Information Society Technologies

ARTIST2 - Progress Review

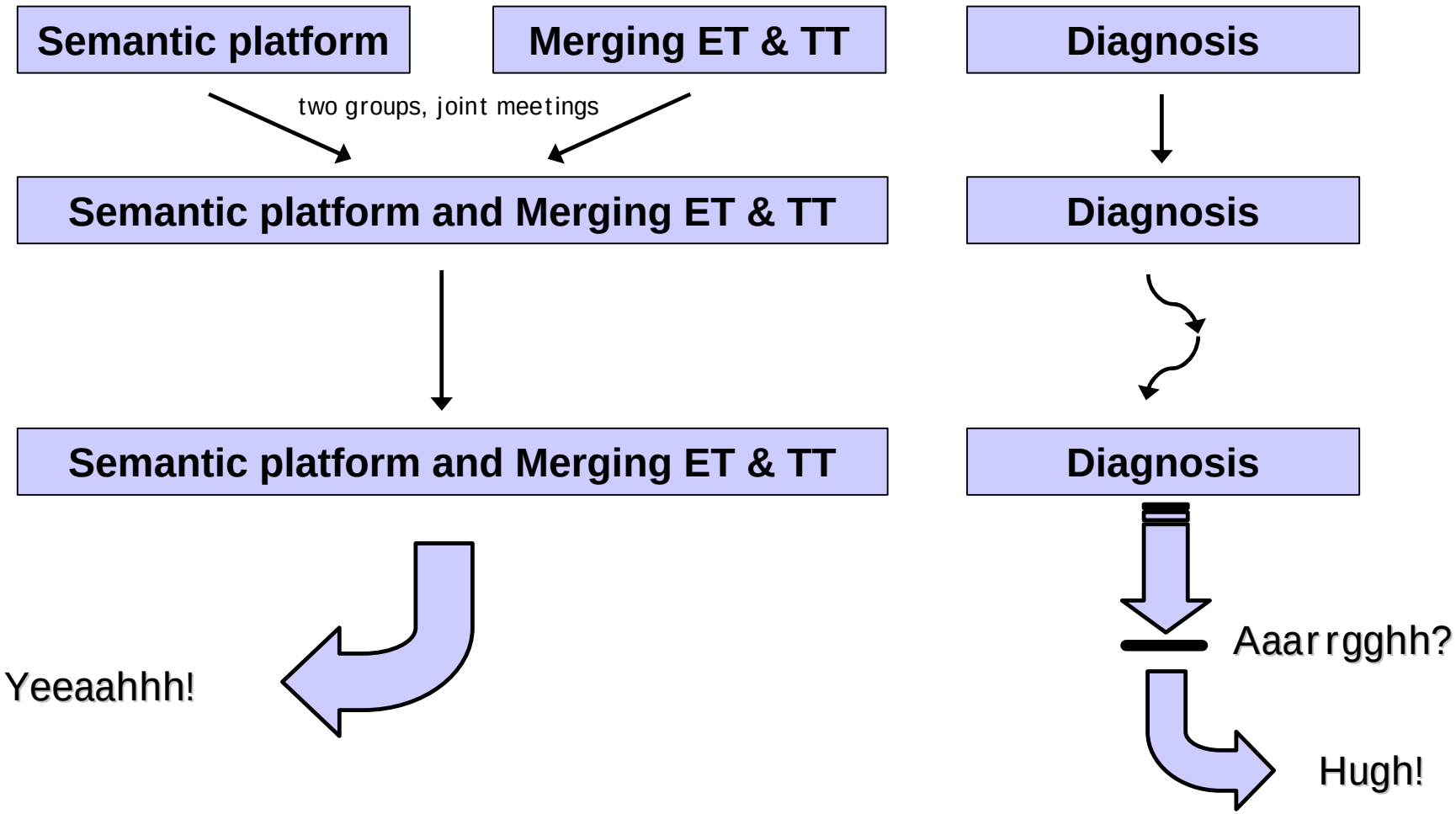
Grenoble, October 3-4th, 2005

Semantic Framework for HRT Design Flow

Activity leader:
Albert Benveniste (INRIA)

HRT Overview

A hectic family story



HRT Overview: integration

Selected Joint publications

❖ JPRA on Semantic Platform: INRIA+Verimag+PARADES

- A. Benveniste, L. Carloni, P. Caspi, A. Sangiovanni-Vincentelli. *Heterogeneous Reactive Systems Modeling and Correct-by-Construction Deployment*. Proc. of EMSOFT'2003, R. Alur and I. Lee Eds., Oct. 2003.
- A. Benveniste, B. Caillaud, L. Carloni, P. Caspi, A. Sangiovanni-Vincentelli. *Heterogeneous Reactive Systems Modeling: Capturing Causality and the Correctness of Loosely Time-Triggered Architectures (LTTA).* Proc. of EMSOFT'2004, G. Buttazzo and S. Edwards, Eds., Sept. 27-29, 2004.
- A. Benveniste, B. Caillaud, L. Carloni, A. Sangiovanni-Vincentelli. *Tag machines.* In Proceedings of EMSOFT'05, Sept. 2005.

Semantic Platform and Merging ET & TT

- **1st meeting at PARADES, Rome (near Piazza Navona) 12—14 Jan, 2005**
  - 27 participants
  - Industrials: 2 BMW, 2 GM
  - 4-5 affiliates
  - 3-4 from other clusters
- **2nd joint meeting with Components and Execution Platform clusters at INRIA, Rennes 27—28 June, 2005**
  - 30 participants
  - Industrials: 1 FT, 2 DC

Semantic Platform and Merging ET & TT
Executive summary of Rome meeting: sample

- **Summary of research suggestions from our industry colleagues**
  - **GM:**
    - techniques to decouple application schedules from communication schedules, in a reasonably optimal way
    - Incremental addition of functions so that architecture is changed minimally
    - Select best schedule from certain metrics among possible ones. Even determining what the metrics should be. Find metrics that reflect extensibility and scalability.
    - How to select an architecture that is optimal in scalability and extensibility?
    - Static scheduling generation for distributed implementations? One of the problems is with the suppliers: you can calibrate a schedule a priori, but when the supplier changes something, then this schedule is no longer valid.
    - How can we apply these techniques with incomplete and approximate information? For early architecture decisions. (Much harder to do with TT than it was with ET CAN in the past.)
    - Overall, shares the views presented in W. Damm's presentation (on rich components).
    - Desire to use ECU reuse → preference for techniques that make applications insensitive to changes rather than provide automatic adaptation techniques.
  - **BMW:**
    - Agrees with above issues
    - Tool support for the above issues? Distributed application → distributed deployment & scheduling.

Semantic Platform and Merging ET & TT
Executive summary of Rome meeting: sample

- **Summary of other research issues**
  - P. Caspi: some presentations relate heterogeneity & scheduling. Seems to be an interesting line of research.
  - A. Benveniste: prepare research on heterogeneity to accommodate for the much more flexible QoS parameters that will occur in the future [synchronize with cluster of adaptive RT]
  - P. Caspi: modeling and implementation; what are the different refinement relations between them?
  - P. Caspi: MoCC, can we structure them? How many of them? Classification scheme of MoCCs? Why do they exist? Which ones should be distinguished? [synchronize with cluster on components]
  - ASV: comparison between environments that embed flows versus stand alone flows, as paradigms to address embedded systems. Flexibility versus optimality in the tool space (of course both is best!)

Semantic Platform and Merging ET & TT
Highlights of Rennes meeting

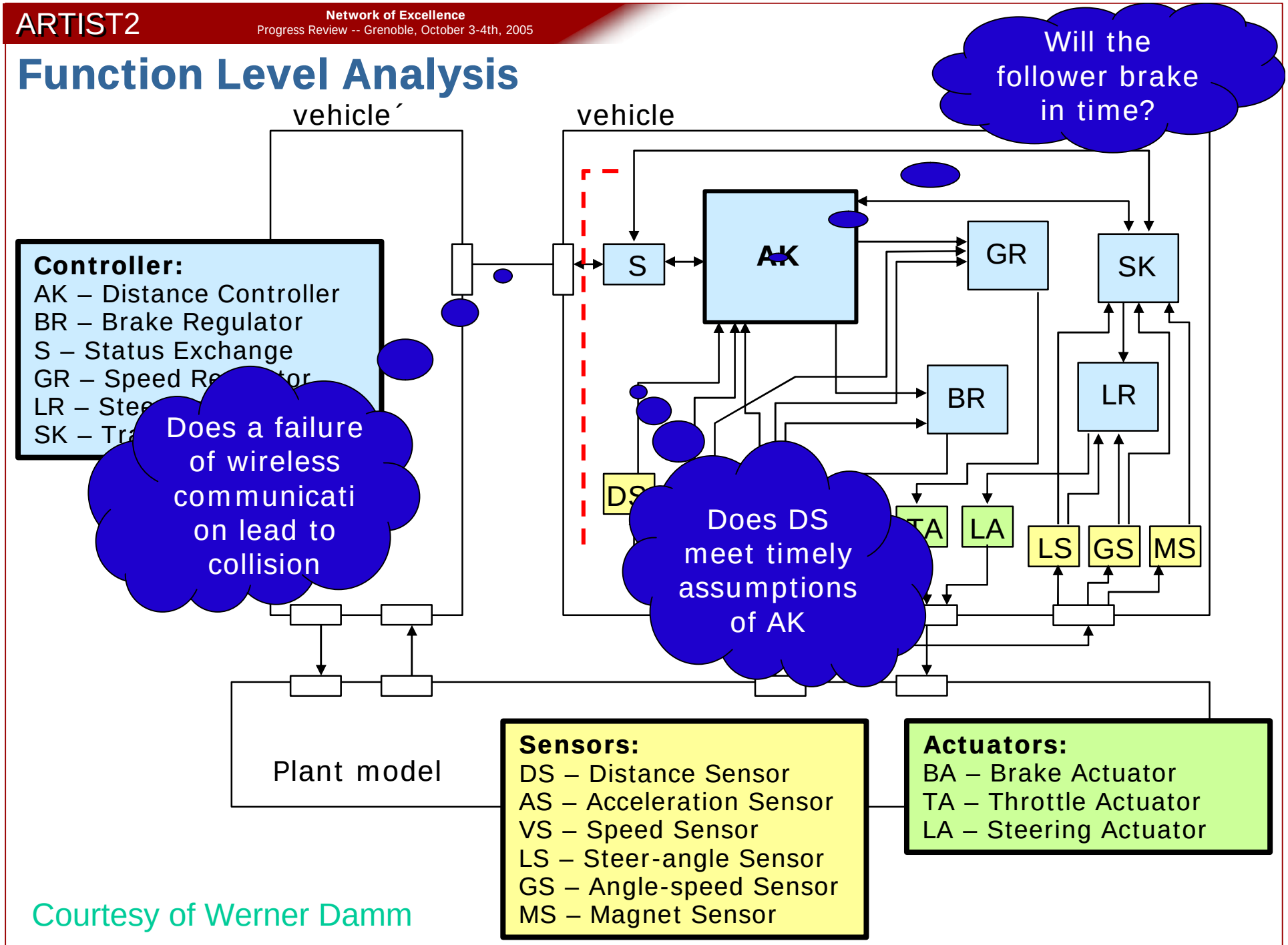
- **Focus on *interfaces***
  - Real-time interfaces (Thiele, Henzinger, Sifakis)
  - Functional/non-functional: rich components (Damm)
- **Focus on *heterogeneity***
  - ET&TT (Obermaisser)
  - Metropolis (ASV)
  - Models for heterogneity (Caillaud)
- **Opening our scope**
  - Web services (FT)

Semantic Platform and Merging ET & TT

Some (biased) conclusions

and showing actual impact on research

Function Level Analysis

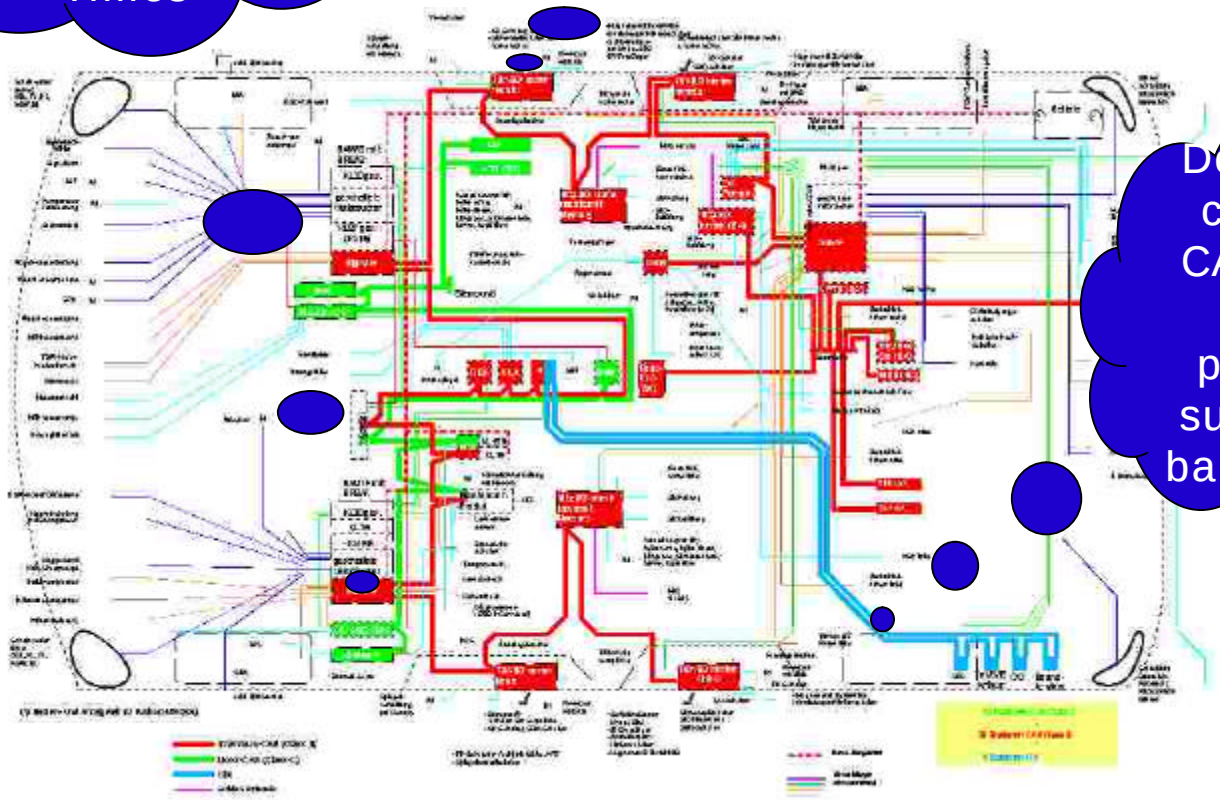


Courtesy of Werner Damm

Vertical Analysis

Does the chosen Processor Guarantee assumed Worst Case Execution Times

Can I implement my function network on this ECU network?



Does the chosen CAN-Bus level provide sufficient bandwidth

Courtesy of Werner Damm

Requirements

- **Components as part of *open systems*; support interface-based composition and refinement**
- **Functional and non-functional aspects *jointly handled*, at both component- and system-level**
- **Design space involves both functions and execution infrastructure**
- **With *heterogeneous and flexible* Models of Computation and Communication (MoCC)**

Requirements → Research Challenges

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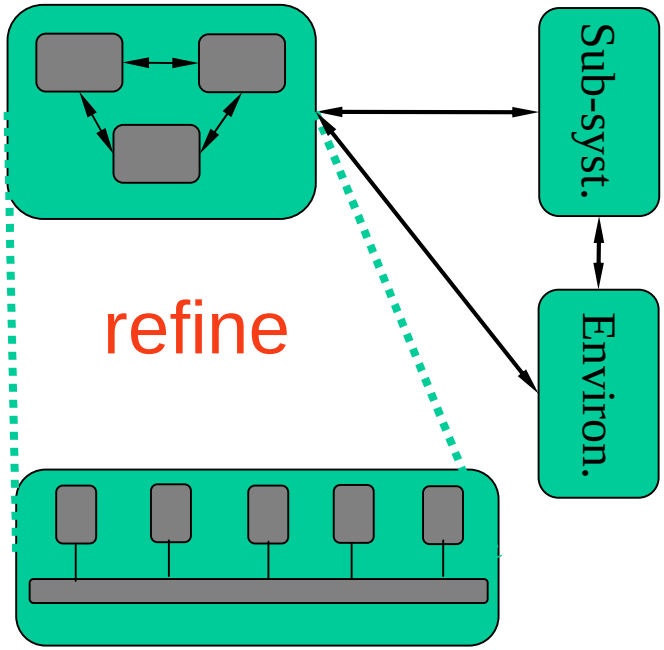

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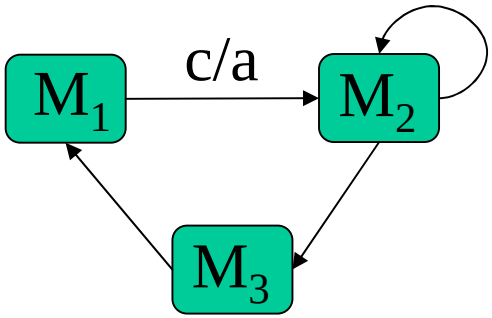

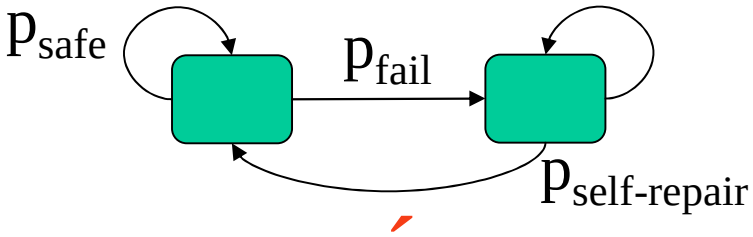

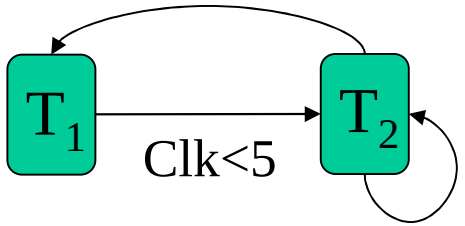

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