# Insert buffers and inverters by Gates On the Fly

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# Introduction

Inserting buffers and inverters in timing paths are very common in gate level netlist timing ECOs. It becomes complicated when netlist has huge size. The following paragraph demonstrates how to insert buffers and inverters into timing path.

# **GUI mode ECO**

### Start up GOF

Start up Gates On the Fly by the command line

gof -lib t65nm.lib -lib io.lib netlist\_port.v

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

In GofViewer netlist window, press ctrl-g or menu commands->'Launch GofTrace with gate'. Fill in the instance name that needs ECO.

GofViewer [File:./v.gz/long_port.v] [Top:long_port] ID demo								
<u>F</u> ile F <u>i</u> nd <u>C</u> ommands <u>O</u> ptions	<u>H</u> elp							
$\leftarrow \rightarrow \bowtie ~ \blacksquare ~ \blacksquare$								
Log_File Top(long_port)								
Enter gate instance to draw on the schematic								
E.G. 'u_abc.U1234' or 'u_abc/U1234' Alternate way is to drag&drop from GofViewer								
Gate instance: core/xtx_fifo/tx_buf_0/din_b4_reg[27]								
OK Cancel								
M ana_cestpaun,								
%%								



# Create partial schematic

In GofTrace schematic window, use mouse middle button to expand the schematic. In this case, pin D of the flop should be inserted an invert.



Figure 2

# Do ECO on schematic

Check ECO button to enable ECO mode



Figure 3

Press mouse-left-button on the wire to select it. Click ECO button 'Insert gates into connections', select the right invert in the gate type selection window.

E G	🖫 GofECO, Schematic 0, Zoom 0.67:1, ECO name eco2167, ID demo,								
<u>F</u> ile	<u>S</u> cł	ematic	<u>E</u> CO	<u>W</u> aveform	is <u>C</u> ommands	<u>O</u> ptions	<u>H</u> elp		
6		5) O	Θ.	).67 🛓 💉	- 🔣 💌 🔳	ECO 🖯	▷ ▷≤▷ ╹→ ▷ 🗙 ↑ ↓ @ 🏥 📟		
	net s	у	324_din_ data_ n_264	rerg. ytx_fife. h=27 n_161 n_162 n_160 n π022_x	tx_buf_0.99492		Insert cates into connections      Select ECO gate to insert into selected connections      Gate Number to Insert in One Connection      Select a gate to insert into the selected connections      Filter      INV_XOP3B_HVT      INV_XOP3B_HVT      INV_XOP3M_HVT      INV_X11B_HVT      INV_X13B_HVT      INV_X16B_HVT      INV_X16B_HVT      INV_X16B_HVT      INV_X18_HVT      INV_X192B_HVT      INV_X1P4B_HVT      INV_X1P4B_HVT      INV_X1P4B_HVT      INV_X1P4B_HVT      INV_X1P4B_HVT      INV_X1P4B_HVT      INV_X1P4B_HVT		

#### Figure 4

In 'Pin Connections' setup window, use default 'Complete Loop' option, so that the gate can be inserted in the net.



Figure 5

Click OK and the invert is inserted.

Gates On the Fly Use Case: Insert buffers and inverters



#### Figure 6

### 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 DCShell script.





# **Script mode ECO**

The script mode ECO can be handled by these lines. The syntax is pure Perl with internal APIs exported.

- use strict; # Strict syntax
- undo\_eco(); # Remove the previous ECO left over
- setup\_eco("eco2167"); # Setup ECO name
- set\_top("long\_port"); # Setup the top level module
- 5. change\_pin("core/xtx\_fifo/tx\_buf\_0/din\_b4\_reg[27]/D", "INV\_X11B\_HVT", "eco2167\_inv", "-");
- write verilog("eco2167 top net.v"); # Save in verilog netlist format
- write\_cnd("eco2167\_top.soce"); # Save in SOC Encounter ECO script format

The detail supported APIs can be found in this link

http://www.nandigits.com/gofcall apis.htm

In the script, line 5 does the insertions

5. change\_pin("core/xtx\_fifo/tx\_buf\_0/din\_b4\_reg[27]/D", "INV\_X11B\_HVT", "eco2167\_inv", "-");

The first argument is the pin to be inserted invert.

The second argument is the invert full name.

The third is the instance name which can be empty, so the tool can automatically assign one.

The fourth is the pin connection. "-" means connecting up the existing connection.