The Rodin Platform

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DEPLOY Tool-Building Team

www.deploy-project.eu

www.event-b.org

Rodin Tool for Event-B

- Extension of Eclipse IDE (Java based)
- Proof manager use a range of
- Rodin Eclipse *Builder*coordinates:
  - Well-formedness + type checker
  - Proof obligation generator
  - Proof manager
  - Propagation of changes

Rodin Proof Manager (PM)

- PM constructs proof tree for each PO
- Automatic and interactive modes
- PM manages used hypotheses
- PM calls *reasoners*to
  - discharge goal, or
  - split goal into subgoals
- Collection of reasoners:
  - simplifier, rule-based, decision procedures, …
- Basic tactics to define PM and reasoners

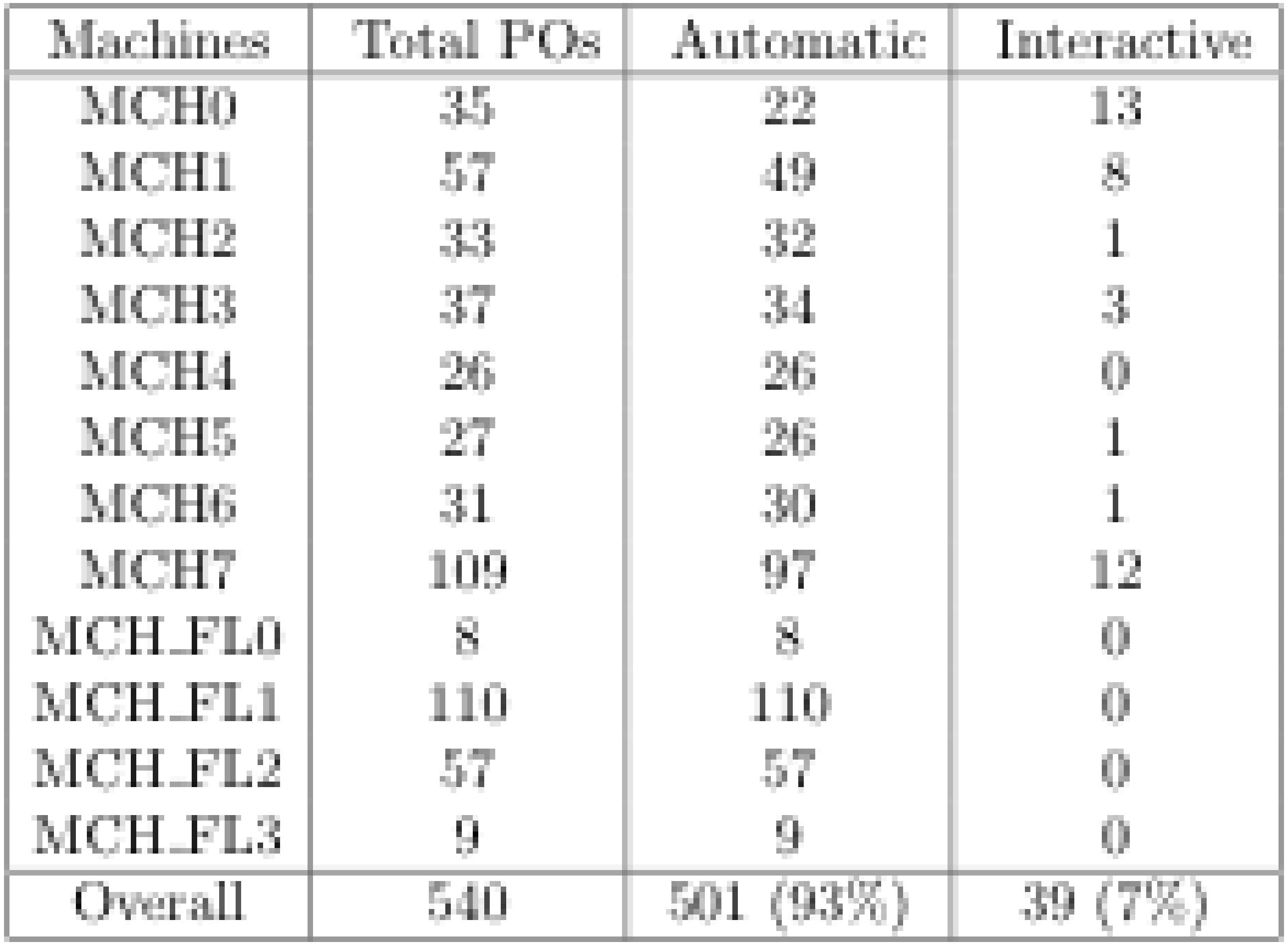
Differential proving in Rodin

- Models are constantly being changed
- When a model changes, proof impact of changes should be minimised as much as possible:

- Sufficiency comparison of POs
  - In case of success, provers return list of *used hypotheses*
  - Proof valid provided the used hypothesis are in the new version of a PO

- Simple model refactoring:
  - Identifier renaming applied to models (avoiding name clash)
  - Corresponding POs and proofs automatically renamed

Statistics from Flash-based file development in Event-B



Machines	Total POs	Automatic	Interactive
MCH0	35	22	13
MCH1	57	49	8
MCH2	33	32	1
MCH3	37	34	3
MCH4	26	26	0
MCH5	27	26	1
MCH6	31	30	1
MCH7	109	97	12
MCH_FL0	8	8	0
MCH_FL1	110	110	0
MCH_FL2	57	57	0
MCH_FL3	9	9	0
Overall	540	501 (93%)	39 (7%)

Rodin Plug-ins

- AtelierBprovers
- UML-B
- ProB: animation, consistency and refinement checking
- AnimB
- Brama
- Camille (texteditor)

Demo

On-going Developments

Improving proof automation

- Better integration with model-checking
- Extensible prover
- Extensible language
- Exploit SMT and First Order provers

Extensible language

- Rodin currently supports rich set theoretic language, but there is always a need for language extensions

- Language extended by defining Theory:
  - User-defined polymorphic operators
  - User-defined algebraic types
  - Proof rules used by rule-based prover
  - Proof rules give rise to POs

Scaling

- Team-based development
  - Parallel development: viewing conflicts / merge
  - Impact on proof (open question)

- Composition + decomposition
  - Shared variables style
  - Shared event style
  - Plug-in for decomposing models and independent refinement

Code Generation

- Introduce *algorithmic* structures
  - introduced through refinement
  - sequential and concurrent
  - data types defined in theory components
  - Back-end to Ada/C

- Event-B importer for AtelierB

Other Deploy commitments

- Requirements tracing
  - Prototype plug-in exists
  - concepts still evolving
- Reuse:
  - Instantiation of generic developments (early 2010)
  - Refinement patterns (evolving)
- Tighter integration of UML-B and Event-B
  - state machines and class diagrams within Event-B models

Wish list

- Enabledness POs
- Automatic refinement
- Support for probability
- Automated provers/SMT for set theory
  - common context
  - used hypothesis
  - extensible operator
- Reasoned modelling support
- Flexible document management

Contributors to Rodin

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Keep up to date / contribute

- www.event-b.org
- wiki.event-b.org
  - – share your Event-B models
  - – share your plug-in plans
  - – suggest plug-in ideas