# Safe Dynamic Reconfiguration of Concurrent Component-based Applications

Salman Farhat*†[1], Simon Bliudze*‡[1], Laurence Duchien*§[1], and Olga Kouchnarenko*¶[2]

[1]Inria Lille - Nord Europe – Institut National de Recherche en Informatique et en Automatique – Parc Scientifique de la Haute Borne 40, avenue Halley Bât.A, Park Plaza 59650 Villeneuve dÁscq, France
[2]Franche-Comté Électronique Mécanique, Thermique et Optique - Sciences et Technologies (UMR 6174) (FEMTO-ST) – Université de Technologie de Belfort-Montbeliard, Ecole Nationale Supérieure de Mécanique et des Microtechniques, Centre National de la Recherche Scientifique, Université de Franche-Comté – 32 avenue de l'Observatoire 25044 BESANCON CEDEX, France

**Résumé**

Cloud applications and cyber-physical systems are becoming increasingly complex, requiring frequent reconfiguration to adapt to changing needs and requirements. Existing approaches compute new valid configurations either at design time, at runtime, or both. However, these approaches can lead to significant computational or validation overheads for each reconfiguration step. We propose a component-based approach that avoids computational and validation overheads using a representation of the set of valid configurations as a variability model. More precisely, our approach leverages feature models to automatically generate, in a component-based formalism called JavaBIP, run-time variability models that respect the feature model constraints. Produced run-time variability models enable control over application reconfiguration by executing reconfiguration requests in such a manner as to ensure the (partial) validity of all reachable configurations. We evaluate our approach on a simple web application deployed on the Heroku cloud platform. Experimental results show that the overheads induced by generated run-time models on systems involving up to 300 features are negligible, demonstrating the practical interest of our approach.

**Mots-Clés:** Concurrent Component, based Systems, Variability Models, Self, Configuration, Dynamic Reconfiguration

*Intervenant
†Auteur correspondant: salman.farhat@inria.fr
‡Auteur correspondant: simon.bliudze@inria.fr
§Auteur correspondant: laurence.duchien@inria.fr
¶Auteur correspondant: olga.kouchnarenko@univ-fcomte.fr