

Title	ソフトウェアプロダクトライン開発におけるコア資産 の設計検証手法に関する研究
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# Core Asset Development Based on Assumption Modeling

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## 1 Background

As software is embedded in various systems and used at everywhere, there is the high demand for the development of products with many variations, multifunction and quick deliveries. Against this background, the software product line development, which is based on common software architecture (product line architecture) and reusable software components (core assets), is considered to be a promising development approach.

## 2 Motivation

In product line development, core assets play an essential role: if we once establish core assets, we can effectively develop each product. However, if core assets are not well verified in terms of the actual usage of each product, it could cause errors in the product, and we cannot expect the improvement of productivity and quality. One of the serious reasons of these errors is architectural mismatch. Namely, it is reported that many errors are caused by the mismatch between architecture design of product and architecture assumption that are supposed by core asset. The architectural assumption

includes the one on a system external, internal and platform; however, these assumptions tend to be handled implicitly, so it disturbs effective reuse of core assets.

### 3 Proposal

In this paper, we propose an assumption models which explicitly model the architectural assumptions of software product line architecture, and a method to verify core asset based on the model.

This method consists of the following three proposals.

First proposal is assumption model templates. This template systematically shows architectural assumptions that must be examined during the design based on standard classification. This model is depicted in terms of feature model notation and be used as the basis of modeling assumptions.

Second proposal is assumption models for design. We intend to model architectural assumptions based on the template in designing product line architecture and core assets.

Third proposal is a verification method based on assumption model. We propose a verification method of product line architecture design using the model checking technique utilizing assumption model.

In this paper, we describe the way to model architectural assumptions on the development of embedded software product lines based on a real time operating system (RTOS) as a platform. We model important information according to the architectural assumptions for  $\mu$  ITRON (i.e., a Japanese popular RTOS) based on the mechanism characteristics on MARTE as a template. The template will be the base of assumption modeling for each product line architecture on the RTOS. Then we applied the assumption template to the design and the verification of a product line development of an embedded system as a case study.

### 4 Construction of this thesis

This paper consists of the following 9 chapters.

Chapter 2 describes about researches relating to the architectural assumption.

Chapter 3 describes our core asset design verification method.

Chapter 4 describes assumption template modeling and the method of assumption template modeling for a system platform.

Chapter 5 describes a method of assumption modeling on a product line architecture based on an assumption template.

Chapter 6 describes a verification method using model checking technique based on assumptions models of a product line architecture design.

Chapter 7 describes an application of the core asset verification method.

Chapter 8 discusses related technical issues.

The summary of the research and our future works are described in Chapter 9.