Year 2 Review
Paris, November 8th and 9th, 2006

Achievements and Perspectives :

Timing Analysis Activity

Cluster leader : Reinhard Wilhelm

Saarland University

High-Level Objectives

- To achieve :
  - integration of components for timing analysis of different partners
  - basis: a common representation for an intermediate exchange format
- Synergy between **compilation** and **timing analysis**
  - Compilers and TA need information available on the “other end

Impacts on Industry

- TA tools are in use in the aeronautics, aerospace, and automotive industries
- TA is relevant for all sectors using Embedded Real-Time Systems
- Industry trends: integrated architectures (IMA, AUTOSAR)
  - Timing analysis needs to be a part of development process

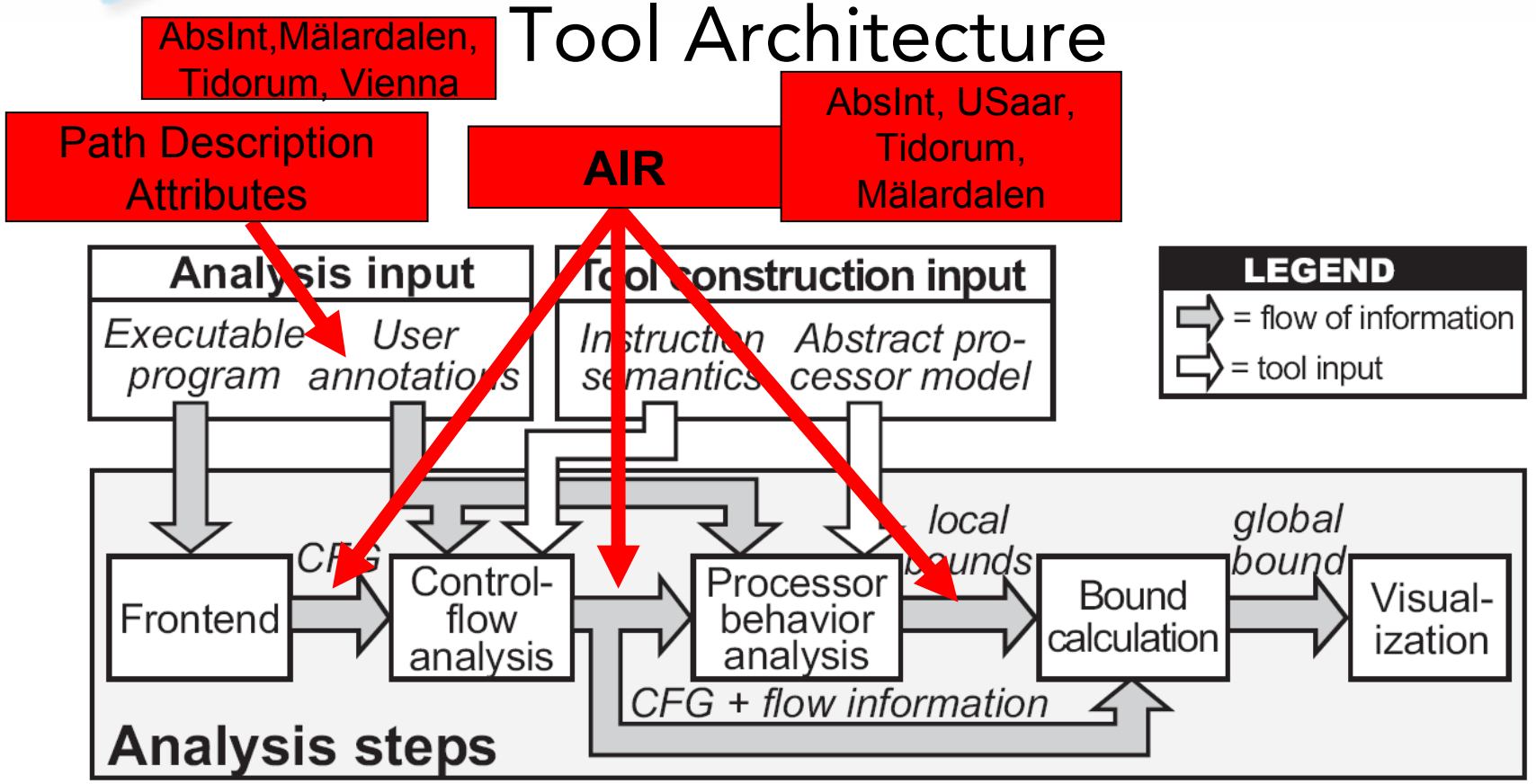
State of the Art - Research Trends

- The problem of determining upper bounds on execution times for single tasks and for quite complex processor architectures has been solved.
  - several commercial TA tools are available.
  - positive feedback from industrial use in the automotive and aeronautics industries
  - TA tools have been adapted to teaching
- Currently do not serve distributed architectures well
- Need computer support for the construction of the architecture-specific components of TA tools
- Need to develop **Design for Predictability**

Integration and Building Excellence

- Indicators for integration in the future
  - working integration of TA components developed by different partners
  - working integration of compilers with TA tools

Tool Architecture



Assessment at Y0+2

- Not well:
  - Research to support automatic TA tool developments is concentrated only at Saarland
  - Hard to integrate measurement-based tools with static-analysis-based tools
  - Definition of the ARTIST2 interchange representation, AIR, is developing slower than expected.
- Well:
  - Europe is still leading the field.
  - Critical Mass is definitely present in the cluster
  - Scientific discussion within the subcluster is lively (c.f. survey paper), cooperation is strong
  - Industrial case studies produced new insights
  - Componentization of flow-analysis methods is advancing
  - Timing predictability is recognized as a highly relevant issue, first results achieved
  - AIR conceived as an open standard
  - CRL2 also used as Compiler – Timing-Analysis interface

Future Work

- AIR Semantics
  - The semantics of the chosen interface language will be specified.
- Computation semantics language
  - Discussion of the computation semantics language as an extension of AIR.
  - Definition of the primitive operations
  - Specification of the semantics for a core language
- ALF flow analysis input format
  - The ALF flow analysis input format will be finalized, and Mälardalen's flow analysis will be adapted to use ALF instead of the current NIC format.
- WCET-Aware compiler Optimizations
- Predictability (see talk in Scientific Highlights)
- The WCET Tool Challenge (see talk in Scientific Highlights)

Current and Future Milestones

- Year2: Standard tool architecture and interfaces
  - The tool architecture has been further clarified. In the course of writing the joint survey paper, modularity of the architecture has been further extended (*100% completed*).
  - An agreement on the ARTIST2 common interface language, AIR. The syntax defined, the semantics accepted, but has not been formally written down (*60% completed by writing up the syntax for the agreed semantics*).
  - The extension of AIR for the computation semantics has been conceived. Basic operations have, yet, to be defined (*50% completed by specifying the approach to the specification of computation semantics*)
- Year3: Initial integration of existing components
  - The chosen interface language, AIR, is being extended by Saarland University and by AbsInt to suit the needs of other partners.
  - Vienna, Mälardalen, Tidorum, AbsInt will continue to work on path description attributes for AIR to arrive at a uniform notation.
  - Mälardalen will wrap up its flow analysis into a component with well-defined interfaces, which will be integrated with the aiT tool of AbsInt and the Bound-T tool of Tidorum.
- Year4: Integration of existing components