Simulink Design Documenter Tool

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1   Introduction

The purpose of the Simulink Design Documenter is to facilitate the production of useful Software Design Description documents for software systems developed with Simulink. While producing documentation is often seen as a tedious task, it is not possible to disregard it since many projects are too large and complex to easily understand without it. The existence of documentation reduces difficulty and time required for software changes and maintenance.

Further details, as well as additional options and capabilities, can be found in the full guide, located in SimulinkDesignDocumenter_FullGuide.pdf.

What the Simulink Design Documenter Provides

The Simulink Design Documenter generates a Word document with a title page, clickable table of contents, Changelog, Document Purpose section, Scope section, design details, a glossary, appendix, and a summary of warnings (if there were any during generation). The table of contents as well as overall formatting of the document are handled completely automatically, while the title page, Document Purpose, and Scope are also included automatically, though they may be configured or edited.

To provide design details for the system, the Simulink Design Documenter approaches documentation with the mentality that there will be subsystems within the 'main system' which are complex enough to warrant documentation for themselves and as such the Simulink Design Documenter allows the user to designate subsystems to document and will nest a subsystem's design details within an upper-level system's design details. For each system/subsystem being documented the Simulink Design Documenter will automatically produce a picture of the system, a list of subsystems within it, and an Interface section with information about the blocks which are involved in the interface. Beyond this each system will be documented with Purpose, Internal Design, Rationale, and Anticipated Changes sections as well as a Requirements Specification section if desired.

A Note on Other Software Documentation

A Software Design Description document is not the only document that *should* be produced in a project that uses Simulink. Among other documents, Software Requirements Specification documents are also very important to a successful project and they should not be overlooked. However, the Simulink Design Documenter focuses only on Software Design Description documents.

2 How to Use the Tool

This section describes what must be done to setup the tool, as well as how to use the tool.

2.1 Prerequisites

Please ensure the following, before using the tool:

- Use MATLAB/Simulink 2016b or newer to generate (the model can be saved in earlier versions).

- Simulink Report Generator is installed (check for it with the `ver` command in MATLAB).

- The Simulink Design Documenter is present in your MATLAB path.

- The Signature Tool is present in your MATLAB path. To download, see www.mathworks.com/matlabcentral/fileexchange/49897-signature-tool.

- The model is open (or loaded, for command line use).

2.2 Getting Started

The Simulink Design Documenter can be used via the Simulink Context Menu, which can be viewed by right-clicking in a model. The following option will be available in the Context Menu (as shown in Figure 1):

- *Generate Simulink Design Document*

2.3 Functionality

This section describes the tool functionality when being used from the Simulink Context Menu.

2.3.1 Report Configuration

Prior to report generation, the report needs to be configured by the user. Specifically, a configuration file is needed to set up options on how the document will generate (e.g., adding a title image, specifying authors, etc.). This file must be placed on the MATLAB path and named `<MySystem>_SDD_Config.m`. A template configuration file, that also explains the different options available, can be found at `Report_Specific_Files/TopsysName_SDD_Config.m`. This template can be duplicated, renamed according to the system you wish to document, and altered to fit one's needs. In particular, users are urged to choose a list of subsystems in `MySystem` to document, and set the *subsystemList* variable with this information.
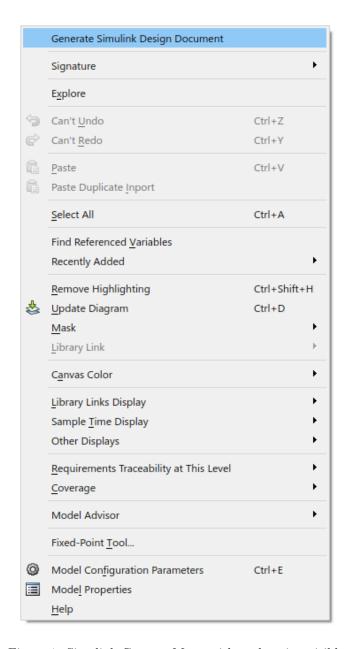
Figure 1: Simulink Context Menu with tool option visible

2.3.2 Report Content

Next, the user must add DocBlocks to the system being documented as well as those subsystems listed by the subsystemList variable. The four mandatory DocBlocks are: "Purpose", "Internal Design", "Rationale", and "Anticipated Changes". The purpose of these blocks is to store useful information describing the system, in order to help others to understand and work with the model. Therefore, after adding these four blocks, the user should open them and populate them with information:

- The Purpose DocBlock should describe the purpose of the system.

- The Internal Design DocBlock should describe how the system works to accomplish the purpose.

- The Rationale DocBlock should describe why certain design decisions were made.

- The Anticipated Changes DocBlock should describe expected changes to the system (such as from changes in project scope or requirements).

To assist the user, the SDD Blocks block library provides these blocks. This library contains both mandatory and other optional DocBlocks. The mandatory blocks are shown in Figure 2). The default contents of the blocks briefly explains what content should be stored in them.

Note, one may use ordinary DocBlocks, however they must have the specific names required by the tool, as given in the SDD Blocks library.

If a user attempts to generate without creating the configuration file or adding the DocBlocks, the generated document will include warnings at the end of the document which explain what to do (as shown in Figure 3):

2.3.3 Report Generation

Finally, to generate the Software Design Description document, right-click anywhere in the model and then select Generate Simulink Design Document from the Context Menu. This will begin the generation of a Software Design Description document. This document will be named SDD_<MySystem>.docx, and saved in the current folder in MATLAB.

2.4 Errors and Warnings

Any errors or warnings during tool use will be visible in the MATLAB Command Window or at the bottom of the generated document. Typically, warnings will occur when any of the mandatory DocBlocks are missing (i.e., Purpose, Internal Design, Rationale, or Anticipated Changes), or if an appropriately named configuration file is not found.
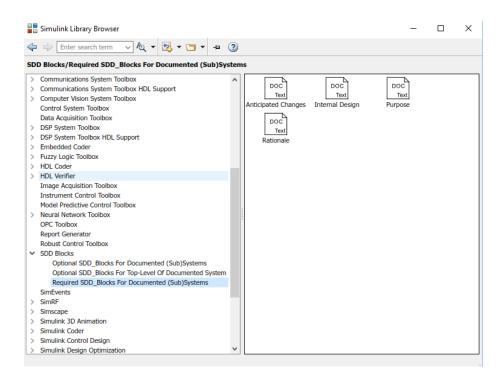
Figure 2: `SDD Blocks` library in the library browser, showing which `DocBlocks` are required for each system/subsystem being documented
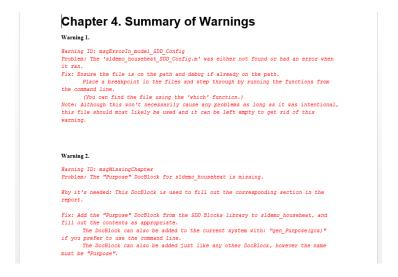

Figure 3: Summary of Warnings section in a report generated for the `sldemo_househeat` system
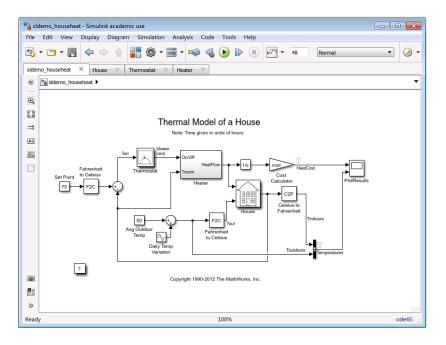
Figure 4: The `sldemo_househeat` system

3 Example

This section provides simple demonstration of the Simulink Design Documenter.
For a more in depth example, please see the full guide, located in `SimulinkDesignDocumenter_FullGuide/FullG`

Let us create documentation for the top-level of the `sldemo_househeat` model, which is built into MATLAB. It is shown in Figure 4.

The following steps will demonstrate the creation of a simple Software Design Description document.

1. Use the command `sldemo_househeat` in the Simulink command window to open the example model

2. Create a file on the MATLAB path called "`sldemo_househeat_SDD_Config.m`".
    Insert the following lines:

    -   `author = 'John Smith';`
    -   `subsystemList = {};`

    This sets the author name and tells the Simulink Design Documenter to only generate documentation for the top-level of the system.

3. Add the four mandatory DocBlocks from the `SDD Blocks` block library to the top-level system. For each of the DocBlocks, write meaningful content, as described in Section 2.3.2.

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4. Save each DocBlock before closing them, and then save the model as well.

5. From the top-level system, right-click to access the Simulink Context Menu and select `Generate Simulink Design Document`

6. The Software Design Description document will automatically open when generation is complete.

4 Matlab Commands

The tool can also be used via the MATLAB command line, with the following function(s).

Function	GenSDD
Syntax	GenSDD(*topsys*)
Description	Generate the Software Design Description document for *topsys*.
Inputs	*topsys*: Name of the system to generate the documentation for. It should be a specific subsystem name.
Outputs	N/A