The latest release of Simcenter Amesim™ software, formerly LMS Imagine.Lab Amesim™ software, enables you to ramp up system simulation productivity by offering a revamped user experience and better integration with overall design processes. Simcenter Amesim supports new applications that focus on current industry (automotive and transportation, aeronautics and defense, mechanical industry) challenges, such as energy efficiency, pollutant emissions reduction, e-mobility trends as well as controls validation and calibration.

**Leverage the revamped user experience**
The Simcenter Amesim user interface (UI) has been fully redesigned. Thanks to this revamping and layout enhancements such as restructuring menus, the brand new library tree and fully vectorized sketch, you will have a more intuitive and optimized browsing experience. This new version is a user-friendly tool for new and experienced users alike.

**Main features**
- Redesigned user interface, menus tailored to the simulation workflow
- Easy component browsing
- Scalable vector graphics in sketches
- New CAD import capabilities
- Reinforced integration with Simcenter STAR-CCM+, Simcenter 3D Motion and HEEDS

**Summary**
The latest release of Simcenter Amesim™ software, formerly LMS Imagine.Lab Amesim™ software, enables you to ramp up system simulation productivity by offering a revamped user experience and better integration with overall design processes.

**Benefits**
- Drive innovation without compromising time-to-market and quality
- Improve productivity and accelerate the learning curve
- Ramp up system simulation productivity
- Enable concurrent and distributed development
- Keep costs under control

www.siemens.com/simcenter
What’s new in Simcenter Amesim 16

Integrate Simcenter Amesim into your global design process
Simcenter Amesim 16 relies on extended capabilities in the CAD Import tool, which enables users to automatically generate system simulation models from computer-aided design (CAD) for various physical domains. This applies to lubrication, cooling/air conditioning, multibody systems, pumps, gas dynamics, torsional analysis, environmental control, landing and fuel systems.

Since Excel spreadsheet software is the preferred tool for many engineers and is used for analyzing data from measurements and simulations. Simcenter Amesim features integrated Microsoft Excel interfaces to ensure a seamless exchange of data between both platforms. Support for data exchange via application program interfaces (APIs) is as much a part of Simcenter Amesim as the integrated Excel interface.

With the addition of Functional Mockup Interface (FMI) 2.0 for model exchange import and export, Simcenter Amesim 16 supports all existing continuous and discrete coupling modes of FMI. Moreover, all Simcenter Amesim Functional Mockup Units (FMUs) 2.0 can provide their directional derivatives. As a result, the recognized frequency analysis capabilities of Simcenter Amesim become available within an advanced FMI master or importing environments. These high-end FMI capabilities make Simcenter Amesim one of the most interoperable system simulation tools and reflects Siemens PLM Software’s expertise and prominence in the FMI Steering Committee, which defines FMI policy, strategy, feature road map and future FMI releases.

Extend possibilities by integrating other Simcenter solutions
Integrating Simcenter Amesim with other Simcenter™ solutions has been a crucial focus for this new release. First, you can seamlessly export models from Simcenter Amesim to Simcenter 3D Motion thanks to dedicated interface blocks, available in model exchange or co-simulation mode. The inputs and outputs defined in Simcenter Amesim are automatically listed in the Simcenter 3D Motion model, and can be re-used/assigned to a specific element of the multibody model. In addition, you can import a co-simulation model in Simcenter Amesim that was built in Simcenter 3D Motion.

In parallel, now that HEEDS™ software is part of the Simcenter portfolio, you can capitalize on the integration of Simcenter Amesim into the HEEDS design exploration workflow. You can automatically parse your Simcenter Amesim for inputs and outputs of interest, thus taking full advantage of the heterogeneous sequential toolchain approach adopted in HEEDS. This also enables you to run multiple Simcenter Amesim simulations in parallel.

Capitalize on model management within the enterprise context
The release of Simcenter Amesim comes with the new version of Simcenter Sysdm 16, formerly named LMS Imagine.Lab™ Sysdm software. This new version enlarges the definition of the model management tool, which was created to enhance collaboration, knowledge capitalization, modeling and simulation processes support. Based on role-based access control, it comes with a brand new simplified UI for daily usage, and a filtered one for ongoing activities. By focusing on simplified workflow, using Simcenter Sysdm 16 drastically reduces the learning curve, enabling engineering teams to perform concurrent and collaborative tasks. With Simcenter Sysdm 16, data models and lifecycles are customizable to support company-specific processes and ensure global collaboration and quality.
Optimize the design of your energy-efficient vehicles

Main features

• IFP Drive library upgrade to deal with complex mission profiles
• Battery presizing and aging
• Embedded CFD powered by Simcenter STAR-CCM+
• Bearing with 3D mechanical ports

The challenge for all automotive original equipment manufacturers (OEMs) is the tradeoff between fuel economy, pollutant emissions and battery life. Today all OEMs selling cars in Europe have to meet real driving emissions (RDE) standards. That’s why we strongly focused on the handling of pollutant emissions and the evaluation of exhaust after-treatment systems performance when it is integrated in the complete vehicle model. Upgraded models and a new calibration tool lead to a significant step forward for facilitating a fast and efficient evaluation of emission treatment devices and systems in an RDE context.

Additionally, to support the analysis and design of internal combustion engines, several updates provide a faster and finer prediction of the air path system performance and are illustrated with a set of new solution demonstrators and guidelines.

Likewise, the modeling of injection systems can be improved for a finer prediction of injected quantities thanks to the new co-simulation capabilities of Simcenter Amesim with finite element electromagnetic tool JMAG. This co-simulation can easily be set up for solenoids thanks to dedicated submodels, with optimized communication time using variable time step or a JMAG sub-cycling algorithm.

Bringing electrical vehicles to market is also a critical part of your engineering challenges. With the new capabilities in Simcenter Amesim 16, you can validate electrical systems performance with advanced multilevel modeling. Reducing models from finite element method (FEM) solutions to system simulation has been extended to wound rotor synchronous machine (WRSM), for accurate representation of electrical and mechanical behavior with reduced computation time.

Additionally, maximizing battery performance from concept design to control validation is a key focus. With Simcenter Amesim 16, you can easily model a realistic battery pack at an early stage of the design, use physical-based aging law to evaluate the impact of aging on the battery performance and perform model-in-the-loop (MiL) simulation for validation of the battery management system (BMS).

Optimizing mechanical efficiency of powertrain systems is a must-have to meet carbon dioxide (CO2) emissions standards. That is the reason we focused our development efforts on the piloted engine mechanical systems, and have developed a new demo for accessory belts with a detailed model of a multi-groove v-belt to calculate frictions so you can right size the belt tensioner.

There is a strong focus in Simcenter Amesim 16 on the design of energy-efficient lubrication systems. This was accomplished by creating new easy-to-use submodels of variable stroke vane pumps, developing a new engine lubrication template for computing bearing minimum oil thickness, bearing frictions...
and oil consumption and new discretized hydrodynamic bearing submodels for more accurate flow prediction. Controlling the lubrication system is also an important energy-efficiency factor: a template model of pressure controlled pivot vane pump and a template model of hardware-in-the-loop (HiL) lubrication system, including cam phaser, are available. Also, this version offers new thermal hydraulic 3D engine bearings and piston load models. Used in new solution demos, they will help you improve your engine lubrication circuits, including camshaft loads and acyclisms.

This version also enables you to improve valve lift simulations thanks to the new flexible multi-mode spring with 3D animation, which will help you understand how it behaves.

Finally, a new engine mounting analyzer and transfer path analysis (TPA) tools enable you to more effectively reduce engine noise and vibrations.

Additionally, for thermal application you will find several enhancements for heating, ventilation and air conditioning (HVAC) in Simcenter Amesim 16, including a new fins and tubes heat exchanger, which you can set the connections to in a dedicated user interface. Phase change materials (PCM) can now be modeled for thermal energy storage or for thermal stability enhancements. Under-hood thermal management has also been prioritized in this release; with a new engine block component in the Simcenter Amesim Heat Exchangers Assembly Tool (HEAT) library, which is used to model the air pressure drop and heat exchange at the engine block walls. Finally, an embedded computational fluid dynamics (CFD) powered by Simcenter STAR-CCM+™ software is available in the HEAT library. Using system simulation (1D) and computational fluid dynamics (3D CFD), it takes minimal simulation time to capture the 3D flow that naturally occurs under the hood and the subsequent impact on heat exchangers.

“Our partnership with Siemens PLM Software gives us proven responsiveness and efficiency when creating new component models – components which are at the heart of innovative trends like thermal management in the cars of the future,” says Jérémy Blandin, the 1D simulation manager in the Valeo Thermal Systems department.

A thermal module is now available in the CAD Import tool. This module allows you to quickly create engine thermal mass models directly from the engine CAD and interlace it with the coolant and lubrication networks. This functionality drastically reduces the time required for building such models, which are key assets for predicting engine warm-up and consequently pollutant emissions.
Boost the aircraft or spacecraft systems' performance

Main features

- New Gas Turbine library
- New Liquid Propulsion library
- Fuel tank modeling with slosh dynamics, pressure loss models
- New atmospheric models
- Ready-to-use demos

Simcenter Amesim enables you to model aircraft fuel tanks that take into account slosh dynamics to better predict fuel cascading and transient behaviors of the fuel system. Also thanks to the solution improvement you can simulate pressure loss fuel transfer by considering gas and liquid flows, aircraft attitude, gravity and acceleration variation, enabling you to take full advantage of the digital twin. Finally, you can enjoy new ready-to-use fuel systems solution demos such as siphoning and fuel escape from vent pipe as well as fuel tank flammability.

“Thanks to Siemens PLM Software team’s responsiveness, new capabilities introduced in Simcenter Amesim 16 enabled us to increase effectiveness in modeling and studying siphoning effects in our fuel system,” says Michael E Herbstreit, associate technical fellow at the Boeing Company.

Maximize your systems’ power generation and engines’ performance thanks to the new Simcenter Amesim Gas Turbine library, which enables you to build virtual integrated aircraft (VIA) with conventional yet innovative propulsive systems. It allows you to model and simulate any kind of gas turbine thermodynamic cycles to assess performance as well as transient behaviors. Plus, the new Simcenter Amesim Liquid Propulsion library will enable you to build rocket engine and space propulsion engines, including assessing their startup and shutdown, while using the new expander cycle engine demo to validate firing tests.

Electrification and hybridization of the propulsion system is also at the top of the aerospace industry agenda. With this new release, you get features that help you design an optimal hybrid propulsion system in the shortest time. This is made possible using the battery pre-sizing and aging library and the MiL simulation for battery management system, and is highlighted by a demo of a hybrid propulsion plant.

Currently, the main focus for aircraft manufacturers is to globally address aircraft performance encompassing all aircraft systems’ complexity while assessing systems’ interactions. The VIA approach is supported by Simcenter Amesim demos such as the Helmholtz resonator sizing, leading-edge flap driving system, anti-skid braking system, hydraulic bootstrap reservoir, etc., and new atmospheric models (according to U.S. military standards), reinforcing the capability to analyze the aircraft digital twin in realistic conditions.
Frontload controls validation of your industrial machines

Main features
- 2D and 3D mechanical libraries
- Connection with programmable logic controllers (PLCs)
- Physics modeling enhancement

The new Automation Connect module represents the synergies between the Siemens simulation and automation worlds, enabling the interfacing of a Simcenter Amesim digital twin model with various kinds of real or emulated programmable logic controllers (PLCs). Connections are established directly or through a Siemens SIMIT Unit hardware gateway whereas an OPC Unified Architecture (UA) client allows for broader interfacing. Typical HiL and SiL applications that can be supported by Automation Connect include virtual commissioning, virtual sensors, predictive maintenance and operator training systems.

For the mechanical industry, exporting mechatronic systems to the real-time platform is essential to design controllers. Using Simcenter Amesim 16, you can have access to new junctions in the Simcenter Amesim Planar Mechanical library and the Simcenter Amesim 3D Mechanical library, allowing you to model multibody systems with a reduced number of state equations. This enables you to reduce central processing unit (CPU) time, and export the model to a real-time target. The new recursive junctions are fully compatible with the current components from the 2D and 3D mechanical libraries. Thus, you can close kinematical branches in order to model closed-loop systems (for example, four-bar systems) that you can find in any kind of mechanical system.