KeY Symposium 2009

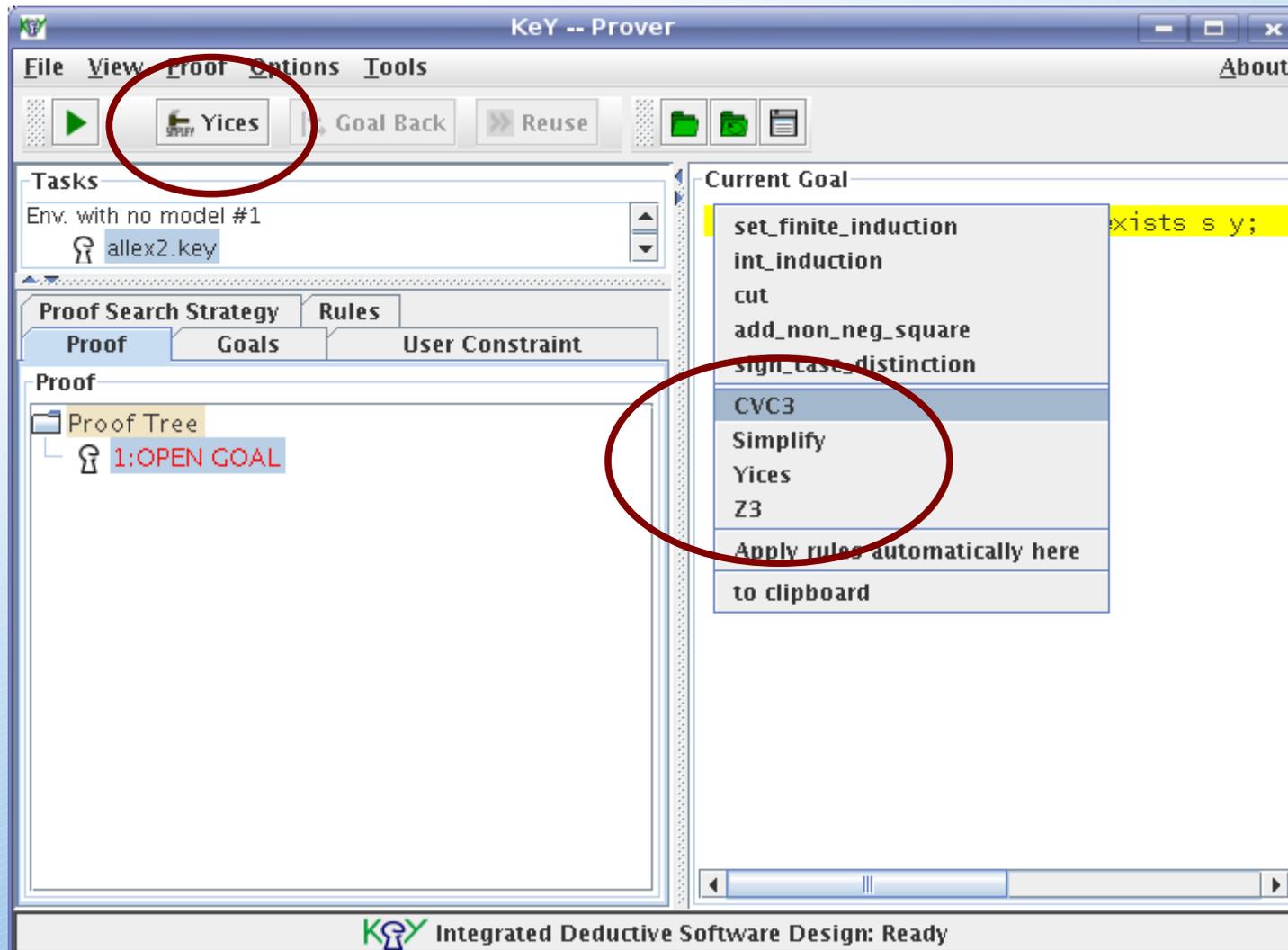# Integration of external SMT solver in KeY
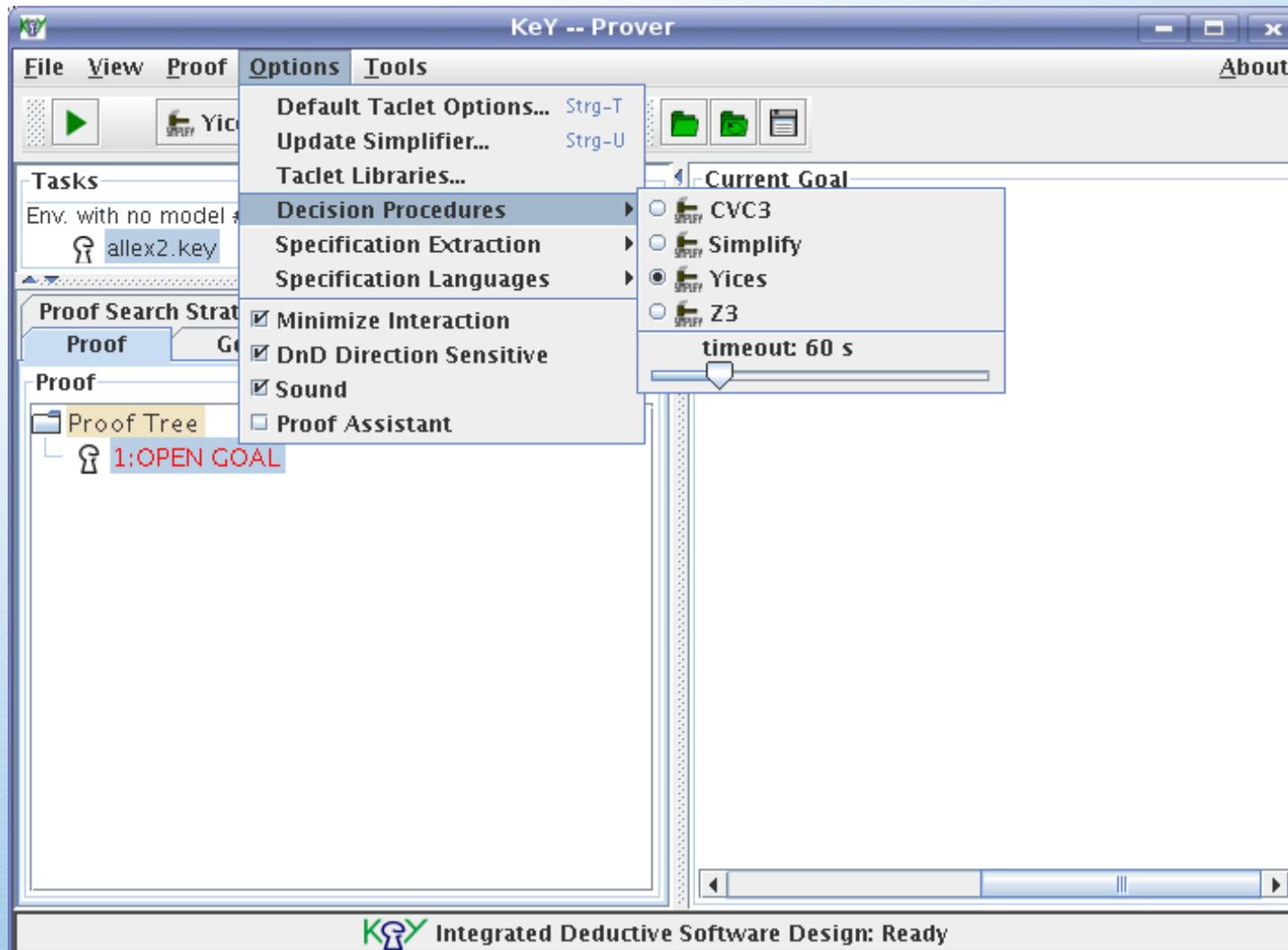
18.05.2009

by Simon Greiner

Reasons for overworking old integration

- Less coding effort for new integrations
- Easy integration for as many solver types as possible
- Removing some bugs in the old version

Using external solver

Integration of SMT solver
KeY Symposium 2009

Using external solver (options)

The de.uka.ilkd.key.smt package

Start a prover

Translate from KeY to other language

SMTRule

SMTSolver

SMTTranslator

AbstractSmtSolver

AbstractSmtSolver

Integration of SMT solver
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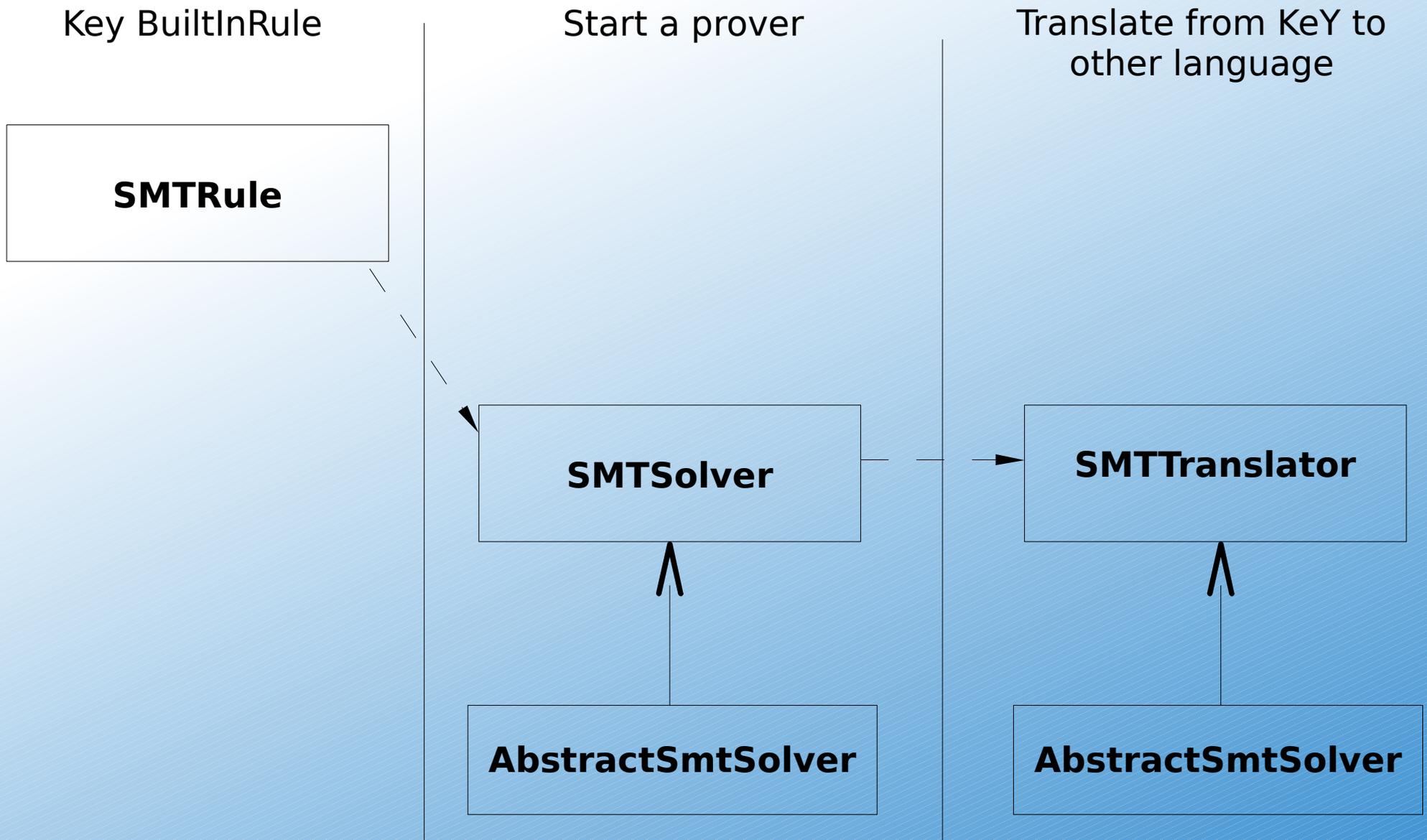
The AbstractSmtSolver class

AbstractSmtSolver
String[] **getExecutionCommand** (String,String) SMTSolverResult **interpretAnswer**(String)   String **Name**() SMTTranslator **getTranslator**(Services)

Program specific implementations

Inherited from SMTSolver
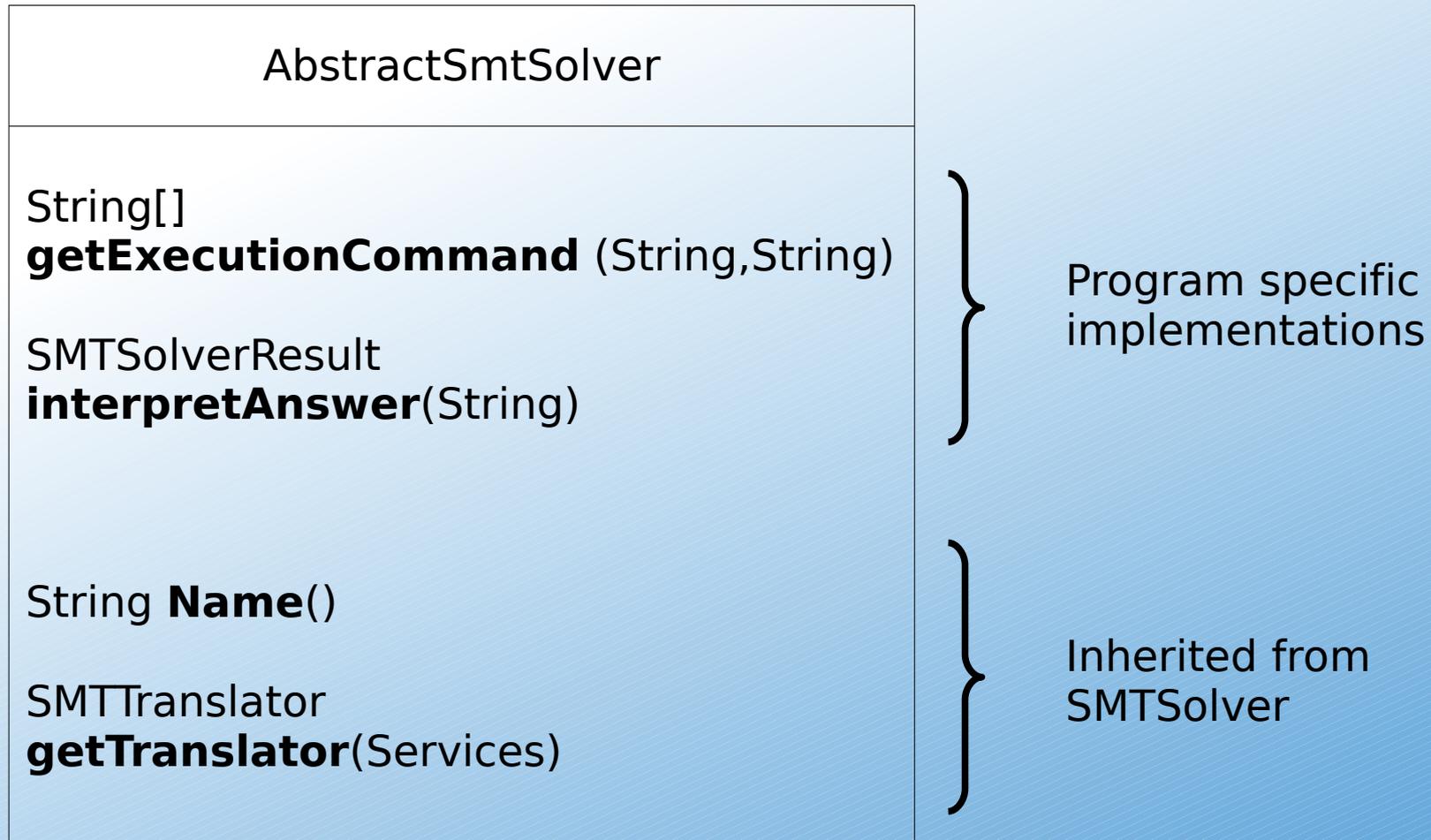
The AbstractSmtTranslator class

AbstractSmtTranslator
StringBuffer **translateLogicalAnd** (StringBuffer,StringBuffer) StringBuffer **translateLogicalOr**(...) ... StringBuffer **translateIntegerMult**(...) StringBuffer **translateTermIfThenElse**(...) ... boolean is**Multisorted**() StringBuffer **buildCompleteText**(...)

Abstract implementation;
have to be supported

Dummy Implementation;
Can be supported, or
implement for optimization

technical implementations
(definition settings,
complete translation, ...)

Some realizations

- **Multisortedness** using type predicates

  integer used as only sort

  \exists x:s p(x) ~> E x (type_of_s(x) & p(x))

  \forall x:s p(x) ~> V x (type_of_s(x) -> p(x))

- **if-then-else** for terms

  Dummy implementation always supported:

  if (phi) then a else b ~>

  c + assumption:

  if (phi) then (c=a) else (c=b)

Adding a Solver to the System

- Add new Solver to de.uka.ilkd.key.gui.DecisionProcedureSettings.java in readSettings()
- Extend de.uka.ilkd.key.smt.test.AbstractSolverTest and add it to the testsuite
- add it to the class TestBenchmark.java
- More details in Wiki and javaDoc

Future work

- Further investigations on modeling sorts with type predicates
- Some change requests in the GUI
    - Make created files savable
    - improvements to the usability
- Bit vector support