Chapter 6 - OpenROAD GUI

Course authors (Git file)



Analysing desings with the GUI



Section 1

Analysing desings with the GUI



View layout

Viewing Layout Results

The make gui_final command target successively reads and loads the technology .odb files and the parasitics and invokes the GUI in these steps:

- · Reads and loads .odb files.
- Loads .spef (parasitics).

The figure below shows the post-routed DEF for the ibex design.

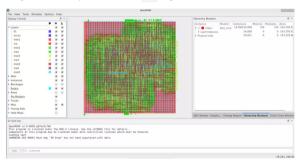




Figure 1: View layout

View objects

Visualizing Design Objects And Connectivity

Note the Display Control window on the LHS that shows buttons for color, visibility and selection options for various design objects: Layers, Nets, Instances, Blockages, Heatmaps, etc.

The Inspector window on the RHS allows users to inspect details of selected design objects and the timing report.

Try selectively displaying (show/hide) various design objects through the display control window and observing their impact on the display.

Figure 2: View objects



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Clock tree

Tracing The Clock Tree View the synthesized clock tree for _bex design: • From the top Toolbar Click windows >> Clock Tree Viewer **Storm the top Toolbar Click windows >> Clock Tree V

Figure 3: Clock tree



Heat maps

Using Heat Maps

From the Menu Bar, Click on Tools -> Heat Maps -> Placement Density to view congestion selectively on vertical and horizontal layers.

Expand Heat Maps -> Placement Density from the Display Control window available on LHS of OpenROAD GUI.

View congestion on all layers between 50-100%:

In the Placement density setup pop-up window, Select Minimum -> 50.00% Maximum -> 100.00%

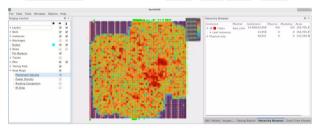


Figure 4: Heat maps



Timing report

Viewing Timing Report

Click Timing -> Options to view and traverse specific timing paths. From Toolbar, click on the Timing icon,

View Timing Report window added at the right side (RHS) of GUI as shown below.

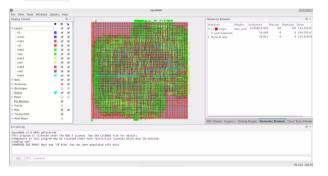


Figure 5: Timing report

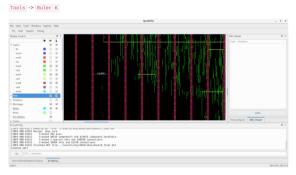


Rulers (measure distances)

Using Rulers

A ruler can measure the distance between any two objects in the design or metal layer length and width to be measured, etc.

Example of how to measure the distance between VDD and VSS power grid click on:



Distance between VDD and VSS layer is 11.970





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TCL command interface

Tcl Command Interface Execute OpenROAD-flow-scripts Tcl commands from the GUI. Type help to view Tcl Commands available. In OpenROAD GUI, at the bottom, Tcl commands executable space is available to run the commands. For example View design area in the Tcl Commands section of the GUI: report_design_area Try the below timing report commands to view timing results interactively:

Figure 7: TCL interface



Area report

Area View design area and its core utilization: make qui_final In the Tel Commands section: report_design_area View the resulting area as: Design area 191262 u^2 30% utilization.

Figure 8: Area report



Timing slack report

Timing

Users can view flow results using the command interface from the shell or the OpenROAD GUI to visualize further and debug, Learn more about the GUI.

```
make gui_final
```

Use the following commands in the Tc1 Commands section of GUI:

```
report_morst_slack
report_tns
report_wms
```

Note the worst slack, total negative slack and worst negative slack:

```
worst slack -0.99
tns -1.29
wns -0.99
```

Figure 9: Timing slack report



Power report

Power

Use the report command to view individual power components i.e. sequential, combinational, macro and power consumed by I/O pads.

In the Tcl Commands section:

report_power

The power output is as follows:

Group	Internal Power	Switching Power	Leakage Power	Total Power	
Sequential	5.58e-03	6.12e-04	1.67e-08	6.19e-03	19.09
Combinational	9.23e-03	1.71e-02	4.90e-08	2.63e-02	81.0%
Macro	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.0%
Pad	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.0%
Total	1.48e-02	1.77e-02	6.57e-08	3.25e-02	100.0%
	45.6%	54.4%	0.0%		

Figure 10: Power report



DRC viewer

DRC Viewer

You can use the GUI to trace DRC violations and fix them.

View DRC violations post routing:



Any DRC violations are logged in the 5_route_drc.rpt file, which is empty otherwise.

From OpenROAD GUI, Enable the menu options Windows -> DRC Viewer. A DRC viewer window is added on the right side (RHS) of the GUI. From DRC Viewer -> Load navigate to 5_route_drc.rpt



Figure 11: DRC viewer

