Chapter 23
EAST-ADL:
An Architecture Description Language for Automotive Software-Intensive Systems

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ABSTRACT

EAST-ADL is an Architecture Description Language (ADL) initially defined in several European-funded research projects and subsequently refined and aligned with the more recent AUTOSAR automotive standard. It provides a comprehensive approach for defining automotive electronic systems through an information model that captures engineering information in a standardized form. Aspects covered include vehicle features, requirements, analysis functions, software and hardware components, and communication. The representation of the system's implementation is not defined in EAST-ADL itself but by AUTOSAR. However, traceability is supported from EAST-ADL's lower abstraction levels to the implementation level elements in AUTOSAR. In this chapter, the authors describe EAST-ADL in detail, show how it relates to AUTOSAR as well as other significant automotive standards, and present current research work on using EAST-ADL in the context of fully-electric vehicles, the functional safety standard ISO 26262, and for multi-objective optimization.

INTRODUCTION

EAST-ADL is an Architecture Description Language (ADL) initially defined in the European ITEA EAST-EEA project and subsequently refined and aligned with the more recent AUTOSAR automotive standard (AUTOSAR Development Partnership, 2012) in the European FP6 and FP7 ATESST projects (ATESST2 Consortium, 2010). Currently, it is maintained by the EAST-ADL Association (EAST-ADL Association, 2012). It is an approach for describing automotive electronic systems through an information model that captures engineering information in a standardized form. The language provides a wide range of modeling entities, including vehicle features, functions, requirements, variability, software components, hardware components and communication.

EAST-ADL clearly defines several abstraction levels (see Figure 1) and at each of these levels, the software- and electronics-based functionality of the vehicle is modelled with a different level of detail. The proposed abstraction levels and the contained modeling elements provide a separation of concerns and an implicit style for using the language elements. The embedded system is defined completely on each abstraction level, and identical parts of the model are linked across abstraction levels with various traceability relations. This makes it possible to trace an entity from feature down to components in hardware and software.

The features in the "TechnicalFeatureModel" at the vehicle level represent the content and properties of the vehicle from top-level perspective without exposing the realization. It is possible to manage the content of each vehicle and entire product lines in a systematic manner. A complete representation of the electronic functionality in an abstract form is modeled in the Functional Analysis Architecture (FAA). One or more entities (analysis functions) of the FAA can be combined and reused to realize features. The FAA captures the principal interfaces and behavior of the vehicle's subsystems. It allows validation and verification of the integrated system or its subsystems on a high level of abstraction. Critical issues for understanding or analysis can thus be considered, without the risk of them being obscured by implementation details.

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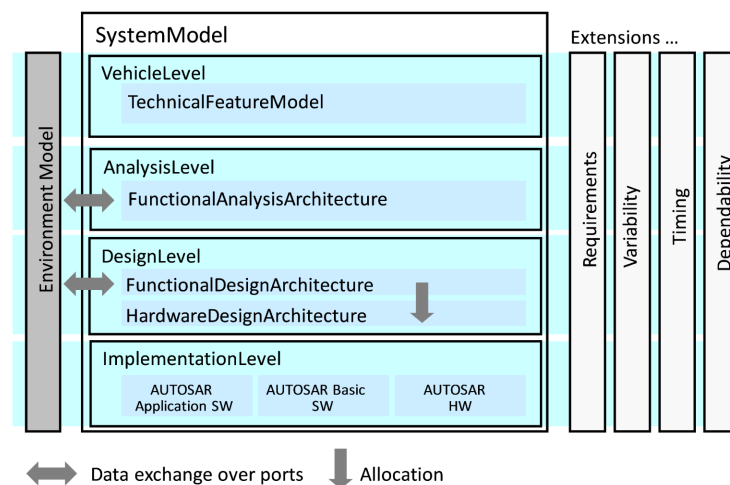
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