Co-simulation with Abaqus and Dymola

Abaqus 2020
Course objectives
Upon completion of this course you will be able to:

- Set up an Abaqus model for Abaqus-Dymola co-simulation
- Create a simple control system in Dymola
- Run a co-simulation

Targeted audience
Simulation Analysts

Prerequisites
None
Day 1

- **Lesson 1** Abaqus-Dymola co-simulation
  - Workshop 1 Machining tool cooling system
- **Lesson 2** Introduction to Dymola
  - Workshop 2 Dymola control system
- **Lesson 3** Co-simulation features in Abaqus and execution
  - Workshop 3 Abaqus model for co-simulation
- **Lesson 4** Interpretation of results
  - Workshop 4 Running jobs and interpreting results
SIMULIA is the Dassault Systèmes brand for Realistic Simulation solutions

- Portfolio of established, best-in-class products
  - Abaqus, Isight, Tosca, fe-safe, Simpack

- Design Optimization. Tosca Structure *
  - Simulation-driven design refinement to improve performance

- FEA Stress Analysis. Abaqus *
  - Detailed stress analysis using extracted load history from MBS

- Multibody Simulation. Simpack
  - System analysis to extract virtual load history of complete working cycle

- Durability Assessment. fe-safe *
  - Accurate life estimation to achieve certification

- CAD Geometry. CATIA
  - Fully parameterized 3D geometry; FEA model generation via associative interface

- Mesh Calibration. Isight *
  - Automated mesh calibration; sufficient mesh quality for accurate results

* Included in extended licensing pool
### SIMULIA’s Power of the Portfolio

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<th>Application</th>
<th>Features</th>
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| **Abaqus**  | - Routine and Advanced Simulation  
- Linear and Nonlinear, Static and Dynamic  
- Thermal, Electrical, Acoustics  
- Extended Physics through Co-simulation  
- Model Preparation and Visualization |
| **Isight**  | - Process Integration  
- Design Optimization  
- Parametric Optimization  
- Six Sigma and Design of Experiments |
| **Tosca**   | - Non-Parametric Optimization  
- Structural and Fluid Flow Optimization  
- Topology, Sizing, Shape, Bead Optimization |
| **fe-safe** | - Durability Simulation  
- Low Cycle and High Cycle Fatigue  
- Weld, High Temperature, Non-metallics |
| **Simpack** | - 3D Multibody Dynamics Simulation  
- Mechanical or Mechatronic Systems  
- Detailed Transient Simulation (Offline and Realtime) |

### Realistic Human Simulation
- High Speed Crash & Impact  
- Noise & Vibration

### Material Calibration
- Workflow Automation  
- Design Exploration

### Conceptual/Detailed Design
- Weight, Stiffness, Stress  
- Pressure Loss Reduction

### Safety Factors
- Creep-Fatigue Interaction  
- Weld Fatigue

### Complete System Analyses
- (Quasi-)Static, Dynamics, NVH  
- Flex Bodies, Advanced Contact
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Connect with peers to share knowledge and get technical insights

Go to www.3ds.com/slc to log in or join!

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North American

By Location

By Course

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By Location

By Course

Live Online Training

Full Schedule
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## Revision Status

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Lesson content:

- Logical modeling
- Abaqus-Dymola co-simulation
- Illustration – Backhoe digging automation
- Workflow for Abaqus-Dymola co-simulation
- Workshop Preliminaries
In this workshop, you will create a three-dimensional model of a lathe tool, simulate the heat produced by the friction, and control the flux of water cooling down the tool in order to maintain a target temperature at the tip.

Objectives

When you complete this workshop you will be able to:

i. Set up an Abaqus model for Abaqus-Dymola co-simulation.

ii. Create a simple control system in Dymola.

iii. Run a co-simulation.
Lesson content:

- Introduction to Dymola
- GUI Editor
- Modelica Language
- Requirements for Co-simulation
- What is FMI and FMU?
- Example – Cantilever Beam
- Summary
In this workshop, you will create a Dymola model of the control system of a robot with three degrees of freedom.

Objectives

When you complete this workshop you will be able to:

i. Create a Dymola model oriented for co-simulation.
Lesson content:

- Abaqus-Dymola co-simulation model preparation workflow
- Identifying the Abaqus analysis step for co-simulation
- Defining sensors and actuators
- SIMULIA co-simulation engine
- Configuration file
- Example – Cantilever Beam
- Summary
Workshop 3: Robot Abaqus model for co-simulation

In this workshop, you will modify the robot model in order to prepare it to be controlled by Dymola.

Objectives

When you complete this workshop you will be able to:

i. Set up an Abaqus model for Abaqus-Dymola co-simulation.

15 minutes
Lesson 4: Interpretation of results

Lesson content:

- Running the co-simulation
- Example – Cantilever Beam
- Analyzing the results in Abaqus
- Analyzing the results in Dymola
Workshop 4: Running jobs and interpreting results

In this workshop, you will set the parameters for the co-simulation, run the co-simulation jobs and examine the results in both Abaqus and Dymola.

Objectives

When you complete this workshop you will be able to:

i. Set up and run an Abaqus-Dymola co-simulation
ii. Evaluate the results in Abaqus
iii. Evaluate the results in Dymola