

APLE: Architecture-Centric Product Line Engineering

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Abstract

Software developers, especially embedded systems developers, are faced with fierce market competition with: diverse market needs, ever increasing number of features, and shortening product life cycle. Without responding to the market needs quickly with more and better features, product developers can no longer survive in this global competition. In response to this new market environment, many software developers are searching for methods and tools to increase their productivity and improve software quality. As a result, there has been an increase in interest in software product line and support tools that help reuse software assets and produce high quality application software.

By analyzing industrial software product lines of various domains ranging from factory management applications to game software, we could identify several architecture models that are commonly used. An architecture model is a kind of recurring pattern that emerges based on the characteristics of an application domain. For instance, game software is user interaction scenario-based while factory control applications are typically state-based (i.e., they react to external events based on the state of the factory). Software that controls a system based on the states of the system, for example, can be developed using the state-based architecture model.

By applying an appropriate architecture model to software development, we can ensure that the target software has a stable structure and thus achieve high productivity and high quality of software as a result. We currently provide four architecture models:

- State-based architecture model
- Decision structure-based architecture model
- Workflow-based architecture model
- Interaction scenario-based architecture model

Architecture-model-based software development is a basic requirement for guaranteeing high productivity and high quality of software, because “proven” architecture models can be reused, properties of specific architecture models can be verified, and code can be generated automatically from the verified model. In my talk, I will introduce a feature-based product line engineering method, discuss architecture engineering principles, and explain how we can generate applications based on architecture models.