Simulink PLC Coder

Generate IEC 61131 structured text for PLCs and PACs

Simulink PLC Coder™ generates hardware-independent IEC 61131 structured text from Simulink® models, Stateflow® charts, and Embedded MATLAB® functions. The structured text is generated in PLCopen XML and other file formats supported by widely used integrated development environments (IDEs). As a result, you can compile and deploy your application to numerous programmable logic controller (PLC) and programmable automation controller (PAC) devices.

Simulink PLC Coder generates test benches that help you verify the structured text using PLC and PAC IDEs and simulation tools. Support for industry standards is available through IEC Certification Kit (for IEC 61508 and IEC 61511).

Key Features

▪ Automatic generation of IEC 61131-3 structured text
▪ Simulink support, including reusable subsystems, PID controller blocks, and lookup tables
▪ Stateflow support, including graphical functions, truth tables, and state machines
▪ Embedded MATLAB support, including if-else statements, loop constructs, and math operations
▪ Support for multiple data types, including Boolean, integer, enumerated, and floating-point, as well as vectors, matrices, buses, and tunable parameters
▪ IDE support, including B&R Automation Studio™, PLCopen XML, Rockwell Automation® RSlogix™ 5000, Siemens® SIMATIC® STEP® 7, and 3S-Smart Software Solutions CoDeSys
▪ Test-bench creation

Simulink PLC Coder generates test benches that help you verify the structured text using PLC and PAC IDEs and simulation tools.

From model to structured text to application. Simulink PLC Coder generates structured text from your model that an IDE can deploy to your industrial control system.
Working with Simulink PLC Coder

In Simulink, you can generate structured text using Simulink PLC Coder by right-clicking on a Subsystem block and selecting the PLC Coder > Generate Code for Subsystem option in the resulting context menu. In MATLAB, you can invoke the plcgeneratecode command, which lets you create scripts to generate structured text using an automated, repeatable build process.

With support for more than 130 Simulink blocks, all Stateflow constructs, and many Embedded MATLAB functions, Simulink PLC Coder can fully implement your control system models comprising feedback loops, mode and state logic, and math-intensive algorithms. You can use Simulink PLC Coder to convert discrete-time plant models into structured text for hardware-in-the-loop (HIL) testing. Alternatively, you can use Simulink Coder™ to generate C/C++ code for HIL testing with discrete-time or continuous-time models.

Code Optimization and IDE Integration

Simulink PLC Coder provides optimizations that reduce the memory size and increase the execution speed of the generated structured text. These optimizations include:

- Dead-code elimination
- Expression folding
- For-loop fusion
- Inline parameters
- Signal storage reuse
- Subsystem reuse

Generating structured text in Simulink with Simulink PLC Coder. Right-click on a Subsystem block and select the PLC Coder > Generate Code for Subsystem option in the resulting context menu.
Your optimization needs can change with your project’s development phase. For example, during rapid prototyping, you might place parameters in global memory for tuning or calibration; during a subsequent production build, you might generate parameters with their literal numeric values using the Inline parameters option to produce more optimized code.

Simulink PLC Coder can output structured text in a variety of file formats used by third-party IDEs. File formats supported by Simulink PLC Coder include:

- 3S-Smart Software Solutions CoDeSys
- B&R Automation Studio
- Beckhoff® TwinCAT®
- Generic ASCII
- KW-Software MULTIPROG®
- PLCopen XML
- Rockwell Automation RSlogix 5000
- Siemens® SIMATIC® STEP® 7

To generate structured text, you select from the list of supported IDEs in the Simulink PLC Coder configuration parameters dialog box. The structured text can then be integrated and compiled using the selected IDE.

Example of optimized structured text. Simulink PLC Coder generates optimized, well-integrated code for Simulink, Stateflow, and Embedded MATLAB functions.
Code Test and Verification

Simulink PLC Coder inserts comments and user-specified block descriptions in the structured text so that you can trace text back to the model. Built-in identifier naming control lets you create unique identifiers that preserve object names and signal names in the model. These capabilities help you conduct more efficient code reviews and document how the model was implemented.

Simulink PLC Coder can simulate the model prior to structured text generation and package the results into a test harness that is generated with the algorithm code. The test harness serves to verify that model simulation behavior and structured text execution results match within an acceptable tolerance. You can then execute the test and analyze the results using your IDE or PLC device.

Example of well-commented structured text. Simulink PLC Coder can be configured to include high levels of commenting that enhance readability and traceability.

Resources

<table>
<thead>
<tr>
<th>Product Details, Examples, and System Requirements</th>
<th>Online User Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial Software</td>
<td>Training Services</td>
</tr>
<tr>
<td><a href="http://www.mathworks.com/trialrequest">www.mathworks.com/trialrequest</a></td>
<td><a href="http://www.mathworks.com/training">www.mathworks.com/training</a></td>
</tr>
<tr>
<td>Sales</td>
<td>Third-Party Products and Services</td>
</tr>
<tr>
<td>Technical Support</td>
<td>Worldwide Contacts</td>
</tr>
<tr>
<td><a href="http://www.mathworks.com/support">www.mathworks.com/support</a></td>
<td><a href="http://www.mathworks.com/contact">www.mathworks.com/contact</a></td>
</tr>
</tbody>
</table>

© 2012 The MathWorks, Inc. MATLAB and Simulink are registered trademarks of The MathWorks, Inc. See www.mathworks.com/trademarks for a list of additional trademarks. Other product or brand names may be trademarks or registered trademarks of their respective holders.