

EAST-ADL

An Architecture Description Language for Automotive Software-Intensive Systems

Introduction

- EAST-ADL represents an Architecture Description Language (ADL) to describe automotive systems

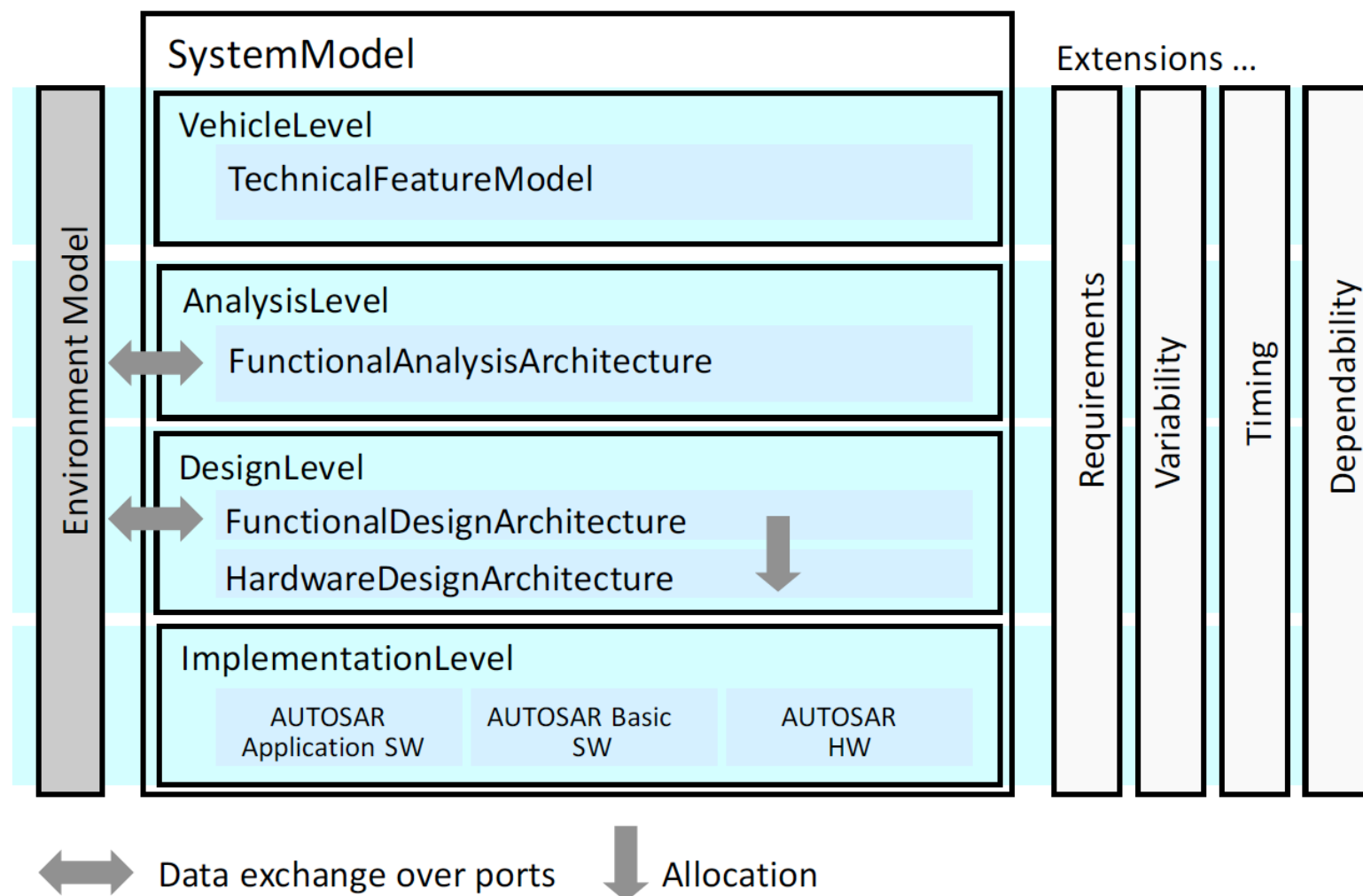


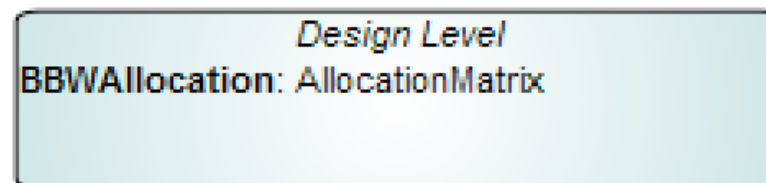
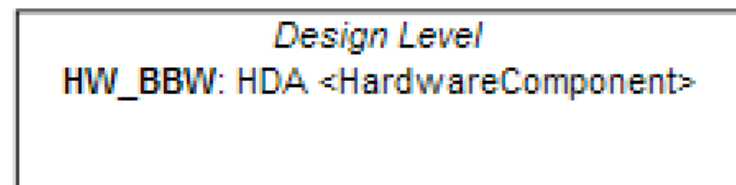
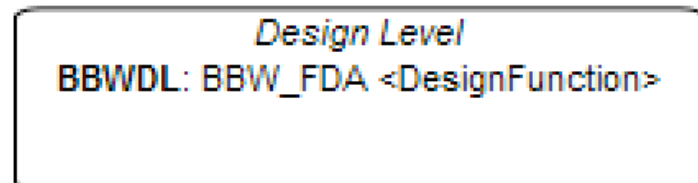
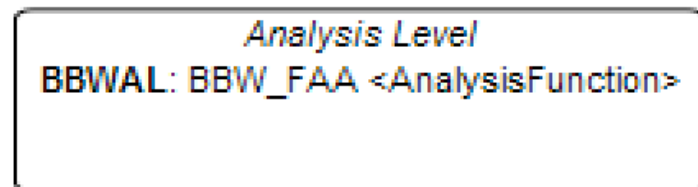
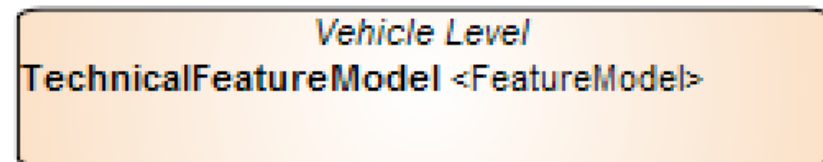
Figure 1: The EAST-ADL's breakdown in abstraction levels (vertically) and in core system model, environment and extensions (horizontally).

The four abstraction levels

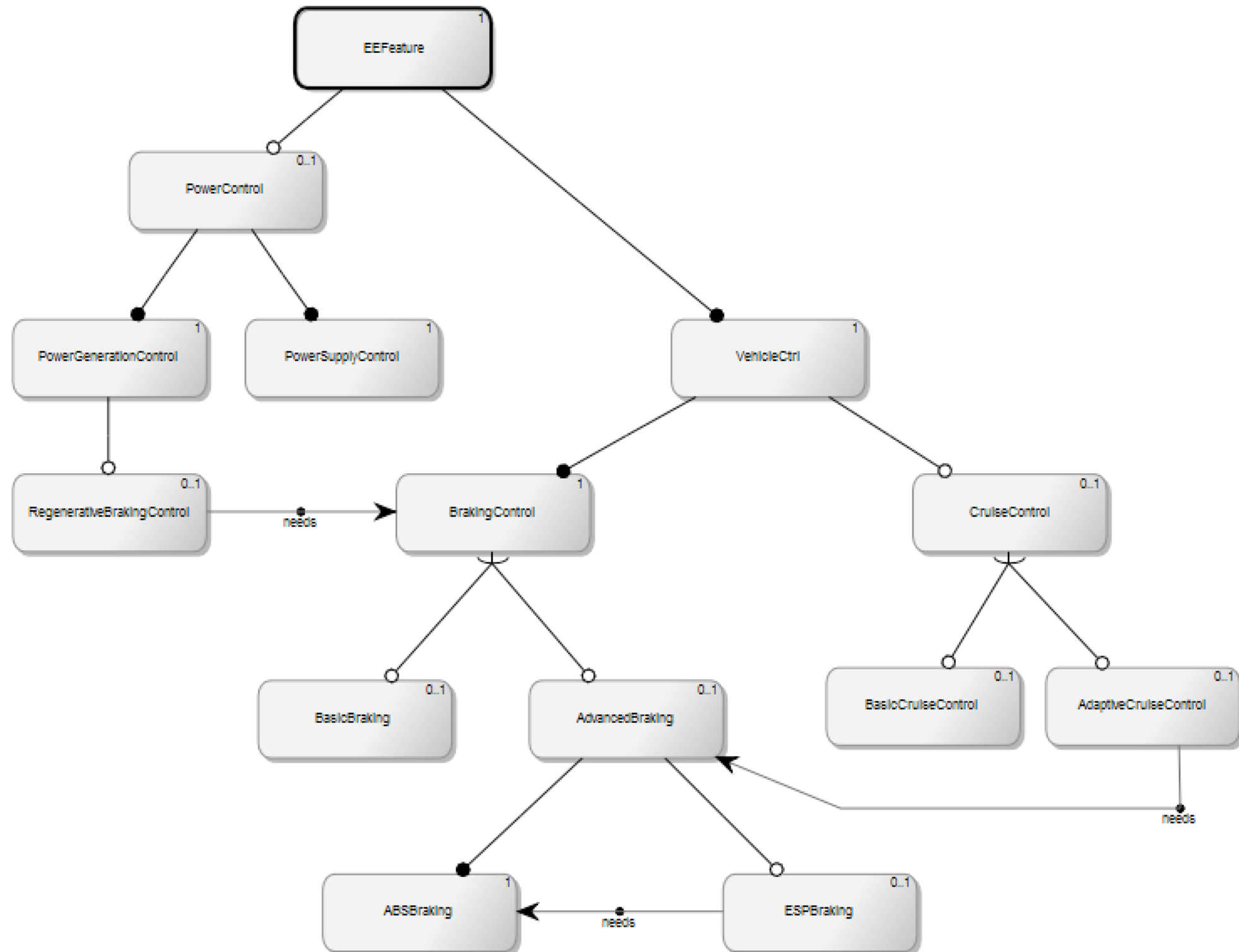
- **Vehicle Level**
Feature trees characterizing the vehicle content as it is perceived externally.
- **Analysis Level**
An abstract functional architecture defining systems from a functional point of view.
- **Design Level**
The detailed functional architecture allocated to a hardware architecture.
- **Implementation Level**
The implementation of the embedded system represented using AUTOSAR elements

Example Model—BBW

- Brake By Wire System



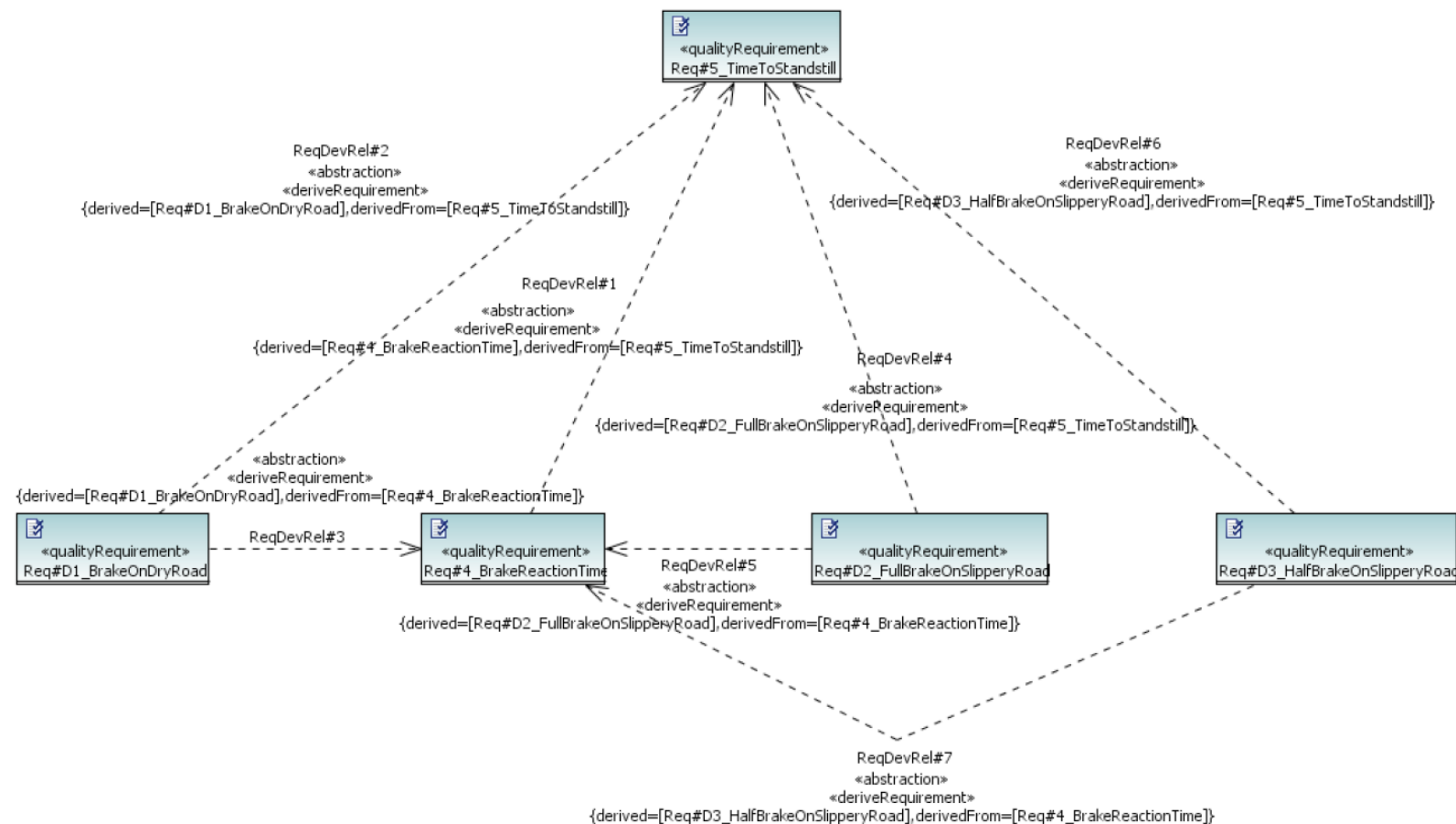
Vehicle Level



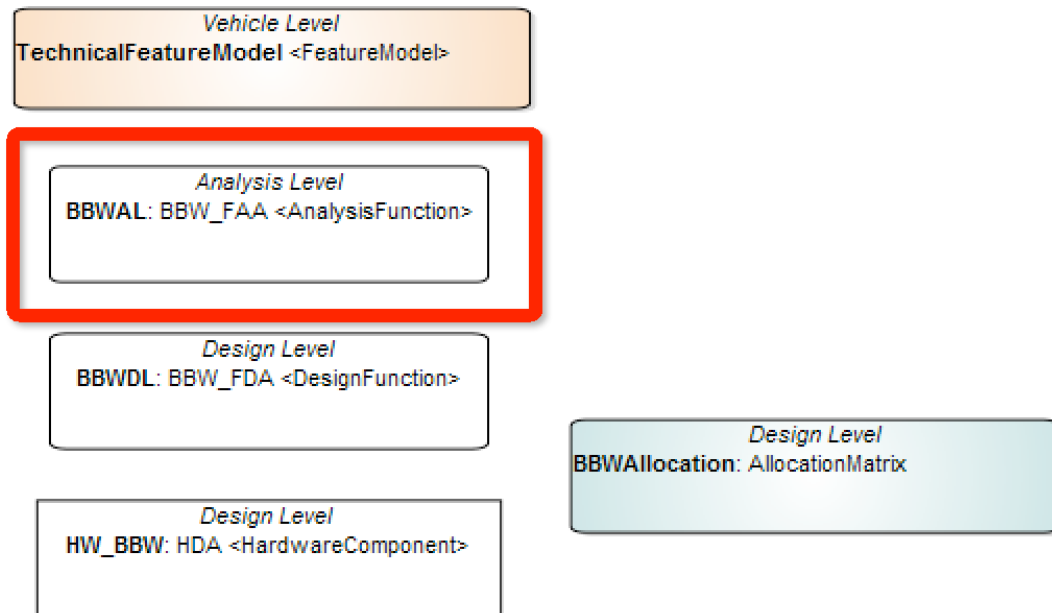
Vehicle Level

- The Technical Feature tree of the target braking system
- Requirements at the Vehicle Level are directly based on system use cases and allocated to vehicle Features denoting the expected system functions.

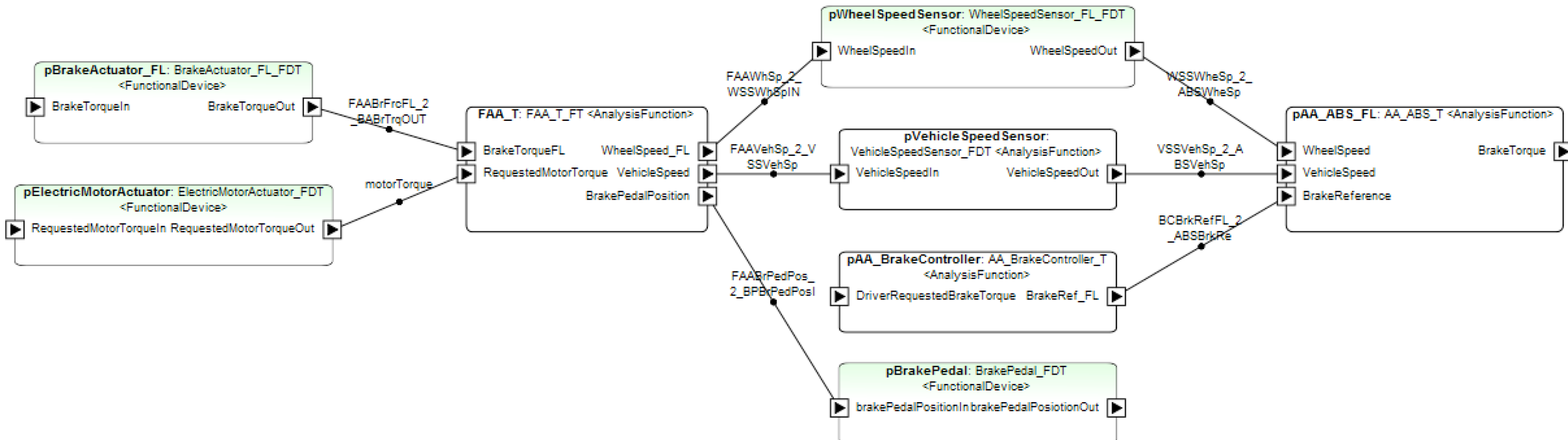
ID	Description
Req#1_BaseBraking	"The system shall provide a base brake functionality where the driver indicates that he/she wants to reduce speed and the braking system starts decelerating the vehicle"
Req#2_DriverBrakeRequest	"The driver shall be able to request braking"
Req#3_Anti-LockBraking	"The system shall be an anti-lock braking system (ABS) by preventing the wheels from locking while braking"
Req#4_BrakeReactionTime	"The time from the driver's brake request until the actual start of the deceleration shall be $\leq 300\text{ms}$. (Value derived from expert judgment)"
Req#5_TimeToStandstill	"The time to standstill shall follow the recommendations in EU braking systems Directive 71/320 EEC. The Swedish Road Administration claims that a factor of 3 (on braking distance) is acceptable for ice"
Req#6_OperationofBrakePedal	"The Operator shall be able to vary the desired braking force using the brake pedal. A fully pressed pedal means maximum brake force."
Req#7_BrakeRelease	"When the brake pedal is not pressed, the brake shall not be active."



Analysis Level



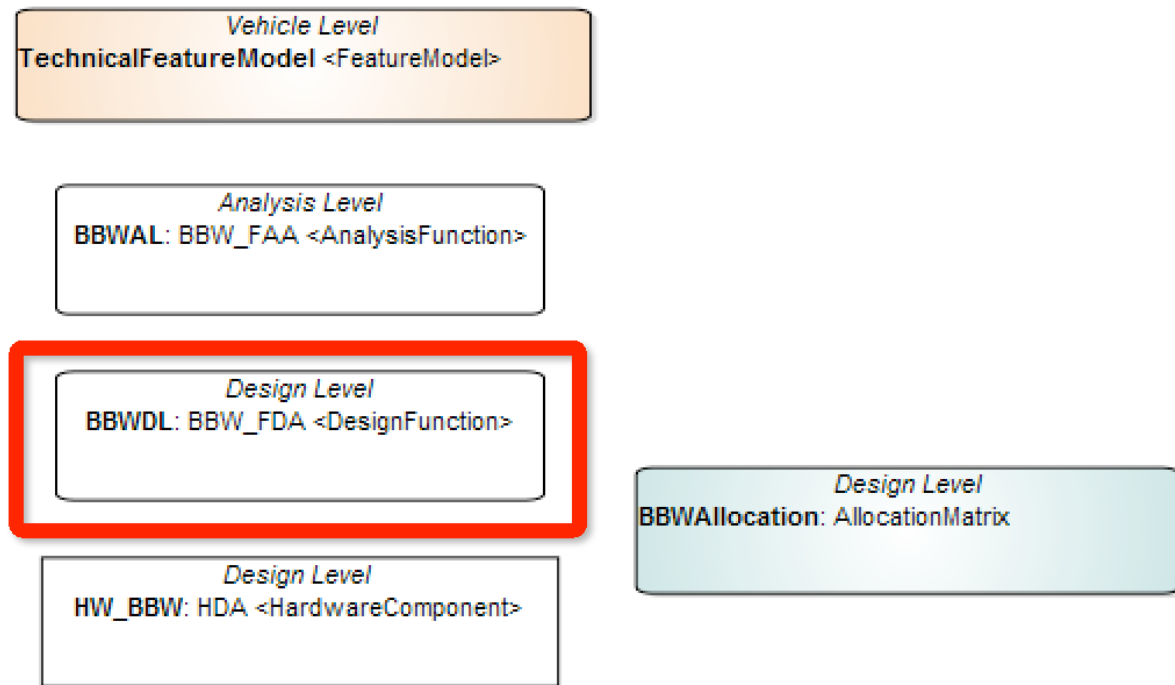
- Functional Analysis Architecture (FAA)



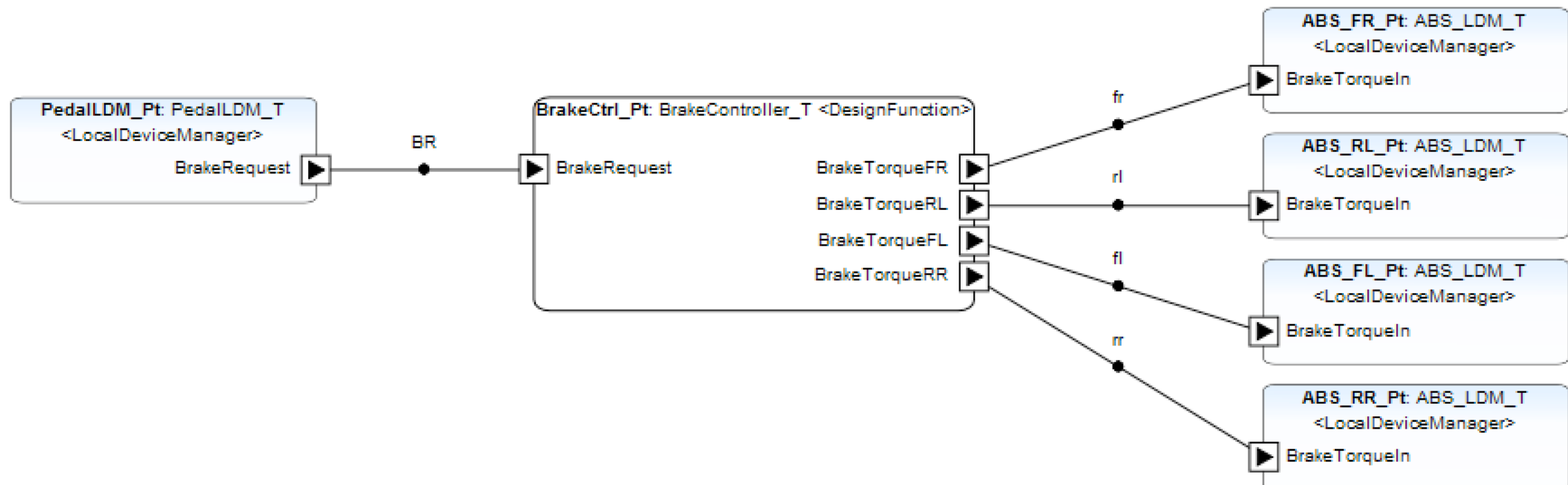
Analysis Level

- The Vehicle Level Features are realized by some interconnected abstract functions at the Analysis Level
- Functional Device: Sensor or Actuator. Through Functional Devices, an Analysis Function interacts with the physical environment.
- Analysis Functional Prototype: Calculation or Control Logic

Design Level



- Functional Design Architecture



Design Level

- The Design Level architecture further details the Analysis Level design by taking the software and hardware resources into consideration.

Implementation Level

- AUTOSAR model
- C\C++, Java, Matlab Code