Exploiting a Modern Engineering Simulation Environment: NX CAE from Siemens PLM

CIMdata Commentary

Key takeaways:

- *Siemens NX CAE delivers a comprehensive analysis environment for integrated multi-disciplinary simulation coupled with CAD and simulation data and process management*
- *Siemens has a vision to further integrate 1D simulation, test engineering, requirements management, and model-based systems engineering with these 3D design and simulation tools*
- *Such integrated simulation environments, which focus on the PLM data flow and process issues, should be considered in favor of "best-of-breed" strategies that focus primarily on depth-of-application features and functions*
- *Siemens NX CAE is gaining ground as a favored tool for advanced thermal analysis, particularly for space systems*

Almost 200 people attended the 3rd Annual NX CAE Symposium on November 5-6, 2013. The event was held on the campus of the University of Cincinnati, the birthplace of much of the SDRC I-DEAS technology, now the basis of the advanced analysis capabilities within the NX CAE portfolio.

In his welcoming remarks, Dave Shook, Senior Vice President and Managing Director, Americas for Siemens PLM Software, noted that Siemens has invested billions of dollars in software acquisitions over the past few years, including $750 million to acquire LMS about a year ago. He discussed their goal of leveraging the combined Siemens and LMS technologies to enable "closed-loop, systems-driven product development," which is the capability to define and track performance requirements and verify them by simulation throughout the development cycle.

This theme was continued by Jim Rusk, Senior VP for Product Engineering Software, in describing the NX CAE / LMS Roadmap and Vision. He noted that LMS' capabilities for 3D simulation (e.g., durability, acoustics, and multi-body dynamics) are complementary with NX CAE's strengths in geometry-integrated model building, structural and thermal analysis, and results analysis/post-processing. Rusk put forth a comprehensive and impressive vision for the integration of 1D and 3D simulation with product design, test engineering, and cross-discipline systems engineering (Figure 1). In this vision, models serve as instruments to communicate and collaborate across domains, enabling the concurrent development of mechanical, electrical, and software for the control and validation of complex systems.

Other speakers echoed the theme for the NX CAE Symposium, "A modern CAE environment: Enabling smarter decisions."[1] In recent years, integrated CAE environments, like NX CAE, have increased in capability, offering a framework that includes geometry authoring (both history-based CAD and direct modeling with Siemens Synchronous Technology), and enabling geometry-associative, multi-physics simulation along with simulation data management. The emphasis is on the seamless flow of product information. For example,

[1] *Modern Engineering Simulation Environments - Maximizing the Value of your CAE Investments*, CIMdata, October 2011. Accessible by registering at:
http://cimdata.com/en/download-modern-engineering-simulation-environments-maximizing-the-value-of-your-cae-investments

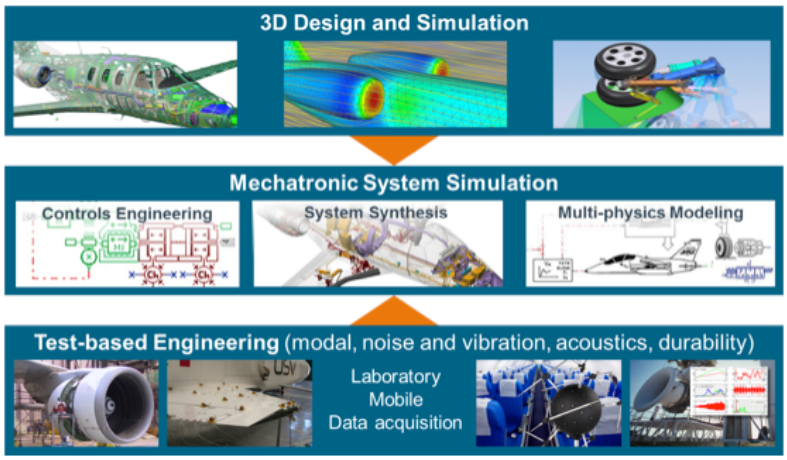

Figure 1—The Scope of Siemens' Vision for NX CAE and LMS
(Courtesy of Siemens PLM Software)

some solutions can demonstrate a workflow with the progression of a mechanism from simple sketches to 2D and 3D CAD with a kinematics analysis, to multi-body dynamics, to nonlinear durability of flexible components. This involves different people and tools, without the need to export, translate, or recreate data. Users spend much less time looking for data, and the quality of the data is much improved by assuring its pedigree and reducing manual manipulations. Siemens' vision is to extend this to include requirements management and validation, "closed-loop" model-based systems engineering, and test engineering—via integration with the Teamcenter PLM platform.

The capabilities of CAE tools in suites like NX CAE are now comparable to those of best-of-breed stand-alone tools. Siemens believes that the discussion should now turn to the essential PLM concerns of process and data. CIMdata suggests that end users should question a best-of-breed strategy for choosing CAE applications, where the integration and data management issues fall largely on the end user. Figure 2 is a representation of the integrated NX environment.

In his opening remarks for the second day, Marc Boonen, LMS General Manager Americas, a Siemens business, discussed LMS' activities in test, simulation, and cross-discipline

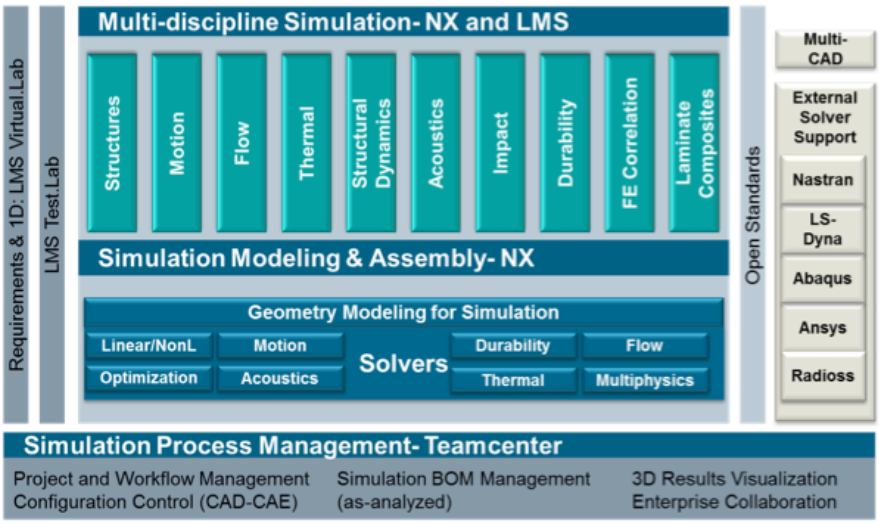

Figure 2—Realization of the Siemens NX CAE Integrated Environment
(Courtesy of Siemens PLM Software)

integration. He noted that LMS engages in close collaborative projects with selected customers to develop technology and to demonstrate first-time application of new techniques and methods. CIMdata is aware that GM, Ford, and Chrysler have all stated in the past that LMS' capabilities for vehicle thermal system analysis are essential to meet future fuel economy standards.

The NX CAE Symposium featured a number of presentations on strategic issues. Dennis Nagy (Beyond CAE) gave his thoughts on the future needs to address mechatronics; Michelle Boucher (Aberdeen Group) discussed best practices for closed-loop system simulation; Paul Caito of Siemens PLM Software led a discussion among managers associated with Siemens PLM Software, including Bill Carrelli (VP for Strategic Marketing); and Monica Schnitger (Schnitger Corporation) moderated a panel discussion on simulation with a cross section of end-user agenda participants.

The discussions were rather strategic. The managers echoed the theme of system-driven product development, with simulation playing a key role. The end users noted the need for standardization and validation of simulation procedures, for process and data management, and of the importance of cultural issues: "People must be engaged in a culture of continuous improvement," said Ed Roubal of Graham Packaging. "They must be enthusiastic about collaboration and sharing information," added Marc Solomon, PLM Evangelist at United Launch Systems.

Some end-user presentations focused on leveraging the NX CAE environment: Dan Mekker (Siemens Energy) on smarter designs, Marc Solomon (United Launch Alliance) and Oscar Morataya (GE Aviation) on simulation data management, Clark Briggs (ATA) on process reuse during design evolution, and Sankar Nallapati (General Motors) on knowledge-based tools in the NX CAD and CAE environments. All these speakers are leveraging the combination of NX and Teamcenter to improve the effectiveness of simulation for product development.

Spearheaded by Nicolas Parise's (Maya Heat Transfer Technologies, a Siemens PLM partner) discussion of NX Thermal/Flow, a number of other end-user presentations focused on 1D and 3D thermal simulation use cases. NX CAE seems to be gaining a significant foothold in the thermal simulation domain, particularly for space systems. Thermal performance concerns have increased dramatically over the past few years because of, for example, the electrification of vehicles, the need for improved fuel efficiency, and the higher energy density of heat generated by electronic components.

Through internal development of core CAE tools, adding capabilities like Simulation Data Management in Teamcenter, productive partnerships with companies like Maya, and strategic acquisitions, notably LMS, Siemens PLM Software has developed an impressive range of simulation-related capabilities. They provide a comprehensive vision for CAE integrated in the PLM environment, directed towards managing a company's intellectual assets over the product lifecycle. CIMdata looks forward to the continued integration of simulation with requirements management, data management, and model-based systems engineering. Siemens PLM is very, if not uniquely, equipped to deliver on this vision.

The NX CAE Symposium presentations are available by registering at:
https://www.plm.automation.siemens.com/en_us/about_us/events_webinars/nxcae-symposium/index.cfm?

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