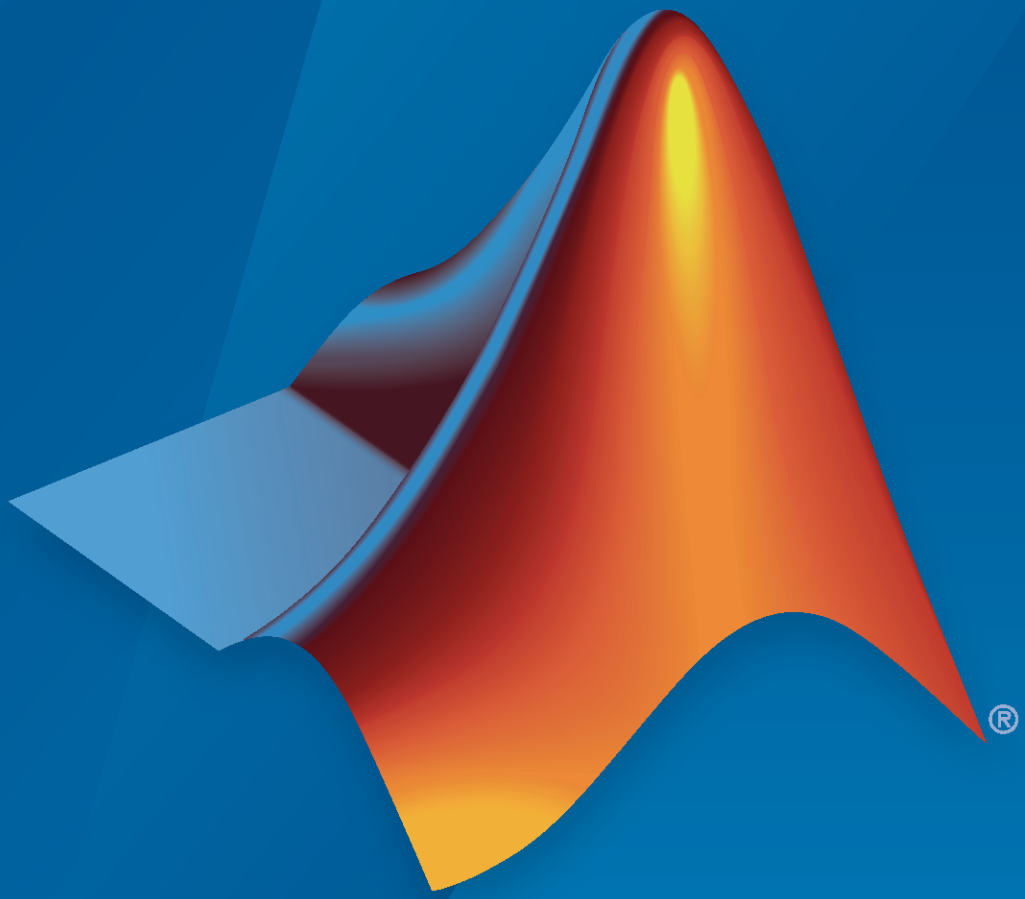
Simulink® Real-Time™

Reference



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Simulink® Real-Time™ Reference

Revision History

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Configuration Parameters

Simulink Real-Time Options Pane

Parameter	Description
Log level on page 1-4	Selects filtering level that limits RTOS system messages that appear in the system log.
Force polling mode on page 1-5	Enables polling mode —instead of interrupt-driven mode— for clocking the real-time application.
Max file log runs on page 1-6	Selects the number of file log run to retain when logs are stored on the target computer.
Compile with GCC -ffast-math on page 1-7	Enables the GCC compiler `-ffast-math` option when compiling real-time application code.

Control the code created by Simulink Coder™ code generation software for a Simulink Real-Time application. Set up general information about building real-time applications, including target, execution, data logging, and other options.

Configuration

The **Simulink Real-Time Options** node in the Configuration Parameters dialog box allows you to specify how the software generates the real-time application. To reveal the **Simulink Real-Time Options** node, do the following:

1 In the **Code Generation** pane, in the **System target file** list, select `slrealtime.tlc`. This setting generates system target code for Simulink Real-Time.

> **Note** If you open a model that was originally saved with **System target file** set to `xpctarget.tlc`, the software updates the setting to `slrealtime.tlc`. To retain the updated setting, save the updated model.

Tips

- The default values work for the generation of most real-time applications. If you want to customize the build of your real-time application, set the option parameters to suit your specifications.
- To access configuration parameters from the MATLAB® command line, use:
  - `gcs` — To access the current model.
  - `set_param` — To set the parameter value.
  - `get_param` — To get the current value of the parameter.

To get help on an option

1 Right-click the option text label.

2 From the context menu, select **What's This**.


What's This?

Log level

Selects filtering level that limits Simulink Real-Time target computer system messages that appear in the system log. To open the viewer tab in Simulink Real-Time Explorer and view the system log from the target computer `tg`, in the MATLAB Command Window, type:

```
slrtExplorer
```

For more information, see `slrtExplorer`.

Settings

Default: `info`

`info`
: Select to include all system messages in the system log.

`trace`
: Select to include all system memory trace messages in the system log.

`debug`
: Select to include all system debug messages in the system log.

`warning`
: Select to include all system warning messages in the system log.

`error`
: Select to include all system error messages in the system log.

`fatal`
: Select to include all system fatal messages in the system log.

`...`

Command-Line Information

Parameter: `SLRTLogLevel`
Type: character vector
Value: `'info'` | `'trace'` | `'debug'` | `'warning'` | `'error'` | `'fatal'`
Default: `'info'`

Related Real-Time Application Option

The `SLRTLogLevel` configuration parameter sets the initial value for the `loglevel` option when you build the real-time application.

For more information, see `Application` object.
Option: `loglevel`

Force polling mode

Enables polling mode — instead of interrupt-driven mode — for clocking the real-time application. Polling mode can be useful for reducing sample time jitter. But, enabling this option causes the real-time application to consume a CPU core completely to clock and execute the base rate.

Settings

Default: `off`

`off`

When `Force polling mode` is disabled, the real-time application is clocked by a timer interrupt, unless the base sample rate is equal to or below the polling threshold (100 µs). If the base sample rate is less than or equal to the threshold, the real-time application is clocked in polling mode.

`on`

When `Force polling mode` is enabled, the real-time application is always clocked in polling mode.

Command-Line Information

Parameter: `SLRTForcePollingMode`
Type: character vector
Value: `'off'` | `'on'`
Default: `'off'`

Related Real-Time Application Option

The `SLRTForcePollingMode` configuration parameter sets the initial value for the `pollingThreshold` option when you build the real-time application. Enabling `SLRTForcePollingMode` sets the `pollingThreshold` to a value above the base sample rate. This setting forces clocking the real-time application in polling mode.
Option: `pollingThreshold`

Max file log runs

Selects the number of file log runs to retain for the real-time application when logs are stored on the target computer instead of uploaded to the development computer after each simulation run. The logs are stored if auto-import is disabled, or the target is not connected to the host at stop time.

Settings

Default: 1

`int`

Select the number of file log runs to retain for the real-time application when logs are stored on the target computer instead of uploaded to the development computer after each simulation run.

Command-Line Information

Parameter: `SLRTFileLogMaxRuns`
Type: int
Value: int
Default: 1

Related Real-Time Application Option

The `SLRTFileLogMaxRuns` configuration parameter sets the initial value for the `fileLogMaxRuns` option when you build the real-time application.
Option: `fileLogMaxRuns`

Compile with GCC -ffast-math

Enables the GCC compiler `-ffast-math` option when compiling real-time application code. This option is disabled by default for Simulink Real-Time models.

By enabling the **Compile with GCC -ffast-math** option, you provide the compiler with more flexibility to optimize floating-point math at the expense of deviating from the IEEE-754 floating-point standard.

For more information about the `-ffast-math` option, see the Semantics of Floating-Point Math in GCC.

- gcc.gnu.org/wiki/FloatingPointMath/

Settings

Default: `off`

`off`

When `UseGCCFastMath` is disabled, Simulink Real-Time compiles real-time application code without the compiler `-ffast-math` option.

`on`

When `UseGCCFastMath` is enabled, Simulink Real-Time compiles real-time application code with the compiler `-ffast-math` option.

Command-Line Information

Type: character vector
Value: `'off'` | `'on'`
Default: `'off'`

Configuration Parameters (slrt.tlc OBSOLETE)

Simulink Real-Time Options Pane (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Parameter	Description
Execution mode	Specify execution mode of downloaded code.
Real-time interrupt source	Select a real-time interrupt source from the I/O board.
I/O board generating the interrupt	Specify the board interrupt source.
PCI slot (-1: autosearch) or ISA base address	Enter the slot number or base address for the I/O board generating the interrupt.
Monitor Task Execution Time	Monitor task execution times and append the results to the target object property `tg.TETlog`.
Signal logging data buffer size in doubles	Enter the maximum number of sample points that the software stores before wrapping.
Double buffer parameter changes	Use a double buffer for parameter tuning. This setting enables parameter tuning so that the process of changing parameters in the real-time application uses a double buffer.
Load a parameter set from a file on the designated target file system	Automatically load a parameter set from a file on the designated target computer file system.
File name	Specify the target computer file name from which to load the parameter set.
Generate INCA/CANape extensions	Enable real-time applications to generate data, such as A2L data, for Vector CANape® and ETAS® Inca.
Enable Stateflow animation	Enables visualization of Stateflow® chart animation.

Control the code created by Simulink Coder code generation software for a Simulink Real-Time application. Set up general information about building real-time applications, including target, execution, data logging, and other options.

Configuration

The **Simulink Real-Time Options** node in the Configuration Parameters dialog box allows you to specify how the software generates the real-time application. To reveal the **Simulink Real-Time Options** node, do the following:

1. In the **Code Generation** pane, in the **System target file** list, select `slrt.tlc`. This setting generates system target code for Simulink Real-Time.

Note If you open a model that was originally saved with **System target file** set to `xpctarget.tlc`, the software updates the setting to `slrt.tlc`. To retain the updated setting, save the updated model.

2 Select `C` for the **Language** parameter on the code generation pane.

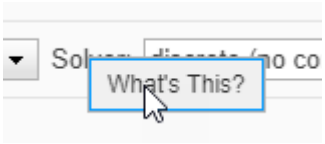
Tips

- The default values work for the generation of most real-time applications. If you want to customize the build of your real-time application, set the option parameters to suit your specifications.
- To access configuration parameters from the MATLAB command line, use:
  - `gcs` — To access the current model.
  - `set_param` — To set the parameter value.
  - `get_param` — To get the current value of the parameter.

To get help on an option

1 Right-click the option text label.

2 From the context menu, select **What's This**.



Execution mode (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Specify execution mode of downloaded code.

Settings

Default: `Real-Time`

`Real-Time`

Executes downloaded code as a real-time application.

`Freerun`

Executes downloaded code as fast as possible.

Multirate models cannot be executed in `Freerun` execution mode. On the **Solver** pane in the Configuration Parameters dialog box, clear the check box for **Treat each discrete rate as a separate task**.

Command-Line Information

Parameter: `RL32ModeModifier`
Type: character vector
Value: `'Real-Time'` | `'Freerun'`
Default: `'Real-Time'`

Real-time interrupt source (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Select a real-time interrupt source from the I/O board.

Settings

Default: `Timer`

`Timer`

Specifies that the board interrupt source is a timer.

`Auto (PCI only)`

Enables the Simulink Real-Time software to automatically determine the IRQ that the BIOS assigned to the board and use it.

3 to 15

Specifies that the board interrupt source is an IRQ number on the board.

Tips

- The `Auto (PCI only)` option is available only for PCI boards. If you have an ISA board (PC/104 or onboard parallel port), set the IRQ manually.
- The Simulink Real-Time software treats PCI parallel port plugin boards like ISA boards. For PCI parallel port plugin boards, set the IRQ manually.
- Multiple boards can share an interrupt number.

Command-Line Information

Parameter: `RL32IRQSourceModifier`
Type: character vector
Value: `'Timer'|Auto (PCI only)|'3'|'4'|'5'|'6'|'7'|'8'|'9'|'10'|'11'|'12'|'13'|'14'|'15'`
Default: `'Timer'`

I/O board generating the interrupt (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Specify the board interrupt source.

Settings

Default: `None/Other`

`Bitflow NEON`

Specifies that the interrupt source is the BitFlow™ NEON video board.

`GE_Fanuc(VMIC)_PCI-5565`

Specifies that the interrupt source is the GE® Fanuc VMIC PCI-5565 board.

`General Standards 24DSI12`

Specifies that the interrupt source is the General Standards 24DSI12 board.

`Parallel_Port`

Specifies that the interrupt source is the parallel port of the target computer.

`Speedgoat_IO321`

Specifies that the interrupt source is the Speedgoat IO321 FPGA board.

`Speedgoat_IO331`

Specifies that the interrupt source is the Speedgoat IO331 FPGA board.

`Speedgoat_IO333`

Specifies that the interrupt source is the Speedgoat IO333 FPGA board.

`None/Other`

Specifies that the I/O board has no interrupt source.

Command-Line Information

Parameter: `xPCIRQSourceBoard`
Type: character vector
Value: `'Bitflow NEON'|`
`'GE_Fanuc(VMIC)_PCI-5565'|`
`'General Standards 24DSI12'|`
`'Parallel_Port'|`
`'Speedgoat_IO321'|`
`'Speedgoat_IO331'|`
`'Speedgoat_IO333'|`
`'None/Other'`
Default: `'None/Other'`

PCI slot (-1: autosearch) or ISA base address (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Enter the slot number or base address for the I/O board generating the interrupt.

Settings

Default: -1

The PCI slot can be either `-1` (let the Simulink Real-Time software determine the slot number) or of the form `[bus, slot]`.

The base address is a hexadecimal number of the form `0x300`.

Tip

To determine the bus and PCI slot number of the boards in the target computer, in the Command Window, type:

```
tg = slrt;
getPCIInfo(tg, 'installed')
```

Command-Line Information

Parameter: `xPCIOIRQSlot`
Type: character vector
Value: `'-1'` | hexadecimal value
Default: `'-1'`

Monitor Task Execution Time (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Monitor task execution times and append the results to the target object property `tg.TETlog`.

Task execution time (TET) measures how long it takes the RTOS to run for one base-rate time step. For a multirate model, use the profiler to find out what the execution time is for each rate.

Settings

Default: on

 On

Monitors task execution times and appends the results to the target object property `tg.TETlog`.

 Off

Does not monitor task execution times.

Command-Line Information

Parameter: `RL32LogTETModifier`
Type: character vector
Value: `'on'` | `'off'`
Default: `'on'`

Signal logging data buffer size in doubles (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Enter the maximum number of sample points that the software stores before wrapping.

Settings

Default: 100000

The maximum value for this option cannot exceed the available target computer memory, which the Simulink Real-Time software also uses to hold other items.

Tips

- Real-time applications use this buffer to store the time, states, outputs, and task execution time (TET) logs as defined in the Simulink model.
- The maximum value for this option derives from available target computer memory, which the Simulink Real-Time software also uses to hold other items. For example, in addition to signal logging data, the software also uses the target computer memory for the Simulink Real-Time RTOS, real-time application, and scopes.

  For example, assume that your model has six data items (time, two states, two outputs, and task execution time). If you enter a buffer size of `100000`, the target object property `tg.MaxLogSamples` is calculated as `floor(100000 / 6) = 16666`. After the buffer saves 16666 sample points, it wraps and further samples overwrite the older ones.
- Suppose that you enter a logging buffer size larger than the available RAM on the target computer. When you download and initialize the real-time application, the target computer displays a message, `ERROR: allocation of logging memory failed`. To avoid this error, either install more RAM or reduce the buffer size for logging, and then restart the target computer. To calculate the maximum buffer size available for your real-time application logs, divide the amount of available RAM on your target computer by `sizeof(double)`, or `8`. Enter that value for the **Signal logging data buffer size in doubles** value.

Command-Line Information

Parameter: `RL32LogBufSizeModifier`
Type: character vector
Value: `'100000'` | A valid memory size
Default: `'100000'`

Double buffer parameter changes (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Use a double buffer for parameter tuning. This setting enables parameter tuning so that the process of changing parameters in the real-time application uses a double buffer.

Settings

Default: off

 On

Changes parameter tuning to use a double buffer.

 Off

Suppresses double buffering of parameter changes in the real-time application.

Tips

- When a parameter change request is received, the new value is compared to the old one. If the new value is identical to the old one, it is discarded, and if different, it is queued.
- At the start of execution of the next sample of the real-time task, the queued parameters are updated. This operation increases the task execution time (TET) and can cause a CPU overload error.
- Double buffering leads to a more robust parameter tuning interface, but it increases task execution time and the higher probability of overloads. Under typical conditions, keep double buffering off (default).
- If the real-time application contains MATLAB variables as the value of block parameters, the software ignores this double buffering setting. Normal parameter tuning occurs.

Command-Line Information

Parameter: `xpcDblBuff`
Type: character vector
Value: `'on'` | `'off'`
Default: `'off'`

Load a parameter set from a file on the designated target file system (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Automatically load a parameter set from a file on the designated target computer file system.

Settings

Default: off

 On

Enable the automatic loading of a parameter set from the file specified by **File name** on the designated target computer file system.

 Off

Suppress the automatic loading of a parameter set from a file on the designated target computer file system.

Dependencies

This parameter enables **File name**.

Command-Line Information

Parameter: `xPCLoadParamSetFile`
Type: character vector
Value: `'on'` | `'off'`
Default: `'off'`

File name (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Specify the target computer file name from which to load the parameter set.

Settings

`''`

Tip

If the named file does not exist, the software loads the parameter set built with the model.

Dependencies

To enable this parameter, set **Load a parameter set from a file on the designated target file system**.

Command-Line Information

Parameter: `xPCOnTgtParamSetFileName`
Type: character vector
Value: A valid file name
Default: `''`

Generate INCA/CANape extensions (disables the Simulation Data Inspector and Dashboard blocks) (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Enable real-time applications to generate data, such as A2L data, for Vector CANape and ETAS Inca.

Settings

Default: off

 On

Enables real-time applications to generate data, such as that for A2L, for Vector CANape and ETAS Inca.

 Off

Does not enable real-time applications to generate data, such as that for A2L, for Vector CANape and ETAS Inca.

Command-Line Information

Parameter: `GenerateASAP2`
Type: character vector
Value: `'on'` | `'off'`
Default: `'off'`

Enable Stateflow animation (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Enables visualization of Stateflow chart animation.

Settings

Default: off

 On

Enables visualization of Stateflow chart animation.

 Off

Disables visualization of Stateflow chart animation.

Command-Line Information

Parameter: `xPCEnableSFAnimation`
Type: character vector
Value: `'on'` | `'off'`
Default: `'off'`

Arm when connecting to target (slrt.tlc OBSOLETE)

Note The system target file `slrt.tlc` is obsolete for R2020b. The configuration parameters for that code generation target are not supported.

Whether a button or a signal triggers data uploading (as defined by **Source**), the trigger must be armed to allow data uploading to begin.

If the trigger **Source** is signal, monitoring of the trigger signal begins immediately. Data uploading begins when the trigger signal satisfies trigger conditions (as defined in the Trigger signal section).

If you clear **Arm when connecting to target**, manually arm the trigger by clicking the Arm **Trigger** button on the External Mode Control Panel.

Settings

Default: off

 On

Connecting to the target arms the trigger.

 Off

Data uploading begins immediately after clicking the **Arm Trigger** button on the External Mode Control Panel.

Command-Line Information

Parameter: `ExtModeArmWhenConnect`
Type: character vector
Value: `'on'` | `'off'`
Default: `'off'`

TLC Options Parameters

TLC Command-Line Options

TLC command-line options are model options set before code generation to configure the real-time application and the real-time RTOS.

To set these options from the **Code Generation** pane in the Configuration Parameters dialog box, select **Advanced Parameters**. Type the option in the **TLC command line options** text box in this form:

```
-aoption_name1=option_value1 -aoption_nameN=option_valueN
```

Prefix each option name with `-a`. Do not leave spaces around the equal sign. Do not place a comma between consecutive value assignments.

To set these options from the Command Window, use the syntax:

```
set_param(model_name, ...
     'TLCOptions', ...
     '-aoption_name1=option_value1 -aoption_nameN=option_valueN')
```

To read these options from the Command Window, use the syntax:

```
get_param(model_name, 'TLCOptions');
```

To remove these options, use the syntax:

```
set_param(model_name, 'TLCOptions', '')
```

Note At this time, no TLC options for Simulink Real-Time are supported.

4

Simulink Real-Time Tools and Applications

Simulink Real-Time Explorer

Interact with target computer and real-time application running on target computer

Description

Simulink Real-Time Explorer provides a single point of contact for viewing connection status and interacting with a real-time application. You can monitor and trace signals, tune parameters, and stream data to the Simulation Data Inspector.

Note Do not use Simulink external mode while Simulink Real-Time Target Explorer is running. Use only one interface or the other.

Use Simulink Real-Time Explorer for these tasks:

- Connect the development computer and target computer.
- Load, start, and stop a real-time application on target computer.
- View real-time application parameters and signal hierarchy.
- Select real-time application signals for streaming to the Simulation Data Inspector.
- Set real-time application stop time.
- View task execution time (TET).

For examples, click the links in the **More Information** column.

Target Computer Configuration

Capability	More Information
Configure target computer configuration settings. View target computer disk usage.	“Target Computer Settings”

Real-Time Application Access and Control

Capability	More Information
• Connect target computers to a development computer, and then disconnect them. • Load a prebuilt real-time application into a target computer. • Start and then stop running a real-time application that you downloaded to the target computer. • Display execution time, task execution time, and other properties of the real-time application. • Change stop time without regenerating code.	• “Real-Time Application and Target Computer Modes” • “Configure and Control Real-Time Application by Using Simulink Real-Time Explorer”

Real-Time Application Management

Capability	More Information
By using **Configuration** tab or right-click menu in **Targets** tree: • View real-time applications available on target computer, including detailed properties. • Delete real-time applications from target computer. • Select a real-time application as startup application.	“Connect, Load Application, and Start” on page 4-5

Signal Access

Capability	More Information
Filter and group hierarchical signals	“Display and Filter Hierarchical Signals and Parameters”
Monitor signals.	• “Monitor Signals by Using Simulink Real-Time Explorer” • “Instrument a Stateflow Subsystem”
Create, save, and load signal groups.	“Export and Import Signals in Instrument by Using Simulink Real-Time Explorer”

Parameter Tuning

Capability	More Information
Filter and group hierarchical parameters	“Display and Filter Hierarchical Signals and Parameters”
Display and tune parameter values while the real-time application is running.	“Tune Parameters by Using Simulink Real-Time Explorer”
Enable parameter table operation by correcting ECU and XCP page selection mismatch by using the **Enable Parameter Table** button.	• `copyPage` • `getECUPage` • `getNumPages` • `getXCPPage` • `setECUAndXCPPage` • `setECUPage` • `setXCPPage`
Refresh cached parameter table values by clicking the **Refresh Values** button.	Use the **Refresh Values** button for instances in which the parameter table data becomes disabled (for example when page switching occurs),
Use the **Hold Updates** button and **Update All Parameters** button to change multiple parameter values simultaneously. These buttons in Explorer operate in the same way as these buttons on the **Real-Time** tab in the Simulink Editor.	“Tune Parameters by Using Hold Updates and Update All Parameters”

Monitor Task Execution Time and Target Computer Status

Capability	More Information
Open the **TET Monitor** tab and monitor task execution time.	Simulink Real-Time TET Monitor
Open the **System Log Viewer** tab and monitor the target computer system messages.	`slrtLogViewer` “Target Computer Status Monitor” on page 5-2

Open the Simulink Real-Time Explorer

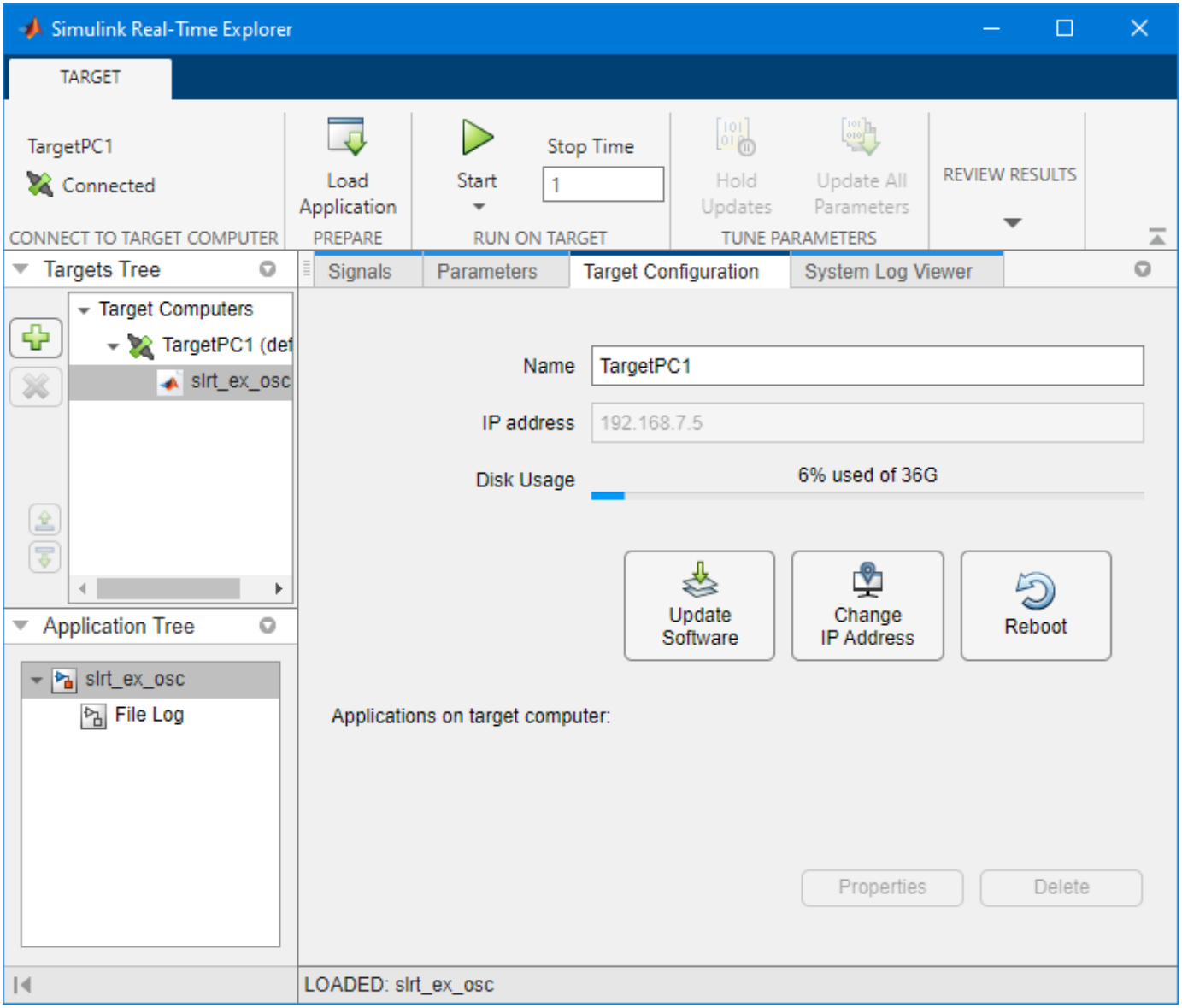
From the Simulink Editor, in the **Real-Time** tab, select **Prepare** > **SLRT Explorer**. Or, from the MATLAB Command Window, type:

```
slrtExplorer
```

Examples

Configure Target, Update, and Reboot

This example shows how to change the IP address of the target computer, update the target computer software, and reboot the target computer.



Open the Simulink Real-Time Explorer.

Select the target computer in the **Targets Tree** panel.

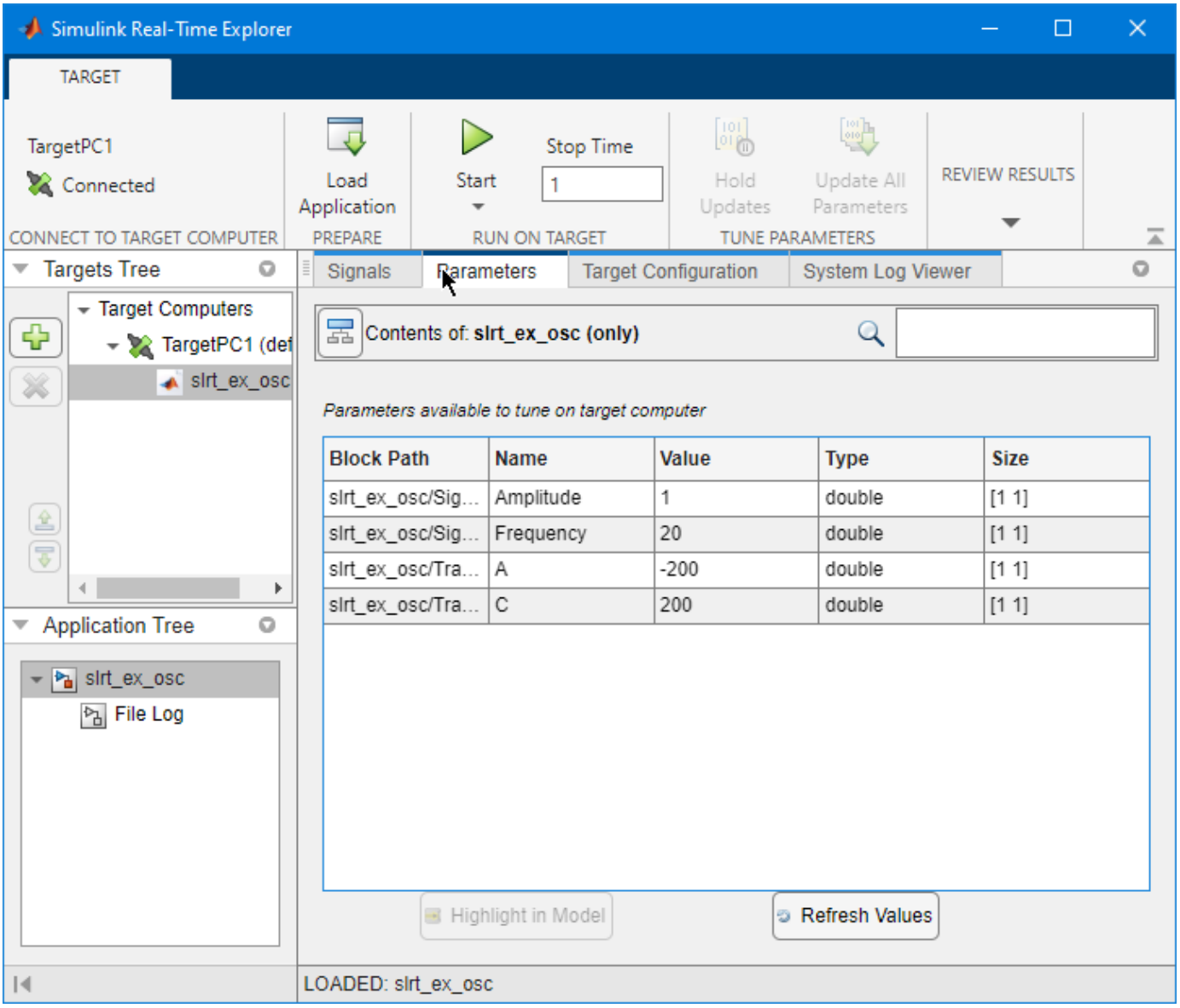
To change the IP address of the target computer, click the **Change IP Address** button.

To update the target computer software, click the **Update Software** button.

To reboot the target computer, click the **Reboot** button.

Connect, Load Application, and Start

This example shows how to connect to the target computer, load the real-time application, set the stop time, and start the real-time application.



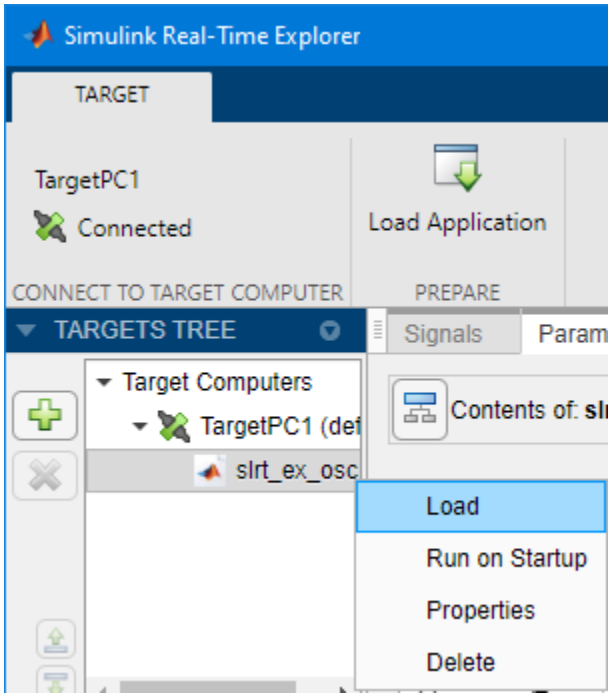
Open the Simulink Real-Time Explorer.

Select the target computer in the **Targets Tree** panel.

To connect to the target computer if not already connected, click **Disconnected** toggling it to **Connected**.

To select and load a real-time application, click **Load Application** and select the MLDATX file.

Note You can select and load a real-time application by using the context menu. Right-click on the application and select **Load**.



To select the application stop time, type a value (in seconds) in the **Stop time** field.

To start the application, click the **Start** button.

In Explorer, clicking the **Start** button is equivalent to executing this command for target object `tg`:

```
start(tg, 'ReloadOnStop', true, 'AutoImportFileLog', true)
```

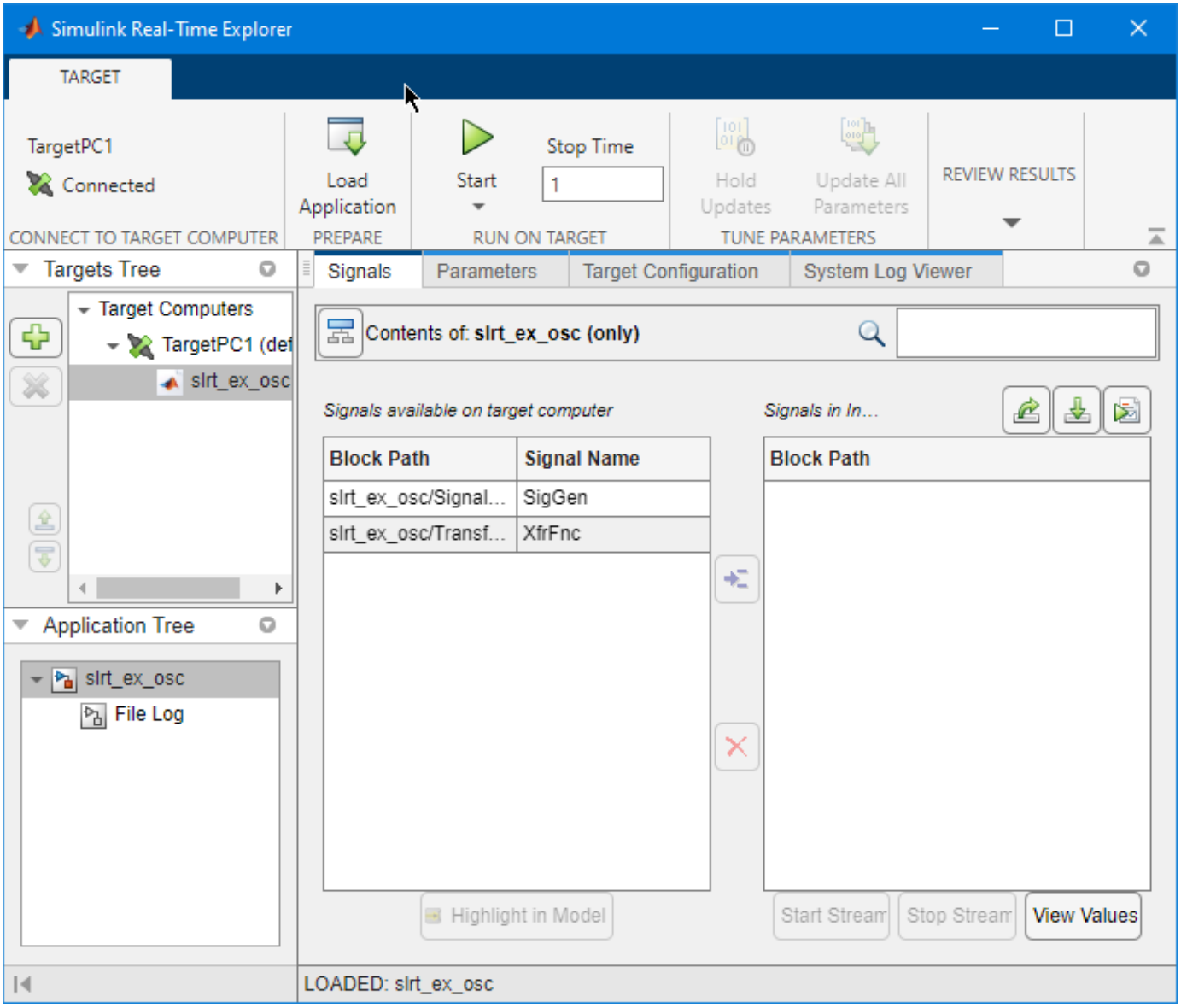
Note To change the `ReloadOnStop` and `AutoImportFileLog` operation of the **Start** button, you can:

- Select **Start** > **ReloadOnStop**
- Select **Start** > **AutoImportFileLog**.

To stop the real-time application, click the **Stop** button.

Select Signals and Stream Data to Simulation Data Inspector

This example shows how to connect to the target computer, load the real-time application, select signals for a signal list, start the real-time application, and view the streaming data in the Simulation Data Inspector.



Open the Simulink Real-Time Explorer.

To connect to the target computer if not already connected, click **Disconnected** toggling it to **Connected**.

To select and load a real-time application, click **Load Application** and select the MLDATX file.

To select signals for streaming, click the application name, select signals from the **Signals** tab, and click the **Add selected signals** button.

To run the application and generate data for streaming, click the **Run** button.

To stream the signal data, select the signals in the **Group signals to stream for SDI** list and click the **Stream Signal Group to SDI** button.

To view the streaming signals, click the **Open in SDI** button.

After viewing the data, to stop the real-time application, click the **Stop** button.

Programmatic Use

`slrtExplorer` opens the Simulink Real-Time Explorer. Operations in the Simulink Real-Time Explorer UI correspond to Simulink Real-Time commands. For example, the explorer **Start** button corresponds to the `start` function.

See Also

`slrtExplorer` | `slrtLogViewer` | `slrtTETMonitor`

Topics

“Target Computer Settings”
“Real-Time Application and Target Computer Modes”
“Configure and Control Real-Time Application by Using Simulink Real-Time Explorer”
“Display and Filter Hierarchical Signals and Parameters”
“Monitor Signals by Using Simulink Real-Time Explorer”
“Export and Import Signals in Instrument by Using Simulink Real-Time Explorer”
“Tune Parameters by Using Simulink Real-Time Explorer”

Introduced in R2020b

Simulink Real-Time TET Monitor

Monitor task execution time for the real-time application running on target computer

Description

Simulink Real-Time Task Execution Time (TET) Monitor lets you view the task execution time for the real-time application running on target computer.

You can open the TET monitor at any time. Depending on the current state of connected target computers, the monitor displays TET data for each real-time application task. Changes to the target computer state are updated in the TET monitor.

Open the Simulink Real-Time TET Monitor

From the Simulink Editor, in the **Real-Time** tab, select **TET Monitor**. Or, from the MATLAB Command Window, type:

```
slrtTETMonitor
```

Examples

Open TET Monitor and View Status

In the “Data Logging with Simulation Data Inspector (SDI)” example, use these additional steps to display the TET monitor.

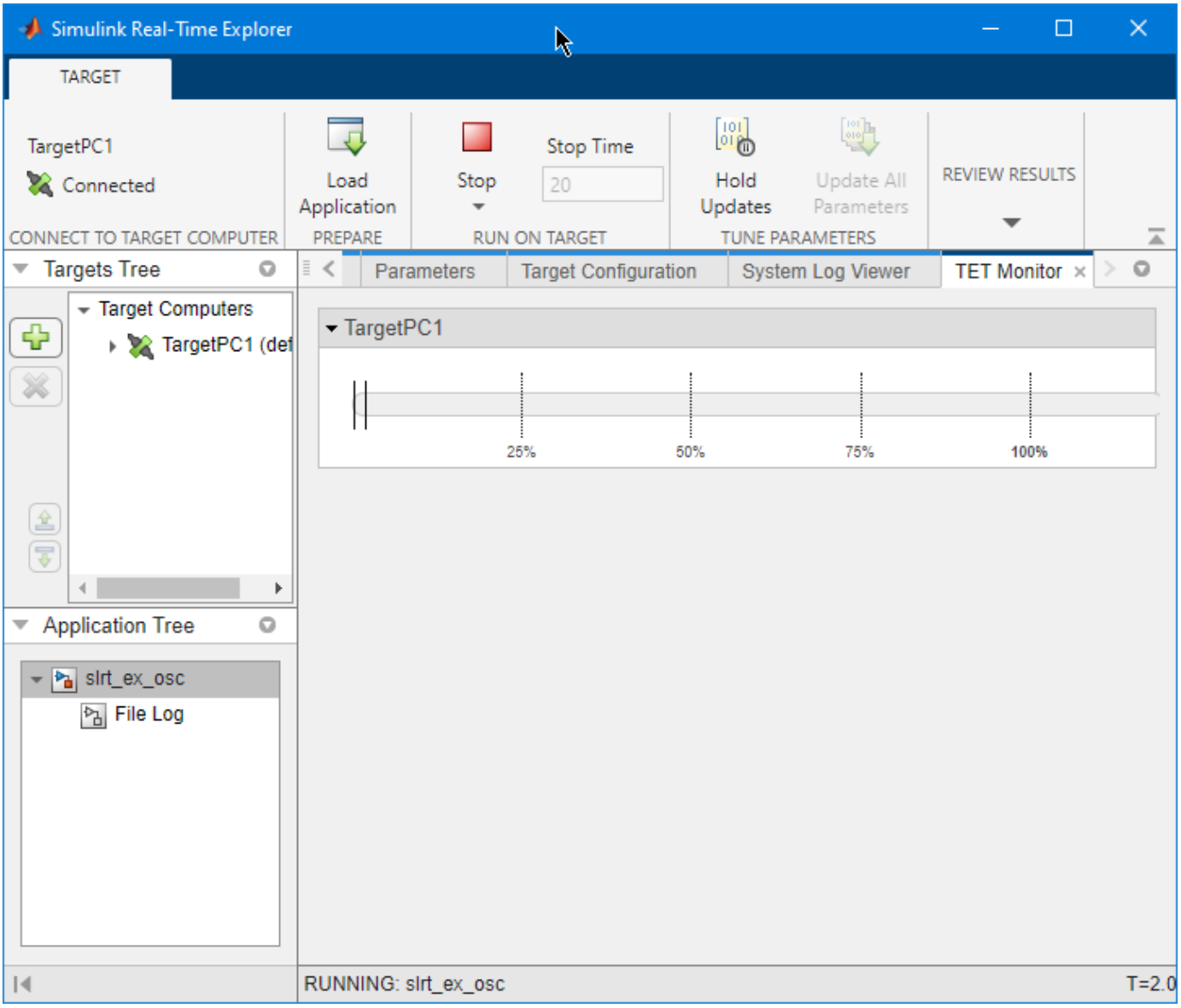
Open the `slrt_ex_osc` model.

Build the real-time application, load it on the target computer, and start the application. In Simulink Editor **Real-Time** tab, click **Run on Target**.

Open the TET monitor. In the **Real-Time** tab, click **TET Monitor**. Or, in the Command Window, enter:

```
slrtTETMonitor
```

When you run the real-time application, the TET monitor displays status.



Programmatic Use

`slrtTETMonitor` opens the Simulink Real-Time TET Monitor.

See Also

`slrtTETMonitor` | SLRT Overload Options | `slrtExplorer`

Topics

“Data Logging with Simulation Data Inspector (SDI)”
“Parameter Tuning and Data Logging”
“Real-Time Application and Target Computer Modes”
“Configure and Control Real-Time Application by Using Simulink Real-Time Explorer”

“Execution Profiling for Real-Time Applications”

Introduced in R2020b

Simulink Real-Time App Generator

Generate instrument panel app to interact with target computer and real-time application running on target computer

Description

Simulink Real-Time App Generator helps you generate an instrument panel app that interacts with the target computer and real-time application running on the target computer. You can select signals and parameters in your model to represent as instrument panel controls and configure the controls before generating the app.

To use the Simulink Real-Time App Generator, open the App Generator from the **Real-Time** tab in the Simulink Editor and use the App Generator for these tasks:

- Open a model file SLX or real-time application file MLDATX, and create an instrument panel app.
- Select signals and parameters to add to an instrument panel app.
- Configure controls for instrument panel app.
- Create instrument panel app.
- Save an App Generator session file MAT, and open it in a future App Generator session

Open the Simulink Real-Time App Generator

From the Simulink Editor, in the **Real-Time** tab, select **Review Results** > **App Generator**. Or, from the MATLAB Command Window, type:

```
slrtAppGenerator
```

If you open the App Generator from a model, the App Generator populates the **Signals and Parameters** pane with information from the model.

Examples

Configure Instrument Panel Controls and Create App

This example shows how to configure instrument panel controls for signals and parameter, then create an instrument panel app by using the App Generator. This example uses example model `slrt_ex_osc`.

Open example model `slrt_ex_osc`. In the MATLAB Command Window, type:

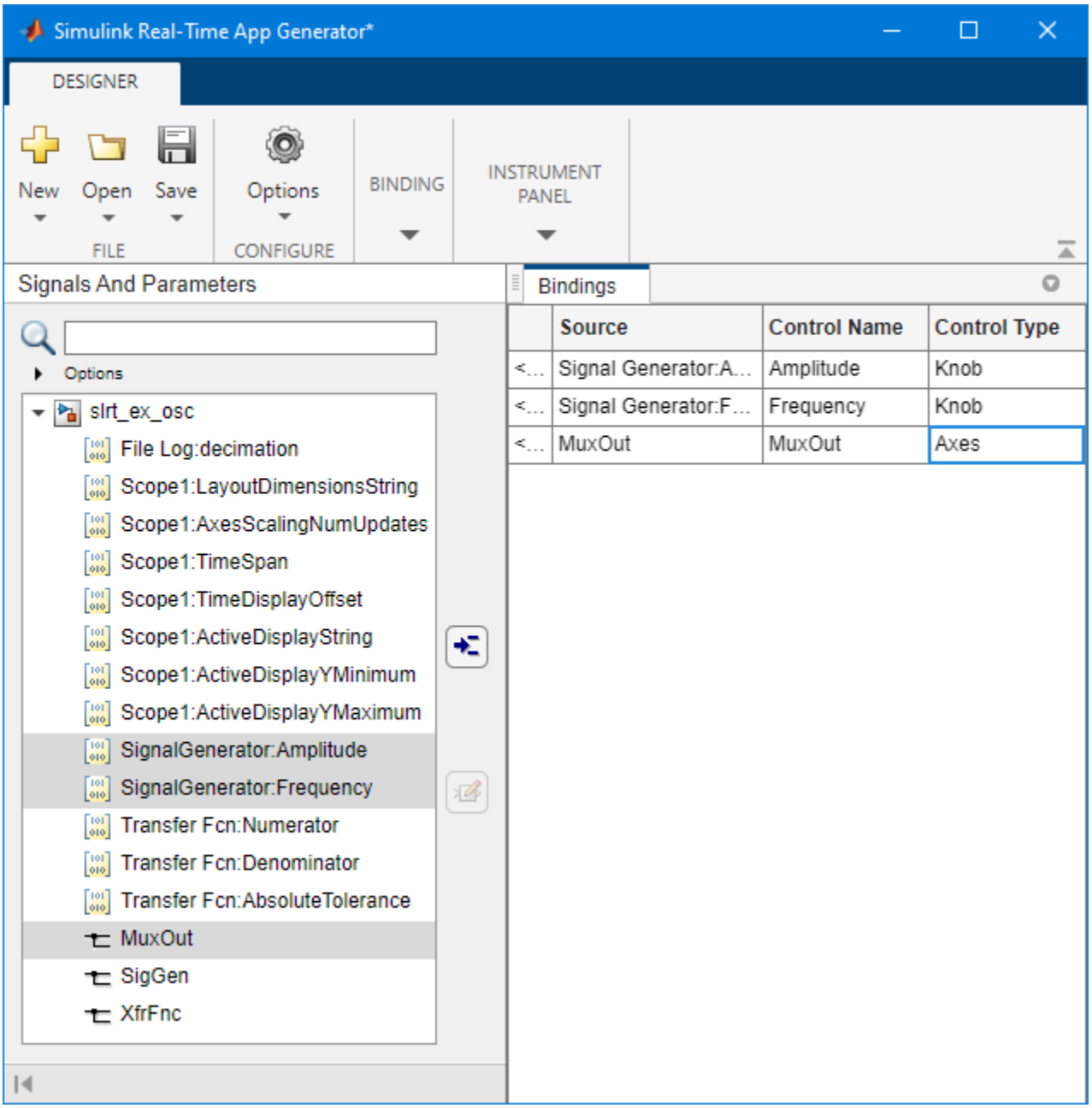
```
open_system(fullfile(matlabroot,'toolbox',...
    'slrealtime','examples','slrt_ex_osc'))
```

Build the model, creating a real-time application file MLDATX.

Open the Simulink Real-Time App Generator. In the **Real-Time** tab, select **Review Results** > **App Generator**.

Add signals and parameters to the instrument panel app. From the **Signals and Parameters** pane, select the `Amplitude` parameter, the `Frequency` parameter, and the `MuxOut` signal. Click the **Add to panel** button.

Configure each control by clicking on its **Control Type** entry and editing the selections for the control. This figure shows a possible configuration for this instrument panel.



To create the instrument panel app, click the **Generate App** button.

After creating the app, you can open it in App Designer to further customize the instrument panel.

The App Generator adds controls to your instrument panel that let the panel interface with the real-time application. These controls include the target computer selector, connect button, load application button, start/stop button, stop time field, and system log. Any instrumented signals from the model are added in an axis component. For more information, see “Create App Designer Instrument Panels by Using Simulink Real-Time Components”.

Open Real-Time Application and Create App

This example shows how to open a real-time application in the App Generator, add signals and parameters to an instrument panel app from the real-time application, and add signals and parameters to the instrument panel app from the model that corresponds to the real-time application..

Open the App Generator. In the MATLAB Command Window, type:

```
slrtAppGenerator
```

To create a new instrument panel app, click the **New** button and select the real-time application file `slrt_ex_osc.mldatx`. You created this file in “Configure Instrument Panel Controls and Create App” on page 4-13.

Add signals and parameters to the instrument panel app. From the **Signals and Parameters** pane, select the `Amplitude` parameter, the `Frequency` parameter, and the `XfrFnc` signal. Click the **Add to panel** button.

To add signals and parameters from the model that corresponds to the real-time application, click the **Add From Model** button.

The App Generator opens the model and puts the model in bind mode for signal and parameter selection. For more information about bind mode, see “Add Instruments to Real-Time Application from Simulink Model”.

To return to the App Generator, close bind mode in the model.

To create the instrument panel app, click the **Generate App** button.

Programmatic Use

`slrtAppGenerator` opens the Simulink Real-Time App Generator. Operations that the Simulink Real-Time App Generator UI adds to an instrument panel app correspond App Designer controls that are customized for your real-time application.

See Also

`slrtAppGenerator` | `slrtExplorer` | `slrtLogViewer` | `slrtTETMonitor`

Topics
“Target Computer Settings”
“Real-Time Application and Target Computer Modes”
“Configure and Control Real-Time Application by Using Simulink Real-Time Explorer”
“Display and Filter Hierarchical Signals and Parameters”
“Monitor Signals by Using Simulink Real-Time Explorer”
“Export and Import Signals in Instrument by Using Simulink Real-Time Explorer”
“Tune Parameters by Using Simulink Real-Time Explorer”

Introduced in R2022a

Simulation Data Inspector

Inspect and compare data and simulation results to validate and iterate model designs

Description

The Simulation Data Inspector visualizes and compares multiple kinds of data.

Using the Simulation Data Inspector, you can inspect and compare time series data at multiple stages of your workflow. This example workflow shows how the Simulation Data Inspector supports all stages of the design cycle:

1. “View Data in the Simulation Data Inspector”.

   Run a simulation in a model configured to log data to the Simulation Data Inspector, or import data from the workspace or a MAT-file. You can view and verify model input data or inspect logged simulation data while iteratively modifying your model diagram, parameter values, or model configuration.

2. “Inspect Simulation Data”.

   Plot signals on multiple subplots, zoom in and out on specified plot axes, and use data cursors to understand and evaluate the data. “Create Plots Using the Simulation Data Inspector” to tell your story.

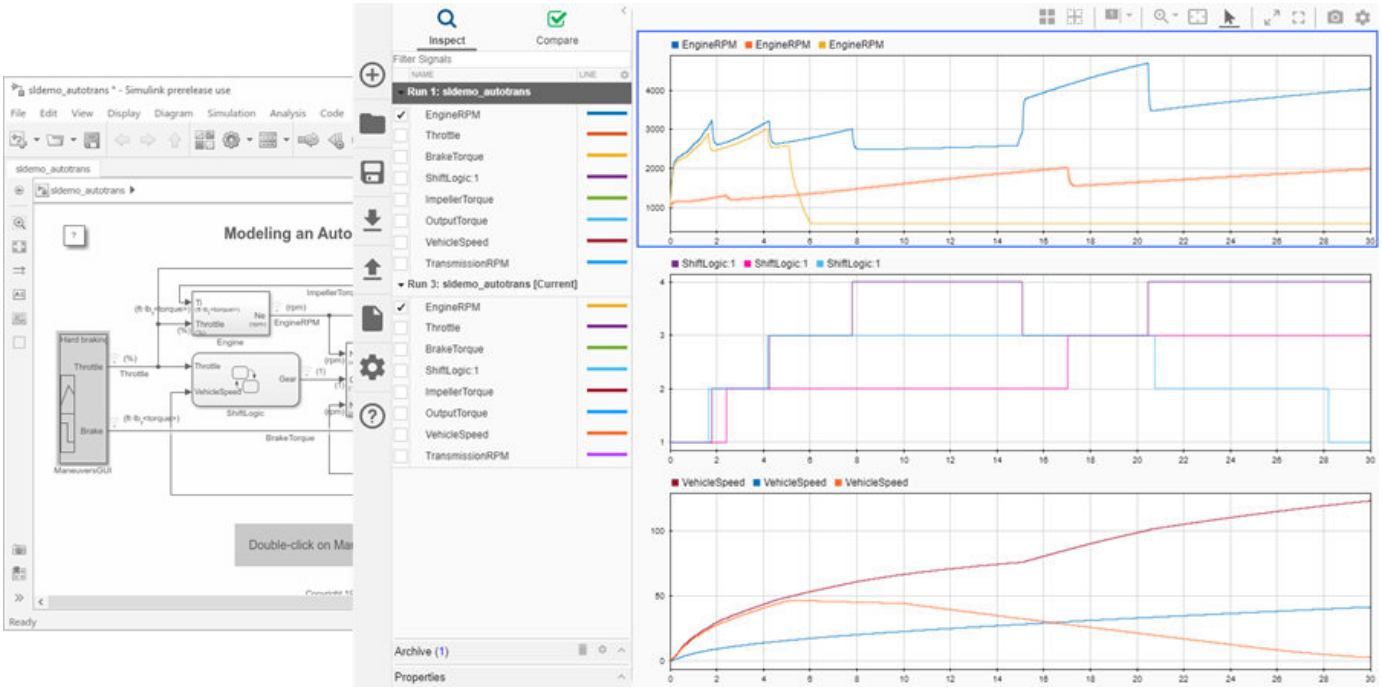
3. “Compare Simulation Data”

   Compare individual signals or simulation runs and analyze your comparison results with relative, absolute, and time tolerances. The compare tools in the Simulation Data Inspector facilitate iterative design and allow you to highlight signals that do not meet your tolerance requirements. For more information about the comparison operation, see “How the Simulation Data Inspector Compares Data”.

4. “Save and Share Simulation Data Inspector Data and Views”.

   Share your findings with others by saving Simulation Data Inspector data and views.

You can also harness the capabilities of the Simulation Data Inspector from the command line. For more information, see “Inspect and Compare Data Programmatically”.



Open the Simulation Data Inspector

- Simulink Toolstrip: On the **Simulation** tab, under **Review Results**, click **Data Inspector**.
- Click the streaming badge on a signal to open the Simulation Data Inspector and plot the signal.
- MATLAB command prompt: Enter `Simulink.sdi.view`.

Examples

Apply a Tolerance to a Signal in Multiple Runs

You can use the Simulation Data Inspector programmatic interface to modify a parameter for the same signal in multiple runs. This example adds an absolute tolerance of `0.1` to a signal in all four runs of data.

First, clear the workspace and load the Simulation Data Inspector session with the data. The session includes logged data from four simulations of a Simulink® model of a longitudinal controller for an aircraft.

```
Simulink.sdi.clear
Simulink.sdi.load('AircraftExample.mldatx');
```

Use the `Simulink.sdi.getRunCount` function to get the number of runs in the Simulation Data Inspector. You can use this number as the index for a for loop that operates on each run.

```
count = Simulink.sdi.getRunCount;
```

Then, use a for loop to assign the absolute tolerance of `0.1` to the first signal in each run.

```
for a = 1:count
    runID = Simulink.sdi.getRunIDByIndex(a);
    aircraftRun = Simulink.sdi.getRun(runID);
    sig = getSignalByIndex(aircraftRun,1);
    sig.AbsTol = 0.1;
end
```

- “View Data in the Simulation Data Inspector”
- “Inspect Simulation Data”
- “Compare Simulation Data”
- “Iterate Model Design Using the Simulation Data Inspector”

Programmatic Use

`Simulink.sdi.view` opens the Simulation Data Inspector from the MATLAB command line.

See Also

Functions
`Simulink.sdi.clear` | `Simulink.sdi.clearPreferences` | `Simulink.sdi.snapshot`

Topics
“View Data in the Simulation Data Inspector”
“Inspect Simulation Data”
“Compare Simulation Data”
“Iterate Model Design Using the Simulation Data Inspector”

Introduced in R2010b

Target Computer Status Monitor

Target Computer Status Monitor

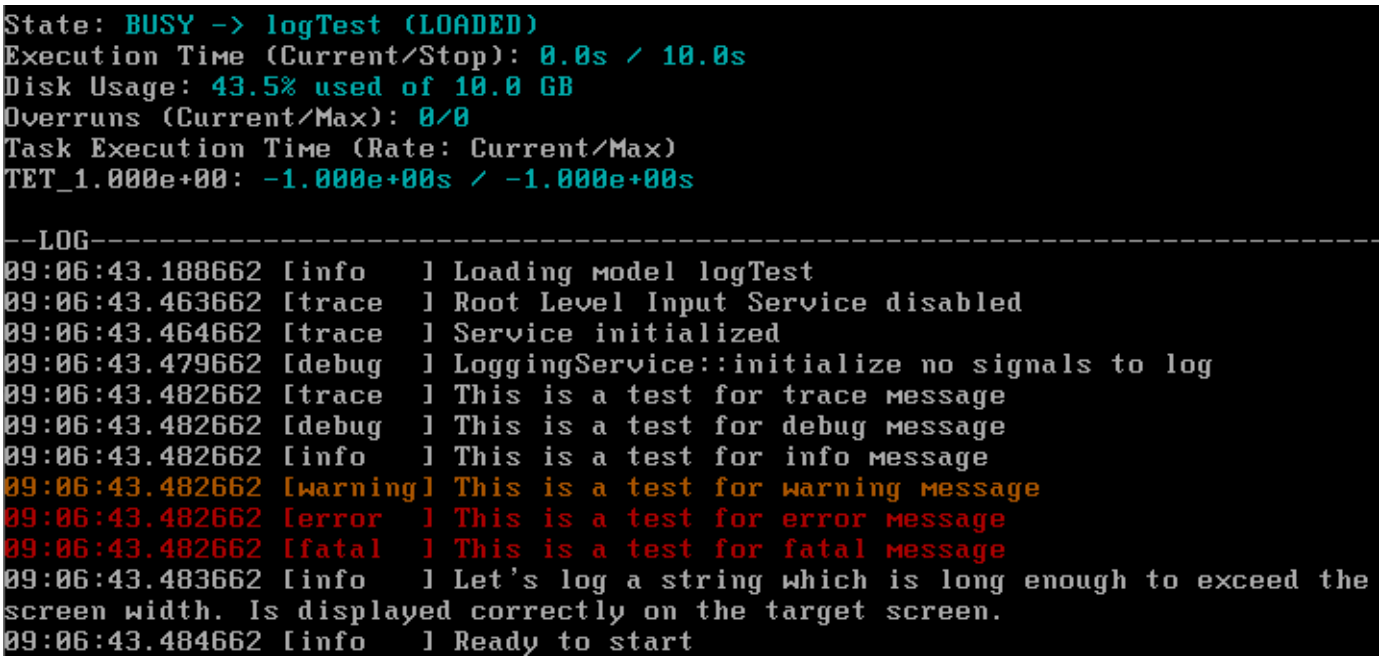
The status monitor application on the target computer displays the status of the real-time application, disk usage, and other target computer status information.

The target computer display supports multiple sessions. You can choose to display the status monitor (default, session 1) or display the target computer command-line interface (session 2).

Display Status Monitor

Start the target computer.

The target computer displays session 1 (default) and the target computer status monitor.



Display Status Monitor by Using PuTTY

To view the status monitor from the development computer, use PuTTY to open an SSH client and start the status monitor application `statusmonitor` on the target computer. Keyboard commands for the status monitor include:

- Q (quit)
- Up arrow (scroll up in the log)
- Down arrow (scroll down in the log)

For more information about PuTTY, see “Execute Target Computer RTOS Commands at Target Computer Command Line”.

To display the target computer command-line interface, switch to display session 2:

1. Start the target computer.

The target computer displays session 1 and the target computer status monitor.

2. To switch to session 2 and use the target computer command-line interface, on the target computer keyboard (console), press **Ctrl+Alt+2**.
3. To switch back to session 1 (status monitor), on the target computer keyboard (console), press **Ctrl+Alt+1**.

6

Target Computer Command-Line Interface Reference

Target Computer Command-Line Interface

You can load, run, stop, and check the status of a real-time application by using the target computer command-line interface commands.

By default, the target computer displays the session 1 screen with the target computer status monitor. For information about switching to the session 2 screen with the command-line interface, see “Target Computer Status Monitor” on page 5-2.

To read the target computer console log, view the log in the `slrtLogViewer`.

Target Object Commands

When you are using the target computer command-line interface, target object functions support loading, starting, stopping, and checking the status of the real-time application.

For a description of how to use these commands, see “Control Real-Time Application at Target Computer Command Line”.

Note To run user commands, log in as user `slrt` by using password `slrt`. To run the system commands (for example, `date`, `ntdate`, `ntpd`, `rtc`, or setting the time zone), login as user `root` by using password `root`.

These commands are `Target` object commands that you can use through the command-line interface on the target computer. Each command appears with its equivalent MATLAB syntax. In the descriptions, tg_object is the target object name, and app_name is the real-time application MLDATX file name.

- **Target:** `slrealtime load --AppName app_name`

  MATLAB: `load(tg_object,'app_name')`

  When run from the development computer in the MATLAB Command Window, the `load` command deploys the real-time application to the target computer and loads the application. When run from the target computer command interface, the `load` command loads the application.
- **Target:** `slrealtime start`

  MATLAB: `start(tg_object)`

  The `start` command runs the real-time application that is loaded on the target computer.
- **Target:** `slrealtime stop`

  MATLAB: `stop(tg_object)`

  The `stop` command stops the real-time application that is running on the target computer.
- **Target:** `slrealtime install --AppName app_name`

  MATLAB: `install(tg_object,'app_name')`

  The `install` command installs the real-time application for standalone operation on the target computer.

- **Target:** `slrealtime saveParamSet filename`

  MATLAB: `saveParamSet(tg_object,filename)`

  The `saveParamSet` command saves the parameter set from the loaded the real-time application on the target computer.
- **Target:** `slrealtime loadParamSet filename`

  MATLAB: `loadParamSet(tg_object,filename)`

  The `loadParamSet` command loads the parameter set into the real-time application on the target computer.
- **Target:** `shutdown -S reboot`

  MATLAB: `reboot(tg_object)`

  The `reboot` command reboots the target computer.

  If you prefer to safely shutdown the RTOS before turning off power to the target computer, you can use the command: `shutdown -S system`

Target Computer RTOS System Commands

The target computer uses the QNX Neutrino Real-Time Operating System (RTOS). You can run system commands on the target computer from the development computer by using an SSH utility, such as PuTTY. Or, you can run system commands on the target computer from its keyboard (console). Target computer RTOS system command information is available in the Utilities Reference in the QNX Momentics IDE 7.1 User's Guide. All commands that this reference identifies as **Runs on: QNX Neutrino** are supported on the target computer.

Some RTOS commands are required for configuring the target computer. These commands include:

- `date` — set date and time
- `ntpdate` — set the local date and time from NTP server
- `ntpd` — start NTP daemon
- `rtc` — set date from hardware clock

Note To run user commands, log in as user `slrt` by using password `slrt`. To run the system commands (for example, `date`, `ntdate`, `ntpd`, `rtc`, or setting the time zone), login as user `root` by using password `root`.

For a description of how to use these commands, see "Execute Target Computer RTOS Commands at Target Computer Command Line".

See Also

More About

- "Control Real-Time Application at Target Computer Command Line"

- “Execute Target Computer RTOS Commands at Target Computer Command Line”

External Websites

- QNX Momentics IDE 7.1 User’s Guide
- QNX Momentics IDE 7.1 User’s Guide, Utilities Reference