ANSYS

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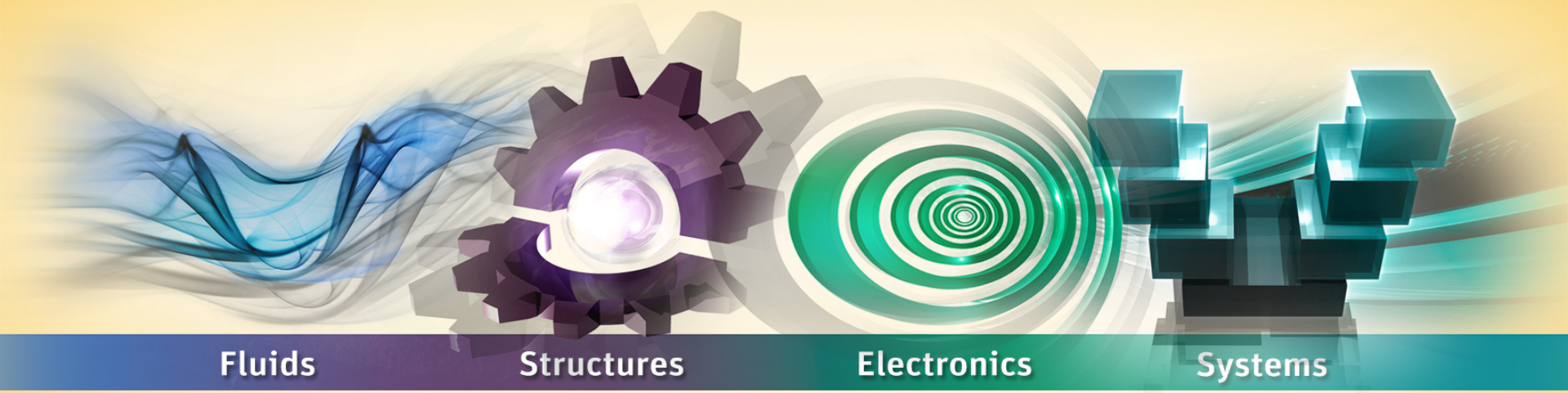
SCADE LifeCycle Rapid Prototyper Basic Training



Overview

ESTEREL Technologies

DESIGN A GRAPHICAL PANEL FOR SCADE SUITE

Create a New Graphical Panel

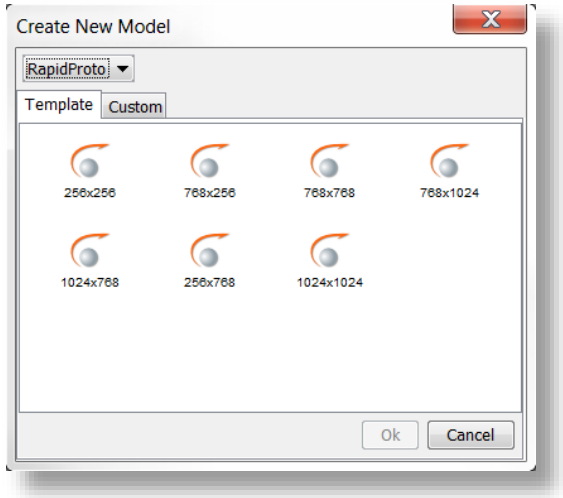
Connect Graphical Panel To SCADE Suite Model

Rapid Prototyper Tips with SCADE Suite

Create a New Graphical Panel

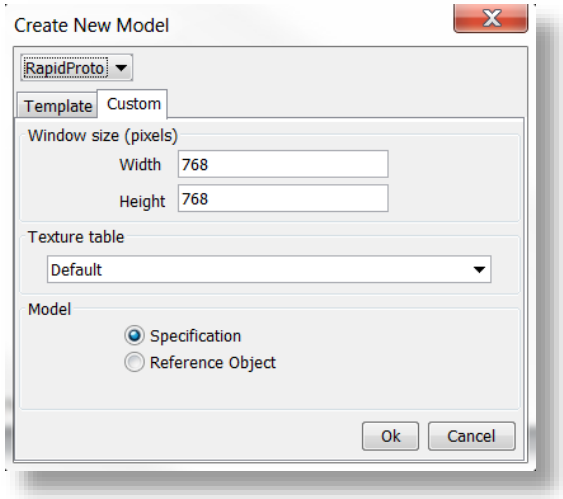
From a Template

- File > New > X×Y Template
- Template presents templates of predefined sizes



From Scratch

- File > New > Custom tab
  - Select a Specification model
  - Type the desired width and height

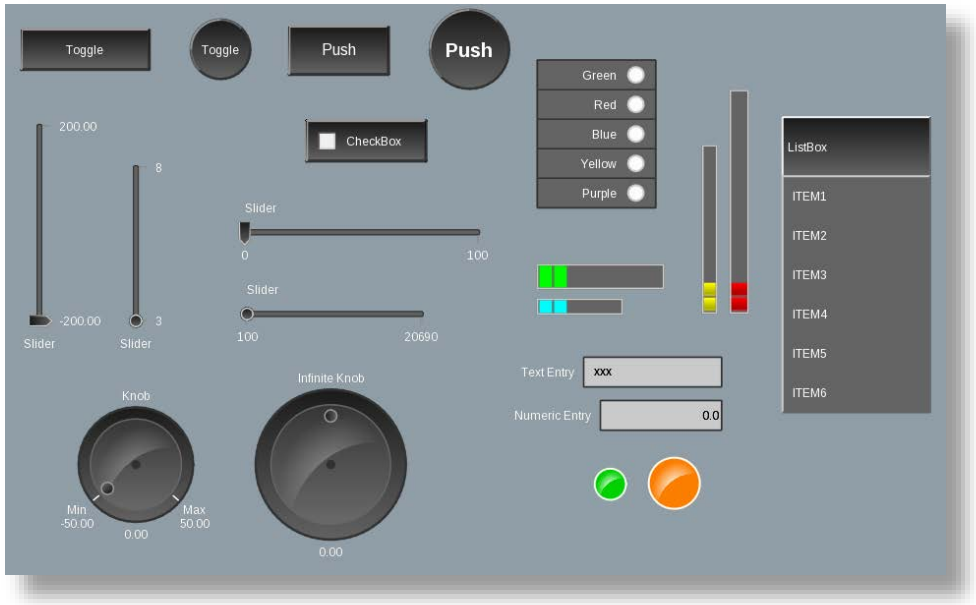


Widgets Library

29 predefined widgets, including:

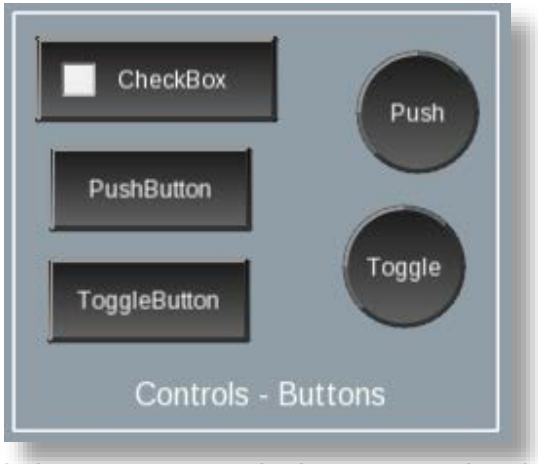
- Interactive control widgets: buttons, knobs, sliders, list boxes, radio buttons, text and numerical entry boxes, etc.
- Display widgets: LEDs, counters, text and numerical indicators, etc.
- Signal generators

Library of widgets can be user-customized/augmented



Extract of the Rapid Prototyper Widget Library

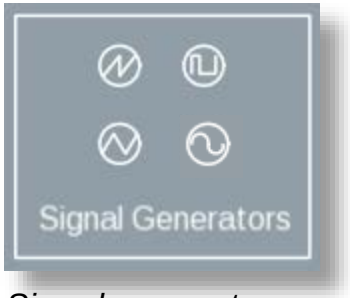
Controls



Push buttons, Toggle buttons, Checkbox
to drive Boolean values

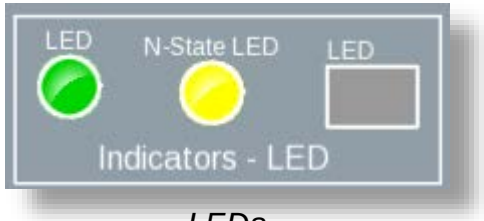
Listbox, Radio list, Rotary switch
to drive enumerate & integer values

Sliders, Knobs (finite/infinite), Numerical edit box
to drive real & integer values



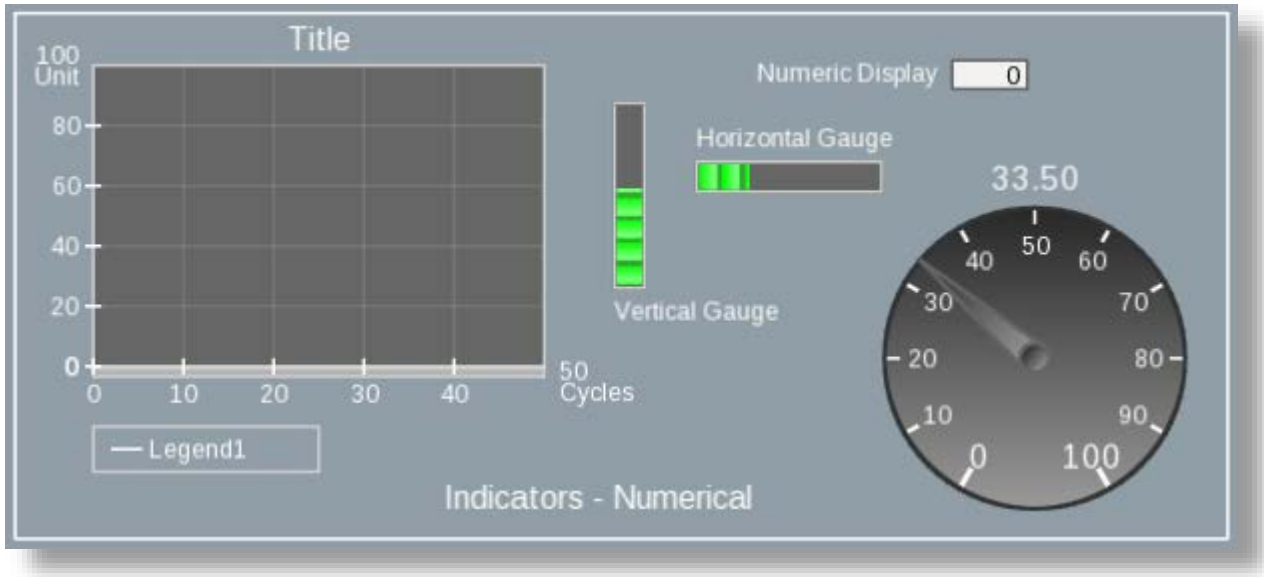
Signal generators
(ramp, rectangle, sinus, triangle)
to drive real & integer values

Indicators & Text Management



LEDs
to display Boolean values

Text Entry and Text Indicator
to enter or display strings (array of char)

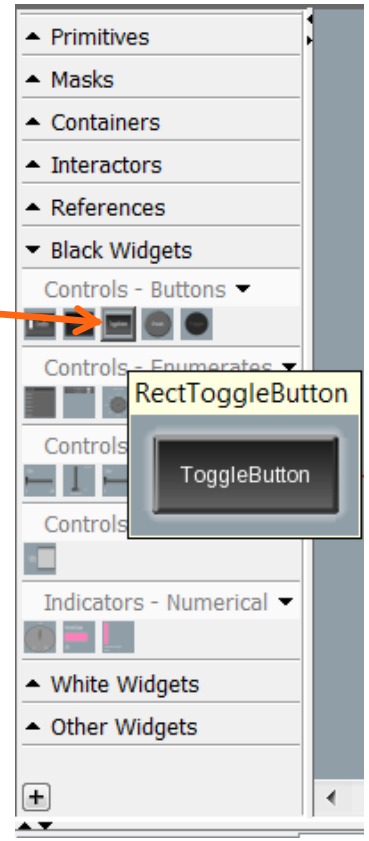


Counter, Gauges, Graph and Numerical Display
to display real & integer values

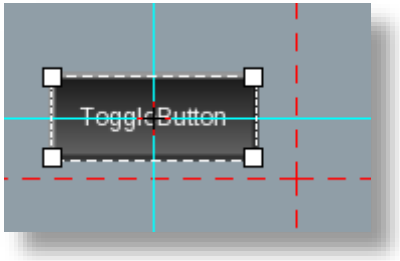
Design the Graphical Panel (1/6)

Instantiate widgets in the graphical panel

- Select a widget in the objects creator toolbar



- Click in the Graphical Panel view to instantiate the widget



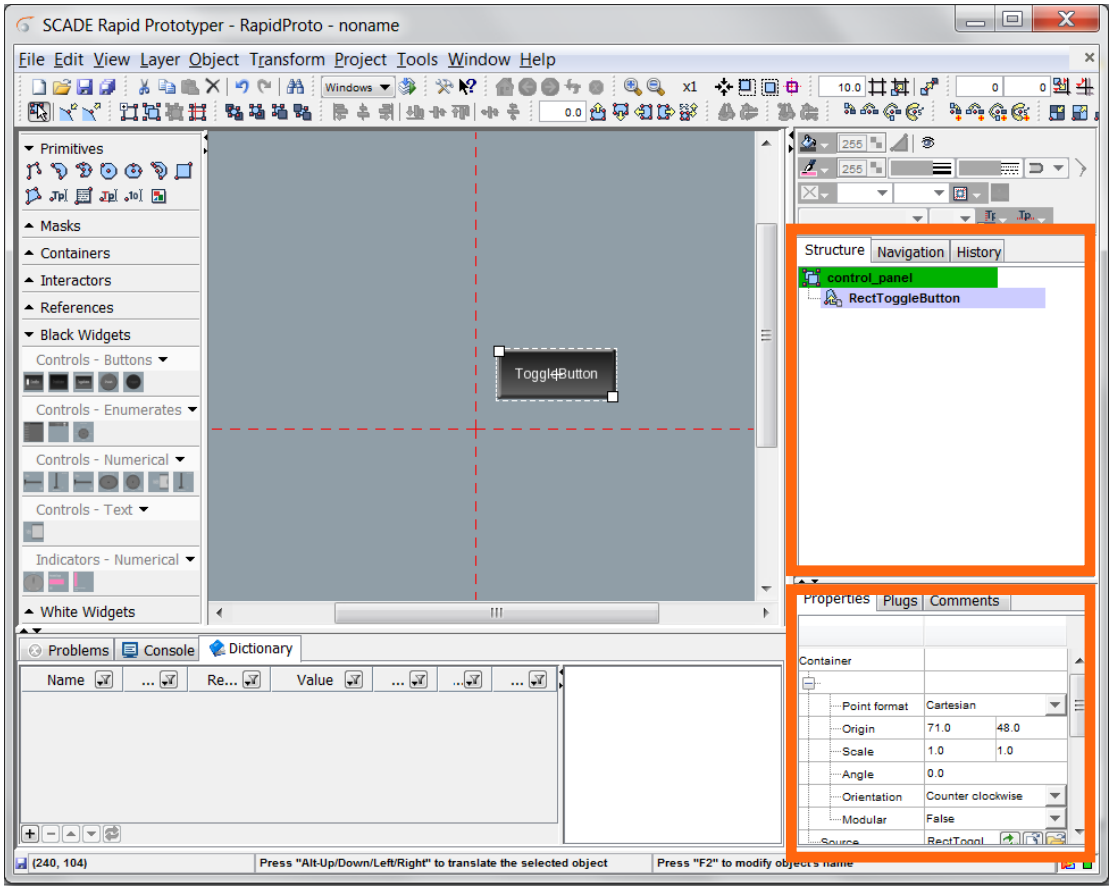
Tip : *2 libraries of similar widgets*

Black *and* ***White***

Design the Graphical Panel (2/6)

The widget is added to the Structure view of the graphical panel

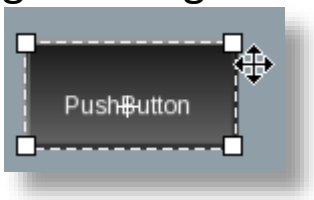
Its properties appear in the Properties view



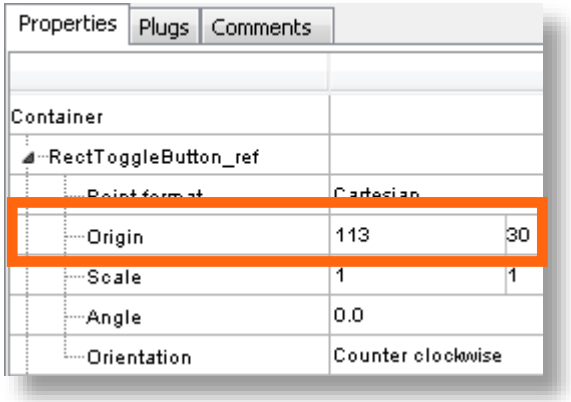
Design the Graphical Panel (3/6)

Configure Widgets

- Move a widget
  - Click and hold to drag the widget and release the mouse to drop it in its new location



  - Directly enter position coordinates in the properties view



  - With the translate toolbar, set the amount of pixels to move then click the direction button (top/bottom/right/left).

Design the Graphical Panel (4/6)

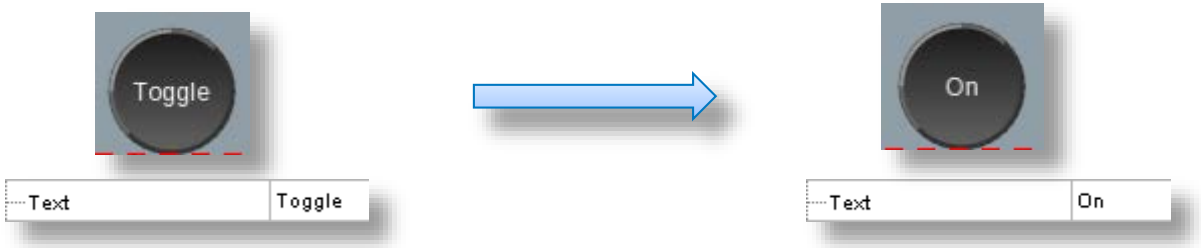
Configure Widgets

- Resize a widget
  - Click and drag a control point of the widget

  - Directly enter new size values in the properties view

xLeft	-50.0
xRight	50.0
yBottom	-20.0
yTop	20.0

- Change displayed text on a widget

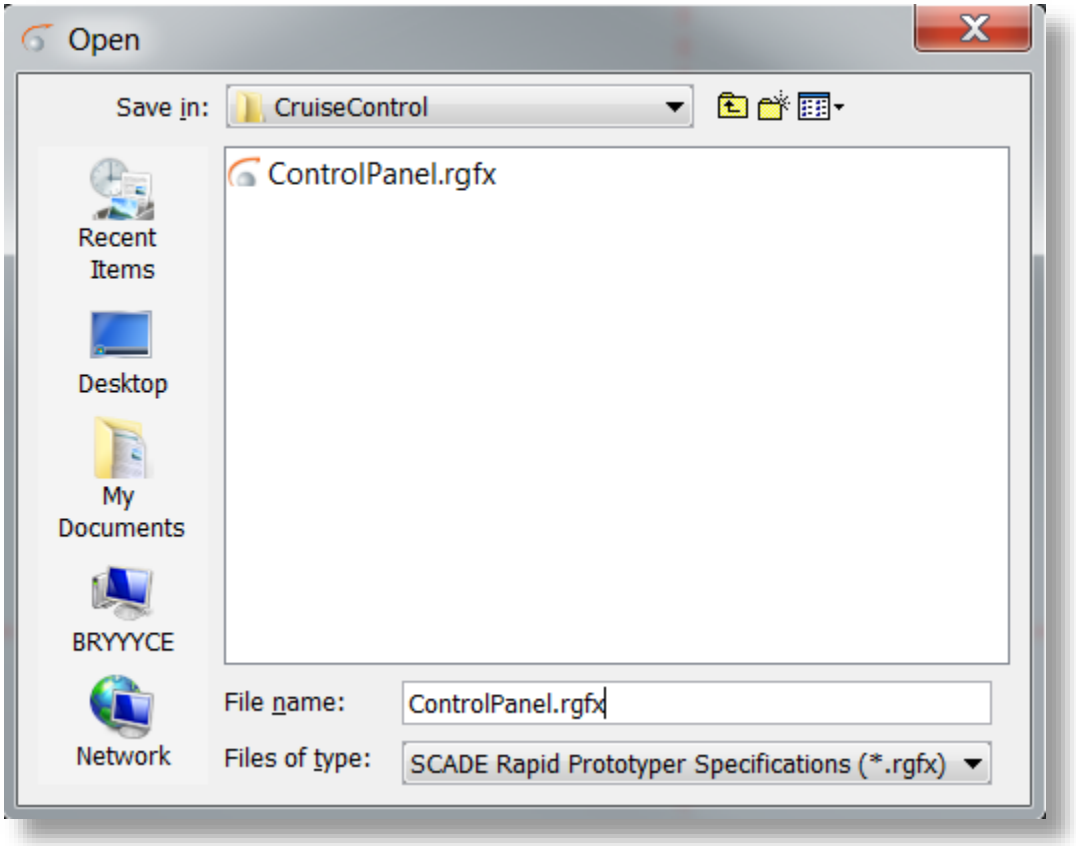


Design the Graphical Panel (5/6)

Complete Graphical Panel

Design the Graphical Panel (6/6)

Save the Graphical Panel .rgfx



Lab

Create a counter with 2 functionalities:

- On/Off
- Counting up/Counting down

Note: The behaviour will be provided by a prerequisite SCADE Suite operator

Lab

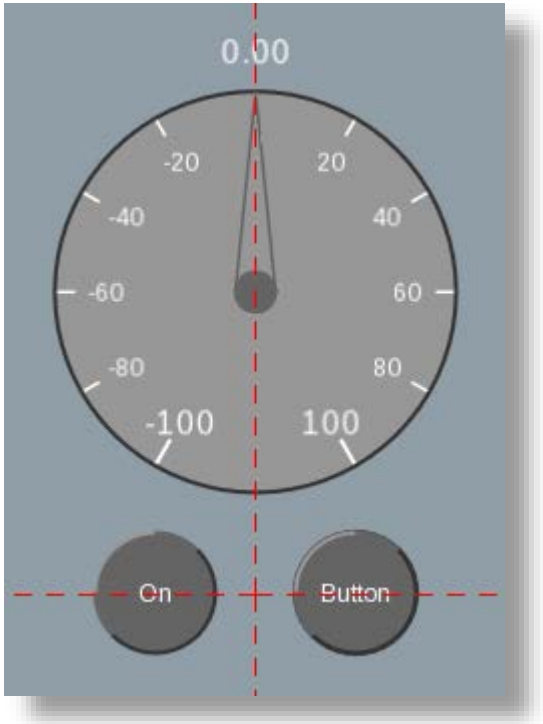
Lab 1

Lab

Create a New Graphical Panel from template 768x768

Create a Design with:

- 1 toggle button for the On input:
  - origin -50, 0
- 1 push button for the Button input:
  - origin 50, 0
- An analog counter for the Count output:
  - origin: 0, 150
  - max : 100
  - min: -100

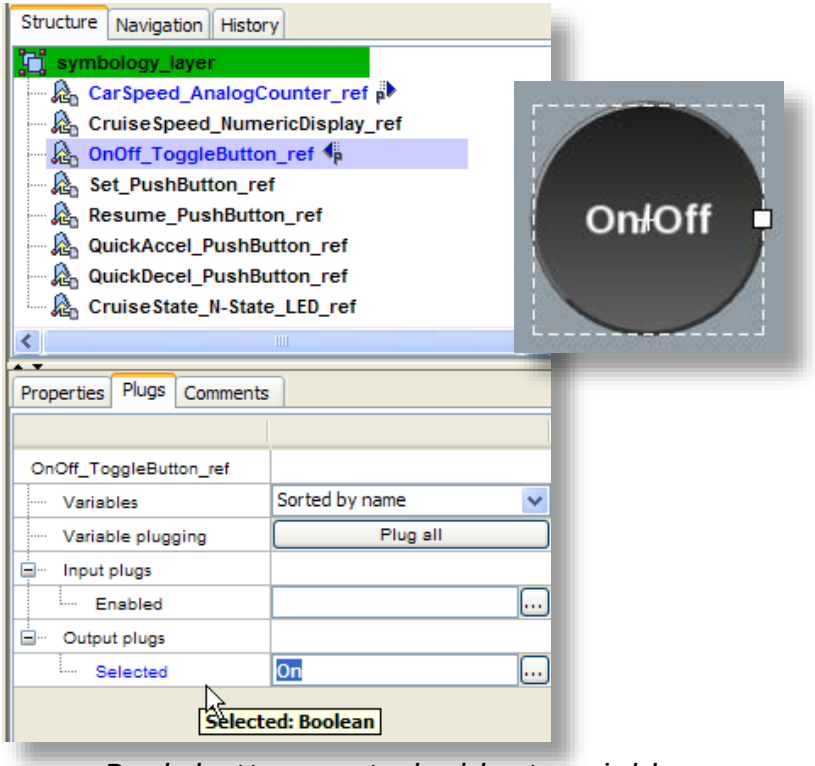


*Tip : Use **Black Widgets***

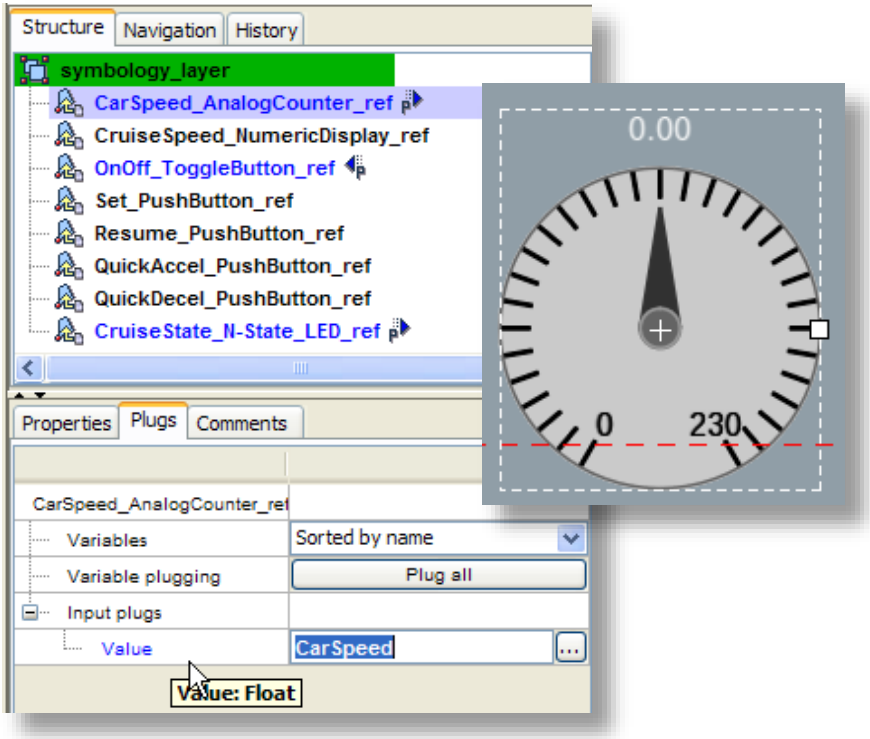
Create Widgets I/Os

All widgets can be associated to input and/or output variables

- All control widgets can be Enabled/Disabled (input plug) and produce an output value or event (output plug)
- All indicator widgets display input values (input plug)



Push button control widget variables



Counter indicator widget variables

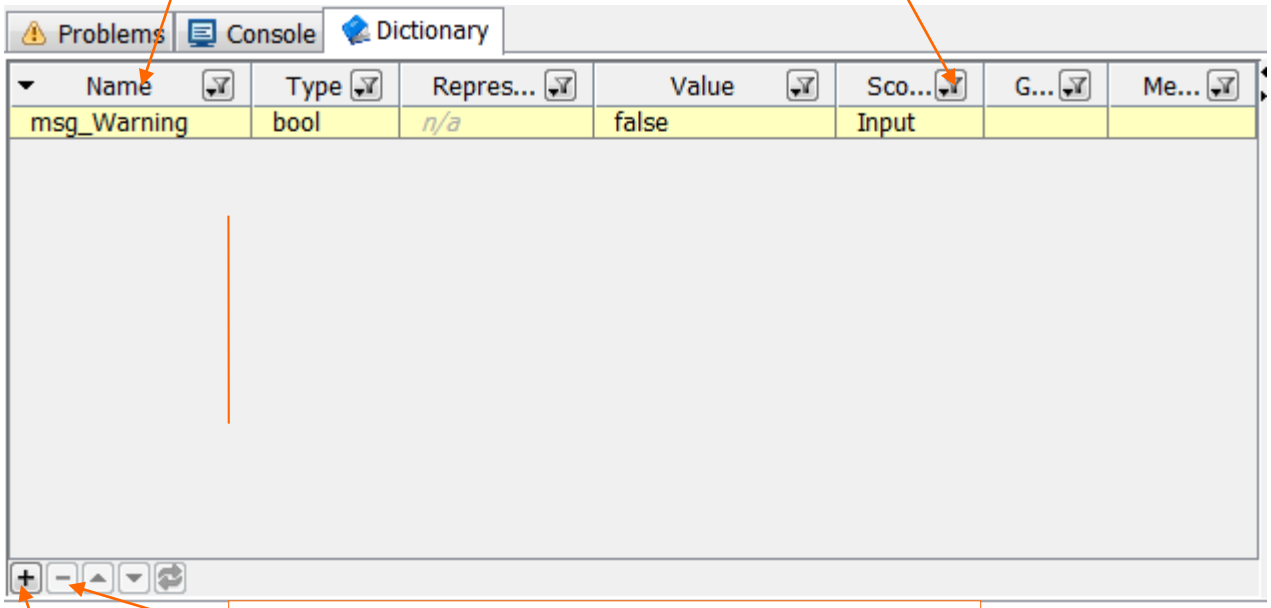
Create Widgets I/Os

Tip #1 : The Data Dictionary allows copy/paste variables

Widgets variables are managed in a single location

Sort on column

Filter on column



Delete the selected variables

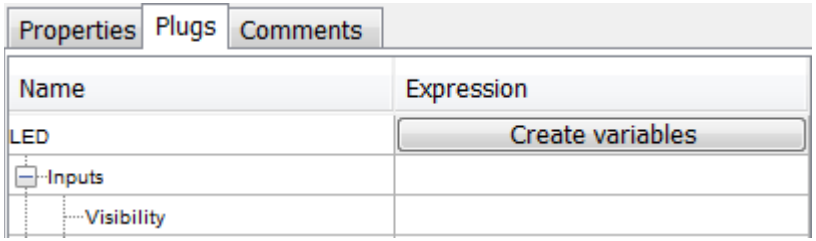
Create a new variable

Tip #2: Use the Tab key to change the focus

Create Widgets I/Os

Go to Plugs tab to plug the variable:

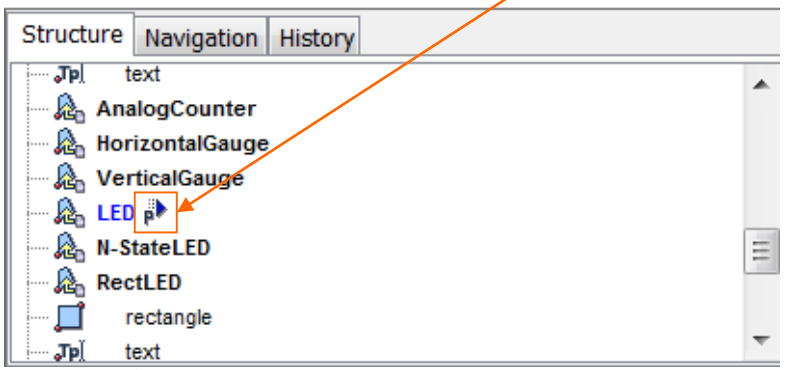
- Associate the variable names to
- the available attributes / properties



- Once the variable name is entered into the text-field, the text turns blue to highlight the plugged attribute / property:

A primitive plugged to at least one variable is highlighted in **blue** into the layer **tree sheet**

“Plug” icon



Lab 2

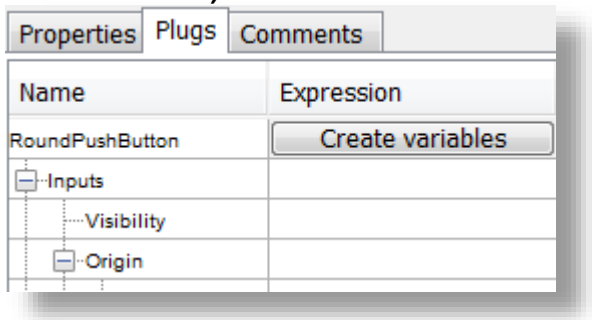
Lab

1. Add I/Os to the graphical panel created in the exercise 02-1

Name	Type	Repres...	Value	Sco...	G...	Me...
Value	real	*n/a*	0.0	Input		
On	bool	*n/a*	false	Output		false
Button	bool	*n/a*	false	Output		false

2. Plug

- o `Value` on “Value” input of AnalogCounter, to recover counting value and to show
- o `On` on “Selected” ouput of RoundTogglebutton, to enable/disable the counter
- o `Button` on “EvtClick” output of RoundPushButton, to command the counter



DESIGN A GRAPHICAL PANEL FOR SCADE SUITE

Create a New Graphical Panel

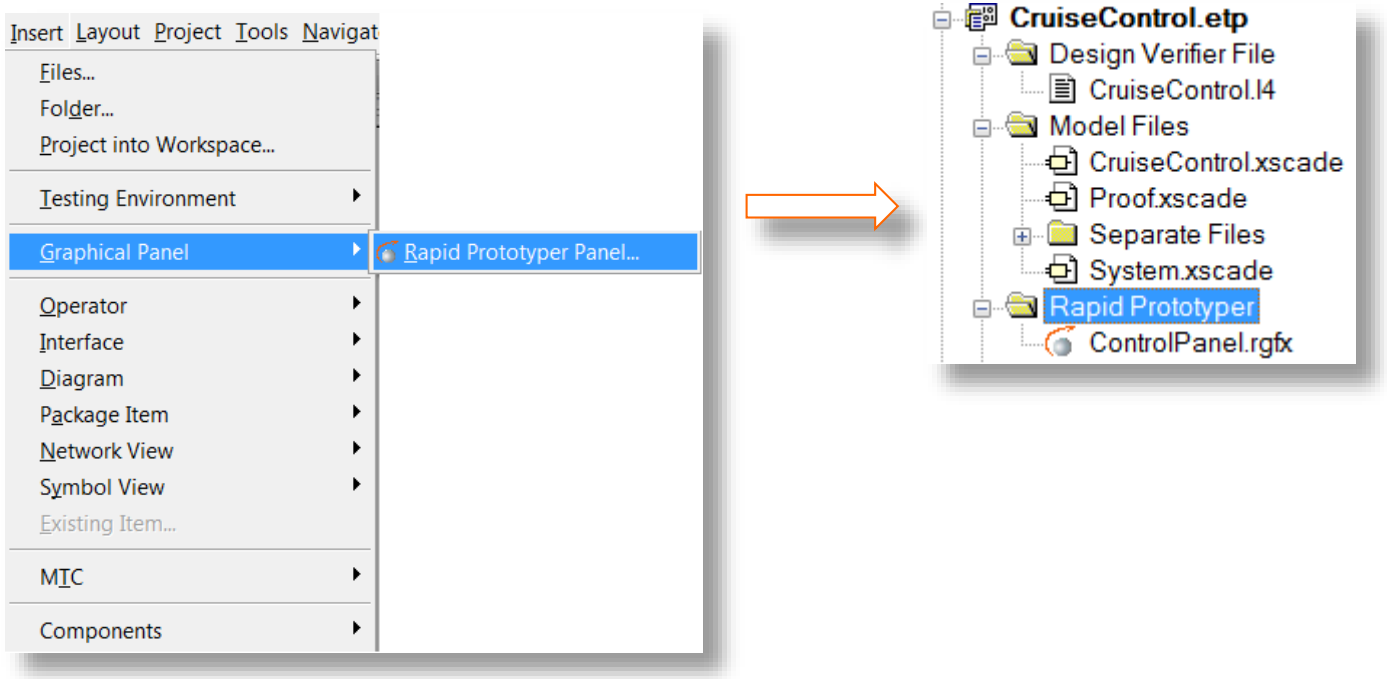
Connect Graphical Panel To SCADE Suite Model

Rapid Prototyper Tips with SCADE Suite

Add a Graphical Panel in SCADE Suite

Insert > Graphical Panel > Rapid Prototyper Panel

- Select .rgfx file



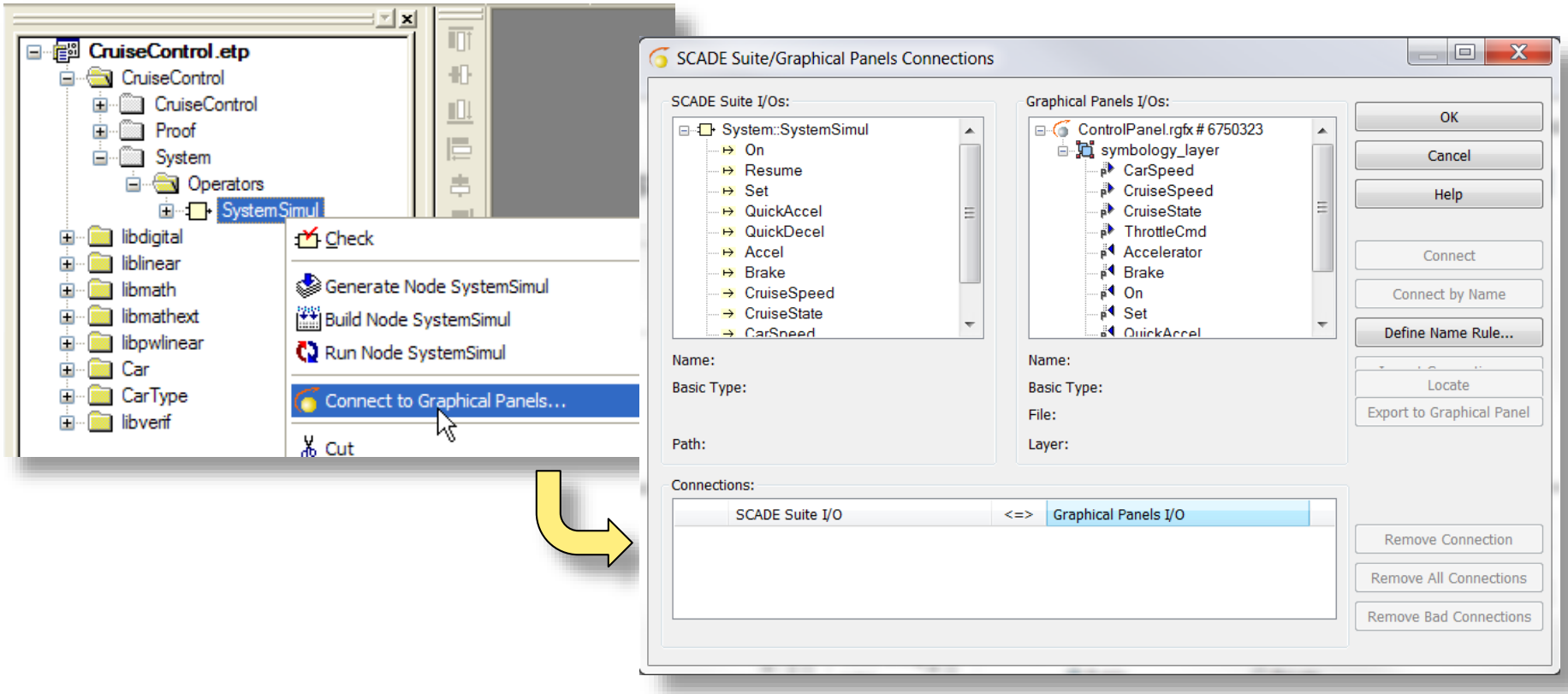
Double click on the .rgfx file to open the Rapid Prototyper Editor

Note: *Several graphical panels can be associated to a single SCADE Suite project*

Connect Model I/Os to Graphical Panel I/Os (1/2)

Open the SCADE Suite/Graphical Panels Connections window

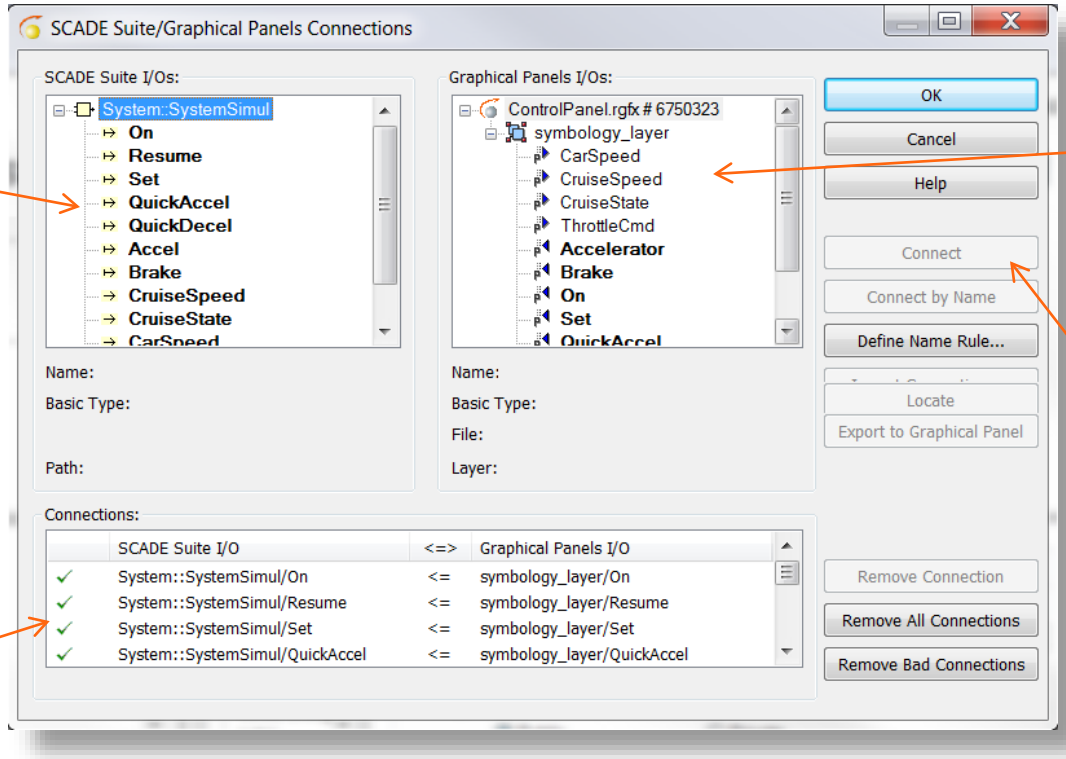
- Right-click on a SCADE Suite node > Connect to Graphical Panels…



Connect Model I/Os to Graphical Panel I/Os (2/2)

Create the connections between model I/Os and graphical panel(s) I/Os

- Connect I/Os one-by-one, or automatically in a row
- Automatic connect by name can be used if I/Os share name patterns



SCADE Suite node I/O

Rapid Prototyper graphical panel(s) I/O

Connection buttons

Established connections

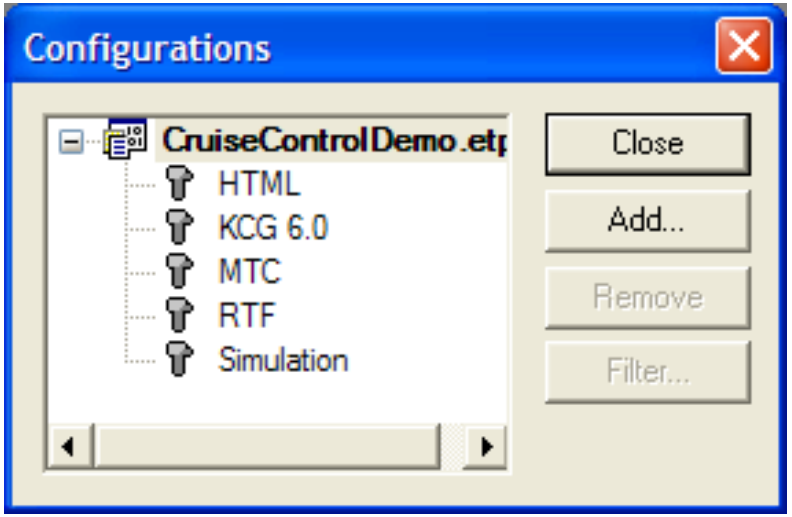
Reminder SCADE Suite: Configurations

For each project, configurations can be added to the default configurations

Configurations allow you to save different code generation simulator/reporter options for different purposes for the same project

For example:

- A Rapid Prototyping
- a Standalone Executable



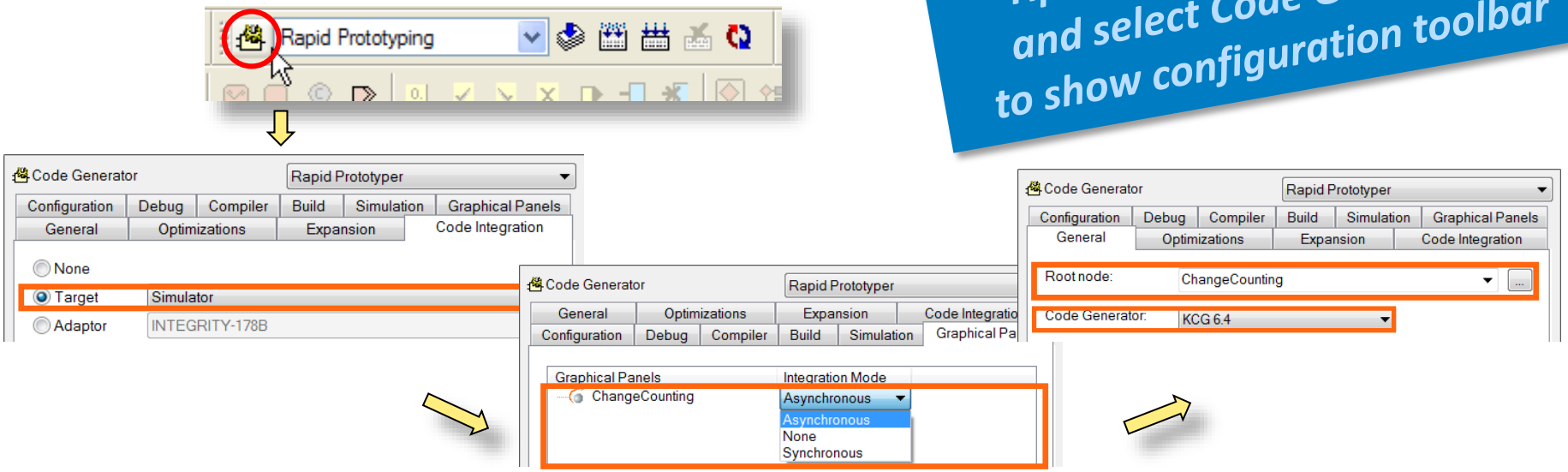
How to do: Click on *Project - Configurations*

Perform SCADE Suite Interactive Simulation (1/2)

Create a Rapid Prototyping configuration

Configure interactive simulation session

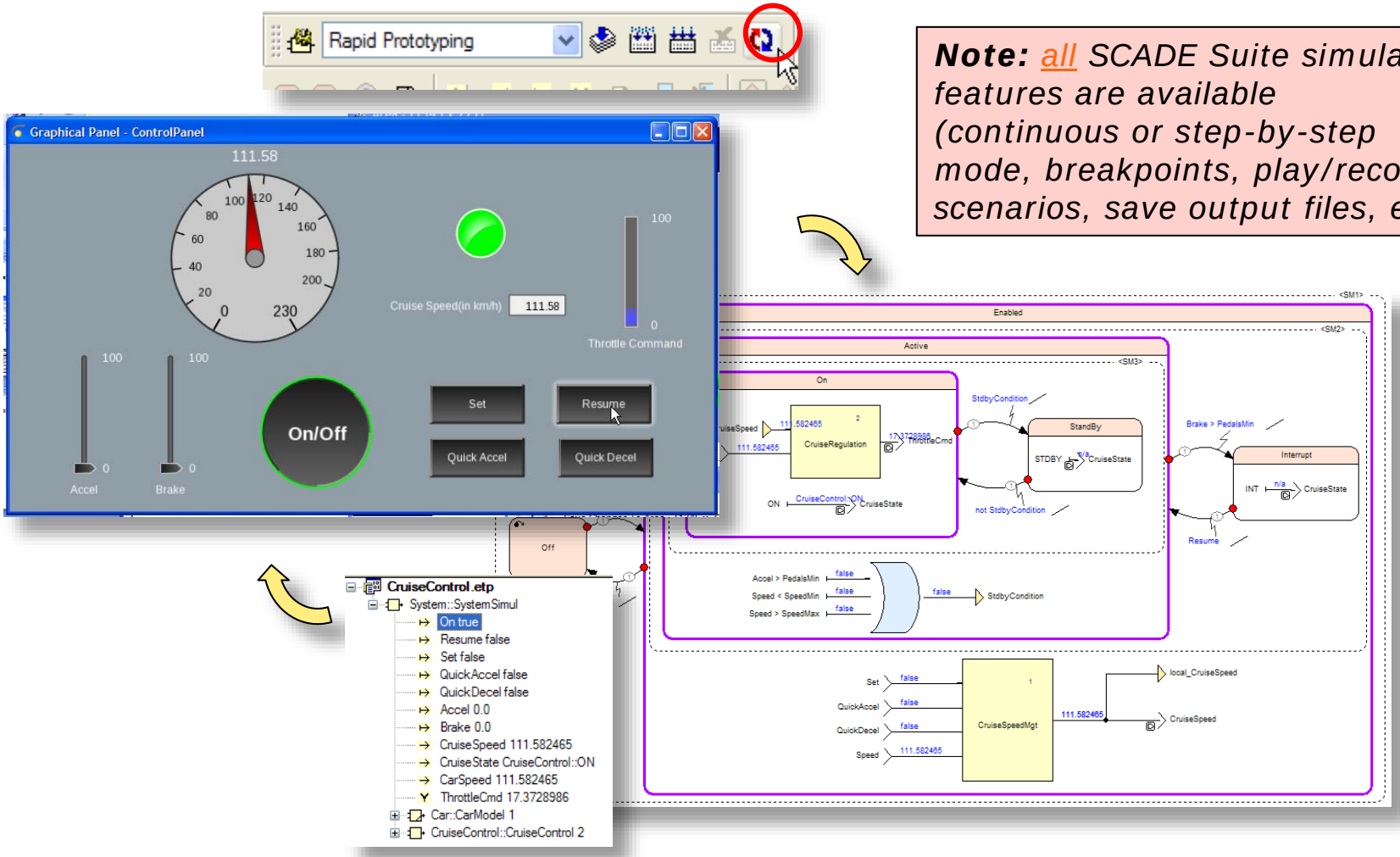
Tip : Right click on Toolbar and select Code Generator to show configuration toolbar



Note: *when the Integration Mode is set to Asynchronous, the graphical panel runs in parallel of the SCADE Suite simulator (in a dedicated thread, at its own rate). This allows pausing the simulator while still having the capability to manipulate the widgets to position simulation inputs.*
When the Integration Mode is set to Synchronous, the graphical panel runs in synch with the simulator. When in pause, the widgets then cannot be manipulated.

Perform SCADE Suite Interactive Simulation (2/2)

Run interactive simulation session

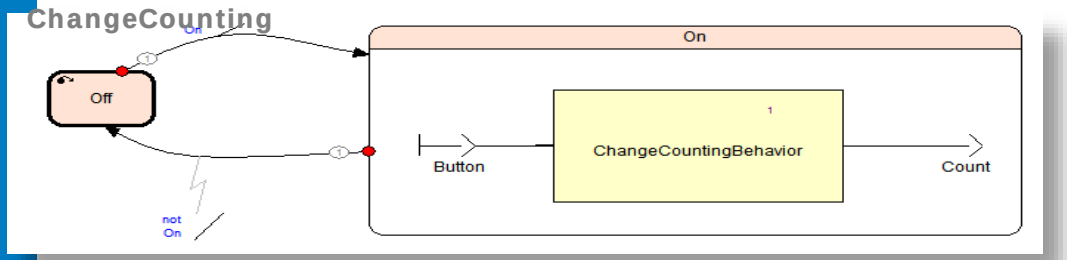


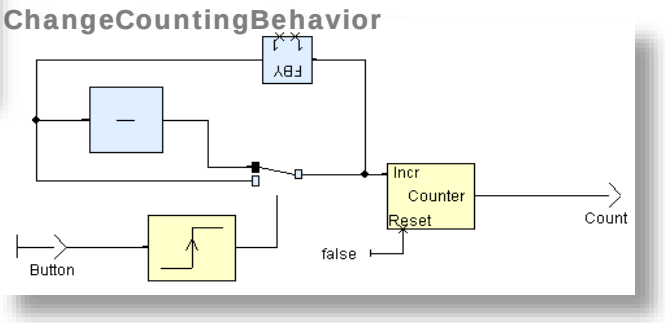
Note: *all SCADE Suite simulator features are available (continuous or step-by-step mode, breakpoints, play/record scenarios, save output files, etc.)*

Lab 3 (1/2)

1. **Open the ChangeCounting SCADE Suite project in Prerequisites\Exercises\Exercise02-3 and add Graphical Panel developed in the previous exercise**

   - This application changes counting mode (counting up/counting down) each time you press on a *Button* input and if you have switched *On* first.

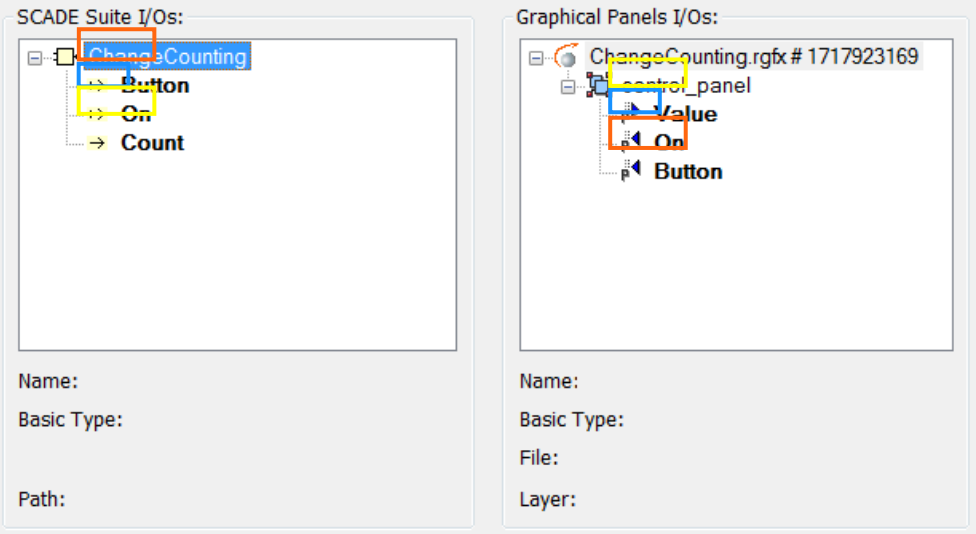




Lab 3 (2/2)

Lab

2. **Connect the RapidPrototyper Graphical Panel to the ChangeCounting SCADE Suite model**



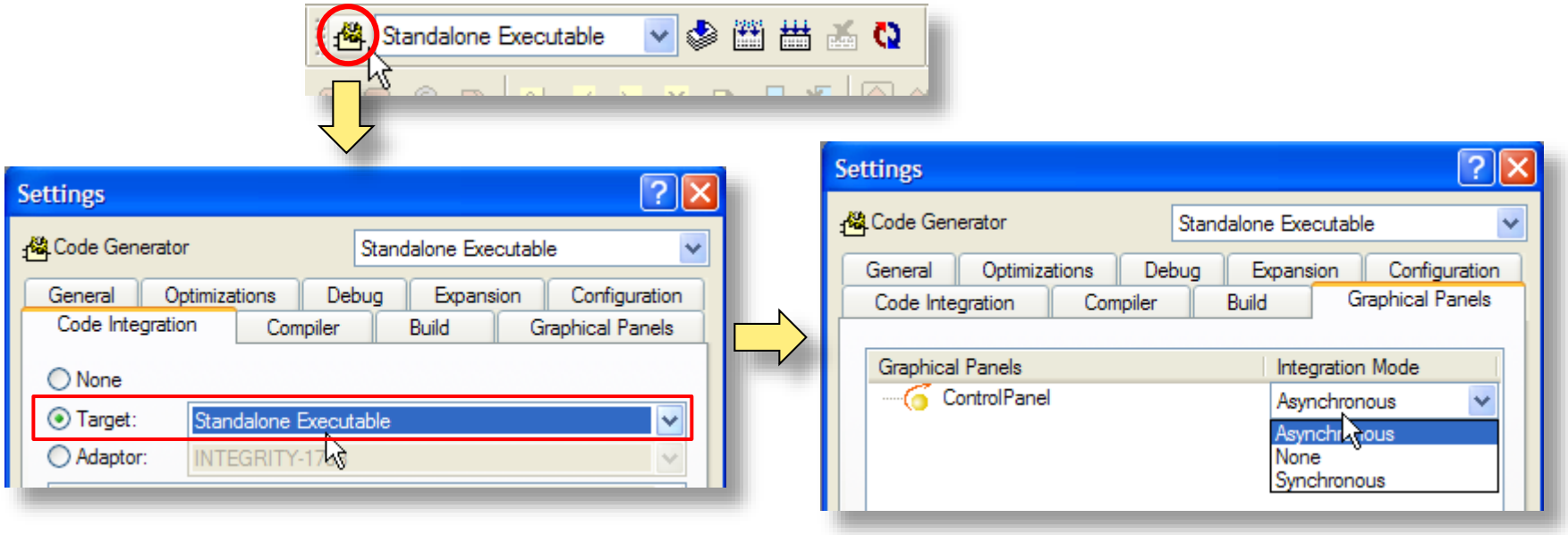
3. **Simulate the SCADE Suite model with the graphical panel**

Generate Standalone Executable from SCADE Suite (1/4)

Create a “Standalone Executable” configuration

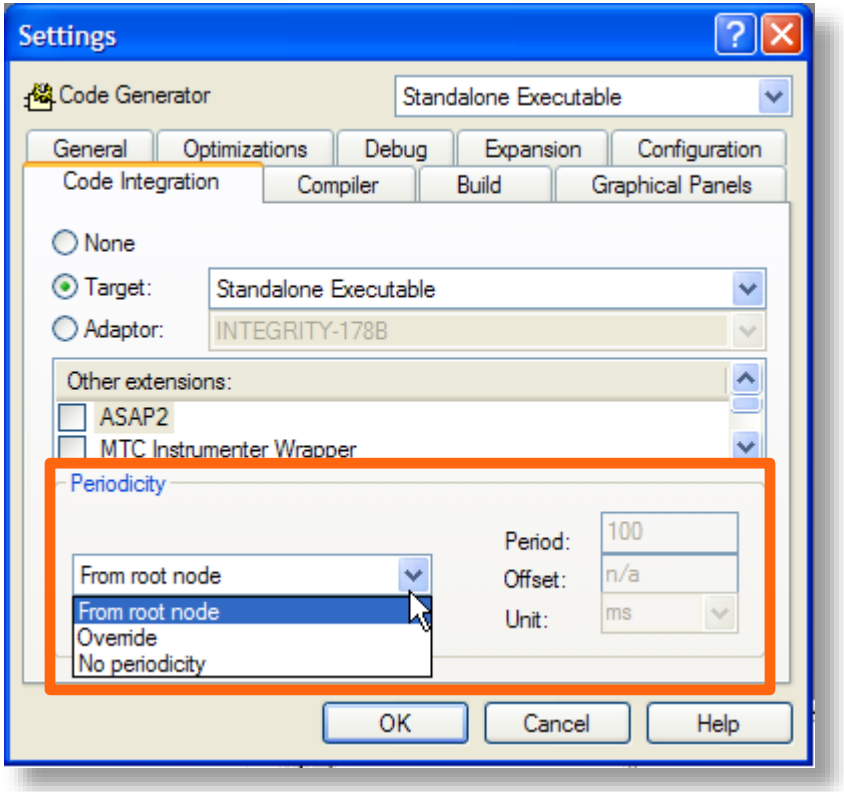
Configure standalone executable generation

- Select the “Standalone Executable” code integration target
- Select the graphical panels to be included

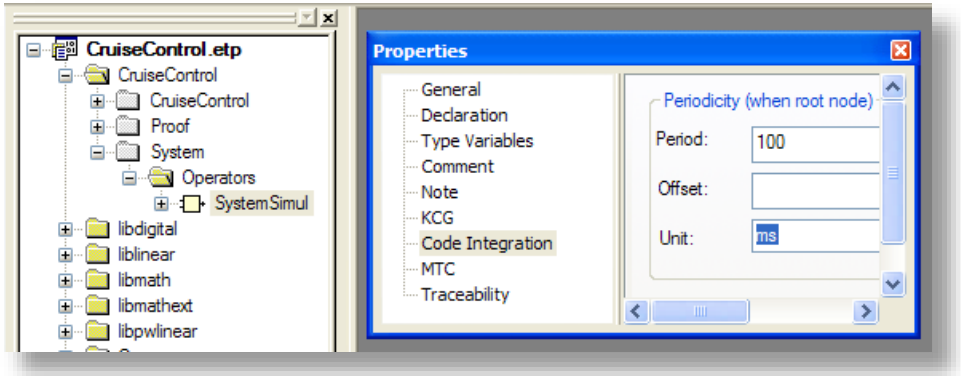


Generate Standalone Executable from SCADE Suite (2/4)

Set the desired “Standalone Executable” periodicity (in µs, ms, or s)



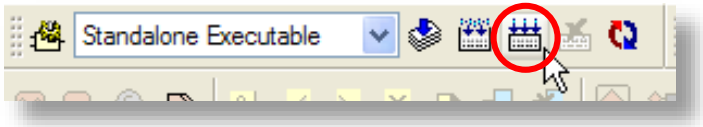
Note: *by default, the periodicity inherits from the code generation root node (default value = 100ms). The root node periodicity can nevertheless be overridden.*



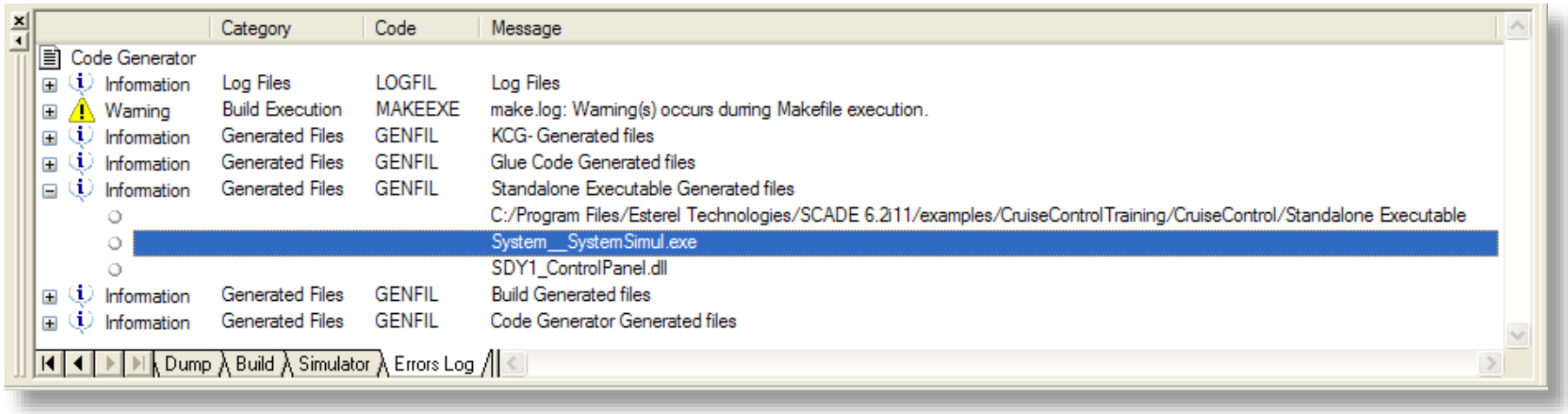
Node periodicity properties (when root)

Generate Standalone Executable from SCADE Suite (3/4)

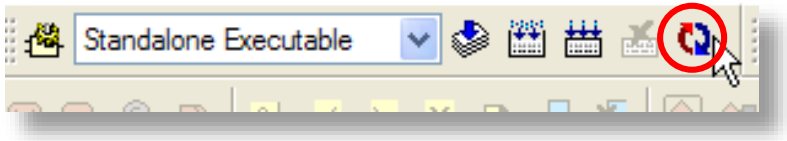
Generate standalone executable



- Name of generated file is: <package>__<rootnodename>.exe

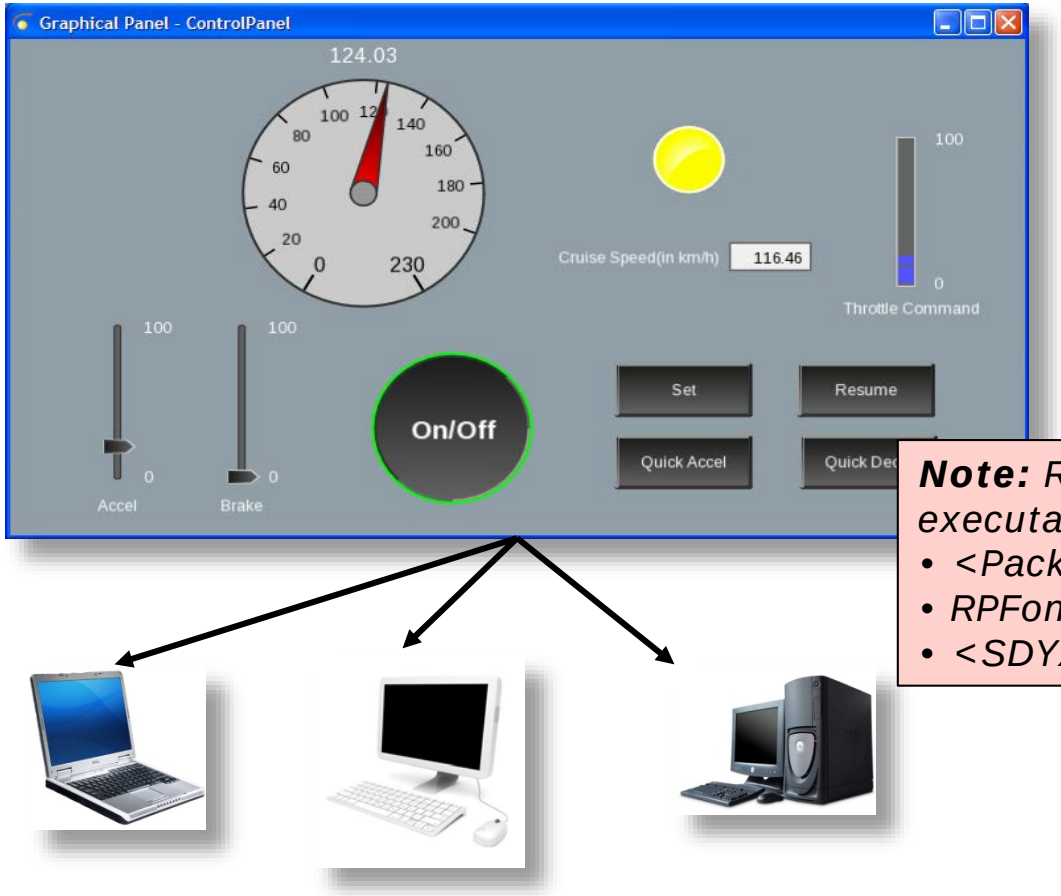


- Standalone executable can be run directly from SCADE Suite



Generate Standalone Executable from SCADE Suite (4/4)

Standalone executable can be shared with colleagues, managers, customers, stakeholders, etc.



Note: *Required files for standalone executable are:*

- *<Package_RootNodeName>.exe*
- *RPFonts.dll*
- *<SDYx_GraphicalPanelName>.dll*

Lab 4

Generate and run a Standalone Executable from ChangeCounting SCADE Suite model

Lab

DESIGN A GRAPHICAL PANEL FOR SCADE SUITE

Create a New Graphical Panel

Connect Graphical Panel To SCADE Suite Model

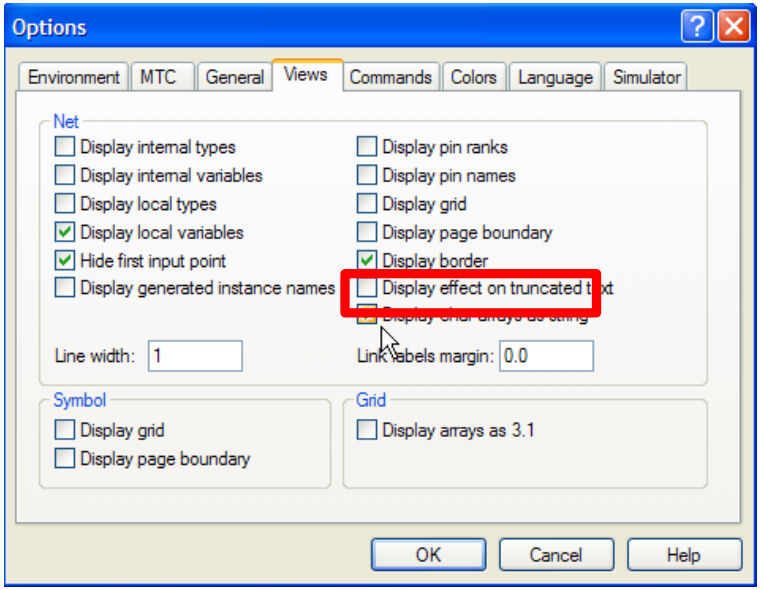
Rapid Prototyper Tips with SCADE Suite

Managing Strings

a) Manipulating strings as arrays of SCADE char

- Strings are implemented as arrays of chars

- A tool option enables entering, and displaying, arrays of SCADE chars between double quotes
  - Tools > Options… > Views > Display char arrays as string



Constant	Type	Value
MyString	char ^5	"Hello"

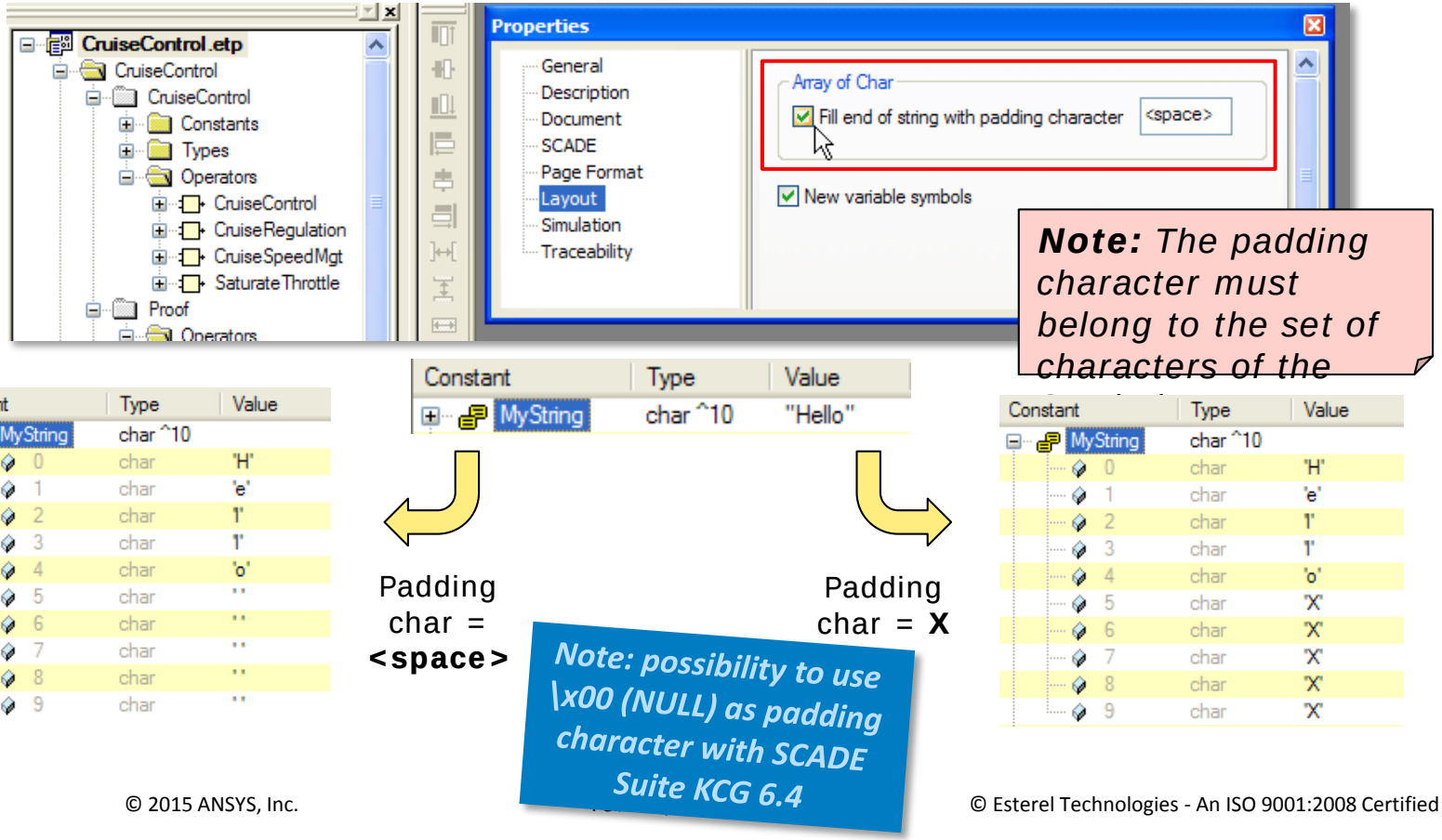
=

Constant	Type	Value
MyString	char ^5	
0	char	'H'
1	char	'e'
2	char	'l'
3	char	'l'
4	char	'o'

Managing Strings

b) The notion of “padding” character

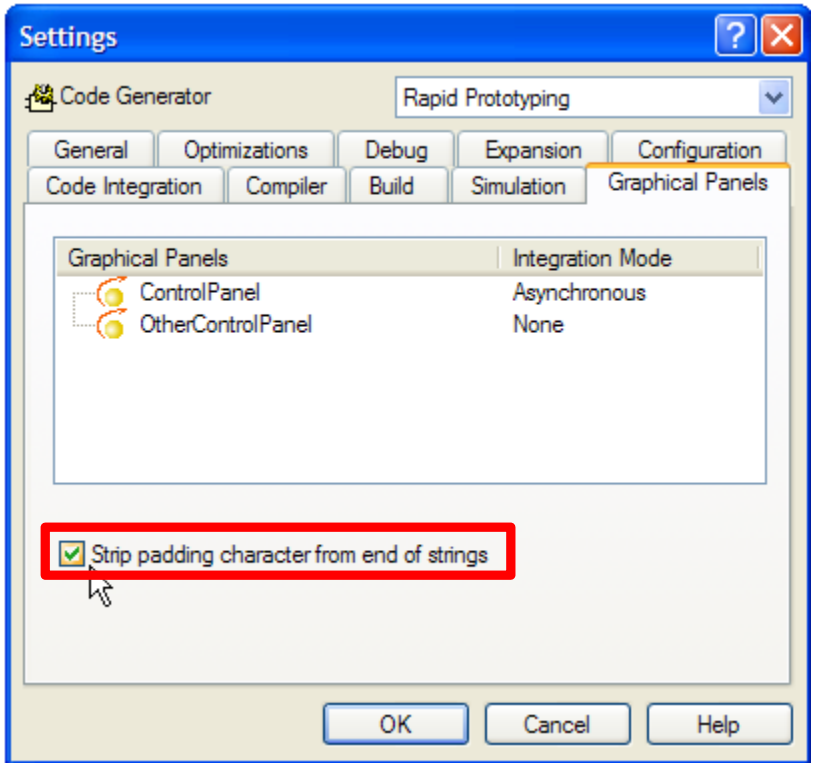
- A project option (.ETP properties) enables automatically filling the end of strings with a padding character (default padding = <space>)

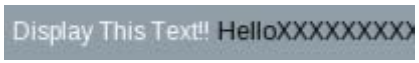


Managing Strings

c) Using strings in Rapid Prototyper graphical panels

- SCADE LifeCycle Rapid Prototyper is manipulating strings as arrays of 256 characters
- During interactive simulation, or in standalone executables, stripping the padding character from the end of strings allows "cutting" the array of SCADE chars at the right place in order to display ONLY the effective characters in graphical panels (not the padding chars)





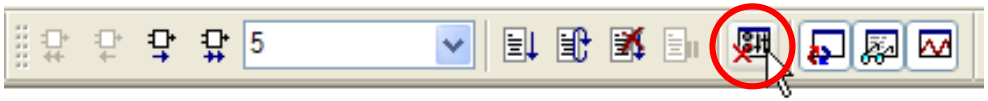
Note: possibility to use \x00 (NULL) as padding character with SCADE Suite KCG 6.4

Optimizing the Simulation Experience

During simulation sessions, SCADE Suite inputs are _driven_ by the graphical panel:

- At each computation cycle, the input value comes from the panel

The user can Disconnect the Inputs from Graphical Panels:



This allows:

- Performing step-by-step debug, when the user needs to enter “exact” values through the SCADE Suite simulator GUI
- Or loading, and playing a pre-recorded SCADE scenario (eg. at the beginning of a session) before reconnecting the graphical panel inputs

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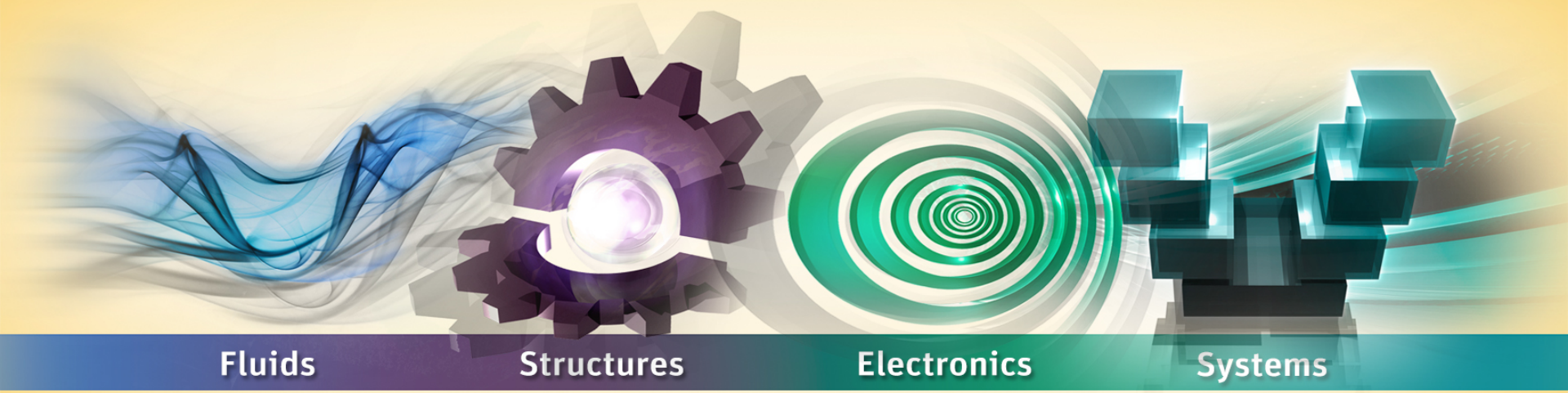
Exercises Solutions



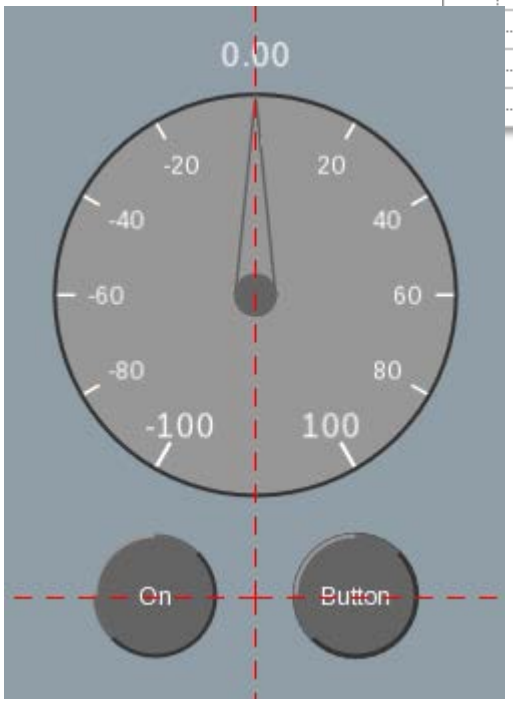
ESTEREL Technologies

Lab 1

Lab

Container		
RoundToggleButton_ref		
Point format	Cartesian	
Origin	-50	0
Scale	1	1
Angle	0.0	
Orientation	Counter clockwise	
Source	RoundToggleButton.ogf	
Parameters	Sorted by name	
Enabled	True	
Radius	30.0	
SelectedColor	41	
Text	On	
TextSize	1: Size 1	
TextVisible	True	

Container		
RoundPushButton_ref		
Point format	Cartesian	
Origin	50	0
Scale	1	1
Angle	0.0	
Orientation	Counter clockwise	
Source	RoundPushButton.ogf	
Parameters	Sorted by name	
Enabled	True	
Radius	30.0	
Text	Button	
TextSize	1: Size 1	
TextVisible	True	



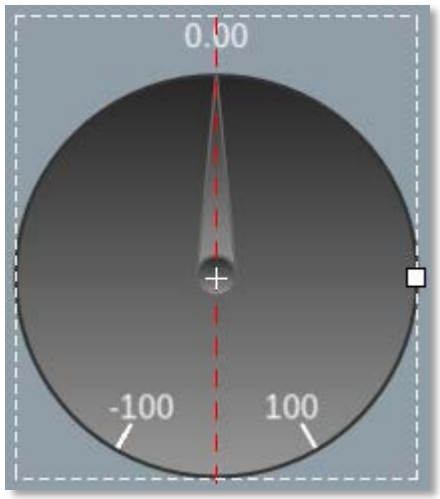
Container		
AnalogCounter_ref		
Point format	Cartesian	
Origin	0	150
Scale	1	1
Angle	0.0	
Orientation	Counter clockwise	
Source	AnalogCounter.ogf	
Parameters	Sorted by name	
Max	100.0	
Min	-100.0	
NeedleColor	5	
Size	100.0	
Value	0.0	
ValueVisible	True	

Lab 2

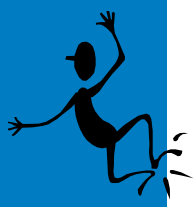
Lab

Properties	Plugs	Comments
RoundToggleButton_ref		
Variables	Sorted by name	
Variable plugging	Plug all	
Input plugs		
Enabled		
Output plugs		
Selected	On	

Properties	Plugs	Comments
RoundPushButton_ref		
Variables	Sorted by name	
Variable plugging	Plug all	
Input plugs		
Enabled		
Output plugs		
evtClick	Button	



Properties	Plugs	Comments
AnalogCounter_ref		
Variables	Sorted by name	
Variable plugging	Plug all	
Input plugs		
Value	Count	



Lab 3