



**Collaboration between Industry and Research
for the Introduction of Model-Driven Software
Engineering in a Master Program**

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PROGRESS
A national Swedish Strategic Research Centre

 MÅLARDALENS HÖGSKOLA

 **MRTC**
MÅLARDALEN REAL-TIME
RESEARCH CENTRE

 Stiftelsen för Strategisk Forskning
TEKNIK - MEDICIN

Outline

- Partner presentations
- Collaboration goals and interests
- Description of the MDD education
- The introduction process

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Mälardalen University (MdH) – Research

- School of Innovation, Design and Engineering



- Research Institute:
 - Mälardalen Real-Time Research Centre (MRTC)

Mälardalen University (MdH) – Master Education

■ Offered programs:

- Embedded Systems
- Software Engineering
- Intelligent Sensor systems
- Biomedical engineering
- Robotics
- Artificial Intelligence

Software Engineering Course

Focusing on:

- Architecture
 - Modeling
 - Real-Time
 - Component-Based
- for Real-Time Embedded Systems

State of MDD at MdH

No direct research

But,

- *Utilisation for building tools*
- *Utilisation in the ES development process*

No direct education

But,

- *Some courses related to intensive modelling*

Some information about the industrial partner

A known Swedish Telecommunication Company

- *Already experienced in MDD*
- *Utilisation of proprietary technology*



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Collaboration goals

MdH

Introduce MDD as a part of education

- *Related to research*
- *Related to industrial requirements*


The Company

Increase the use of MDD in the development process

- *Validate the MDD approach*
- *Increase the knowledge on MDD*
- *Include MDD in the development process at a large scale*

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Interests of the collaboration



- MdH**
 - Motivate the students
 - Increase the knowledge and priority of MDD at the research centre
 - Get insights into industry-related projects and solutions
 - Improve industrial relationship
- The Company**
 - Validation of the MDD approach for products with specific domain requirements
 - Possibility to recruit young engineers with MDD experience
 - Possibility to have a continuing education for their employees

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Addressing the industrial needs



- Validation of the MDD approach
 - MsC Theses
 - Course Projects
- Recruiting Continuing Education
 - Courses
 - Dedicated Lectures




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MDD Education in SE program

<p>Course</p> 	<p>Dedicated Lectures</p> 	<p>Projects & MsC Theses</p> 
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MDD Course – Theoretical part

Lectures

- Context and theory,
- Model-driven approaches and modeling languages,
- Model-based testing, Model analysis and quality in modelling,
- Model manipulation and management,
- Modern development process

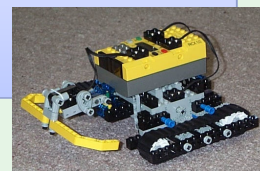
Demonstration

- Examples to illustrate the basics of xUML and its transformation to particular platforms of embedded systems
- Examples from the partner company (already developed or done in cooperation)

MDD Course – Practical part 1

Tutorial

- Application of the basis of xUML and MDD on a simple system (a “Lego Robot”)
- Description:
 - Modelling of a system at a high level of abstraction
 - Code generation for a specific target platform
 - Simulation
 - Execution of the generated code



MDD Course – Practical part 2

Team-work project

- Small-size projects
 - Examples given by the company
 - Examples done in cooperation with the company
- Purpose:
 - Practice of the Agile development process
 - Practice of the concepts of model-driven engineering using xUML through an MDA approach
 - Application of the tutorial concepts
- Description:
 - Design of a system at a high level of abstraction
 - Generation of the implementation for different selected platform

Dedicated lectures

Overview of MDD in different courses

- Software Engineering - general MDD principles
- System Verification and Validation - MDD testing
- CBD - MDD and component specification and implementation

Projects and MsC theses

- Provide a deeper investigation of MDD concepts
- Done in 2 possible context:
 - Research settings
 - Industrial settings
- Thesis examples:
 - Specification and design of a prototype of IDE for Component-Based Embedded System
 - Software testing in model-driven engineering.
 - Model management and modeling in the large.
 - UML profile for PROGRESS Component Model

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The introduction process – how to foster the cooperation ?

Initial phase – *Elaboration of the preliminary plans*

- an internship student analyzing the requirements from the company
- Several workshops

Ongoing phase – *Refinement of the preliminary plans*

- 1 post-doc expert in MDD working part-time with the company
 - Study the feasibility of MDD in the company product development process
 - Lead the MsC theses

Thanks

QUESTIONS



MDD Course Objectives

- Throughout the course, the student will get:
 - Essential theoretical knowledge in methods and approaches in MDE,
 - Experience in modeling at high level of abstraction(PIM),
 - Experience in driving software development using model-centric approach
 - Team-work experience.

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MDD Course Objectives

- At the end of the course, students should be able to:
 - Explain why MDE appear as a solution to address today's Software Engineering concerns.
 - Give details about the various methods and techniques related to the use models as primary artifacts.
 - Describe the implications of the shift from code-centric to model-centric approaches.
 - Demonstrate high level of abstraction modeling skills.
 - Summarize the benefits and challenges of MDE compare to other software development approaches.
 - Appreciate the difference between Agile development processes and other lifecycles.

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