automotive CAE GRAND CHALLENGE

April 16 – 17, 2024
Congress Park Hanau
Germany

// ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, BIG DATA: **HYBRID TWINS BASED ON SIMULATIONS AND COMPONENT TESTS**

// OCCUPANT SAFETY: **HUMAN BODY MODELS FOR OCCUPANT SAFETY, ESPECIALLY AUTONOMOUS VEHICLES**

// MATERIAL MODELING - FOCUS CRASH ANALYSIS: **MATERIAL AND FAILURE MODELS FOR CAST METALS, ESPECIALLY GIGA-CASTINGS**

// CAE PROCESS & QUALITY ASSURANCE: **MATERIAL TESTING, MODELING & DATA MANAGEMENT**

// DURABILITY / FATIGUE: **DURABILITY AND FATIGUE OF BATTERY PACKS, THEIR HOUSINGS AND SUPPORTING STRUCTURES**

// MULTI SIMULATION: **COUPLED ELECTRO/THERMAL/ CHEMICAL/FLUID ANALYSIS OF BATTERIES**

// FULL VEHICLE SIMULATION: **SENSORS AND ACTUATORS IN AUTOMATED DRIVING SIMULATION**

www.carhs.de/grandchallenge

ON SITE & ONLINE

carhs
Empowering Engineers

automotive CAE GRAND CHALLENGE

April 16 – 17, 2024
Congress Park Hanau
Germany

Background, Concept and Implementation

In the last 30 years computer simulation has become an indispensable tool of automotive development.

Challenges in virtual vehicle development

Despite of significant progress in simulation technology and impressive results in industrial application there remains a number of challenges.

The Grand Challenge as a platform for dialog

The automotive CAE Grand Challenge stimulates the exchange between users, scientists and software developers in order to solve these challenges.

Grand Challenges 2024

The Grand Challenges 2024 have been identified through a survey among the simulation experts of the international automotive industry:

- Artificial Intelligence, Machine Learning, Big Data:
  Hybrid twins based on simulations and component tests
- Occupant Safety:
  Human Body Models for occupant safety, including autonomous vehicles
- Material Modeling - Focus Crash Analysis:
  Material and failure models for cast metals, especially Giga-Castings
- CAE Process & Quality Assurance:
  Material testing, modeling & data management
- Durability / Fatigue:
  Durability and fatigue of battery packs, their housings and supporting structures
- Multi Simulation:
  Coupled electro/thermal/chemical/fluid analysis of batteries
- Full Vehicle Simulation:
  Sensors and actuators in automated driving simulation

Industry Requirements → Science & Research → Software Development

April 16 – 17, 2024
Congress Park Hanau
Germany

automotive CAE GRAND CHALLENGE

In the conference one session is dedicated to each of the most critical challenges, the „Grand Challenges“.

In every session of the conference experts from industry, research and software development will explain how critical the individual challenge is for the virtual car development process and report about their efforts to overcome the challenge.

Scientific Committee

To continuously improve the concept of the conference and to ensure the up-to-dateness and industrial relevance of the topics of the yearly survey we have introduced a scientific committee in 2013.

The scientific committee is made up of renowned CAE experts from OEMs, suppliers, engineering consultants, education and research thus representing all stake holders of automotive CAE.

We are honored to introduce the members of the scientific committee:

- **Stephen Fisher** – Jaguar Land Rover Ltd.
- **Mark Gevers** – TECOSIM Technische Simulation GmbH
- **Dr. Axel Hänschke** – CPS Pekka Stuckert Consulting Unternehmensberatung
- **Lutz Haese** – ZF Automotive Safety Germany GmbH
- **Prof. Dr. Lothar Harzheim** – Opel Automobile GmbH
- **Prof. Dr.-Ing. Dietmar Jennewein** – Hochschule Darmstadt
- **Stefan Kirschbichler** – Virtual Vehicle Research GmbH
- **Dr.-Ing. Boris Künkler** – Opel Automobile GmbH
- **Bart Peeters Weem** – BMW AG
- **Dr. Dirk Rensink** – SEGULA Technologies GmbH
- **Prof. Dr. Axel Schumacher** – Bergische Universität Wuppertal
- **Christian Stender** – Volkswagen AG
- **Alexander-Frederic Walser** – ASC-S e.V.

TUESDAY, APRIL 16, 2024

09:00 Welcome and Introduction
Dr.-Ing. Dirk Ulrich - carhs.training gmbh

Parallel Sessions 09:30 – 13:00 Brüder Grimm Saal

//FULL VEHICLE SIMULATION: **SENSORS AND ACTUATORS IN AUTOMATED DRIVING SIMULATION**

Chair: Dr.-Ing. Axel Hänschke - CPS Pekka Stuckert Consulting Unternehmensberatung

09:30 Industrial Requirements Full Vehicle Simulation: Sensors and Actuators in Automated Driving Simulation
Jürgen Wille - FrontMod GmbH

10:00 Credible and Adaptable Perception Sensor Models for Virtual Validation of ADAS/AD Functions
Stefan Kirschbichler, Simon Genser - Virtual Vehicle Research GmbH

10:30 AI-Powered Virtual Testing: Safeguarding AV Sensors for Complex Scenarios
Prof. Dr. Franz Wotawa - TU Graz; Dr. Mihai Nica - AVL List GmbH

11:00 Coffee Break

11:30 Towards Credible Perception Sensor Simulation: How to deal with uncertainties in model validation?
Dr.-Ing. Philipp Rosenberger - Persival GmbH

12:00 How to leverage simulation in ADAS development?
Gagan Gopal - Hexagon Manufacturing Intelligence GmbH; David Mear - Hexagon Manufacturing Intelligence

12:30 Simulating road weather for ADAS and AD in real-time
Samu Karanko, Petri Marjava - Vaisala Oyj

13:00 Lunch Break

Parallel Sessions 09:30 – 13:00 Conference Rooms 1 – 4

MATERIAL MODELING - FOCUS CRASH: **MATERIAL AND FAILURE MODELS FOR CAST METALS, ESPECIALLY GIGA-CASTINGS**

Chair: Bart Peeters Weem - BMW AG

09:30 Study of crash CAE technology for aluminum die-cast car bodies
Kenichiro Fukagawa - Honda Motor Co., Ltd.

10:00 Materials modelling. From crack growth in aluminium plates with Abaqus to fracture in crash of aluminium wheels linking injection with ANSA and PAMCRASH
Dr. Andrés-Amador Garcia Granada - IQS School of Engineering

10:25 Experimental and theoretical prediction of a micromechanics-based stress state dependent failure model for ductile materials in ABAQUS, LS-DYNA and PAM-CRASH
Sirus Rafiee - Waldaschaff Automotive GmbH

10:50 Coffee Break

11:20 Material and failure criteria in Altair Radioss for modelling of large casted structures
Marian Bulla - Altair Engineering GmbH

11:45 Modelling of HPDC und LPDC Components with Material Model MF GenYld+CrachFEM
Gernot Oberhofer, Philipp van der Loos, Dr.-Ing. Helmut Gese - MATFEM Ingenieurgesellschaft mbH

12:10 New Modular Material framework applied to casted components: Handling manufacturing simulation results in performance evaluation
Jean-Christophe Allain, Dr.-Ing. Sebastian Müller, Dr.-Ing. Dominic Hühn, Mathieu Moerckel - ESI Group

12:35 Controlled-Fracture-Driven CAE Analysis of Aluminum-Based Lightweight Structures in Crashworthiness Applications: SAMP-1 plus GISSMO
Ovidi Casals, Alejandro Domínguez, Pedro Marijuan, Ángel Sillero - Applus IDIADA

13:00 Lunch Break

TUESDAY, APRIL 16, 2024

Parallel Sessions 14:00 – 17:30 | Brüder Grimm Saal

MULTI SIMULATION: **COUPLED ELECTRO/THERMAL/ CHEMICAL/FLUID ANALYSIS OF BATTERIES**

Chair: Dr.-Ing. Dirk Rensink - SEGULA Technologies Germany

14:00 Industrial Requirements Multi Simulation Batteries
Dr.-Ing. Dirk Rensink - SEGULA Technologies Germany

14:30 Numerical modelling of thermal runaway in Li-ion battery modules
Luis Otavio Cortes Magalhaes, Benjamin Schaufelberger, Dr. Simon Holz - Fraunhofer-Institut für Kurzzeitdynamik, Ernst-Mach-Institut, EMI

14:55 The digital battery: advanced physical simulation models for cell development and characterization
Dr. Jochen Zausch, Jan Lammel, Dr. Dariusz Niedziela, Dr. Falco Schneider - Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM

15:20 Coffee Break

15:50 Multiphysical battery modeling with a focus on crash failure
Klemens Jantscher - Virtual Vehicle Research GmbH

16:15 Lifetime modeling of modern BEV batteries
Mohammadali Mirsalehian, Rüdiger Beykirch, Dominik Thien - FEV Europe GmbH

16:40 Advancing Battery Technology through Unlimited Multiphysics Analysis
Dr. Johannes Sperber - Comsol Multiphysics GmbH

17:05 Comparison of a fully coupled 3D electrothermal battery model with a common sequential 1D/3D simulation approach for EDAG´s second life battery
Fabian Möller, Nishant Jakhiya, Ronny Katzorke, Dr. Andreas Viehmann - EDAG Engineering GmbH

17:30 Exhibition

18:30 Bus Transfer to “Wirtshaus am See”

Evening Reception and Dinner 19:00 // Wirtshaus am See

Parallel Sessions 14:00 – 17:30 Conference Rooms 1 – 4

CAE PROCESS & QA: **MATERIAL TESTING, MODELING & DATA MANAGEMENT**

Chair: Dr.-Ing. Boris Künkler - Opel Automobile GmbH

14:00 From basic specimen to material card – daily challenges and opportunities from the Volkswagen perspective
Dr.-Ing. Tony Porsch - Volkswagen AG

14:30 Variable Material Characterization of FRPs and their Recyclates from Combined Test and Simulation Data
Dr. Hannes Grimm-Strele - Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM et al.

15:00 Experimental and Numerical Investigations on Crack Propagation in Float Glass
Prof. Dr.-Ing. Thomas Pyttel - TH Mittelhessen Campus Gießen; Dr. Helge Liebertz - Volkswagen AG; Dr.-Ing. Dominic Hühn, Jan Kappmeyer - ESI Group

15:30 Coffee Break

16:00 Integrated Experimental Analysis, Modeling, and Validation of High-Performance Unidirectional Thermoplastic Composite Lamina
Dr. Daniel Campos (Murcia) - Applus DatapointLabs; Brian Croop - DatapointLabs

16:30 From Raw Material to CAE. Data Management in the Generation of Material Cards at Newgentechs
Daniel Muñoz Valentin, Alberto Regidor, Javier Ferrer Revenga - newgentechs

17:00 Function Data Management for Virtual Vehicle Development
Michael Baumann, Dirk Kress - Karakun AG

17:30 Exhibition

18:30 Bus Transfer to “Wirtshaus am See”

Parallel Sessions 08:30 – 13:30 Brüder Grimm Saal

OCCUPANT SAFETY: **HBMS FOR OCCUPANT SAFETY, INCLUDING AUTONOMOUS VEHICLES**

Chair: Stefan Kirschbichler - VIRTUAL VEHICLE Research GmbH

08:30 Integration of Human Body Models in Occupant Safety – Challenges and Opportunities from Volkswagen's perspective
Christoph Vieler, Dr. Debasis Sahoo, Fenna Neumann, Ernst Glas - Volkswagen AG

09:00 Development of Human Body Model (HBM) for Virtual Testing and Product Development
Stefan Kirschbichler - VIRTUAL VEHICLE Research GmbH; Dr. Chirag Shah - Humanetics Innovative Solutions, Inc.

09:25 Hans – a High Fidelity Human Body Model for the Automotive Industry
Alexander Gromer, Dr.-Ing. Dirk Freßmann - DYNAmore GmbH

09:50 Addressing Industry Positioning Challenges of Human Body Models with the aid of ANSA
Thanassis Lioras - BETA CAE Systems S.A.

10:15 Coffee Break

10:45 Realistic articulation and positioning of Human Body Models in vehicle safety simulations
Manu Agarwal - Arup India Private Ltd; Dr. Galal Mohamed - Arup

11:10 Altair HyperWorks – Application of HBMs in Occupant Safety Tools and Advanced Physical Positioning using Machine Learning
Vincent Dampuré - Altair Engineering GmbH; Dr. Franck Njilie Adamou - Altair Development France

11:35 Human Body Models customization by advanced mesh morphing: parametric THUMS
Emanuele Di Meo - RBF Morph srl; Emanuele Lombardi, Andrea Lopez, Prof. Marco Evangelos Biancolini - University of Rome "Tor Vergata"

12:00 Lunch Break

13:00 **KEYNOTE:**
The role of CAE in handling the Grand Challenges of Hydrogen Production, Storage and Use in cars
Dr.-Ing. Dirk Rensink - SEGULA Technologies Germany

Parallel Sessions 08:30 – 12:00 Conference Rooms 1 – 4

DURABILITY / FATIGUE: **DURABILITY AND FATIGUE OF BATTERY PACKS, THEIR HOUSINGS AND SUPPORTING STRUCTURES**

Chair: Frank Braunroth - SEGULA Technologies GmbH

08:30 Industrial Requirement Durability and Fatigue of Battery Packs, their Housings and Supporting Structures
Dr.-Ing. Dirk Ulrich - carhs.training gmbh

09:00 Experimental and Numerical Developments on Fatigue of Chassis Components: Conclusions from the Fatigue4Light H2020 Project
Prof. Dr. Lucia Barbu, Dr. Sergio Jimenez - International Centre for Numerical Methods in Engineering (CIMNE); Sergi Parareda - Eurecat - Centre Tecnològic de Catalunya

09:30 Fatigue life Calculation and Joining Technology for Battery Frames in the Automotive Industry
Axel Werkhausen - Engineering Center Steyr GmbH & Co KG

10:00 Coffee Break

10:30 Test and simulation challenges and solutions for battery fatigue
Dr. rer. nat. Michael Hack - Siemens Industry Software GmbH

11:00 Battery Pack Vibration Fatigue Assessment by Abaqus and fe-safe
Dr. Jaehwan Choi - Dassault Systemes Simulia Corp

11:30 Simulation-based Cable Durability: Relative and Absolute Predictions
Dr. Fabio Julian Schneider-Jung - Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM

12:00 Lunch Break

WEDNESDAY, APRIL 17, 2024

13:30 – 17:05 Brüder Grimm Saal

ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, BIG DATA: **HYBRID TWINS BASED ON SIMULATIONS AND TESTS**

Chair: Alexander Frederic Walser - ASC-S Automotive Solution Center for Simulation e. V.

13:30 AI Integration in Structural CAE Analysis: Are We Addressing the Right Challenges?
Dr. Fabiola Cavaliere - Centro Técnico de SEAT, S.A.

14:00 Towards accelerated crash simulations: Finite Element Method Integrated Networks (FEMIN)
Simon Thel - Volkswagen AG + TU München; Dr. Lars Greve, Dr. Bram van de Weg, Prof. Dr. Patrick van der Smagt - Volkswagen AG

14:30 How Simulation Models can Learn from Real World Test Data
Dr. André Backes - TECOSIM GmbH

15:00 Coffee Break

15:30 Applications of Model Order Reduction comparing test and simulation results
Clemens-August Thole - SIDACT GmbH; Dr. Masahiro Okamura - JSOL Corporation; Dominik Borsotto, Vinay Krishnappa - SIDACT GmbH

16:00 Simulation Data Management Systems: The Foundation to Integrate ML and Data Analysis Techniques
Dr. Ferenc Leichsenring, Dr. Martin Liebscher, Marko Thiele - SCALE GmbH

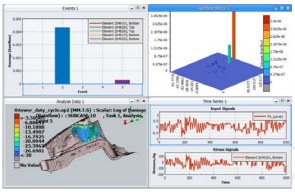
16:30 Real-Time Multiphysics Twins by Extending Simulation Apps with Surrogate Models
Dr. Thorsten Koch - Comsol Multiphysics GmbH

17:00 Summary and Closing Remarks
Rainer Hoffmann - carhs.training gmbh

Program subject to change.

APRIL 16, 2024 | 11:30 – 13:00

BETA CAE Systems Workshop



Part 1

ANSERS: Visualizing Simulation and Test Data on the Web

In this informative session, we will present an in-depth overview of ANSERS, a web application that offers a front-end web dashboard interface for accessing and combining engineering simulation and test data.

Throughout the session, we will demo a series of use cases, such as evaluation of Human Body Models Injury Criteria, analysis of Battery Structures in different load cases, handling of model and material data. These showcases provide insights of how ANSERS can facilitate efficient decision-making and optimization of engineering designs.

Part 2

Key features and use cases of FATIQ

FATIQ is a new fatigue analysis software built on a versatile solver-neutral framework, designed to simplify and streamline fatigue assessment processes. In this conference demo presentation, we showcase the software's capabilities through two widely recognized industrial use cases.

The first use case focuses on vibration fatigue analysis, where a single Power Spectral Density (PSD) loading is applied. The second use case delves into a pseudo-static scenario, where a complex loading pattern is represented by a duty cycle. By showcasing these examples, will gain insights into the process of load definition, materials assignment, and comprehensive post-processing functionalities.

BETA
SIMULATION SOLUTIONS

APRIL 16, 2024 | 14:00 – 17:30

asc(s Workshop: “simpulse day”

Advancing Data & Model Based Certification

As vehicles become increasingly complex, driven by advancements in software-defined architectures, electrification, connectivity, and automation, the traditional methods of testing and certification struggle to keep pace. Virtual development methods offer decisive advantages in order to meet increasing product complexity, faster software update cycles as well as forcing certification and customer requirements by getting a deeper understanding of how a product will perform under various circumstances, thereby reducing the risks associated with product failures.

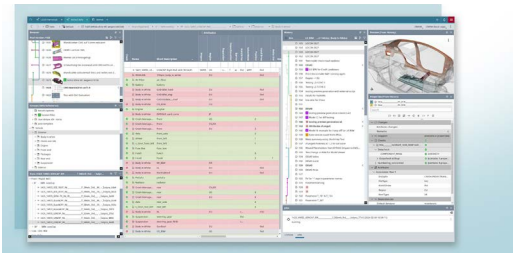
The increasing demand for simulation-based decisions requires the potential for virtual certification to be tapped. The evidence in simulation results and thus the simulation credibility is becoming increasingly important, especially for the approval of safety-relevant systems. Virtual certification of vehicles can offer numerous benefits for manufacturers, regulatory authorities, and consumers alike. This includes cost savings, time efficiency, reduced environmental impact, enhanced safety, improved accuracy, flexibility, scalability, risk reduction, innovation, and global accessibility. By leveraging virtual simulations, manufacturers can streamline the certification process, deliver safer and more efficient vehicles, and meet the evolving needs of the automotive industry. In this workshop participants will have the opportunity to engage with peers, share experiences, and explore emerging trends and approaches shaping the future of vehicle certification in an increasingly complex automotive landscape. We invite you to explore and discuss cutting-edge methodologies, tools, and best practices for leveraging data and simulation models to achieve certification objectives efficiently and effectively.

simpulse day tickets are free of charge – but limited.
SIGN UP NOW

asc(s Automotive Simulation Center Stuttgart

APRIL 17, 2024 | 10:30 – 12:00

Exploring SCALE.sdm: Advancing Simulation Data Management



Discover Simulation Data Management with SCALE.sdm!

Join us for an informative workshop where Ferenc Leichsenring and Marko Thiele from SCALE GmbH will provide an in-depth overview of SCALE.sdm, an advanced simulation data management solution. Throughout the session, we'll delve into the three core components of our SDM solution:

- Project management: Handling project administration, milestones, requirements, responsibilities, targets, and approval processes.
- Model management: Managing model setup including CAD, mesh, simulation, version control, load cases, HPC-submission, documentation, and collaboration features.
- Result analysis: Evaluating test and simulation results, generating reports, conducting correlation studies, and performing data analysis.

Gain valuable insights from the perspective of both users and project managers on how SCALE solutions can enhance your workflows.
Live demonstrations will illustrate typical CAE processes and workflows facilitated by SCALE.sdm.

We welcome your participation in a constructive discussion exploring the potential integration of SCALE.sdm software into your existing environment. Join us to explore the practical aspects of simulation data management and its impact on your projects with SCALE.sdm!

SCALE
IT-Solutions for CAE

automotive CAE GRAND CHALLENGE

April 16 – 17, 2024
Congress Park Hanau
Germany








April 16 – 17, 2024
Congress Park Hanau
Germany

automotive CAE GRAND CHALLENGE

Event Facts & Registration

Date	April 16 – 17, 2024
Location	Frankfurt/Hanau, Germany
Fee	**ON SITE:** EUR 1,090 till 19.03.2024, thereafter EUR 1,390 includes evening reception and full access to the ONLINE – Live & On demand package. **ONLINE:** Live & On Demand: EUR 990 includes access to the conference video stream live and on demand (up to 12 months after the event).
Discounts	Universities and public research institutes receive a 40% discount on the registration fees.
Language	English

All prices are exclusive of VAT.

- Access to conference venue including presentations and exhibition
- Networking: Coffee, refreshments & lunches during conference breaks
- Networking: Conference dinner
- Ask questions to the speakers after presentations
- Watch live stream of conference presentations (including pause/resume/skip function)
- Watch lab and demo sessions on demand (these sessions are not part of the live stream)
- Watch conference recording at any time you want and as many times as you want for at least 12 months
- Full personal access to the conference app
- Add your profile to the conference app and connect with other attendees & speakers
- Download presentations (PDF) from the conference app (depending on speakers permissions)
- Access to sponsor and exhibitor profiles on the conference app

Register for **ON SITE**

Register for **ONLINE**

April 16 – 17, 2024
Congress Park Hanau
Germany

automotive CAE GRAND CHALLENGE

PLATINUM SPONSOR

TECOSIM

GOLD SPONSORS

BETA SIMULATION SOLUTIONS

science + computing

SILVER SPONSORS

ALTAIR

Applus DatapointLabs

ARUP

atnorth

COMSOL

newgentechs

DYNA MORE /An Ansys Company

FEMFAT software BY MAGNA POWERTRAIN

GESELLSCHAFT FÜR NUMERISCHE SIMULATION gns

KARAKUN

Oasys LS-DYNA ENVIRONMENT

SCALE IT-Solutions for CAE

scapos

SIDACT GmbH

EXHIBITORS

This event is organized by
carhs.training gmbh
Siemensstraße 12
D-63755 Alzenau, GERMANY
www.carhs.de

Tel. + 49 6023 96 40 60
Fax + 49 6023 96 40 70
trainingcenter@carhs.de

Congress Venue:
Congress Park Hanau
Schlossplatz 1
D-63450 Hanau, GERMANY
www.cph-hanau.de

www.carhs.de/grandchallenge