Twin Builder 19.2

Build Systems Models and Digital Twins

Twin Builder improves predictive maintenance outcomes to save on warranty and insurance costs and optimize your product’s operations.

To build your system easily and quickly, Twin Builder combines the power of a multidomain systems modeler with extensive 0D application-specific libraries, 3D physics solvers and reduced-order model (ROM) capabilities. When combined with embedded software development tools, Twin Builder allow you to reuse existing components and quickly create a systems model of your product.

To validate your system and ensure expected performance, Twin Builder combines multidomain systems simulation capabilities with rapid human-machine interface (HMI) prototyping, systems optimization and XiL validation tools.

To connect your twin to test or real-time data, Twin Builder easily integrates with industrial internet of things (IIoT) platforms and contains runtime deployment options, allowing you to perform predictive maintenance on your physical product. It is the only product that offers a packaged approach for your digital twin strategy.

Build System Models and Digital Twins

Powerful Multi-Domain System Modeling

Create hierarchical schematics of complex power electronic circuits and multi-domain systems. Model with standard languages and exchange formats, including:

- VHDL-AMS (IEEE 1076.1)
- Modelica
- SML (Simplorer Modeling Language)
- FMI (Functional Mock-up Interface)
- C/C++
- SPICE
- Use wizard-driven code editors to create VHDL-AMS, Modelica®, SML, C/C++ and SPICE models
- Combine conserved (acausal), signal-flow (causal), and discrete event system behaviors
- Use on-the-fly design checking tools to assure consistency of connection types and physical domains

Access to Extensive Model Libraries

- Develop multi-domain system models using built-in Modelica and specialized Twin Builder libraries.
- Model complete electrical/electronic systems with libraries of analog and power electronics components, digital and logic blocks, sensors, and transformers.
- Build battery cell model with Twin Builder Modelica library that includes four templates for Equivalent Circuit Models(ECM) with SOC or SOC-Temperature dependency.
- Select from broad collections of characterized manufacturers, components, including power semiconductors, power management ICs, magnetic devices and ultracapacitors.
- Add-on library, Twin Builder Heating and Cooling library, which includes Modelon Liquid Cooling library, Modelon Vapor Cycle library, Modelon Heat Exchanger and Modelon Base libraries, is now available at ACT App store.
- Use application-specific libraries for switch-mode power supplies, electric vehicle powertrains and aircraft electrical power systems.
- Create and manage user and corporate model libraries with built-in graphical tools.
- Use wizard-driven graphical tools to create power MOSFET, IGBT and diode components from datasheet information.
Model Exchange with External Tools
- Compatible with the functional mock-up interface (FMI) for model exchange to import models from all FMI-compliant tools and export Modelica models as FMUs.
- Create or reuse C/C++ models with the Twin Builder C interface.
- Import MathWorks® Simulink® models using Simulink Coder™.

3D Reduced Order Model (ROM)
- Use reduced-order modeling (ROM) interfaces to generate accurate, compact models from detailed 2D and 3D physics simulations.
- Visualize 3D fields of Static ROM directly in the Twin Builder.
- Link to a variety of ANSYS tools to create high performing models for electromagnetic machines and actuators, circuit parasitics and cables, excitations for EMI/EMC, electronics thermal networks, signal integrity, general flow and heat transfer characteristics, and rigid-body dynamics.
- Multiple ROM generation techniques (including state-space, electrical circuit equivalent, SVD, modal response) support a range of analysis requirements.

Integrated with SCADE Suite® for Embedded Control Software
- Use SCADE Suite to verify, optimize and calibrate performance of safety-critical embedded control software.

Validate and Optimize Digital Twins

Robust Solvers
- Perform fast and accurate simulation of continuous-time, discrete-time, digital and analog/mixed-signal behaviors.
- Achieve high numerical efficiency with sophisticated solver synchronization and adaptive time-step control.
- Connect to high-performance compute resources to increase throughput of simulation runs.

Basic Simulation Experiments
- Calculate steady-state, time-domain and frequency-domain responses of the system.
- Create multiple analysis configurations with options for fine-grain control of solver settings.
- Replay simulations from existing results.

Advanced Simulation Studies
- Sweep parameter values within defined ranges to identify effects on system response.
- Optimize system performance based on cost functions of specified design variables.
- Determine the sensitivity of performance metrics to variations in model parameters.
- Analyze the effects of statistical variations (e.g., manufacturing tolerances, environmental uncertainty, etc.) on system performance.
- Change variable values interactively to tune performance of the model.
- Connect with ANSYS Workbench™ to construct and manage simulation project workflows with 3-D physics solvers.
- Use ANSYS DesignXplorer™ to construct sophisticated design exploration studies.

Tool Integration and Customization
- Connect with SCADE Suite® and SCADE Display® for interactive white-box and black-box simulation with embedded control designs.
• Dynamically couple with ANSYS 2-D and 3-D electromagnetic (low and high frequency), CFD and mechanical solvers.
• Build custom graphical panels with SCADE Test™ rapid prototyper to control and monitor Twin Builder simulations.
• Co-simulate with MathWorks Simulink and PTC® Mathcad®
• Write or record Python or Visual Basic scripts to automate simulation workflows.
• Build custom toolkits with Twin Builder comprehensive Python API.
• Add new model libraries and application extensions from the ANSYS ACT store.

Integrated with SCADE Display® for HMI Design
• Use SCADE Display to enhance the simulation experience with powerful, easy-to-design, and interactive Human Machine Interface (HMI)

Deploy Digital Twins on IIoT Platforms

IIoT Connectivity
• Configure connector to connect to IIoT platform and send and receive operational data

Digital Twin Runtime Deployment
• Export from Twin Builder to generate portable, cloud deployable Twin for IIoT platforms like SAP, PTC or GE Predix.

Analysis and Reporting
Creating Graphical and Tabular Reports
• Select from a broad range of graphical and tabular reports for displaying and analyzing simulation results.
• Plot time-domain and frequency-domain waveforms and parametric relationships in 2-D and 3-D.
• Display frequency-domain responses as Bode and Nyquist plots.
• Generate data tables and numeric displays.
• Display graphical reports directly on system diagrams and update them as the simulation progresses.
• Apply a range of transformations, markers and measurements to waveform traces.

Export to Other Environments
• Quickly export diagrams, plots, and tables to Microsoft® Excel® or a variety of image formats.
• Automatically generate design summary reports in HTML.

Twin Builder Product Line

<table>
<thead>
<tr>
<th>Schematic Editor</th>
<th>Twin Builder Coupling with 3rd Party Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulator and Solver</td>
<td>Integration with SCADE Test Rapid Prototyper</td>
</tr>
<tr>
<td>SML and VHDL-AMS Libraries</td>
<td>3D Reduced Order Model (ROM) Integration</td>
</tr>
<tr>
<td>Standard Modelica and Battery Cell Modelica Libraries</td>
<td>IIoT connectivity</td>
</tr>
<tr>
<td>Device Characterization Wizard</td>
<td>Network Data Explorer</td>
</tr>
<tr>
<td>Power Module Characterization Wizard</td>
<td>Optimetrics</td>
</tr>
<tr>
<td>Component Dialog Wizard</td>
<td>VBA and IronPython Desktop Scripting</td>
</tr>
<tr>
<td>Netlist Editor</td>
<td>Postprocessing and Reports Generation</td>
</tr>
<tr>
<td>Twin Builder Integration with ANSYS Products</td>
<td>Modelling examples</td>
</tr>
<tr>
<td></td>
<td>Online Help and Tutorial</td>
</tr>
</tbody>
</table>

ANSYS, Inc.
www.ansys.com
ansysinfo@ansys.com
866.267.9724
© 2018 ANSYS, Inc. All Rights Reserved.