



Course 8

Advanced Dataflow

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Introduction

The Advanced Dataflow window is a tool that allows you to explore the connectivity of a simulated design and analyze dataflow among instances, concurrent statements, VHDL signals and Verilog nets and variables. Values in the design logic can be traced back to their origin, and forward, to the design outputs.

The Advanced Dataflow window shows VHDL processes, Verilog always and initial blocks, assert and cover statements as rounded rectangles. Lines coming in and out of such rectangles indicate signals, nets, and variables that are either read or driven by the process or the block. The Advanced Dataflow does not translate processes or blocks into logic components. They are always shown using the same shape, regardless of whether they describe flip-flops, counters, multiplexors, etc.

The Advanced Dataflow window can work in two modes: hierarchical and flat. In the hierarchical mode, the contents of each design unit are enclosed by a rectangle. In the flat mode, the rectangular hierarchy boundaries are not visible. Instead, small vertical marks across signal lines indicate ports where signals cross the boundaries between hierarchy regions.

How to Enable Advanced Dataflow

The Advanced Dataflow window can only be used after simulation has been initialized and all source files have been compiled using **Enable Debug** option from **Design | Setting | VHDL / Verilog** under **Compilation** category (-dbg switch in vcom / vlog command). It is not available for simulations loaded from .asdb files.

The Advanced Dataflow has to be enabled before the initialization of simulation by using the -advdataflow switch for the asim command or the Generate data for Advanced Dataflow check box in the **Design | Setting | Simulation** category of the **Design Settings** dialog box.

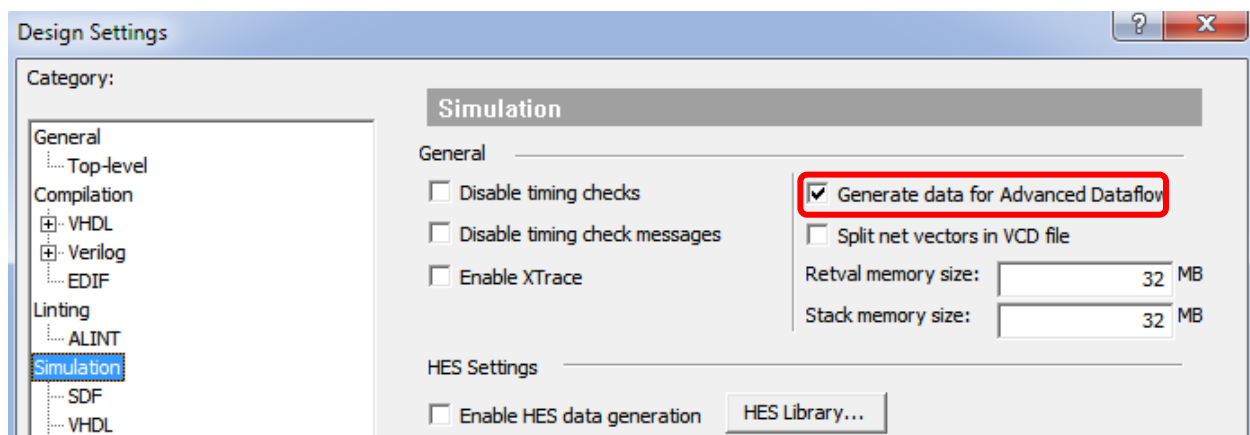


Figure 1 Enabling Advanced Dataflow

Display design objects in Advanced Dataflow

To display a design object in the Advanced Dataflow window, use any of the following methods:

- Drag and drop a hierarchy region, process or primitive from the **Hierarchy Viewer** to the Advanced Dataflow window.
- Drag and drop signals from the **Object Viewer** to the Advanced Dataflow window.
- Drag a signal name selected in the HDL Editor to the Advanced Dataflow window. The hierarchical name of the signal is constructed by appending the signal name (selected in the editor) to the name of the hierarchy region displayed on the editor title bar.

- Use a context menu in the **Assertion Viewer**, **Cover Viewer**, **Hierarchy Viewer**, **Memory Viewer**, **Object Viewer**, **Process**, **Waveform**, or **Watch windows**. The menu can be invoked on a design region or a design object (port, signal, assertion, etc.).

Select **Add to Advanced Dataflow** from the menu:

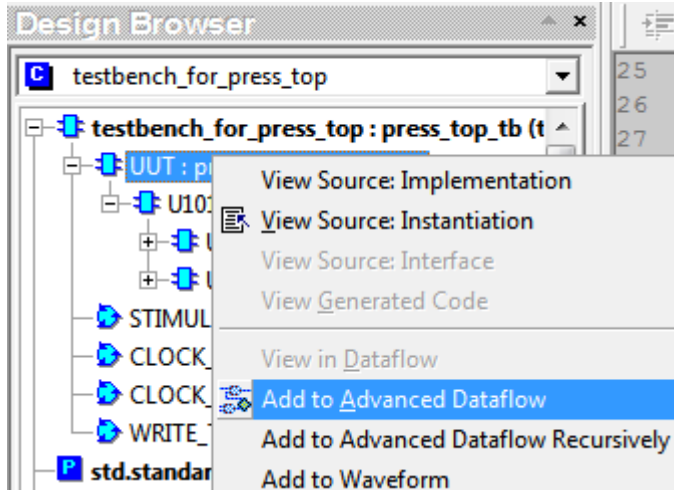


Figure 2 Context menu in the Hierarchy Viewer window

Display modes in Advanced Dataflow

The Advanced Dataflow window displays interconnects of an active design. Concurrent statements, port maps, signals, nets, and registers from all units on all hierarchy levels are flattened and displayed as a single-level diagram. Two display modes are available:

- Hierarchical
- Flat

By **default**, the **hierarchical mode** is used to display objects. To modify initial settings for the Advanced Dataflow open the **Tools | Preferences | Advanced Dataflow** under **Simulation** category and change option **Show Mode** from Hierarchical to Flat.

In the hierarchical mode all units from a given hierarchy region are surrounded by a rectangular frame. A full hierarchical name is shown below the upper side of the rectangle. The example Advanced Dataflow window in the hierarchical mode is shown in Figure 3.

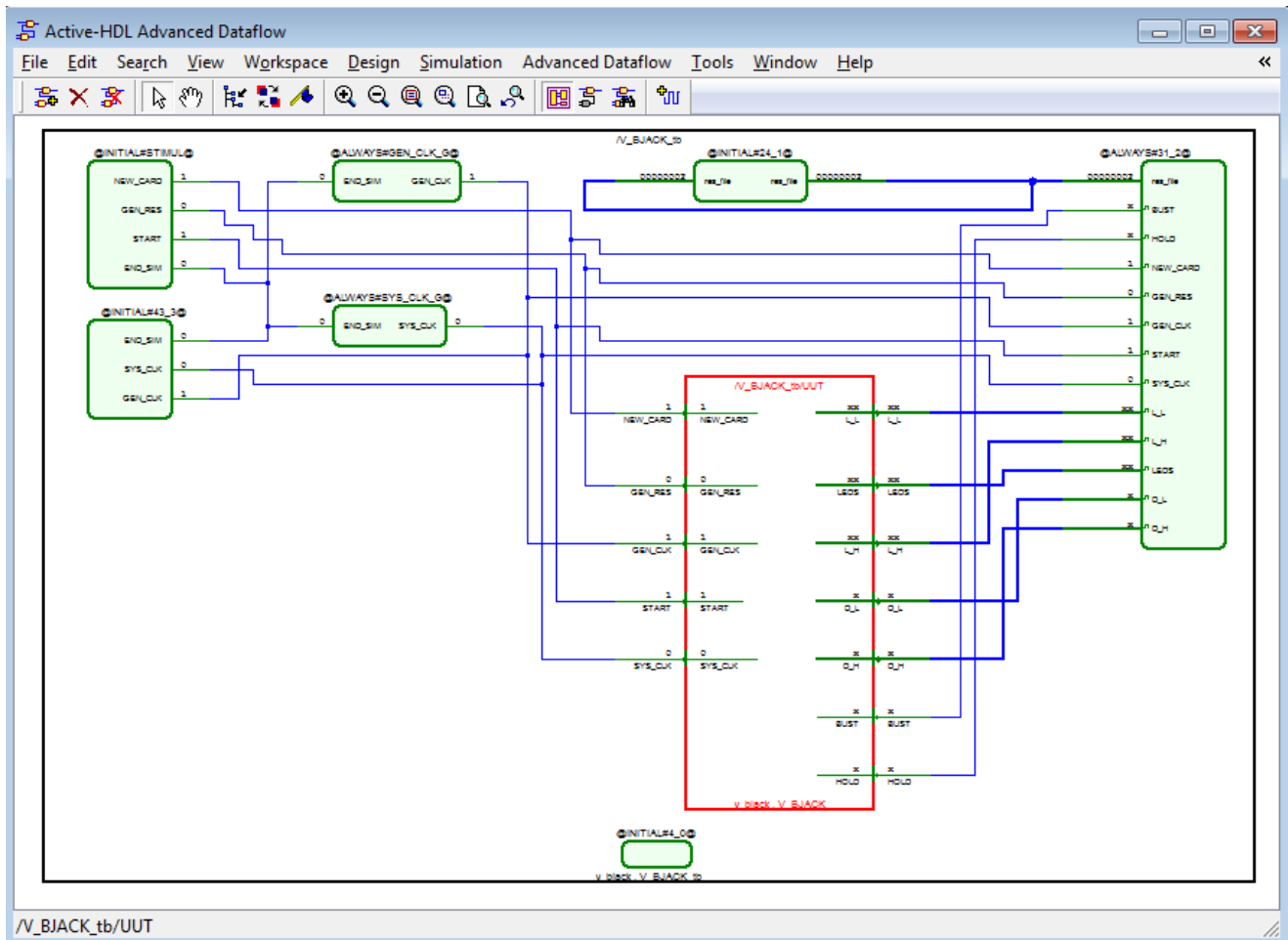



Figure 3 Advanced Dataflow window in the hierarchical mode

In the flat mode rectangular hierarchy boundaries are not visible. Instead, small vertical marks across signal lines indicate ports where signals cross the boundaries between hierarchy regions. To switch between modes use button  on toolbar.

The example Advanced Dataflow window in the flat mode is shown in Figure 4.

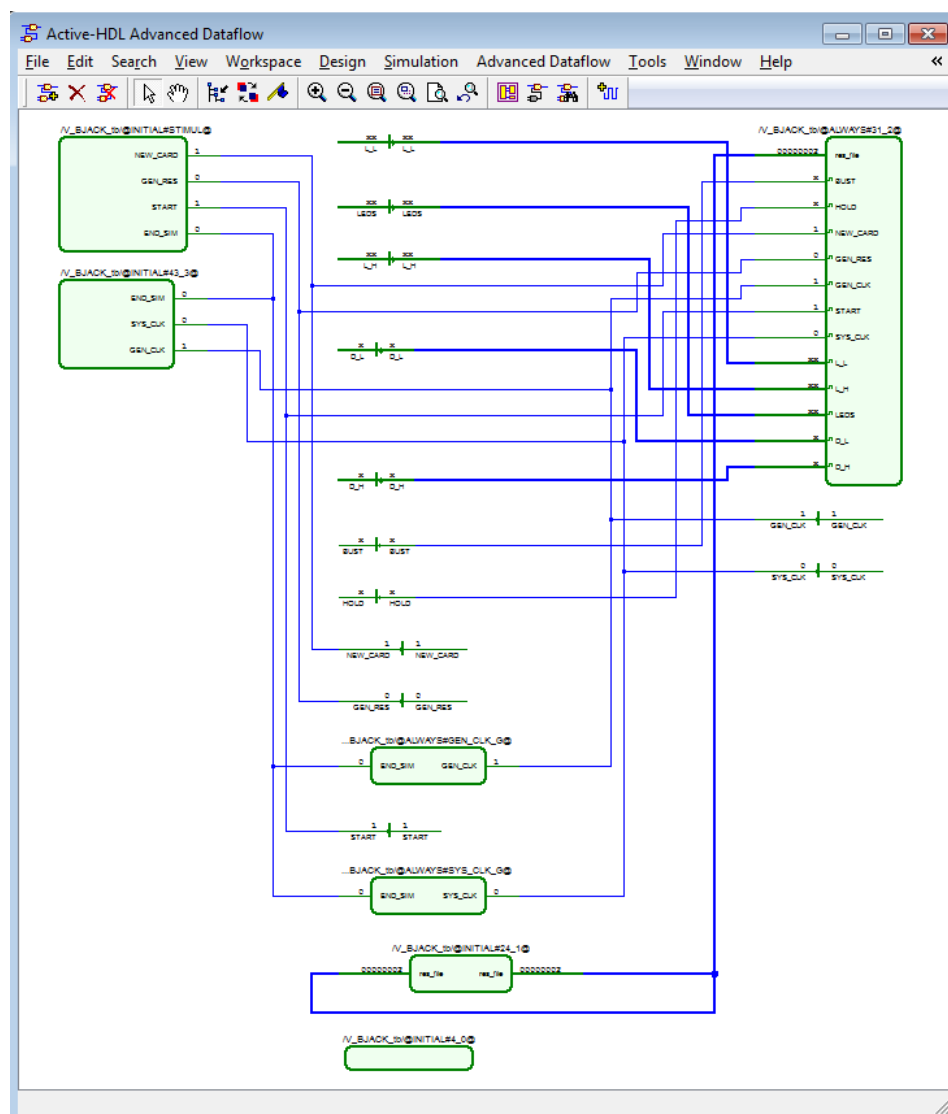


Figure 4 Advanced Dataflow window in the flat mode

Exploring the Advanced Dataflow

Using Discover

To expand the structure of the selected design region and show its internal objects (nets, statements, primitives, etc.) use the **Discover** or **Discover Recursively** options available in the context menu (Figure 5). The **Discover Recursively** option works recursively, i.e. it expands both the selected design and all regions below the selected region. This option is available only when the Advanced Dataflow window is working in the Hierarchical mode.

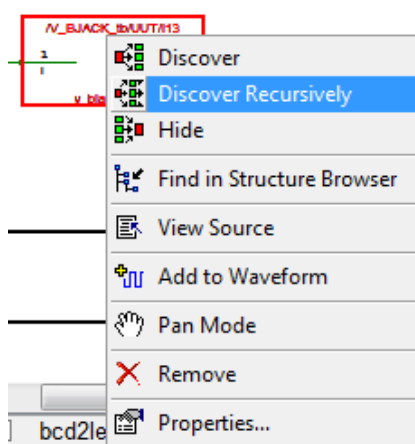


Figure 5 Discover context menu

Using Expand

A primary purpose of the Advanced Dataflow window is to explore the connectivity of the design. Context menus in the Advanced Dataflow window allow expanding the view from one process to another and watching drivers and readers of a particular signal, net, or register. Figure 6 below shows the context menu.

To expand the view click on a signal with the right-mouse button and select one of the following options:

- **Expand Net**
Displays both drivers and readers of the selected signal, net, or register.
- **Expand Net to Readers**
Displays readers of the selected signal, net, or register.
- **Expand Net to Drivers**
Displays drivers of the selected signal, net, or register.

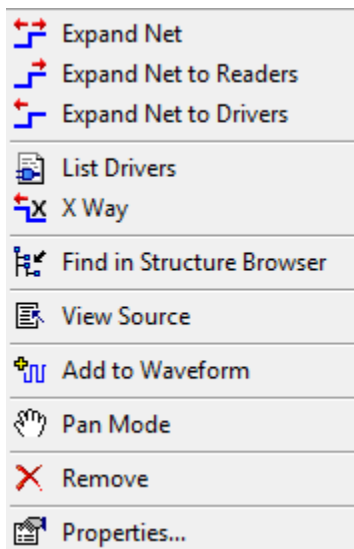



Figure 6 Context menu in Advanced Dataflow

The Gray Mode

Click on the **Toggle Gray View Mode** button  on the toolbar. This grays out all objects displayed in the Advanced Dataflow window. Newly added objects (for example object displayed when a net is expanded) are displayed in full color. This helps to distinguish objects that are being tracked, especially on large dataflow diagrams.

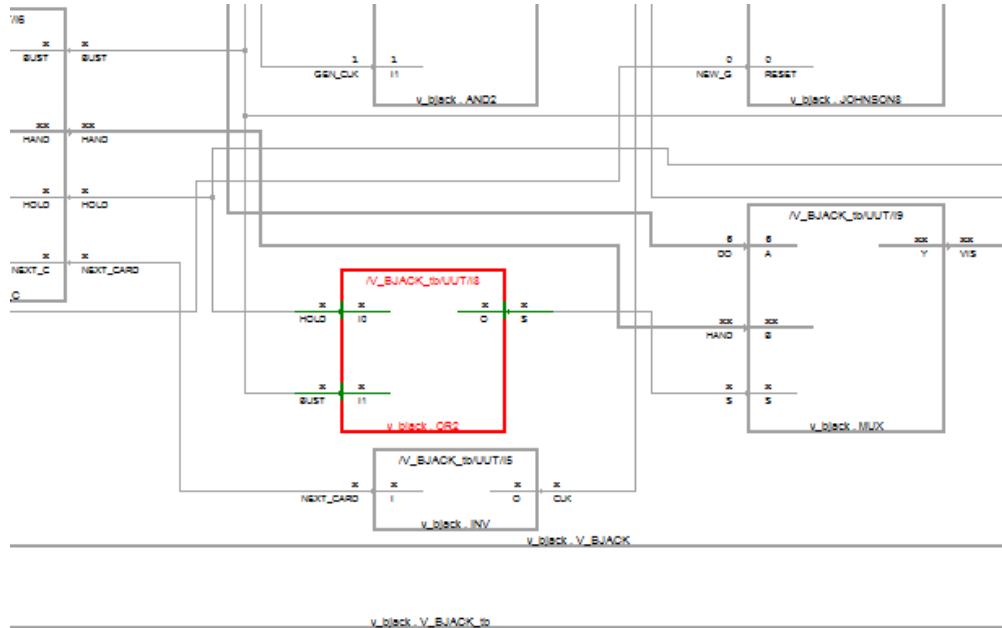


Figure 7 Gray Mode in Advanced Dataflow

Tracing Unexpected Values

If an X or U occurs during simulation, its source can be located in the Advanced Dataflow window by selecting the **X Way** option from the pop-up menu.

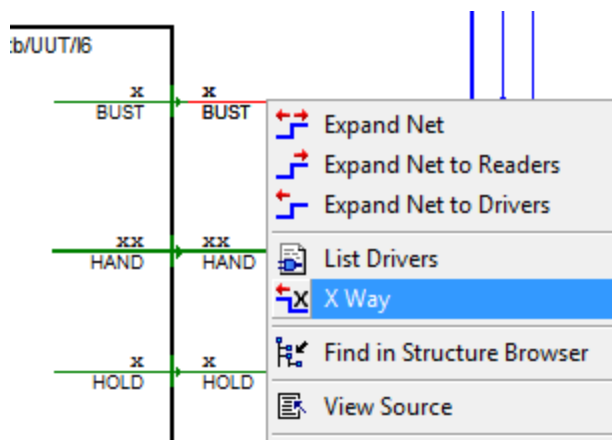



Figure 8 X Way in Advanced Dataflow

This option explores (expands) connections until a statement (or statements) that is a source of the unexpected value is reached.

If the drivers of a net that has an unknown value are already displayed, toggle the gray mode on  and unhighlight all items before using X Way. Then select **X Way**; the path of the value will be displayed.

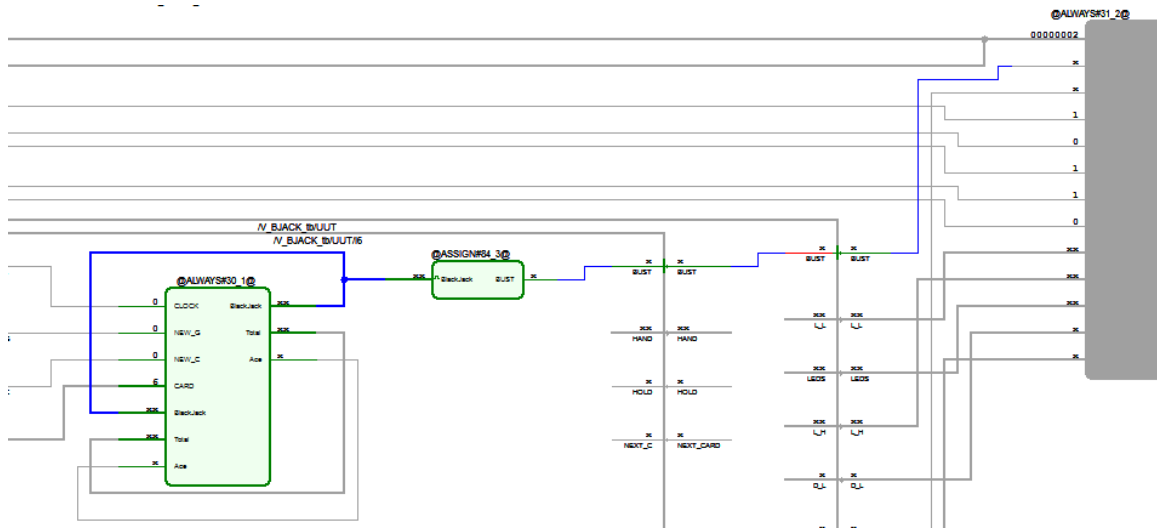


Figure 9 Using Gray Mode with X Way in Advanced Dataflow

Cross Probing in Advanced Dataflow

- Active-HDL supports adding objects displayed in the Advanced Dataflow window to the Waveform Viewer windows.
- You can also open the HDL Editor with the source of the VHDL/Verilog units or PSL, OVA, SystemVerilog assertions using the **View Source** option from the context menu.

Cross probing to the Structure Browser

An object selected in the Advanced Dataflow window can be located in the Hierarchy Viewer with the **Find in Structure Browser** option from the context menu.

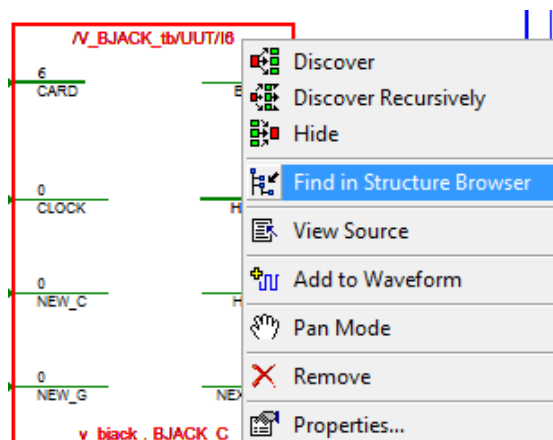


Figure 10 Find in Hierarchy Viewer option in the Context menu

Printing List Drivers to the Console

You can print the list of drivers to the Console window using the **List Drivers** option from the context menu.

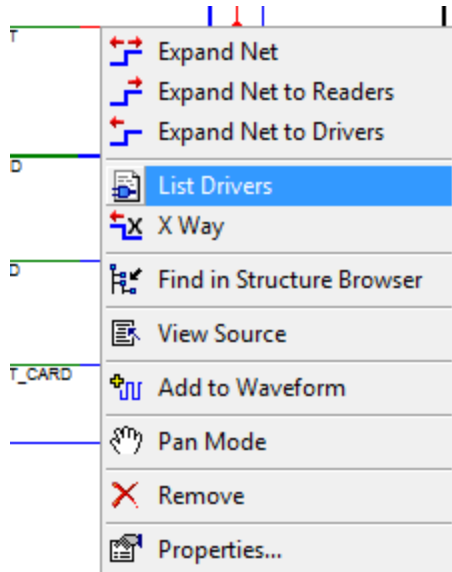



Figure 11 The List Drivers option in the Context menu

Clearing Advanced Dataflow

You can clear the Advanced Dataflow window using the **Clear Advanced Dataflow View**  button on the **Main** toolbar. Remember that the Advanced Dataflow window is cleared automatically after simulation is finished.