Metal ECO in GUI mode

Contents

Introduction

Metal ECO can only use existing gates on the silicon. User has to check the layout physical position to find the best gates. In the use case "Insert buffers and inverters", the invert can be added freely since the case is full-layer ECO. In Metal ECO the invert has to be located first, or there may be no invert close by at all and it has to be converted by other gate. The following paragraph demonstrates how to use GOF's layout viewer to find the proper invert and use GOF's GUI ECO to add the gate.

Start up Gates On the Fly

GOF should be started up by loading lef and def files in order to view the layout.

```
gof -lib t65nm.lib -lib io.lib netlist_port.v -lef t65nm.lef io.lef -def top.def
```

For detail usage, visit this link
http://www.nandigits.com/usage.htm

In GofViewer netlist window, press ctrl-g (Press both 'Ctrl' key and 'g' key) or menu commands->'Launch GofTrace with gate'. Fill in the instance name that needs ECO.

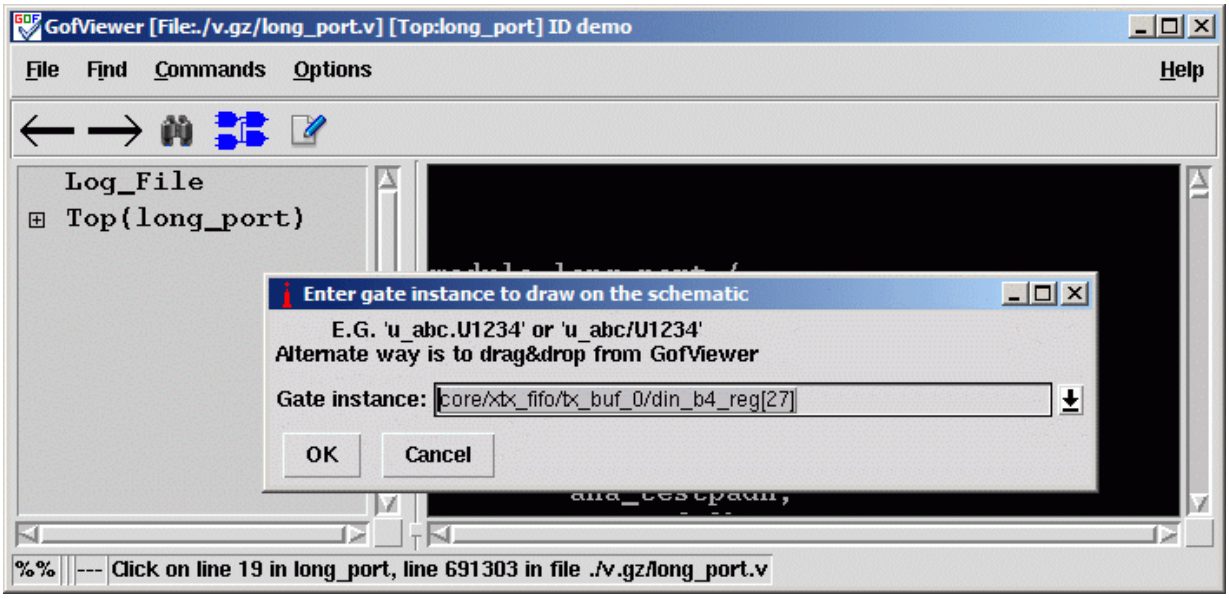

Figure 1

Analyze the partial schematic

Use mouse-middle-button to expand the schematic. Use mouse-left-button or press ctrl-a to select all the schematic. Press mouse-right-button to select menu 'Copy selected to->Layout New'

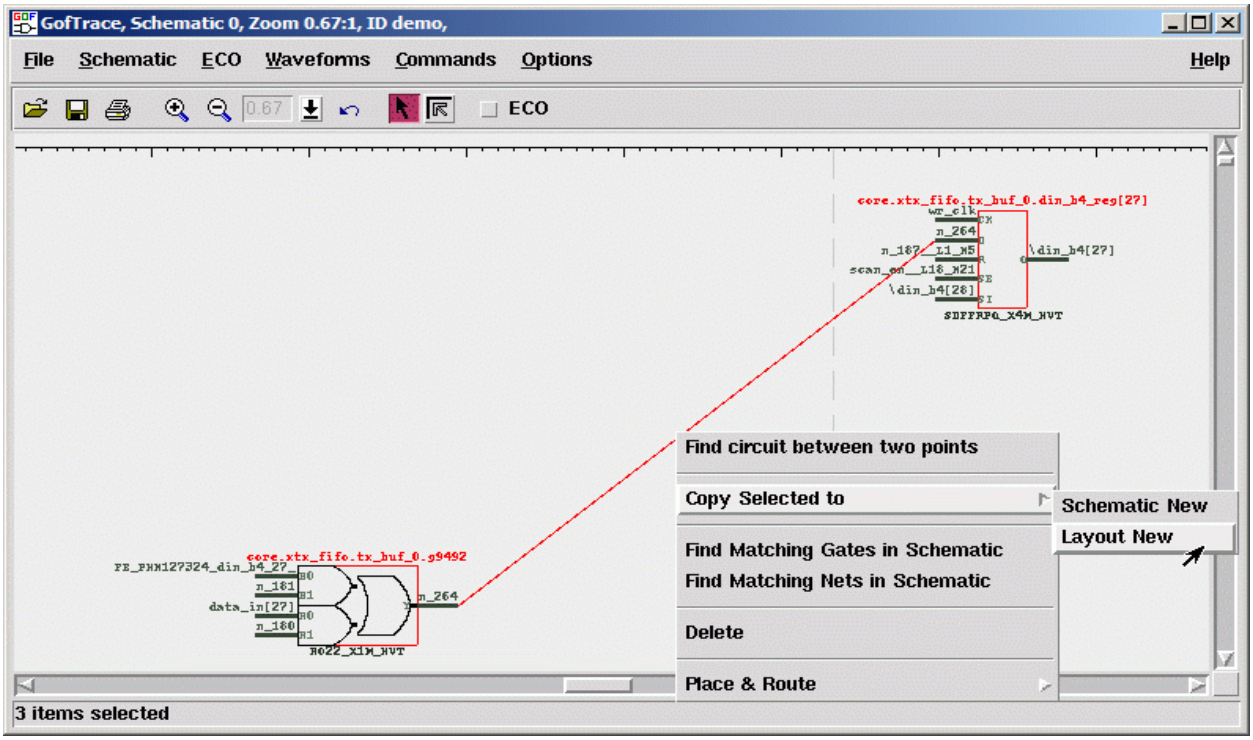

Figure 2

On the layout viewer, the partial schematic/circuit is shown by points and arrow wires. In the search entry at the bottom, enter '*spare*' and press 'Enter' key to high light all spare gates close to the circuit. The high lighted spare gates are in green. The spare string can vary depending on the implementation.

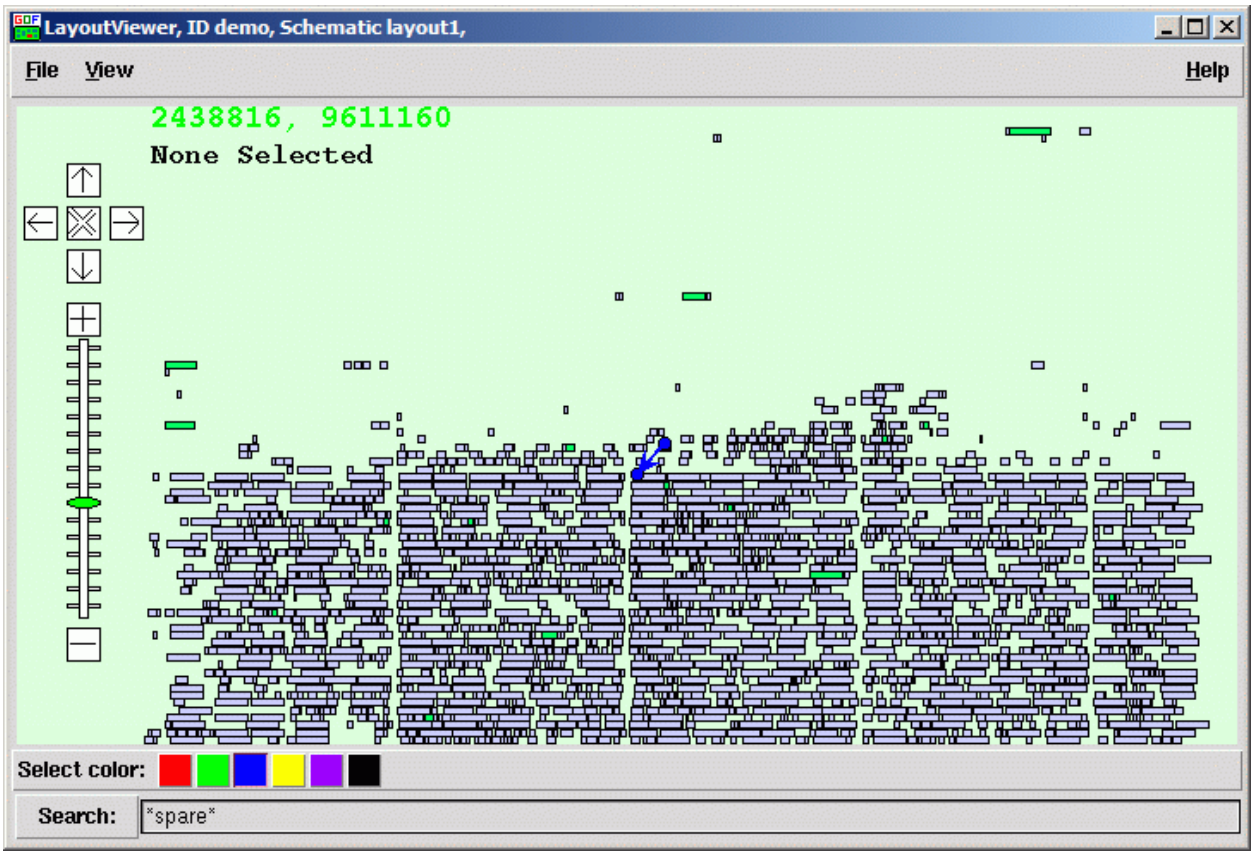

Figure 3

Now the goal is to find an invert near the blue high lighted circuit and insert it into the connection.

- Press ‘Shift’ key and don’t release.
- Use mouse-left-button to draw a virtual rectangle on the layout viewer window.
- Release mouse-left-button and ‘Shift’ key.
- All the spare gates inside the virtual rectangle have their out-lines high lighted.
- Use mouse- right-button to pop menu.
- Select command ‘Copy Selected to->Schematic #’ to send the selected spare gates back to the schematic under ECO.

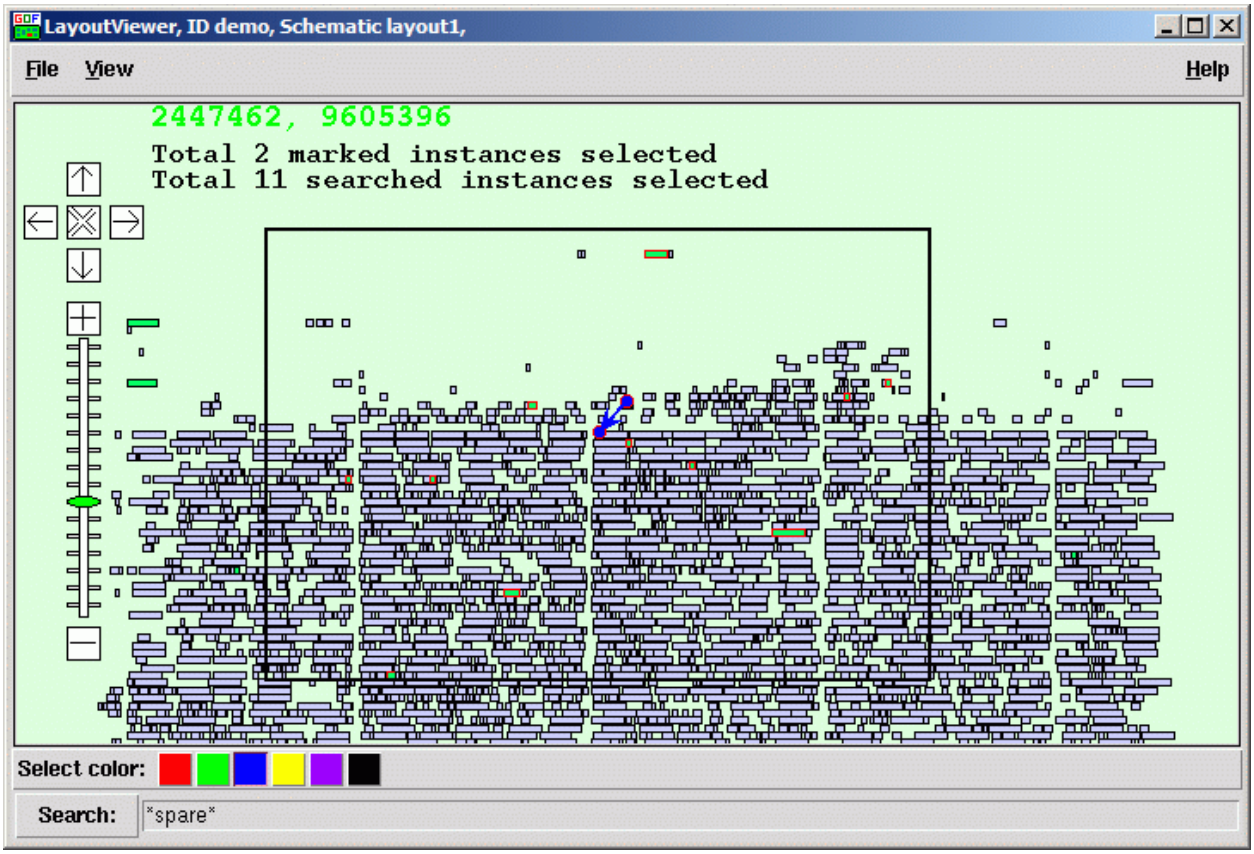

Figure 4

Implement ECO on the schematic

Now the candidate spare gates are all on the schematic. Check all the gate types, and invert can't be found. But the invert logic can be implemented by tying two inputs pin of NAND gate.

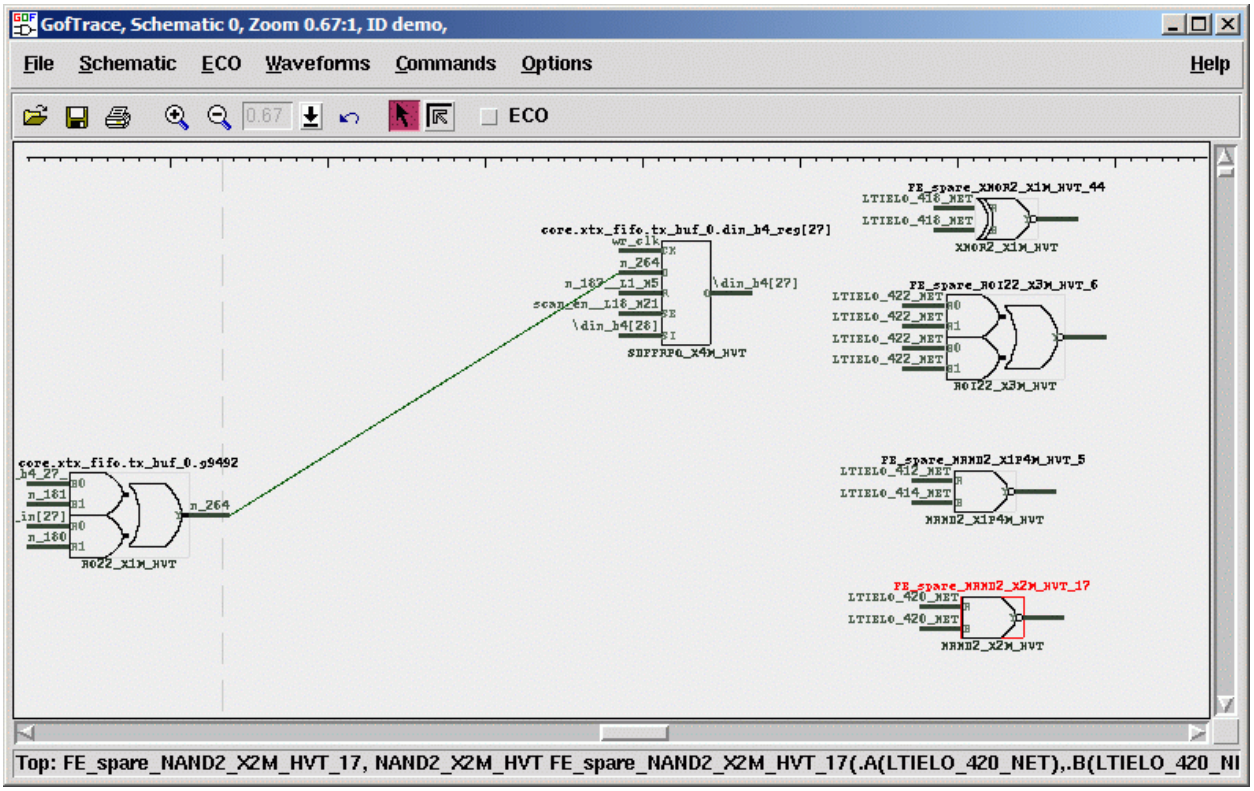

Figure 5

Since there are two NAND gates, more interactions can be done between the schematic and layout viewer to find the best closest NAND gate.

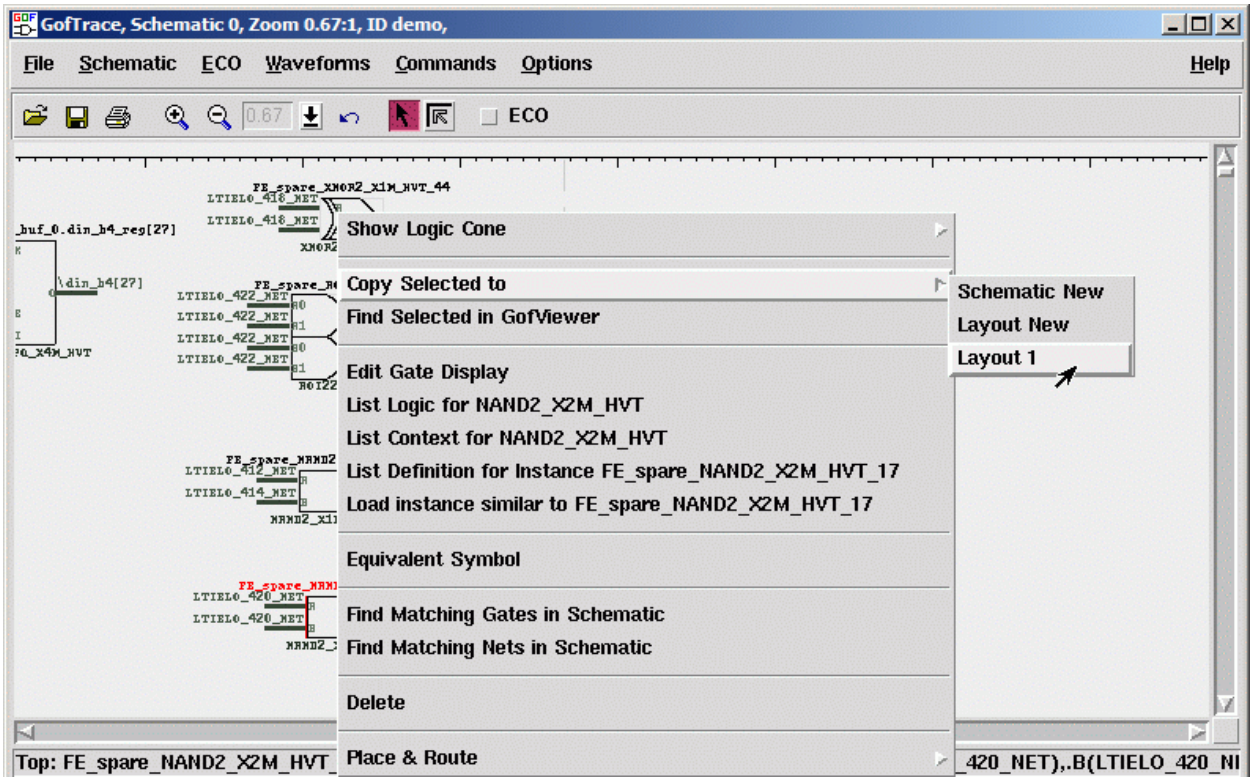

Figure 6

By checking different color on Layout Viewer (Select color bar), the two NAND gates are displayed in different colors. The NAND gate in red solid point appears more close to the circuit under ECO. So that NAND is selected to be inserted in the connection.

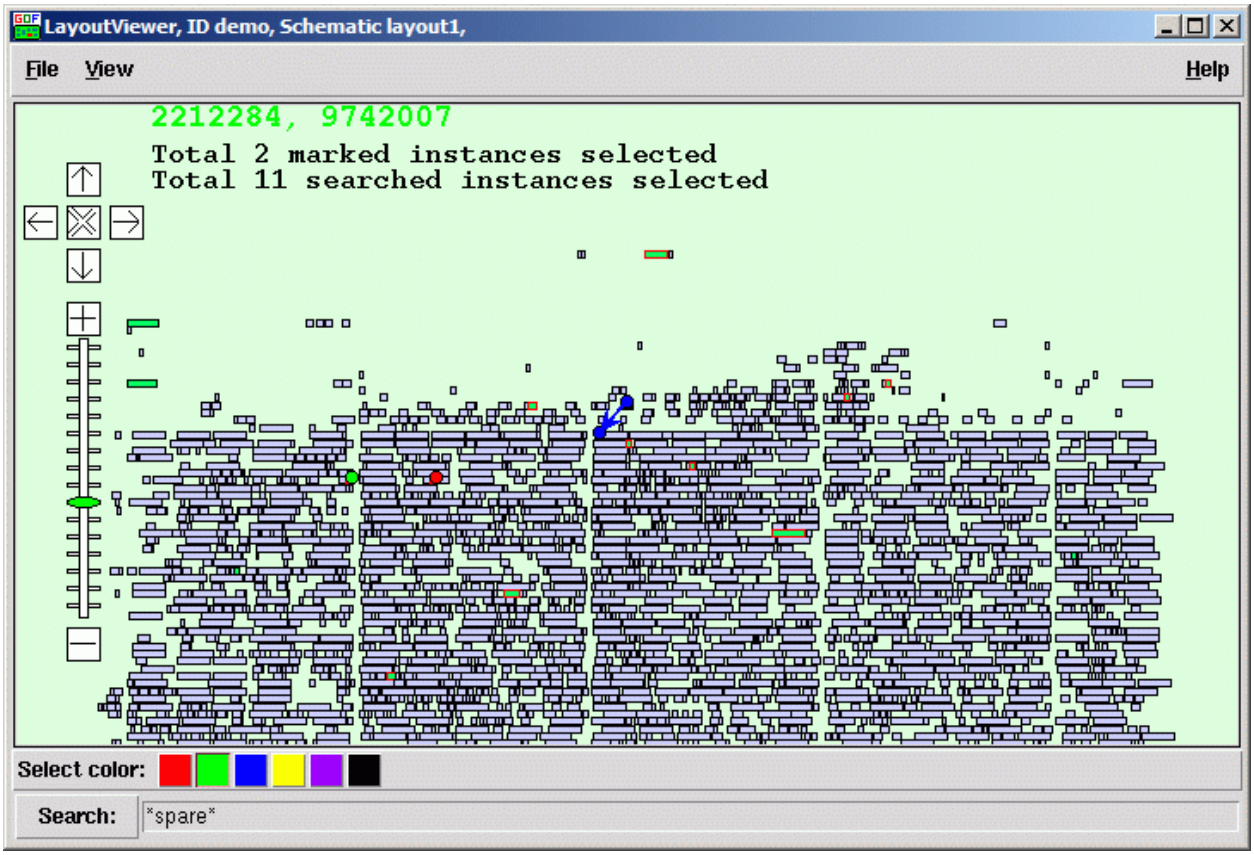

Figure 7

Move the NAND gate closer to the circuit on the schematic. Check ‘ECO’ button to enable ECO mode. Use mouse-middle-button to trace the input pins of the NAND gate, since they tied to zeros in the netlist.

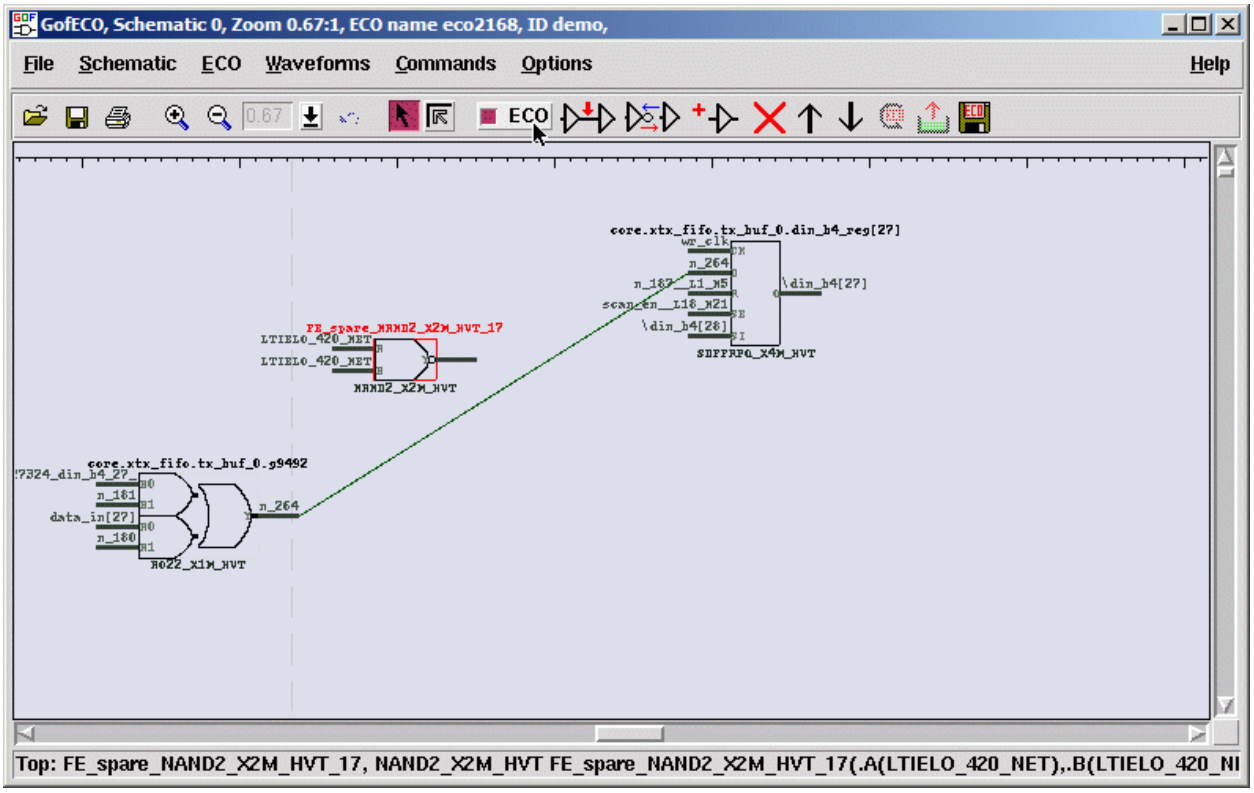

Figure 8

To select all the connections to be deleted:

- Press ‘Ctrl’ key and don’t release.
- Use mouse-left-button to click on the wires.

Click ‘Delete selected item’ ECO button to delete the selected wires.

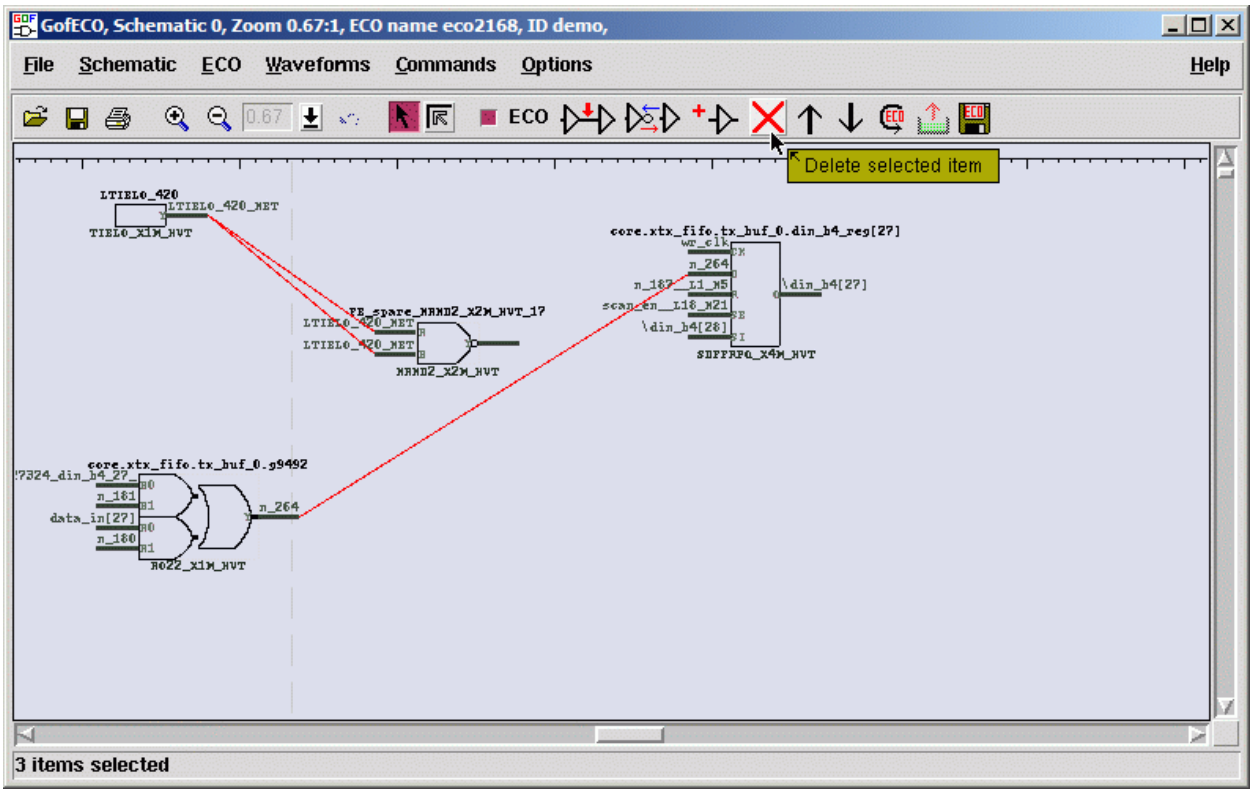

Figure 9

To connect up the new connections:

- Press mouse-middle-button on one of the empty input pins and don't release.
- Move cursor to the destination output pin.
- Release mouse-middle-button.
- The connection is created.
- The hierarchical connectors are added if the source and destination pins are in different hierarchies.

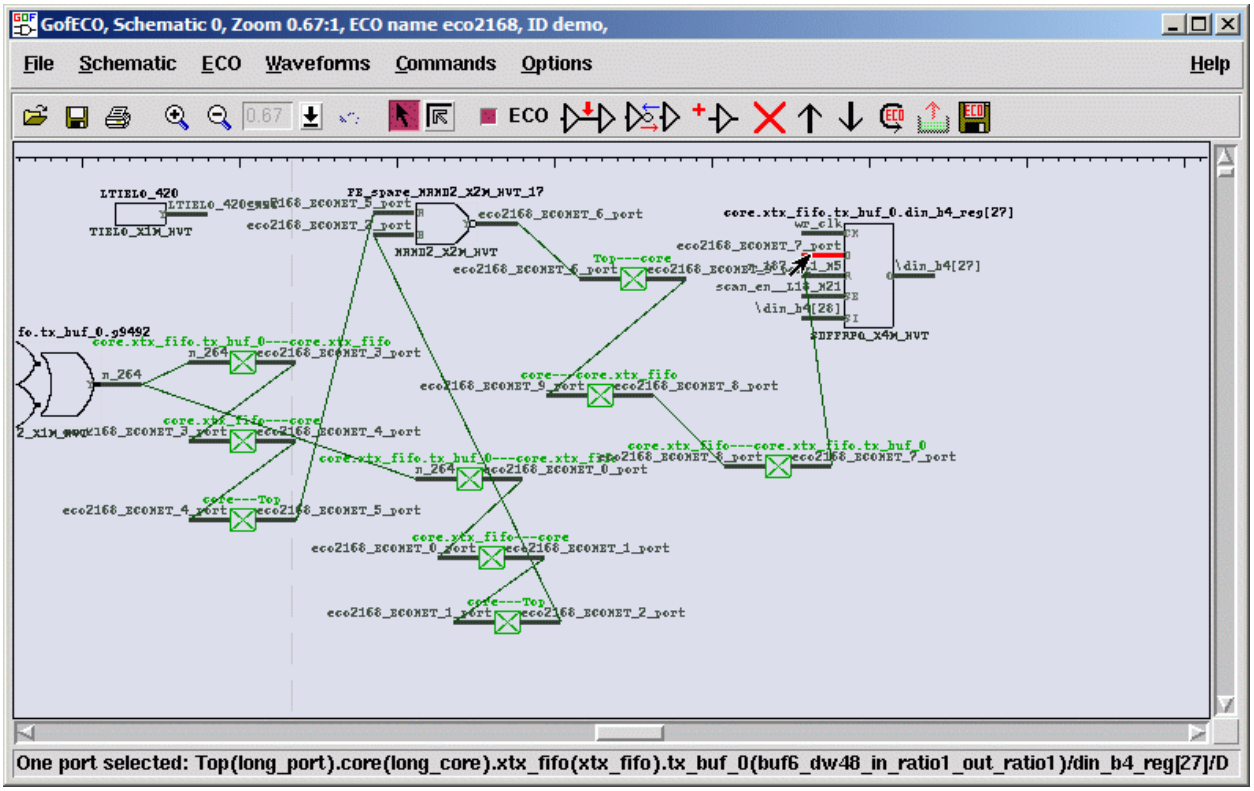

Figure 10

Save ECO

Press ECO button ‘Save ECO result to file’. And select the format to be saved. The supported formats include verilog netlist, SOC Encounter ECO script, GofCall Script, TCL script and DC-Shell script.

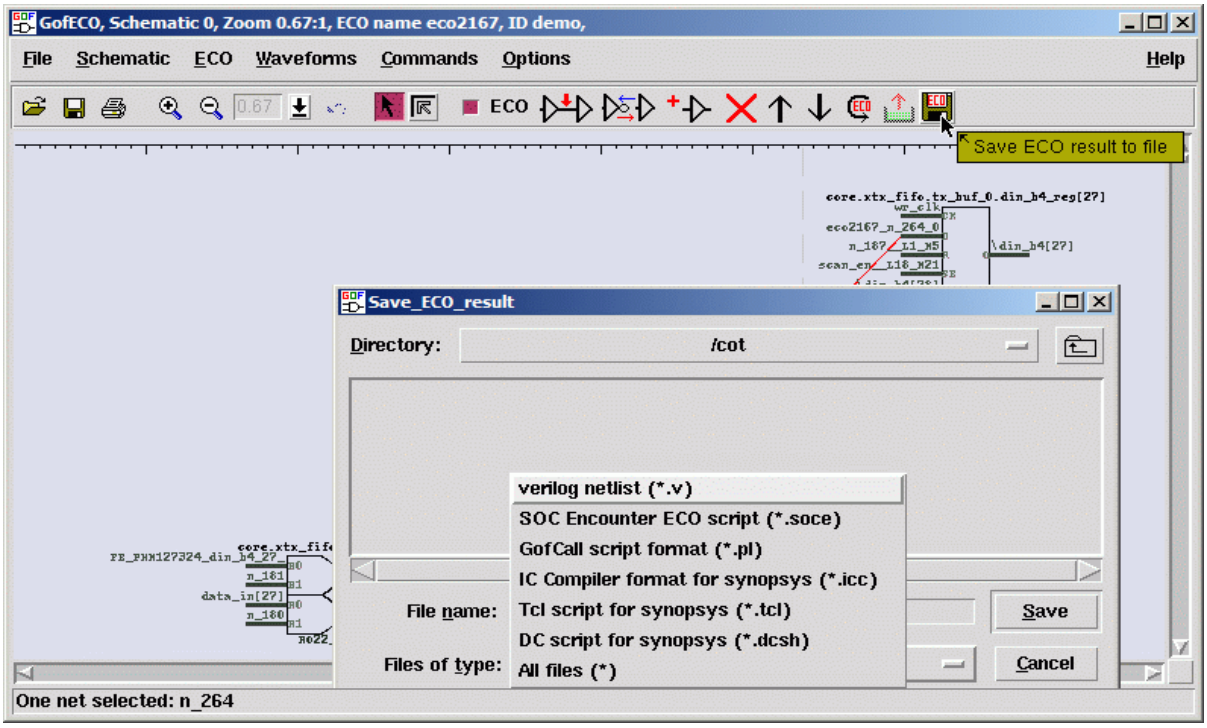

Figure 11