Mapping scheme between AMALTHEA and RCM

The development of modern automotive software is a tremendous challenge: heterogeneous software applications (e.g., different work-loads, activation semantics, etc.) coming from formerly separated function domains (e.g., ADAS, safety, chassis, etc.) need to be integrated into heterogeneous computing platforms(e.g., automotive-certified real-time micro-controller units with general purpose HPC processors and accelerators) from distributed, heterogeneous teams (e.g., control engineers, embedded systems programmers, software engineers, etc.) while ensuring compliance to the automotive software functional and non functional requirements (e.g., timing, performance, etc.) .

One common strategy for coping with the tremendous heterogeneity and complexity of modern automotive software and its development is the use of Architectural Languages (ALs) as the means for enabling effective use of domain skills through the promotion of different views over the automotive software. An example of this is the jointuse of domain-specific logical ALs together with domain-specific technical ALs. While the former are typically used for designing purposes (as they reflect the decomposition of software systems into sets of components and interactions among them), the latter are mostly used for functional and non-functional analyses of software systems (as they de-scribe software systems from the realisation-perspective, e.g.,execution environment, hardware platform and allocation). However, the use of several ALs comes with the cost of reduced interoperability as, oftentimes, different ALs have weak or no integration with each other. Such a lack of integration represents a major challenge for a full-fledged industrial adoption o these languages.

We address the challenge of integrating different ALs by considering two industrial languages heavily used within the automotive domain, namely AMALTHEA and the Rubus Component Model (RCM). In recent years, more and more automotive OEMs and suppliers have adopted an integrated development scenario where AMALTHEA is mostly used for the automotive system and software modelling whileRCM is employed for providing high-precision timing analysis and synthesis of the automotive software.

In this paper, we report on our experience in improving the design and timing analysis of automotive systems by providing an architectural mapping scheme between AMALTHEA and RCM. The main contribution of this paper is the mapping scheme as the means for enabling the translation o an AMALTHA architecture into an RCM compliant architecture where high-precision timing analysis can be run and the back-propagation of the analysis results in the AMALTHA architecture.

*Required

1. AMALTHEA and RCM are two languages used for the design and timing-analysis of automotive software. In general, how relevant do you find a mapping between languages belonging to these two categories? *

Mark only one oval.

	1	2	3	4	5	
Not much	◯	◯	◯	◯	◯	Extremely

2. Remarks

Mapping scheme between AMALTHEA and RCM

3. Do you think the mapping is missing any important relation? *

Tick all that apply.

- [ ] Yes
- [ ] No
- [ ] Not sure

4. If you answered yes or not sure, can you elaborate why?

5. Do you think there are any misunderstandings or incorrect relations identified? *

Tick all that apply.

- [ ] Yes
- [ ] No
- [ ] Not sure

6. If you answered yes or not sure, can you elaborate why?

Applicability

7. Do you think the mapping would be useful in creating an RCM model (from an AMALTHEA one) where timing analysis can be run? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Not sure

8. If you answered no or not sure, can you elaborate why?

Industrial relevance

9. How industrially relevant do you find the mapping scheme? *

Mark only one oval.

	1	2	3	4	5	
Not relevant	◯	◯	◯	◯	◯	Higlhly relevant

10. Remarks

11. In "A method for evaluating rigor and industrial relevance of technology evaluations", the authors proposed a model for assessing the industrial relevance of a research. The mode focus on the research methodology and assess the relevance of 4 aspects being: subject context, scale, and research method. For each of this aspect, a person gives a point if tha aspect contributes to the relevance. The "Subjects" aspect refers to the subjects used for the evaluation, i.e., students vs practitioners. Do you think the subjects for this research were industrially relevant? *

Tick all that apply.

- [ ] 0 (no)
- [ ] 1 (yes)

12. The "Context" aspect refers to the context in where the research and evaluation was carried, i.e., labs vs academic environment vs industry. Do you think the context for this research was industrially relevant? *

Tick all that apply.

- [ ] 0 (no)
- [ ] 1 (yes)

13. The "Scale" aspect refers to the significance of the used case study. Do you think the size and the significance of the use cases used are industrially relevant? *

Tick all that apply.

- [ ] 0 (no)
- [ ] 1 (yes)

14. The "Research Method" aspect refers to the method used and whether this facilitate the understanding and the use of the research for practitioners. Do you the method is significant for the industry? *

Tick all that apply.

- [ ] 0 (no)
- [ ] 1 (yes)