

# Formal Methods and Analysis in Software Product Line Engineering

3rd edition of FMSPLE workshop series

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## ABSTRACT

FMSPLE 2012 is the third edition of the FMSPLE workshop series, traditionally affiliated with SPLC, which aims to connect researchers and practitioners interested in raising the efficiency and the effectiveness of SPLE through the application of innovative analysis approaches and formal methods.

## Categories and Subject Descriptors

D.2.2 [Software Engineering]: Design Tools and Techniques; D.2.4 [Software Engineering]: Software/Program Verification—*Formal methods, Model checking, Validation*; D.2.5 [Software Engineering]: Testing and Debugging; D.2.11 [Software Engineering]: Software Architectures; D.2.13 [Software Engineering]: Reusable Software

## General Terms

Design, Theory, Verification

## Keywords

Formal methods, Software Product Lines, Variability, Verification, Testing, Semantics, Evolution

## 1. MOTIVATION AND OBJECTIVES

Software Product Line Engineering (SPLE) aims to develop a family of (software) systems or products via systematic, large-scale reuse in order to reduce both their costs and time to market and to increase their quality. To achieve these goals, formal methods and analysis techniques are promising approaches, which — to maximize their overall efficiency and effectiveness — are best applied throughout the product line lifecycle.

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In the last couple of years, analysis approaches and formal methods are increasingly being applied in SPLE [1–12]. A considerable potential however appears to be unexploited and despite the aforementioned research, the respective communities seem to be only loosely connected. To this end, the long-term objectives of the FMSPLE workshop series are:

1. to raise awareness and to find a common understanding of practical challenges and existing solution approaches in the different communities working on formal methods and analysis techniques for SPLE, and
2. to create a broader community interested in formal methods and analysis techniques for software product lines in order to keep SPLE research and tools up-to-date with the latest technologies and with practical challenges.

FMSPLE 2012 focuses on the application of formal methods and analysis approaches in all phases of SPLE in order to ensure the correctness of individual artifacts as well as the consistency among them. The topics of interest include:

- Analysis approaches and formal methods for:
  - domain analysis and scoping
  - variability modeling
  - specification and verification of functional and non-functional properties in SPLE
  - safety and security aspects in SPLE
  - product line architectures and component-based product line development
  - product line implementation, such as type systems, programming languages, formal semantics
  - formal verification of product lines and product line artifacts
  - correctness-by-construction techniques in SPLE
  - automated test case generation and model-based testing in SPLE
  - product derivation and application engineering
  - product line life-cycle management (e.g., consistency assurance)
  - reuse and evolution of software product lines

- Proofs of concept, industrial experiences and empirical evaluations
- Tool presentations
- Vision and position papers on formal methods and analyses applied in SPLE

## 2. IMPACT AND RELEVANCE

SPLE has matured much over the last decade, but there are still many challenges remaining. Among them are efficient variability management and product derivation, assuring consistency between domain and application engineering, the reduction of quality assurance efforts, and the consistent and sustainable evolution of product families.

Applying formal methods and analysis techniques in SPLE is a promising way of addressing many such challenges. Formal approaches to variability modeling, for instance, provide a solid basis for improving SPLE activities like early validation during product derivation by detecting inconsistencies or interactions for given feature configurations. By formally verifying critical requirements of reusable product line artifacts, the quality of the product line artifacts as well as the derived products can be increased, which in turn reduces additional quality assurance efforts. Formal modeling of product lines accompanied with suitable analysis approaches helps maintaining consistency between product line artifacts in both the domain engineering and the application engineering processes. During product line evolution, formal methods help analyzing what effects of changing individual product line artifacts have on the overall properties of the product line.

## 3. HISTORY OF THE WORKSHOP SERIES

The first FMSPLE workshop was held in 2010 ([www.iese.fraunhofer.de/en/events/fmsple2010.html](http://www.iese.fraunhofer.de/en/events/fmsple2010.html)). Its second edition ([www.iese.fraunhofer.de/en/events/fmsple2011.html](http://www.iese.fraunhofer.de/en/events/fmsple2011.html)), in 2011, was the result of a merge with ASPL 2008: The first workshop on Analyses of Software Product Lines ([www.isa.us.es/aspl08](http://www.isa.us.es/aspl08)).

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