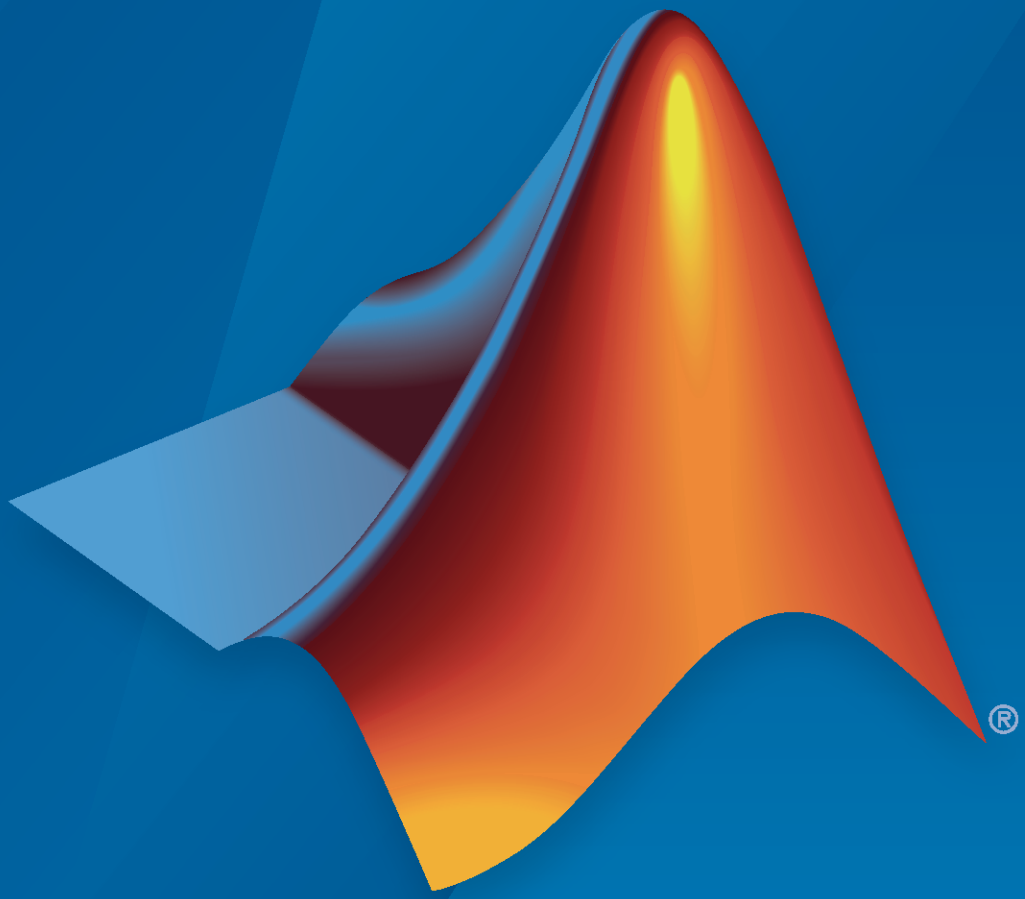
Simulink® Compiler™

Reference



MATLAB® & SIMULINK®

R2022a

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Simulink® Compiler™ Reference

Revision History

March 2020	Online only	New for Version 1.0 (Release 2020a)
September 2020	Online only	Revised for Version 1.1 (Release 2020b)
March 2021	Online only	Revised for Version 1.2 (Release 2021a)
September 2021	Online only	Revised for Version 1.3 (Release 2021b)
March 2022	Online only	Revised for Version 1.4 (Release 2022a)

Contents

Functions

simulink.compiler.configureForDeployment

Configure `Simulink.SimulationInput` object for deployment with Simulink Compiler

Syntax

```
simulink.compiler.configureForDeployment(in)
```

Description

`in = simulink.compiler.configureForDeployment(in)` configures the `Simulink.SimulationInput` object, `in`, to be compatible for deployment with Simulink® Compiler™. `simulink.compiler.configureForDeployment` sets the simulation mode to Rapid Accelerator and the model parameter, `RapidAcceleratorUpToDateCheck` to `off` for the model used in `Simulink.SimulationInput` object, `in`, these settings ensure that the specified inputs does not require the deployed applications to be rebuilt.

Examples

Configure the `Simulink.SimulationInput` Object for Deployment with Simulink Compiler

This example shows how to configure a `Simulink.SimulationInput` object for deployment as a command line executable or an application with Simulink Compiler.

Create a function that you want to deploy as a standalone executable. In the function, create a `Simulink.SimulationInput` object for the model `sldemo_suspn_3dof`. Using the `setVariable` method of the `Simulink.SimulationInput` object, set the variable `Mb` to 1000.

Use the `simulink.compiler.configureForDeployment` function to make the `Simulink.SimulationInput` object compatible for deployment. Once the `Simulink.SimulationInput` object is configured for deployment, simulate it with the `sim` command.

```
function deployedScript()
    in = Simulink.SimulationInput('sldemo_suspn_3dof');
    in = in.setVariable('Mb', 1000);
    in = simulink.compiler.configureForDeployment(in);
    out = sim(in);
end
```

Input Arguments

`in` — `Simulink.SimulationInput` object

`Simulink.SimulationInput`object | array of `Simulink.SimulationInput` objects

A `Simulink.SimulationInput` object or an array of `Simulink.SimulationInput` objects that is used to specify changes to the model for a simulation.

Example: `in = Simulink.SimulationInput('vdp')`

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS`

Topics

“Simulink Compiler Workflow Overview”
“Create and Deploy a Script with Simulink Compiler”
“Deploy an App Designer Simulation with Simulink Compiler”
“Deploy Simulations with Tunable Parameters”

Introduced in R2020a

exportToFMU2CS

Export Simulink model to functional mock-up unit (FMU)

Syntax

```
exportToFMU2CS(mdl)
exportToFMU2CS(mdl,Name,Value)
```

Description

`exportToFMU2CS(mdl)` exports a model to a Functional Mock-Up Unit (FMU) and creates a model, `mdl_fmu.slx`, that contains a FMU Co-Simulation block with the original model. The model solver type must be `fixed-step` solver.

`exportToFMU2CS(mdl,Name,Value)` exports a model to a Functional Mock-Up Unit (FMU) using one or more `Name, Value` pair arguments.

Examples

Export a Model to FMU

Export the model `vdp` to an FMU.

Open the model.

```
open_system('vdp')
```

Set the solver type of the model to `fixed-step`.

```
set_param('vdp', 'SolverType', 'Fixed-step')
```

Export the model to an FMU. The model, `vdp_fmu.slx` is created from the exported FMU.

```
exportToFMU2CS('vdp')
```

Input Arguments

`mdl` — Name of model

string

Name of the model to be exported to an FMU, specified as a string.

Name-Value Pair Arguments

Specify optional pairs of arguments as `Name1=Value1,...,NameN=ValueN`, where `Name` is the argument name and `Value` is the corresponding value. Name-value arguments must appear after other arguments, but the order of the pairs does not matter.

Before R2021a, use commas to separate each name and value, and enclose `Name` *in quotes.*

Example: `'CreateModelAfterGeneratingFMU','off'`

`CreateModelAfterGeneratingFMU` — Option toreate model after export
`'on'` (default) | `'off'`

Option to create model after export, specified as `'on'` or `'off'`. By default, this argument creates a model, `mdl_fmu.slx`, that contains an FMU Co-Simulation block with the original model. Create this model to check the integrity of the exported FMU.

When set to `'off'`, no model is created.

`AddIcon` — Block icon or exported FMU image
`'snapshot'` (default) | `'off'` | `'filepath'`

Block icon or exported FMU image, character vector specified as one of these values:

- `'off'` – No block icon image.
- `'snapshot'` – Use image of model as block icon.
- `'filepath'` – Filepath of the image.

`Generate32BitDLL` — Option to generate 32-bit DLL
`'off'` (default) | `'on'`

Option to generate 32-bit DLL, specified as `'on'` or `'off'`. Set the option to `'on'` to support exporting Co-simulations of FMUs with 32-bit binaries. Only valid on `win64` platform with MSVC toolchain installed.

`SaveSourceCodeToFMU` — Option to save source code to FMU
`'off'` (default) | `'on'`

Option to save source code to FMU, specified as `'on'` or `'off'`. Set to `'on'` to package the source code in the source directory and documentation file, which recompiles the binary files in the documentation directory in the FMU. This option requires Simulink Coder™.

`SaveDirectory` — Specify save location for FMU
string | character vector

Save location for FMU, specified as a string or character vector. By default, the location is the current working folder.

Example: `exportToFMU2CS(model,'SavedDirectory','/tmp/flightcontrol/')`

`ExportedContent` — Option to createre a wrapper archived project or harness model with dependencies
`'off'` (default) | `'project'`

Option to create to create a wrapper-archived project or harness model with dependencies, specified as `'off'` or `'project'`. Set to `'project'` to enable this option.

`ProjectName` — Name of archived project
string

Name of archived project with harness model, specified as a string. This argument must be specified along with the `'ExportContent'` argument. By default, archived project is named `modelName_fmu`

Package — Destination folder and the files to be packaged
cell array

Destination folder and files to be packaged, specified as a cell array.

Example: `exportToFMU2CS(model, 'Package', {'documentation/', {'/local/bouncingBall/index.html','/local/bouncingBall/siteFiles'},... 'resources', {'local/bouncingBall/resources/input.txt'}})`

See Also

`configureForDeployment` | `sim`

Topics
“Import FMUs”
“Export Simulink Models to Functional Mock-up Units”

Introduced in R2020a

simulink.compiler.genapp

Generate MATLAB App to simulate model and deploy application

Syntax

```
simulink.compiler.genapp('modelName')
simulink.compiler.genapp(modelName,Name,Value)
```

Description

`simulink.compiler.genapp('modelName')` analyzes a Simulink model and generates a deployable MATLAB® app, to simulate the model in rapid accelerator simulation mode with different inputs, parameters, and initial states and plot the results.

`simulink.compiler.genapp(modelName,Name,Value)` generates a deployable MATLAB app with the specified options.

While generating an app, ensure that the current working folder does not contain older generated app artifacts.

Examples

Generate a MATLAB App for a Simulink Model

This example shows how to generate a MATLAB app using the `simulink.compiler.genapp` function for the model, `sldemo_suspn_3dof`.

Open the model

```
open_system('sldemo_suspn_3dof')
```

Generate a MATLAB app for the model with app name, `suspn_3dof_app`.

```
simulink.compiler.genapp('sldemo_suspn_3dof', 'AppName', 'suspn_3dof_app')
```

Once the app is generated, click **Simulate** to view the simulation result of the model

Generate App Using Different Templates

The `simulink.compiler.genapp` function also allows you to generate an app with the `SimAppTemplate` and the `SLSimApp2` template. To generate an app using this template, use the name-value pair along with the model name as arguments in the `simulink.compiler.genapp` function.

Before generating the app, clear the generated artifacts from the Current Folder and the workspace.

```
myApp = simulink.compiler.genapp('sldemo_suspn_3dof', 'Template', 'SLSimApp2')
```

Input Arguments

`modelName` — Name of model

string

Name of model for which the MATLAB app is generated, specified as a string.

Name-Value Pair Arguments

Specify optional pairs of arguments as `Name1=Value1,...,NameN=ValueN`, where `Name` is the argument name and `Value` is the corresponding value. Name-value arguments must appear after other arguments, but the order of the pairs does not matter.

Before R2021a, use commas to separate each name and value, and enclose `Name` *in quotes.*

Example: `'AppName', 'modelNameApp'`

`AppName` — Name of the app

`modelName_SLSimApp` (default) | string

Name of the generated app, specified as the comma-separated pair consisting of '`AppName`' and a string.

`Template` — Template to use

`MultiPaneSimApp` (default) | `SimAppTemplate` | `SLSimApp2`

Template to use to generate a MATLAB app. Specified as the comma-separated pair consisting of '`Template`' and a string.

`OutputDir` — Directory for creating build artifacts

pwd (default) | string

Directory for creating build artifacts, as the comma-separated pair consisting of '`OutputDir`' and a string.

`InputMatFiles` — MAT files that specify inputs

MAT file name

MAT files that specify inputs for the `Simulink.SimulationInput` objects, specified as the comma-separated pair consisting of '`InputMatFiles`' and a MAT file.

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS` | `simulink.compiler.configureForDeployment` | **applicationCompiler**

Topics

“Simulink Compiler Workflow Overview”
“Deploy an App Designer Simulation with Simulink Compiler”
“Generate, Modify and Deploy a MATLAB App for a Simulink Model”

Introduced in R2020b

simulink.compiler.getTunableVariables

Find names of all tunable variables

Syntax

```
simulink.compiler.getTunableVariables(modelName)
```

Description

`simulink.compiler.getTunableVariables(modelName)` returns a structure containing all the tunable variables in the model `modelName`, and their values.

Each leaf of a `struct` variable present in the model is given an entry in the output of `simulink.compiler.getTunableVariables` function.

Examples

Find Tunable Variables in a Model

This example shows how to use `simulink.compiler.getTunableVariables` to find the tunable variables in a model.

Open the model.

```
open_system('sldemo_suspn_3dof')
```

Find the tunable variables present in the model.

```
simulink.compiler.getTunableVariables('sldemo_suspn_3dof')
```

```
### Building the rapid accelerator target for model: sldemo_suspn_3dof
### Successfully built the rapid accelerator target for model: sldemo_suspn_3dof

Build Summary

Top model rapid accelerator targets built:

Model              Action                       Rebuild Reason
========================================================================================================
sldemo_suspn_3dof  Code generated and compiled  Code generation information file does not exist.

1 of 1 models built (0 models already up to date)
Build duration: 0h 1m 1.066s

ans =

  1×8 struct array with fields:

    QualifiedName
    Value
```

View a variable and its value.

```
ans(1)
```

```
ans =

  struct with fields:

    QualifiedName: "Ixx"
            Value: 1500
```

Input Arguments

`modelName` — Name of the model

string

Name of model for which you want to find tunable parameters, specified as a string

See Also

`simulink.compiler.configureForDeployment` | `simulink.compiler.genapp`

Introduced in R2021a

simulink.compiler.loadEnumTypes

Configure model with enum types for deployment

Syntax

```
simulink.compiler.loadEnumTypes('modelName')
```

Description

`simulink.compiler.loadEnumTypes('modelName')` configures the deployment for models with enum types. Use the `simulink.compiler.loadEnumTypes` function only if the following is true:

- The `simulink.compiler.configureForDeployment` function is not used to configure the `Simulink.SimulationInput` object.
- Model in the deployed script or application uses enum types.
- The deployed scripts or applications refer to enum types before the execution of the `sim` command.

Input Arguments

`modelName` — Name of the model

string

Name of the model, specified by a string, for which the enum types are loaded.

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS` | `simulink.compiler.configureForDeployment`

Topics

“Simulink Compiler Workflow Overview”
“Create and Deploy a Script with Simulink Compiler”
“Deploy an App Designer Simulation with Simulink Compiler”
“Deploy Simulations with Tunable Parameters”

Introduced in R2020a

simulink.compiler.modifyParameters

Tune block parameters at runtime via workspace variables

Syntax

```
simulink.compiler.modifyParameters(modelName)
```

Description

`simulink.compiler.modifyParameters(modelName)` tunes block parameters at simulation runtime via workspace variables. You can use `simulink.compiler.modifyParameters` to modify variables only during a running simulation.

You can use `simulink.compiler.modifyParameters` to tune any variables that are returned by the `simulink.compiler.getTunableVariables` function. `simulink.compiler.modifyParameters` is supported only for rapid accelerator and deployment workflows.

Examples

Use `simulink.compiler.modifyParameters` to Tune Block Parameters

This example shows you how to use the `simulink.compiler.modifyParameters` function to tune block parameters.

Open the Model

The example model example_modify_`parameters` referneces another model, ex`RefUsingGlobalWksVars`. The top model gain block, the triggered subsystem and the gain block in the referenced model all use global workspace variables. The masked subsystem present in the model uses a global variable and a model workspace variable.

```
open_system("example_modify_parameters.slx");
```

Write a Function for Runtime Parameter Tuning

The following function sets the simulation mode to rapid and creates a `Simulink.SimulationInput` object. In this function, you can use `simulink.compiler.setPostStepFcn` API to set a callback which uses `simulink.compiler.modifyParameters` to tune block parameters

```
function runtimeParameterTuning()
simMode = 'rapid';
model = 'example_modify_parameters';
ref = 'exRefModelWorkspaceVars';
load_system(model);
closeModels = onCleanup(@() cellfun(@(x)close_system(x,0),{model,ref}));
set_param(model, "SimulationMode", simMode);

% Get simulation input object
```

```
simInput = Simulink.SimulationInput(model);
% Set post-step callback function that tunes variables
simInput = simulink.compiler.setPostStepFcn(simInput,@(time)postStepParameterTuner(time,model));

out = sim(simInput);
end
```

Write a Function for the Post-Step Callback

The function `postStepParameterTuner` uses `simulink.compiler.modifyParameters` to modify the variables.

```
function postStepParameterTuner(time,model)
% Callback which tunes parameters based on time
if time==5.0
    % Modify global variables used by top model gain block
    newGlobalVars = [Simulink.Simulation.Variable('gNum',1.1),...
                     Simulink.Simulation.Variable('gDen',0.5)];
    simulink.compiler.modifyParameters(model,newGlobalVars);
end
if time==2.5
    % Modify variables in reference model workspace
    newRefWksVars = [Simulink.Simulation.Variable('gNum',1.2),...
                     Simulink.Simulation.Variable('gDen',0.1)];
    simulink.compiler.modifyParameters(model,newRefWksVars);
end
if time==4.5
    % Modify variables used by mask dialog parameters
    newMaskVars = [Simulink.Simulation.Variable('mGain',2.0),...
                   Simulink.Simulation.Variable('Bias',-1,'Workspace',model)];
    simulink.compiler.modifyParameters(model,newMaskVars);
end
end
```

Input Arguments

`modelName` — Name of the model

string

Name of model for which you want to find tunable parameters, specified as a string

See Also

`simulink.compiler.configureForDeployment` | `simulink.compiler.genapp`

Introduced in R2021b

simulink.compiler.setExternalInputsFcn

Set callback to specify data to each external root inport port block at the start of each simulation step

Syntax

```
in = simulink.compiler.setExternalInputsFcn(in, @(id, time) getInput(id,
time))
```

Description

`in = simulink.compiler.setExternalInputsFcn(in, @(id, time) getInput(id, time))` function registers a callback that dynamically provides values for every external root input port block specified by `id` at the specified `time` at the root level of a model during simulation. The callback is required to return the value to be set at the inport block. To return the value from the callback, use the syntax, `returningValue = getInput(id, time)`.

Examples

Input Arguments

`in` — Simulation inputs

`Simulink.SimulationInput` object

Simulation inputs and changes to model for simulation, specified as a `Simulink.SimulationInput` object

Example: `in = Simulink.SimulationInput('vdp')`

`@(id, time) getInput(id, time)` — Function handle for callback

MATLAB function handle

Function handle for callback to provide values for each root inport block specified by `id` at simulation step time, `time`.

- `id` – A root inport block index, for which the callback is set, specified by a numerical value.
- `time` – Time for which the input to the root inport block is required, specified by a numeric value.

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS` | `simulink.compiler.configureForDeployment`

Topics

“Simulink Compiler Workflow Overview”
“Create and Deploy a Script with Simulink Compiler”
“Deploy an App Designer Simulation with Simulink Compiler”
“Deploy Simulations with Tunable Parameters”

Introduced in R2020b

simulink.compiler.setExternalOutputsFcn

Set callback to read external root outport block data after each simulation step

Syntax

```
in = simulink.compiler.setExternalOutputsFcn(in, @(id, time, data)
processOutput(id, time, data))
```

Description

`in = simulink.compiler.setExternalOutputsFcn(in, @(id, time, data) processOutput(id, time, data))` function registers a callback to dynamically process the values for every output port at the root level of a model during simulation.

Examples

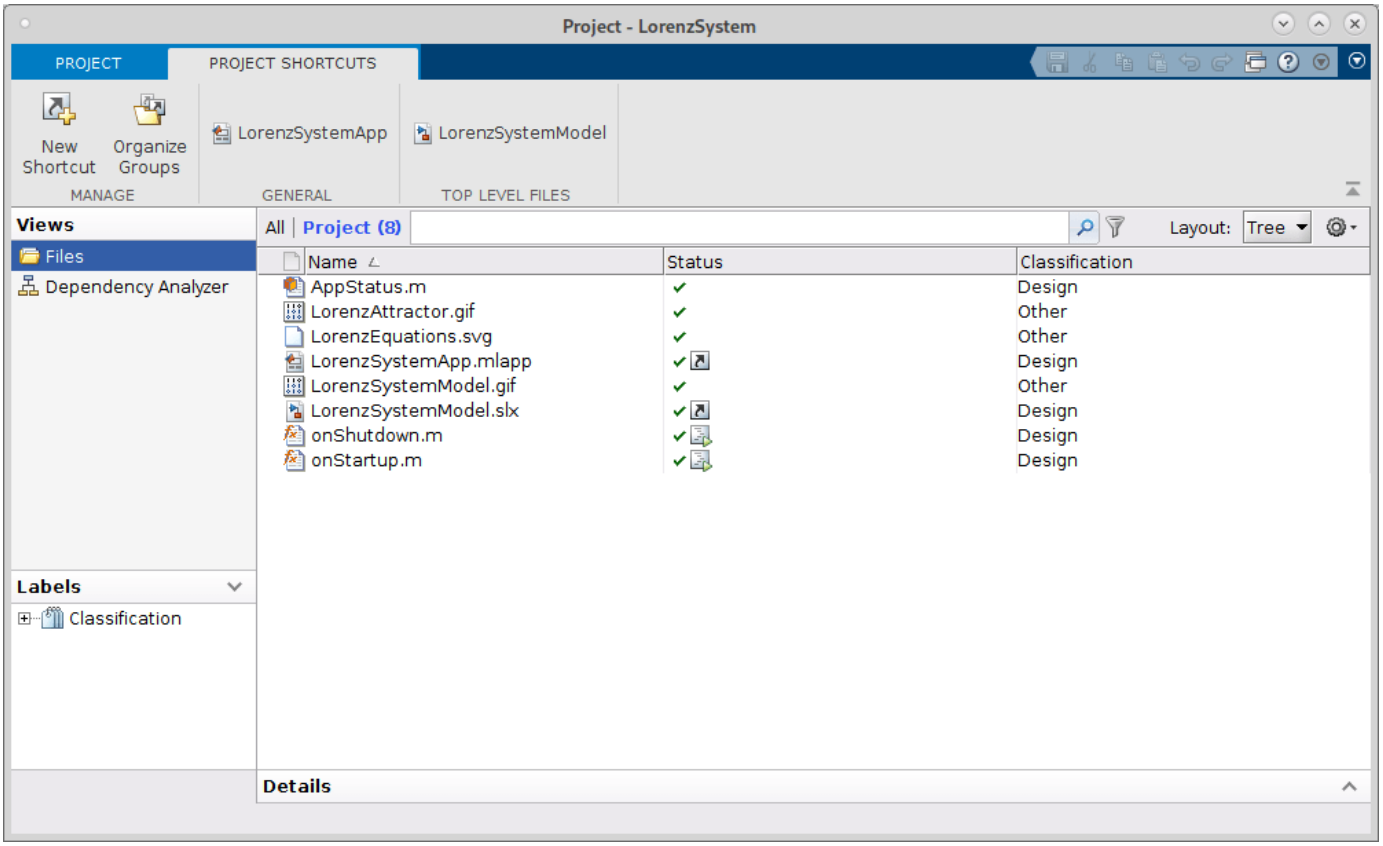
Deploy App with Live Simulation Results of Lorenz System

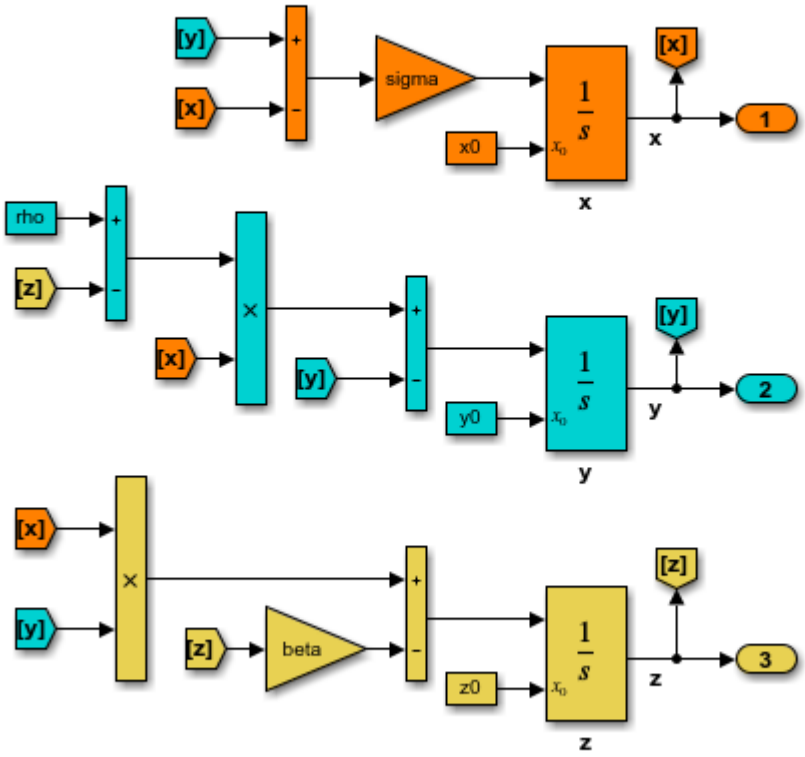
This example shows how to develop an app that uses callbacks for simulation inputs and outputs to view the simulation of a Simulink model of the Lorenz system. You can then deploy the app with Simulink® Compiler™.

Open and Examine the Project File

This example uses a Simulink project that contains all the files required to run this example. The project contains a Simulink® model of the Lorenz system and an app, created in the MATLAB ® App Designer that simulates the model with different input and output values. To learn more about how to create an app using the App Designer, see “Create and Run a Simple App Using App Designer”.

```
simulink.compiler.example.LorenzSystem
```


Project - LorenzSystem
PROJECT
PROJECT SHORTCUTS
New Shortcut
Organize Groups
MANAGE
LorenzSystemApp
GENERAL
LorenzSystemModel
TOP LEVEL FILES
Views
Files
Dependency Analyzer
Labels
Classification
All | Project (8)
Layout: Tree
Name
Status
Classification
AppStatus.m
Design
LorenzAttractor.gif
Other
LorenzEquations.svg
Other
LorenzSystemApp.mlapp
Design
LorenzSystemModel.gif
Other
LorenzSystemModel.slx
Design
onShutdown.m
Design
onStartup.m
Design
Details



App Details

Open the `LorenzSystemApp.mlapp` file. You can view the code written to create this app in the **Code View** section of App Sesigner. The essential part of building this app is the behavior of the **Simulate** button. It has the following salient parts: creating the `SimulationInput` object, configuring it for deployment, using simulation callbacks to read the output port data and plot the data at each time step. These three functions allow you to see the live results of the simulation in the deployed app.

Create the `Simulink.SimulationInput` Object

In the function `createSimulationInput`, define an empty `Simulink.SimulationInput` object for the model. Use this `Simulink.SimulationInput` object to set simulation callbacks and variables for the model.

The simulation callback functions are used to register the callbacks. The `simulink.compiler.setPostStepFcn` function registers a callback that is invoked after every simulation step. The `simulink.compiler.setExternalOuputsFcn` registers a callback that dynamically processes the values for every output port at root level of a model during simulation.

Use the `setVariable` method of the `Simulink.SimulationInput` object to provide the parameter values to the app. Values for the simulation are obtained from the edit fields of the UI of the app. To deploy the app, use the `simulink.compiler.configureForDeployment` function. (Comment the line of code that calls `simulink.compiler.configureForDeployment` function for faster debugging.)

```
function simInp = createSimulationInput(app)
            % Create an empty SimulationInput object
            simInp = Simulink.SimulationInput('LorenzSystemModel');

            % Specify the simulation callbacks
            simInp = simulink.compiler.setPostStepFcn(simInp, @app.postStepFcn);
            simInp = simulink.compiler.setExternalOutputsFcn(simInp, @app.processOutputs);

            % Load the parameters values from the ui edit fields
            simInp = simInp.setVariable('rho',app.rhoUIC.Value);
            simInp = simInp.setVariable('beta',app.betaUIC.Value);
            simInp = simInp.setVariable('sigma',app.sigmaUIC.Value);
            simInp = simInp.setVariable('x0',app.x0UIC.Value);
            simInp = simInp.setVariable('y0',app.y0UIC.Value);
            simInp = simInp.setVariable('z0',app.z0UIC.Value);

            % Configure simInp for deployment
            % DEBUG TIP: Comment out the line below for
            % faster/easier debugging when runnng in MATLAB
            simInp = simulink.compiler.configureForDeployment(simInp);
        end % createSimulationInput
```

Simulation Callback Functions

The simulation callback functions register callbacks that allow you to read values from the output ports and to write values to the root input ports. These functions register callbacks at every simulation time step, which allows you to view live results of the simulation.

The `processOutputs` Callback

The `simulink.compiler.setExternalOutputsFcn` line refers to the function `procressOuputs`. The `procressOuputs` callback function processes the values for every root output port block of model during simulation. The `procressOuputs` function is called once per port and per the sample time of the port. When the `procressOuputs` function is called, it reads the values for every root outport block and caches those values. The `postStepFcn` obtains the cached values to update the plot.

```
  function processOutputs(app, opIdx, ~, data)
            % Called during sim to process the external output port data,
            % will be called once per port per its sample hit.
            switch opIdx
                case 1
                    app.txyzBuffer.x = data;
                case 2
                    app.txyzBuffer.y = data;
                case 3
                    app.txyzBuffer.z = data;
                otherwise
                    error(['Invalid port index: ', num2str(opIdx)]);
            end
  end
```

The `postStepFcn` Callback

The `postStepFcn` callback function is invoked after every simulation step. The `time` argument is the time for the previous simulation step. The `postStepFcn` function obtains the cached outport block values for every `time` and passes those values to the `updateTrace` function to plot the cached values at simulation time.

```
function postStepFcn(app, time)
            % Called during sim after each simulation time step
            app.updateSimStats(time);
            if app.status == AppStatus.Starting
                app.switchStatus(AppStatus.Running);
                app.simStats.WallClockTimeAfterFirstStep = tic;
            end
            if app.stopRequested
                app.switchStatus(AppStatus.Stopping);
                stopRequestedID = [mfilename('class'), ':StopRequested'];
                throw(MException(stopRequestedID, 'Stop requested'));
            end
            %---------------------------------------------------------------
            app.txyzBuffer.t = time;
            x = [app.txyzBuffer.x];
            y = [app.txyzBuffer.y];
            z = [app.txyzBuffer.z];
            app.updateTrace(x, y, z);
            app.updateMarker('head', x, y, z);
            %---------------------------------------------------------------
            drawnow limitrate;
        end % postStepFcn
```

Test in App Designer

Before deploying the application, ensure that the app runs in the App Designer. Click **Simulate** to verify that the application works by simulating the model for different values.

Compile App for Deployment

You can use the App Designer to compile and deploy the app. You can also use the `deploytool` function. For more information on compiling and deploying with the App Designer, see Develop Apps Using App Designer, Web Apps and Application Compiler.

To compile the app in this example, use the `mcc` command followed by the app name.

```
mcc -m LorenzSystemApp
```

Input Arguments

`in` — Simulation inputs

`Simulink.SimulationInput` object

Simulation inputs and changes to model for simulation, specified as a `Simulink.SimulationInput` object

Example: `in = Simulink.SimulationInput('vdp')`

`@(id, time, data) processOutput(id, time, data)` — Function handle for callback
MATLAB function handle

Function handle for callback to process outputs with the values, `data` for every root port block specified by `id` at simulation step time, `time`.

- `id` – A root outport block index, for which the callback is set, specified by a numerical value.
- `time` – Time for which the input to the root outport block is required, specified by a numeric value.
- `data` – Value for the root outport block.

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS` | `simulink.compiler.configureForDeployment`

Topics
“Simulink Compiler Workflow Overview”
“Create and Deploy a Script with Simulink Compiler”
“Deploy an App Designer Simulation with Simulink Compiler”
“Deploy Simulations with Tunable Parameters”

Introduced in R2020b

simulink.compiler.setPostStepFcn

Register a callback to run after each simulation step

Syntax

```
in = simulink.compiler.setPostStepFcn(in, @(time) postStepFcn(time))
```

Description

`in = simulink.compiler.setPostStepFcn(in, @(time) postStepFcn(time))` function registers a callback that is invoked after every simulation step.

Examples

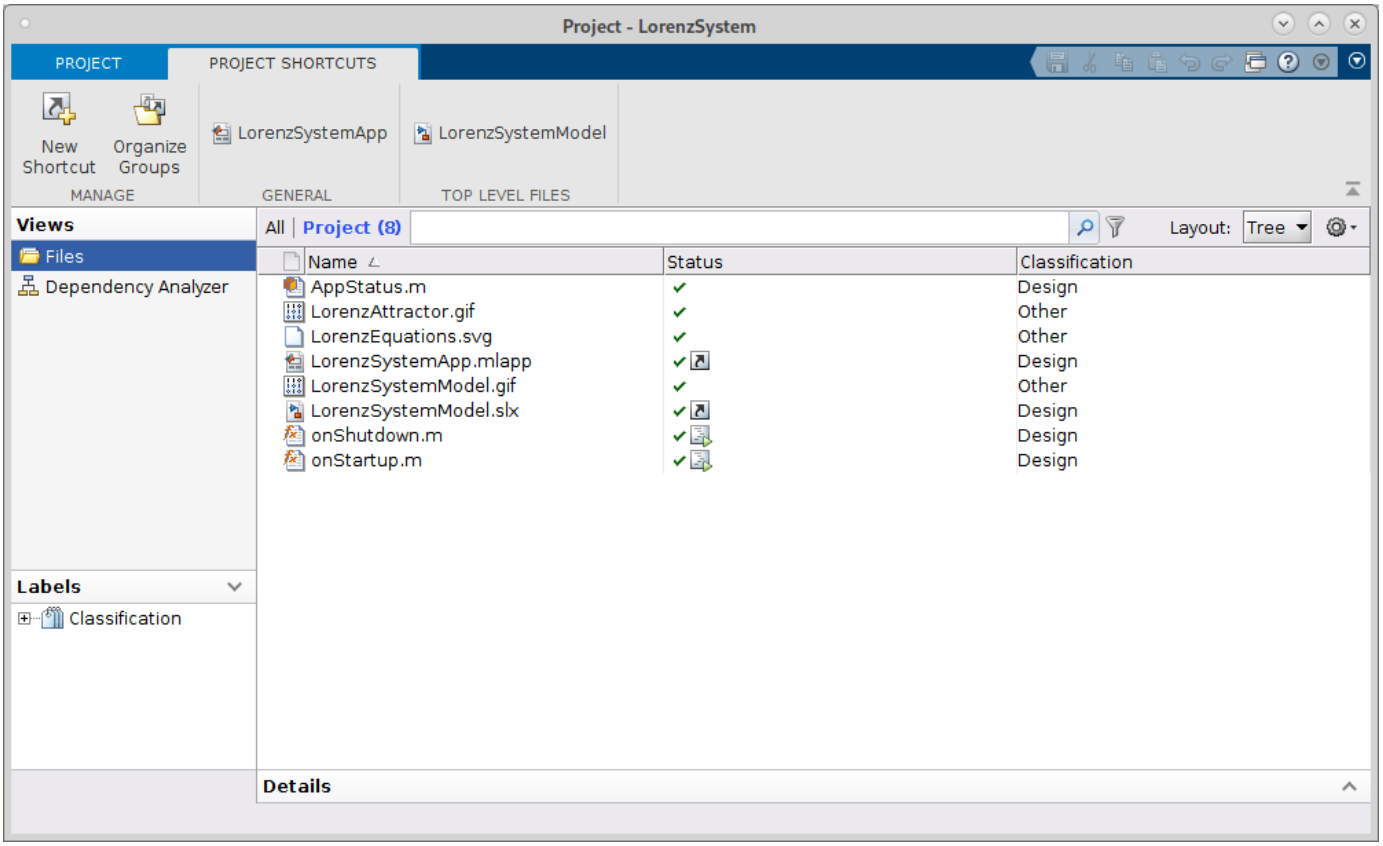
Deploy App with Live Simulation Results of Lorenz System

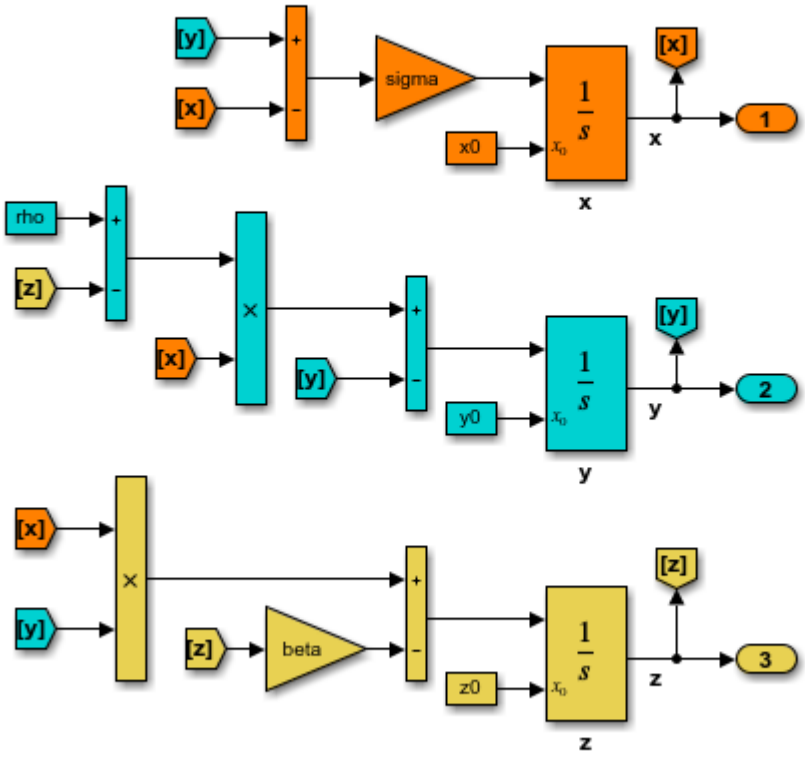
This example shows how to develop an app that uses callbacks for simulation inputs and outputs to view the simulation of a Simulink model of the Lorenz system. You can then deploy the app with Simulink® Compiler™.

Open and Examine the Project File

This example uses a Simulink project that contains all the files required to run this example. The project contains a Simulink® model of the Lorenz system and an app, created in the MATLAB ® App Designer that simulates the model with different input and output values. To learn more about how to create an app using the App Designer, see “Create and Run a Simple App Using App Designer”.

```
simulink.compiler.example.LorenzSystem
```


Project - LorenzSystem
PROJECT
PROJECT SHORTCUTS
New Shortcut
Organize Groups
MANAGE
LorenzSystemApp
GENERAL
LorenzSystemModel
TOP LEVEL FILES
Views
Files
Dependency Analyzer
Labels
Classification
All | Project (8)
Layout: Tree
Name
Status
Classification
AppStatus.m
Design
LorenzAttractor.gif
Other
LorenzEquations.svg
Other
LorenzSystemApp.mlapp
Design
LorenzSystemModel.gif
Other
LorenzSystemModel.slx
Design
onShutdown.m
Design
onStartup.m
Design
Details



App Details

Open the `LorenzSystemApp.mlapp` file. You can view the code written to create this app in the **Code View** section of App Sesigner. The essential part of building this app is the behavior of the **Simulate** button. It has the following salient parts: creating the `SimulationInput` object, configuring it for deployment, using simulation callbacks to read the output port data and plot the data at each time step. These three functions allow you to see the live results of the simulation in the deployed app.

Create the `Simulink.SimulationInput` Object

In the function `createSimulationInput`, define an empty `Simulink.SimulationInput` object for the model. Use this `Simulink.SimulationInput` object to set simulation callbacks and variables for the model.

The simulation callback functions are used to register the callbacks. The `simulink.compiler.setPostStepFcn` function registers a callback that is invoked after every simulation step. The `simulink.compiler.setExternalOuputsFcn` registers a callback that dynamically processes the values for every output port at root level of a model during simulation.

Use the `setVariable` method of the `Simulink.SimulationInput` object to provide the parameter values to the app. Values for the simulation are obtained from the edit fields of the UI of the app. To deploy the app, use the `simulink.compiler.configureForDeployment` function. (Comment the line of code that calls `simulink.compiler.configureForDeployment` function for faster debugging.)

```
function simInp = createSimulationInput(app)
            % Create an empty SimulationInput object
            simInp = Simulink.SimulationInput('LorenzSystemModel');

            % Specify the simulation callbacks
            simInp = simulink.compiler.setPostStepFcn(simInp, @app.postStepFcn);
            simInp = simulink.compiler.setExternalOutputsFcn(simInp, @app.processOutputs);

            % Load the parameters values from the ui edit fields
            simInp = simInp.setVariable('rho',app.rhoUIC.Value);
            simInp = simInp.setVariable('beta',app.betaUIC.Value);
            simInp = simInp.setVariable('sigma',app.sigmaUIC.Value);
            simInp = simInp.setVariable('x0',app.x0UIC.Value);
            simInp = simInp.setVariable('y0',app.y0UIC.Value);
            simInp = simInp.setVariable('z0',app.z0UIC.Value);

            % Configure simInp for deployment
            % DEBUG TIP: Comment out the line below for
            % faster/easier debugging when runnng in MATLAB
            simInp = simulink.compiler.configureForDeployment(simInp);
        end % createSimulationInput
```

Simulation Callback Functions

The simulation callback functions register callbacks that allow you to read values from the output ports and to write values to the root input ports. These functions register callbacks at every simulation time step, which allows you to view live results of the simulation.

The `processOutputs` Callback

The `simulink.compiler.setExternalOutputsFcn` line refers to the function `procressOuputs`. The `procressOuputs` callback function processes the values for every root output port block of model during simulation. The `procressOuputs` function is called once per port and per the sample time of the port. When the `procressOuputs` function is called, it reads the values for every root outport block and caches those values. The `postStepFcn` obtains the cached values to update the plot.

```
  function processOutputs(app, opIdx, ~, data)
            % Called during sim to process the external output port data,
            % will be called once per port per its sample hit.
            switch opIdx
                case 1
                    app.txyzBuffer.x = data;
                case 2
                    app.txyzBuffer.y = data;
                case 3
                    app.txyzBuffer.z = data;
                otherwise
                    error(['Invalid port index: ', num2str(opIdx)]);
            end
  end
```

The `postStepFcn` Callback

The `postStepFcn` callback function is invoked after every simulation step. The `time` argument is the time for the previous simulation step. The `postStepFcn` function obtains the cached outport block values for every `time` and passes those values to the `updateTrace` function to plot the cached values at simulation time.

```
function postStepFcn(app, time)
            % Called during sim after each simulation time step
            app.updateSimStats(time);
            if app.status == AppStatus.Starting
                app.switchStatus(AppStatus.Running);
                app.simStats.WallClockTimeAfterFirstStep = tic;
            end
            if app.stopRequested
                app.switchStatus(AppStatus.Stopping);
                stopRequestedID = [mfilename('class'), ':StopRequested'];
                throw(MException(stopRequestedID, 'Stop requested'));
            end
            %----------------------------------------------------------------
            app.txyzBuffer.t = time;
            x = [app.txyzBuffer.x];
            y = [app.txyzBuffer.y];
            z = [app.txyzBuffer.z];
            app.updateTrace(x, y, z);
            app.updateMarker('head', x, y, z);
            %----------------------------------------------------------------
            drawnow limitrate;
        end % postStepFcn
```

Test in App Designer

Before deploying the application, ensure that the app runs in the App Designer. Click **Simulate** to verify that the application works by simulating the model for different values.

Compile App for Deployment

You can use the App Designer to compile and deploy the app. You can also use the `deploytool` function. For more information on compiling and deploying with the App Designer, see Develop Apps Using App Designer, Web Apps and Application Compiler.

To compile the app in this example, use the `mcc` command followed by the app name.

```
mcc -m LorenzSystemApp
```

Input Arguments

`in` — Simulation inputs

`Simulink.SimulationInput` object

Simulation inputs and changes to model for simulation, specified as a `Simulink.SimulationInput` object

Example: `in = Simulink.SimulationInput('vdp')`

`@(time) postStepFcn(time))` — Function handle for callback
MATLAB function handle

Function handle for a callback that is invoked after every simulation step.

- `time` – Time for the previous simulation step, specified by a numeric value.

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS` | `simulink.compiler.configureForDeployment`

Topics
“Simulink Compiler Workflow Overview”
“Create and Deploy a Script with Simulink Compiler”
“Deploy an App Designer Simulation with Simulink Compiler”
“Deploy Simulations with Tunable Parameters”

Introduced in R2020b

simulink.compiler.stopSimulation

Stop a long running simulation

Syntax

```
simulink.compiler.stopSimulation('modelName')
```

Description

`simulink.compiler.stopSimulation('modelName')` function enables you to stop a running simulation from a callback or a MATLAB app for the model specified .

Input Arguments

`modelName` — Name of model

string

Name of model for which you want to stop the simulation, specified by a string.

See Also

`sim` | `Simulink.SimulationInput` | `mcc` | `deploytool` | `exportToFMU2CS` | `simulink.compiler.configureForDeployment` | **applicationCompiler**

Topics

“Simulink Compiler Workflow Overview”
“Deploy an App Designer Simulation with Simulink Compiler”
“Generate, Modify and Deploy a MATLAB App for a Simulink Model”

Introduced in R2020b