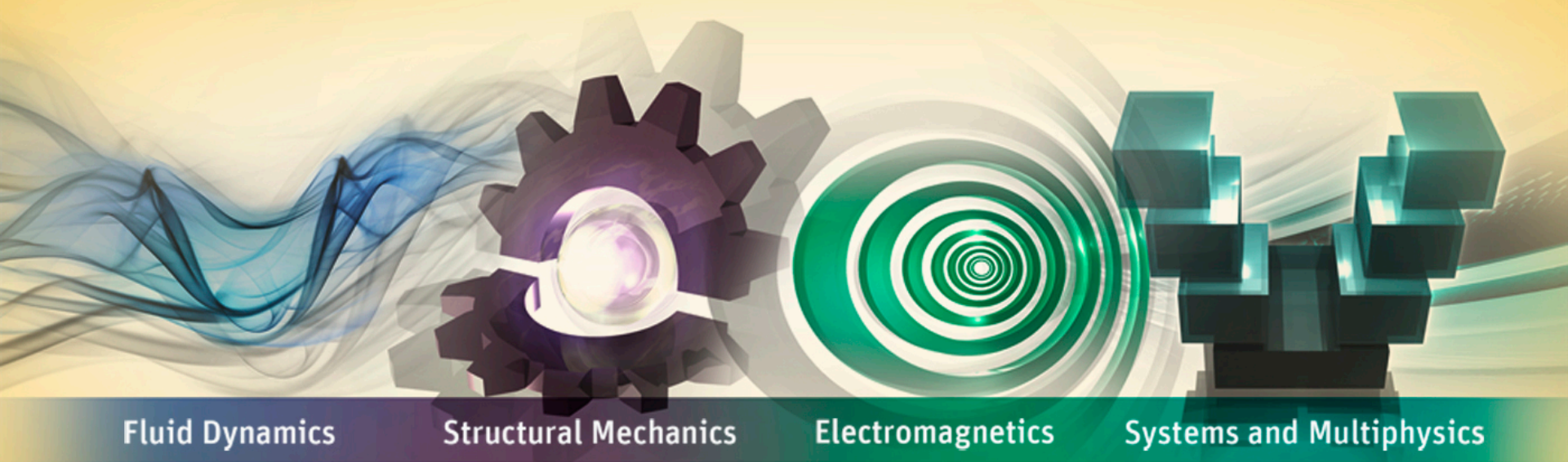


LABVIEW GATEWAY



Using LabView Gateway

- **Introduction**
- **Getting started**
- **Black-box co-simulation**
- **White-box co-simulation**
- **Rapid prototyping**

- **Objectives of the gateway**
 - Smooth coupling between SCADE software models and LabVIEW simulation environment
 - Co-simulation: SCADE and LabVIEW VIs
 - Rapid prototyping: SCADE @ any LabVIEW RT target (e.g. cRIO)
 - Two different modes
 - Black-box mode
 - White-box mode
- **Technical background**

- **Simulation of a SCADE model within a virtual environment designed with LabVIEW utilizing:**
 - LabVIEW physical data acquisition
 - LabVIEW test scenario creation and monitoring
 - LabVIEW GUI driven interactive simulation capabilities

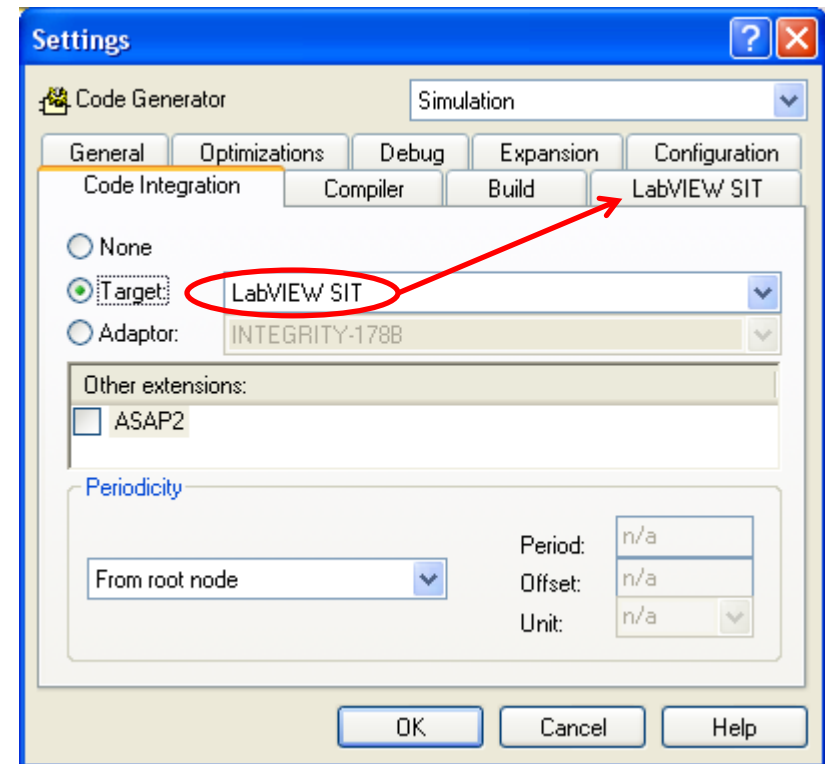
- **Improved verification capabilities for complex algorithms (signal processing)**
- **Validation of SCADE designs using LabVIEW front panel (virtual dashboard) for I/O**

- **Seamless and easy-to-use integration of SCADE models into LabVIEW targets**
 - Variety of NI prototyping hardware
 - Real-time processors
 - Digital/analog I/O modules
 - FPGA modules
- **Enables interaction of the SCADE model with the real physical system.**

- **Two modes possible:**
 - Black-box mode:
 - Embed SCADE model in a VI or an NI real-time target to validate its behaviour
 - White-box mode:
 - Couple LabVIEW and SCADE Simulator to debug a SCADE model
 - SCADE Simulation is stimulated by LabVIEW

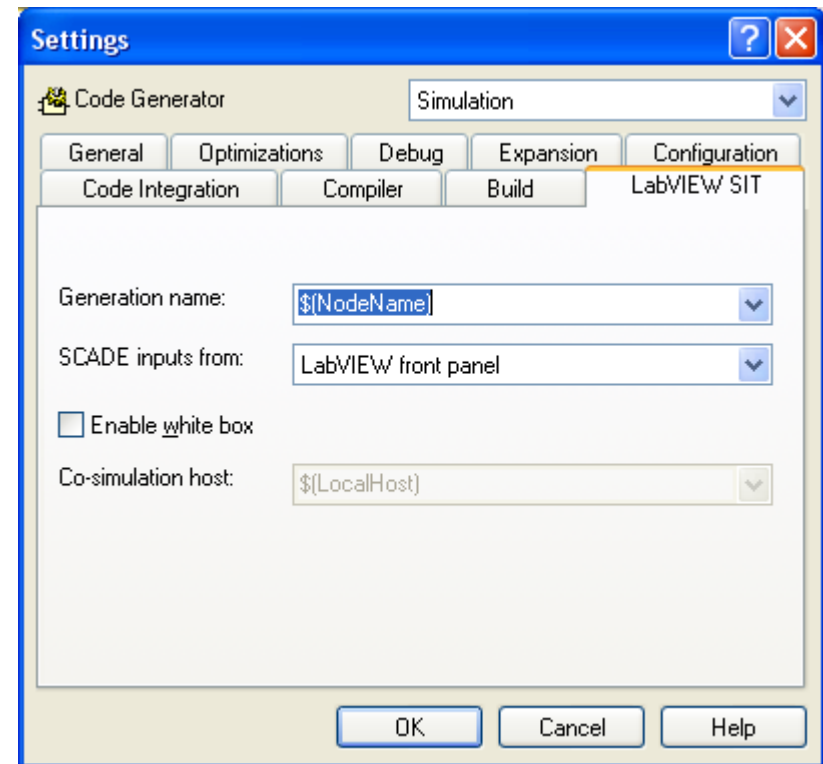
- **Based on LabVIEW SIT – Simulation Interface Toolkit**
 - Generic interoperability framework of LabVIEW
 - Seamless integration of SCADE model into LabVIEW context

- Select preferred CG configuration
- In Code Extension tab
 - Select target
 - Select LabVIEW SIT as target



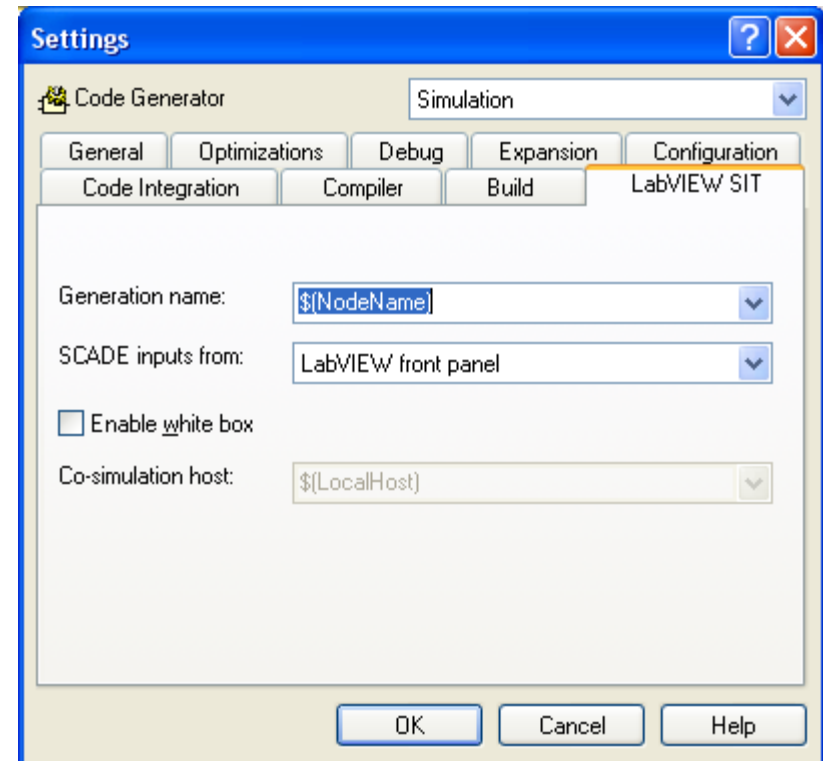
Configuring the LabVIEW wrapper (1/2)

- **LabVIEW SIT configuration tab**
 - Generation name:
\$(NodeName) references
the name of the operator
that is taken as CG root
operator.



Configuring the LabVIEW wrapper (2/2)

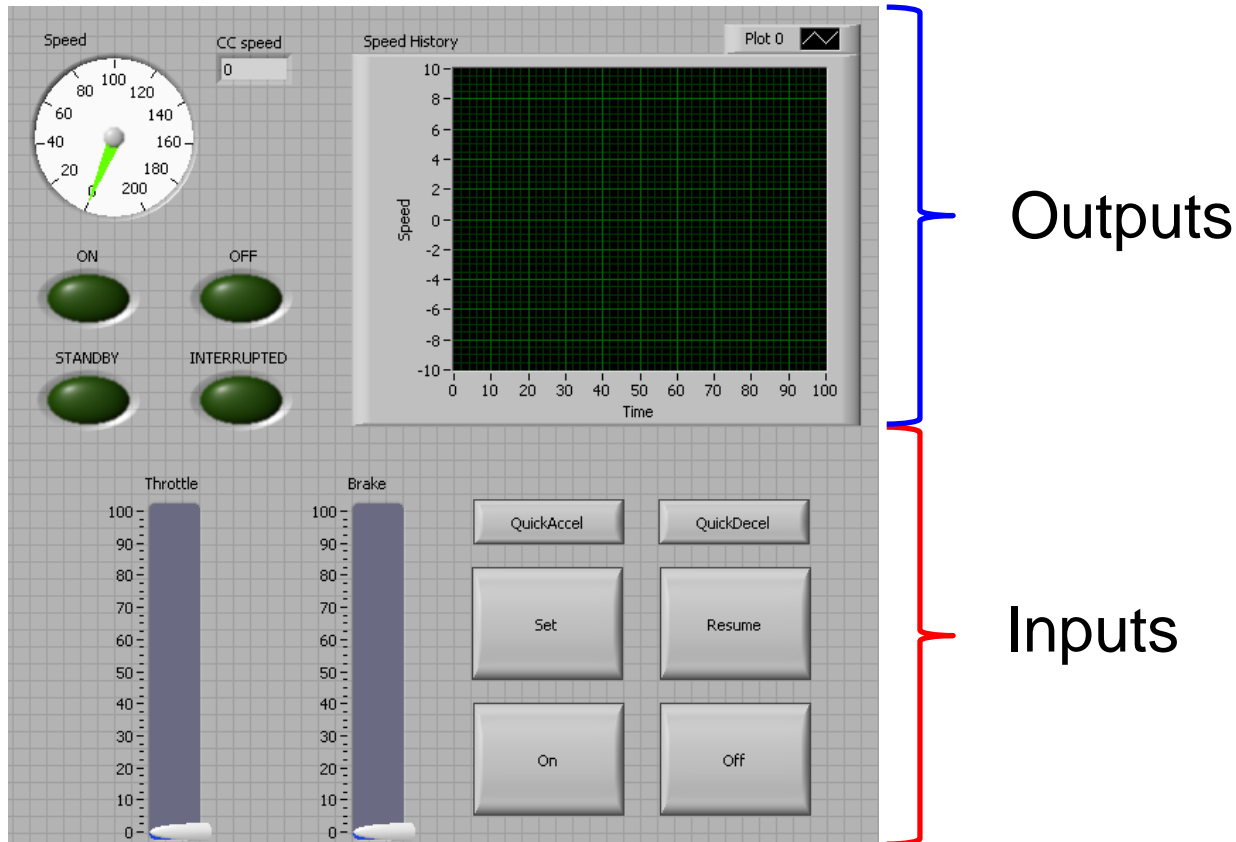
- **SCADE inputs from:**
References the source of the DLL's inputs.
 - LabVIEW front panel → SIT parameters (co-simulation)
 - Hardware I/O → SIT inputs (rapid prototyping with real target)
- Enable white box:
Activates white-box mode
- Co-simulation host:
Host of LabVIEW session



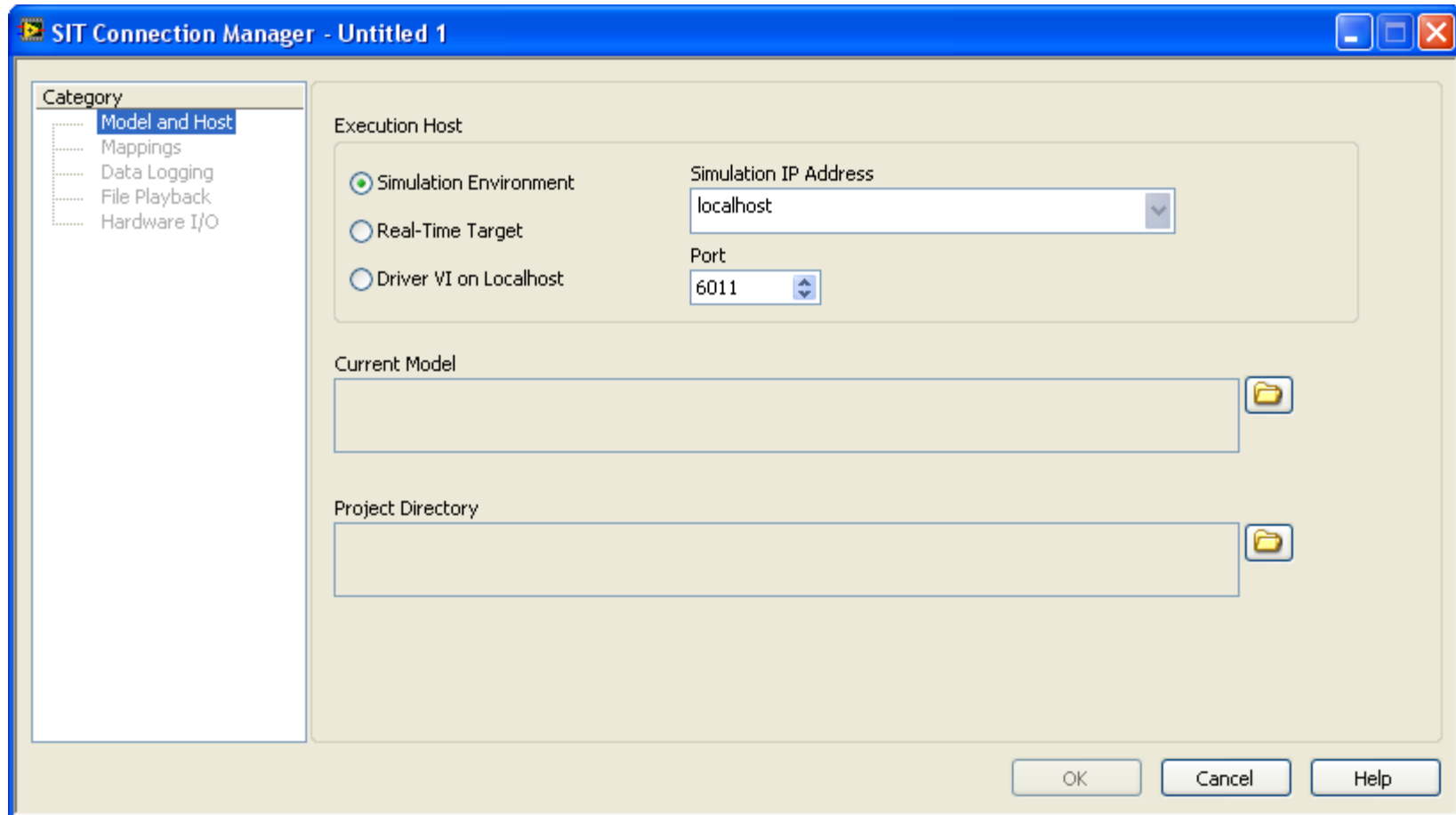
- **Build code using the LabVIEW Wrapper CG configuration**
- **Additionally generated files:**
 - `<rootnode>_SIT.c` – SIT wrapper code
 - `<modelname>_SIT.dll` - SIT DLL of the SCADE model
 - `<rootnode_path>.dll` – Simulation DLL if white-box mode selected

- **LabVIEW.ini needs to be modified to enable SCADE LabView coupling**
- **Two additional lines:**
 - LVSITAllowDLLModel=True
 - LVSITNumScaleUnchanged=True

- Connection established from LabVIEW
- Via Connection Manager of a selected VI



- Tools → SIT Connection Manager

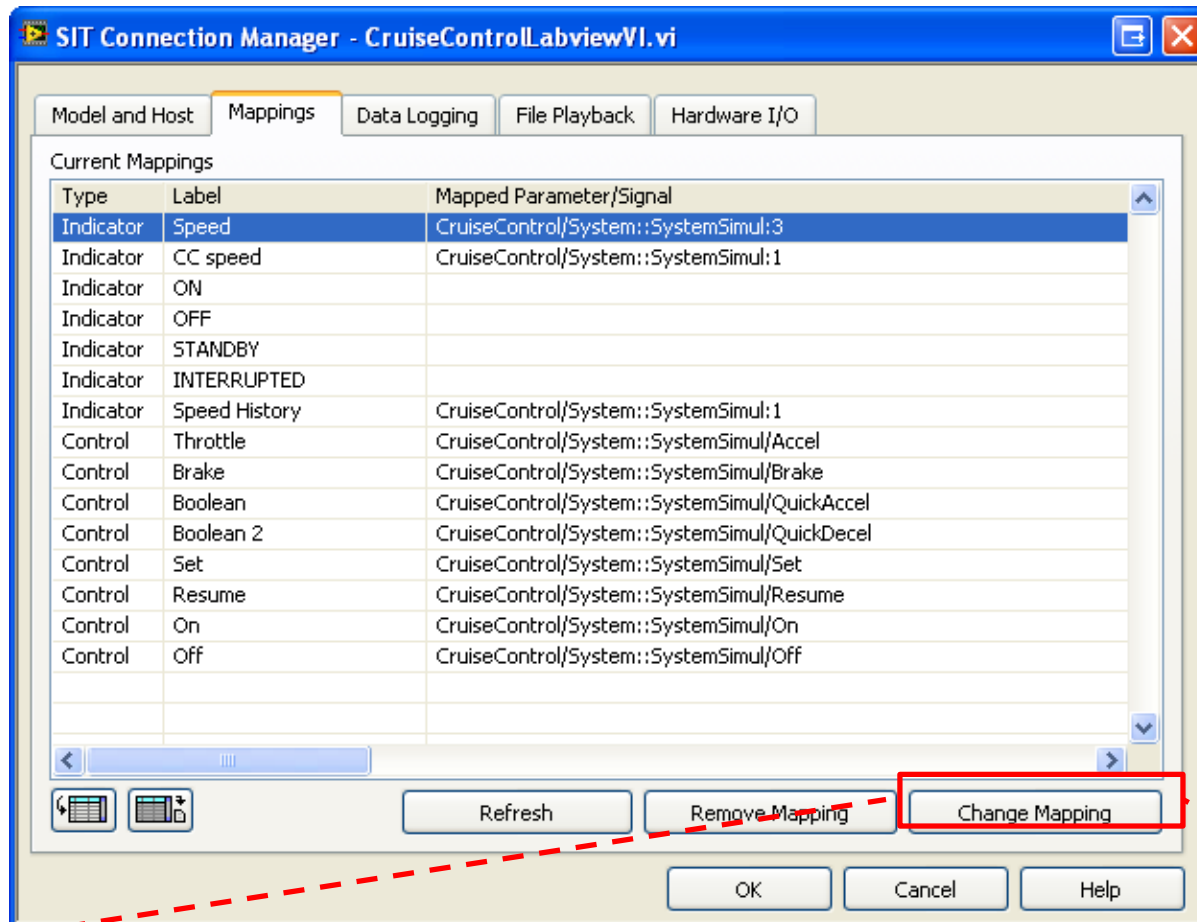


- Select “Driver VI on Localhost” in Connection Manager
- Port: 6011
- <modelname>_SIT.dll of SCADE model as
 - Current Model
 - Model DLL

- Select “Real-time Target” under “Model and Host” in the SIT Connection Manager
- Click „Change“ next to target and specify the IP address of the RT target
- Port: 6011
- <modelname>_SIT.dll of SCADE model as
 - Current Model
 - Model DLL

Mapping between VI and SCADE model

- Select element of VI and browse for SCADE element

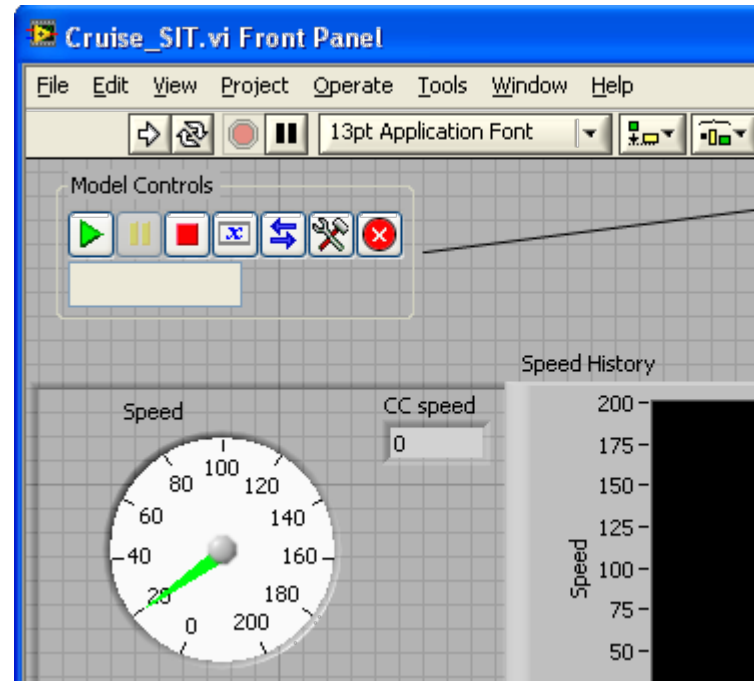


Mapping between VI and SCADE model

- For each LabVIEW *control*, select a SCADE Suite model *parameter* (input) using the Change Mapping button.
- For each LabVIEW *indicator*, select a SCADE Suite model *signal* (output).

Mapping between VI and SCADE model

- LabVIEW SIT automatically creates
 - a driver VI
 - some controls



Driver VI

- In LabVIEW, click the Run button to run the host VI.
- Click Run Simulation in the Front Panel of the host VI to start the simulation.
- Execute simulation operations using LabVIEW commands.

Stopping the Simulation

- **Click Stop Simulation in the Front Panel to stop the simulation.**
- **Click Stop Host VI in the Front Panel to stop the host VI.**

EXERCISE



Fluid Dynamics

Structural Mechanics

Electromagnetics

Systems and Multiphysics

Exercise 1: Step 1

- **During this exercise you will:**
 - Build the Cruise Control project for the LabVIEW SIT target.
 - Integrate the code into LabVIEW via the LabVIEW Simulation Integration Toolkit.
 - Execute the project in black box and white box co-simulation.

Exercise 1: Step 2

- Open the “CruiseControl” Example under Help ➔ Examples ➔ Cruise Control
- Step 1: Select as target for the code generation “LabVIEW SIT”.
- Step 2: Build the project

- **Step3: Check the error message generated by the SCADE Code Generator.**
- **Step 4: Modify the Node “SystemSimul” to resolve the error (Hint: Check the “Properties” Window)**
- **Step 5: Build the project again.**

Exercise 1: Step 4

- **Step 6: Open the LabVIEW project “CruiseControlPanel.vi”.**
- **Step 7: Load the LabVIEW SIT and integrate the generated SCADE project with LabVIEW.**
- **Step 8: Map LabVIEW indicators and controls to SCADE inputs and outputs.**

Exercise 1: Step 5

- **Step 9: Run the simulation.**
- **Step 10: Redo the Exercise as white-box co-simulation**

End of Session

