# SIMULIA EURONORTH REGIONAL USER MEETING 2026

## Essential Guide

# Contents

# Your Exclusive Invitation to the SIMULIA EURONORTH Regional User Meeting (RUM)

Join us in Göteborg at the Scandic Göteborg Central Hotel on May 27-28 for the SIMULIA EURONORTH Regional User Meeting – a must-attend event designed specifically for our valued customers.

Inside this eBook, you'll find all the essential details to help you decide to join us for what promises to be our best event yet. Get a sneak peek at the preliminary agenda and discover how this meeting will benefit you:

What Awaits You:

- Complimentary Access: Enjoy full access to both days of the RUM – completely free of charge
- Real-World Insights: Learn from over 10 customer presentations showcasing practical applications with Industry leaders such as Essity AB, Norconsult, TERASi, and more!
- Tailored Breakout Sessions: Deep dive into your area of interest with 4 focused technology tracks:
  - Structures
  - Electromagnetic
  - Multibody System Dynamics & Motion Simulation
  - Fluids
- SIMULIA Innovation: Get the latest updates on the SIMULIA portfolio directly from our R&D team and meet the SIMULIA CEO, Michelle Ash!
- Unlock the Power of 3DEXPERIENCE: Discover how to maximize the value of your simulation processes and data
- Interactive Exhibition: Explore cutting-edge solutions and connect with industry experts
- Valuable Networking: Enjoy a free networking banquet on the evening of May 27
- Focused Content: Benefit from presentations and discussions tailored to local industry trends and challenges
- Connect with Peers: Engage with other SIMULIA users, share knowledge, and build valuable connections

## Who Should Be There?

This meeting is ideal for industry professionals, engineering teams, team leaders, managers, and directors seeking to leverage state-of-the-art multiscale, multi-discipline simulation.

## We look forward to welcoming you to Göteborg!

# Venue & Accommodation

This year's SIMULIA EURONORTH Regional User Meeting will take place at the conveniently located Scandic Göteborg Central Hotel. For more information about the venue, please visit [www.scandichotels.com/scandic-goteborg-central](www.scandichotels.com/scandic-goteborg-central)

We have secured a special discounted rate of SEK1380 per night for single occupancy / SEK1580 per night for double occupancy bed and breakfast. To take advantage of this offer, please contact the hotel directly at +46 08517517 00 - Option 1 and quote 'BBRI260526' when making your reservation.

We strongly recommend booking your accommodation as soon as possible, as this discounted rate is available for a limited time and rooms are expected to fill quickly.

Hotel Details:
Scandic Göteborg Central
Vikingsgatan 7
41104 Göteborg
Sweden

## Registration

We are delighted to offer complimentary registration for both days of the conference, including the networking banquet. However, due to anticipated high demand and limited spaces, it is crucial to register only if you are certain you can attend. If your plans change, please notify us as soon as possible so your place can be offered to another attendee.

Scan QR code to register

Click here to register OR

# Agenda

| Day One \| May 27 – Advanced Structures Seminar | |
|---|---|
| 12:00 – 12:30 | Registration |
| 12:30 – 12:45 | Welcome & Introduction |
| 12:45 – 14:00 | |
| 14:00 – 14:40 | Mid-Afternoon Break |
| 14:40 – 15:55 | |
| 15:55 – 16:35 | Mid-Afternoon Break |
| 16:35 – 17:50 | |
| 17:55 – 18:00 | Closing Remarks |
| *Refresh & Reset: Break Before Evening Events* | |
| 19:00 – 19:30 | Drinks Reception |
| 19:30 – 22:30 | Evening Banquet |

| Day Two \| June 28 | |
|---|---|
| 08:30 – 09:15 | Registration |
| 09:15 – 09:30 | Welcome & SIMULIA CEO Opening Remarks |
| 09:30 – 09:55 | SIMULIA Brand Insights 2026 |
| 09:55 – 10:20 | Customer Presentation: To be announced soon! |
| 10:20 – 10:50 | Mid-Morning Break & 3DEXPERIENCE Playground |
| 10:50 – 11:15 | MODSIM (+AI )– Enabling Transformation from Sequential to Concurrent Engineering |
| 11:15 – 11:40 | Customer Presentation \| Modeling Yarn using Nonlinear Beam Elements in a Multibody Environment \| Jan Schroeder, Dresden University of Technology |
| 11:40 – 12:05 | UKAEA \| Multi-Physics Simulation Solution For Fusion Applications – The Neutronics-Thermal-Structural Analysis Of A Breeding Blanket Module |
| 12:05 – 13:05 | Lunch & 3DEXPERIENCE Playground |
| 13:05 – 13:30 | Customer Presentation \| Enhancing Product Comfort and Fit Through Finite Element Simulation at Essity \| Manuel Mendoza Vázquez & Ioan Danese, Essity AB |
| 13:30 – 15:05 | Technology Breakout Sessions (Choose one*) |

| | | | |
|---|---|---|---|
| Structures | Electromagnetic | Multibody System Dynamics & Motion Simulation | Fluids |
| 15:05 – 15:35 | Mid- Afternoon Break & 3DEXPERIENCE Playground | | |
| 15:35 – 16:50 | Continued \| Technology Breakout Sessions (Choose one*) | | |
| Structures | Electromagnetic | Multibody System Dynamics & Motion Simulation | Fluids |
| 16:50 – 17:00 | End of Conference | | |

## Pre-Conference: Advanced Structures Seminar

### Wednesday, May 27, 2026 | 12:00 – 18:00

### Advanced Structures Seminar | Sandeep Kulathu and Jan Granlund, Dassault Systèmes

Join us for an intensive, half-day technical deep-dive led by Sandeep Kulathu (SIMULIA R&D) and Regional Expert Jan Granlund. This seminar is crafted for experienced power users looking to push the boundaries of their simulation workflows. We will explore the latest R&D innovations in Abaqus/Standard and multiphysics, paired with the advanced methodologies required to solve the industry's most challenging non-linear structural problems. From troubleshooting convergence in complex assemblies to optimizing solver performance with the newest SIMULIA features, this session provides the high-level expertise needed to stay at the cutting edge of simulation technology.

### Networking & Evening Events | Wednesday, May 27 | 19:00 – 22:30

Wrap up an intensive day of technical learning by connecting with your peers in a relaxed setting.

- 19:00 – 19:30 | Drinks Reception: Unwind and network with fellow simulation experts and the SIMULIA team
- 19:30 – 22:30 | Evening Banquet: Enjoy a complimentary formal dinner followed by our legendary After Dinner Game—a popular challenge of skill, problem-solving, and "buffoonery."

# User Meeting: Plenary & Breakouts

Thursday, May 28, 2026 | 08:30 – 17:00

## Main Plenary

### Welcome & SIMULIA CEO Opening Remarks | Michelle Ash, Dassault Systèmes

This session begins with a warm welcome to our community, followed by keynote remarks from the SIMULIA CEO.

### SIMULIA Brand Insights 2026 | Michelle Ash, Dassault Systèmes

Last year, we celebrated twenty years of the SIMULIA brand, using the milestone as an opportunity to showcase our commitment to enhancing and expanding our simulation portfolio.

Today, we highlight our advancements in bringing AI to the simulation market. We use MODSIM as a basis for industrial AI to create Virtual Twins Physics Behavior. These state-of-the-art machine learning models aggregate specialized knowledge and know-how to democratize simulation and dramatically shorten design cycles. Additionally, we are excited to announce our virtual companions that will transform how engineers approach simulation tasks.

Last but not least, we want to celebrate you, our users and the amazing things you have accomplished. We appreciate your dedication and are eager to see the fabulous milestones you will accomplish in the coming years.

### Finite Element Evaluation of Negative Pressure Wound Therapy Effects on Surgical Incisions | Alit Putra, Mölnlycke Health Care

Negative pressure wound therapy (NPWT) is widely used to support healing of surgical incisions, with reported clinical benefits including improved perfusion and reduced tissue strain and oedema. In this study, finite element (FE) simulations were developed to evaluate the ability of different NPWT systems to stabilize the incision line by reducing incisional strain and generating beneficial peri-wound stresses. The analysis compared two intended negative pressure levels (−80 and −125 mmHg) and two dressing architectures: a multilayer absorptive (MLA) dressing and a peel-and-place (PP) dressing.

Methods
FE models representing NPWT dressing configurations and a soft-tissue incision were constructed in Abaqus 2022, using material properties informed by laboratory testing. The simulation workflow consisted of three sequential steps: suture closure, dressing application, and application of negative pressure. Key output measures included the reduction of peak skin strain across the incision and the magnitude of positive peri-wound tissue stress generated by each dressing configuration.

Results
MLA-based NPWT systems demonstrated the greatest reduction in incisional strain, achieving decreases of 47% and 63% at −125 and −80 mmHg, respectively. In comparison, the PP dressing at −125 mmHg produced a 22% strain reduction. The highest enhancement of positive peri-wound stress occurred with

the MLA dressing at −125 mmHg, yielding a 90% increase, whereas the PP dressing at −125 mmHg provided a 24% increase. A 10% decrease in peri-wound stress was observed for the MLA dressing at −80 mmHg.

Conclusions
The results highlight the influence of dressing design and applied pressure level on NPWT performance. Both factors substantially affect the capacity of NPWT systems to reduce incisional strain and apply supportive peri-wound stress—mechanical parameters considered important for promoting optimal healing of surgical incisions. These FE models demonstrate the value of simulation in guiding NPWT system design and pressure-setting strategies.

### MODSIM (+AI) - Enabling Transformation from Sequential to Concurrent Engineering | Jan Granlund, Dassault Systèmes

Exploring how the MODSIM paradigm is allowing customers from many industries to shift their engineering and product development process from sequential to concurrent. Typical design and validation process are sequential, involving fragile data chains, and time delays due to dependencies for each step to be completed before the next can begin. By contrast, MODSIM allows a concurrent approach, where design and validation can be performed interchangeably on the dame data, removing dependencies and delivering significant time savings

In addition, AI enhancements such as virtual companions and virtual twin generative experiences empower MODSIM to deliver even greater benefits, and accelerate this transformation. This will be illustrated with real world examples of AI generated virtual twin physics behaviors, as well as other AI assistance & generation functionality which can greatly improve productivity.

### Customer Presentation | Modeling Yarn using Nonlinear Beam Elements in a Multibody Environment | Jan Schroeder, Technische Universität Dresden

High speed warp knitting represents a well-established method for textile production. Production speeds using highly elastic yarn are limited to 4400 rpm due to lapses in quality. This research project is tasked to develop a monolithic modeling approach of the warp knitting process with a focus on the yarn dynamics in the multibody environment Simpack. The dynamic modeling of conventional textile production machines in multibody systems is well understood, therefore there is a focus on approaches of yarn modeling. The modeling approach has been delineated by a series of requirements. The model must contain tensile and bending stiffness. Additionally, the reliable contact of neighboring yarns, self-contacting behavior, and reli able environmental contact (i.e. machine contact) must be accurately resolved. Due to the temporary loss of yarn tension during mesh formation, bending effects become significant and the bending stiffness must therefore be considered. The yarn has been modeled using nonlinear Simbeam bodies. Using the option to disconnect the physical cross-sectional properties from the mechanical properties, nonlinear material behavior can be approximated. Polygonal Contact Method (PCM) is used to model contact between two yarns. The square knot is selected as a benchmark model and simulated. It can be shown that this modeling approach is generally feasible. That said, it requires a high number of degrees of freedom and a high discretization, significantly increasing the state vector size and therefor the required computational effort. Staggered grid discretization employed in Simbeam bodies represents a limiting factor for this approach.

### UKAEA | Multi-Physics Simulation Solution For Fusion Applications – The Neutronics-Thermal-Structural Analysis Of A Breeding Blanket Module | Eric Veron, Dassault Systèmes

Modelling the behaviour of fusion reactor components, equipment, and installations represents a key challenge for the fusion industry. Component behaviour is very multi-physics in nature and simulation of the underlying physics relies on a range of highly specialized and poorly connected simulation tools.
A key simulation capability for fusion is the ability to perform co-simulation of tightly coupled physics, including coupling of software from different providers or simulation ecosystems. One example application of this is the simulation of the neutronic-thermal-structural behaviour of a breeder blanket. The breeding blanket plays critical roles in fusion reactors by absorbing high-energy neutrons to breed tritium from lithium, multiplying the neutron flux, converting neutron energy into thermal energy for electricity production, cooling internal reactor components directly facing the plasma, and shielding external reactor components from neutron and X-ray radiation.
This work considers an indicative breeder blanket module and operating scenario, for use in demonstrating coupled neutronic-thermal-structural simulation. The component is subjected to neutron bombardment from a fusion plasma source, which leads to a volumetric heating in the blanket module components. This thermal load is combined with a large heat flux at the blanket module surface facing the plasma and the convection cooling over internal surfaces bounding cooling channels. The interaction of materials with neutrons is temperature dependent, and the simulated temperature is therefore used to update the neutronics prediction. The raised temperature of the component results in thermal expansion and the structural response must be predicted to validate the design.
The proposed solution couples OpenMC, an open-source Monte Carlo neutron and photon simulation transport code, and Abaqus/Standard, in a two-way partitioned manner, using the SIMULIA Co-Simulation Services. The use of a co-simulation approach allows the reuse of well-established and high-performance simulation tools to solve the Neutronics-Thermal problem. The Thermal-Structural problems is solved sequentially by importing the temperature field from the thermal analysis into the structural simulation.
The developed solution enables a comprehensive assessment of neutronics performance (tritium breeding), thermal performance (heat generation and cooling), and structural behaviour (assembly tolerances and structural integrity), which are essential for the design of breeding blanket modules. This work demonstrates how efficiently third-party solvers can be couple to commercial solution using co-simulation. It further highlights the impact of advanced algorithms on the computation performance when solving strongly coupled problems.

### Customer Presentation | Enhancing Product Comfort and Fit Through Finite Element Simulation at Essity | Manuel Mendoza Vázquez & Ioan Danese, Essity AB

Essity is a global leader in hygiene and health, with products used by one billion people across 150 countries every day. Consumers' perceptions of these products, such as comfort, fit, reliability and dignity are inherently subjective. Traditionally, product design and evaluation rely on consumer studies, which often occur late in the development process, when design changes tend to be costly. The interpretation of consumer study results can also be challenging due to the subjective nature of the responses.
To address these challenges, Essity has adopted finite element analysis (FEA) to increase the understanding of the relationships between mechanical product parameters and subjective user experience. By integrating FEA earlier in the development cycle, designers can more efficiently explore design alternatives and identify optimal concepts before physical prototypes are created.
This presentation describes Essity's journey in adopting FEA by showing the evolution from open diapers to pants type products applied to human body models. Challenges related to simulation techniques,

material characterization, and human model representation are discussed, along with how these challenges are being addressed to enable more predictive and consumer relevant simulations.

## Technology Breakout Sessions

Scheduled for the afternoon on Thursday, May 28, these focused sessions offer a thorough and in-depth understanding of the core SIMULIA Disciplines. Our knowledgeable SIMULIA technical experts will lead engaging presentations, providing clarity on their functionalities and potential applications. Additionally, you will hear directly from customer presenters who will share real-world examples and unique perspectives on leveraging SIMULIA technology.

## Structures Technology Breakout

### Customer Presentation | Fatigue crack evaluation for antivibration components using Abaqus with the effective tensile stress criterion | Robert Luo, Trelleborg

Rubber isolators operate in a high-dynamic environment, and fatigue damage often occurs during service. Simulation of fatigue crack initiation and propagation is very challenging in engineering design. Fracture mechanics is the dominant approach to this problem, using parameters measured from pre-cut plane specimens. However, in actual 3D products under multiple axial loading conditions, it is difficult to obtain consistent results. Since Abaqus software provides user subroutines to control elements' response under external loadings, it is possible to use these facilities to assess the fatigue cracks. An Abaqus simulation was performed after a rubber spring used in a rail vehicle failed during the fatigue test. The results show that fatigue crack initiation occurred at approximately 82k cycles, compared with the predicted 81k cycles, and that after 125k cycles were completed, the observed crack length propagated to 97mm, whereas the predicted value was in the range 93–95mm. Therefore, the prediction successfully evaluated the fatigue crack initiation and propagation. The presentation will show the whole simulation procedure and the results obtained.

### Customer Presentation | Not just a wind-up: Using Abaqus to show the best way to loosen a tight screw | Bob Johnson, Realistic Engineering Analysis Limited.

At the 2022 UK Regional User Group Meeting in Manchester the author presented a detailed computer simulation of an M16 threaded connection which incorporated a large amount of pre-load. The aim of those simulations was to prove, or otherwise, the assertion that my father had given me: namely that a long-handled screwdriver would release a tightened screw more effectively than a short/stubby one. The simulations showed that the long screwdriver provided greater torsional flexibility and this was thought to enable the human (on the other end of it) to apply more energy to the release of the screw.
The author is in the process of extending the screwdriver work to include a further trick that could help loosen such a pre-loaded assembly. The "enhancement" will be revealed at the Gothenburg RUM, and computer simulations will be used to prove the worth of this trick.
The simulations will all use finite-sliding contact, large displacements and include non-linear geometry effects. The author will also table some fears about the original work and employ mesh enhancements to support (or otherwise) those concerns. The presentation will be of interest for all those old-school users of Abaqus whose daily concerns involve contact and friction, accuracy of stress predictions and the closeness that their work mimics reality. Coupled to the above, the author will attempt to make the

human connection between the human "feel" of a tool (such as the screwdrivers in question) and the simulation results which quote torque and net rotation and the like.

## Customer Presentation | Machine learning-accelerated cyclic plasticity simulations | Nasrin Talebi, Chalmers University of Technology

Finite element simulations involving many loading cycles with nonlinear material models can lead to high computational costs. In this work, we propose an approach to speed up cyclic plasticity simulations by taking large time increments in multiaxial loading. Specifically, we train a Machine Learning (ML) model to give the incremental solutions of evolution equations for solution-dependent state variables. We incorporate knowledge from the underlying reference plasticity model to guide the ML-based model and reduce the amount of needed training data. The resulting explicit material model can take much larger time steps than existing implicit material models.

The trained ML-based material model has been implemented in Abaqus through a user-defined material subroutine (UMAT) and evaluated in finite element simulations against both a cyclic plasticity model implemented as a UMAT and the built-in Abaqus plasticity model. We have assessed the approach in terms of accuracy and computational efficiency for cyclic loading simulations. The results demonstrate the potential of the ML-based material model to reduce simulation time while maintaining accuracy.

## Customer Presentation | Calculation of Reinforced Concrete Beams in Abaqus | Anton Magne Gjørven, Norconsult A.S.

The material model in Abaqus/Standard for concrete can be utilized during concrete design calculations or in back-calculation of damaged concrete structures in order to come as close as possible to the real behavior of concrete when doing calculations with Abaqus/Standard. The sub option *Concrete Damaged Plasticity is used in the presentation example, both for beam elements and solid elements. Special attention should be taken to the development of tensile strain and stress in the section. These are crucial parameters for the concrete behavior in the Ultimate Limit State. Abaqus enables the user to do parametric studies for different assumptions of how cracks are developing in the tension part of the section. This leads to an enhanced understanding of the interaction between concrete and the rebars when the concrete is cracking and the rebars are taking over more of the tensile stresses when the section cracks.

## Customer Presentation | Calculation and Validation of Sloshing Frequencies in Complex Shaped Tanks Using an Acoustic-Structural Approach and a Eulerian Approach | Oliver Bracher, AtkinsRéalis

Liquid filled tanks can impose large hydrodynamic stresses on structures when exposed to seismic excitation. Accurately representing the dynamic behaviour of the fluid-structure system, including its sloshing frequencies, is paramount when designing safety critical structures with fluid filled tanks. For regularly shaped tanks, well established codes and standards are readily available to represent the impulsive and convective motion using springs and masses in finite element analysis (FEA). Depending on the complexity of the geometry, these codes and standards are unlikely to accurately predict the sloshing frequencies and hydrodynamic stresses of irregularly shaped tanks.

A study from literature, used an acoustic-structural approach to predict the sloshing modes in a complex shaped tank and validated using a physical model. This investigation replicates this acoustic-structural approach using Abaqus and uses a modified acoustic-structural approach, utilising Isight, and a Eulerian based FEA method, separately, to validate the sloshing frequencies.

The sloshing frequencies from the acoustic-structural eigenvalue extraction successfully replicate the sloshing frequencies from the literature. The modified acoustic-structural and the Eulerian methods both correctly predict the lower frequency modes, meaning both methods can be used to validate the sloshing frequencies from complex shaped tanks in the future.

To conclude, the acoustic method can accurately calculate the sloshing frequencies of a fluid-structure system and can be used to tune the spring-mass system representing the convective motion of the fluid.

# Electromagnetic Technology Breakout

### SIMULIA Electromagnetics 2026 Update | Yingjie You, Dassault Systèmes

This talk will highlight the best technology of CST Studio Suite and the Electromagnetic Engineer on 3DEXPERIENCE® Cloud. The updates will focus on the major industry processes like antenna and microwave component engineering, as well as communication and detection. In addition, the talk will introduce the enhancements for EMC compliance analysis for PCB and Wire Harness, considering the effect of mechanical assembly.

### Customer Presentation | Automated Design and Optimization of Phased Array Antennas Using CST Studio Suite and Python | Freysteinn Vidarsson, TERASi

We present a Python-based workflow for the automated design, simulation, and optimization of millimeter-wave phased array antennas in CST Studio Suite. Antenna geometries are constructed programmatically enabling full parametric control without manual interaction. Electromagnetic simulations are executed through CST's Python API, and S-parameter results are exported and parsed in Python for post-processing. Array performance metrics — including scan patterns, beam efficiency, and port matching — are evaluated using NumPy and custom analysis routines. The flexibility of Python allows the workflow to be readily adapted to new antenna topologies, array configurations, and design requirements. This enables closed-loop optimization where Python drives parameter updates and re-simulation iteratively, reducing design cycle time and enabling systematic tolerance and sensitivity analysis across large parameter spaces.

### Keep cool! Electronics Cooling Simulation using CST Studio Suite | Yingjie You, Dassault Systèmes

As electronics shrink in size and surge in power, efficient thermal management is crucial. This presentation explores how CST Studio Suite facilitates innovative electronics cooling simulations, ensuring optimal thermal performance. Learn how to leverage advanced simulation tools to design reliable, compact, and high-performance devices, keeping electronics cool and efficient.

### Modelling and Simulation of Phased Array Antenna based Systems | Yingjie You, Dassault Systèmes

Full-wave analysis of antenna arrays in mobile base stations has gained traction in recent years. A virtual twin of an antenna array provides a comprehensive performance overview, allowing engineers to predict and troubleshoot issues before manufacturing, ultimately reducing costs and development time. These antenna arrays typically contain at least fifty elements, and for 4G LTE networks, Multiple Input Multiple Output (MIMO) technology relies on the broadband behavior of individual elements to function effectively.

Two primary numerical methods are used for antenna simulations: time-based methods like the Finite Integration Method (FIT) and Transmission Line Method (TLM), and frequency-based methods such as the Finite Element Method (FEM). Time-based methods are robust and GPU-accelerated but require fine mesh resolution, resulting in small time steps and long simulations. Additionally, Frequency Selective Structures (FSS) within arrays are highly resonant, further increasing convergence time.

FEM handles multiple excitations well but struggles with scalability. As mesh size increases, its memory requirements grow as $O(N^2)$ and computational time between $O(N^2)$ and $O(N^3)$, making large-scale simulations impractical.

A promising alternative is the Domain Decomposition Method (DDM), a subset of FEM that divides the simulation domain into smaller subdomains. Though widely used in structural mechanics, it has been underutilized in electromagnetic simulations. By exploiting the periodicity of antenna arrays, DDM accelerates simulations while reducing hardware demands. This approach retains FEM's advantage in handling multiple excitations while significantly cutting computational costs.

Previously, full antenna array performance was determined through prototype measurements, as simulations were too costly or time-consuming. With DDM, large-scale full-wave simulations are now feasible, enabling detailed volumetric analysis within reasonable time frames.

Continuous improvements in DDM implementation optimize high-performance computing (HPC) hardware, including early-stage GPU computing. Ongoing refinements have further minimized hardware requirements, making high-accuracy simulations more accessible. This democratization of simulation technology enhances efficiency and cost-effectiveness in antenna array development.

Benchmarks using internal and real-world customer models demonstrate significant reductions in simulation time and computational resources, translating into lower costs for users. With DDM's benefits, this method is positioned as a powerful tool for simulating electrically large structures efficiently and affordably.

This talk aims at taking the audience through a journey of antenna array simulation, its challenges, a brief overview of the DDM method and why it is suited to tackle antenna arrays and prove it with some benchmarks.

## The Industry Simulation Software for Fusion project aims to demonstrate the capability of existing simulation software on fusion relevant problems. Case Study 6 is an electromagnetic-structur | Ben Pine Dassault Systèmes

The Industry Simulation Software for Fusion project aims to demonstrate the capability of existing simulation software on fusion relevant problems. Case Study 6 is an electromagnetic-structural workflow modelling transient loads on a representation of a tokamak thermal shield. The primary goal of the study is assessing capability in computation of induced Lorentz forces and resultant structural response on thin, large aspect ratio structures.

The geometry includes a 1/12 symmetric section of the tokamak thermal shield, conductors and supports. Important to note is the extreme aspect ratio of the thermal shield which is almost 30 m high, 15 m radius but only 2.5 cm thick. It also has a complicated, in some areas triply curved, topology.

SIMULIA products CST STUDIO SUITE, Opera and Abaqus have been to used to simulate two subcases for Case Study 6. In the first, the main conductors ramp down over 200 seconds. In the second, the main conductors stay at their nominal currents, but there is a plasma disruption inside the tokamak. For both subcases, eddy currents are excited in the conducting material of the thermal shield. These will lead to large (Lorentz) forces on the thermal shield. The element force densities were then converted to Abaqus sim files which could be used as inputs to the Abaqus simulations.

An overview of how the simulations were prepared and carried out, with a summary of the results, will be reported.

# Multibody System Dynamics & Motion Simulation Technology Breakout

### Multibody/Motion State of Technology and Motion Vertical Roles | Avijit Chauhan, Dassault Systèmes

Motion Roles provide a full spectrum of Multibody Dynamics capability on the 3DX platform. While the users can utilize the full CAD potential to create their models, the Simpack high end solver provides the accuracy, reliability and robustness to solve these. In this session we will provide insights of what's currently available, and the updates in the most recently released versions. The Motion Roles and the associated Apps functionalities will be discussed in detail with some examples.

### High Fidelity Electric Drive NVH Simulations with Simpack | Avijit Chauhan, Dassault Systèmes

The heart of an E-Drive powertrain is the power unit. This session will demonstrate Simpack's capabilities to model and solve typical Electric Drive simulations. We will provide an overview of the Simpack E-Machine Interface that allows users to include / import electromagnetic Forces and Torques for the excitation of the system w.r.t. the NVH analysis. A detailed modelling of gearbox components will be discussed including roller bearings, gear pairs (including flex gears). The model would also include a flexible housing to consider resonances and surface oscillation as a source for acoustic radiation.

Various analysis methods will be discussed including: time integration, frequency/order analysis and operating deflections shapes methods.

### Simpack Automotive Database and Realtime Profiler | Avijit Chauhan, Dassault Systèmes

This session will present an overview of the Simpack Automotive Database (Simpack ADB). Simpack ADB allows for quick creation of full vehicle models which are hard realtime ready and can be connected directly to hardwares like a driving simulator. You may use these high fidelity component based models which may also include flexible (deformable) bodies, hydromounts, active systems, etc. to analyse ride comfort for rough roads, or drive around corners to analyse their handling performance.

Simpack also features a Realtime Profiler which can be used to gain insight of various components within the Simpack model with an aim to distribute the load on the CPUs more evenly if required, hence achieve maximum performance. This session will give an overview of this profiler using a full vehicle model example

# Fluids Technology Breakout

## Accelerate Aerodynamics & Aeroacoustics with PowerFLOW on GPU | Giovanni Fiore, Dassault Systèmes

SIMULIA offers a comprehensive Fluids portfolio that delivers hundreds of workflows to customers across industries. In this presentation, we'll summarize highlights and recent deliveries in the PowerFLOW suite, Fluid Dynamics Engineer, Plastics Injection Engineer and other fluids roles. All roles embrace the MODSIM paradigm: the tight integration of design engineering and simulation that enables full associativity between CAD and simulation model, automatic updates when the design changes, and the capability for multiphysics optimization. Key enhancements have been delivered in all steps of the simulation process, including model preparation and geometry idealization, mesh generation, and results exploration. We'll also describe important advancements in solver capabilities, including GPU computing, and improved user experience for scenario creation.

## Accelerate Aerodynamics & Aeroacoustics with PowerFLOW on GPU | Guido Parenti, Dassault Systèmes

In today's automotive industry, vehicle development teams have to meet strict deadlines and have limited resources to iterate and evolve the design and performance of the vehicle exterior. The number of possible styling variants and configurations can often reach into the hundreds. Therefore, increased performance and accuracy of Computational Fluid Dynamics (CFD) simulations have become a main objective of every vehicle OEM. Today, GPGPU memory and performance has reached a point where there is an increased interest in their usage for aerodynamic & aeroacoustics simulations. GPGPUs offer potential simulation performance improvements due to lower power consumption and hardware costs. With this in mind Dassault Systèmes has recently implemented a GPU based version of its Lattice Boltzmann Method (LBM) fluid solver PowerFLOW. LBM is known to be well suited for GPU computation as the method is naturally vectorizable. Additionally, as a low dissipation, inherently transient approach, it is also well-suited for accurate evaluation of external automotive aerodynamics & aeroacoustics.
This talk will provide a detailed comparison between GPGPU based PowerFLOW results vs its x86 CPU based equivalent using the publicly available DriAver aerodynamic model. The resulting flow structures and forces will be compared to show that the results are numerically equivalent. Additionally, aeroacoustics examples for workflows such as greenhouse wind noise & fan noise will be demonstrated. A comparison of turn-around time and scalability on NVIDA A100, H100 & L40 cards will also be demonstrated showing significant potential to reduce overall simulation time for vehicle analysis using GPGPUs.

## Multi-species and Multi-phase capabilities with PowerFLOW | Tom Lindén, Dassault Systèmes

This presentation is focused on the extended capabilities of the high fidelity PowerFLOW Lattice Boltzmann solver related to multi-species and multi-phase simulation. We will review the legacy Lagrangian particle tracking capabilities and the current standard workflows associated with it. Next, we will give an overview of the newly released User Defined Scalar [UDS] and Phasefield solvers. These solvers provide continuum-based solutions for gas tracking, extended visualization methods, as well as multi-phase flows for gas-liquid or liquid-liquid simulations. This overview will provide background on the advantages and limitations of the solvers, as well as show examples of the capabilities.

### Improved Fluid Dynamics Engineer on the 3DEXPERIENCE platform PowerFLOW | Tommaso Messa, Dassault Systèmes

This presentation showcases ground breaking CFD simulations of a submerged submarine, both with and without its propulsion unit, delivering key insights into its hydrodynamic performance. For the first time, we are publishing hydrodynamic simulations using SIMULIA PowerFLOW. Our analysis covers resistance, drag, and appendage effects while examining skin friction and pressure distribution across the hull. Additionally, we predict turbulent boundary layer pressure fluctuations, crucial for hydro-acoustic applications.

Beyond flow dynamics, we evaluate open-water propeller performance, assessing thrust, torque, and efficiency. The study also delves into installed propeller behavior, leveraging RPM trimming to determine self-propulsion points accurately. Furthermore, we tackle the challenge of tracking extreme long-distance wakes using transient boundary seeding techniques.

By combining high-fidelity simulations with real-world applications, this research provides valuable data for optimizing submarine design. These insights enhance propulsion efficiency, minimize noise signatures, and improve overall underwater manoeuvrability for naval, research, and engineering advancements.

### Analysis of turbulent wakes with model reduction techniques | Alejandro Martinez Navarro ,Dassault Systèmes

Road vehicles and their rotating wheels act as complex bluff bodies, generating highly turbulent wakes characterized by multi-scale vortex shedding with complex interactions. Geometry changes in the vehicle have an impact on these inherently dynamic interactions, which are unnoticed in steady-state modeling. While transient simulations offer the necessary data to show this dynamic behavior, the sheer volume and complexity of it often obscures meaningful patterns. In this presentation Proper Orthogonal Decomposition (POD) is introduced as means to synthesize coherent flow structures and interactions into modes that describe the transient flow behavior

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Back by popular demand, we are bringing the SIMULIA Driving Simulator. Experience the precision of real-time simulation firsthand. Get behind the wheel of our driving simulator to see how high-fidelity physics models translate into real-world performance.

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