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Final programme

Wednesday: May 20, 2026

8:00 (CST)	Welcome
8:30	**Keynote**: **The role of AI in accelerating high efficiency engine development for the future** This keynote address explores how AI-assisted simulation is transforming the future of high-efficiency engine development. Focusing on China's rapidly evolving automotive sector, the presentation highlights how AI can accelerate engineering workflows, reduce calibration and testing effort, and enhance simulation-driven decision-making. It also outlines Realis Simulation's vision for combining physics-based modelling with domain-specific AI to deliver faster, smarter and more efficient powertrain development. Chris Hopper Managing Director, Realis Simulation Inc.
	Chair: Daniel Terber Technical Lead, Fluid Dynamics, Realis Simulation
9:00 (CST)	**Comparative calibration of vehicle fuel economy for methanol range extender power generation strategies using WAVE-RT** This presentation demonstrates how to utilize the WAVE-RT virtual calibration HIL test bench for the efficient validation and optimization of the "intelligent power generation strategy" in a methanol range-extended electric truck. By replacing real vehicle testing with high-precision models, this approach successfully achieves precise comparisons of the economic performance of different power generation strategies while shortening the R&D cycle and reducing risks. The final calibration results indicate that the optimized intelligent power generation strategy can significantly improve the methanol-to-electricity conversion efficiency under suburban driving conditions, achieving a maximum methanol consumption reduction of 6.6%. This provides effective support for the energy-efficient development of methanol range-extended commercial vehicles. Xian Zhang Geely-CV

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9:30	**Key technologies for hybrid vehicle virtual calibration applications based on WAVE-RT** This presentation systematically elaborates on the key technical pathway adopted by FAW Hongqi to construct a virtual calibration system for hybrid vehicles based on the WAVE-RT real-time simulation tool. By converting one-dimensional WAVE models into real-time models and integrating them into a Hardware-in-the-Loop (HiL) system, a closed loop is formed with real ECUs/HCUs, enabling automated front-loaded calibration of the engine air-charge model, VVT, and hybrid strategies. The system covers various hybrid architectures, including P1P3, P2, P1P3P4, and range extenders, achieving a convergence accuracy of over 95% for key engine model parameters. The simulation deviation in vehicle fuel consumption under WLTC conditions is optimized from 8% to 4%, significantly compressing the calibration cycle and supporting energy consumption optimization and OBD diagnostic validation. Hailong Su FAW
10:00	Tea break
	Chair: Vratislav Ondrak Product Manager, Systems Engineering, Realis Simulation
10:30 (CST)	**Multi-scenario Virtual Development based on VECTIS CFD for sustainable power systems** This presentation focuses on the multi-scenario application of VECTIS CFD-based virtual development in sustainable power systems. Traditional power system development relies heavily on physical prototypes and repetitive tests, causing high costs and low efficiency in energy-saving and low-carbon upgrading. This work adopts CFD simulation technology to carry out full-process virtual verification, targeting three core scenarios: green fuel flow characteristics, advanced combustion system optimization, and integrated generator unit performance analysis. By accurately predicting fluid flow, combustion reaction and energy conversion behaviours, CFD virtual development eliminates design defects in the early stage, optimizes structural and operational parameters, and effectively improves the operational reliability and efficiency of power products. It greatly reduces prototype trial costs and development cycles, providing an efficient technical path for the iterative upgrading and green transformation of modern sustainable power systems. Jeff Xu Ricardo Shanghai

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11:00	**The application of FAST in optimising friction and improving efficiency in motorcycle engines** To address increasingly stringent emission regulations and fuel economy requirements, Jiangmen Da-Changjiang Group systematically introduced the FAST friction assessment tool in the development of its motorcycle engines, achieving precise analysis and optimization of the engine friction system. By establishing a comprehensive friction model that includes the crankshaft-connecting rod mechanism, piston assembly, valve train, and auxiliary systems, FAST efficiently simulates friction loss distribution under different operating conditions. The forward design of the friction system based on FAST has effectively improved the fuel economy of Da-Changjiang's motorcycle engines, providing a reliable technical approach and data support for the development of high-performance, low-friction motorcycle powertrains. Hongliang Gao DCJ CAE
11:30	**Application of FAST in friction calculation and predictive analysis of passenger car engines** This case study systematically introduces the application practice of the FAST tool in the low-friction development of FAW passenger car engines. Leveraging the rapid calculation advantages of semi-empirical models, this method achieves sensitivity quantification of key parameters such as main bearing journals, connecting rod journals, piston ring tension, and oil viscosity during the conceptual design phase. By building models of the main motion system and valve train, it accurately predicts the changes in friction power under different design schemes. The results are validated against motoring friction tests, with minimal deviations observed across all modules. This approach effectively supports the formulation of low-friction targets and the decision-making process for design solutions. Xiaoli Kong FAW
12:00	**The application of VECTIS in 3D-CFD development of motorcycle engines** To enhance the comprehensive performance and development efficiency of motorcycle engines, Jiangmen Da-Changjiang Group Co., Ltd. introduced the VECTIS 3D CFD simulation platform and systematically conducted refined numerical simulation research on key flow and combustion processes within the engine. Leveraging the multi-physics field coupling capability of VECTIS, the study simultaneously evaluated the interaction mechanisms between in-cylinder

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	flow and heat transfer, providing a basis for the co-design of the cooling water jacket and combustion chamber. The application of this technology shortened the calibration cycle for the motorcycle engines and successfully supported the development of a new-generation, low-emission, high-performance engine platform, significantly enhancing product competitiveness. Fang Shang DCJ CAE
12.30	Lunch
	Chair: Daniel Terber Technical Lead, Fluid Dynamics, Realis Simulation
13.30 (CST)	**Applicability of default flow field boundaries for exhaust manifolds based on FEARCE-Vulcan and validation of boiling module** This case systematically evaluates the two core functions of FEARCE-Vulcan software—"empirical thermal boundaries" and the "boiling module"—to address the engineering need for accurate thermal load prediction in high-power-density gasoline engines. The study shows that by using the software's built-in empirical thermal boundaries for in-cylinder and exhaust port simulations, the predicted results compared to bench test data exhibit an average error of less than 5% in key areas, with a maximum point error below 10%. This fully meets engineering accuracy requirements and validates the feasibility of "replacing high-cost CFD with semi-empirical models." Furthermore, after enabling the boiling module, simulation accuracy in high-risk boiling regions of the cylinder head is significantly improved, with the average error further reduced to 2.6%. This work demonstrates that the combined "empirical boundaries + boiling module" approach in FEARCE-Vulcan can drastically shorten the simulation cycle for full-engine temperature fields from "weeks" to "hours" while maintaining prediction accuracy. It provides an efficient and reliable tool for engine conceptual design and thermal optimization. Mingliang Liu Great Wall
14:00	**From feedback to functionality: Delivering Hino Motors requested enhancements in FEARCE-Vulcan** At the Realis 2024 Japan User Conference, Hino Motors presented a case study using FEARCE-Vulcan for thermal analysis on their engines. While the results were strong and the simulation run times orders of magnitude faster than traditional approaches, their conclusion identified several areas where usability

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	could be improved, particularly around setup complexity and integration of CFD coolant analyses. This presentation highlights the improvements delivered in the 2025.1 release of FEARCE-Vulcan, driven by Hino's feedback. Key updates include a streamlined workflow, improved default settings, clearer results visualisation, and a significantly simplified user interface. Most notably, FEARCE-Vulcan now provides a method that automatically links VECTIS 3D CFD, to predict the coolant jacket thermal load, and includes that as part of the iterative FEARCE-Vulcan FE thermal solution. This new method delivers significant efficiency and accuracy improvements as it removes manual data exchange between CFD and FE models whilst guaranteeing the correct heat transfer between the two domains. Zhiguo Lu Realis Simulation
14.30	**Calculation of the piston temperature field for a heavy-duty Diesel engine using FEARCE-Vulcan** This case study demonstrates how to efficiently address the challenge of analysing the temperature field of pistons in high cylinder pressure heavy-duty diesel engines, using the professional FEARCE-Vulcan thermal simulation tool and an innovative "core component modelling + semi-empirical formula" approach. The model established with this method improved computational efficiency by a factor of a hundred while maintaining high accuracy. Based on this model, pistons made of steel and iron were compared. The results showed that, due to its lower thermal conductivity, the iron piston exhibited a higher maximum temperature at the top centre compared to the steel piston. Moreover, areas like the first ring groove were more prone to heat accumulation, resulting in higher thermal loads and greater cooling requirements. This work provided crucial data for piston material selection, cooling structure optimization, and thermal management strategy development, effectively supporting the forward reliability engineering of high-power-density engines. Xin Wang FAWDE
15:00	**Application of WAVE and FEARCE-Vulcan in the temperature prediction of engine thermal systems** This case study introduces the integration of WAVE 1D performance simulation and FEARCE-Vulcan thermal analysis tools to address the challenges of combustion chamber temperature prediction and durability in the development of

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	high-power-density motorcycle engines. By importing engine data matched with combustion analysis databases into WAVE to obtain precise thermodynamic boundary conditions, the time required for traditional CFD combustion simulations is significantly reduced. The study demonstrates that Vulcan's temperature predictions for key areas such as the combustion chamber and valve seats show high consistency with measured results. Most errors are controlled within 5%, with a maximum error not exceeding 10%. This method has successfully guided the selection of valve materials, determination of compression ratios, and optimization of cylinder head cooling water jacket designs. While ensuring prediction accuracy, it has substantially shortened the development cycle, providing an efficient and reliable technical approach for enhancing engine durability and performance. Junjie Shi Sundiro Honda
15.30	Tea break

	Chair: Vratislav Ondrak Product Manager, Systems Engineering, Realis Simulation
16:00 (CST)	**Simulation and development of Li Auto's new generation range extender** This case study presents the simulation-based development of Li Auto's all-new range extender, covering one-dimensional performance analysis, three-dimensional CFD flow analysis, three-dimensional structural strength analysis, multi-body dynamics, and NVH analysis. It demonstrates how these advanced simulation methods supported Li Auto in achieving comprehensive performance targets for NVH, fuel consumption, and reliability in its new generation range extender, driving technological advancements in the industry. Hailong Su Li Auto
16:30	**A study on the effect of aluminium piston pin bore profiles on stress using PISDYN** To address the issues of stress concentration and fatigue failure in the head of aluminium pistons for high-power-density engines under load, Jiangbin Piston

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	Company employed PISDYN dynamics analysis software to systematically investigate the impact mechanisms of different pin bore profiles on the stress distribution in the piston head. The study established a multi-body dynamics model encompassing the piston-connecting rod-crankshaft system, accurately simulating the transient force process of the piston under combustion pressure impact. This research provided critical theoretical foundations for the reliability design of highly reinforced aluminium pistons. It aided Jiangbin Piston in achieving weight reduction while enhancing product durability, effectively supporting the piston development and supply for engines. Siping Wu JB Piston
17.00	**Driving efficiency through ring pack optimisation with RINGPAK and mode FRONTIER** Automation offers a great potential for improving efficiency in CAE workflows. Utilising the power of advanced optimisation algorithms to determine geometric parameters that deliver the best possible performance for piston assembly components can significantly save engineering teams' time. These algorithms offer many advantages over manual or Design of Experiment (DoE) type studies, including in-built tools that allow users to easily interrogate the data, and to make an assessment based on trade-off and rankings. With it's proven 3-piece Oil Control Ring (OCR) model, RINGPAK can predict Lubricant Oil Consumption (LOC) accurately making it the ideal tool for parametric studies of the piston ring pack. In this study, we show how RINGPAK coupled with modeFRONTIER is used to optimise the ring pack of a 3-cylinder GTI engine to find the optimal trade-off between oil consumption, blow-by and friction. Zhiguo Lu Realis Simulation
17:30	**Accelerated accurate detailed kinetics in 3D-CFD VECTIS simulations** Detailed chemistry is crucial in internal combustion engine (ICE) simulations to capture fuel composition effects and pollutant formation. However, high computational costs limit its use. A new feature in VECTIS introduces a chemical clustering method that groups cells with similar thermo-chemical states, dramatically accelerating source term computation by up to 10 times and cutting overall simulation time by up to 2.5 times. This breakthrough enables practical,

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	high-fidelity fuel and emissions modelling across a broader range of powertrain development workflows. Qingqiang Jiang, Evgeniy Shapiro, Charles Turquand D'Auzay, Ignacio Hernandez Realis Simulation Fabian Mauss, Lars Seidel, Anders Borg LOGEsoft
18.00	Close

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Thursday: May 21, 2026

Realis experts will host a series of workshops demonstrating how Realis Simulation products deliver low carbon solutions and reduce time to market. The workshops are organised by solution domain running concurrently in 2 separate rooms.

	Workshops Fluid Dynamics and Systems Engineering Room 1
9.00 (CST)	**Physics-based controllers in WAVE - usage and benefits** Traditional PID based turbocharger controllers rely on manual calibration, which can be time-consuming and difficult to maintain across a wide range of operating conditions. The physics-driven controllers in WAVE eliminate the need for manual tuning by automatically adapting to operating conditions based on the underlying turbocharger and engine physics. Its fast dynamic response makes it suitable for both steady-state and transient simulations, while the inclusion of turbocharger rotational acceleration effects further improve controller responsiveness. This session demonstrates the setup of conventional PID turbocharger controllers for WAVE engine models with wastegate and VGT configurations and compares them with equivalent RS physics-based boost controllers. Model convergence and performance are evaluated under steady-state and transient conditions, highlighting the benefits of physics-based controllers without calibration. Daniel Terber, Shuxin Jiang
10.30	Tea break
11.00	**Unlocking dual-fuel engine potential with VECTIS 3D-CFD** This workshop explores how the latest dual-fuel modelling capabilities in VECTIS enable engineers to achieve more accurate, chemistry-driven insights into modern combustion systems. By moving beyond simplified equilibrium approaches, users can better predict ignition, burn rates, and emissions for complex fuel blends such as diesel–ammonia or diesel–methanol. The result is improved confidence in simulation-led design, supporting the development of cleaner, high-efficiency engines and accelerating innovation in low-carbon powertrain technologies.

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	Participants will learn how to apply the dual-fuel CPV framework within a practical CFD workflow, including chemistry table generation, model setup, and simulation execution. The session will demonstrate how detailed kinetics influence combustion behaviour and emissions, supported by example results. Attendees will gain hands-on understanding of how to leverage these tools to optimise fuel strategies and engine performance Qingquiang Jiang, Nick Tiney
12.30	Lunch

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13.30 (CST)	**WAVE-RT model development workflow using a motorcycle ICE** This workshop outlines a streamlined workflow for converting an initial engine model into a calibrated WAVE-RT model suitable for XiL deployment. While the example uses a WAVE model, the approach is equally applicable to GT-Power models or models built from scratch. The final model will support system-level simulation in an IGNITE session, covered separately. Attendees will gain a high-level understanding of how Realis Simulation tools integrate to create an accurate, faster-than-real-time digital twin of a single-cylinder motorcycle engine. Key topics include model instrumentation for automated calibration in R-Desk Tuner using user libraries, and efficient calibration across the full operating range. The session concludes with post-processing and an evaluation of statistical accuracy using R-Post. Daniel Terber, Shuxin Jiang
15.00	Tea break
15.30	**System-level impact of motorcycle ICE thermal and lubrication design using Real-Time 1D models in IGNITE and WAVE** This workshop presents a physics-based method for assessing the system-level impact of engine cooling and lubrication design using parameterised 1D real-time CAE models. Using a representative single-cylinder motorcycle engine, it demonstrates how simplified flow networks can capture key behaviours of coolant and oil circuits and their interaction with engine thermal states. Participants will learn how flow distribution, pump characteristics, and control strategies affect warm-up, losses, friction, and fuel economy. The session also highlights how these models support early-stage design and calibration tasks—such as thermostat and oil pressure strategies—providing a fast, scalable approach for system optimisation and engineering insight. Vratislav Ondrak, Shuxin Jiang
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	Workshops Structural Mechanics Room 2
9.00 (CST)	**Power cylinder thermal analysis of a Hydrogen ICE using FEARCE-Vulcan** This workshop demonstrates how the Realis FE-based thermal analysis tool, FEARCE-Vulcan, can be used to rapidly and accurately predict temperatures across all components of the power cylinder in a hydrogen internal combustion engine (ICE). The approach combines physical modelling with semi-empirical correlations to deliver robust results early in the design process. Aimed at engineers involved in ICE design and development, the session showcases how FEARCE-Vulcan enables efficient evaluation of thermal behaviour across multiple engine load conditions using the Run Distribution Manager (RDM). Participants will also be introduced to a new feature for streamlined extraction of engine performance data across a range of operating cases. In addition, the workshop highlights co-simulation capabilities, demonstrating the integration of coolant-side heat transfer through coupling with VECTIS 3D-CFD. Overall, the session focuses on practical, efficient workflows that support accurate and scalable thermal analysis for advanced engine concepts such as hydrogen ICEs. Zhiguo Lu, Jan Hynous
10.30	Tea break
11.00	**Automated piston thermo-structural-durability using FEARCE-Vulcan** The automated piston thermo-structural durability workflow in FEARCE-Vulcan streamlines piston stress analysis by enabling direct setup within the piston stress task in the GUI. This eliminates the multiple manual steps previously required in FEARCE, resulting in a faster, more efficient, and more robust workflow. This workshop is aimed at engineers and analysts seeking a rapid and reliable approach to piston temperature prediction and structural durability assessment under realistic operating conditions. Participants will learn how to efficiently build piston models that capture the full thermo-mechanical loading environment. The workflow integrates temperature fields predicted by FEARCE-

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	Vulcan with mechanical loads derived from piston secondary motion analysis, all within a unified framework. Using these inputs, participants will gain an understanding of piston stress analysis and high-cycle fatigue durability evaluation using the FEARCE solver. The session focuses on practical, production-ready workflows that significantly reduce model setup time while maintaining high levels of accuracy. This enables confident assessment of piston structural integrity and durability early in the design and development process. Zhiguo Lu, Jan Hynous
12.30	Lunch

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13.30 (CST)	**Performing parametric studies using the PISDYN-RINGPAK plugin** This workshop demonstrates how the PISDYN-RINGPAK plugin enables efficient and systematic parametric studies for ring pack design, helping engineers explore design spaces quickly and make more informed decisions. Attendees will gain practical insight into evaluating multiple design variants, understanding performance trade-offs, and streamlining simulation workflows to improve engine efficiency and component performance. During the session, participants will learn how to define input parameters and design variables, and how to set up loadcases incorporating cylinder pressure, temperature, and thermal deformation data. The workshop will also cover running sweep analyses to assess multiple configurations, along with post-processing techniques such as graphical visualization and clear result summarisation to support engineering analysis and decision-making. Zhiguo Lu, Michal Brezina
15.00	Tea break
15.30	**Minimising friction using the Realis toolset** Learn how the Realis Structural Mechanics toolset can be used to evaluate and minimize engine friction. This workshop will cover how the toolset can be used to investigate the trade-offs between NVH, durability and friction, and how FAST is used for predictive friction assessment in the early stages of an engine design programme. You will learn how ENGDYN can be used to predict bearing power losses against engine speed and oil feed temperature, and how these data can be used in IGNITE to predict fuel consumption for a P2 hybrid driveline. The impact on fuel consumption of changing the main bearing diameter from 45 to 40 mm will be demonstrated. This workshop will be of interest to all those involved in delivering efficient Internal Combustion (IC) engines. Michal Brezina, Zhiguo Lu
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Friday: May 22, 2026

Realis experts will be available on the final day to answer any of your questions, in an informal setting with coffee and a light buffet.

	Fluid Dynamics, Structural Mechanics, and Systems Engineering
9.00 (CST)	**Q & A** An opportunity to meet the Realis experts and to ask any questions regarding the presented material, specific software questions, or something that might not have been covered in the past 2 days. Meet the following experts from the product and application teams: Daniel Terber Qingquiang Jiang Zhiguo Lu Shuxin Jiang Vratislav Ondrak
12.30	Close