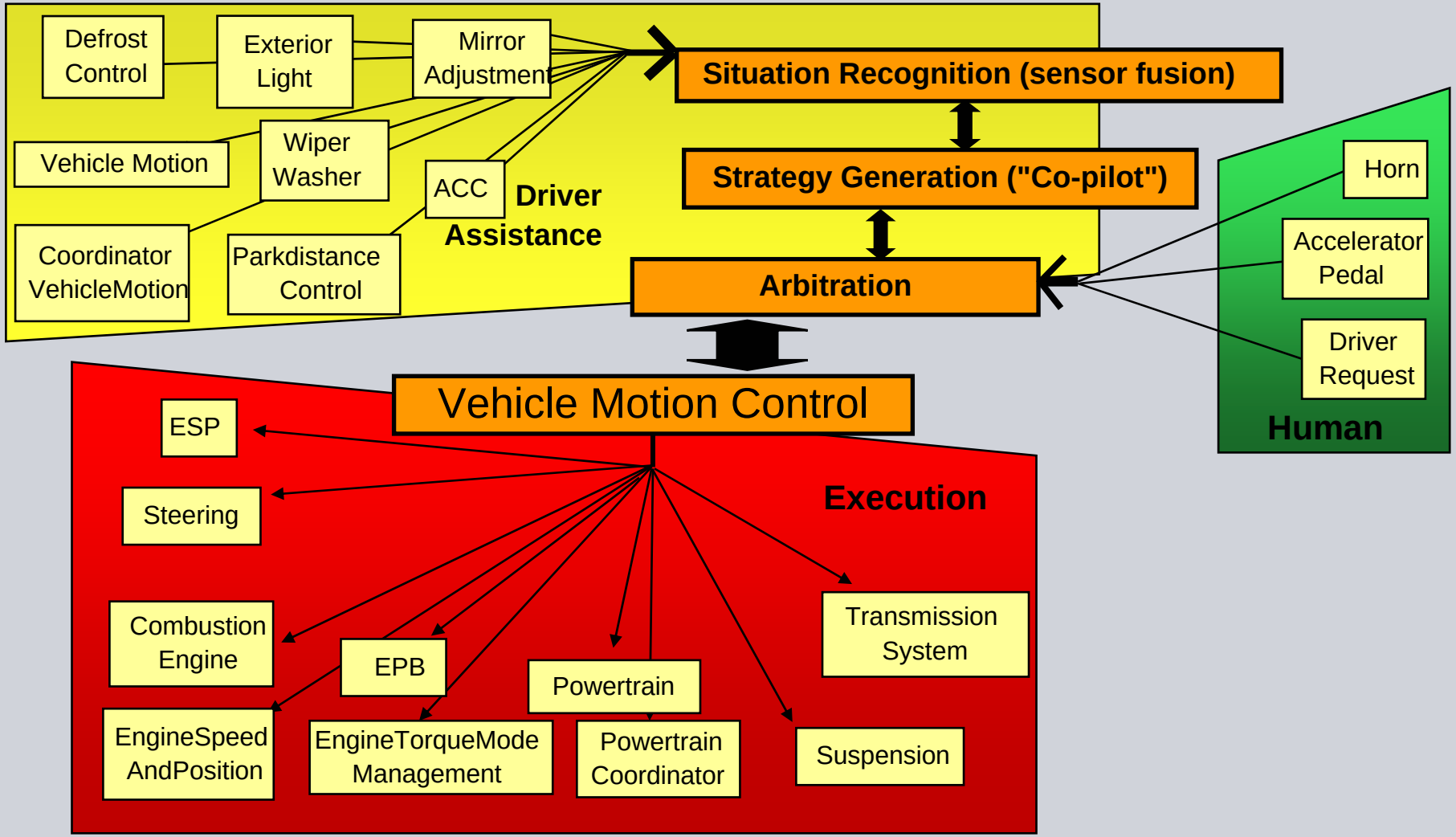


Application Interfaces with low interaction

From function cluster to fusion in data flow



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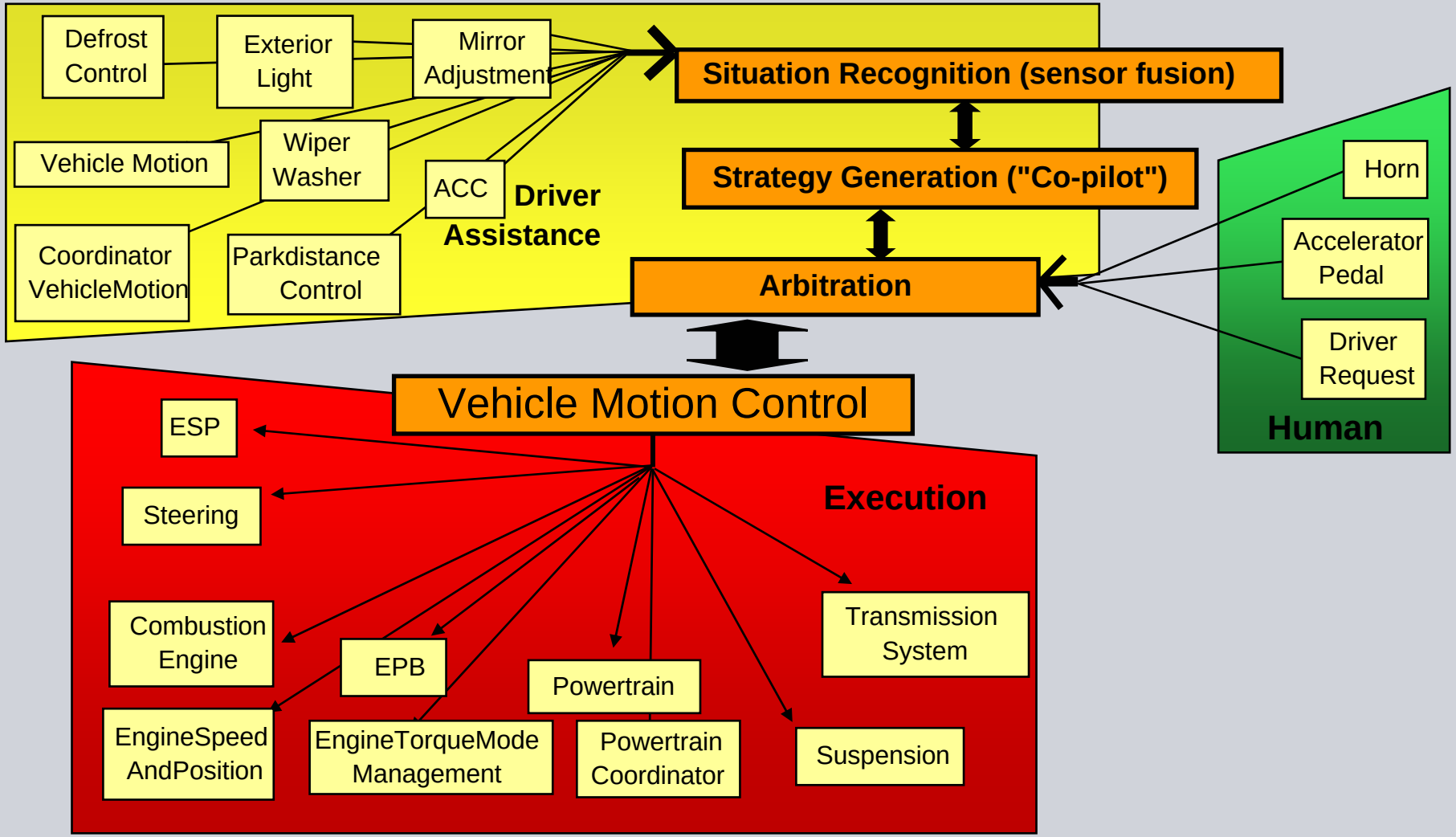
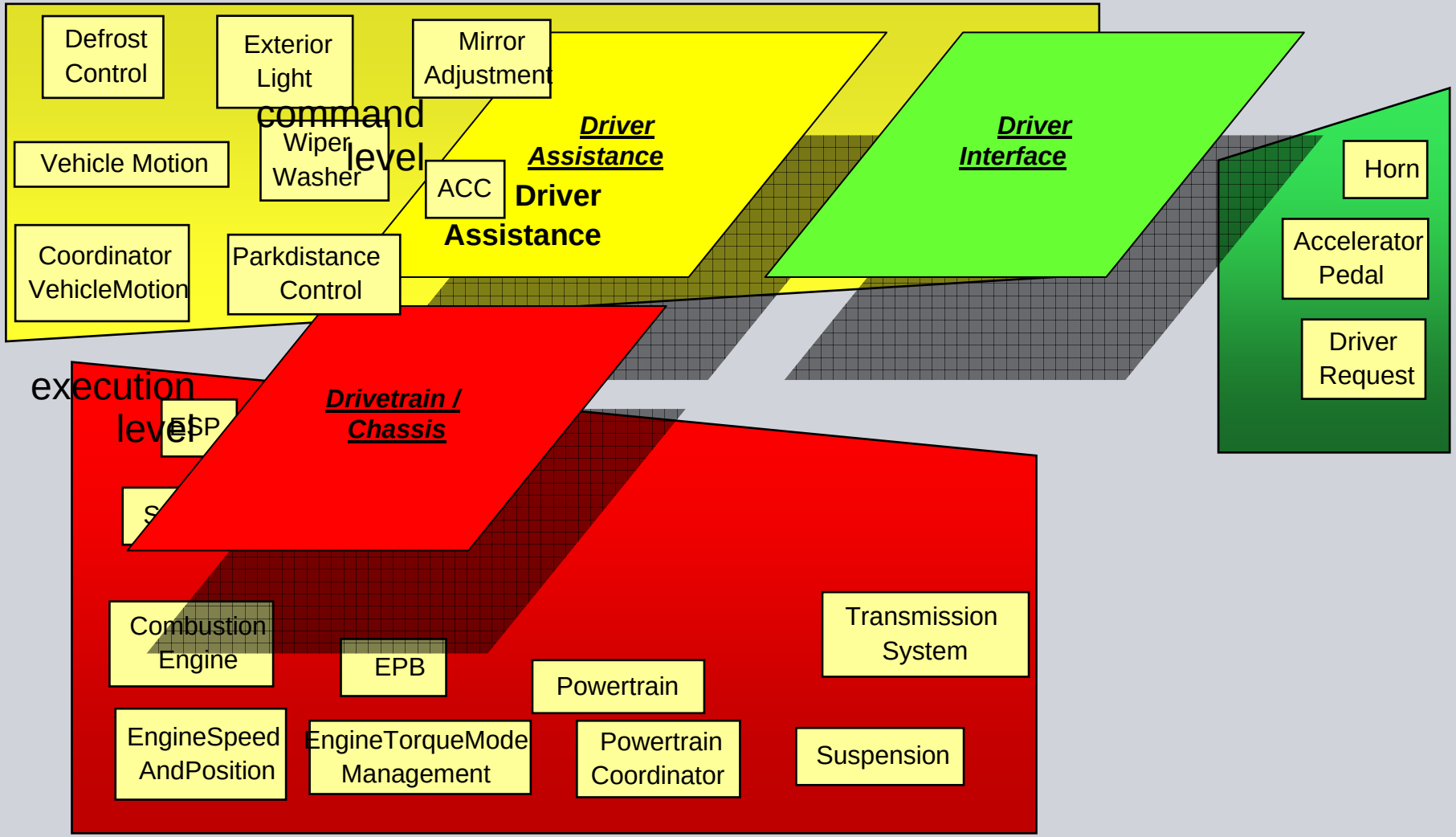


Application Interfaces with low interaction

The structures form the modulized functional architecture



We have to optimize the system architecture based on data flow

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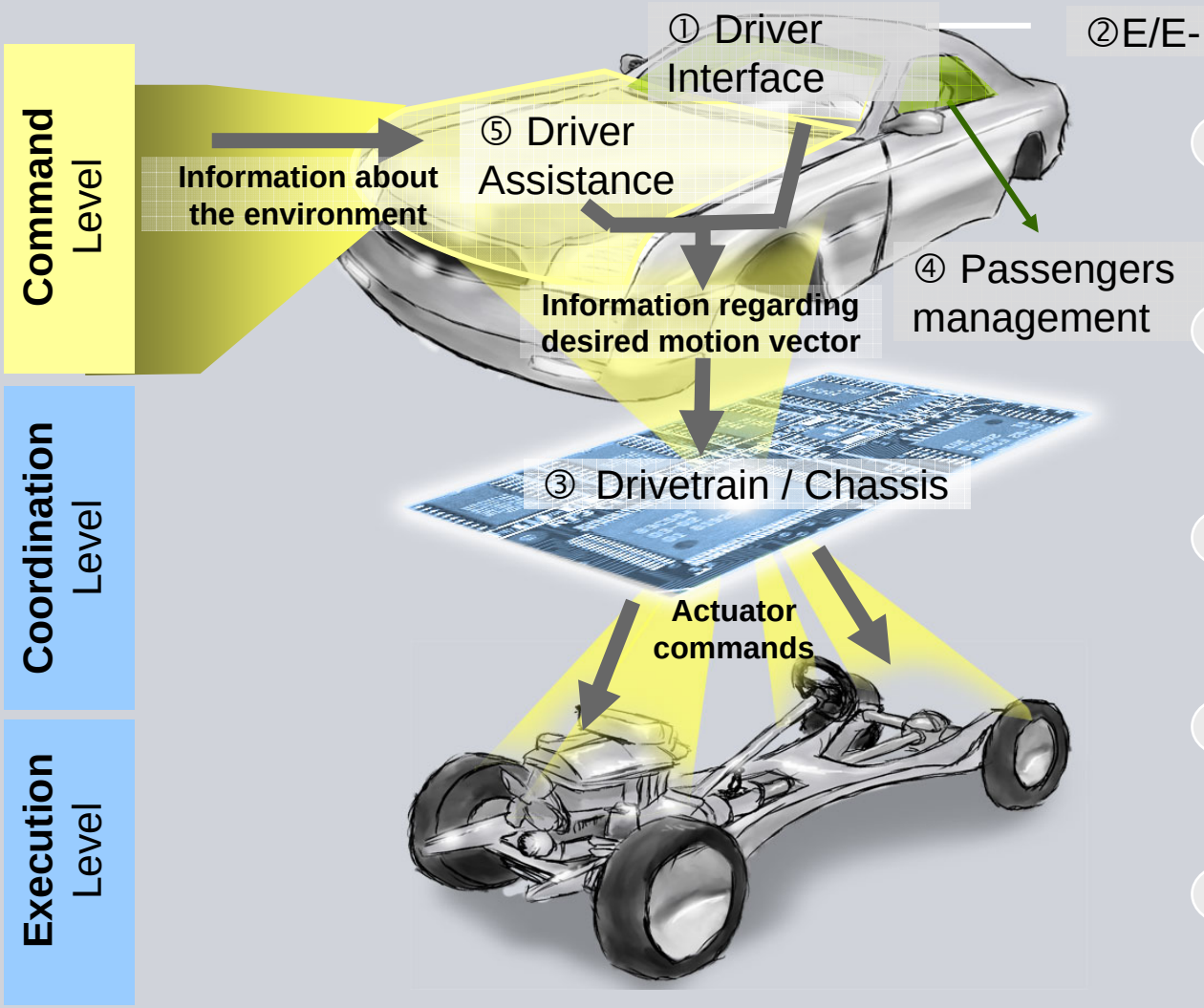


1 **Driver Interface**
- Capture of Driver commands
- Display of information to driver
- Infotainment

2 **E/E Infrastructure**
- Wiring harness
- Multiplexing
- Passive safety
- Entry system

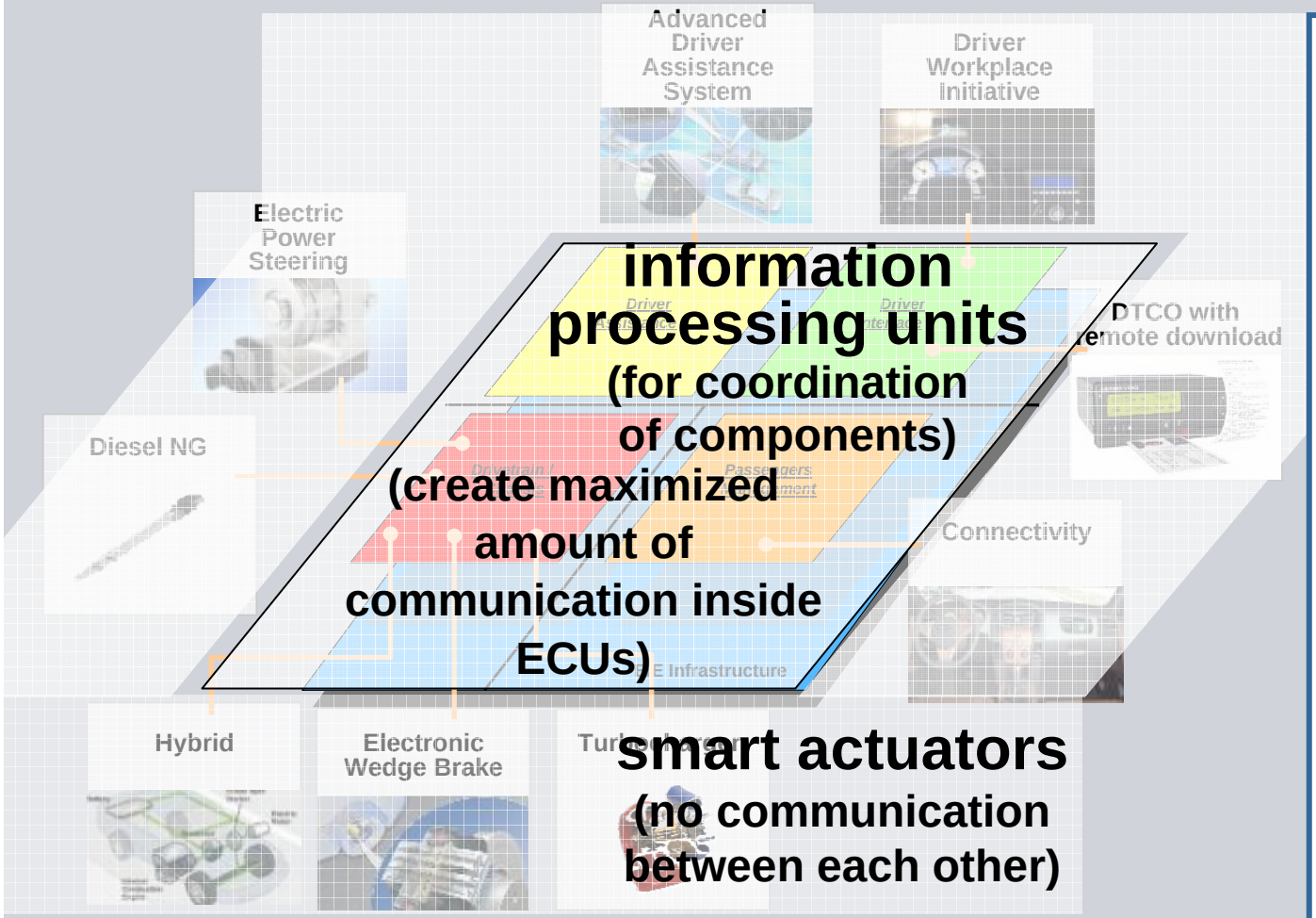
3 **Drivetrain / Chassis**
- Motion execution
- Energy-creation and -management
- Stability = reactive active safety

4 **Passengers Management (all non-driving related tasks)**
- Radio / entertainment
- Heating / climate

5 **Driver Assistance**
- Predictive surrounding evaluation
- Creation of the motion strategy based on primary / redundant surrounding evaluation

Source: Siemens VDO

The functional architecture can be transformed in a corresponding system architecture



- first discripe the needed communication to each smart actuator
- bundle coordinating communication in functional moduls, maximize communication inside ECU
- describe minimized remaining communication between functional moduls
- communication via real busses/gateways is as less as possible
- **complexity is decreased**

Source: Siemens VDO

First sidestick vehicle of Siemens VDO on road with licensed driver

Conclusions for communication in systems

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- **don´t increase bandwidth of busses and numbers of gateways, create a optimized architecture with mainly virtuel busses/gateways inside ECUs**

- depart information processing from power processing (hirachical levels with coordinating information processing and smart actuators)
- bundle functionalities for coordination with high communication between each other in one ECU (functional modules, but have in mind organisations)
- communicate inside the coordinating ECUs via defined memory areas
- drive as much as possible control at the smart actuator, but don´t interact with an other actuator on the same hirachical level to decrease bus load
- take care of optimized data flow between the functional modules to increase performance of functionality and to decrease bus load

- **the main work is to define the interfaces inside of ECUs (Autosar), with right architecture the remaining communication via busses and gateways is low**

results in performance and costs not taking in account right data flow

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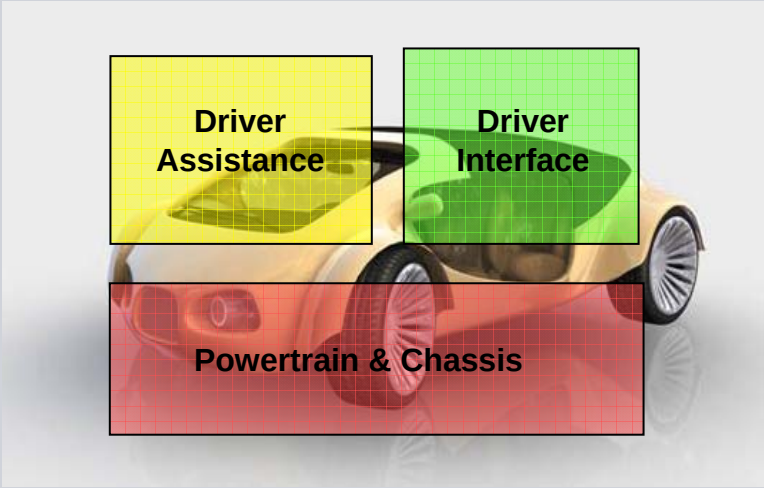

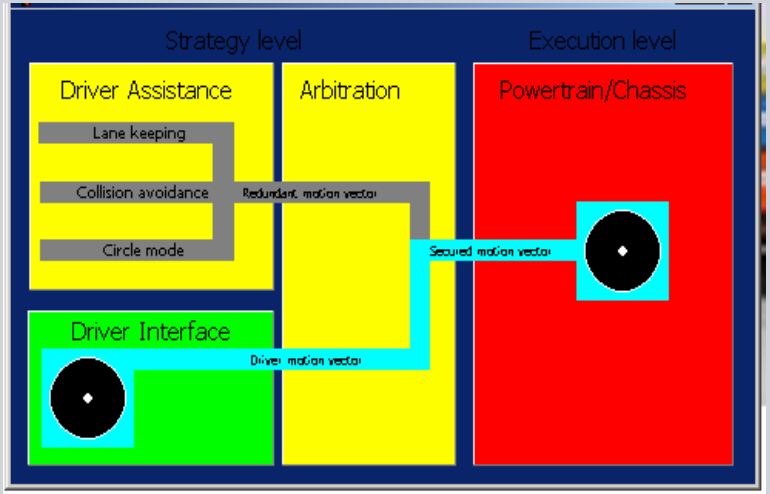

1. bad performance in multimedia
2. bad performance in stability control
3. intransparent data flow in decisions

It´s a lot of work to do, so support it ....
..... with smart architecture

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