



# Safe and Efficient Electrical Vehicle

## Simplified Architecture by the use of Decision Units

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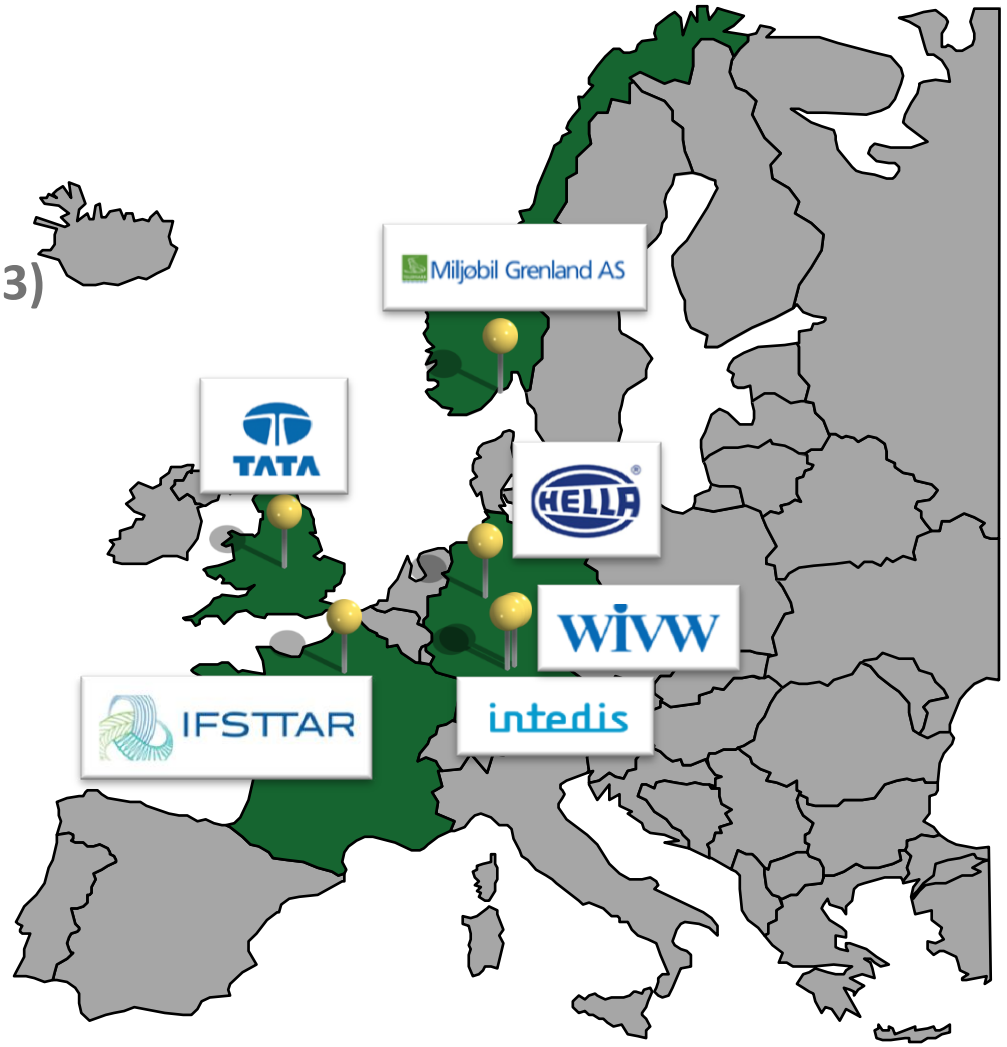
# Agenda
## Simplified Architecture by the use of Decision Units

- A few words about the project eFuture
- The idea of a simplified and scalable functional architecture
- The concept of the Decision Units
- Vehicle integration

# Outline of eFuture

## „Safe and Efficient Electrical Vehicle“

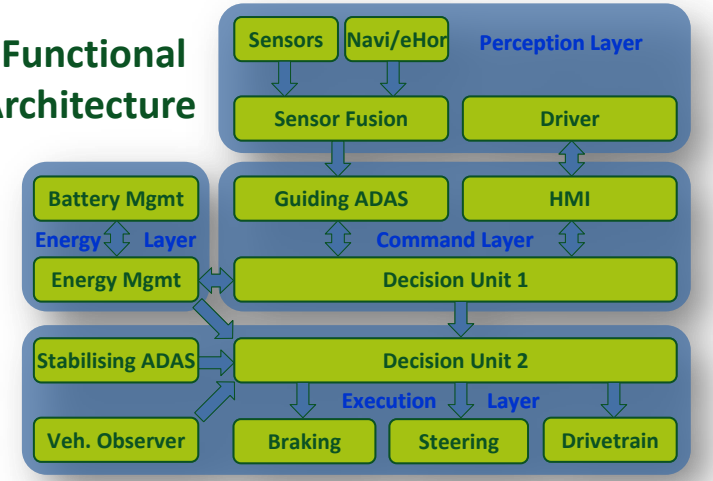
- Funded by the European Commission (grant no. 258133)
- Duration 3 years (until September 2013)
- Budget ca. 7 Mio. Euro
- Funding ca. 4 Mio. Euro
- 6 partners from 4 countries
  4 from industry
  2 research institutes
- Coordinator:
  Intedis, Würzburg

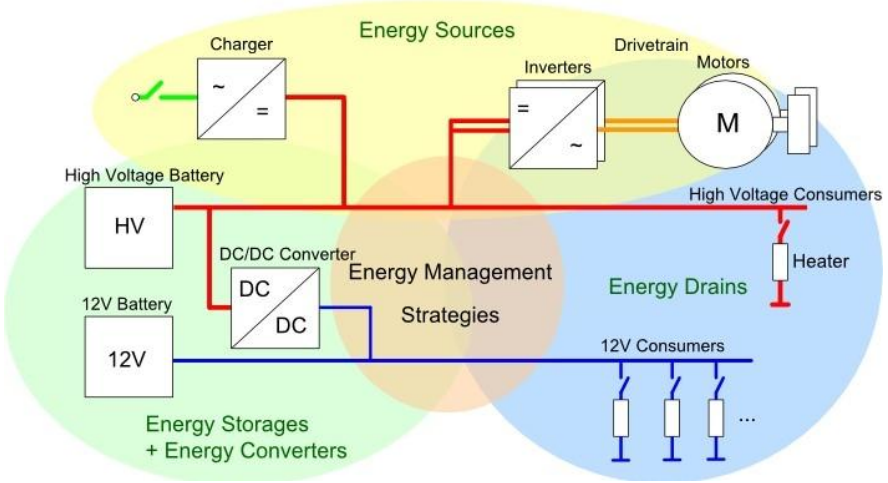


# Project focus

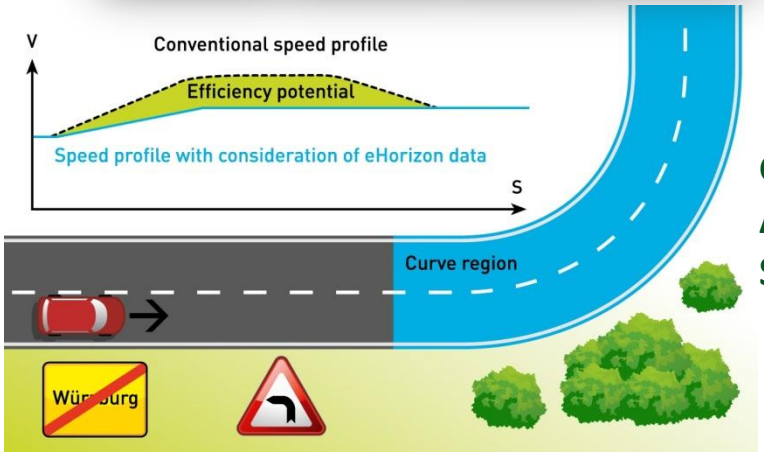
## „Safe and Efficient Electrical Vehicle“

**Functional Architecture**




**Energy management**

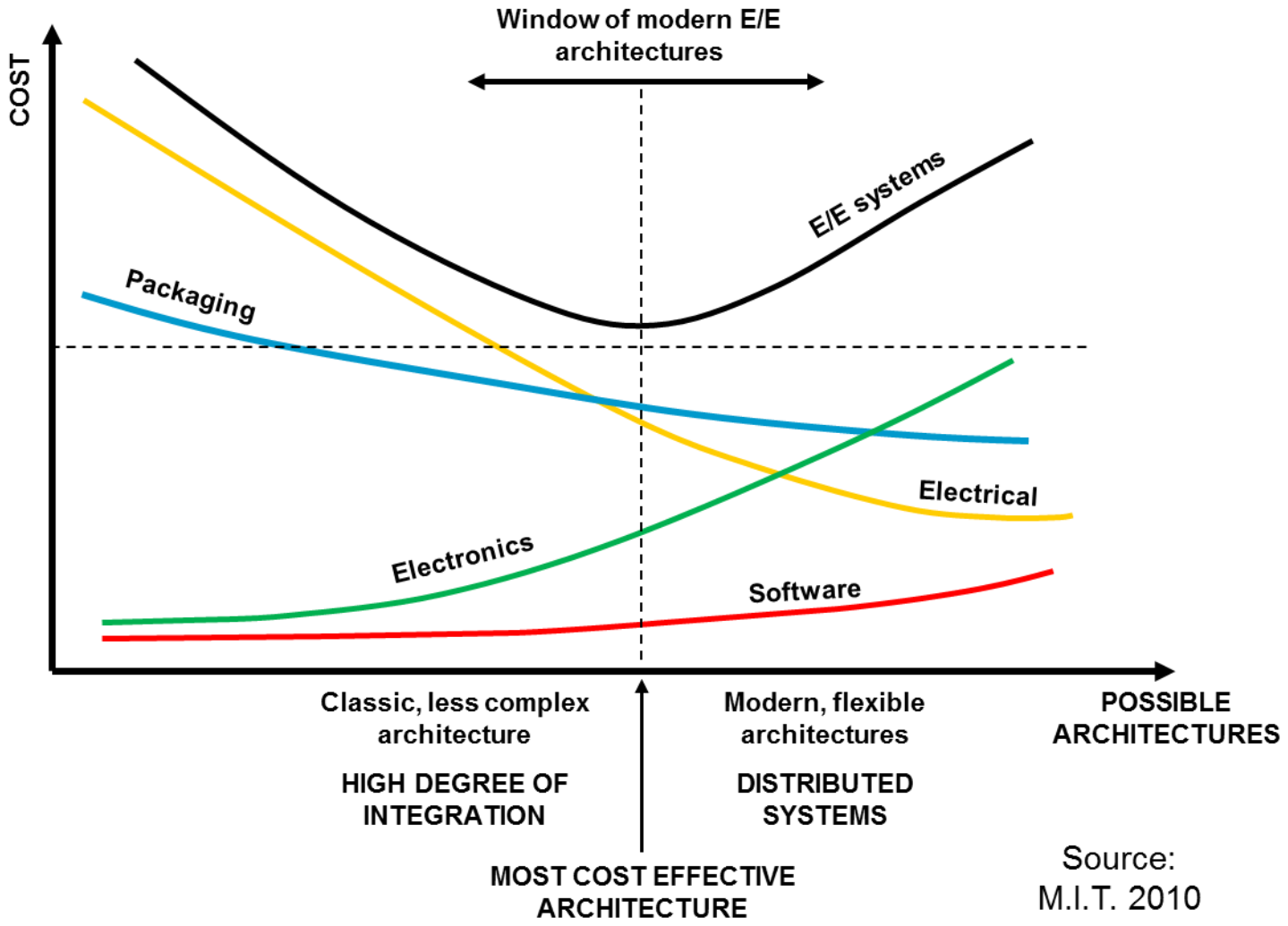



**Green Assistance Systems**


**Driver Coaching**

# Factors for architecture selection

## Flexibility means high software effort

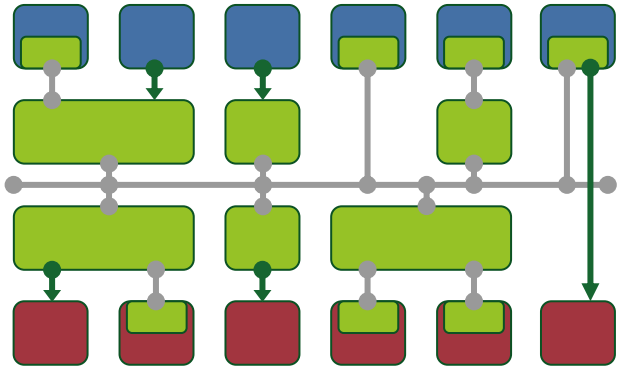



Source:
M.I.T. 2010

# Architecture concepts

## Domain controllers require new functional concepts

### Function Controller



Sensors with, w/o function controller

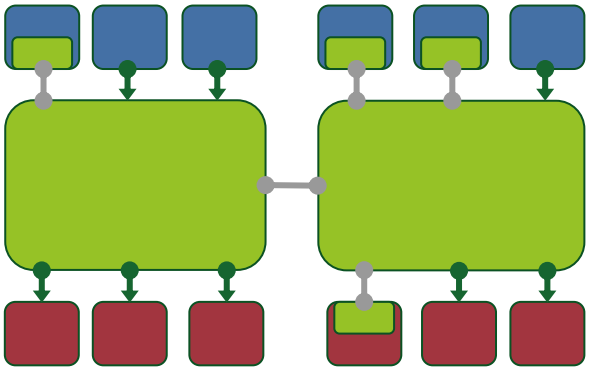
Control Units

Communication Network

Actuators with, w/o function controller

- One / a few SW functions per ECU
- High HW complexity
- High data communication
- High integration effort for vehicle functions

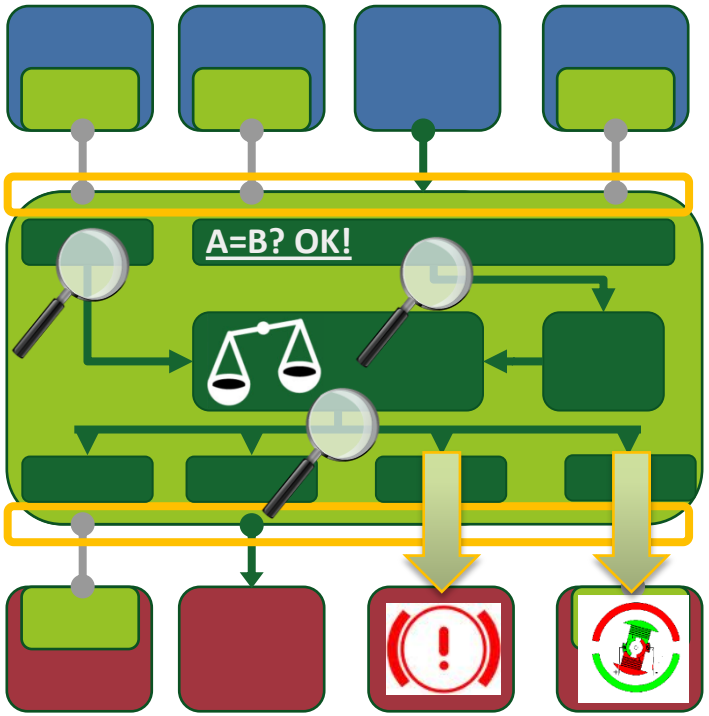
### Domain Controller



- More (central) SW functions per ECU
- High SW complexity
- Low data communication
- Lower integration effort for vehicle functions

# Features of the functional architecture for domain controllers

- **Requirements**
  - Scalability
  - Standardised interfaces
  - Hierarchic composition
  - Support of Functional Safety
- **Prospects**
  - Central parametrisation
  - Plausibility check of sensor data
  - Scenario specific actuator selection
- **Application to the electric vehicle**
  - Enabler for strategy change
  - Necessity for new functions
  - Efficiency and Safety

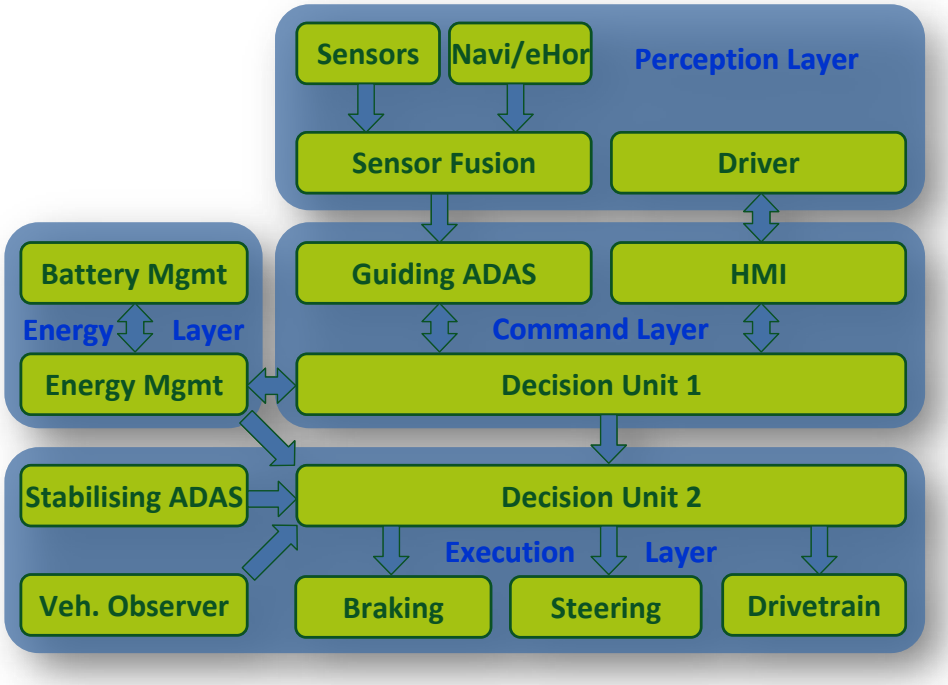


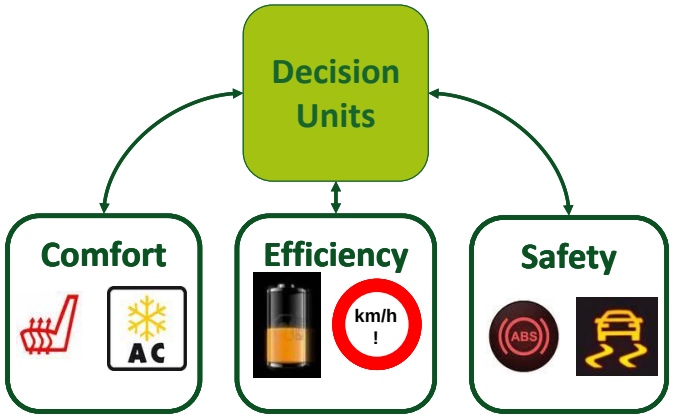
# eFuture‘s compact functional architecture

## …supports energy efficiency and safety

- Introduction of decision units as central intelligence functions
- Balancing of efficiency and comfort
- Allowing for various new functions

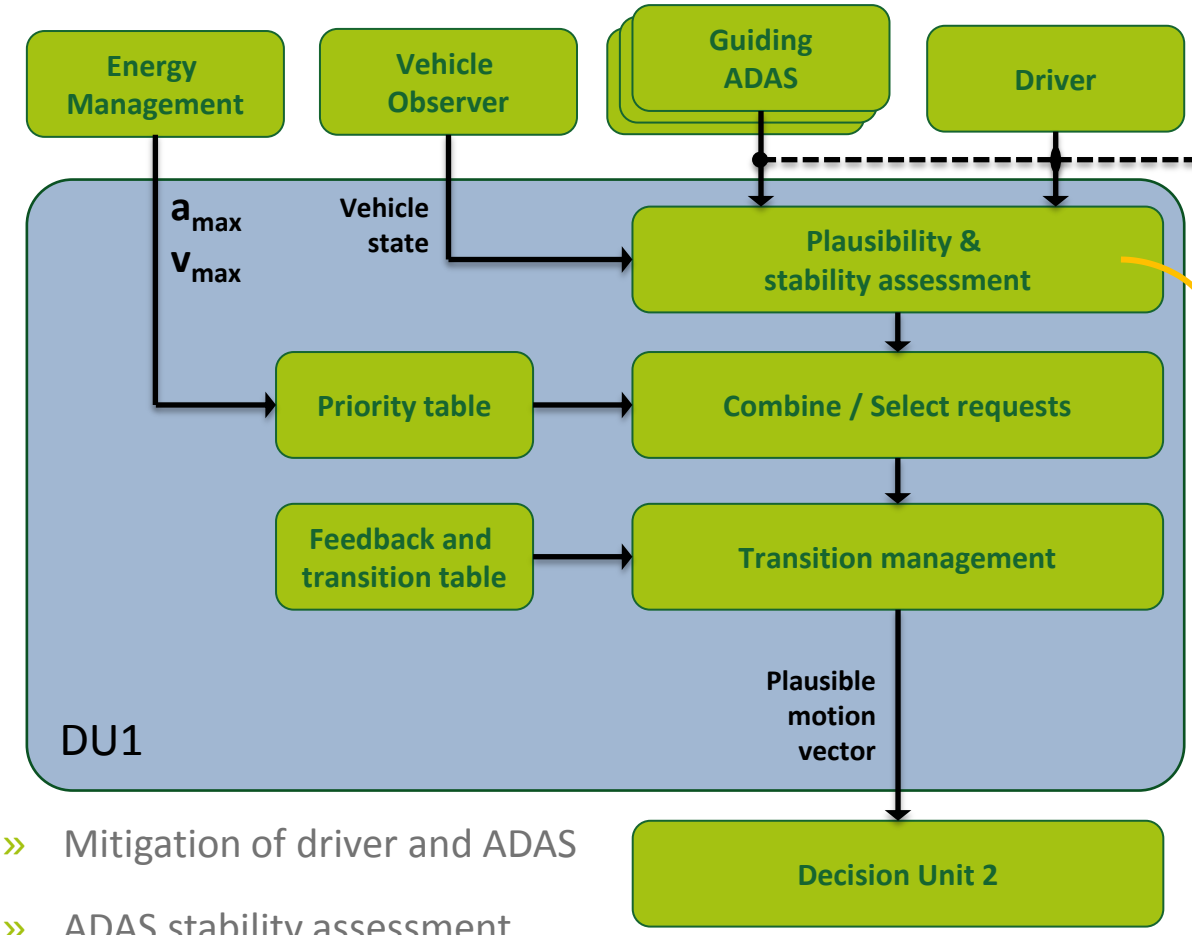
Adv. Energy Mgmt. | Energy Modes | Driver Coaching | Smart & Green ACC | Vehicle Observer | Torque Vectoring

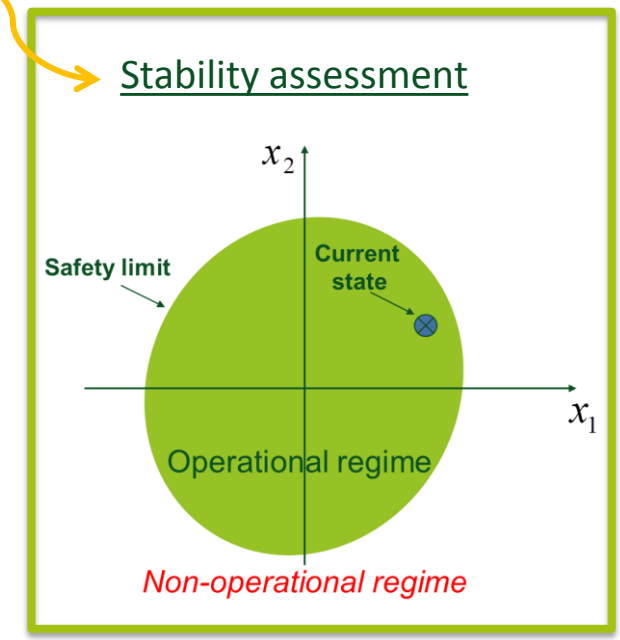


# Decision Unit 1: Command Layer

## Where the vehicle shall drive to?

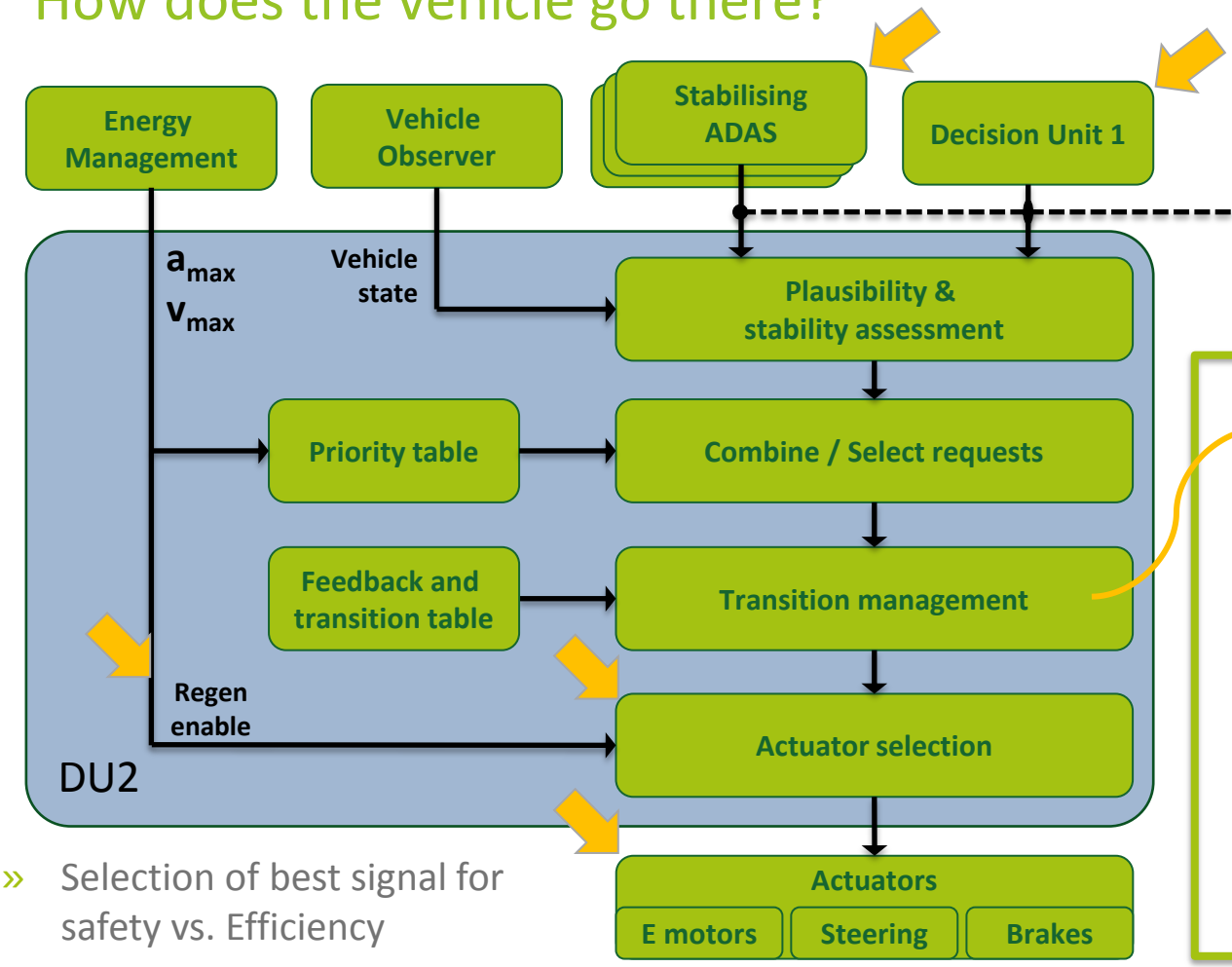


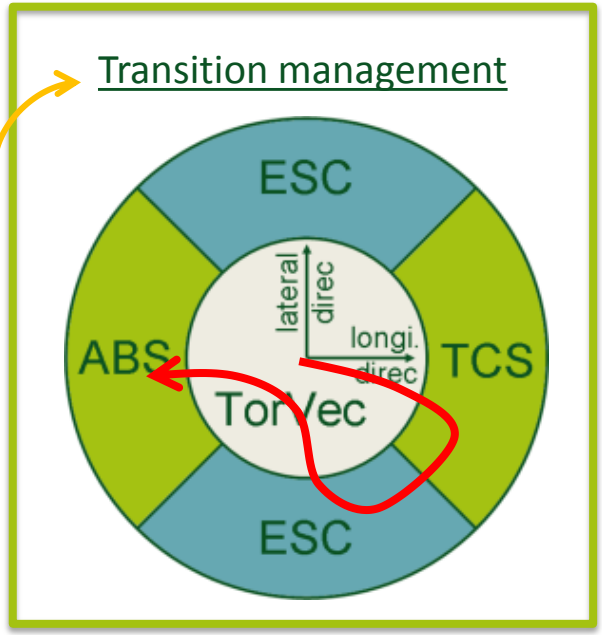




- Mitigation of driver and ADAS
- ADAS stability assessment
- Transition management

# Decision Unit 2: Execution Layer

## How does the vehicle go there?

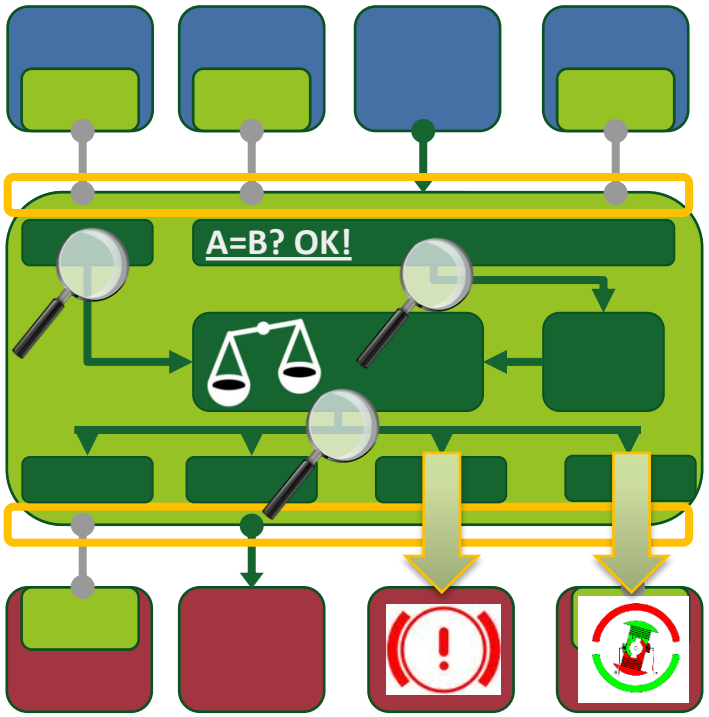



- Selection of best signal for safety vs. Efficiency
- Selection of most suitable actuator

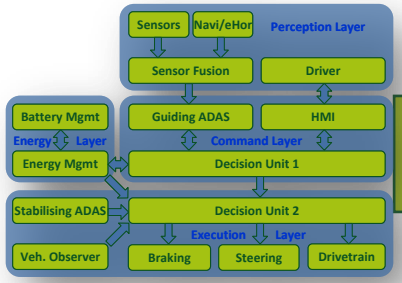
# Features of the concept

- Scalable function integration („Plug‘n‘Play“)
- Vehicle behaviour follows simple parameters and rules set in priority tables
- Redundant plausibility check for high ASIL ratings
- Controlling the transition between manual and assisted driving

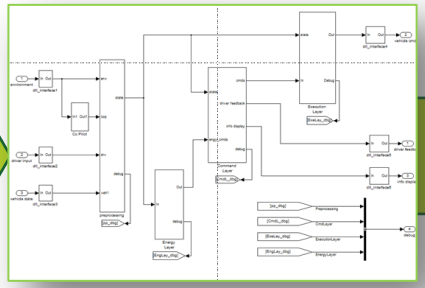


# Vehicle Integration

- Migration from simulation to the vehicle
- Validation of the concept




Functional Architecture



Simulation Model

Lab Testing

AUTOSAR




Thank you for your attention.

Questions?

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