Multi-Domain Modeling and Simulation in MATLAB & Simulink

4th MODPROD Workshop on Model-Based Product Development
February 9-10, 2010

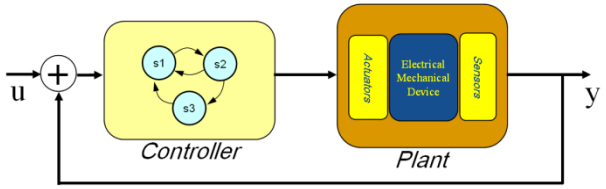
Patrik Ekdahl

Application Engineering, Physical Modeling

patrik.ekdahl@mathworks.com

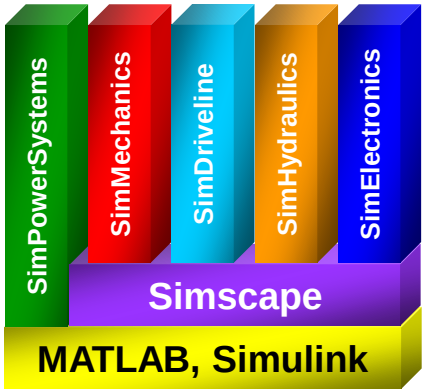
Value Proposal

- **Model Controller and Plant in One Environment**
- **Model in Multiple Physical Domains**
  - → Understand and Optimize the Entire System
  - → No Co-Simulation



- **Create Intuitive, Accurate and Reusable Models Quickly**
  - → Enhance Communication and Teamwork
  - → Rapid Design Iterations
  - →'What-If?' Studies
- **Real-Time Capable - Hardware In Loop Testing**
  - → Early Test and Verification
  - → Find Errors Before Building Hardware
- **Leverage MATLAB and Simulink**

  Integrated, mature and seamless environment

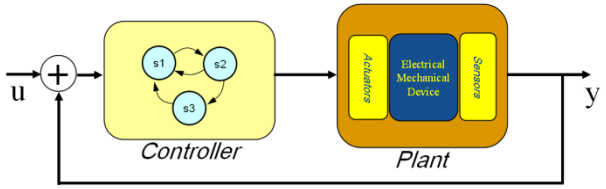


Live Demo

1. Introduction to the Simulink Top Level System Model
   - Closed-Loop Simulation
   - Controller and Plant in One Environment
   - Physical Multi Domain Plant
2. Build SimMechanics 3D Model by Reuse of SolidWorks CAD Data
3. Simulate, Visualize and Analyze 3D Mechanical Motion
4. Easy Model Reuse of SimHydraulics Shipping Demo
   - Hydro-Mechanic Multi Domain Acausal Physical System
5. Add Custom Physical Components Using the Simscape Language
6. Work with Simulation Settings to Balance Performance vs. Fidelity
   - Variable vs. Fixed Step Time
   - Manage Stiff System Restrictions
   - Leverage Local Solvers
7. Add PI Controller and Close the Control Loop
8. Generate Code of Controller and Plant Using Real-Time Workshop
   - ANSI C/C++
   - Next step: Hardware-In-Loop

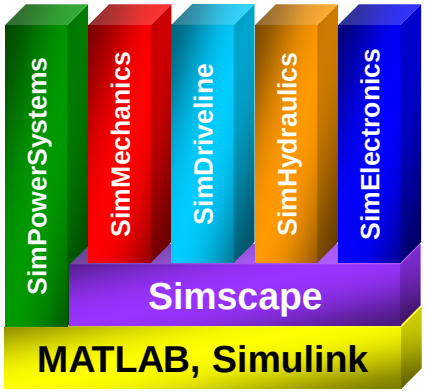
Value Proposal

- **Model Controller and Plant in One Environment**
- **Model in Multiple Physical Domains**
  - → Understand and Optimize the Entire System
  - → No Co-Simulation



- **Create Intuitive, Accurate and Reusable Models Quickly**
  - → Enhance Communication and Teamwork
  - → Rapid Design Iterations
  - →'What-If?' Studies
- **Real-Time Capable - Hardware In Loop Testing**
  - → Early Test and Verification
  - → Find Errors Before Building Hardware
- **Leverage MATLAB and Simulink**

  Integrated, mature and seamless environment



Want to Know More?

- For more information
  - General information
    - info-se@mathworks.com
    - +46 8 5051 6900
    - www.mathworks.se
  - Support
    - +46 8 5051 6900
    - support-se@mathworks.com
  - MathWorks Nordic Training Courses
    - www.mathworks.se/training