Basic Design Analysis in the Vivado IDE Demo Script

Introduction

This demonstration script provides high-level instructions on the Vivado® IDE visualization features used to analyze the design.

Preparation:

- Required files: `$TRAINING_PATH/Basic_Dsgn_Analysis/demo/KCU105/verilog`
- Required hardware: None
- Supporting materials: None

Basic Design Analysis

Action with Description	Point of Emphasis and Key Takeaway

• Launch Vivado Design Suite 2021.2.	• The Getting Started page provides links to:
	  • Create a new project
	  • Open an existing project
	  • Open example projects
	  • Manage IP
	  • Open the hardware manager
	  • Visit the Xilinx Tcl Store
	  • View documentation and QuickTake videos for the Vivado Design Suite

• Open the **wave_gen.xpr** project from the `$TRAINING_PATH/Basic_Dsgn_Analysis/demo/KCU105/verilog` directory.	• The Open Project link in the Getting Started page helps you to open any existing project.

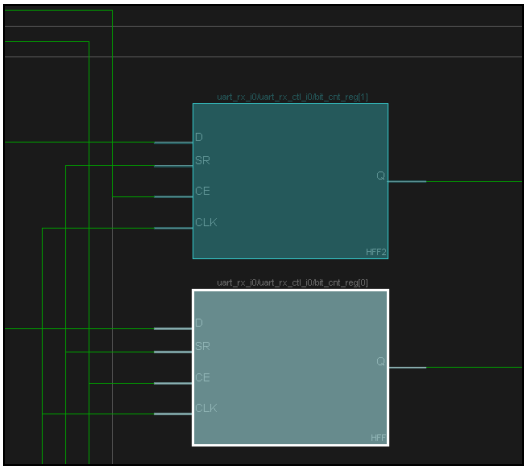
Action with Description	Point of Emphasis and Key Takeaway

• Open the synthesized design for design analysis.	• The Vivado IDE allows different ways of opening a synthesized design.
	• You can open a synthesized design via:
	  • The Flow Navigator
	  • The Tcl Console

• Select the **Netlist** window (if it is not already selected).	• The Netlist window displays a hierarchical view of the synthesized design, including:
	  • Nets
	  • Leaf cells
	• The RTL Netlist window displays the hierarchical view of the elaborated design.

• Generate the **Schematic** from **Synthesis** > **Open Synthesized Design**.	• The Schematic viewer allows you to perform selective exploration and expansion of the logical design.
• Select any object in the Schematic tab to see the cross selection of the same object in the Netlist window.	• The Vivado IDE allows you to cross-select objects between windows. • For example, if you select any object in the schematic, the same object will be highlighted in the Netlist window.
• Right-click the selected object in the Netlist window to see the pop-up menu. • Select **Show Hierarchy** to see the hierarchy of the selected object in the design hierarchy.	• The Hierarchy viewer displays the graphical representation of the logic hierarchy of the design. • For a better view, select the **Mark** option.

Action with Description	Point of Emphasis and Key Takeaway
• Select any object in the Netlist window to notice the same object highlighted in both the Hierarchy viewer and Schematic viewer. • Enable the **Auto Fit Selection** icon (⌖) to see the best view of the selected objects in the Schematic and Device viewer.	• The visualization features of the Vivado IDE (such as the Schematic, Hierarchy, and Device views) help you to analyze the design completely.
• Close the synthesized design.	
• Open the implemented design.	• The implemented design shows placed and routed device resources, such as slices, CLB, block RAMs.
• Select the **Device** viewer (if it is not already selected) to see the placed and routed design. • **Hint:** Enable the **Routing Resources** icon (▦) to see the routing resources and connectivity of the design.	• The Device window main graphical interface is used for floorplanning, etc.

Action with Description	Point of Emphasis and Key Takeaway
• Zoom into the Device viewer to see the placed and routed resource. • For example, go to **uart_rx_i0** > **uart_rx_ctl_i0** > **Leaf Cells** > **bit_cnt_reg[0]** in the netlist window to see the following cell. 	
• Select any resource in the Device viewer to notice the same object selected in the Netlist window. • Right-click the selected object and select the **Go To Source**, **Schematic**, and **Show Connectivity** options to explore the design analysis features in the Device view.	• This allows cross-probing of the cells and paths back to RTL sources, the schematic, and its connectivity.

Action with Description	Point of Emphasis and Key Takeaway

• Close the implemented design.	• You can close the implemented design in various ways via:
	  • Project status bar
	  • Tcl Console
	  • Menu bar
	  • Flow Navigator
	• Enter `close_design` in the Tcl Console.
	Or
	• Click the **X** in the project status bar to close the implemented design.

• Select **File** > **Exit**.	• This option closes the Vivado Design Suite.

Summary

In this demo, you walked through the various design analysis features of Vivado IDE, such as the Schematic viewer, Hierarchy viewer, and Netlist window that help in analyzing the design.

References:

- Supporting materials
  - *Vivado Design Suite User Guide: Design Analysis and Closure Techniques* (UG906)