CosiMate

Cosimulation Operating Platform

CosiMate supports more than 20 simulation environments and programming languages.

CosiMate provides the framework to link heterogeneous simulators at different abstraction levels representing physical and mathematical systems.
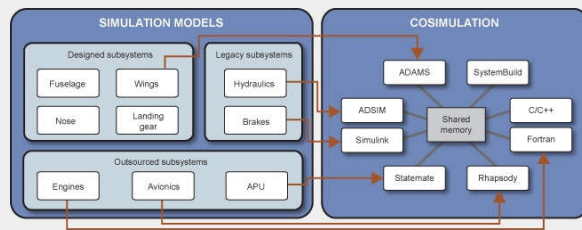
Introducing Co-simulation

With the growing complexity of systems in areas such as automotive, aerospace, and communications, integrating software, hardware, and mechanical components is becoming more and more challenging. In many engineering organizations, the design of complex systems often requires the cooperation of several teams from different domains of expertise using different development and validation tools. Before actual implementation, system engineers today need to be able to validate the whole system behavior as early as possible in the development- cycle and at different abstraction levels.
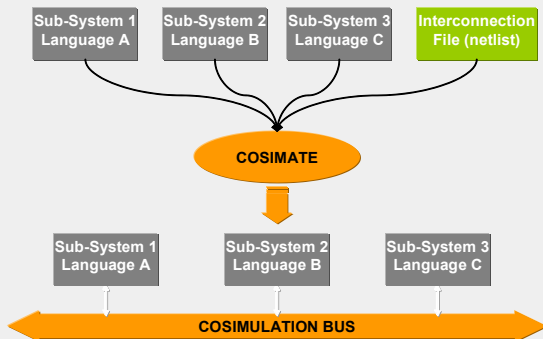
Use Case

Industry (Aero, Auto) OEM use CosiMate for Vehicule Energy Management, System sizing and validation

In contrast to a point-to-point solution, where one simulator is able to communicate with only one other simulator, CosiMate uses an open architecture based on a co-simulation bus. This solution offers two major advantages: an open architecture enabling multi-point integration and communication of heterogeneous simulators, and the ability to simulate models across the network optimizing CPU usage and simulation performance.

CosiMate Benefits

An Open Architecture

CosiMate's open architecture enables engineers to connect an unlimited number of simulation environments together. Once the co-simulation process is launched, users can interact with their native simulators transparently as if CosiMate were not present. Models representing different abstraction levels can be mixed and matched providing a high degree of flexibility. Additionally, overall system quality is ensured because individual engineers can work in their familiar environment.
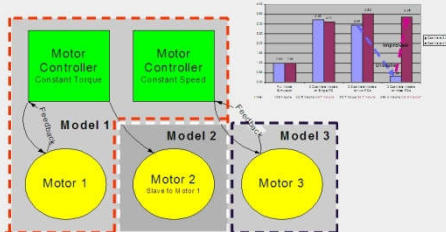
Test Environment

CosiMate can also be used as a test environment by integrating C/C++ debuggers or monitors into the co-simulation as well as Test & Measurement tools such as LabVIEW or LabWindows/CVI. Specialized tools such as CarSim which simulates and animates dynamic tests of cars and trucks can also be supported.

CosiMate also provides a set of utilities such as the Automatic Bench Generator to facilitate the development of models or code without co-simulating the full system. The generated C code allows an easy way to test a part of the system by using co-simulation techniques.
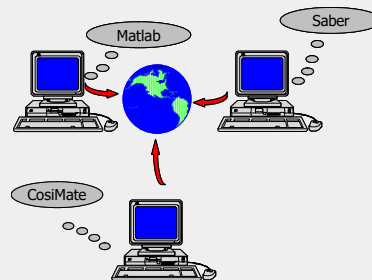
A Networked Architecture

CosiMate networked architecture is well adapted to the concept of multi-disciplinary development teams. Because of its networked nature, CosiMate also supports the study of system behavior in a multi tasking mode by partitioning the model and distributing the simulation of the various parts across several different machines. In a number of customer benchmarks, this technique has contributed to significant improvements in simulation speed.

A Verification Platform

Another aspect of CosiMate is its ability to co-simulate a model at different levels of abstraction. This capability provides a complete environment to verify a non regression of the model functionality along the design flow.
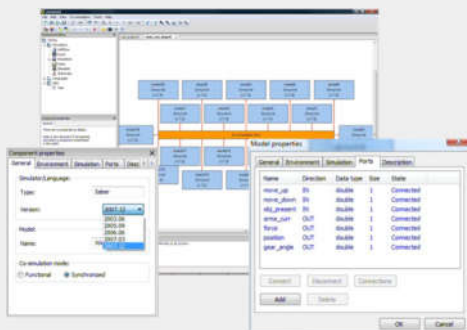
Along with our OEM customers, Chiastek has proved the concept of software-in-the-loop (SIL) verification using CosiMate. Our customers created a complete framework for testing production control software against various plant models on PCs. The focus was mainly on software communication (direct I/Os, CAN ...), software initialization (calibration) and the system synchronization (tasks scheduling).

Performance Implications

CosiMate technology offers a solution to overcome the difficulty in simulating integrated, large-scale, dynamic systems. A potential speed up of 2 to 11 was measured on an actual large Simulink model. Significant reduction in simulation time is achieved by the traditional technique of partitioning (splitting the full-order model into several smaller parts) and simulating on single or multiple computers.
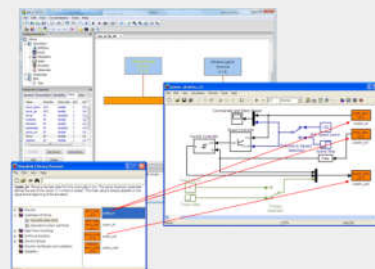
User Interfaces

Interacting With CosiMate

Users configure the co-simulation session using a graphical drag & drop interface and must define the following set of parameters: simulator list (types, network addresses, etc.), connection types between simulators, and simulation start mode. A data manager controls data synchronization between the different environments throughout the co-simulation process. Internal scopes are also available to follow the activity on the co-simulation bus.

Interacting With Native Simulators

An important CosiMate feature is the easy way to interact with the user's preferred simulator. In addition to the default CosiMate user interface to control the co-simulation, CosiMate allows execution in the native simulation environment. As a result, CosiMate users can easily work in their familiar environment controlling, debugging, and monitoring simulations as if they are running in a stand-alone mode.

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CosiMate
Platform for Multi-physics and Co-Simulation

CHIAS TEK

Key Features

- Heterogeneous models: electrical, mechanical, electronic, hydraulic, algorithmic, state charts etc...

- Simulation across functional areas and across the organization.

- Supports multiple simulators/languages, multiple solvers within a unique simulator, multiple abstraction levels, various data type connections all possible within a single co-simulation project.

- Flexibility for simulation dynamics: multiple communication sample times (time steps) and multiple start times are supported.

- Supports pure Event-Driven co-simulations with HDL and UML based simulators.

- Flexibility for event-driven communication: interrupt driven, busy-wait polling, buffering...

- Supports heterogeneous co-simulation between solvers (e.g., Simulink) and event-driven (HDL, UML) or sequential (C) simulators.

- Easy simulator connection using a graphical editor to build the co-simulation netlist.

- Easy setup for remote access and multi-platform co-simulations.

- Easy simulator management and customized simulators set up.

- Integrated debugging and monitoring features (Spy data, VCD and CSV traces, co-simulation controls).

- A large choice of simulation types (e.g., continuous or discrete simulations) and data types (e.g., scalar, logic, vector and bus).

- LAN and WAN co-simulations.

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Supported Simulator and Language Interfaces

1D Simulators

- Dassault, Dymola **(multi component)**
- Gamma Technologies, GT-Power **(engine performance)**
- Magna, KULI **(thermal)**
- MathWorks, Simulink **(multi component)**
- Mentor Graphics, ModelSim **(electronic)**
- MSC, Easy5 **(multi component)**
- OpenModelica **(multi component)**
- Powersim, PSIM **(power electronic)**
- Siemens/LMS, Amesim **(multi component)**
- Synopsys, SaberRD **(power electronic)**

3D Simulators

- Ansys, MP (multi physic)
- Altair, Flux (Electromagnetic 2D and 3D)
- Autodesk, Inventor (mechanic)
- Gamma Technologies, GT-Suite (multi component)
- MSC, Adams (mechanic)
- Siemens/LMS, NX I-deas TMG (thermal)
- Siemens/LMS, Virtual Lab Motion (mechatronic)Siemens/LMS, Amesim **(multi component)**

Generic Tools

- IBM, Rhapsody **(embedded software)**
- Mechanical Simulation, CarSim **(driving scenarios)**
- Powersys, EMTP-RV **(power systems)**
- Synopsys, Virtualizer **(virtual prototype)**

Languages & Standards

- FMI 1.0 and 2.0
- Microsoft, C/C++ (programmer language)
- Oracle, Java (programmer language)
- Synopsys, VHDL-AMS (programmer language

Instantiated within PDM/PLM tools

- Argonne, Autonomie **(system methods)**
- IBM, Rhapsody **(CLM)**
- Phoenix Integration, ModelCenter **(optimization)**
- Siemens, SysDM **(data management)**
- Siemens, System Synthesis **(product lifecycle management)**

Supported Platforms : Windows 32 and 64, Linux 64