



# MoDES Workshop

Michael R. Hansen & Jan Madsen

Informatics and Mathematical Modeling  
Technical University of Denmark  
Richard Petersens Plads, Building 321  
DK2800 Lyngby, Denmark



## Agenda



Time	Presentation
09:30 – 09:50	Welcome and practical matters, Jan Madsen, DTU
09:50 – 10:10	Models for Hybrid Systems, AP Ravn, AAU
10:10 – 10:30	COMDES-II: Formal Definition and Experimental Validation, Xu Ke and Yu Guo, SDU
10:30 – 10:50	Timed Games and Uppaal Tiga, kim G. Larsen, AAU
10:50 – 11:20	Break
11:20 – 11:40	Task Graph Scheduling on FPGA architecture using Uppaal Cora, Jacob, AAU
11:40 – 12:00	Model-driven power management for energy-aware embedded systems, Zdravko Karakehayov, SDU
12:00 – 13:00	Lunch
13:00 – 13:20	On Timed Automata Models for ARTS, Michael R. Hansen, DTU
13:20 – 13:40	Status for Roadmap on Methods and Tools, Istvan, AAU
13:40 – 14:00	Summary – identification of links and action points between groups
14:00 – 14:15	Break
14:15 – 14:30	Danfoss Case Study, Roozbeh, AAU
14:30 – 14:45	PAJ Case Study in the MoDES, Xin Wang, PAJ
14:45 – 15:00	Hardi International
15:00 – 16:00	Plan of Actions: Focus on action points, which bind (university and company) groups together - Industry cases



## ❖ What did we promise?



- Research activities
- Expected results
- 4 PhD projects
  - based on (a) particular industrial case(s) and involve particular models, tools and technologies.
- Accompanying activities



## ❖ Research activities



- **Survey of existing models and tools** supporting various aspects and development phases for embedded systems;
- **Evaluation of existing academic tools** in the context of model-driven development of industrial cases;
- **Enhancement of existing commercial tools** with capabilities present in most prominent academic tools.
- Development of **integrated modelling formalisms** supporting heterogeneous models of computation and communication.
- Dissemination of results in research and practice.



## Expected results



- A **catalogue of modelling formalisms and tools** for development of intelligent embedded systems experimentally evaluated in industrial settings.
- **Enhanced formalisms and tools** driven by the needs in practice and promising techniques identified in research.
- **Courses, training programs and workshops** for practitioners to disseminate the practical experience to the broader embedded systems community.
- Successful completion of **4 PhD theses** contributing to the area.
- **Convincing exemplary industrial cases** illustrating model-driven embedded system design in a coherent way.

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## PhD Projects



- *Exploration* (8 months)
  - Initial investigation of the **application**, which may be either
    - a) design of a product line using advanced techniques and technologies, or
    - b) redevelopment and refactoring of an existing product line such that advanced techniques apply.
  - The outcome is a **preliminary design trajectory** that identifies available theories, models and techniques that may be useful in a model-driven approach for the specific application. Furthermore it will include a survey of potentially useful academic or commercial tools to support the development.
- *Prototype Modelling* (11 months)
  - **Theories and tools** are used to build coherent models along the design trajectory.
  - The outcome is a **demonstration of the techniques and tools** as they would apply for the given application in the specific company.
- *Scientific Exploitation* (8 months)
  - **Generalisation**, analysis and investigation of selected aspects of the applied methods and/or tools.
  - The outcome is research publications pertaining to the tools or theories. It is the groundwork for the main scientific results of the project.
- *Reporting and Dissemination* (8 months)
  - **Reporting** to the scientific community and revisions of application in connection with the company.
  - Final outcome are a number of PhD-theses and design guidelines etc. for practical use.

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## Accompanying activities



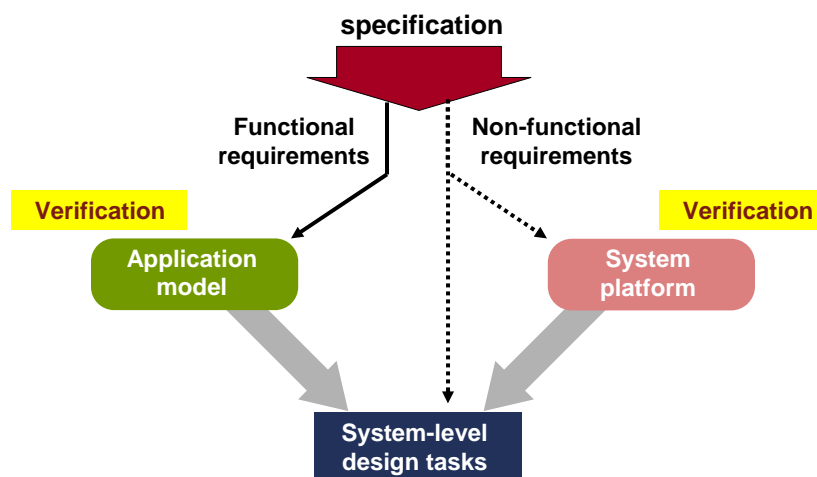
- *Joint Project Supervision*
  - For each PhD-project there is a **supervisory team** with representation from at least two of the basic research areas (Control Engineering, Embedded Software Engineering, Hardware Engineering) and an application area specialist from the company.
- *Annual Workshop and Meetings*
  - The PhD students and their supervisors and industrial contacts will have regular, joint meetings (every 2 months).
  - The project will have **annual workshop seminars**, open for external participation, where all PhD students, researchers and industrial contacts will disseminate results.
- *Danish ARTEMIS consortium*
  - The participants of the project will **initiate** the formation of a **Danish consortium** to become member of the ARTEMIS research platform.

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## Embedded systems design flow

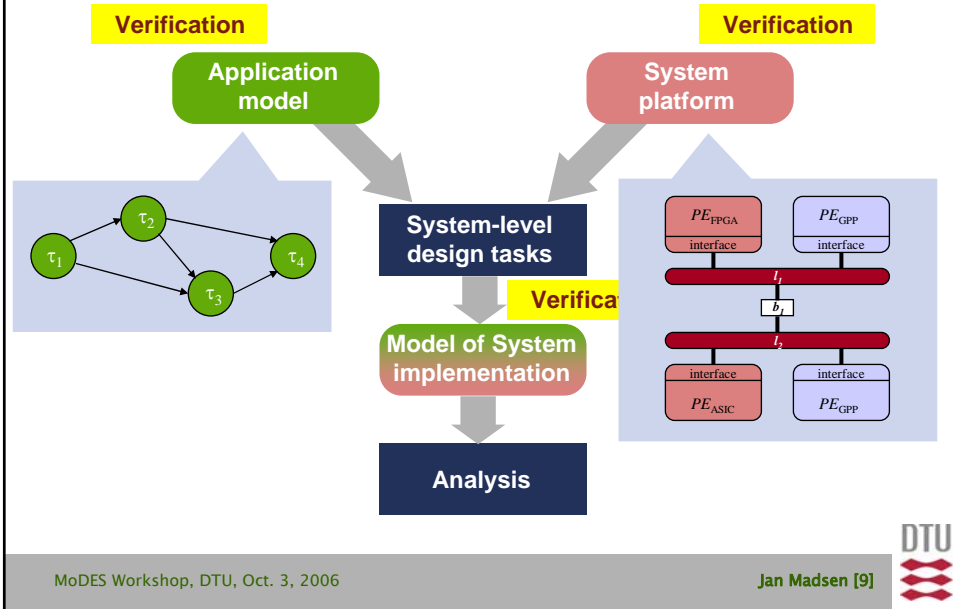


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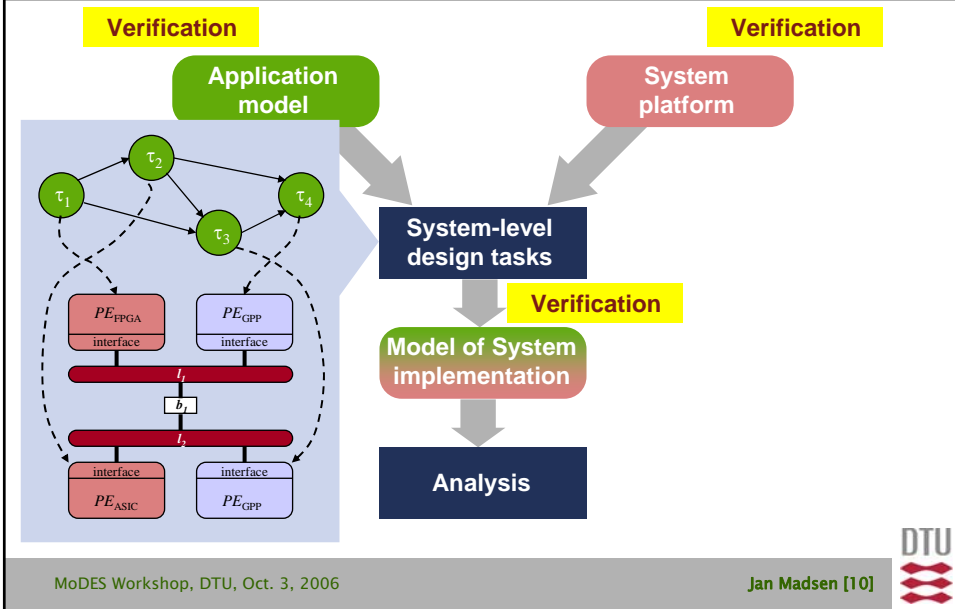
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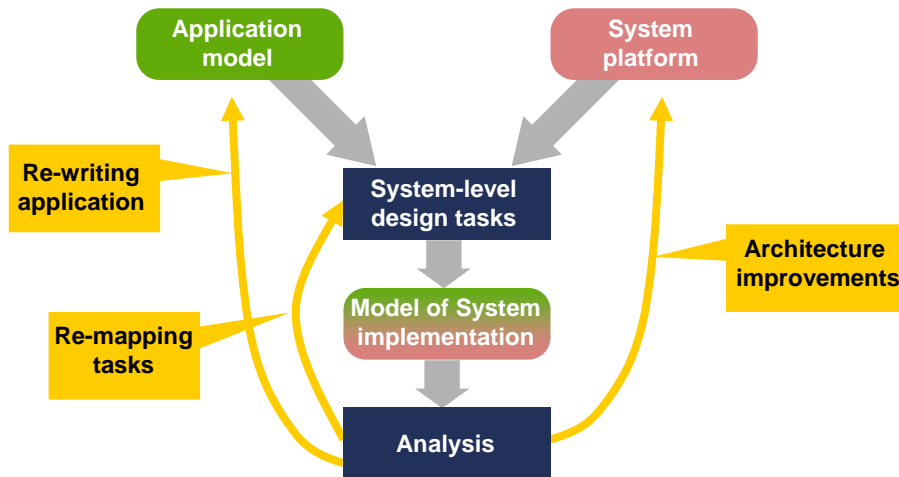
# Embedded systems design flow



# Embedded systems design flow



## Design space exploration

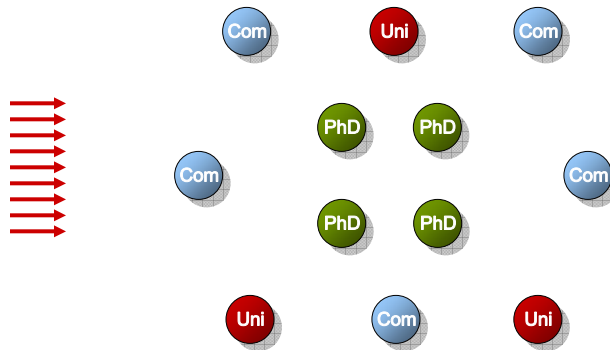


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## Goal of today!



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# Agenda



## Frame & vision

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10:10 – 10:30	COMDES-II: Formal Definition and Experimental Validation, Xu Ke and Yu Guo, SDU
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## Models & experiments

	Break
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11:40 – 12:00	Model-driven power management for energy-aware embedded systems, Zdravko Karakehayov, SDU
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## Industrial cases

	Summary – identification of links and action points between groups
	Break
14:15 – 14:30	Danfoss Case Study, Roozbeh, AAU
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	Hardi International

## Links & actions

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