

## Chapter 04 - OpenROAD first run - TRAINING - Common

Course authors (Git file)



1 gcd example

2 ibex: RISC-V



## gcd example

Start the OpenROAD flow scripts for the gcd example. ORFS shall create a GDS in this run.



# Makefile

## Task: Enable the gcd design in the Makefile

- Navigate to the `/flow` folder
- Edit the Makefile:
  - Uncomment the line with `DESIGN_CONFIG` from `ihp-sg13g2` for the gcd example:

```
1 | DESIGN_CONFIG=./designs/ihp-sg13g2/gcd/config.mk
```

- Re-comment the previous uncommented line with `DESIGN_CONFIG`.
- The line with the default design does not need to be commented. This only applies when no previous line with `DESIGN_CONFIG` is set.



# Run

## Task: Run ORFS with the design

- Run `make` from inside the `/flow` folder.



# Success

- The chosen design should finish after a while with a table (time/memory) like this:

	Log	Elapsed seconds	Peak Memory/MB
1	Log		
2	1_1_yosys	0	24
3	1_1_yosys_canonicalize	0	17
4	1_1_yosys_hier_report	0	12
5	2_1_floorplan	0	110
6	2_2_floorplan_io	0	106
7	2_3_floorplan_tdms	0	98
8	2_4_floorplan_macro	0	106
9	2_5_floorplan_tapcell	0	105
10	2_6_floorplan_pdn	0	108
11	3_1_place_gp_skip_io	0	108
12	3_2_place_iop	0	107
13	3_3_place_gp	0	320
14	3_4_place_resized	0	289
15	3_5_place_dp	0	112
16	4_1_cts	1	379
17	5_1_grt	0	340
18	5_2_route	93	899
19	5_3_fillcell	0	111
20	6_1_fill	0	113
21	6_1_merge	1	368
22	6_report	1	292
23	Total	96	899

# The flow steps

## Task: Match the shell output

- Scroll the shell output from the command to the (successfull) end,
- Identify the flow steps in the shell output
- Try to match your findings to the flow steps and flow components from chapter 2
- Can you identify single open-source tools in the output of the flow? Name the ones you identified.



# The GDS

## Task: Examine the GDS

- See the GDS with the command `make gui_final`

## Task: Save an image from the GDS

- In the TCL console at the bottom of the GUI:
  - `save_image <imagename>.png`
  - Find the saved image in your directories.





## Task: Create a GDS of the ibex design

- Do the same as with the gcd example, but now for the ibex example.
- Do the steps from above:
  - Makefile: Enable ibex design
  - Run ORFS with `make`
  - Examine the shell output
  - See the GDS with `make gui_final`
  - Save an image of the GDS.

**Be aware:** This ORFS run will take more then 30 minutes to finish!

