Continuous Management of Design- and Run-Time Artifacts for Autonomous Systems

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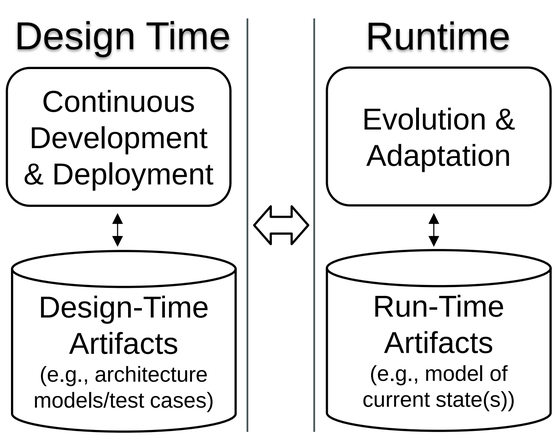
Description:

When developing and operating autonomous systems, a growing amount of information is required. This information forms the basis to systems' evolution and adaptation at runtime, but is also used at design time to evolve and maintain the systems. To support development organizations in the future, efficient ways to manage information throughout the systems' lifecycle are needed.

We aim to develop methods and techniques to manage both design-time and run-time artifacts. To achieve that, we conduct empirical studies to identify practitioners' needs and challenges, develop innovative solutions, and evaluate them in practical scenarios.

Background & Motivation



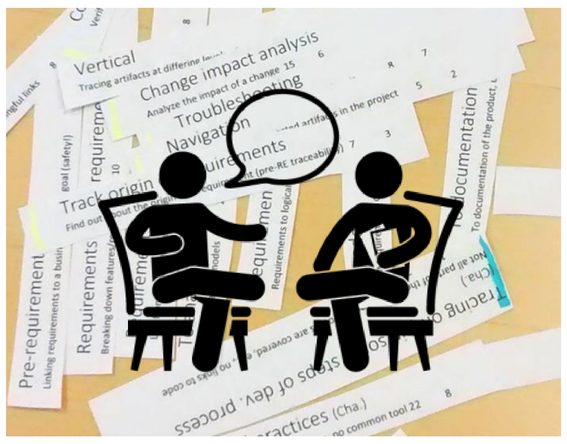
A lifecycle model for self-adaptive systems, adapted from Andersson et al. (2013)

- At design time: Continuous development practices require efficient ways of managing artifacts like architecture models or test cases. Existing methods neglect this need!
- At runtime: Need to represent the system's state and environment. Open questions: What are appropriate runtime artifacts/models? How to manage them?

Research Goals & Questions

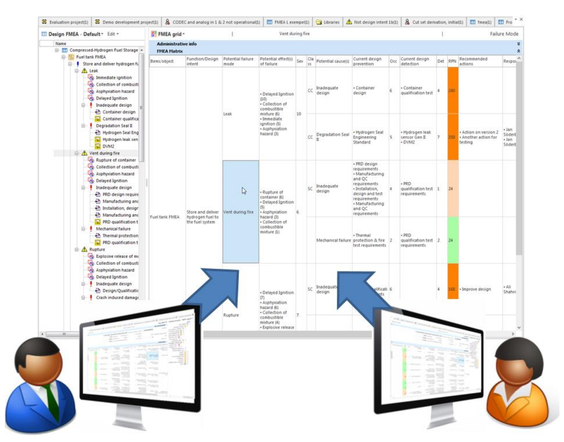
- RQ1: What are applicable practices for the continuous management of systems engineering artifacts at design time?
- RQ2: What are adequate artifacts to enable self-adaptation and strategies to manage them at runtime?

Research Methodology



1. Identification and understanding of practical problems using a theoretical basis
2. Development of innovative candidate solutions based on the state of the art and action research
3. Evaluation together with practitioners

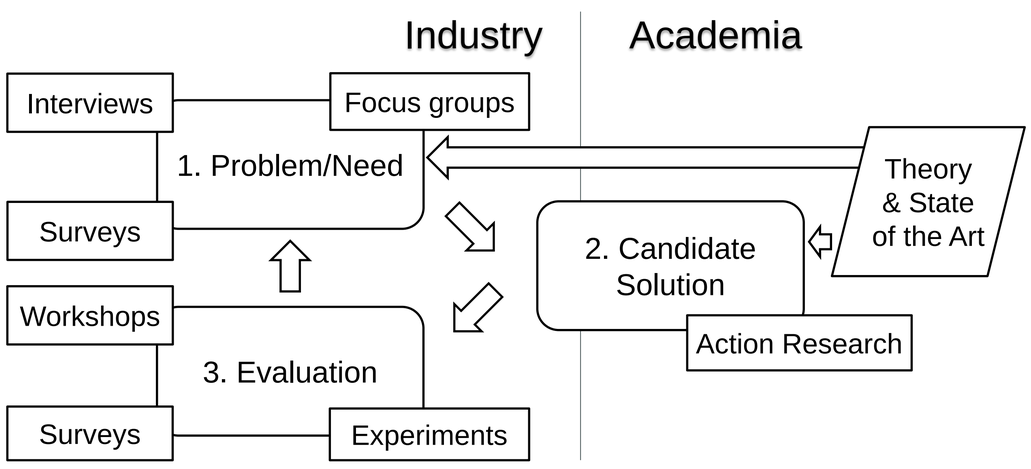
Contributions & Results



- Identification of relevant design- and run-time artifacts and how to manage them continuously [3]
- Practical challenges with continuous management of artifacts and traceability [1,3]
- Factors and guidelines for traceability maintenance [2]
- Identification of applicable run-time artifacts for self-adaptation and strategies to evolve and refactor them
- Solutions integrated into the information management solution SystemWeaver[1]

[1] http://systemweaver.se/

Figure: Research Methodology



Publications

[1] R. Wohlrab, J.-P. Steghöfer, E. Knauss, S. Maro, A. Anjorin. Collaborative traceability management: Challenges and opportunities. In Proceedings of the 24th IEEE Intl. Requirements Engineering Conference (RE'16), 2016.

[2] S. Maro, A. Anjorin, R. Wohlrab, J.-P. Steghöfer. Traceability maintenance: Factors and guidelines. In Proceedings of the 31st IEEE/ACM Intl. Conference on Automated Software Engineering (ASE'2016), 2016.

[3] R. Wohlrab, P. Pelliccione, E. Knauss, M. Larsson. Agility in automotive: Continuous engineering of systems engineering artifacts. Submitted to the 39th Intl. Conference on Software Engineering (ICSE'17), 2017.

[4] R. Wohlrab. Continuous management of design- and run-time artifacts for self-adaptive systems. Submitted to the 39th Intl. Conference on Software Engineering, Doctoral Symposium (ICSE'17), 2017.

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