

The Research Group  
**Software Languages Lab**

has the honour to invite you to the public defence of the Joint PhD of

**Jaime Alberto CHAVARRIAGA LOZANO**

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:  
Using Domain-specific and Standard-specific feature models to  
develop Configuration Systems

Joint PhD with Univ. de los Andes

Promotors:

**Prof. dr. Viviane Jonckers**  
**Prof. dr. Rubby Casallas (Univ. de los Andes)**

The defence will take place on

**February 10<sup>th</sup> 2016**

At the Universidad de los Andes, Bogota,  
Colombia

**Members of the jury**

Prof. Dr. W. De Meuter (chairman, VUB)  
Prof. Dr. Kelly Garcés Pernet (secretary, Univ. de los Andes)  
Prof. Dr. Philippe Cara (VUB)  
Prof. Dr. Dario Correal (Univ. de los Andes)  
Prof. Dr. David Benavides Cuevas (Univ. of Seville)  
Prof. Dr. Mathieu Acher (Univ. of Rennes)

**Curriculum vitae**

Jaime's research focuses on the use of feature models to represent and reason on the variability in diverse domains: software product lines, software architectures, and options for configuration systems. During his PhD, he defined some operators to combine and analyze feature models using propositional logic and off-the-shelf solvers. In addition, he participated in a joint-project with Siemens Colombia where his work was applied in a real-life case study. His PhD was financially supported by a fellowship of COLCIENCIAS.

**Abstract of the PhD research**

A *Configuration System* is a software tool that guides users to specify products by selecting options and preventing conflicts among these choices. In *Feature-based Configuration*, these systems use *Feature Models* to represent the configuration options and constraints. Feature models have been found easy to understand by non-technical users and easy to analyze using automated tools and solvers.

Configuration Systems for complex products such as Cars or Electrical Transformers are usually hard to model and create. First, these products comprise multiple domains of the concern of different domain experts. Second, these domains very often have interactions among them; Third, there are standards and regulations that may vary from one country to the other determining which features in each domain must be present or not. And finally, these domains and standards are usually shared across multiple product families. Trying to use a single model that represents all the domains, standards and families results in a model with a large number of elements, and therefore, hard to create, process, and maintain.

This dissertation aims to overcome some limitations of the existing approaches for modeling and creating configuration systems in the presence of multiple domains and standards: First, we propose an approach where the diverse domains and standards are modeled using multiple artifacts: *feature models for each domain*, *constraint sets* representing the interactions among the domains, and *feature models for the standards*. Second, we propose a new set of automated operations for feature models such as the *Conditional Intersection Merge* and the *Partial Conditional Intersection* to combine feature models for domains and for standards. And third, we propose a strategy to derive automatically the corresponding Configuration Systems. In addition, we built a complete implementation of tools to support the process and have applied our approach in an industrial case study.