

Integrating SMT-solvers in Z and B Tools

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An important frequent task in both Z and B is the proof of verification conditions (VCs). In Z and B, VCs can be predicates to be discharged as a result of refinement steps, some proof about initialization properties or domain checking. Ideally, a tool that supports any Z and B technique should automatically discharge as many VCs as possible. Here, we present **ZB2SMT**³, a **Java** package designed to clearly and directly integrate both Z and B tools to the satisfiability module theory (SMT) solvers such as **veriT** [1], a first-order logic (FOL) theorem prover that accepts the SMT syntax [4] as input. By having the SMT syntax as target we are able to easily integrate with further eleven automatic theorem provers. **ZB2SMT** is currently used by **Batcave** [2], an open source tool that generates VCs for the B method and **CRefine** [3], a tool that supports the *Circus* refinement calculus. Much of the VCs generated to validate the refinement law applications, are based on FOL predicates. Hence, **CRefine** uses the **ZB2SMT** package to automatically prove such predicates. The package integrates elements of Z and B predicates in a common language and transforms these predicates into SMT syntax. In this process, a SMT file is generated containing the predicate and some definitions. It is sent to a chosen SMT solver which yields a Boolean value for the predicate or it can be sent to several SMT solvers in a parallel approach. In order to improve the performance of the proof system, **ZB2SMT** has a module that can call different instances of solvers at different computers, according to a configuration file. It improves the proof process by allowing different strategies to be performed in parallel, reducing the verification time.

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³ Freely available at <http://www.consiste.dimap.ufrn.br/projetos/zb2smt>.