

# Presentation of the Chalmers Team

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# Research Group: Formal Methods in Software Engineering

## Team Members

- Reiner Hähnle, professor, group leader
- Wolfgang Ahrendt, lecturer
- Richard Bubel, postdoc
- Crystal Din, research assistant
- Ran Ji, PhD student
- Ann Lillieström, PhD student
- Gabriele Paganelli, PhD student
- Ina Schaefer, postdoc
- Niklas Sörensson, postdoc
- Angela Wallenburg, PhD student

# Research Group: Formal Methods in Software Engineering

## Research Topics Relevant for COST Action IC0901

- State-of-art source code verification for imperative OO languages
  - Floating point arithmetic
  - Memory model of safety-critical JAVA
- Automated deduction technology tailored to needs of verification:
  - Arithmetic beyond linear/Presburger
  - Finding counter examples that violate contract
  - SAT and extensions
- Behavioral Modeling of OO Concurrent Software Components
- Debugging and symbolic state visualization
- Combining symbolic execution and abstract interpretation

# Research Group:

## Formal Methods in Software Engineering

### Verification Tools Developed

- KeY software verification tool
  - Main version for JAVA
  - KeY-Hoare (education)
  - KeY-TestGen
  - Visual Symbolic State Debugger based on KeY
- MiniSat, Paradox (with K. Claessen)
- Contributions to SPEC#

### Verification Tools Used

- Maude (used to verify KeY-rules)
- Coq (used in MOBIUS)
- JML tools, Lustre, SPIN used in teaching
- Various SMT solvers used in KeY (SMT interface)

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## Current European Projects

- CHARTER: Critical and High Assurance Requirements Transformed through Engineering Rigour  
ARTEMIS Embedded Computing Systems Initiative
- COST Action IC0701:  
Formal Verification of Object-Oriented Software
- FP7 Integrated FET Project: HATS:  
Highly Adaptable and Trustworthy Software using Formal Models
- FP7 Coordination Action: ETERNALS:  
Trustworthy Eternal Systems via Evolving Software, Data and Knowledge

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## Interest in Working Groups of Action

- WG 1**
  - Realization of import/export between KeY and RML
  - Contribution to RM benchmark collection
  - Contribution to design requirements for RML
- WG 3**
  - Abstraction-based symbolic execution with abstract domain tailored to given RML fragment

# Research Group: Formal Methods in Software Engineering

## Potential for Collaboration with other IC0901 Teams

- Linz (SAT)
- Graz (verification, debugging)
- Copenhagen (specification, verification)
- Helsinki (SAT, automated testing)
- Munich (verification)
- Saarbrücken (program analysis)
- Verona (SMT)
- Barcelona (abstract interpretation)
- Madrid (distributed systems)