

# Introduction to the Vivado Logic Analyzer Demo Script

## Introduction

This demonstration introduces the dashboards in the AMD Vivado™ logic analyzer. You will learn to use the dashboards and understand their benefits.

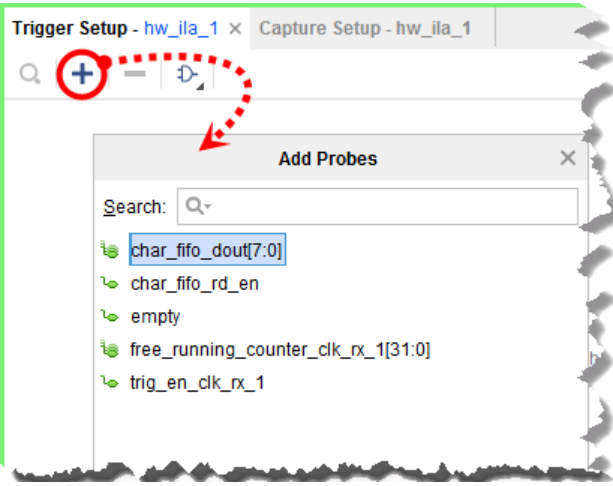
### Preparation:

- Required files: \$TRAINING\_PATH/VLA\_Intro/demo/ZCU104/vhdl
- Required hardware: ZCU104 evaluation board

## Introduction to the Vivado Logic Analyzer

Action with Description	Point of Emphasis and Key Takeaway
<ul style="list-style-type: none"> <li>• Launch the Vivado Design Suite.</li> <li>• Unzip the project using the Tcl Console:  <pre>exec unzip \$::env(TRAINING_PATH) / VLA_Intro/demo/ZCU104/vhdl.zip -d \$::env(TRAINING_PATH) / VLA_Intro/demo/ZCU104/vhdl</pre> </li> </ul>	
<ul style="list-style-type: none"> <li>• Open the project <b>wave_gen.xpr</b> from the following directory:  \$TRAINING_PATH/VLA_Intro/demo/ZCU104/vhdl</li> </ul>	<ul style="list-style-type: none"> <li>• The Open Project selection gives designers access to existing projects.</li> </ul>
<ul style="list-style-type: none"> <li>• Notice that the design provided is already implemented and the bitstream has been generated.</li> <li>• Set up the board and make the necessary connections and verify before turning on the power. <ul style="list-style-type: none"> <li>• Power on the board.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Powering up allows you to establish connections to the target board.</li> </ul>
<ul style="list-style-type: none"> <li>• Click <b>PROGRAM AND DEBUG &gt; Open Hardware Manager</b> from the Flow Navigator to establish a connection to the board.</li> <li>• Click <b>Open target &gt; Auto Connect</b> to connect to the target board automatically with the default settings.</li> </ul>	<ul style="list-style-type: none"> <li>• A hardware manager is the portion of the Vivado Design Suite that enables the monitoring of debug cores that were added to a design.</li> </ul>

Action with Description	Point of Emphasis and Key Takeaway
<p>Now that a connection to the board is established, your first task is to download a bitstream to your board.</p> <ul style="list-style-type: none"> <li>Right-click the <b>xczu7_0</b> device and select <b>Program Device</b>.</li> <li>Make sure that you use the bit file and debug_nets file from the current project directory and click <b>Program</b>.</li> </ul> <p><b>Note:</b> If any extra ILA dashboards are created, delete them.</p>	<ul style="list-style-type: none"> <li>A bitstream programming file is used to download to your hardware device, whereas debug probe files contain details of the probing signals for cores like VIO and ILA.</li> </ul>
<ul style="list-style-type: none"> <li>How many debug cores do you see in the design?             <ul style="list-style-type: none"> <li>There are three debug cores in the design: two ILA and one VIO.</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>Review the default dashboards that are automatically created.</li> </ul>	<ul style="list-style-type: none"> <li>After programming the FPGA on a hardware target for the first time, the tool automatically detects the debug IP within your design and creates a set of default dashboards for you.</li> <li>A separate dashboard is created for each ILA in the design.</li> <li>The Waveform window can now appear within a dashboard.</li> <li>Unlike ILAs, the VIO has only one window (double-click hw_vio_1 in Hardware window).</li> </ul>
<ul style="list-style-type: none"> <li>What are the default windows that are present in the ILA dashboard?             <ul style="list-style-type: none"> <li>Settings</li> <li>Status</li> <li>Trigger Setup</li> <li>Capture Setup</li> <li>Waveform window</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>Select the <b>Trigger Setup</b> window and drag the window using the mouse and place it horizontally above the Capture Setup window.</li> </ul>	<ul style="list-style-type: none"> <li>Note that dropping one window onto an existing window places the two window tabs in the same region.</li> <li>You cannot move windows out of the workspace.</li> </ul>

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<ul style="list-style-type: none"> <li>Click the <b>Dashboard Options</b> tab on the left side of the dashboard.</li> </ul>	<ul style="list-style-type: none"> <li>The Dashboard Options tab can be used to customize the dashboard and select the windows that appear on the current dashboard.</li> </ul>
<ul style="list-style-type: none"> <li>Enable the <b>hw_vio_1</b> check box in the Dashboard Options tab.             <ul style="list-style-type: none"> <li>Observe that the hw_vio_1 window is included in the current dashboard.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>You can select any windows from any of the ILAs or VIO within the design to add to any particular dashboard.</li> </ul>
<ul style="list-style-type: none"> <li>Click the <b>Plus (+)</b> icon in the Trigger Setup window of any dashboard. This opens the Add Probes window.</li> <li>Select any desired probes and click <b>OK</b>.</li> </ul> 	<ul style="list-style-type: none"> <li>You can add probes to the Trigger Setup, Capture Setup, Waveform and VIO Probes windows.</li> <li>Notice that only the probes for that particular ILA or VIO are listed in the Add Probes window.</li> <li>This demo only shows how to add the debug probe in the Trigger Setup window—you are not providing any trigger conditions.</li> <li>The debugging of the added signals can be done by using a trigger condition and observing the corresponding waveform.</li> </ul>
<ul style="list-style-type: none"> <li>Select <b>Window &gt; Debug Probes</b> to open the Debug Probes window that is hidden by default.</li> </ul>	<ul style="list-style-type: none"> <li>The Debug Probes window provides the full list of all probes in the ILA and VIO cores.</li> </ul>
<ul style="list-style-type: none"> <li>Right-click the debug object in the Hardware window and select <b>Dashboard &gt; New Dashboard</b>.</li> <li>Review the options for the dashboards.</li> <li>Leave everything else at their defaults and click <b>OK</b> to create the new dashboard.</li> </ul>	<ul style="list-style-type: none"> <li>Observe that the newly created dashboard <b>dashboard_1</b> is added to the workspace.</li> </ul>
<ul style="list-style-type: none"> <li>If you want to undo the changes you have made or want to start with the default settings again you can select <b>Window &gt; Dashboard &gt; Reset to Default</b> to restore the dashboards to their default settings.</li> </ul>	<ul style="list-style-type: none"> <li>The layout of your dashboards is automatically saved within your project when you make changes.</li> </ul>

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<ul style="list-style-type: none"><li>Close the hardware manager and exit the Vivado Design Suite.</li></ul>	<ul style="list-style-type: none"><li>Exit the GUI and applications.</li></ul>
<ul style="list-style-type: none"><li>Power off the ZCU104 evaluation board.</li></ul>	

## Summary

This demonstration illustrated the dashboards in the Vivado logic analyzer. You also learned about features such as window management, dashboard customization, and creating new dashboards.

References:

- Supporting materials
  - Vivado Design Suite User Guide: Programming and Debugging* (UG908)