NAFEMS 2016 Americas Conference

CIMdata Commentary

Key takeaways:

- *This biennial NAFEMS conference reaffirms the growing importance of engineering modeling and simulation across all industries and domains*
- *System Modeling and Simulation is becoming a key element in enabling the growth of the new paradigm of Model-Based Systems Engineering (MBSE)—"Thinking of a product as the sum of a number of interdependent systems"*
- *With its mini-symposium on "Democratizing CAE," NAFEMS demonstrates a clear commitment to provide a platform for educating not just highly trained simulation experts but every engineer who uses simulation as a design tool*

Over 320 people met in Seattle, coinciding with the 100th anniversary of Boeing, for the 2016 NAFEMS Americas Conference. This event brought together end users, software and service providers, academics, and key associations and organizations from across many manufacturing industries, academia, and government. The attendance was a record for any NAFEMS regional event, with more than double the participants over the 2014 conference. The event showcased over 95 presentations from industry, software providers, researchers, and academia. Dr. Rod Dreisbach, The Boeing Company (retired), Chairman of the NAFEMS Americas Steering Committee, Member of the NAFEMS Council of Management, stated "The conference provided an excellent opportunity and ability to network with software vendors, other end users, and to discuss applications of CAE tools in a diverse industry." For many participants it was a "truly unique international learning experience."

NAFEMS is the International Association for the engineering modeling, analysis and simulation community. It is a not-for-profit organization established in 1983. NAFEMS principal aims are to:

- Improve the professional status of all persons engaged in the use of engineering simulation
- Establish best practices in engineering simulation
- Provide a focal point for the dissemination and exchange of information and knowledge relating to engineering simulation
- Promote collaboration and communication
- Act as an advocate for the deployment of simulation
- Continuously improve education and training in the use of simulation techniques
- Be recognized as a valued independent authority that operates with neutrality and integrity

The focus of NAFEMS[1] is on the practical application of numerical engineering simulation techniques such as the finite element method for structural analysis, computational fluid dynamics, and multibody simulation. In addition to end users from all industry sectors, its stakeholders include technology providers, researchers, and academics.

NAFEMS Americas has had a rapidly growing member base for the last two years, resulting in it becoming the largest region for NAFEMS in 2016. The reason for this is that the organization is addressing the needs of their members to provide guidance, education, and use cases for

[1] https://www.nafems.org/about/technical-working-groups/

the various industries based on new, upcoming technologies in the simulation space. This is reflected in the topics covered during the conference:

- Computational structural mechanics
- Multi-physics
- Democratizing CAE
- System modeling and simulation (SMS)
- Predictive analytics and uncertainty quantification
- High-performance and cloud computing
- Business challenges
- Simulation governance and analysis management

The broader view towards simulation and its role in engineering today is reflected in the fact that SMS now plays a major role in NAFEMS activities. The SMS Working Group (SMSWG) was kicked off in 2013 as a joint working group between NAFEMS and INCOSE (the International Council on Systems Engineering). It combines traditional CAE with traditional systems engineering. The SMSWG is working on providing guidance to bring the different disciplines of simulation and systems engineering together, bridging the gap between end users and solution providers, and thus, helping to promote, define, and identify standards to support this process. It is partially driven by the fact that simulation takes place during all stages of product development and throughout the product lifecycle, not only at the physical model level but more recently there has been an increased use of simulation earlier in the development process to lower-fidelity models.

During the 2016 conference, SMS had its own track of presentations as well as an open roundtable discussion on what is needed from a standards perspective to achieve the goal of the SMSWG. The discussion focused on how to support different levels of fidelity and software domains in a seamless way (considering the complete engineering Vee), to allow democratization within organizations, and to support true collaboration within and between organizations.

The discussion reiterated the trends we see in the market:

- Innovation platforms will find their way into the engineering communities. They will and need to have a well-founded governance process built in.
- Those platforms will enable a model-based systems engineering approach and cultural transformation.

The round-table discussion included very frank comments that targeted the absolute requirement for openness among the different tools. Without this, cultural transformation and democratization will not happen effectively. The end user representatives were adamant that there urgently needs to be a change in the way solution providers work together with the end user community and collaborate among themselves. The SMSWG plays a central role here by enabling this change to promote exchange and collaboration. A centerpiece is not just those communities or councils, but the required technologies to make this happen. Emerging or existing standards need to be open and independent. Neutral organizations, like the SMSWG, need to take the lead in coordinating the efforts of developing and managing those standards, bringing solution providers together at the executive level to promote their collaboration without infringing on intellectual properties.

At the same time, the work on the SMS Roadmap needs to continue. This vision and roadmap is an imperative for proper development and execution strategy. In previous commentaries we

stated that such “grand” visions are needed. The main challenge is to implement cultural change in the way companies operate to make this happen. Virtual and physical engineering need to be brought together. This starts with a consequent deployment of system thinking and understanding of the engineering Vee in terms of iterative processes and not just a sequential approach. NAFEMS shows that independent organizations can take a leading role in this process. At the same time, we also see that consulting companies need to play more of a major role to support this and be a “go-between” with end users and solution providers.

The discussion confirmed CIMdata’s views of increased growth and intersection of model-based systems engineering with traditional physics based simulation and analysis activities, as well as the focus on integrating 0D, 1D, 2D, and 3D multi-physics, multi-scale, and multi-domain simulations, integrating analysis with design optimization, manufacturing, test validation, and certification.

A positive push in the area will come not only from the larger solution providers but also from smaller providers. During the conference we saw innovative and out-of-the-box thinking and discussions about standards for collaboration, communication, and integration on the model and process level. For example, FMI (Functional Mockup Interface), STEP AP209 edition 2 are already well developed even though further work is under way on how to implement new features to support the overall system integration better. Ideas from smaller companies continue to challenge the status quo. We view this as a positive influence on all of the areas supported by NAFEMS. This conference provided insight and support for future developments.

About CIMdata

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