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Siemens PLM Software

What's new in LMS Imagine.Lab 14 for automotive and ground vehicles

Accelerate model-based systems engineering

Benefits
- Design better products faster
- Provide a smooth user experience through all design phases
- Streamline and accelerate your simulation process
- Bring together mechanical parts and controls design
- Strengthen collaboration throughout your organization
- Leverage unique architecture-based configuration environment

Summary
The latest release of LMS Imagine.Lab™ software brings a broad range of enhancements aimed at ensuring a smooth user experience through all phases of the design cycle.

Major development efforts have concentrated on improving usability. New methodology guides and process-related features now allow you to design better products within a shorter timeline.

A set of the latest enhancements for controls validation, real-time simulation and central processing unit (CPU) time reduction allows you to easily address engineering challenges when designing both mechanical parts and controls.

To meet the needs of increasingly complex transverse engineering organizations, LMS Imagine.Lab 14 continues the trend toward openness, which is a key element in streamlining collaborative work. To facilitate model-based systems engineering (MBSE), LMS Imagine.Lab provides you with an enhanced architecture-based configuration environment.

For automotive and ground vehicle manufacturers and suppliers, not only does Siemens PLM Software extend the multi-domain capabilities of LMS Imagine.Lab, but it also delivers significant improvements for advanced subsystems modeling and key vehicle attribute optimization.

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What's new in LMS Imagine.Lab 14 for automotive and ground vehicles

Features

• New innovative multi-domain libraries and application-oriented solutions

• Enhanced solver and numerical capabilities coupled with powerful analysis tools

• Improved usability and efficiency

• Extended openness to other simulation environments

• Integration under the umbrella of product lifecycle management
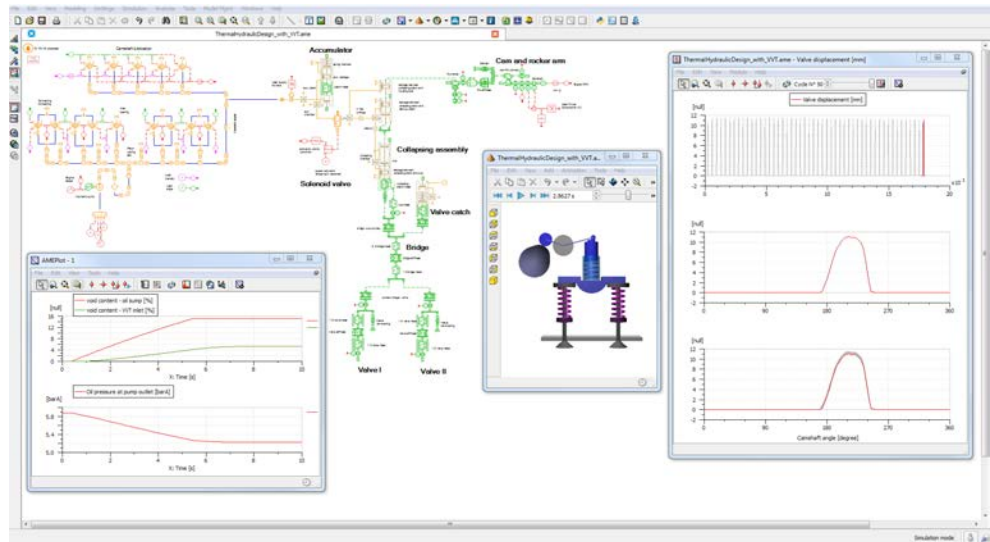
Maximize model accuracy

LMS Imagine.Lab Amesim™ software now enables you to model gas transport within liquid systems and consequently to analyze the impact of the amount of gas on system performance and dynamics. The software also allows you to reproduce noise and vibration issues depending on the quantity of gas in liquids, as well as aeration and dissolution dynamics which can drastically change liquid thermodynamic properties and pressure peaks in high dynamics systems. This new capability is of particular interest for applications such as engine lubrication and variable valve actuation (VVA) systems. The amount of air pumped into the sump directly affects oil flow rates in bearings as well as the response of the VVA system and engine performance. You can also use this feature when designing injection systems as well as many other fluid systems.

LMS Amesim enables you to handle pseudo-pure and zeotropic refrigerants as well as to select the equation of state, ensuring an optimal tradeoff between accuracy and performance. You can predict the performance of heat exchangers using R407C, R404A and R410A fluids.

LMS Amesim comes with an enhanced gas mixture library that enables you to achieve higher fidelity by representing the transport of condensate droplets in gases. For instance, you can assess the presence of fog in ducts across heat exchangers and within cabin components in order to optimize the relative humidity that directly affects passenger comfort.

With new discrete partitioning capabilities, LMS Amesim helps you significantly reduce CPU time when dealing with complex and highly-dynamic thermal-hydraulic systems.
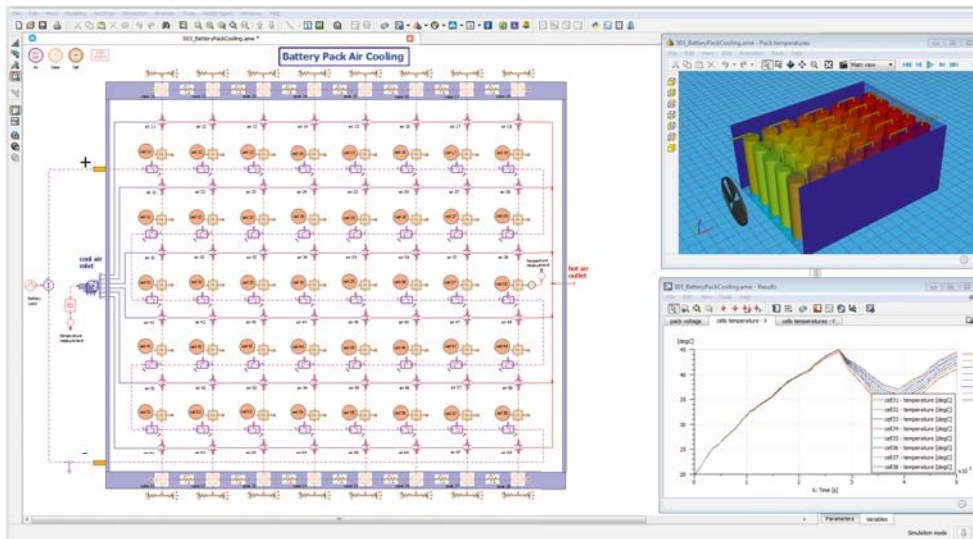
In the context of accelerated vehicle electrification, LMS Amesim provides you with precalibrated lithium-ion (Li-ion) nickel cobalt aluminum (NCA-C) battery models. Using a new demonstrator, you can easily compare battery cell technologies and choose the most appropriate one depending on battery usage. LMS Amesim enables you to rapidly model hybrid electric and full electric vehicle systems and accurately estimate battery performances and aging characteristics when integrated into the final environment.

LMS Amesim offers you a dedicated graphical user interface (GUI) that significantly eases data import from finite element method (FEM) software by controlling the data validity and format.

To support modeling across all stages of the design cycle, LMS Amesim provides users with 3D mechanical junctions for real-time simulation. For instance, they help you perform model-in-the-loop (MiL), software-in-the-loop (SiL) and hardware-in-the-loop (HiL) simulations when dealing with complete excavator models in which the controls, electrical and hydraulic actuation systems are connected to the complete 3D mechanism.

LMS Amesim has drastically improved its numerical performance for internal combustion engine applications and now allows you to reduce the CPU time by a factor of 20 when using computational fluid dynamics (CFD) 1D models for gas dynamics simulation.

Boost vehicle subsystem performance
By using the IFP-Drive library of LMS Amesim, in a few minutes you can generate fuel consumption, friction and maximum torque maps from public engine characteristics. A Python-based engine map creation tool helps you run first simulations without having access to comprehensive data.

LMS Amesim 14 provides you with methodological combustion tools that enable you to save time when setting advanced combustion model parameters.

New applications (apps) for engine and valve parameter definition allow for clear visual representation that helps you rapidly understand the parameters.
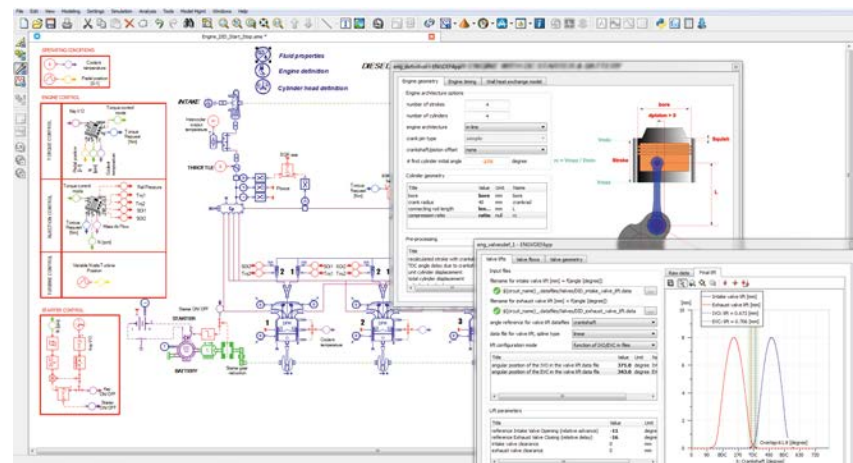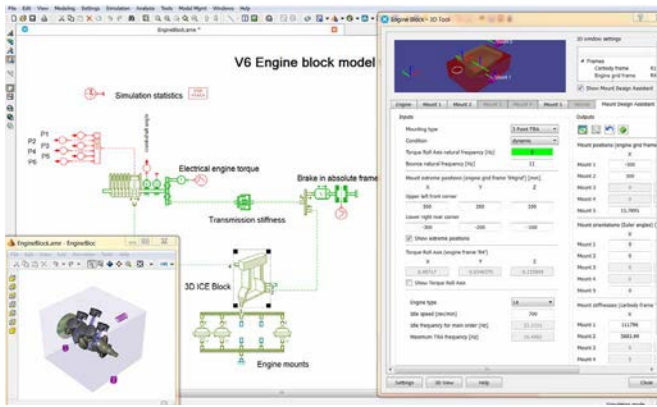
LMS Amesim comes with a new methodology guide for catalytic converter parameterization that provides a detailed description of test data needed as inputs to calibrate any type of after-treatment components, such as lean nitrogen oxide (NOx) traps, three-way catalytic converters or diesel oxidation catalysts.

Using a new after-treatment tool included in the IFP-exhaust library, you can manage a broader set of species and chemical reactions. Moreover, LMS Amesim brings a simpler after-treatment modeling approach that enables you to efficiently manage model complexity in order to adapt to controls development constraints, such as reduced CPU time and fixed-step solver compatibility.

LMS Amesim also comes with a cam designer feature for internal combustion engine actuation and piston pump design, and helps you create accurate cam and follower profiles from scratch or target curves.

Find the best tradeoff between vehicle attributes

LMS Amesim offers you more flexibility when using mean value engine models (MVEM) for engine controls validation, air path and energy management analyses, as well as for engine integration and drivability studies. LMS Amesim 14 comes with emission maps for diesel engines and a new variable valve timing model that provides accurate gasoline engine performance prediction.

Among transmission-related features, the engine block app allows you to optimize engine mount locations as well as their stiffness and damping characteristics.

"LMS Imagine.Lab 14 helps Doosan Infracore improve engine mount development by using the vertical powertrain mount optimization app," comments Kwanghyeon Seo, an associate research engineer from the noise, vibration and harshness (NVH) team at Doosan Infracore. "LMS Imagine. Lab 14 has an outstanding user interface and graphical display."

In addition, LMS Amesim 14 brings the simulation and test worlds together by enabling you to easily compare simulation and test results within a single environment. For instance, you can benefit from the GUI of LMS Test.Lab™ software for conducting advanced NVH analysis.

LMS Amesim comes with more accurate gearbox models that can be parameterized using efficiency and loss data for all gears.

Validated with multibody simulation and test results, a new multibody axle system template helps you analyze kinematics and compliance characteristics of any axle system.

For the off-highway industry, LMS Amesim provides a seamless approach to assess vehicle tire behavior on soft soil by enabling the user to study powertrain, drivetrain and suspension interactions as well as brakes and chassis geometry.
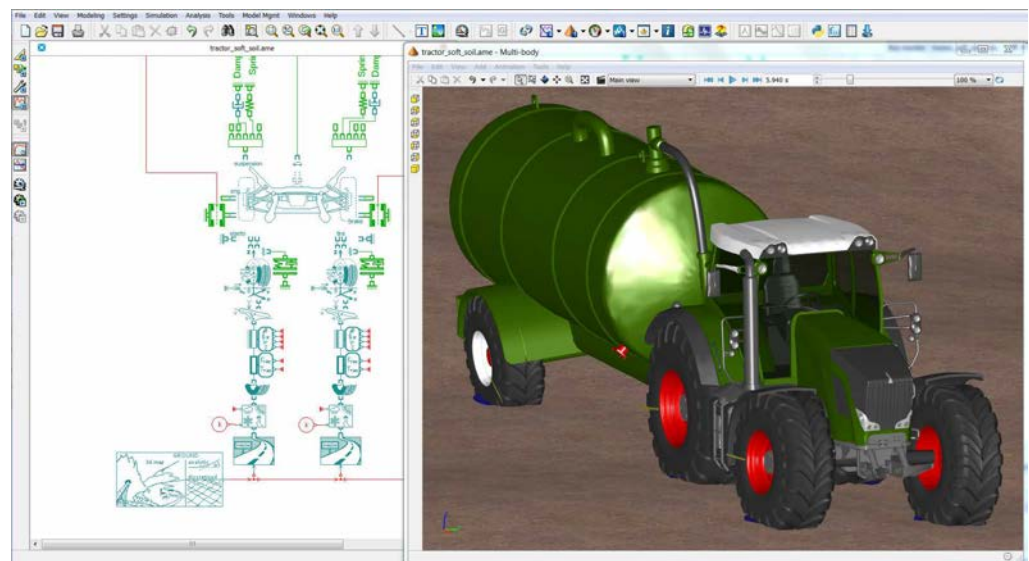
Integrate model-based systems engineering in your organization

Siemens PLM Software continues to extend its support of Modelica for LMS Amesim by offering you a wider range of supported Modelica models and the possibility of handling electric/power electronics models with diodes.

The new release supports the latest functional mockup interface version (FMI 2.0 co-simulation master) to reinforce the role of LMS Amesim as an integration platform for co-simulation of complex coupled systems.

To better answer your needs when validating plant models, driving scenarios and control logics, LMS Amesim now enables you to build more advanced statecharts and visualize your simulation results.

When creating, parameterizing and simulating models, LMS Amesim helps you import experimental data with the right format without using third-party middleware, easily compare simulation results with measurements and streamline your workflow even when dealing with large files.

LMS Amesim enables you to detect algebraic loops directly on the sketch and then to easily simplify models, especially for faster CPU times or real-time simulation.

LMS Amesim 14 comes with the enhanced performance analyzer that allows you to understand numerical performance bottlenecks to enhance CPU time as well as to make the model optimization process easier.

You can benefit from enhanced customization and improved usability of application-dedicated plots by creating graph annotations, callbacks or plot manipulators, enabling you to use your mouse for interactive work with plots.

To boost CPU performance, LMS Amesim provides the users with new data processing and filtering tools. You can easily modify filter parameters and view changes in the same plot.
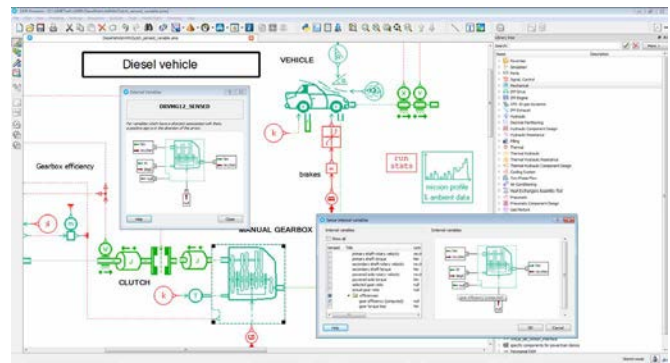
Even nonexperts can rapidly adapt existing components for controls or signal processing purposes by using a new user-friendly and time-saving feature that enables engineers to sense internal variables at additional ports for connection with other LMS Amesim components or interface blocks.

The capabilities of LMS Amesim have been extended to facilitate continuity between computer-aided design (CAD) and the 1D approach. It enables you to extract geometric information to populate submodel parameters in LMS Amesim.

The process of creating an app has become simpler with new menus and an enhanced Python editor.

As part of LMS Imagine.Lab, LMS Imagine.Lab Sysdm software and LMS Imagine.Lab System Synthesis software also include important improvements.

For LMS Sysdm, development efforts have focused on the integration of model management within the organizational environment. LMS Sysdm provides you with a direct link from LMS Sysdm to Teamcenter® software. It allows system engineers to directly publish validated models to the Teamcenter repository while accounting for their daily activities. Thus, system simulation is now integrated under the umbrella of product lifecycle management (PLM), taking into account daily versioning and branching, which are mandatory for monitoring modeling activities.
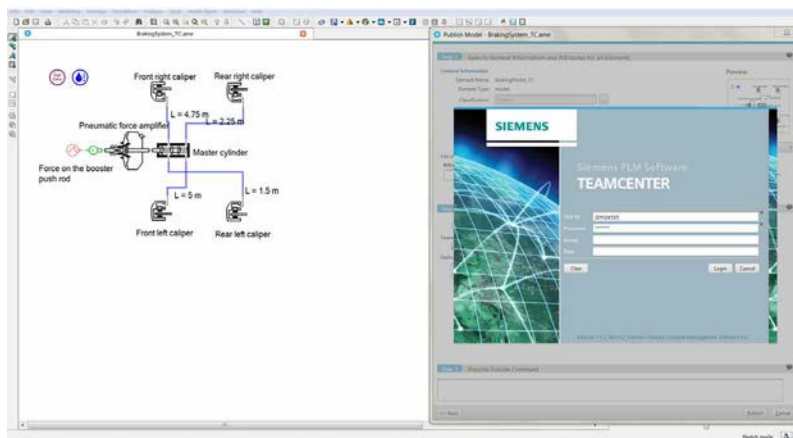
Moreover, the manage users and login features of LMS Sysdm can be synchronized with your information technology (IT) infrastructure. New users can be easily added from the company active directory server, and the security of the LMS Sysdm login process has been strongly increased.

LMS Sysdm ensures smarter management of the traceability of your development activities. The branching and versioning capabilities allow you to create many variants when building models. You can cut branches into versions to keep only those that you consider important. At the same time, merging multiple branches enables engineers who are working concurrently to put their individual contributions into a unique branch. And when concurrent engineering is not required, you can lock a branch to secure its undesired evolution while you continue working on it.

Model import into LMS Sysdm has become easier since the tool adapts seamlessly to the model structure required by your authoring tool.

LMS System Synthesis brings MBSE to the next level with architecture-driven design capabilities. Not only can you design your reference architecture, but you can also configure it with models taken from the repository in order to create a simulation model for a given purpose. This reference architecture can be imported from a SysML description or from a LMS Amesim or Simulink® model available in the LMS Sysdm repository.
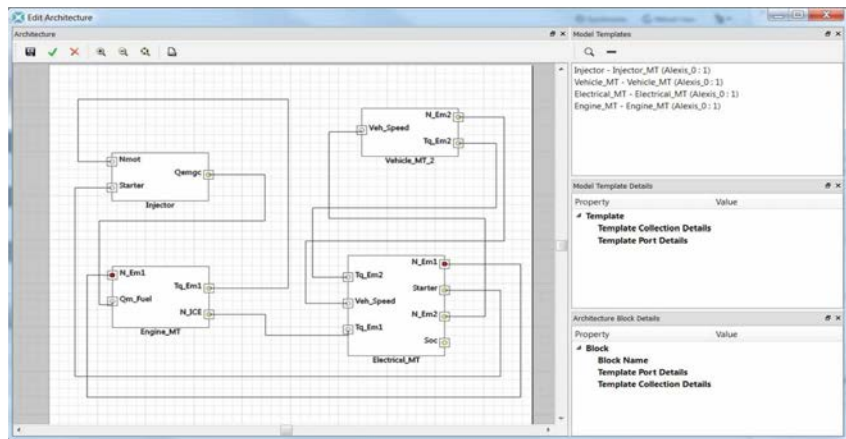
One of the new capabilities in LMS System Synthesis enables users to create tool-neutral reference architectures. LMS System Synthesis 14 provides you with an embedded sketcher in which the architecture is drawn by the simulation architect. You can capitalize on your experience and product knowledge by providing fully customizable templates in the repository.

LMS System Synthesis also brings major enhancements in the field of heterogeneous configuration and co-simulation capabilities. It offers you advanced support when creating heterogeneous model configurations. For example, when using a Simulink model in combination with an LMS Amesim model, the required model interface blocks are automatically added during the configuration process. You don't need to manually create these interfaces on the model anymore, and you can re-use the same model in many different configuration scenarios.