# Composition of set theory-based models

IRIT lab, Université Paul Sabatier, Toulouse

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## PhD Proposal

B, Event-B and TLA are development languages based on set theory. B and Event-B introduce the notion of refinement-based certified development of abstract machines. B targets the development of software components and code generation. Event-B targets system modeling. TLA targets the specification of reactive systems specified in linear temporal logic.

Dedukti is a logical framework based on the $\lambda\Pi$-calculus modulo in which many theories and logics can be expressed. In the context of ICSPA, Dedukti will be used to exchange models and proofs between the set theory-based formal methods B, Event-B and TLA. They will rely on the encoding of set theory and its B and TLA variants in Dedukti.

TLA and B provide composition mechanisms that are not provided by Event-B. In order to facilitate the exchange of models between these formalisms, we propose to study compositions mechanisms for Event-B. Several composition semantics could be considered (synchronous, asynchronous, binary or indexed, ...) in each language. TLA could also be used as the meta-level language. Intrinsec properties of these composition operators will be stated and proved. Models will be exchanged via the pivot language dedukti.

This work will be founded by the ICSPA project of ANR (Agence Nationale de la Recherche) for 3 years.

The candidate is expected to have a strong background in logic, theorem proving and formal methods. She/he must have a Master degree or equivalent related to these areas.

To apply, send the following documents to Jean-Paul Bodeveix (bodeveix at irit dot fr) and Mamoun Filali (filali at irit dot fr):

CV & motivation letter
transcripts of marks (bachelor and master)
reference letters (2-3)

## Keywords

formal methods, language semantics, refinement, synchronous and asynchronous languages, set theory, theorem proving, assisted proofs.

## References:

1. Jean-Raymond Abrial, *Modeling in Event-B - System and Software Engineering.* CUP, 2010.
2. Jean-Raymond Abrial, *The B-book - assigning programs to meanings.* CUP, 1996.
3. Leslie Lamport, *Specifying Systems, The TLA+ Language and Tools for Hardware and Software Engineers.* Addison-Wesley, 2002.
4. Leslie Lamport, *How to Write a 21st Century Proof.* November 2011
5. The Coq Proof Assistant - Inria `https://coq.inria.fr`
6. Dedukti `https://deducteam.github.io`