Information Society Technologies

ARTIST2 – Year 1 Review

Grenoble, October 3rd-4th, 2005

Activity *Execution Platforms*

System Modelling Infrastructure

Activity leader : Jan Madsen (DTU)

Outline of the Presentation

Participants + Objectives

Industrial Needs and Experience

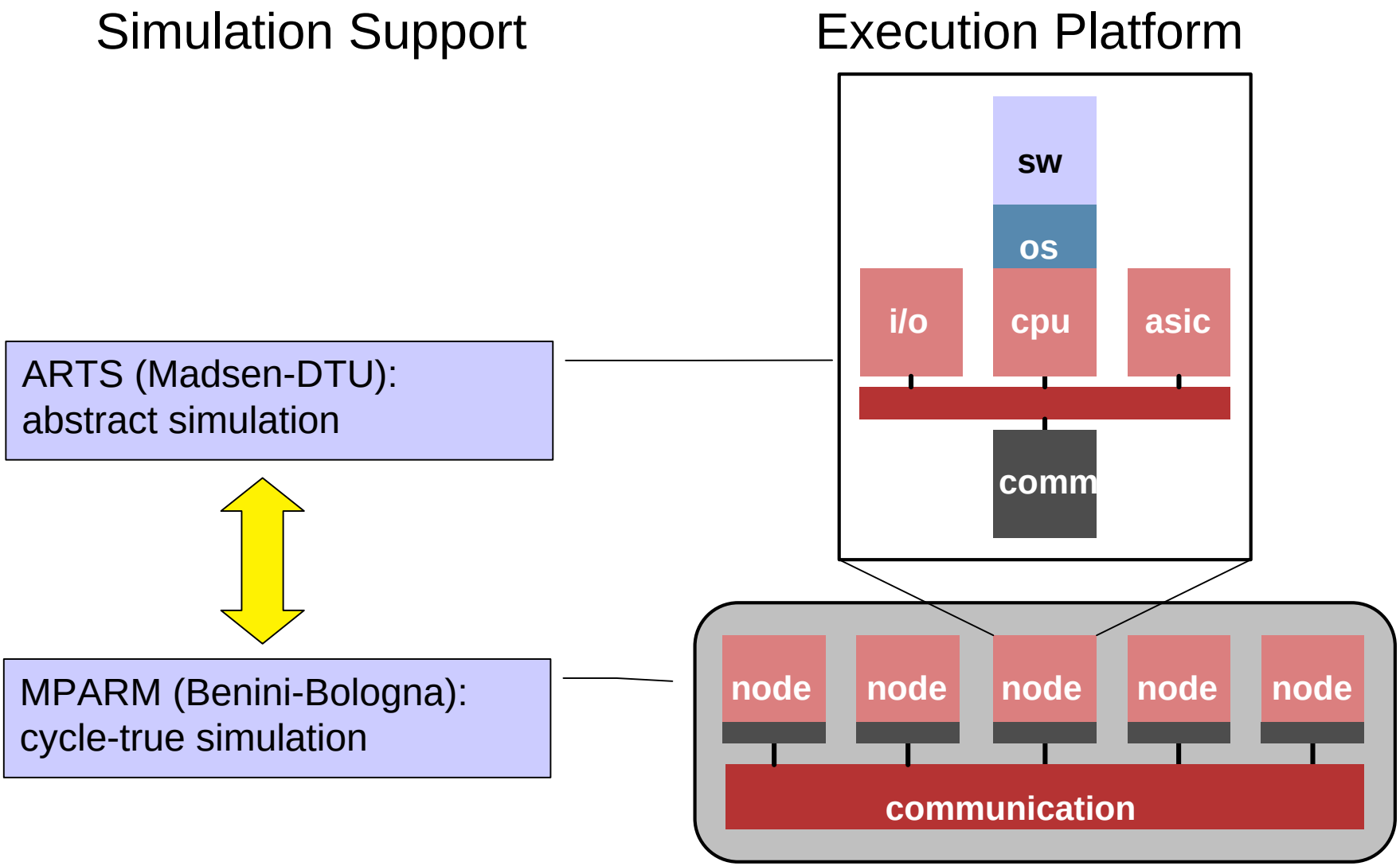
Year 1 Activities

- Interaction Between Partners
- Achievements
- Management Perspective
- Spreading Excellence

18 Month Perspective

- Ongoing Work
- Significant events or achievements expected

Overview JPIA: System Modeling Infrastructure

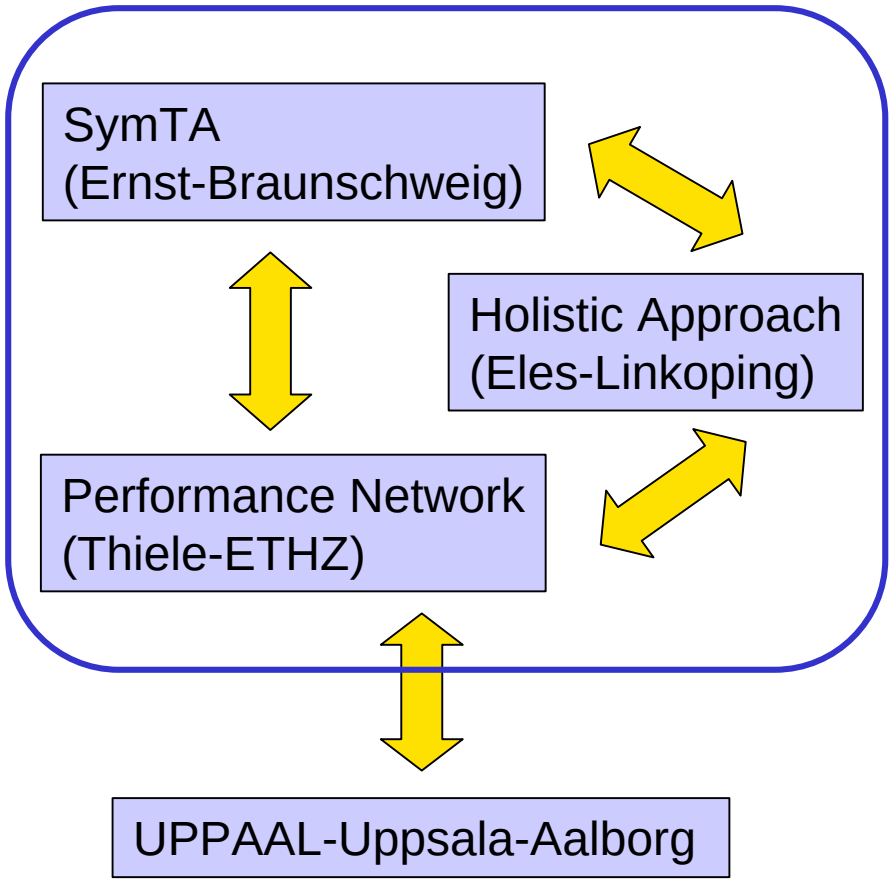


Participants and Objectives

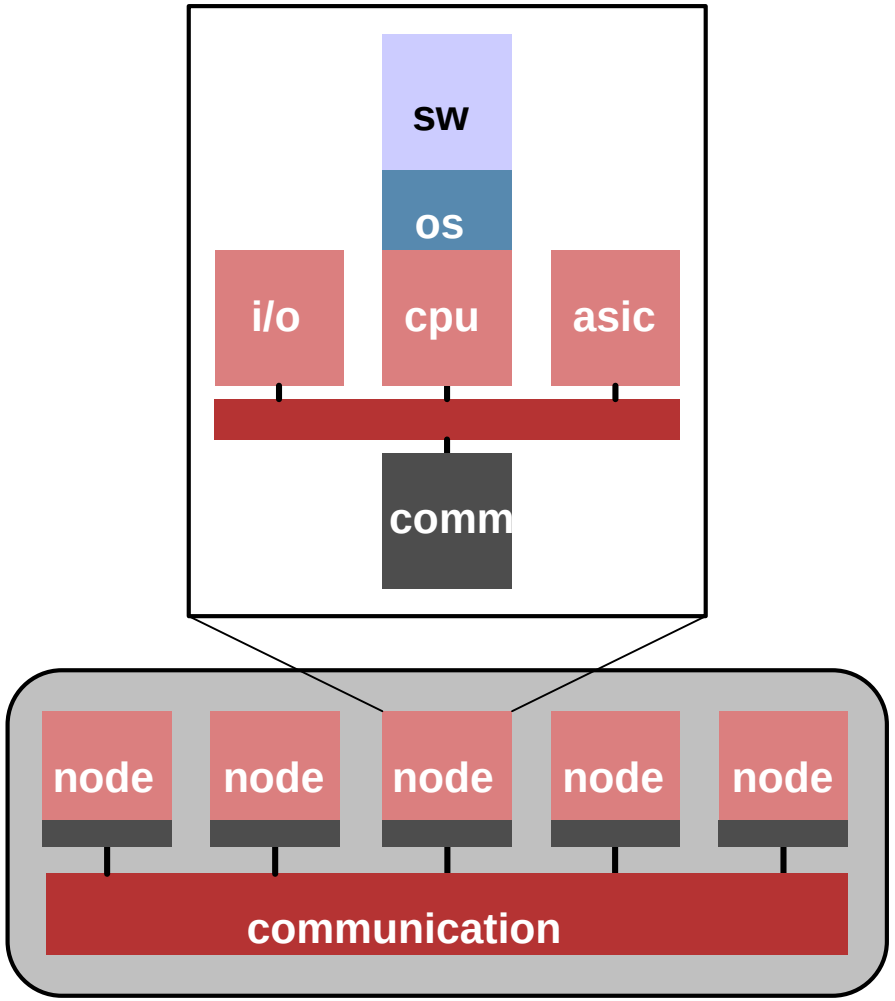
- ***Participants***: Madsen-DTU, Benini-Bologna, Eles-Linkoping, STM
- ***Objective***: Integrate ongoing research efforts on infrastructure modeling.
- ***Plan***: To integrate cycle-true (Benini-Bologna) and transaction level (Madsen-DTU) models, in theory and implementation. The challenges are mixed abstraction levels (cycle-true, instruction-true, transaction-level), handle voltage scaling for energy minimization. Include domain specific communication protocols (time-triggered, event triggered) Eles-Linkoping.
- ***M1-M18***: Integrate the approaches in theory and implementation.

Overview JPIA: System Modeling Infrastructure

Modular Performance Analysis Support



Execution Platform



Participants and Objectives

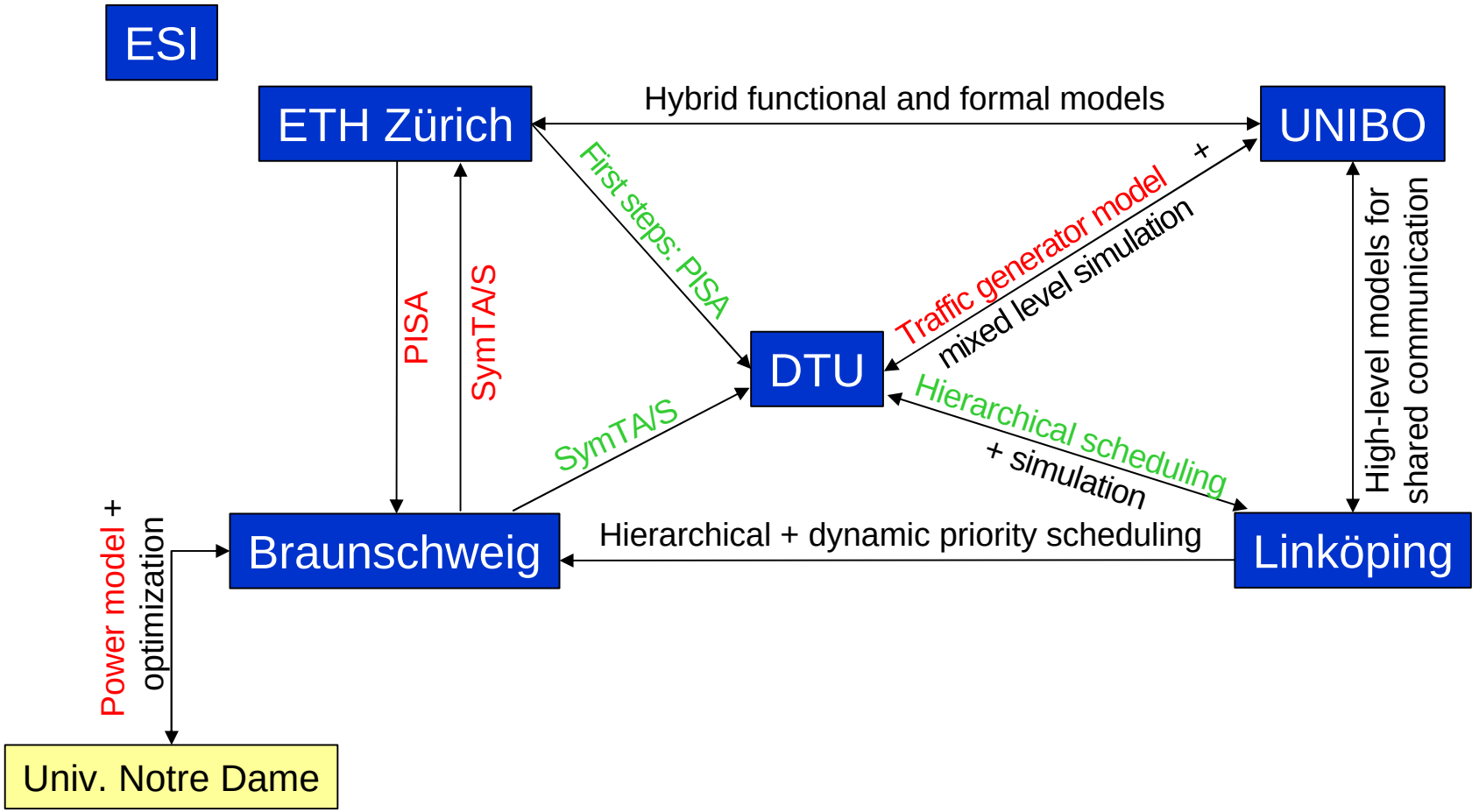
- ***Participants***: Thiele-ETHZ, Ernst-Braunschweig, Eles-Linkoping, VW, Volvo
- ***Objective***: Integrate infrastructures for performance analysis.
- ***Plan***: To integrate the formal performance analysis models from Thiele-ETHZ and SymTA/S (Ernst-Braunschweig) through the development of a semantically clean interface. Link the performance network approach to SymTA/S. An extension of SymTA/S to support hierarchical schedulability analysis is planned as a cooperation between Ernst-Braunschweig and Eles-Linkoping.
- ***M1-M18***: Integrate the different methods in one implementation.

Industrial Needs and Experience

- **Artist2 interaction with industry**
  - Bologna with STM: Virtual platform construction
  - Linkoping University with Volvo: Modelling heterogeneous communication protocols
  - TU Braunschweig with SymtaVision and Bosh: CAN bus modelling including fault models
- **Industrial needs system models for**
  - Handling growing complexity of embedded systems
  - Early analysis of system performance (to avoid overdesign and to meet constraints)
  - Cross-layer analysis (application software, middelware, hardware platform)
- **Possible Global Impacts of Research Results**
  - Increased productivity
  - Higher verification efficiency
  - Better understanding of concequences of outsourcing

Year 1 activities

Achievements: Our integration work



Year 1 activities

Additional Achievements fostered by ARTIST

- **University of Bologna**
  - Development of a cycle-accurate multiprocessor system-on-chip simulation environment MPARM
  - Extending the modelling of software infrastructure through a set of high-level APIs (message passing and shared memory)
  - Development of Traffic generators for simulation speed-up (cooperation between UoB and DTU)
- **Technical University of Denmark**
  - Development of ARTS, a system-level heterogeneous multiprocessor System-on-Chip modelling framework
  - Extending ARTS to support OCP interfaces
  - Development of a wireless communication model and for the ARTS simulation environment
- **Linköping University**
  - Distributed embedded systems for automotive applications based on the ARTS environment from DTU
  - Accurate modelling of background communication cach-refreshment
- **Technical University of Braunschweig**
  - Extended task model to support accurate response time analysis
  - Sensitivity analysis
  - Extending the SymTA/S tool to model and analyse power comsumption of complex heterogeneous embedded systems

Year 1 activities

Management Perspectives

- **What worked well**
  - Close partner cooperation including exchange of research personnel would not have been possible without Artist 2
- **Difficulties encountered**
  - None so far

Year 1 activities

Spreading Excellence

- **Publications at leading international conferences:**
  - DATE, SOC, DAC, CASES, ICCD, ICCAD
- **Evaluation and utilization of the MPARM tools by several companies including:**
  - Samsung, STM
- **Industrial project with VW (TU Braunsweig) on CAN bus modelling**
  - Formal analysis of complex CAN bus with more than 200 tasks
  - Automated interface to read-out VW database

18 Month Perspective

Ongoing and Future Work

- **TU Braunschweig– ETH Zürich**
  - Development of formal coupling between Real-Time Calculus and SymTA/S allowing a per component mixed performance analysis of heterogeneous distributed systems
- **TU Braunschweig**
  - Continue research in formal models for performance analysis, focusing on extending
  - System sensitivity minimization
  - Multidimension sensitivity analysis
- **DTU – University of Bologna**
  - Development of coupling between MPARM and ARTS to support mix-level simulation
  - Extension of the traffic generator model
- **Linköping University – DTU**
  - Extension of ARTS to support heterogeneous distributed embedded systems for automotive applications (hierarchical scheduling, Time-Triggered communication protocol)
- **DTU**
  - Development of models for highly distributed and networked systems, i.e. wireless sensor networks
- **All**
  - Integrate the simulation models and the formal analysis models and open up to other tools and simulation methods (UppAal model checking from Aalborg and Uppsala).
  - Couple to Design Space Exploration (PISA from Thiele-ETHZ).