Applications of Metatheory: Verification of Compiler Optimisations

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October 17, 2007

Objectives and Motivation

- Modern Compilers Perform Complex Optimisations

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- Bugs within a compiler potentially viral
- Idea: Formal Methods useful, Problem: how to approach?

Our Approach

- Domain Specific Language called TRANS (Lacey)

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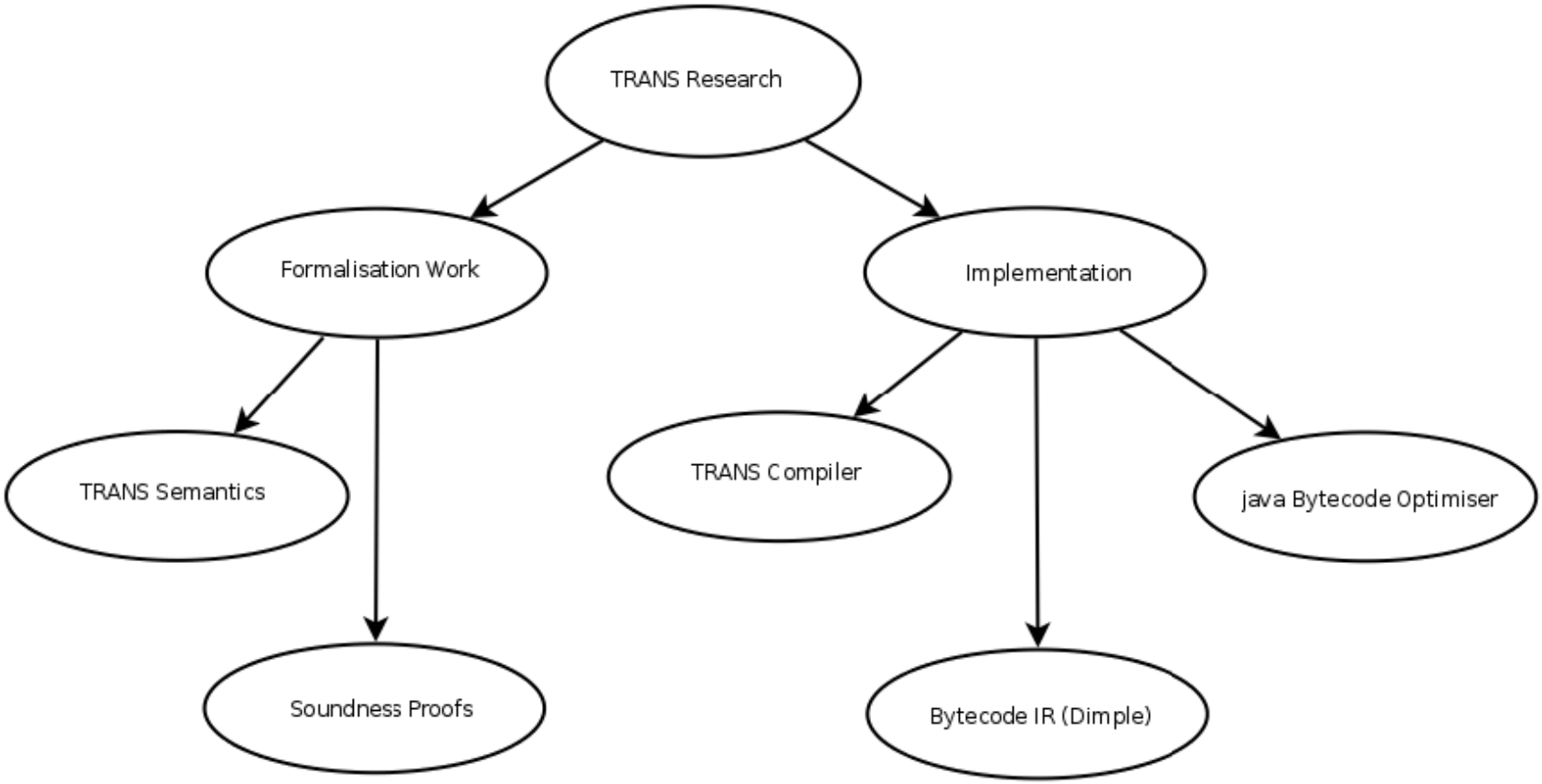
- Prove Soundness of transformations

Architecture - Overview



Example - Loop Invariant Code Motion

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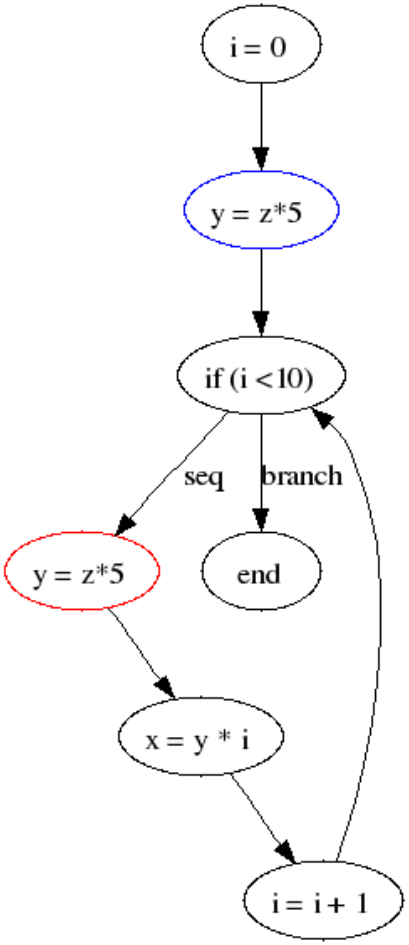
TRANS - Loop Invariant Hoisting



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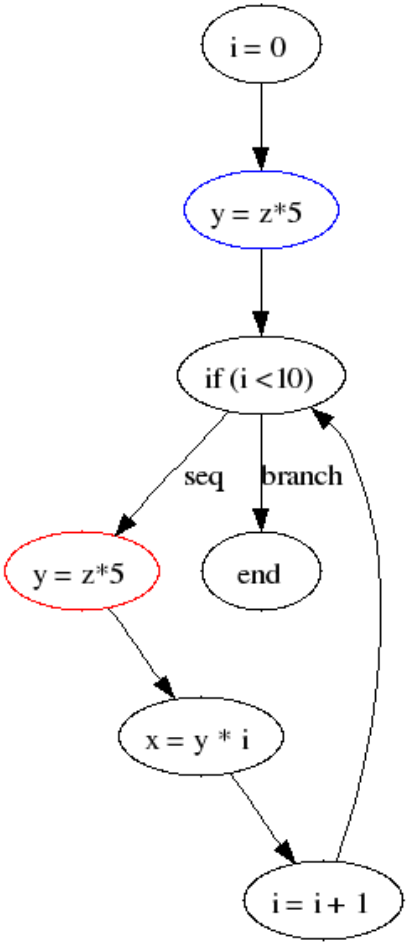

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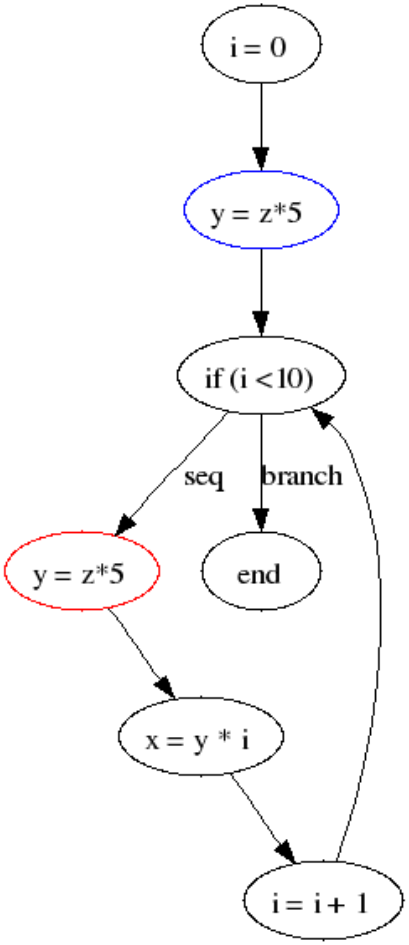

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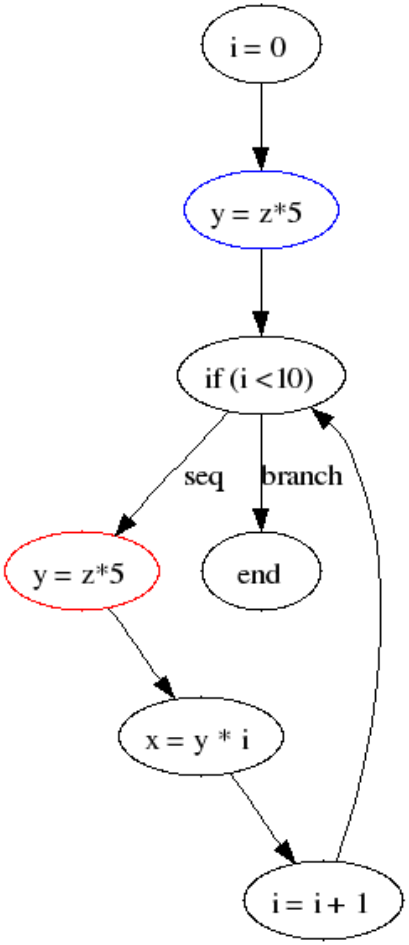

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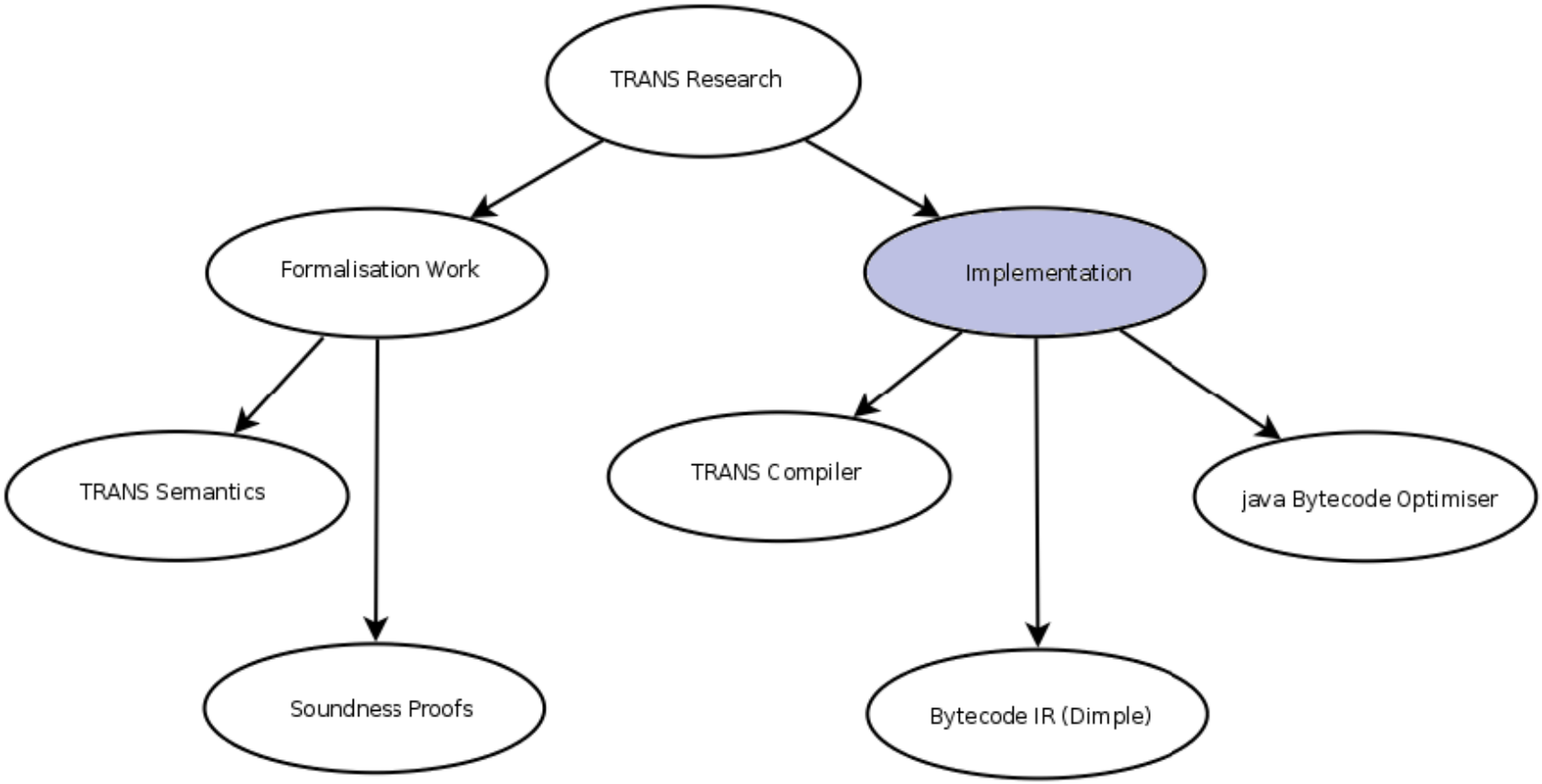

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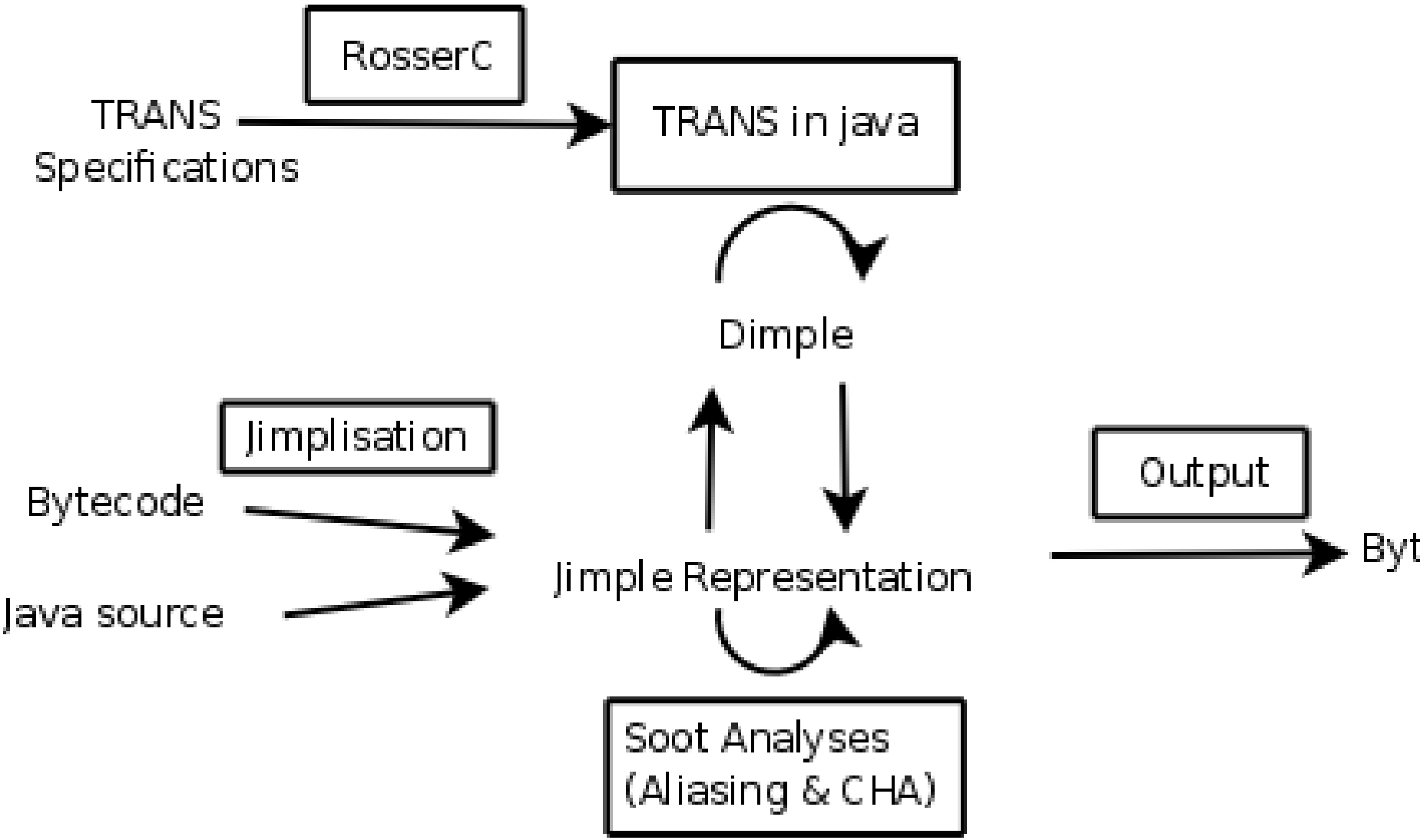
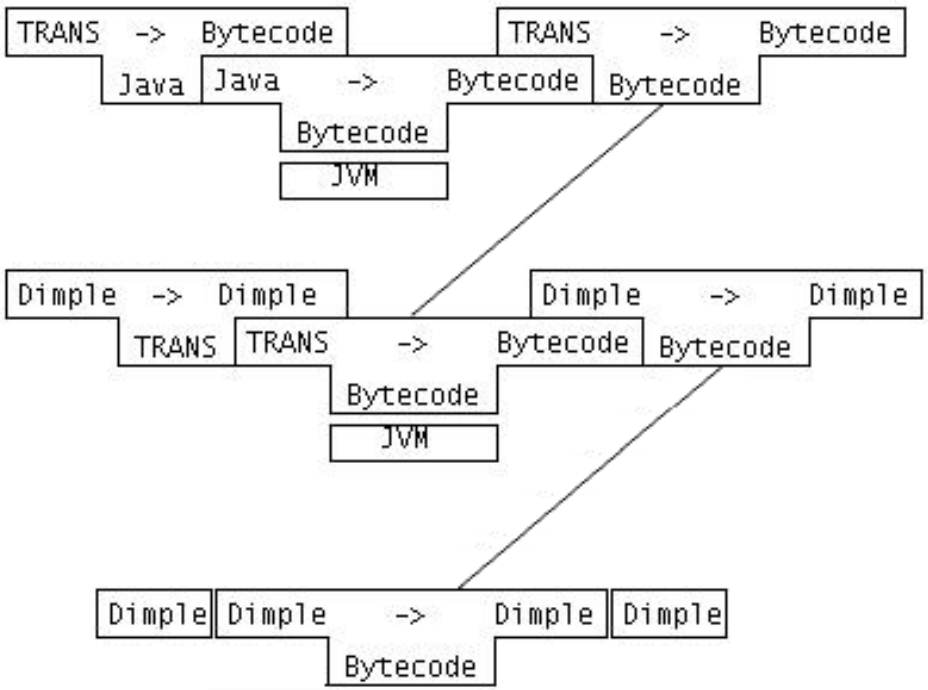


T-Diagram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Java
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JVM
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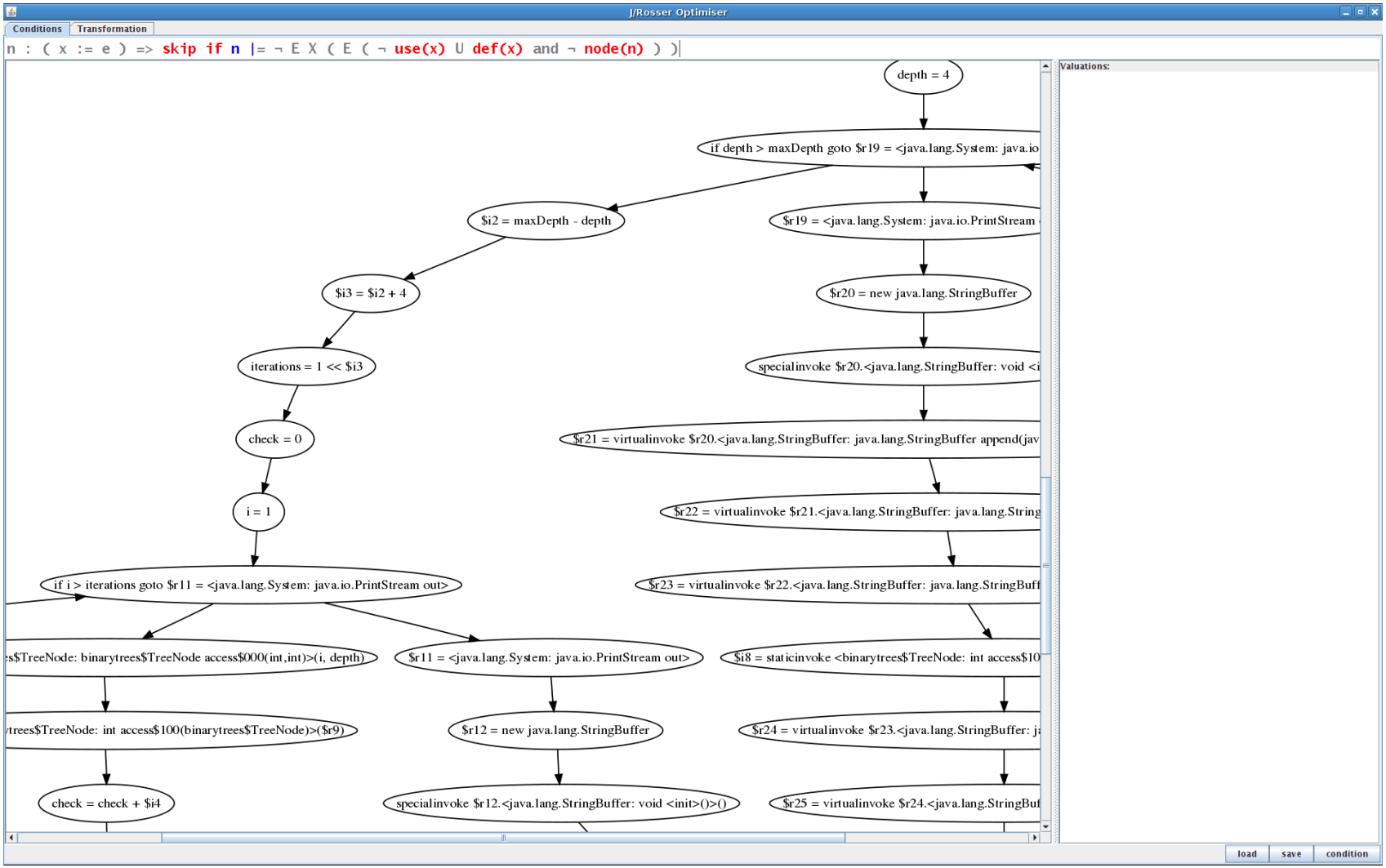
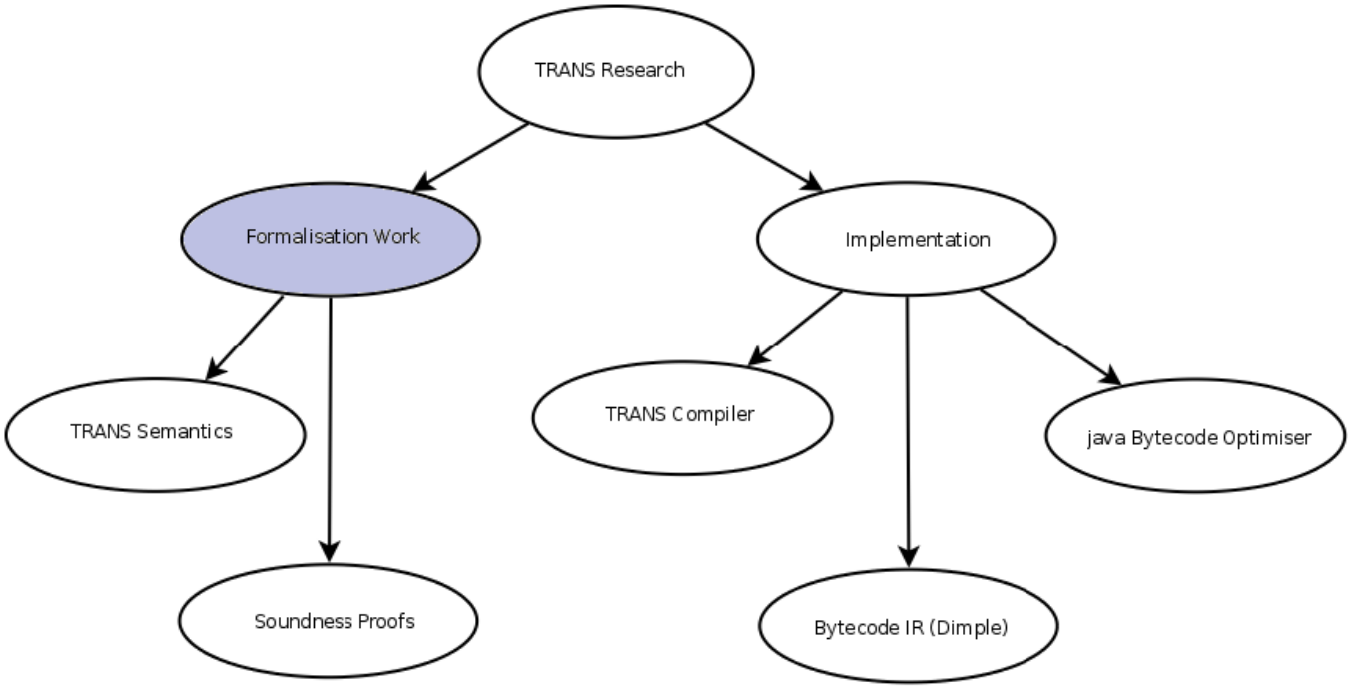
Current Program



Formalisation - Overview



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- Bisimulation within Isabelle/HOL - Co-induction.

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- eg: within Jinja single step execution and rtc. help definition of CFG

The End

Questions?