

EATOP (EAST-ADL Tool Platform)

Introduction

EATOP is an EMF-based implementation of the EAST-ADL meta-model for the Eclipse platform.

The general outcome will be an open platform, which provides a basic model editor, which will support the EAST-ADL language for functional, system, software and hardware description. The platform will be based on Eclipse and will rely on Eclipse Modelling Facilities, such as EMF (Eclipse Modelling Framework). The Eclipse plug-in concept will allow for the flexible integration of already existing (commercial or open source) and newly developed tools. For the integration of already existing tools, which work on proprietary meta-models, model to model transformation will be provided.

The platform is meant to provide an environment for closely integrated commercial and non-commercial tools. This also drives the structure of this project, in which the development of a central model editor and the development of specialized plug-ins are clearly separated, while consistency and integration will be ensured in an integrated platform.

Background

EAST-ADL is a domain specific language to model functional-, system-, software- and hardware-architecture in the automotive domain. EAST-ADL has been created by an ITEA (www.itea2.org) funded project EAST/EEA. Further development has been done in two funded projects ATESSST and ATESSST2. Since 2010 a European funded project MAENAD (www.maenad.eu) maintains and extends the language with respect to electrified vehicles and safety development lifecycle modeling. For long-term maintenance and dissemination the EAST-ADL association (www.east-adl.info) has been founded. It publishes the newest available meta-model in the Web.

Until now, the EAST-ADL has been used in several tools:

- In the Eclipse MDT project Papyrus a UML2 profile of EAST-ADL is provided
- TopCased initiative and their successor project OPEES is using EAST-ADL
- The commercial tool VSA from Mentor Graphics provides editors for EAST-ADL modeling
- The commercial tool MetaCase MetaEdit+ provides a meta-model implementation of EAST-ADL and generic editors of this meta-model
- The commercial tool SystemWeaver from Systemite provides editors for the EAST-ADL modeling

EATOP shall support the work of the EAST-ADL association by providing an Eclipse based tool platform implementation of the EAST-ADL.

The EAST-ADL meta-model has a close relationship to the AUTOSAR meta-model. Therefore, EATOP will have a close relationship to the ARTOP (www.artop.org) initiative. As ARTOP it will be based on the Eclipse project Sphinx.

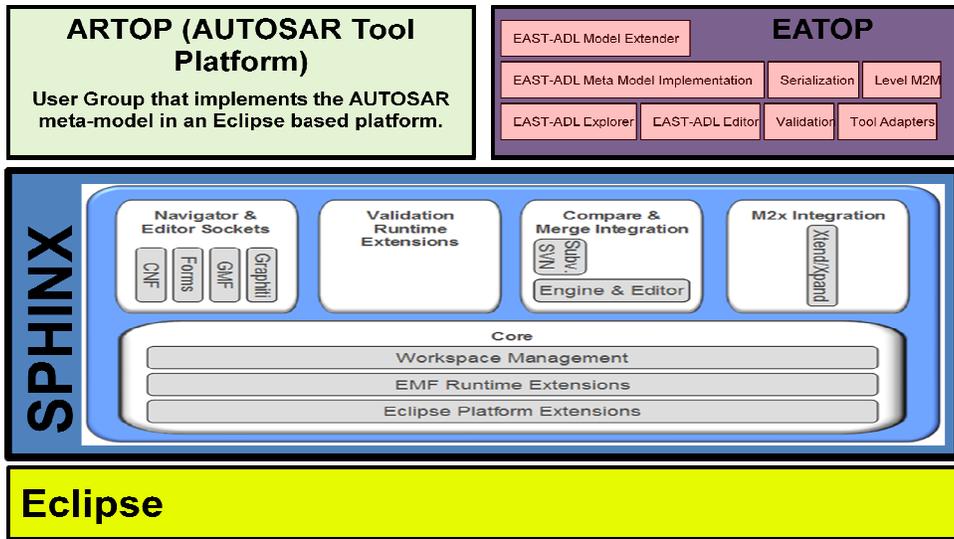


Figure 1. The architecture of EATOP resembles ARTOP. Based on Sphinx and Eclipse.

A base of the work in EATOP is the translation of the meta-model out of Enterprise architect into an ECORE implementation. The following picture summarizes relationships including AUTOSAR meta-model before establishing EATOP.

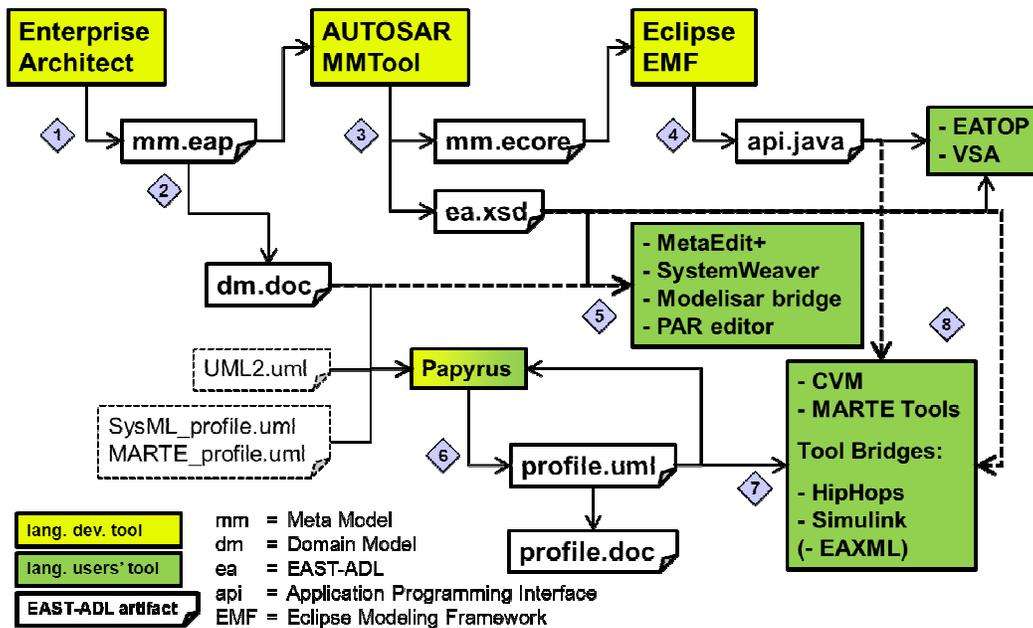


Figure 2. A tool chain from specification, via language development tools to user modeling tools. Intermediate artifacts are also indicated to show the language information needed to implement tools.

Figure 2 shows the different steps, these are described below.

1. Enterprise Architect is used to model the meta-model in UML2. This model contains all elements in the language, with their attributes and relationships. Diagrams give graphical views of these elements. The resulting model is in the Enterprise Architect format (EAP). The model can also be exported in an XMI format.
2. The domain model specification is generated from the meta-model.
3. In case of the AUTOSAR meta-model, an AUTOSAR internal tool “MMTool” is used to transform the meta-model to Eclipse ECORE. This contains the full meta-model supplemented with information on mapping to XML. The MMTool also generates the actual model exchange format as an XML Schema (XSD).
4. Eclipse Modeling Framework is used to generate an API to access and manipulate a model. This result is directly utilized by customized user model editors as VSA and EATOP. The exchanged models between such tools shall be validated against the EAST-ADL XML Schema.
5. Note that the original meta-model cannot be reconstructed from the XSD. Tools that do not utilize the API generated from EMF should use the domain model specification to find information on e.g. inheritance hierarchies.
6. Papyrus is used to model the UML2 Profile based on the domain model specification, this profile extends UML2 and imports other profiles as SysML and in coming releases of EAST-ADL also MARTE. The created UML2 Profile specifies the stereotypes used when creating user models in Papyrus. This means that Papyrus plays a double role in this tool chain, as a language development tool and user modeling tool.
7. The combined environment of UML2 and the set of profiles used in the user models pose the environment for tools that access, analyze, and manipulates Papyrus user models.
8. The EAST-ADL Profile including UML2 and the EAST-ADL XSD or API has to be matched for exchange between the Papyrus based tools and the XSD or ECORE based tools (EAXML).

With the work of EATOP the usage of EAST-ADL should be simplified and with that the number of intermediate formats as shown in Figure 2 should be reduced.

Scope

EATOP is an infrastructure platform implementation of common base functionality for development tools that are used to design and configure EAST-ADL compliant systems. This includes at least

- EAST-ADL meta-model Implementation supports several versions of EAST-ADL meta-model releases. The meta-model is published in Enterprise architect and taken to generate an Ecore. The generator as well as the EAST-ADL Ecore is part of EATOP.
- Serialization is supported by enabling file and repository based persistency of EAST-ADL models. Serializing and de-serializing EAST-ADL models to and from EAST-ADL XML files and databases.
- Refactoring contains a number of mechanisms to modify EAST-ADL models in a safe way.
- Workspace Management supports managing of EAST-ADL models, which are spread over more than one EAST-ADL XML file.
- Further utilities simplify the handling of EAST-ADL models.

- To enable a seamless workflow in a development process, interfacing and model exchange with
 - Requirements Engineering (via ReqIF),
 - Software modeling (via AUTOSAR) and
 - HW modeling (via IPXACT) is enabled.
- Specific platform developments enabling safety analysis and timing modeling will be included.
- Consolidation of bridges between EATOP and Papyrus and the synchronization of EAST-ADL EMF API with the profile implementation.
- Variability management will be included, supporting both the definition of variant-rich EAST-ADL models as well as derivation of fully/partly configured instances of these models.
- Interoperability with domain independent abstractions of EAST-ADL like CMM/IOS platforms (CMM = CESAR Meta Model / IOS is developed by MBAT).

Description

Initial Components

Future Components

Relationship to other Eclipse Projects

- EATOP will be built on top of the Eclipse Platform and EMF.
- Sphinx
- Papyrus
- RMF which is based on MDT

Organization

Mentors

Proposed initial committers

- Continental Automotive GmbH
- Institut Carnot CEA LIST DILS/LISE
- Metacase
- MODEL::SOFT
- Volvo Technology AB
- Technical University Berlin
- OFFIS e.V.

Interested parties

- Continental Automotive France SAS
- University of Augsburg
- University of Applied Sciences Regensburg
- Ohm University of Applied Science Nürnberg

- FZI Forschungszentrum Informatik (to be confirmed)
- FORTISS GmbH
- ITEMIS France SARL (to be confirmed)
- Carmeq (to be confirmed)
- Arccore (to be confirmed)

Code contributions

Tentative Plan

Changes to this Document