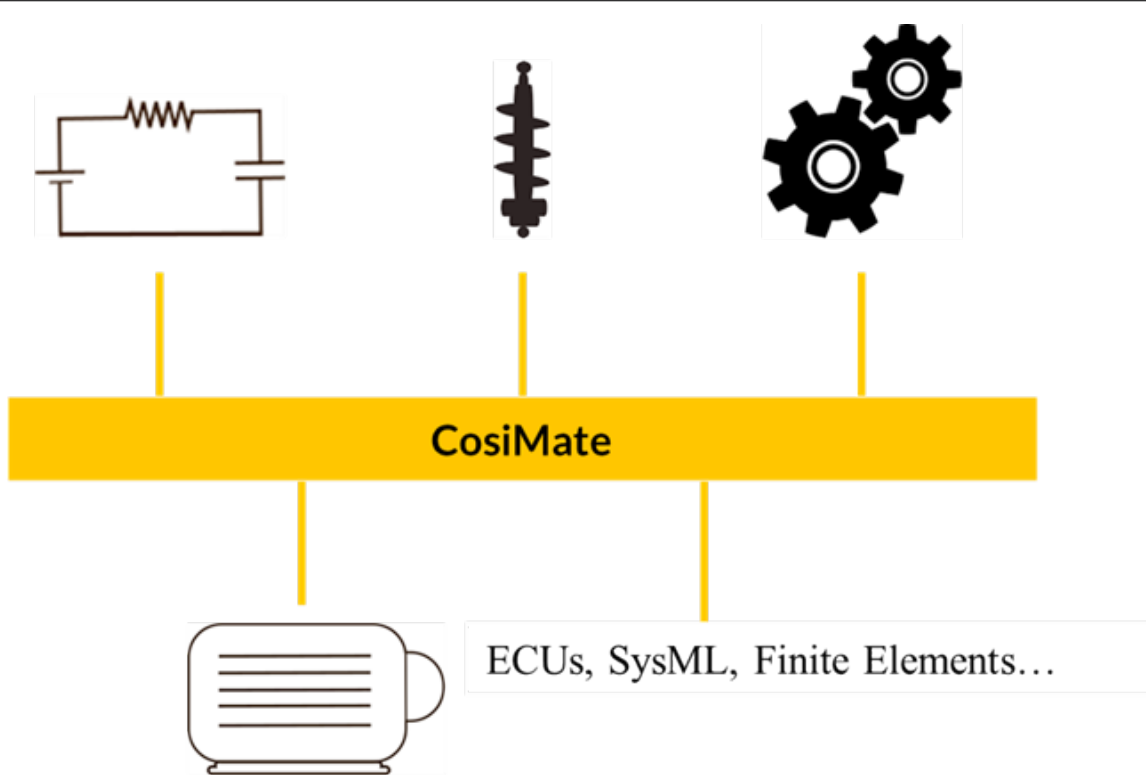△

Altair
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Partner Alliance

Chiastek

PARTNER SPOTLIGHT

Partner Spotlight: Chiastek

Peter Hoffmann, VP Business Development, discusses system simulation software, CosiMate, available through the Altair Partner Alliance.

APA: What prompted the development of your software?

Peter: Back in the early 2000s, the idea of native simulation coupling came about at the TIMA a research Lab in Grenoble. The main idea was to develop some methods for validating heterogeneous systems. The first publication was made by Prof. A. Jerraya at the MEDEA conference on Embedded System Design. In 2005, Groupe PSA had similar simulation challenges and benefited from the foundation of our open co-simulation bus-architecture, called CosiMate. This early foundation has lead to a mature product, now the 9th revision and a robust IT solution, with worldwide proven usage in production, mainly by aerospace and automotive industry customers. We currently have more than 250 commercial users at companies including Boeing, Airbus, Safran, GM, PSA, Toyota, Mazda, Nikon, ...

Today, simulation environments are even more heterogeneous and there is still very little collaboration between engineers. Furthermore, products are more complex, time to market is shorter and inter-dependencies are larger. This results in growing simulation challenges, which can only be addressed through collaboration of domain specific engineers by coupling their simulation tools. The coupling instance needs to be vendor neutral to enable collaborative designs within systems and multi-physics. The CosiMate open bus-architecture supports and enriches a growing amount of simulators and leaves tool familiarity with the respective engineer.

*FADEC: Full Authority Digital Engine Controller
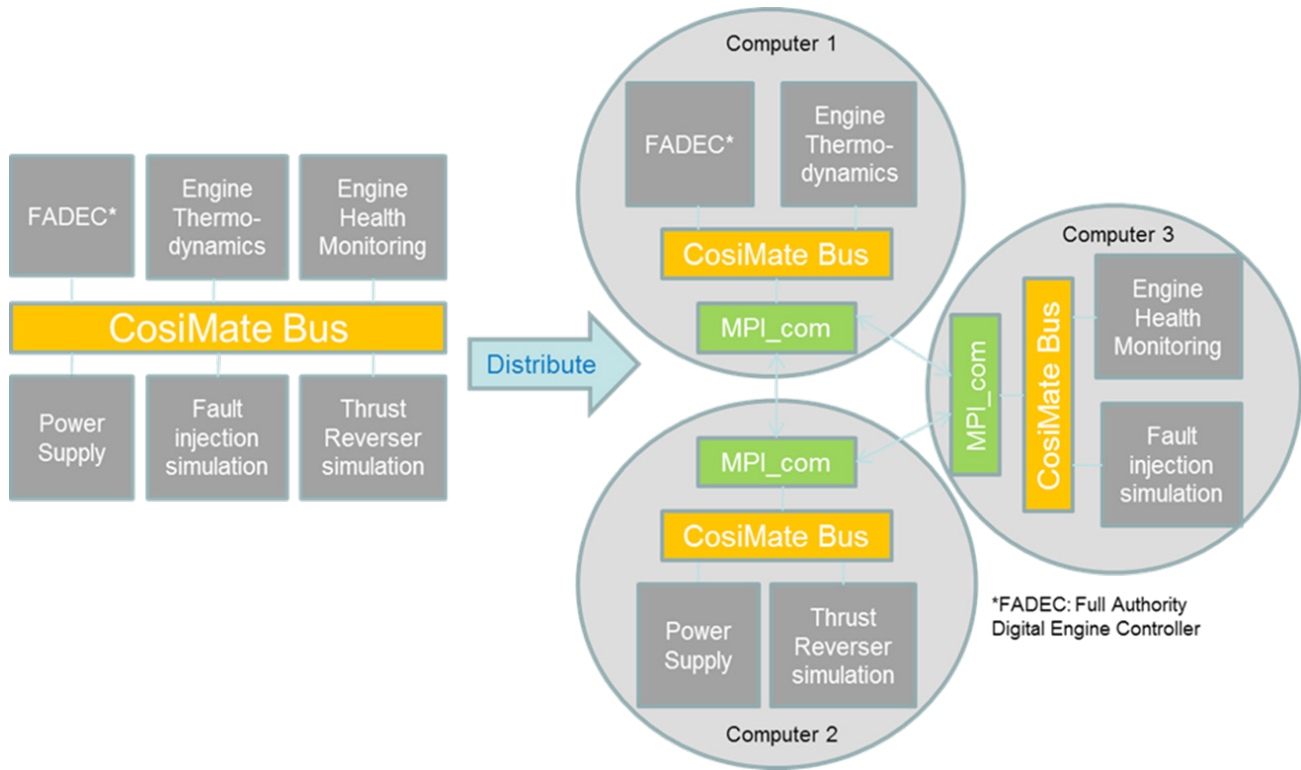
APA: What are the benefits of using CosiMate for system modeling?

Peter: System modeling enhances competition by shortening time to market. It is a suitable method to address new development requirements in this challenging environment. A networked simulation approach is required to establish a collaboration between development teams, multiple sites and regions as well as to support parallel design methods. Key features of the CosiMate platform include integrated test & measurement tools, processes to optimize accuracy, support of multiple versions as well as openness to cooperate with other simulation vendors.

The co-simulation platform applies to system modeling through native coupling. It is an easy and fast configurable co-simulation method that can cope with increasing system complexities, causes of failure during design phases and diversification of system component supplies. CosiMate makes system simulation easy within existing development processes and engineering tools thanks to its unique co-simulation bus architecture. It acts as a background task, delivering the required inter-connectivity without changing familiarity with design environments.

APA: Are there any unique applications that CosiMate works for that your competition cannot?

Peter: The solution to enable simulator coupling is not just a communication interface for inter-connectivity. The real challenge is the correct interpretation of data received in respect to reliability, complexity and correctness. Bi-directional dependencies between real-time and non real-time systems, between slow, fast, continuous, and discrete data exchanges as well as wall clock and round-trip time triggered events require a specifically developed algorithm. Available technologies within CosiMate include numerical solution, signal-based extrapolation, model-based extrapolation and waveform relaxation. An efficient combination of technologies used within the algorithm is the secret to coupling heterogeneous subsystems. Our internally developed coupling algorithms make CosiMate hassle-free for performing in any
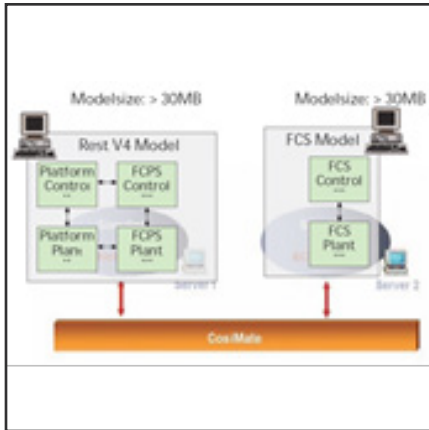
scale of system-simulation.

CosiMate can support any unique application based on the users' creativity. No matter what simulation tools need to be coupled, the co-simulation bus-architecture is ready for it. Our independence allows us to support many combinations of tools from different vendors. We allow the engineer to do their preferred simulation, enrich the tool usage and support the data exchange required. This unique approach has made CosiMate very popular and beneficial within many successful development environments, which is needed to quickly discover inadequate technologies, risky designs and possible performance issues during a life cycle.
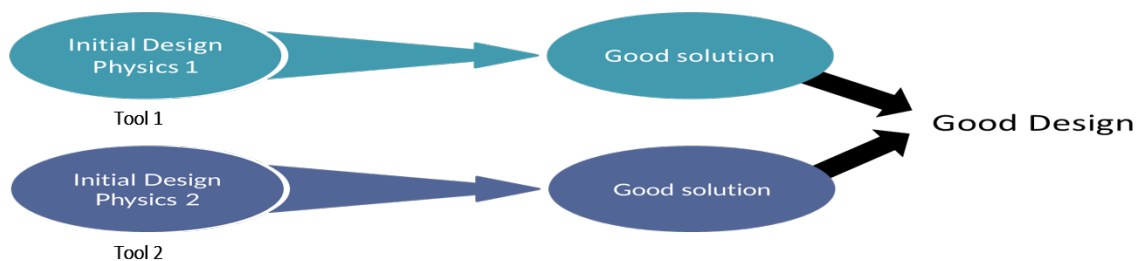
APA: How much time does it take to learn and start using your software?

Peter: The setup of a larger co-simulation solution can be rather complex. With our co-simulation bus-architecture it is easy and fast. A typical user can use CosiMate after a few hours of practice. Many options are available to customize simulation platforms after learning a few additional steps. The ease of use can be seen in the video, "How to Setup Your Own Co-Simulation Environment" which can be downloaded here:
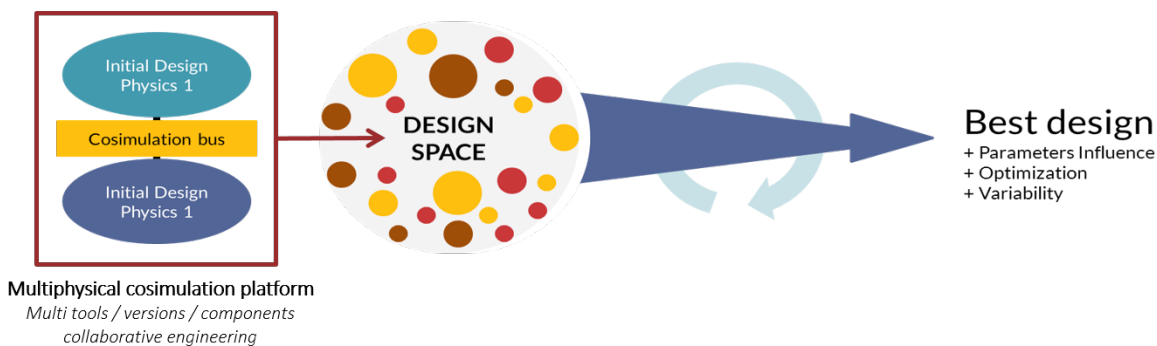
https://site.chiastek.com/downloads1.html

The video shows how to solve version problems with mono-physics co-simulation and how to overcome existing fears

From iterative design methods …

Initial Design Physics 1 — Tool 1 → Good solution

Initial Design Physics 2 — Tool 2 → Good solution

→ Good Design

… to multiphysical Design Exploration

Multiphysical cosimulation platform
Multi tools / versions / components
collaborative engineering

Initial Design Physics 1 — Cosimulation bus — Initial Design Physics 1 → DESIGN SPACE →

Best design
+ Parameters Influence
+ Optimization
+ Variability

with multi-physics co-simulation. The co-simulation example is based on four coupled heterogeneous simulation tools.

In CosiMate, the setup and coupling of each simulator is very intuitive. This can, however, not necessarily be used for control and monitoring, since co-simulation can be an automated function of any familiar or preferred simulator. In summary, CosiMate is developed to act as a background task with no real need to learn another tool. With this in mind, it truly extends the use cases of any simulation software.

APA: What are the biggest challenges or problems that customers in your target market face and how do you address their needs?

Peter: Fundamentally it is about IT and IP issues, addressing how to share data but not the model IP, how to simplify simulation integration processes by avoiding having to translate one model into another technology. Another concern is to avoid huge system blocks into one simulation model, but rather have the different subsystems separated to improve performance and ease of debugging. CosiMate bus-architecture is the perfect interface to couple simulation models without sharing IP, to translate models without using non familiar technology and to network subsystems without risking performance issues.

Practically, part one it is about how to start with a simple simulation model and move it to a high-fidelity one to gain better accuracy and to analyze a detailed behavior. A typical example is within thermal as well as electromagnetic fields, where more simulation details will lead to far better designs in respect to product aging, reliability and performance. Thanks to CosiMate's native coupling capabilities to any multi-dimensional thermal and electromagnetic simulation tool, it is just a mouse click away. Exchanging only the thermal or electromagnetic simplified block, mostly represented as simple as a resistor or capacity, within your detailed power electronic or mechanical model are exchanged with CosiMate input-/output- ports. And again the user does not need to become a thermal or electromagnetic expert as the tool
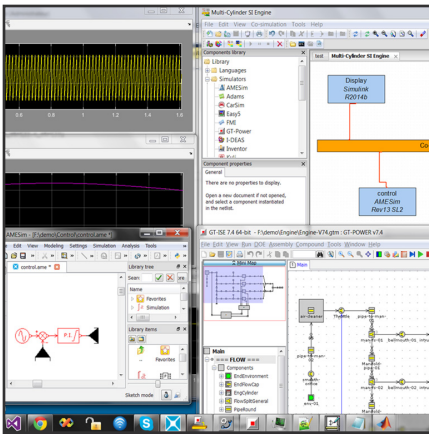
expertise stays with their colleague. Each user will just benefit from thermal or electromagnetic inter-dependencies now exchanged as simulation results between both parties.

Part two it is about the ongoing, evolutionary topic of system optimization, which is as important as revolutionary new designs. To reduce costs, emissions and consumption as well as improve efficiency, safety and performance requires an advanced simulation method. Multi-physics simulation is helpful for exploring optimization possibilities, but requires more coupling of different native and non-native simulators addressing a wider application range. Design exploration using 3D simulation is the answer going forward. Dynamic data- and signal-exchange as well as control through native coupling supports enablement of virtual integration to assess an assembly's consistency before any prototype or even computer aided design (CAD) is available. Processes, like design optimization, as part of a simulation tool or as a standalone application are supported by CosiMate. This native based & open bus architecture, allows users to manage all kind of activities such as communication speeds, timed or unsynchronized traffics, and so on.

APA: Describe a typical workflow of CosiMate.

Peter: 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.
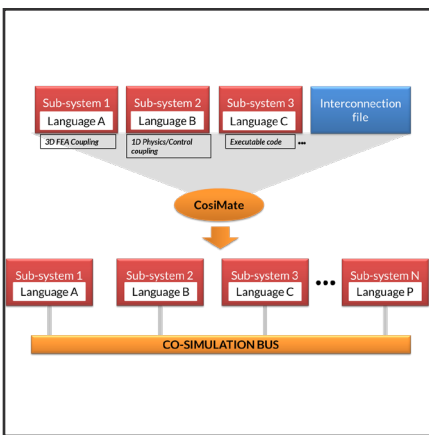
Interacting with CosiMate, users configure the co-simulation session using a graphical drag & drop interface and must define the following set of parameters: simulator list (types, network addresses, etc.), connection types be-

tween 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.

In most cases, CosiMate components are available from the simulation software component libraries and can be added in the user's model through a simple drag-and-drop function. They connect their model to the co-simulation bus and therefore to the other models. They can start their model as if it was a typical simulation or through a simplified control interface.

APA: What's next for Chiastek... what can we look forward to?

Peter: Our current work is based on extending CosiMate capabilities to Linux distributions and then ensuring full compatibility between Windows and Linux single computer or HPC based simulation.

It is our constant effort to extend the list of supported tools. What we have today is outstanding in our industry and it is important to note that any currently supported co-simulation is based on at least one concrete use from our main customer base in the aerospace, automotive, defense and communication industries.

Again, the limitless use of CosiMate is only based on the creativity of simulation experts around the globe, whether they are from electrical/hydraulic/mechanic/thermal domain or design-experiment/-exploration/-optimization application.

For more information about CosiMate, visit the solution page.