ConfigurationDesk

Configuration and implementation software for dSPACE SCALEXIO systems

Highlights

- Implementation of MATLAB®/Simulink®/Stateflow® models for SCALEXIO systems
- Graphical I/O configuration and connection of I/O functionality with behavior model code
- Manage signal paths between external devices (such as ECUs or loads), I/O functions, and behavior models
- Multicore and multi-processing-unit applications
- Support of Functional Mock-up Units (FMUs)

Application Fields

ConfigurationDesk is an intuitive, graphical configuration and implementation tool for SCALEXIO hardware. With this software, you can connect your behavior models from MATLAB®/Simulink®/Simulink Coder™ to I/O functions, for example, configure the SCALEXIO hardware, and control the whole process for generation the real-time code. You can optionally define and document external devices such as ECUs and loads, including their signal properties (descriptions, electrical properties, failure simulation settings, and load settings). ConfigurationDesk offers different views on the configured system. It is possible to display the signal path between the ECU pins/load pins and the behavior model. In other views, you can directly add the I/O functionality to the model hierarchy and propagate interface changes to the connected MATLAB® Simulink® model.

Key Benefits

With ConfigurationDesk, you can easily implement the behavior model code and the I/O function code from ConfigurationDesk on the dSPACE SCALEXIO hardware. The entire build process for a real-time application is handled by ConfigurationDesk. Besides being able to interactively work with MATLAB Simulink models, you can import previously generated C code from different modeling tools, such as code from the Simulink Coder via Simulink Implementation Containers (SICs) or code from other modeling tools via Functional Mock-up Units (FMUs). Comprehensive documentation options and graphical displays give you great project transparency. You can assemble and configure the project-specific hardware offline as a virtual system, in other words, as a purely software-based configuration. A real-time application can be executed for test runs even if parts of the necessary and configured I/O hardware are not physically available. In addition, there are options to generate a Microsoft® Excel® file with information on the wiring harness and on external devices.
## Functionality Overview

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Description</th>
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</thead>
</table>
| General       | - Graphical configuration of real-time applications  
                - Decoupling of I/O configuration and behavior model  
                - Integration of models from various tools |
| Simulink support | - Generate a ConfigurationDesk project directly from the Simulink model  
                   - Switch from Simulink to ConfigurationDesk and vice versa  
                   - Changes to the interfaces made with ConfigurationDesk can be propagated to the respective Simulink model  
                   - Start the overall build process from the Simulink model |
| FMI support   | - Support of the open Functional Mock-up Interface (FMI) standard  
                - Profit from different modeling approaches (e.g., based on physical modeling with Modelica) by using Functional Mock-up Units (FMUs)  
                - Integrate FMUs together with Simulink® models. |
| I/O configuration and documentation | - I/O configuration for connecting behavior models to dSPACE SCALEXIO hardware:  
                                          - External device topologies (properties of ECU pins and load pins)  
                                          - Device port mapping (connections between the ECU/load pins and the signal ports of an I/O function)  
                                          - I/O functions (define and configure the functionality of the assigned SCALEXIO hardware)  
                                          - Model port mapping (connections between function ports and model ports)  
                                          - Model topology (model ports used for the ConfigurationDesk application)  
                                          - Hardware resource assignment (mapping of I/O functions to hardware resources)  
                                          - Hardware topology (hardware resources used by I/O functions)  
                                          - Documentation options  
                                          - External device topologies (properties of ECU pins/load pins)  
                                          - Model topology (describes the interface to the behavior model)  
                                          - Hardware topology (describes the simulator hardware: boards, internal wiring, internal loads, board locations, etc.)  
                                          - Microsoft® Excel® file with pin information for external wiring harnesses |
| Real-time code generation | - Complete build process for I/O functions (ConfigurationDesk) and the behavior model (e.g., MATLAB®/Simulink®/Simulink Coder) |
| Bus simulation | - Import of bus configurations as bus configuration containers generated by the dSPACE Bus Manager  
                 - CAN and LIN signals can be configured either with the Bus Manager or with the RTI CAN MultiMessage Blockset and the RTI LIN MultiMessage Blockset. FlexRay nodes are configured with the dSPACE FlexRay Configuration Package.  
                 - Ethernet UDP/TCP is supported by dedicated function blocks in ConfigurationDesk.  
                 - Ethernet SOME/IP is supported by the Ethernet Configuration Package. |

## Order Information

<table>
<thead>
<tr>
<th>Products</th>
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</tr>
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</table>
| ConfigurationDesk – Loader Version (SCALEXIO)  
For use without license, limited function range (downloading real-time applications possible, but no changes or builds allowed) | - Free of charge |
| ConfigurationDesk – Implementation Version (SCALEXIO) | - CFD_I_100 (implementation version for 100 functions)  
- CFD_I_200 (implementation version for 200 functions)  
- CFD_I_300 (implementation version for 300 functions)  
- CFD_I_1000 (implementation version for 1000 functions)  
- CFD_I_UNLTD (for an unlimited number of functions)  
- CFD_I_MC (implementation version for SCALEXIO multicore applications)  
- CFD_I_MP (implementation version for SCALEXIO multiprocessor applications) |
| For bus simulation (CAN, LIN, FlexRay, Ethernet) with SCALEXIO | Please inquire. |
| For SCALEXIO Fault Simulation | Please inquire. |
Task-specific Views
For an optimal user guidance, ConfigurationDesk offers task-specific views. The navigation bar at the bottom provides dedicated view sets that offer precisely the functionality necessary for each work step.

- Project – view set for managing projects
- Model-Function – new view set for creating and configuring of I/O functions in model structure, optimized for Simulink oriented users
- Signal Chain – for working with complete signal chains, e.g., external devices, functions and model port locks
- Buses – view set for bus configuration
- Tasks – table for tasks configuration
- Multiple Models – for managing multiple models and/or multiple processing unit applications
- Builds – for controlling the build process

Relevant Software and Hardware

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Required</td>
<td>Operating system</td>
</tr>
<tr>
<td>Optional</td>
<td>MathWorks MATLAB®/Simulink®/Simulink Coder™</td>
</tr>
<tr>
<td></td>
<td>RTI CAN MultiMessage Blockset</td>
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<tr>
<td></td>
<td>RTI LIN MultiMessage Blockset</td>
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<td></td>
<td>ConfigurationDesk Ethernet Module</td>
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<tr>
<td></td>
<td>dSPACE FlexRay Configuration Package</td>
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<tr>
<td></td>
<td>Bus Manager</td>
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<tr>
<th>Hardware</th>
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<tbody>
<tr>
<td>Optional</td>
<td>SCALEXIO Processing Unit</td>
</tr>
<tr>
<td></td>
<td>DS6001 Processor Board</td>
</tr>
<tr>
<td></td>
<td>SCALEXIO I/O hardware</td>
</tr>
</tbody>
</table>
Working with ConfigurationDesk (Example)

The ConfigurationDesk navigation bar offers task-specific view sets that are optimized for the chosen workflow. Each view displays only the functions required for the respective task. If needed, you can switch between the views while working.

Besides being able to interactively work with MATLAB Simulink models, you can import already generated C code via Simulink Implementation Containers (SICs) or code from other modeling tools via Functional Mock-up Units (FMUs). Using model containers reduces external dependencies, because no model tool installation is required to use the models. It also simplifies the exchange and re-use of models, because it saves code generation and build time.

Support of Simulink Implementation Containers

- SICs are ZIP containers that include the C code and other artifacts, such as precompiled libraries and a model interface description. ConfigurationDesk provides a method to convert SIC files with source files into SIC files without readable source files but with a SCALEXIO-compatible library file, which might be desirable for protecting your intellectual property. Once the SICs are generated, they can be reused in different projects, without having to generate the C code or library again, thus saving build time.

Support of Functional Mock-up Units

- FMUs enable you to use different modeling approaches, for example, based on physical modeling with Modelica. In ConfigurationDesk, FMUs can be integrated together with Simulink® models. You can also use precompiled FMU files, thus saving build time and protecting your intellectual property. The user workflow for importing and connecting FMUs to other model interfaces and to I/O is identical to the workflow for SICs.

The new ConfigurationDesk version offers optimized view sets for two different working methods:

- The Model-Function page is optimized for Simulink-oriented work with projects for which the Simulink model interface still has to be adapted or changed.
- The Signal Chain page is optimized for container-oriented work with projects for which the model interfaces are already fixed.

Multicore or Multi-Processing-Unit Systems

Large, complex models can be distributed across multiple processing units, processor boards, and processor cores to ensure the simulation runs in real time. Two different workflows are possible for this.

- The first is to use separate behavior models for each core and import them into ConfigurationDesk. The intermodel communication in this workflow is configured in ConfigurationDesk. If you are working with more than one model, ConfigurationDesk provides the Multiple Models view set.
- In the second workflow, there is one overall Simulink® model for the entire application, and a special Simulink block is used to specify which of the subsystems are to be computed together on one core. The overall model is then automatically split into separate model files. The intermodel communication in this workflow is transferred from Simulink® to ConfigurationDesk.

Multiple models can be combined to one process. Multiple processes can be assigned to processing unit applications in ConfigurationDesk, which automatically performs the core-to-process assignment within each unit.
Configuration Version for RapidPro

Key Features
- Configuring the RapidPro hardware (p. 368)
- Monitoring the hardware states during operation
- Support for wiring the RapidPro hardware to sensors and actuators

Application Area
The configuration version offers you configuration and diagnostics functions for RapidPro hardware (p. 368) and supports you in putting the hardware into operation. The RapidPro hardware acts as an extension to dSPACE prototyping systems to cover application scenarios which require signal conditioning, power stages, and intelligent I/O subsystems.

Benefits
The hardware is displayed in an intuitive structured view. You can change the configurations of the individual module channels and monitor the hardware states during operation. Channel-specific diagnostics (open load, etc.) are provided in a list view. You can manage the configurations of different hardware setups via the Project Manager. A pinout list for wiring the RapidPro hardware to sensors and actuators can be exported as a comma-separated value (CSV) file or a Microsoft® Excel® file.
Functionality Overview

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<tr>
<td>RapidPro hardware configuration</td>
<td>ConfigurationDesk displays the RapidPro hardware in a structured view, and provides intuitive access to all the relevant configuration settings. Monitoring of analog and digital signal values is available to support you in connecting sensors and actuators to the RapidPro hardware when the system is put into operation.</td>
</tr>
<tr>
<td>Diagnostics handling</td>
<td>During operation, diagnostic information such as overcurrent, short circuit, open load, overheat, and over- and undervoltage detection is monitored and displayed. This makes it easy to detect and locate faults.</td>
</tr>
<tr>
<td>Project management</td>
<td>ConfigurationDesk’s Project Manager allows you to organize all the relevant project information such as hardware configurations and application-specific data.</td>
</tr>
<tr>
<td>Wiring information</td>
<td>To help you wire your RapidPro hardware, a pinout list with all the relevant information can be exported as a comma-separated value (CSV) file or a Microsoft® Excel® file.</td>
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<td>ConfigurationDesk – Configuration Version (RapidPro)</td>
<td>CFD-C</td>
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