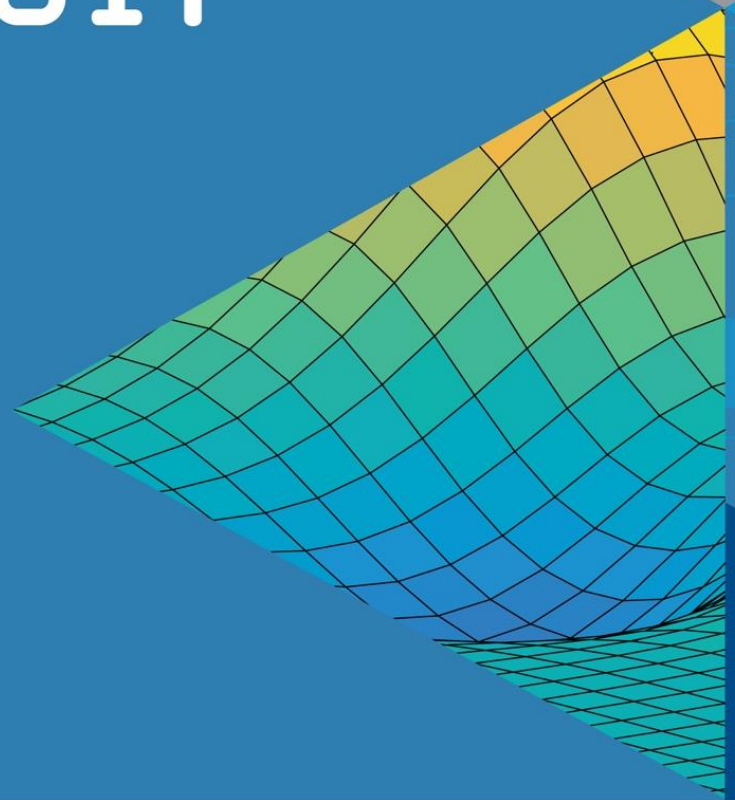
MATLAB EXPO 2017

Simulink as Your Enterprise Simulation Platform

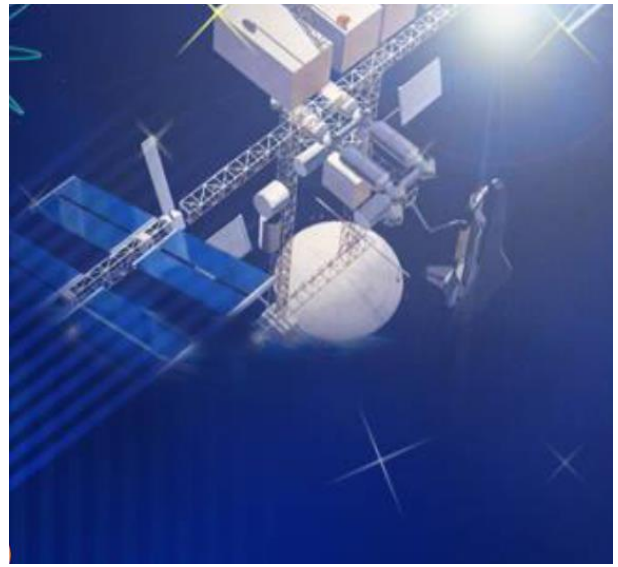
Dr. Mohamed Anas



Simulink as an Enterprise Simulation Platform

Simulating Spacecraft Communications for Deep-Space Missions

Dr. Deepak Mishra, Scientist/Engineer (SF)
Indian Space Research Organization



Challenge

- Integrating large multi-faceted project
- Simulation at multiple stages and in multiple domains to explore the problem

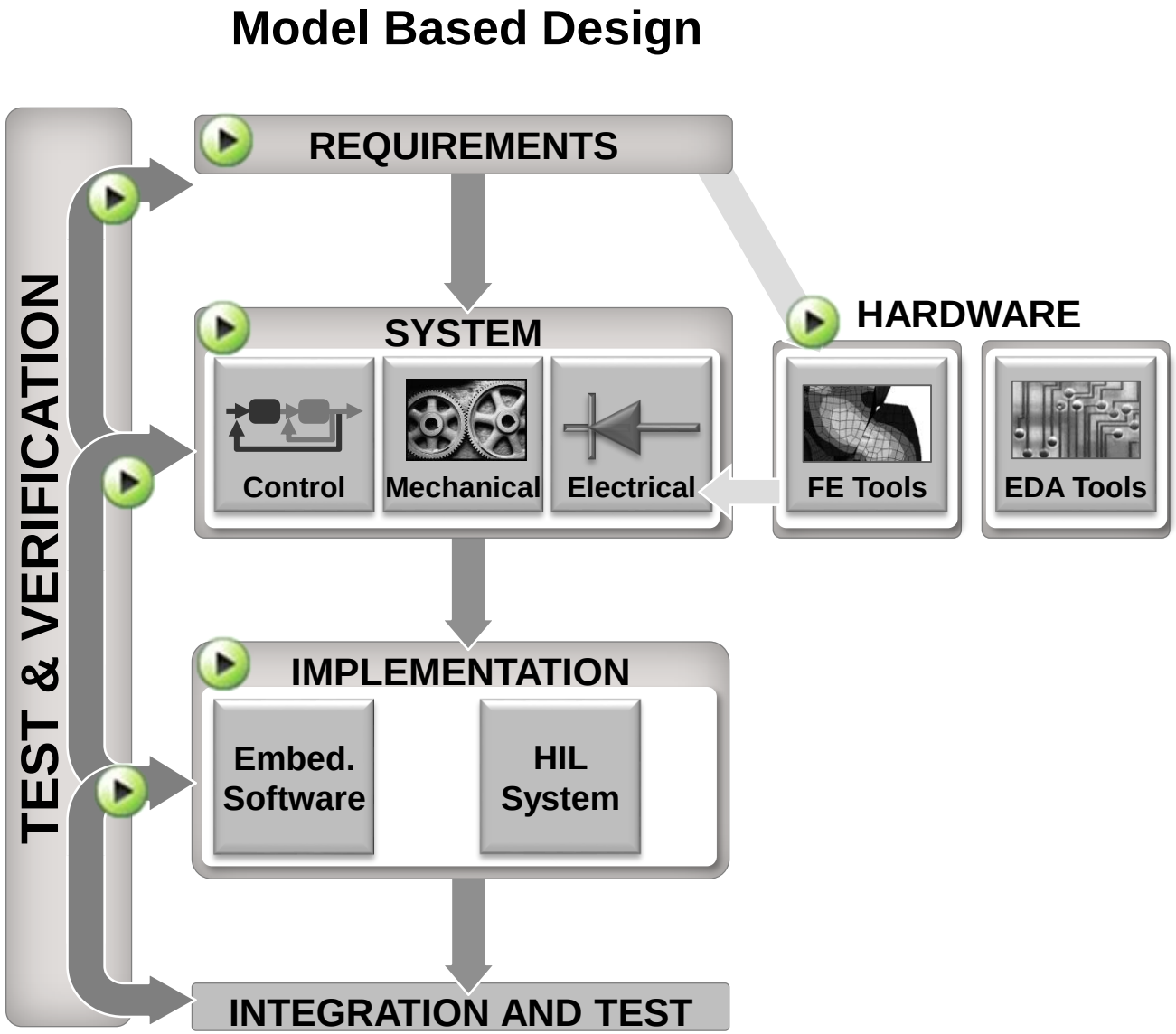
Solution

- Leverage Simulink as a platform

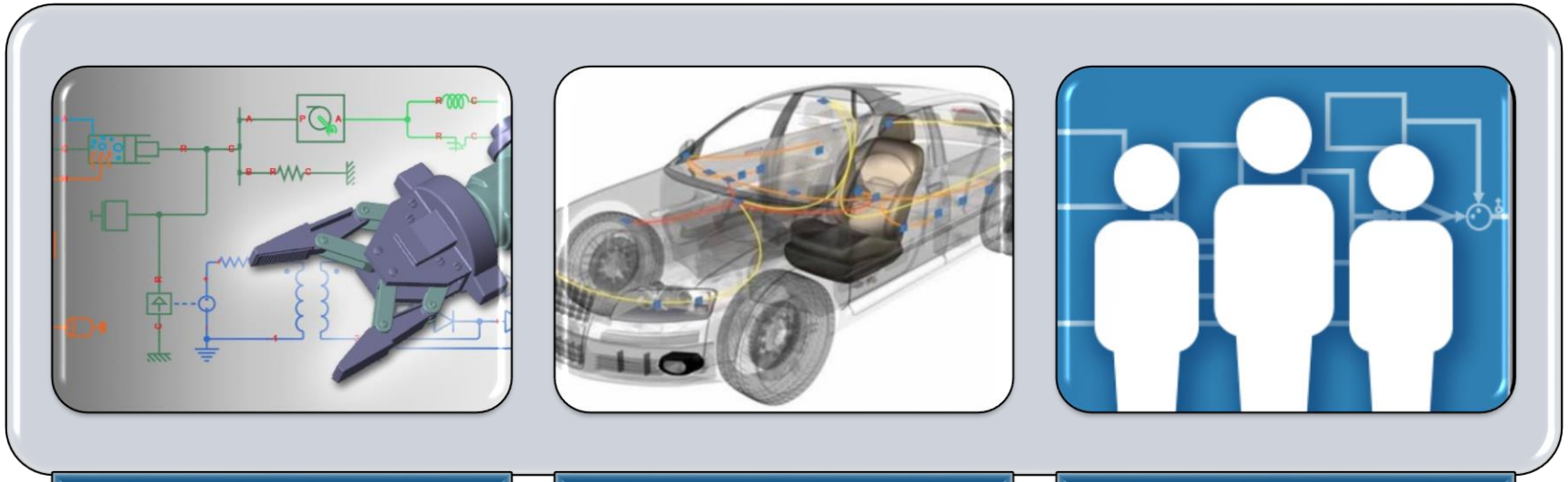
Enterprise Simulation Platform

- Enterprise - Any size business or project
- Simulation – Evaluating system behavior through computation
- Platform – Scalable environment for multi-disciplinary collaboration

Simulation



Enterprise Simulation Platform Enablers

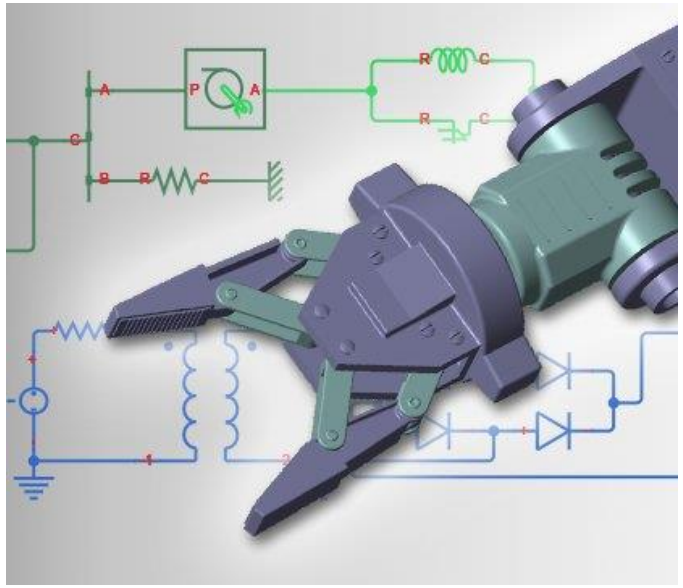


Multi-Domain Modeling

Integration

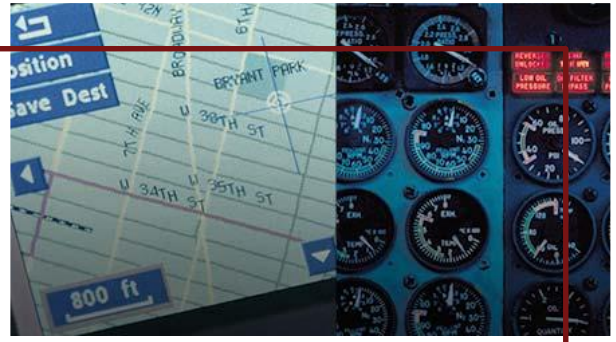
Scalability

Multi-Domain Modeling



Multi-Domain Modeling in Simulink

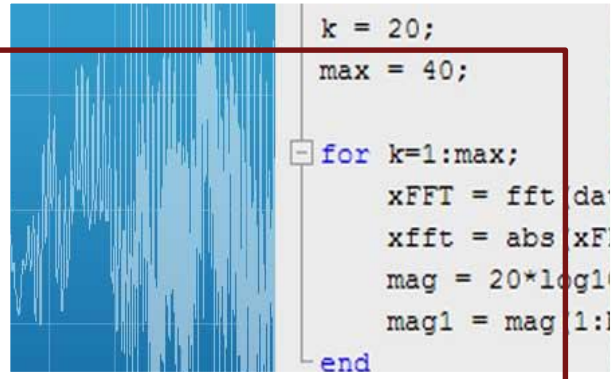
Dynamic Systems



State Machines

Discrete-Event Systems

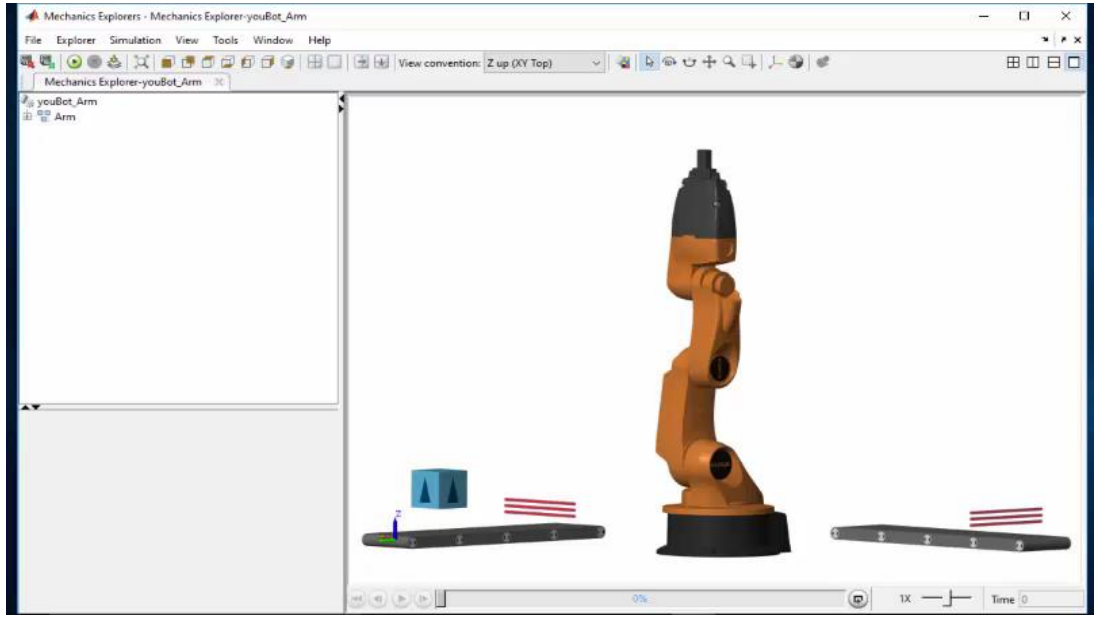
Physical Modeling



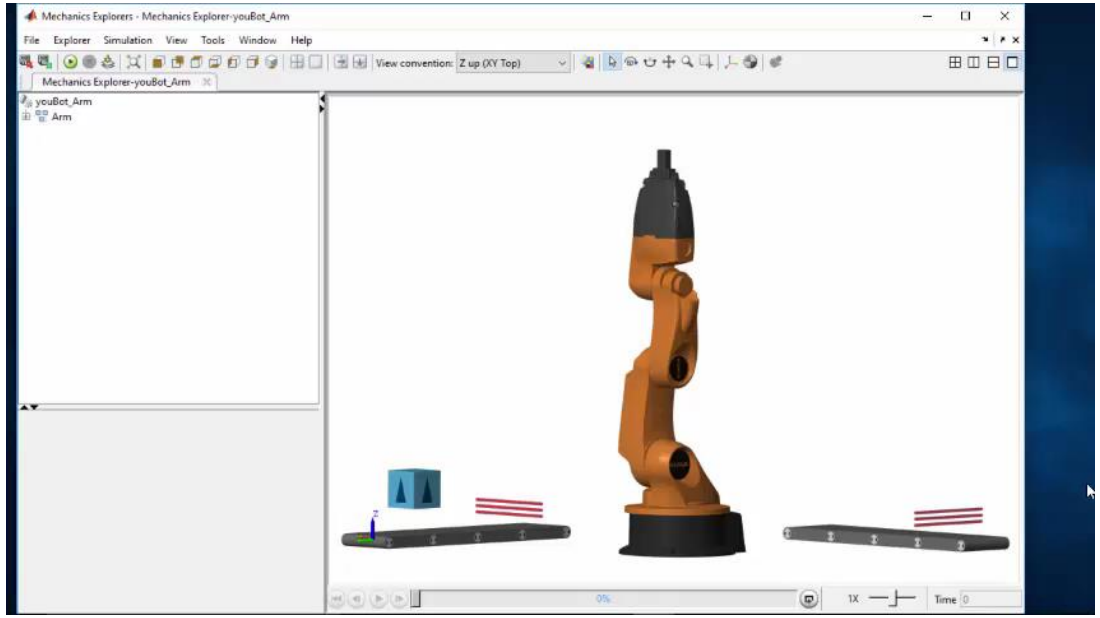
Object-Oriented

Robot Arm Multi-Domain Simulation

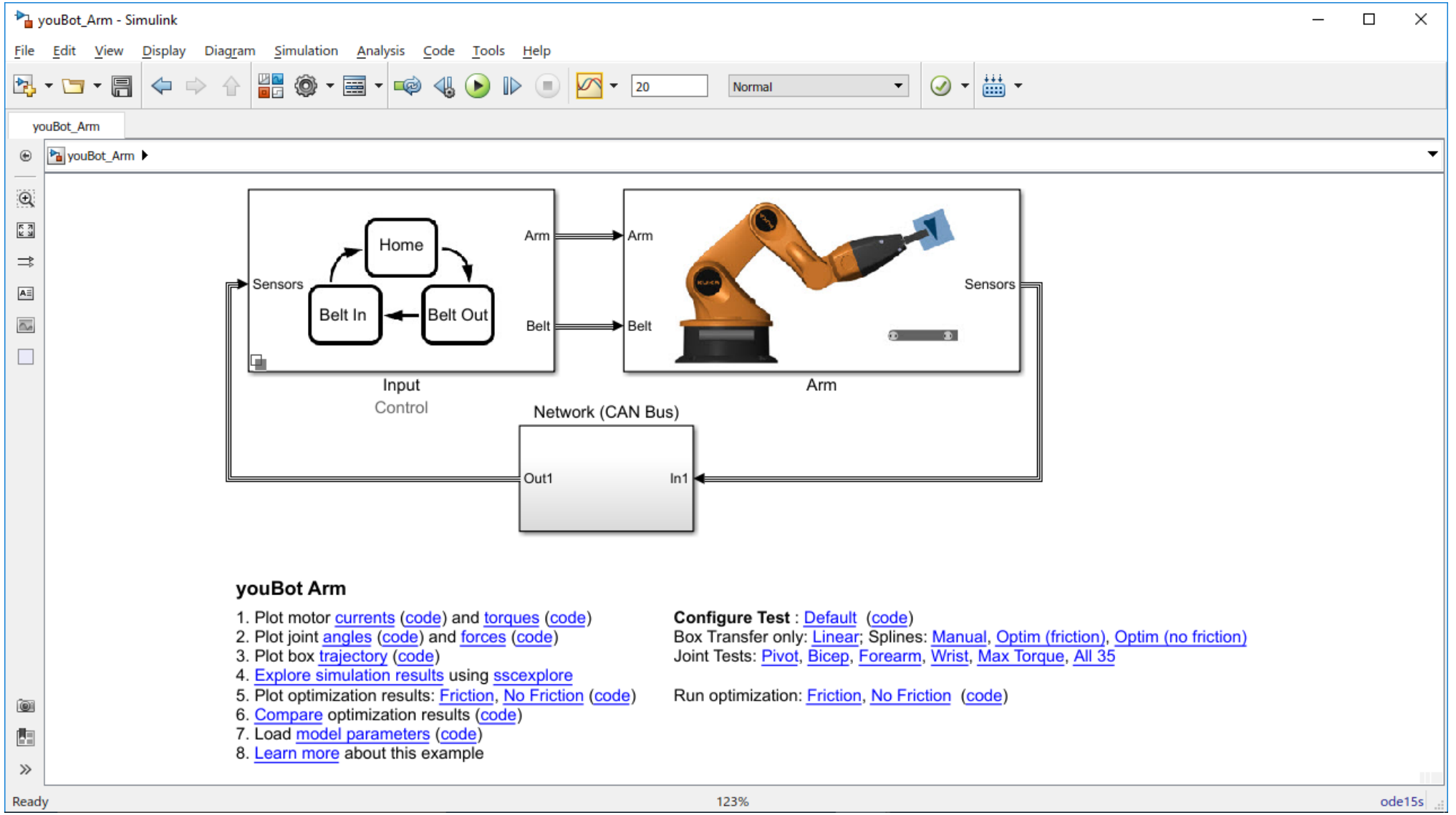
Without Network Model



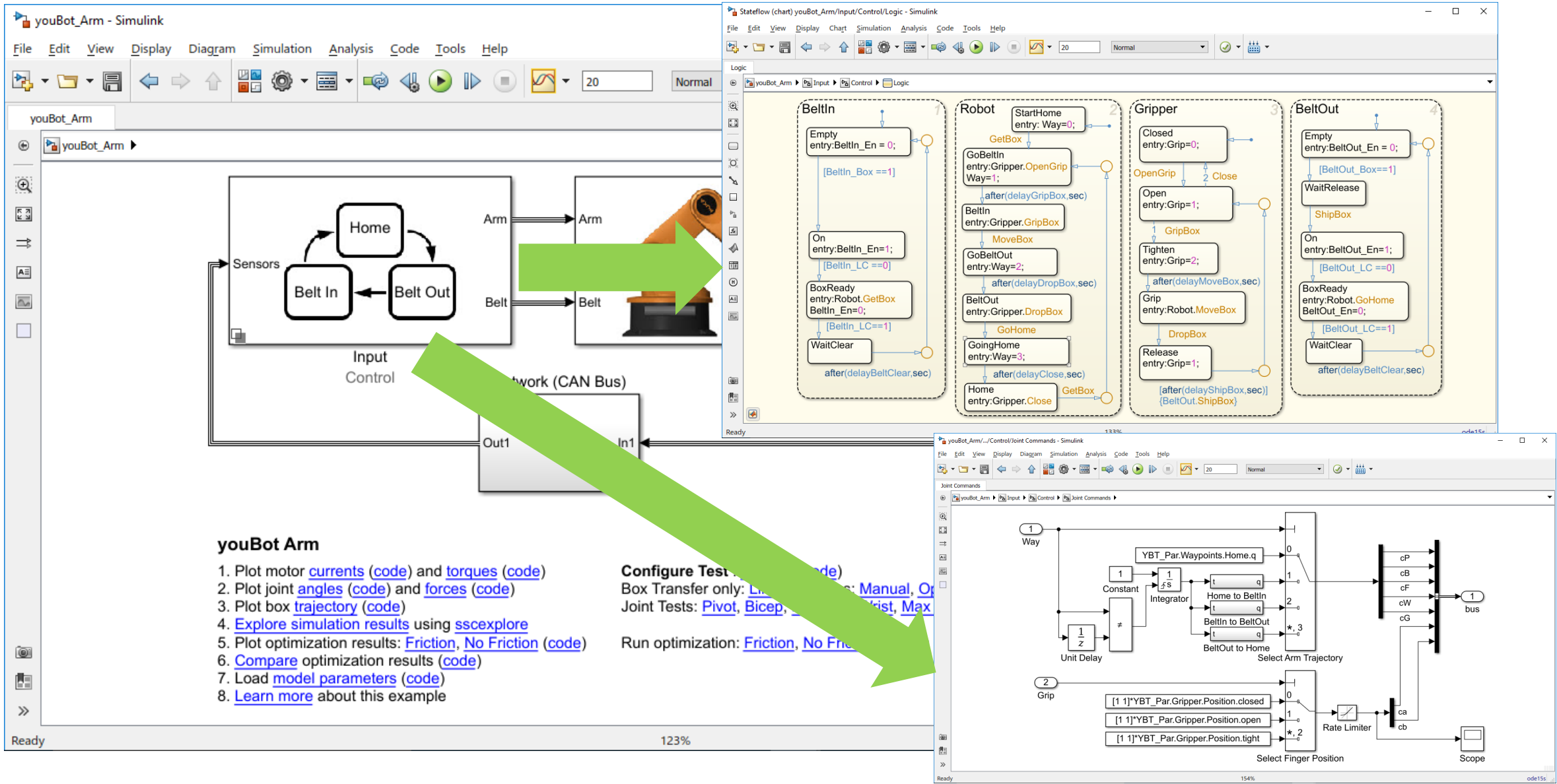
With Network Model



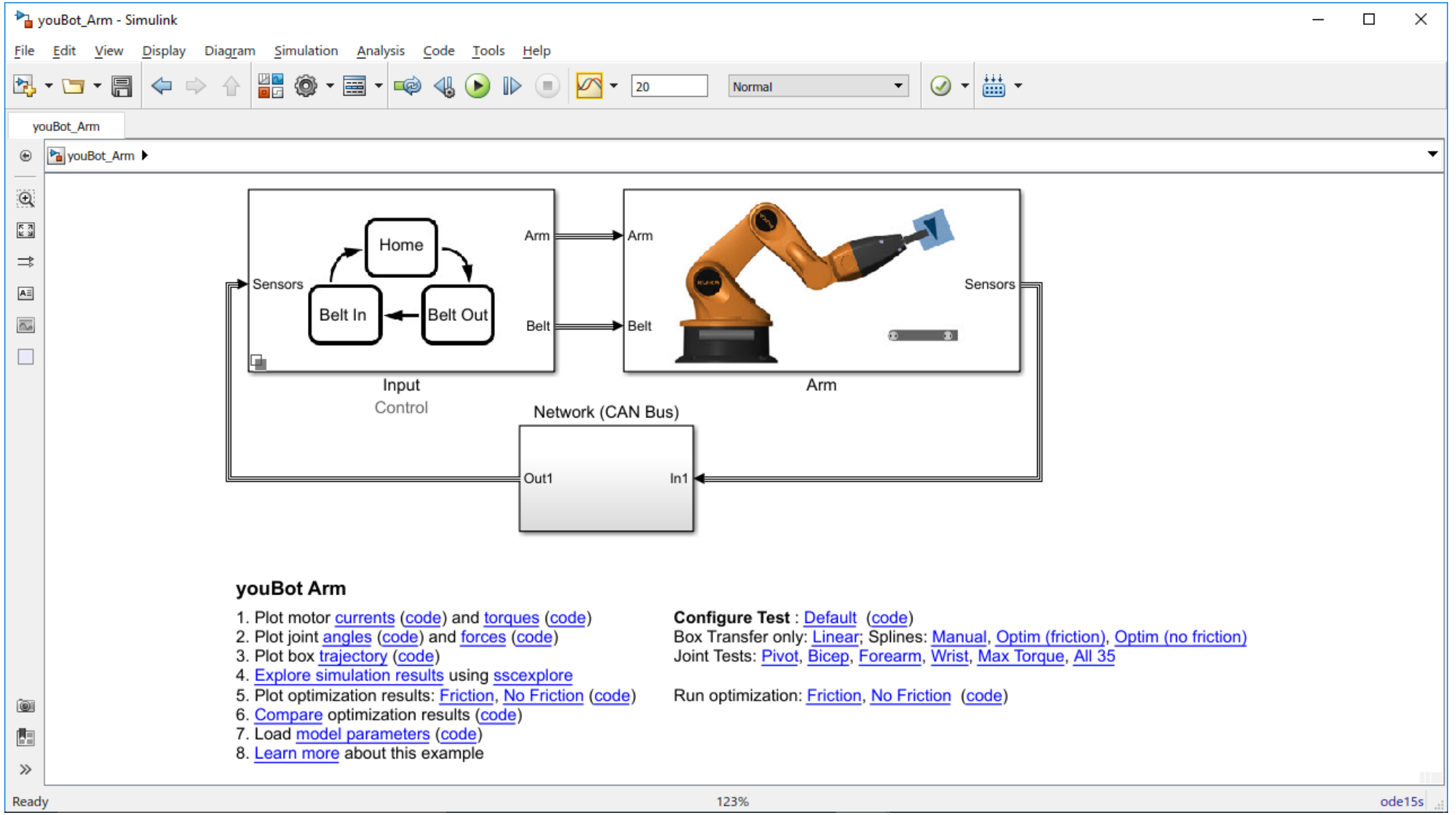
Multi-Domain Model



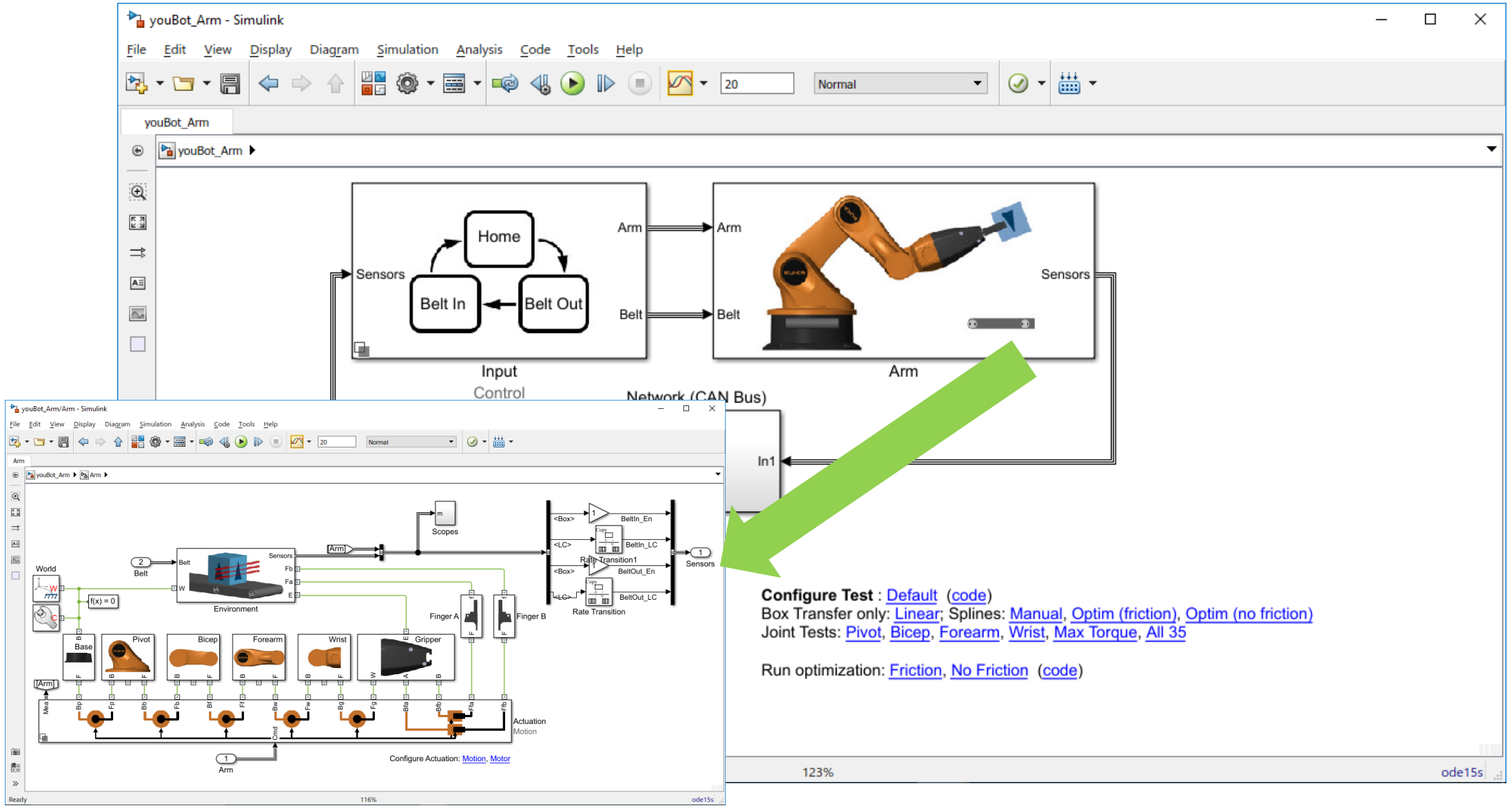
State Charts and System Dynamics



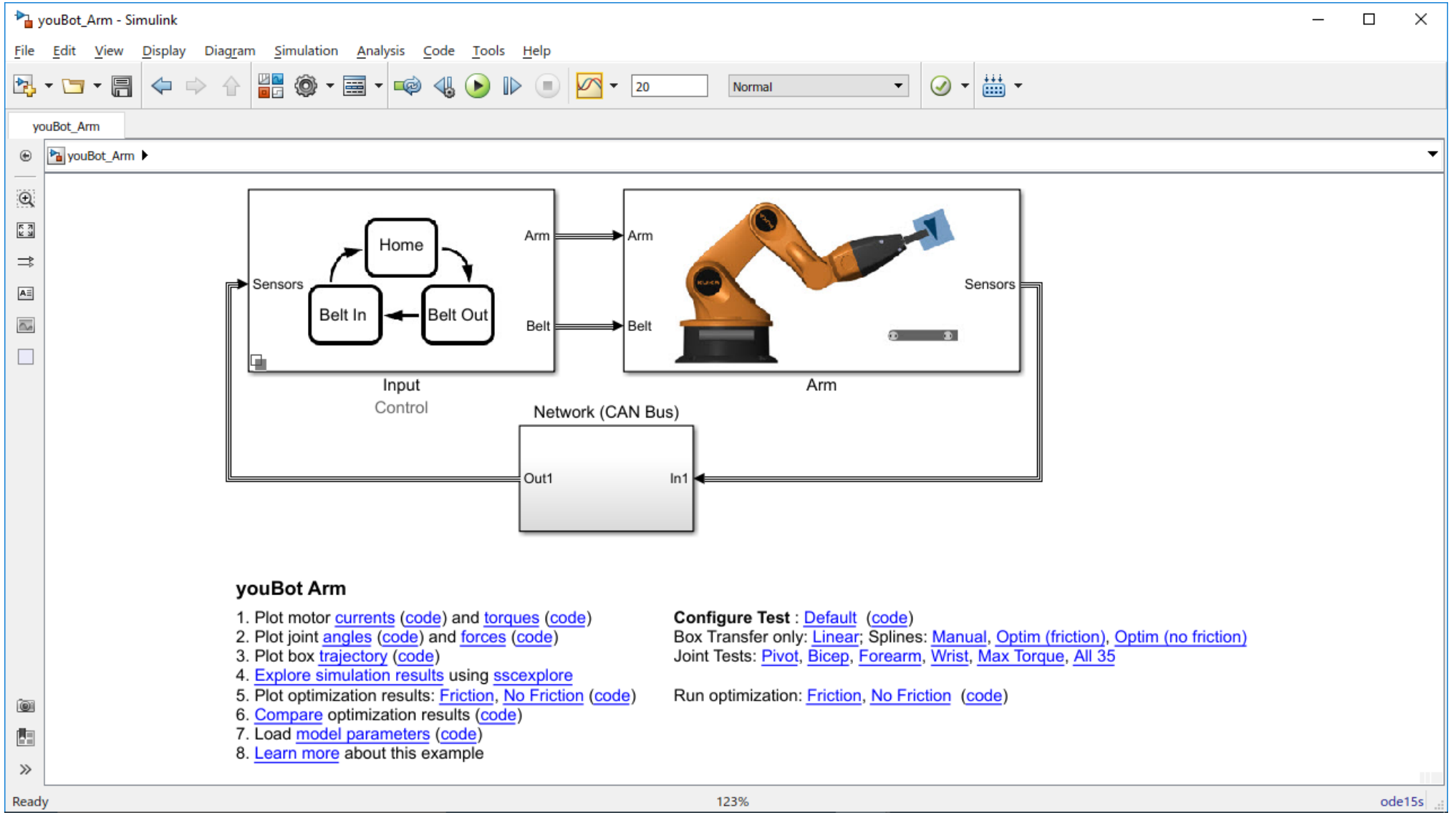
Multi-Domain Model



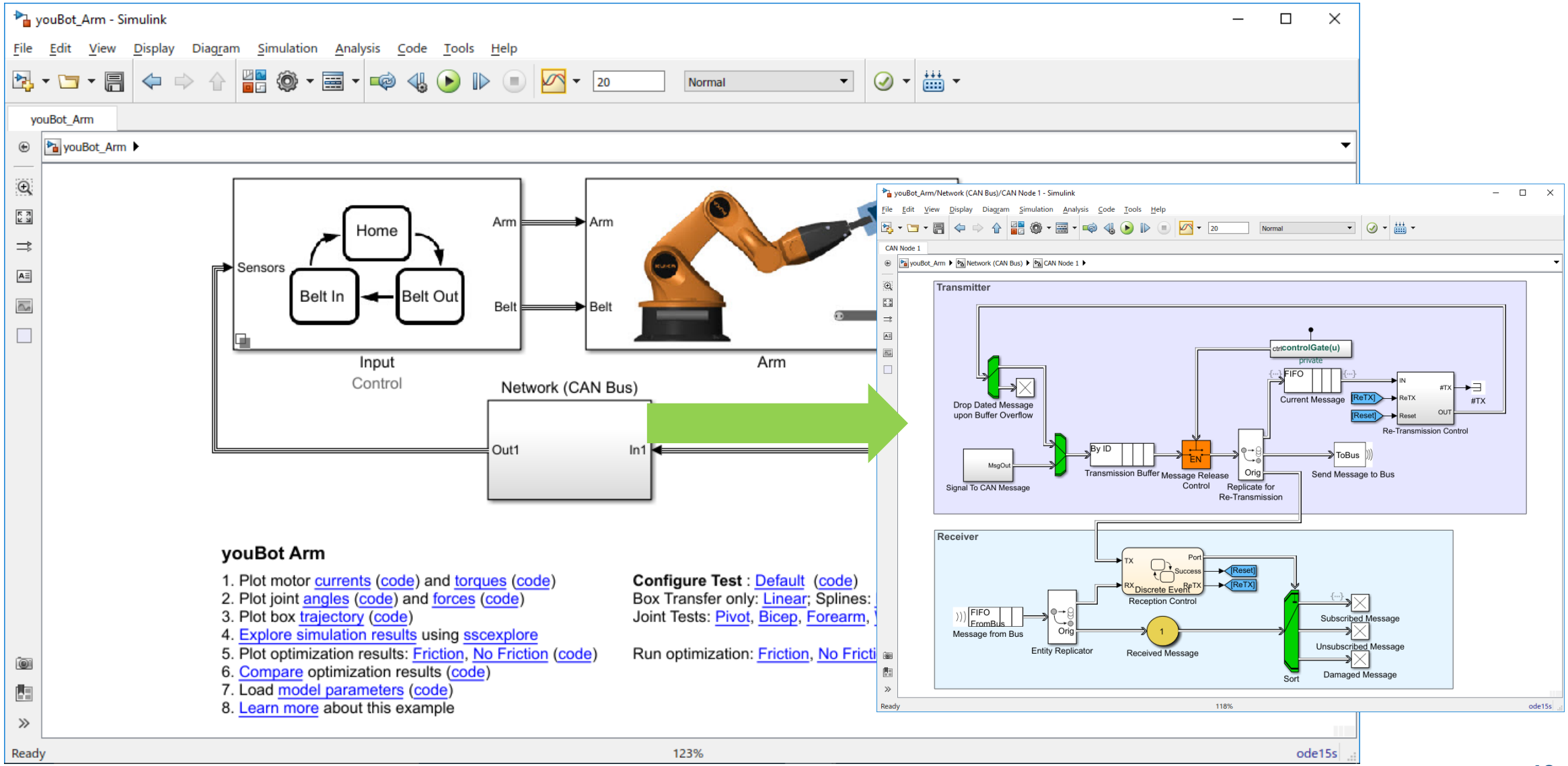
Physical Modeling



Multi-Domain Model

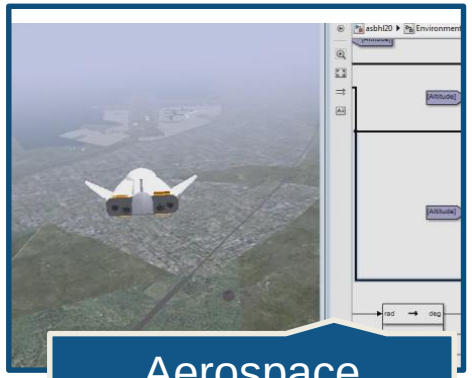


Discrete-Event Modeling



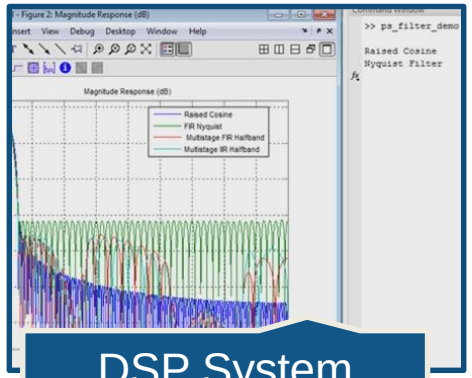
Domain-Specific Blocksets and Toolboxes

- Simulink has numerous domain-specific tools, for example:

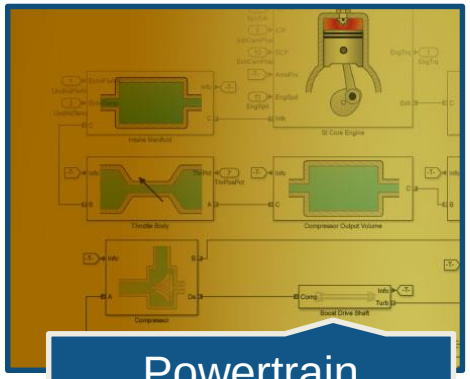


Aerospace Blockset

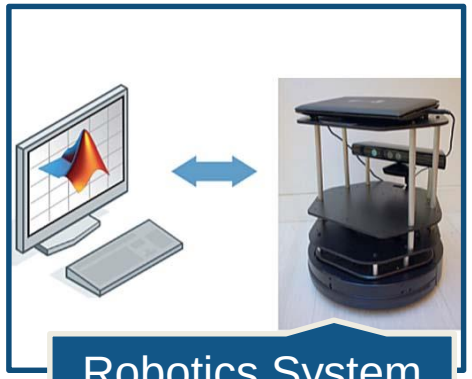
Computer Vision System Toolbox



DSP System Toolbox



Powertrain Blockset



Robotics System Toolbox

Customer Success in Multidomain Modeling

ABB, Deltamarin, and VTT Simulate and Optimize Ship Energy Flows

Challenge

- Increase the energy efficiency of large vessels

Solution

- Use Simulink and Simscape to model, simulate, and optimize ship energy flow

Results

- Cost- and fuel-saving design improvements
- Testing costs reduced by tens of thousands of euros

Customer Success in Multidomain Modeling

“Simulink and Simscape enabled us to create a dynamic model of a complex energy system that spans several physical domains. By simulating this model, we can see how a new energy subsystem will perform before it is built, and provide customers with an accurate estimate of their return on investment.”

Juha Orivuori, ABB

Solution

- Use Simulink and Simscape to model, simulate, and optimize ship energy flow

Results

- Cost- and fuel-saving design improvements
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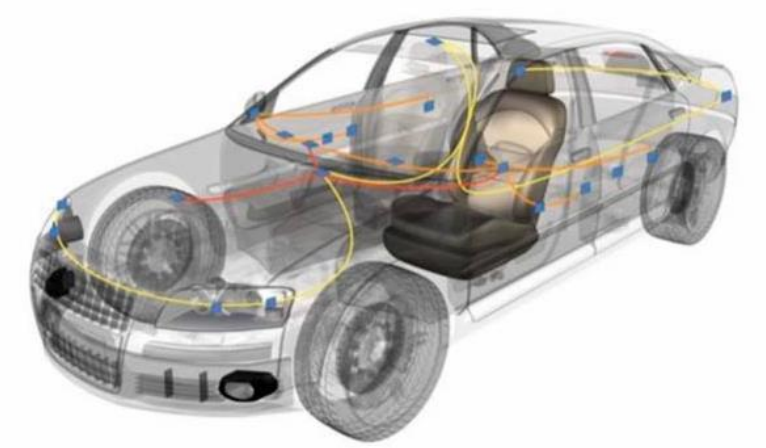
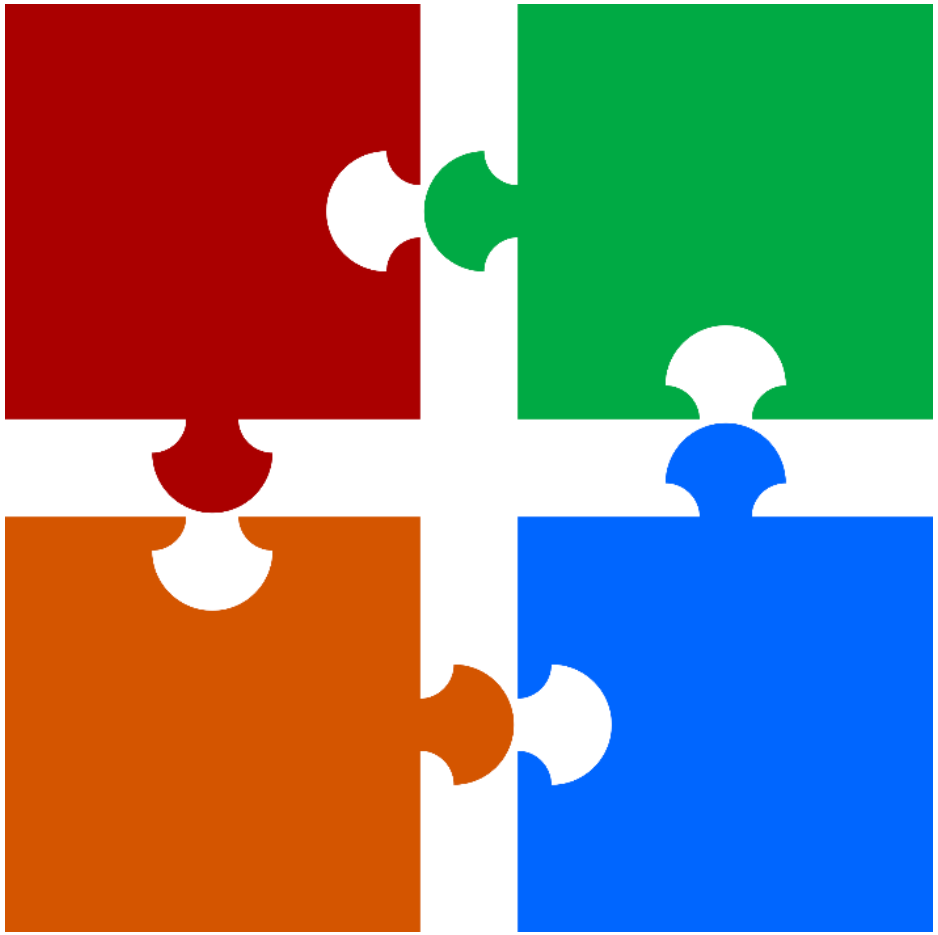
Simulation Integration



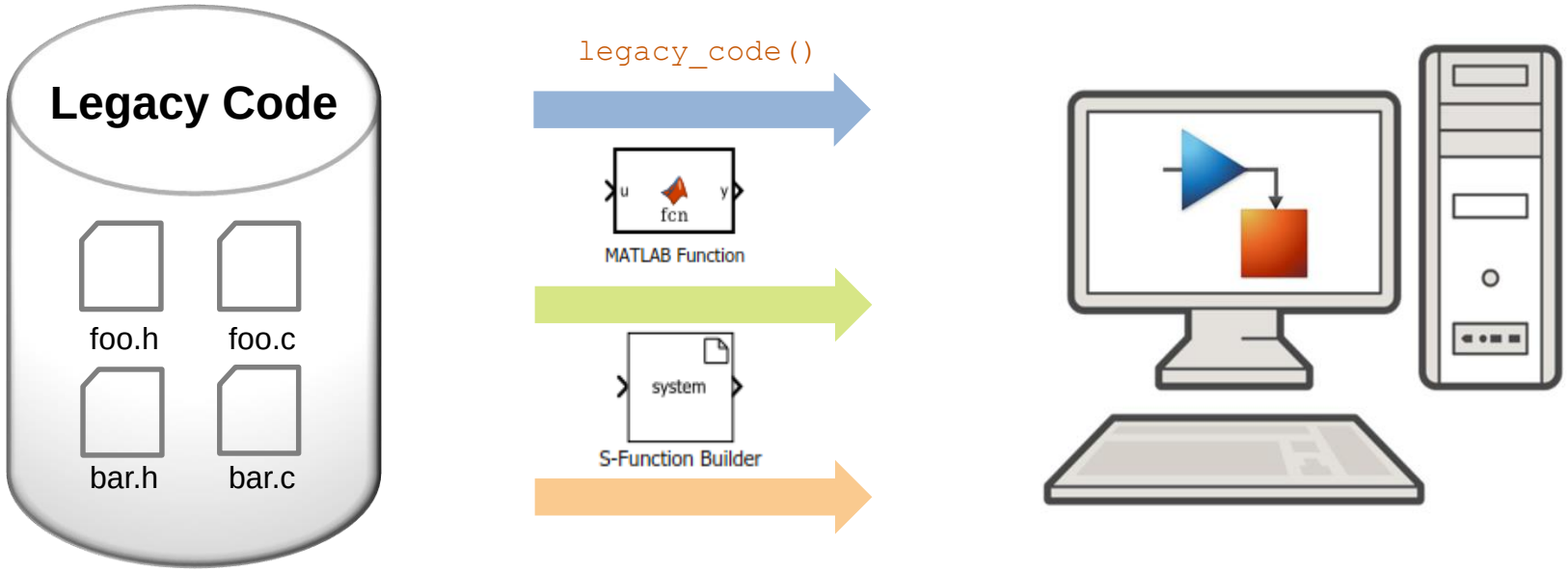
Disconnected Component Intellectual Property (IP)

- Your IP exists in many forms and in many locations, making integration difficult



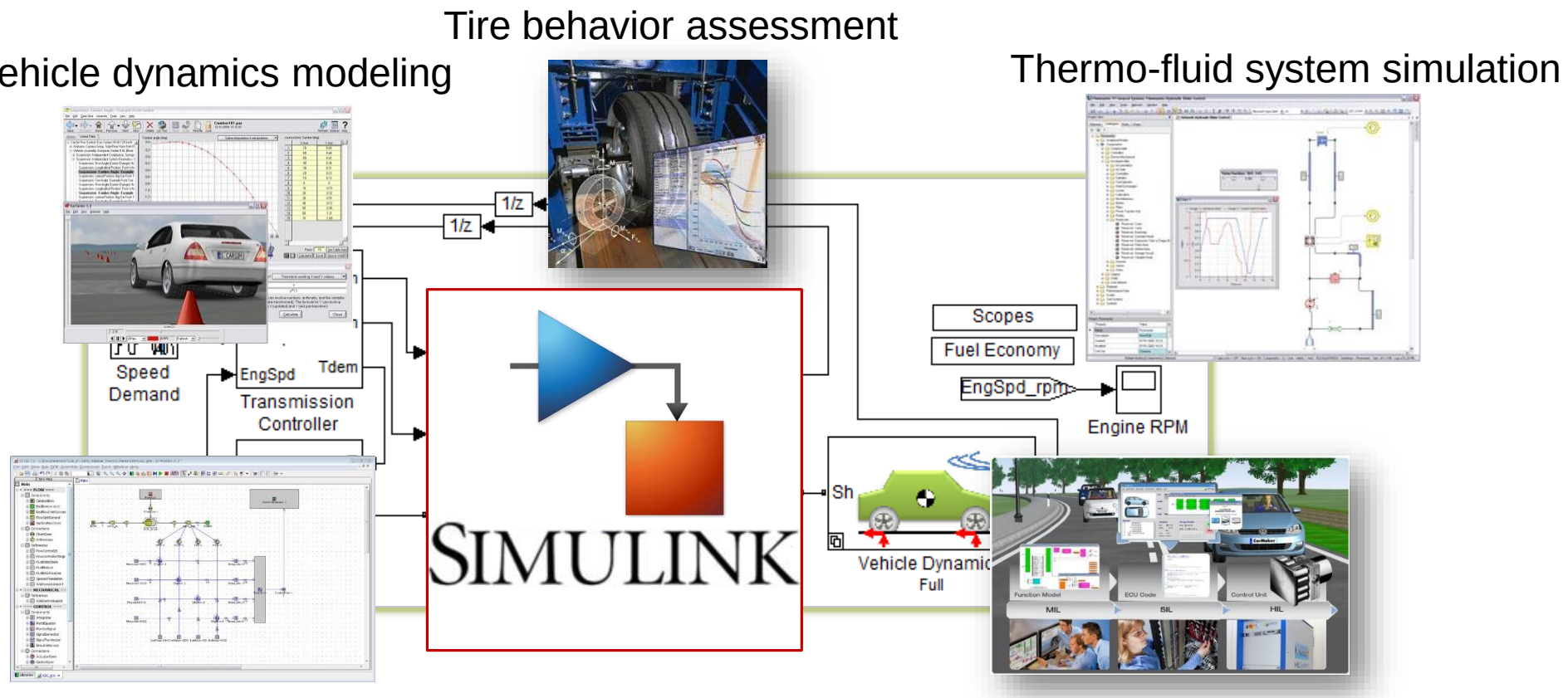
Integrating Your Code

- Multiple ways to reuse your legacy code with Simulink



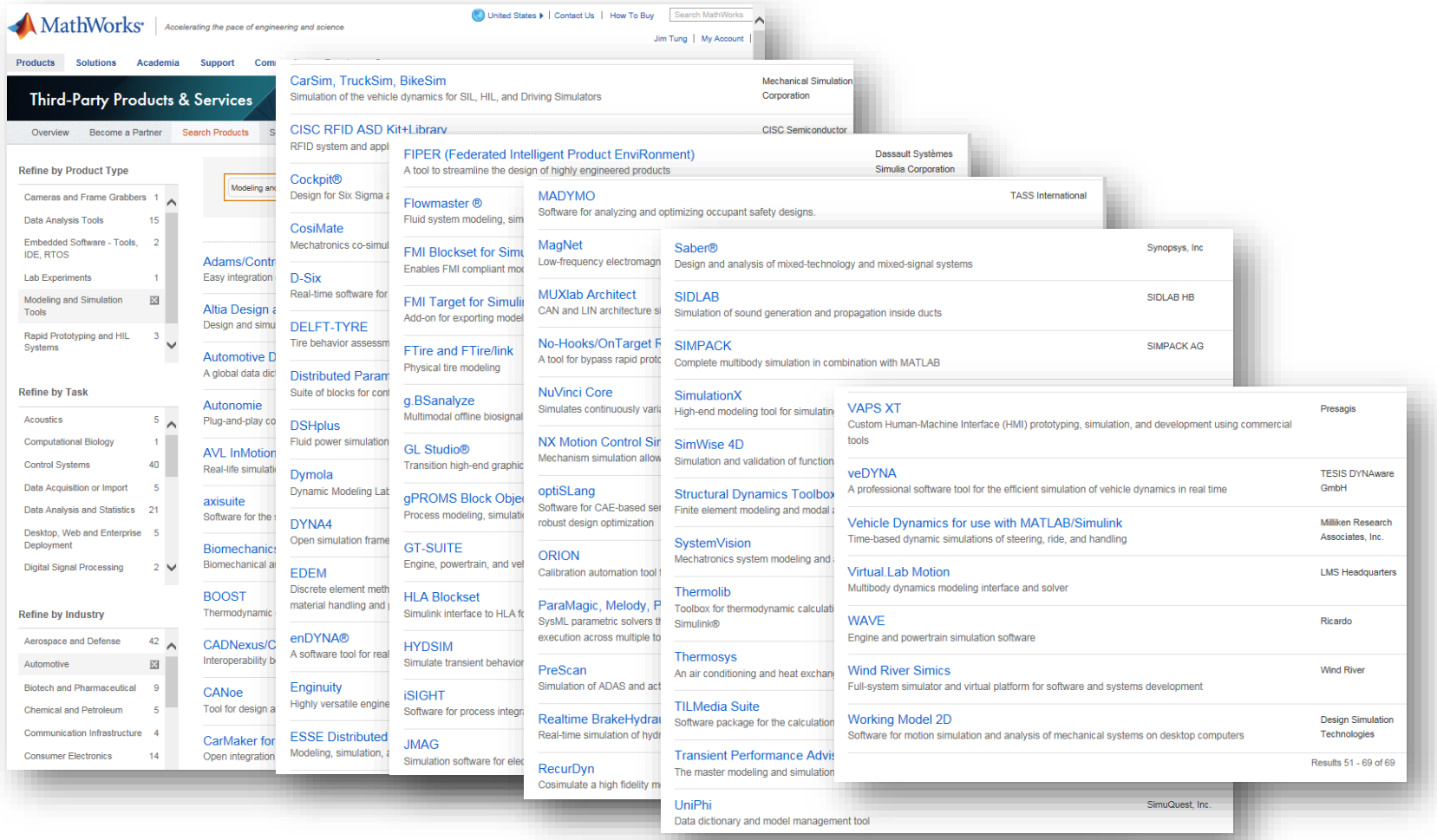
Integrating Third-Party Simulation Tools

Mature and extensive APIs for third-party tool integration



Partner Ecosystem

- Numerous partners provide interface to Simulink



Customer Success in Simulation Integration

Develop Integrated Vehicle Safety Applications

Siddharth D'Silva, Principal Engineer

Autoliv

Challenge

- Design and validate safety-critical algorithms before implementation

Solution

- Leverage Simulink as a platform by integrating third-party software

Customer Success in Simulation Integration

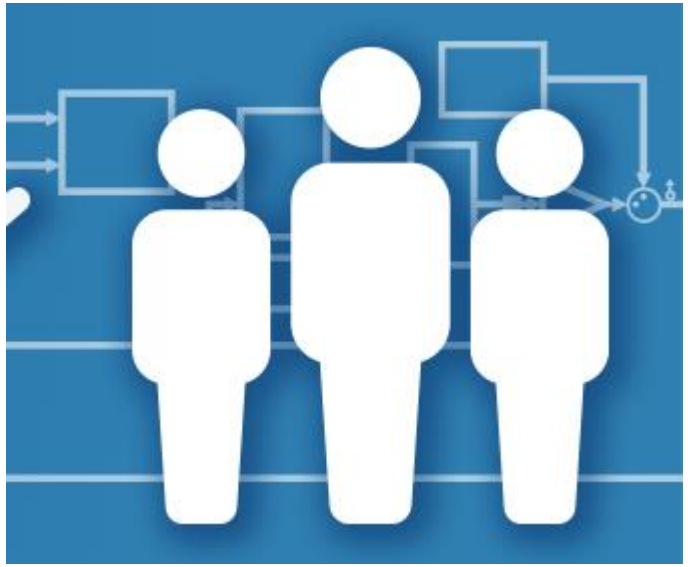
“Seamless integration with third party software solutions enables rigorous development in a safe environment. For application engineers or system engineers, it is very useful that you can export these complex third-party tool functionalities in the form of S-functions and run co-simulation.”

Siddharth D’Silva, Autoliv

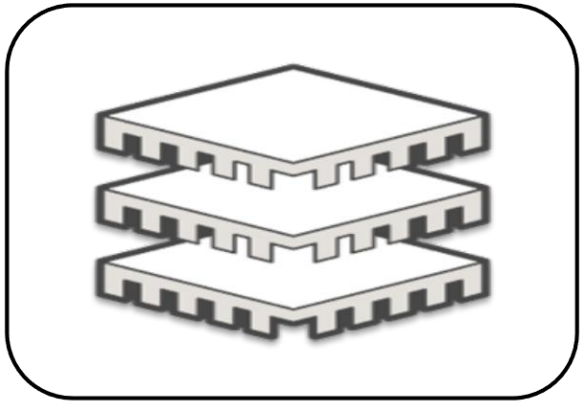
Results

- Industry first integration of stability control inertial sensor into airbag control unit
- Restraint control module software development time reduced by 30%

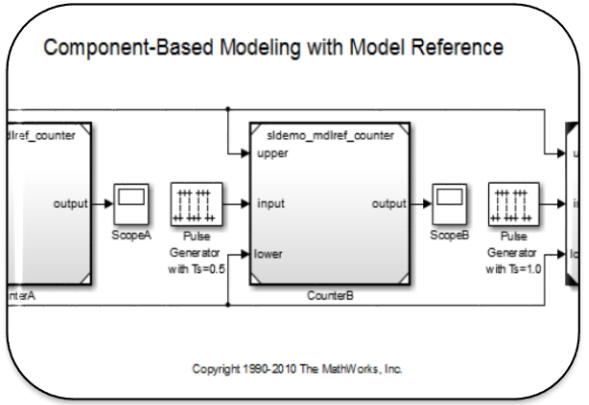
Scalability



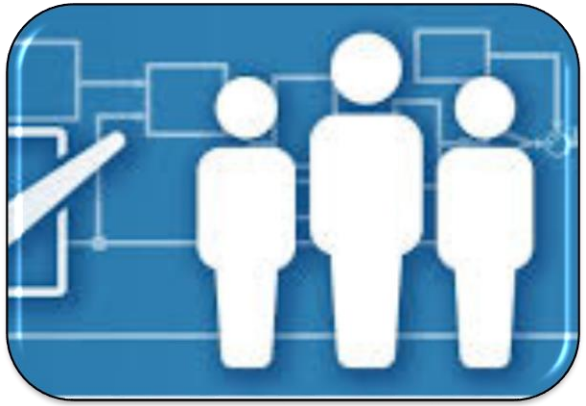
Scalability Challenges



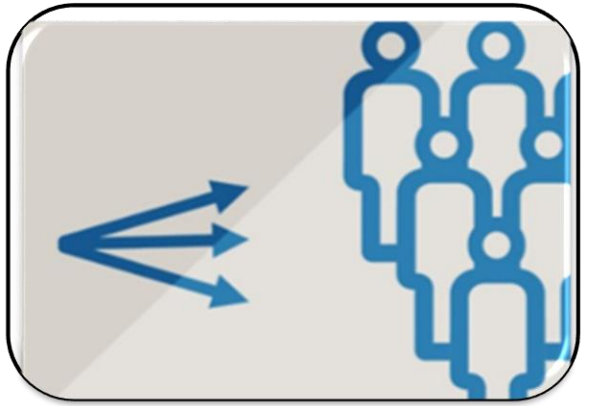
Performance



Componentization



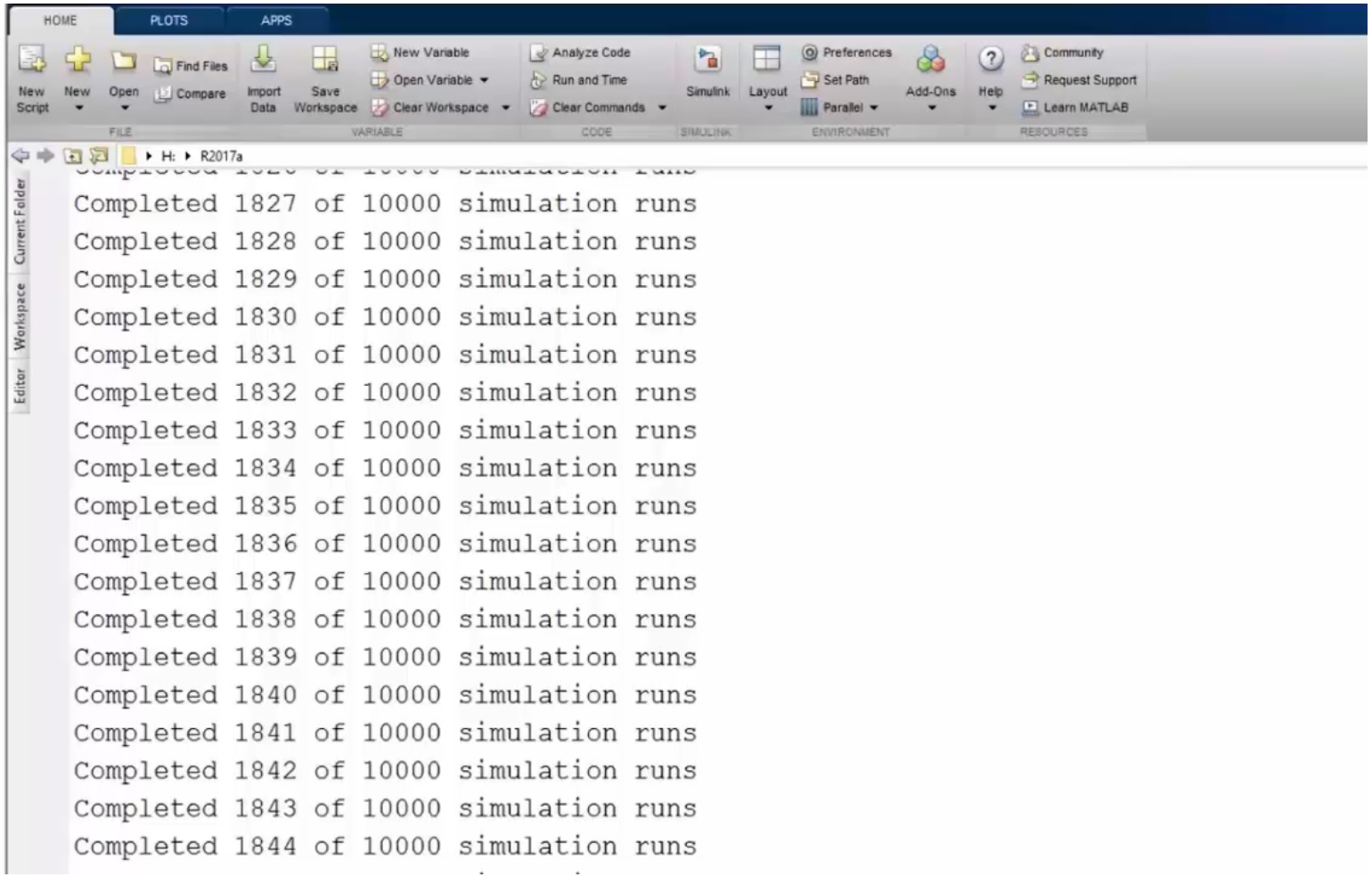
Team Workflows



Sharing

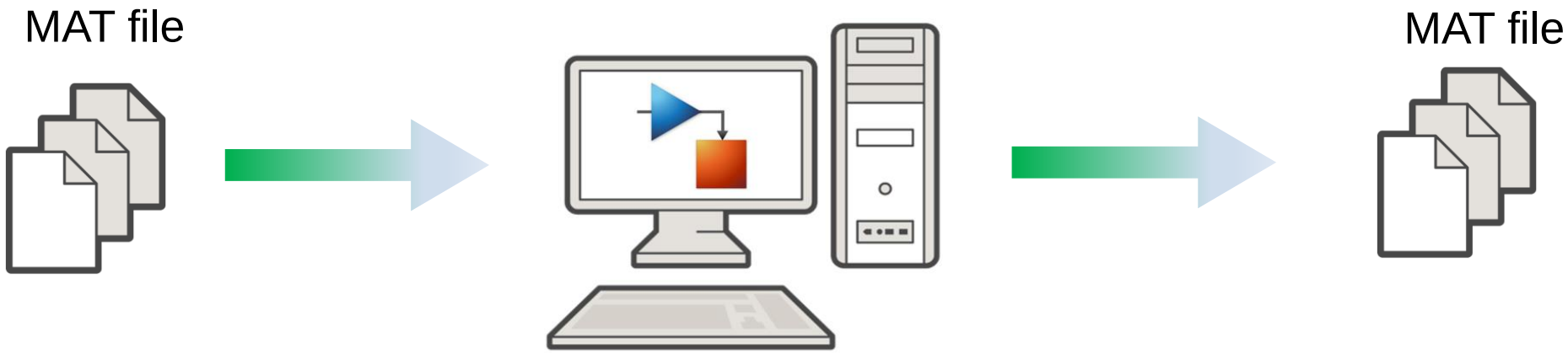
Performance Scalability

- Easy scalability to multicore or cluster/cloud computation environment



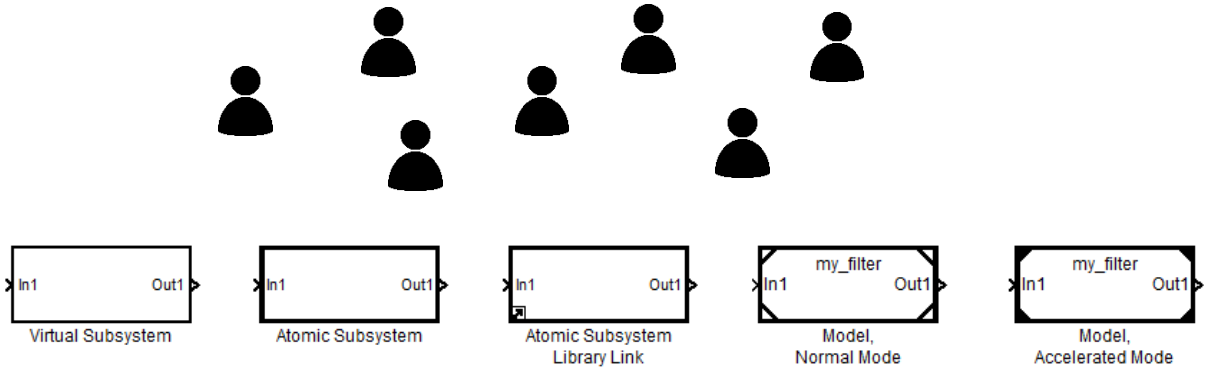
Performance Scalability

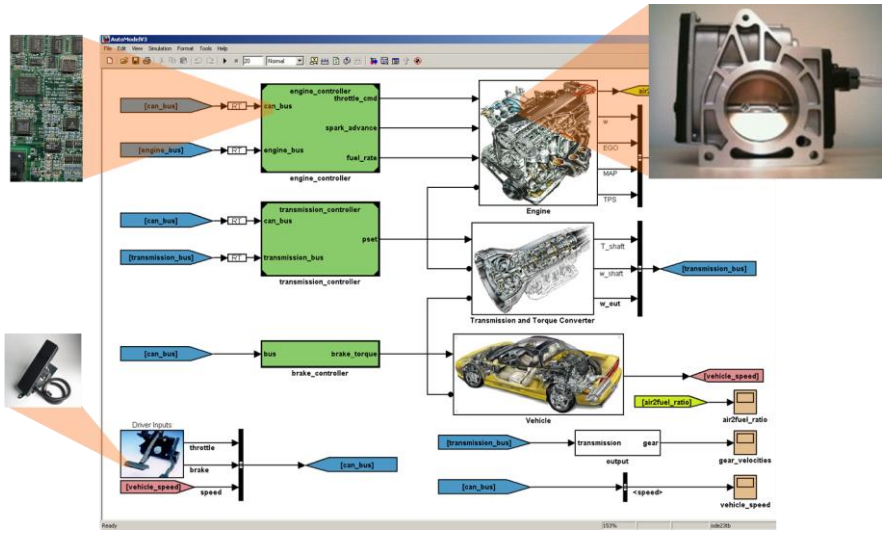
- Big data workflow
  - Processing large amount of simulation inputs / outputs



Complex Design Development through Componentization

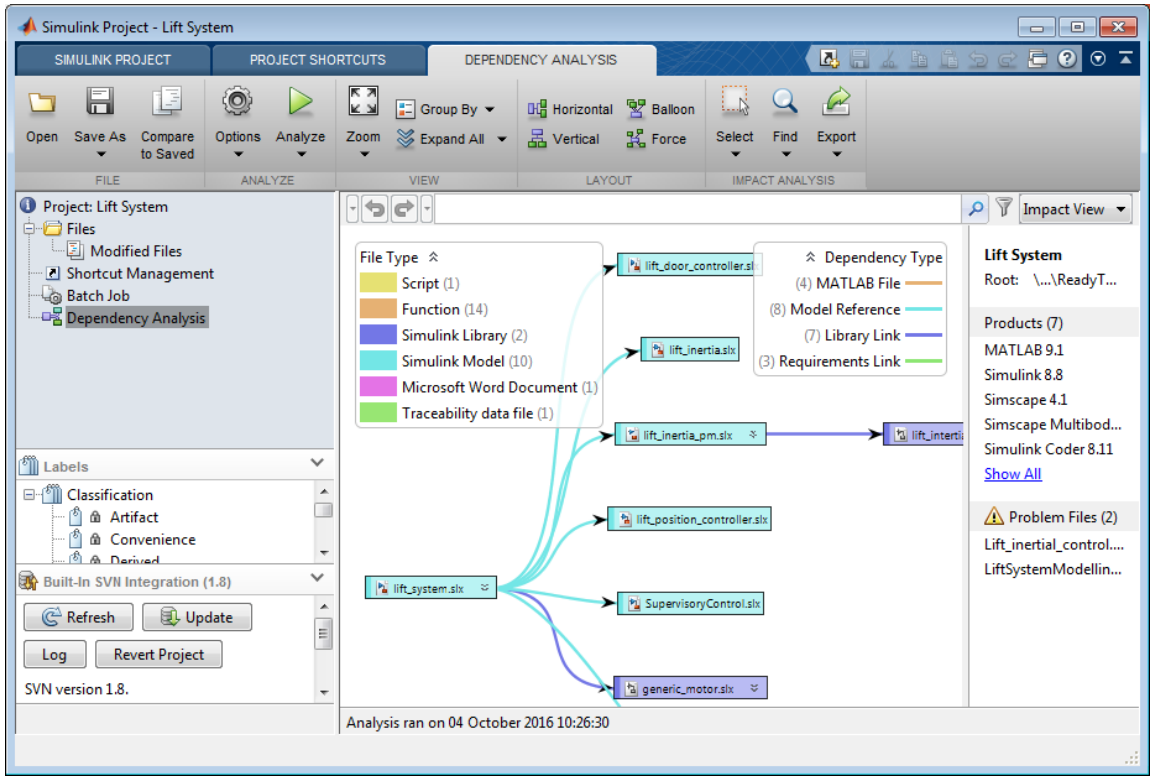
- Supporting team workflows
  - Faster modular development
  - More effective verification
  - Increased reusability
- Improving performance
  - Incremental loading and code generation
  - Simulation speed
  - Memory usage





Capabilities Enabling Team Workflows

- Source control
- Design comparison and merging
- Dependency analysis
- Task automation



Source Control Integrations

- Microsoft Team Foundation Server (TFS) integration available now from MathWorks File Exchange

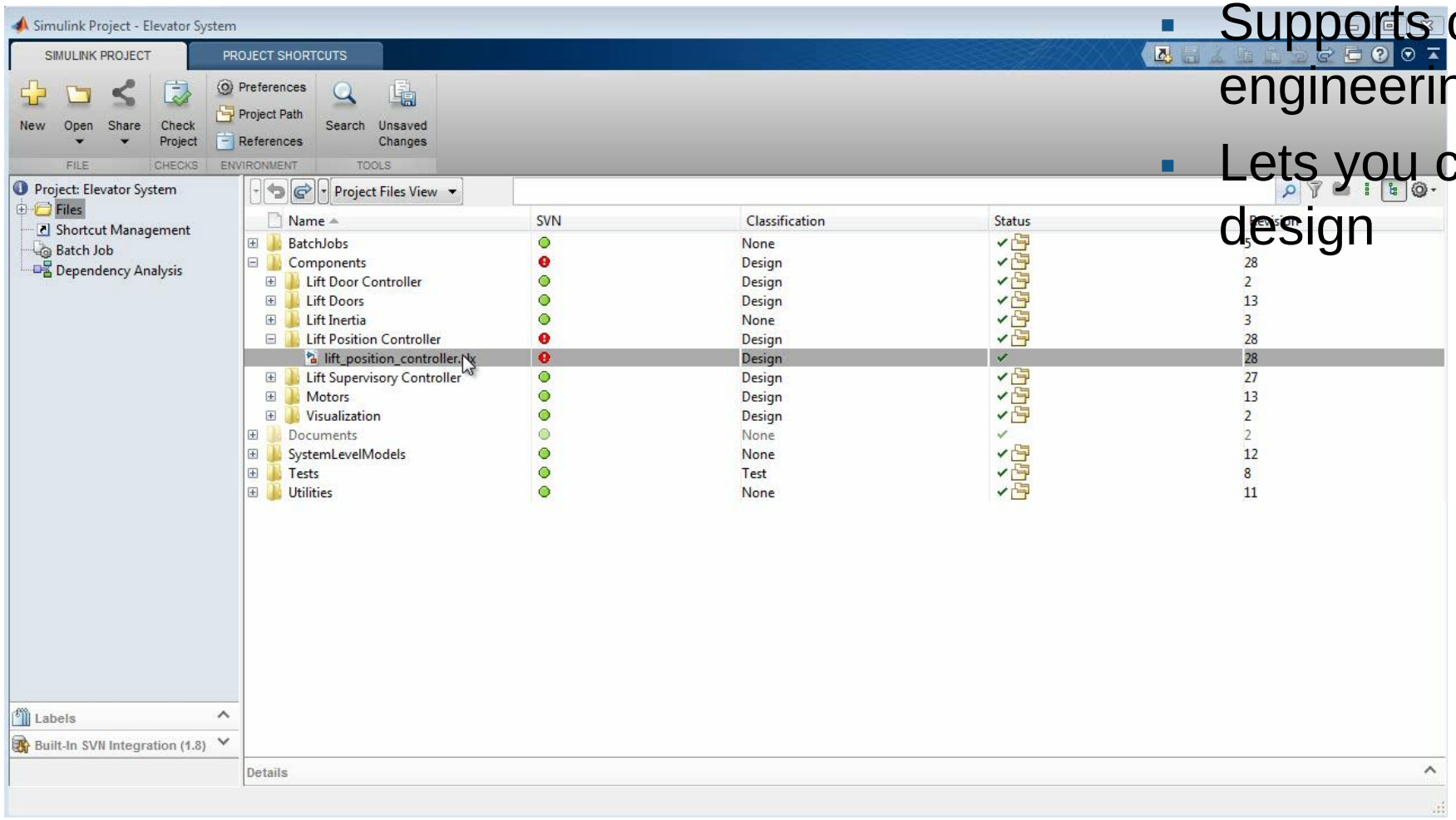
SUBVERSION

PERFORCE
Version everything.

git

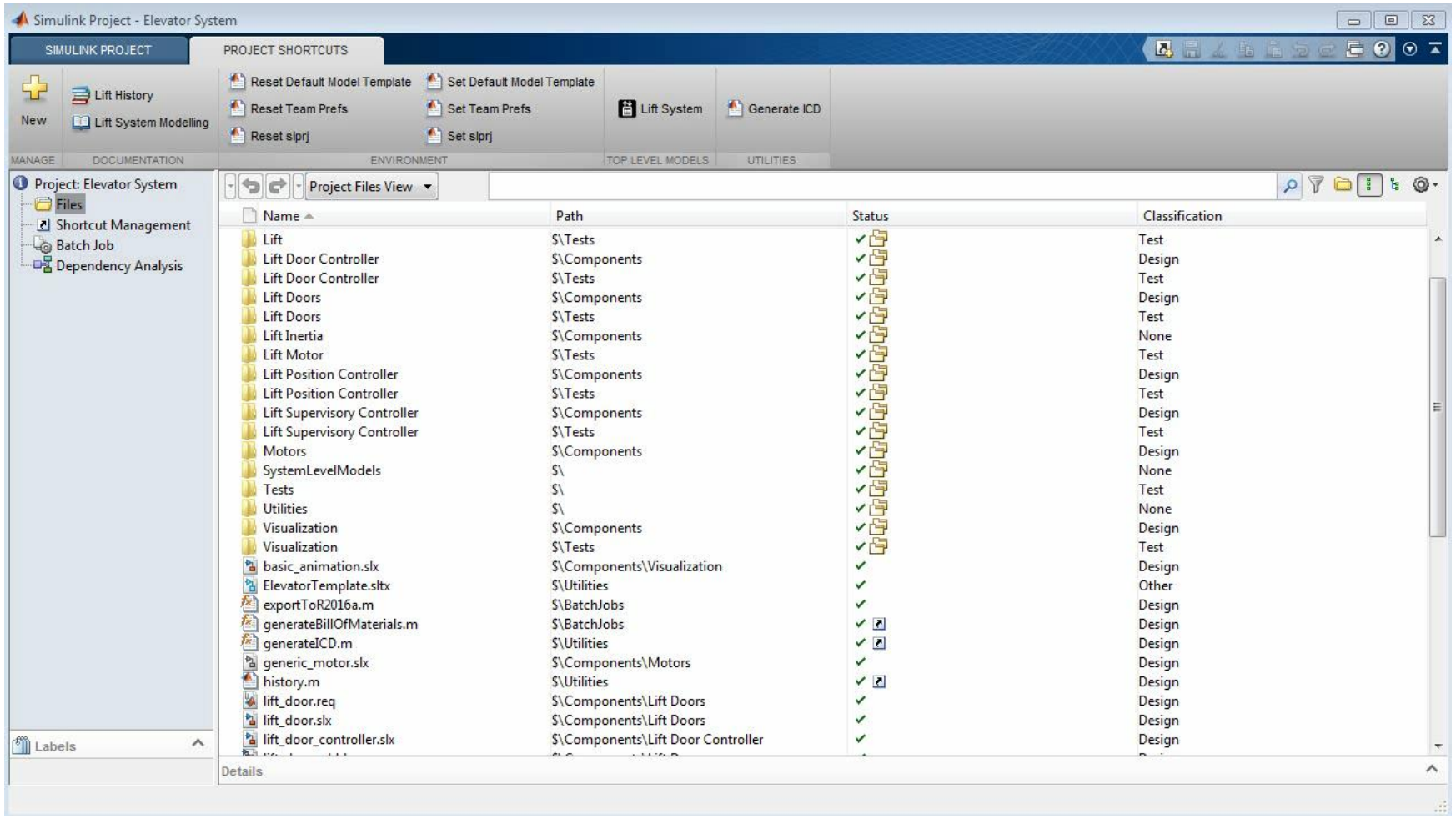
Team Foundation Server 2012
Microsoft

Integrating Work from Different Engineers via Merge

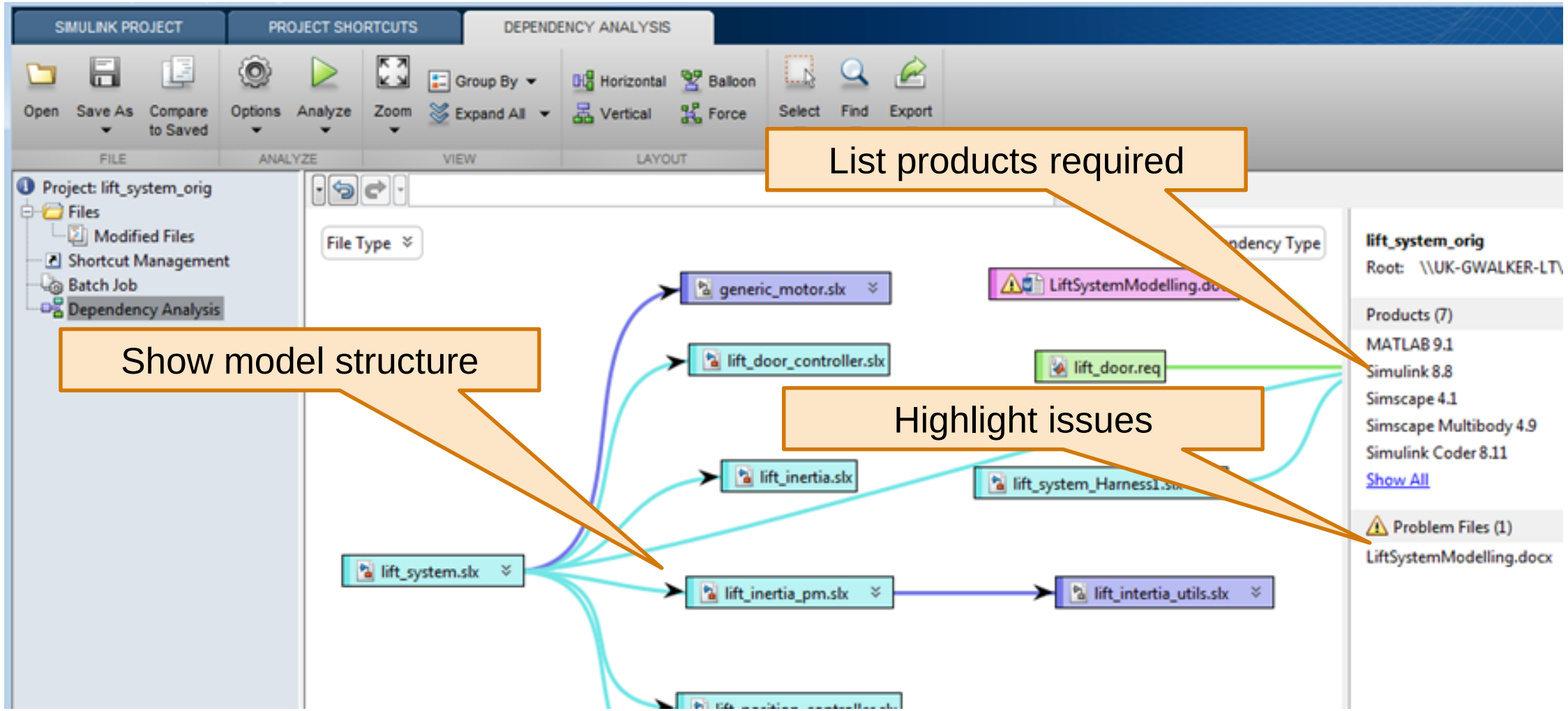


- Supports concurrent engineering
- Lets you concentrate on design

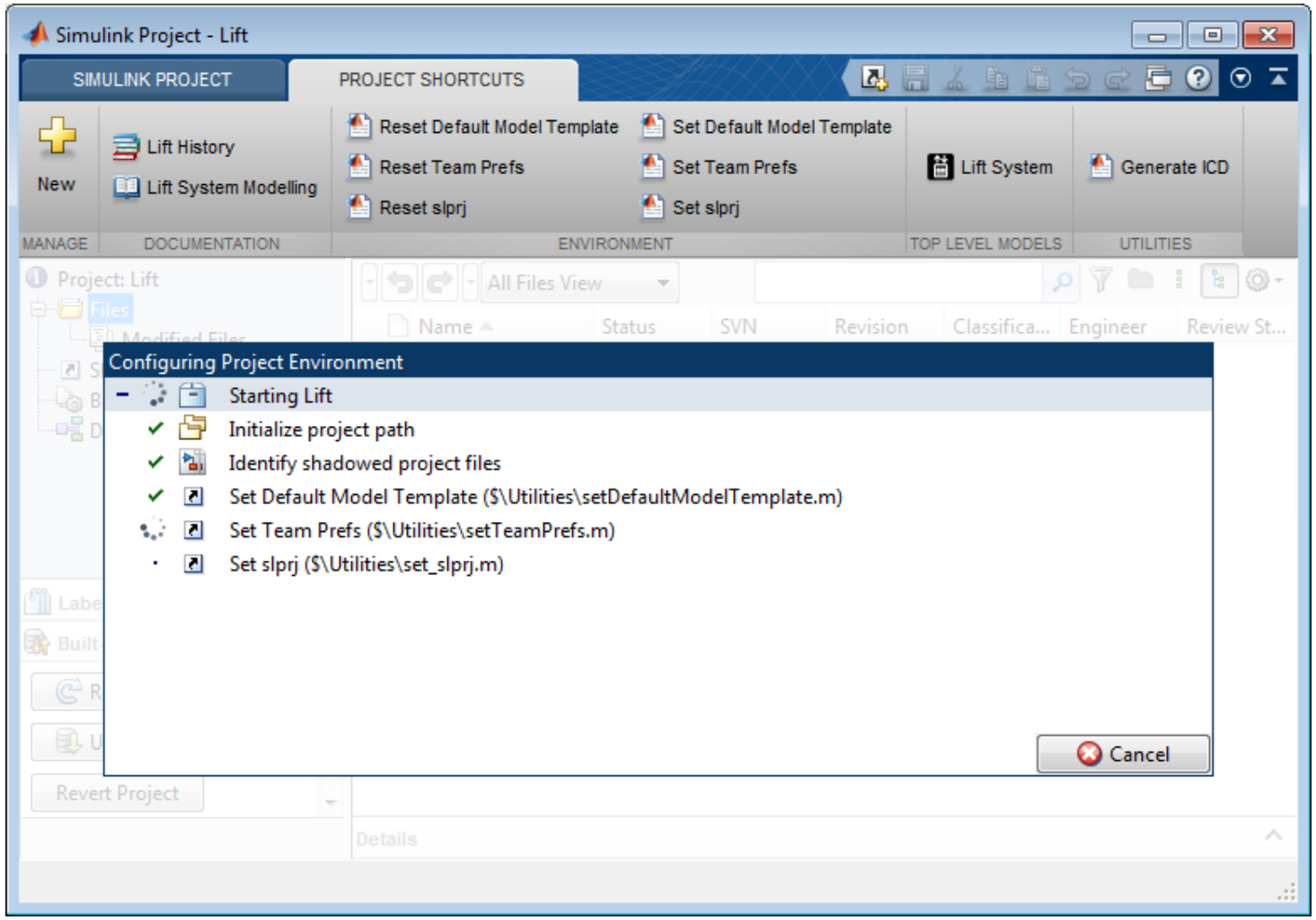
Dependency Analysis – Modular Development



Dependency Analysis – Modular Development



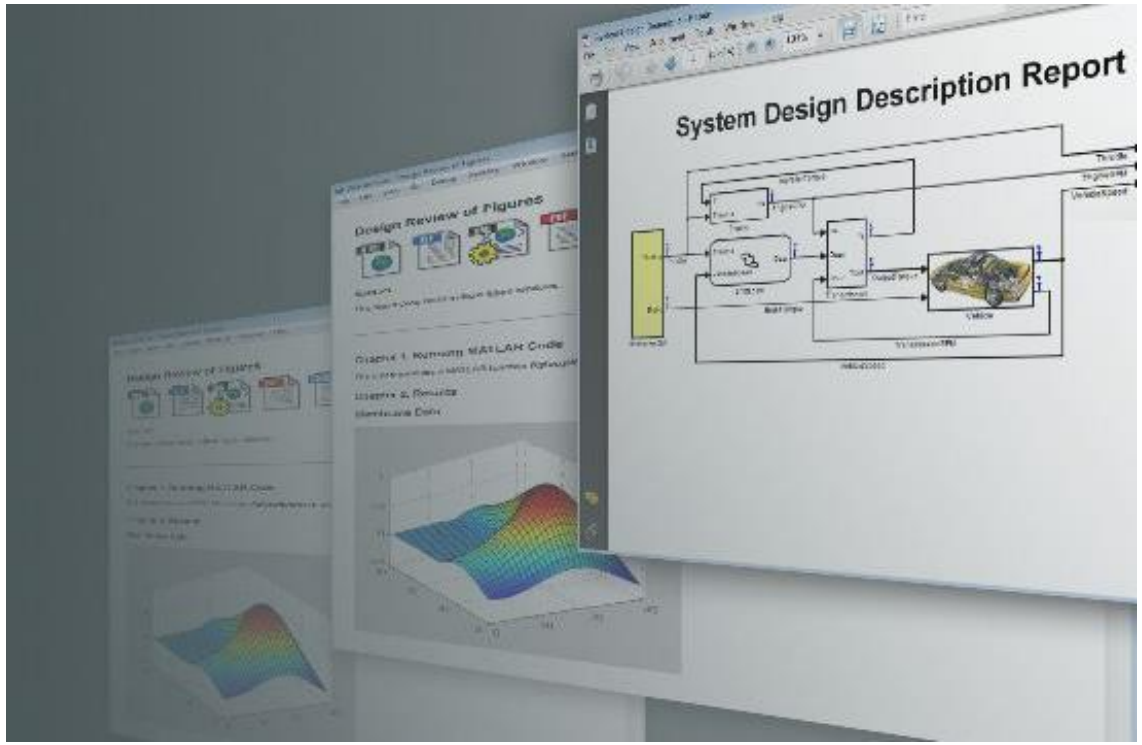
Task Automation – Configuring Project Environment



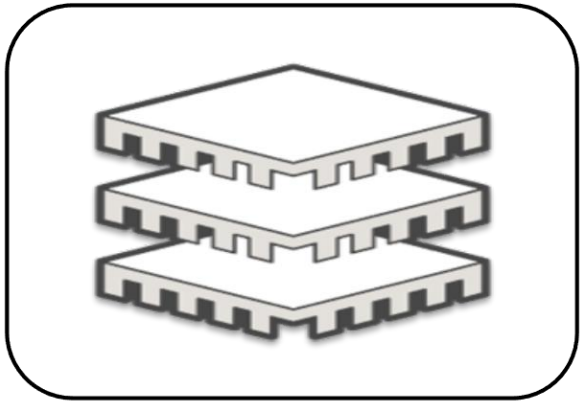
- Robustly configure the team environment
- For everyone
- Automatically

Sharing Outside Your Team

- Quick File Packaging
- Model Protection (IP Management)
- Reporting and Documentation



Simulink Addressing Scalability Challenges



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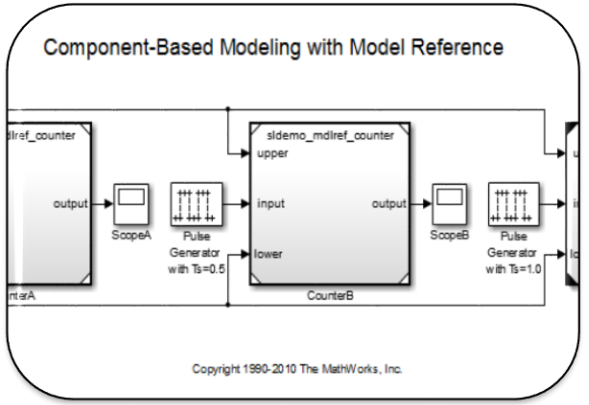

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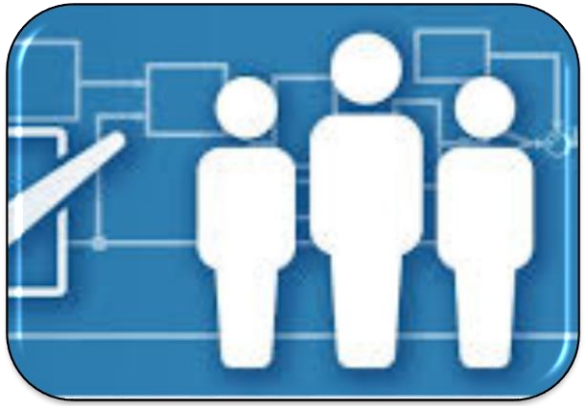
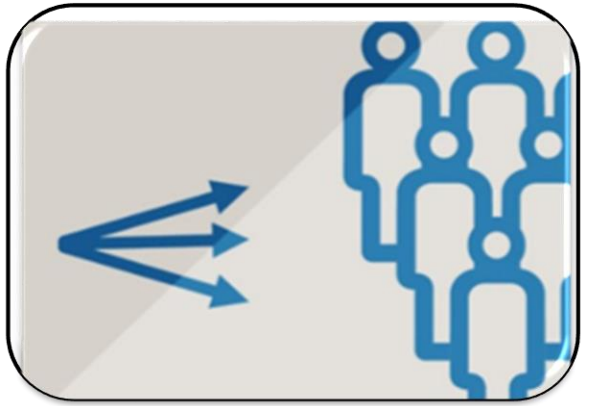


Team Workflows



Sharing

Simulink as Enterprise Simulation Platform

"*There is no such tool, which gives the simulation environment as well as the hardware verification and validation. In a single environment, I am getting these together.* ***That is why I use MATLAB and Simulink.***"

Dr. Deepak Mishra,
Indian Space Research Organization