Integrating AADL within a multi-domain modeling framework

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Roadmap

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Background

• There exist today many languages for specifying software architectures: formal ADLs, UML profiles, other proprietary notations.

• Increasingly, ADLs are defined by stakeholder concerns
  – different degrees of formality,
  – at different levels of abstraction,
  – domain specific (vehicular, electronics…) or generic
  – different analysis

• Researchers acknowledge that a unique universal language cannot exist

→ proliferation of architectural languages and UML-based approaches
Main goal

» New real-time systems have increasingly complex architectures → many different aspects must be considered at design time.

AADL covers many of them, but not all (e.g. reachability analysis).

» A possible solution is to complement AADL-specific capabilities with other notations’ capabilities.

To achieve this goal, we experiment the integration of AADL (along with its behavioral annex) within DUALLY (a multi-domain modeling framework), allowing the translation of AADL models into other notations.
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What is DUALLy

An automated framework that allows architectural languages and tools interoperability, including both ADLs and UML-based notations.

Languages interoperate thanks to automated model transformation techniques.

Ivano Malavolta, PhD student, University of L’Aquila
A₀ : the pivot metamodel

» A₀ is specific to the software architectures domain
The DUALLy framework

Metamodeling expert

semantic links

A0 metamodel

semantic links

MM2 Metamodel

higher-order transformation

Software Architects

transformation

M1 model

transformation

A0 model
	ransformation

M2 model

: conforms to

: ATL transformation

: weaving model
Further informations on DUALLy

Official home page: http://dually.di.univaq.it

Technical details:

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Integrating AADL within DUALLy

Initial step: extend $A_0 \rightarrow A_{\text{behavior}}$

$A_{\text{behavior}} = A_0 + \text{minimal metamodel for state machines}$

The DUALLy-zation of AADL is composed of two main steps:

1) Specify the weaving model between AADL and $A_0$
2) Generate model-to-model transformations (e.g. Aadl2$A_0$)
Mapping core AADL concepts
Mapping behavioral AADL concepts
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Applying the transformations

A_02umlCC

A_02darwinFSP

A_behavior model
Conclusions and future work

We analyzed the feasibility of integrating AADL in DUALLy.

$A_0$ has been designed as general as possible, but it is important to customize it for each specific domain.

- **Next step**: formalize the extension mechanism through well defined, property-preserving extension operators.

**Open issues and future work:**

- **Automatic** generation of weaving models
- **Round-trip engineering** of modifications of target models
- Techniques to check the quality of the transformations

QUESTIONS?