

1.Open the OPENLANE Software

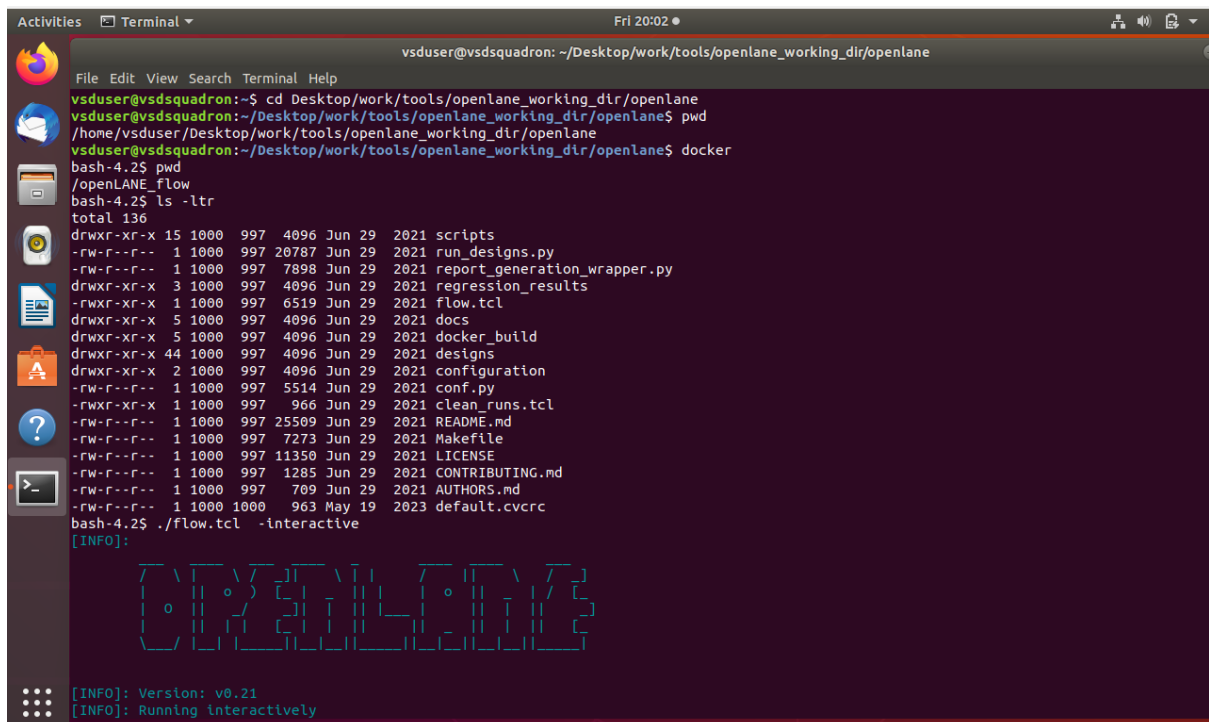
cd Desktop/work/tools/openlane_working_dir/openlane

Desktop/work/tools/openlane_working_dir/openlane\$ docker

./flow.tcl -interactive

% package require openlane 0.9

% prep -design picorv32a



```
vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
File Edit View Search Terminal Help
vsduser@vsdsquadron:~$ cd Desktop/work/tools/openlane_working_dir/openlane
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane$ pwd
/home/vsduser/Desktop/work/tools/openlane_working_dir/openlane
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane$ docker
bash-4.2$ pwd
/openLANE_flow
bash-4.2$ ls -ltr
total 136
drwxr-xr-x 15 1000 997 4096 Jun 29 2021 scripts
-rw-r--r-- 1 1000 997 20787 Jun 29 2021 run_designs.py
-rw-r--r-- 1 1000 997 7898 Jun 29 2021 report_generation_wrapper.py
drwxr-xr-x 3 1000 997 4096 Jun 29 2021 regression_results
-rwxr-xr-x 1 1000 997 6519 Jun 29 2021 flow.tcl
drwxr-xr-x 5 1000 997 4096 Jun 29 2021 docs
drwxr-xr-x 5 1000 997 4096 Jun 29 2021 docker_build
drwxr-xr-x 44 1000 997 4096 Jun 29 2021 designs
drwxr-xr-x 2 1000 997 4096 Jun 29 2021 configuration
-rw-r--r-- 1 1000 997 5514 Jun 29 2021 conf.py
-rwxr-xr-x 1 1000 997 966 Jun 29 2021 clean_runs.tcl
-rw-r--r-- 1 1000 997 25509 Jun 29 2021 README.md
-rw-r--r-- 1 1000 997 7273 Jun 29 2021 Makefile
-rw-r--r-- 1 1000 997 11350 Jun 29 2021 LICENSE
-rw-r--r-- 1 1000 997 1285 Jun 29 2021 CONTRIBUTING.md
-rw-r--r-- 1 1000 997 709 Jun 29 2021 AUTHORS.md
-rw-r--r-- 1 1000 1000 963 May 19 2023 default.cvcrc
bash-4.2$ ./flow.tcl -interactive
[INFO]:
  _____
 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
 |___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|___|
[INFO]: Version: v0.21
[INFO]: Running interactively
```

```
Activities Terminal vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
File Edit View Search Terminal Help
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
[INFO]: Version: v0.21
[INFO]: Running interactively
% package require openlane 0.9
0.9
% prep -design picorv32a
[INFO]: Using design configuration at /openLANE_flow/designs/picorv32a/config.tcl
[INFO]: Sourcing Configurations from /openLANE_flow/designs/picorv32a/config.tcl
[INFO]: PDKs root directory: /home/vsduser/Desktop/work/tools/openlane_working_dir/pdks
[INFO]: PDK: sky130A
[INFO]: Setting PDKPATH to /home/vsduser/Desktop/work/tools/openlane_working_dir/pdks/sky130A
[INFO]: Standard Cell Library: sky130_fd_sc_hd
[INFO]: Sourcing Configurations from /openLANE_flow/designs/picorv32a/config.tcl
[INFO]: Current run directory is /openLANE_flow/designs/picorv32a/runs/31-01_14-31
[INFO]: Preparing LEF Files
[INFO]: Extracting the number of available metal layers from /home/vsduser/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.ref/sky130_fd_sc_hd/techlef/sky130_fd_sc_hd.tlef
[INFO]: The number of available metal layers is 6
[INFO]: The available metal layers are l1 l1 met1 met2 met3 met4 met5
[INFO]: Merging LEF Files...
mergeLef.py : Merging LEFs
sky130_fd_sc_hd.lef: SITES matched found: 0
sky130_fd_sc_hd.lef: MACROS matched found: 437
sky130_ef_sc_hd_fill_12.lef: SITES matched found: 0
sky130_ef_sc_hd_fill_12.lef: MACROS matched found: 1
sky130_ef_sc_hd_decap_12.lef: SITES matched found: 0
sky130_ef_sc_hd_decap_12.lef: MACROS matched found: 1
sky130_ef_sc_hd_fakediode_2.lef: SITES matched found: 0
sky130_ef_sc_hd_fakediode_2.lef: MACROS matched found: 1
mergeLef.py : Merging LEFs complete
[INFO]: Trimming Liberty...
[INFO]: Generating Exclude List...
[INFO]: Storing configs into config.tcl ...
[INFO]: Preparation complete
%
```

2.% run_synthesis (Command for Synthesis)

```
Activities Terminal vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
File Edit View Search Terminal Tabs Help
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane x vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane x
License GPLv3: GNU GPL version 3 <http://gnu.org/licenses/gpl.html>
This is free software, and you are free to change and redistribute it
under certain conditions; type 'show_copying' for details.
This program comes with ABSOLUTELY NO WARRANTY; for details type 'show_warranty'.
Warning: /home/vsduser/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.ref/sky130_fd_sc_hd/lib/sky130_fd_sc_hd_ff_n40C_1v95
line 31, default operating condition ff_n40C_1v95 not found.
Warning: /home/vsduser/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.ref/sky130_fd_sc_hd/lib/sky130_fd_sc_hd_ss_100C_1v60
line 32, default operating condition ss_100C_1v60 not found.
create_clock [get_ports $::env(CLOCK_PORT)] -name $::env(CLOCK_PORT) -period $::env(CLOCK_PERIOD)
set input_delay_value [expr $::env(CLOCK_PERIOD) * $::env(IO_PCT)]
set output_delay_value [expr $::env(CLOCK_PERIOD) * $::env(IO_PCT)]
puts "[INFO]: Setting output delay to: $output_delay_value"
[INFO]: Setting output delay to: 4.946000000000001
puts "[INFO]: Setting input delay to: $input_delay_value"
[INFO]: Setting input delay to: 4.946000000000001
set_max_fanout $::env(SYNTH_MAX_FANOUT) [current_design]
set clk_idx [lsearch [all_inputs] [get_port $::env(CLOCK_PORT)]]
#set rst_idx [lsearch [all_inputs] [get_port resetn]]
set all_inputs_wo_clk [lreplace [all_inputs] $clk_idx $clk_idx]
#set all_inputs_wo_clk_rst [lreplace $all_inputs_wo_clk $rst_idx $rst_idx]
set all_inputs_wo_clk_rst $all_inputs_wo_clk
# correct resetn
set input_delay $input_delay_value -clock [get_clocks $::env(CLOCK_PORT)] $all_inputs_wo_clk_rst
#set input_delay 0.0 -clock [get_clocks $::env(CLOCK_PORT)] {resetn}
set_output_delay $output_delay_value -clock [get_clocks $::env(CLOCK_PORT)] [all_outputs]
# TODO set this as parameter
set_driving_cell -lib cell $::env(SYNTH_DRIVING_CELL) -pin $::env(SYNTH_DRIVING_CELL_PIN) [all_inputs]
set cap_load [expr $::env(SYNTH_CAP_LOAD) / 1000.0]
puts "[INFO]: Setting load to: $cap_load"
[INFO]: Setting load to: 0.01765
set_load $cap_load [all_outputs]
tns -759.46
wns -24.89
[INFO]: Synthesis was successful
```

3.Reviewing synthesis results

```

vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
File Edit View Search Terminal Tabs Help
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane... x vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane x
Number of memories: 0
Number of memory bits: 0
Number of processes: 0
Number of cells: 14876
sky130_fd_sc_hd_a211i0_2 1
sky130_fd_sc_hd_a21i0_2 35
sky130_fd_sc_hd_a21i0i_2 60
sky130_fd_sc_hd_a21b0i_2 149
sky130_fd_sc_hd_a21b0i_2 8
sky130_fd_sc_hd_a21o_2 57
sky130_fd_sc_hd_a21oi_2 244
sky130_fd_sc_hd_a22i0_2 86
sky130_fd_sc_hd_a22o_2 1013
sky130_fd_sc_hd_a2bb2o_2 1748
sky130_fd_sc_hd_a2bb2oi_2 81
sky130_fd_sc_hd_a31i0_2 2
sky130_fd_sc_hd_a31o_2 49
sky130_fd_sc_hd_a31oi_2 7
sky130_fd_sc_hd_a32o_2 46
sky130_fd_sc_hd_a4i0_2 1
sky130_fd_sc_hd_and2_2 157
sky130_fd_sc_hd_and3_2 58
sky130_fd_sc_hd_and4_2 345
sky130_fd_sc_hd_and4b_2 1
sky130_fd_sc_hd_buf_1 1656
sky130_fd_sc_hd_buf_2 8
sky130_fd_sc_hd_conb_1 42
sky130_fd_sc_hd_dfxtp_2 1613
sky130_fd_sc_hd_inv_2 1615
sky130_fd_sc_hd_mux2_1 1224
sky130_fd_sc_hd_mux2_2 2
sky130_fd_sc_hd_mux4_1 221
sky130_fd_sc_hd_nand2_2 78
sky130_fd_sc_hd_nor2_2 524
sky130_fd_sc_hd_nor2b_2 1
sky130_fd_sc_hd_nor2_2 42

```

Flop ratio=Flipflop cell/Total number of cells

$$=1613/14876$$

- `cd Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs`
- `Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ ls -ltr`
- `Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ cd date_time`
- `Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/ date_time$ cd results`
- `Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/ date_time/results$`

```

vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a$ cd runs
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ ls -ltr
total 16
drwxr-xr-x 6 vdsuser vdsuser 4096 Jan 26 17:54 26-01_12-24
drwxr-xr-x 6 vdsuser vdsuser 4096 Jan 26 18:20 26-01_12-45
drwxr-xr-x 6 vdsuser vdsuser 4096 Jan 31 20:06 31-01_14-31
drwxr-xr-x 6 vdsuser vdsuser 4096 Jan 31 20:22 31-01_14-50
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ ^C
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ cd 31-01_14-50
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50$ ls -ltr
total 52
-rwxr-xr-x 1 vdsuser vdsuser 170 Jun 28 2021 PDK_SOURCES
drwxr-xr-x 11 vdsuser vdsuser 4096 Jan 31 20:20 results
drwxr-xr-x 11 vdsuser vdsuser 4096 Jan 31 20:20 reports
-rw-r--r-- 1 vdsuser vdsuser 15 Jan 31 20:20 OPENLANE_VERSION
drwxr-xr-x 11 vdsuser vdsuser 4096 Jan 31 20:20 logs
drwxr-xr-x 11 vdsuser vdsuser 4096 Jan 31 20:20 tmp
-rw-r--r-- 1 vdsuser vdsuser 2846 Jan 31 20:22 cmds.log
-rw-r--r-- 1 vdsuser vdsuser 20953 Jan 31 20:22 config.tcl
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50$

```

```
Activities Terminal Fri 20:34
vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/synthesis
File Edit View Search Terminal Tabs Help
vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openla... x vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane x
drwxr-xr-x 6 vsduser vsduser 4096 Jan 26 17:54 26-01_12-24
drwxr-xr-x 6 vsduser vsduser 4096 Jan 26 18:20 26-01_12-45
drwxr-xr-x 6 vsduser vsduser 4096 Jan 31 20:06 31-01_14-31
drwxr-xr-x 6 vsduser vsduser 4096 Jan 31 20:22 31-01_14-50
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ ^C
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs$ cd 31-01_14-50
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50$ ls -ltr
total 52
-rwxr-xr-x 1 vsduser vsduser 170 Jun 28 2021 PDK_SOURCES
drwxr-xr-x 11 vsduser vsduser 4096 Jan 31 20:20 results
drwxr-xr-x 11 vsduser vsduser 4096 Jan 31 20:20 reports
-rw-r--r-- 1 vsduser vsduser 15 Jan 31 20:20 OPENLANE_VERSION
drwxr-xr-x 11 vsduser vsduser 4096 Jan 31 20:20 logs
drwxr-xr-x 11 vsduser vsduser 4096 Jan 31 20:20 tmp
-rw-r--r-- 1 vsduser vsduser 2846 Jan 31 20:22 cmds.log
-rw-r--r-- 1 vsduser vsduser 20953 Jan 31 20:22 config.tcl
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50$ cd results
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results$ ls -ltr
total 36
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 floorplan
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 routing
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 placement
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 cts
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 magic
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 lvs
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 klayout
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:20 cvc
drwxr-xr-x 2 vsduser vsduser 4096 Jan 31 20:22 synthesis
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results$ cd synthesis
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/synthesis$ ls -l
total 1848
lrwxrwxrwx 1 vsduser vsduser 29 Jan 31 20:20 merged_unpadded.lef -> ../../tmp/merged_unpadded.lef
-rw-r--r-- 1 vsduser vsduser 1889131 Jan 31 20:22 picorv32a.synthesis.v
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/synthesis$ less
corv32a.synthesis.v
vsduser@vsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/synthesis$
```

```
vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/synthesis
File Edit View Search Terminal Tabs Help
vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openla... x vsduser@vsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane x
/* Generated by Yosys 0.9+3621 (git sha1 84e9fa7, gcc 8.3.1 -fPIC -Os) */

module picorv32a(clk, resetn, trap, mem_valid, mem_instr, mem_ready, mem_addr, mem_wdata, mem_wstrb, mem_rdata, mem_la_read, mem_la_
write, mem_la_addr, mem_la_wdata, mem_la_wstrb, pcpi_valid, pcpi_insn, pcpi_rs1, pcpi_rs2, pcpi_wr, pcpi_rd, pcpi_wait, pcpi_ready,
irq, eoi, trace_valid, trace_data);
    wire _00000;
    wire _00001;
    wire _00002;
    wire _00003;
    wire _00004;
    wire _00005;
    wire _00006;
    wire _00007;
    wire _00008;
    wire _00009;
    wire _00010;
    wire _00011;
    wire _00012;
    wire _00013;
    wire _00014;
    wire _00015;
    wire _00016;
    wire _00017;
    wire _00018;
    wire _00019;
    wire _00020;
    wire _00021;
    wire _00022;
    wire _00023;
    wire _00024;
    wire _00025;
    wire _00026;
    wire _00027;
    wire _00028;
    wire _00029;
    ;
```

4. FloorPlanning

% run_floorplan

```

vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
File Edit View Search Terminal Tabs Help
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
set_load $Scap_load [all_outputs]
tns -759.46
wns -24.89
[INFO]: synthesis was successful
% run_floorplan
[INFO]: Running Floorplanning...
[INFO]: Running Initial Floorplanning...
[INFO]: current step index: 3
OpenROAD 0.9.0 1415572a73
This program is licensed under the BSD-3 license. See the LICENSE file for details.
Components of this program may be licensed under more restrictive licenses which must be honored.
Warning: /home/vdsuser/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.ref/sky130_fd_sc_hd/lib/sky130_fd_sc_hd_tt_025C_1v
80.lib line 31, default operating condition tt_025C_1v80 not found.
Notice 0: Reading LEF file: /openLANE_flow/designs/picorv32a/runs/31-01_14-50/tmp/merged_unpadded.lef
Notice 0: Created 13 technology layers
Notice 0: Created 25 technology vias
Notice 0: Created 440 library cells
Notice 0: Finished LEF file: /openLANE_flow/designs/picorv32a/runs/31-01_14-50/tmp/merged_unpadded.lef
[INFO IFP-0001] Added 238 rows of 1412 sites.
[INFO] Extracting DIE AREA and CORE AREA from the floorplan
[INFO] Floorplanned on a die area of 0.0 0.0 660.685 671.405 (microns). Saving to /openLANE_flow/designs/picorv32a/runs/31-01_14-50/
reports/floorplan/3-verilog2def.die_area.rpt.
[INFO] Floorplanned on a core area of 5.52 10.88 655.04 658.24 (microns). Saving to /openLANE_flow/designs/picorv32a/runs/31-01_14-5
0/reports/floorplan/3-verilog2def.core_area.rpt.
[INFO]: Core area width: 649.52
[INFO]: Core area height: 647.36
[INFO]: Changing layout from 0 to /openLANE_flow/designs/picorv32a/runs/31-01_14-50/tmp/floorplan/3-verilog2def_openroad.def
[INFO]: Running IO Placement...
[INFO]: current step index: 4
OpenROAD 0.9.0 1415572a73
This program is licensed under the BSD-3 license. See the LICENSE file for details.
Components of this program may be licensed under more restrictive licenses which must be honored.
Notice 0: Reading LEF file: /openLANE_flow/designs/picorv32a/runs/31-01_14-50/tmp/merged.lef
Notice 0: Created 13 technology layers
Notice 0: Created 25 technology vias
Notice 0: Created 440 library cells

```

```

vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
File Edit View Search Terminal Tabs Help
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane
[WARNING PSM-0030] Vsrc location at (425.520um, 10.880um) and size =10.000um, is not located on a power stripe. Moving to closest st
ripe at (426.600um, 103.880um).
[WARNING PSM-0030] Vsrc location at (565.520um, 10.880um) and size =10.000um, is not located on a power stripe. Moving to closest st
ripe at (567.000um, 103.880um).
[WARNING PSM-0030] Vsrc location at (285.520um, 150.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (286.200um, 103.880um).
[WARNING PSM-0030] Vsrc location at (425.520um, 150.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (426.600um, 103.880um).
[WARNING PSM-0030] Vsrc location at (565.520um, 150.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (567.000um, 103.880um).
[WARNING PSM-0030] Vsrc location at (565.520um, 290.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (567.000um, 257.060um).
[WARNING PSM-0030] Vsrc location at (5.520um, 430.880um) and size =10.000um, is not located on a power stripe. Moving to closest str
ipe at (5.400um, 410.240um).
[WARNING PSM-0030] Vsrc location at (145.520um, 430.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (145.800um, 410.240um).
[WARNING PSM-0030] Vsrc location at (285.520um, 430.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (286.200um, 410.240um).
[WARNING PSM-0030] Vsrc location at (425.520um, 430.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (426.600um, 410.240um).
[WARNING PSM-0030] Vsrc location at (565.520um, 430.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (567.000um, 410.240um).
[WARNING PSM-0030] Vsrc location at (285.520um, 570.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (286.200um, 563.420um).
[WARNING PSM-0030] Vsrc location at (425.520um, 570.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (426.600um, 563.420um).
[WARNING PSM-0030] Vsrc location at (565.520um, 570.880um) and size =10.000um, is not located on a power stripe. Moving to closest s
trip at (567.000um, 563.420um).
[INFO PSM-0031] Number of nodes on net VGND = 19223.
[INFO PSM-0037] G matrix created successfully.
[INFO PSM-0040] Connection between all PDN nodes established in net VGND.
[INFO]: PDN generation was successful.
[INFO]: Changing layout from /openLANE_flow/designs/picorv32a/runs/31-01_14-50/results/floorplan/picorv32a.floorplan.def to /openLAN
E_flow/designs/picorv32a/runs/31-01_14-50/tmp/floorplan/7-pdn.def
1
%

```

Finding Die Area in Micron

- Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/ **date_time/** results/floorplan\$ less picorv32a.floorplan.def


```

vdsuser@vdsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/logs$ cd floorplan
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/logs/floorplan$ ls -ltr
total 40
-rw-r--r-- 1 vdsuser vdsuser 1204 Jan 31 20:54 3-verilog2def.openroad.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 3-verilog2def.openroad_runtime.txt
-rw-r--r-- 1 vdsuser vdsuser 1043 Jan 31 20:54 4-ioPlacer.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 4-ioPlacer_runtime.txt
-rw-r--r-- 1 vdsuser vdsuser 1198 Jan 31 20:54 5-tapcell.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 5-tapcell_runtime.txt
-rw-r--r-- 1 vdsuser vdsuser 8950 Jan 31 20:54 7-pdn.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 7-pdn_runtime.txt
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/logs/floorplan$ cd ../../
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50$ cd results
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results$ cd floorplan
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$ ls -ltr
total 2644
lrwxrwxrwx 1 vdsuser vdsuser 29 Jan 31 20:20 merged_unpadded.lef -> ../../tmp/merged_unpadded.lef
-rw-r--r-- 1 vdsuser vdsuser 2436735 Jan 31 20:54 picorv32a.floorplan.def
-rw-r--r-- 1 vdsuser vdsuser 266915 Jan 31 20:54 picorv32a.floorplan.def.png
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$ less pic
orv32a.floorplan.def
vdsuser@vdsdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$

```

```

vdsuser@vdsdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan
VERSION 5.8 ;
DIVIDERCHAR "/" ;
BUSBITCHARS "[" ;
DESIGN picorv32a ;
UNITS DISTANCE MICRONS 1000 ;
DIEAREA ( 0 0 ) ( 660685 671405 ) ;
ROW ROW_0 unithd 5520 10880 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_1 unithd 5520 13600 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_2 unithd 5520 16320 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_3 unithd 5520 19040 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_4 unithd 5520 21760 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_5 unithd 5520 24480 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_6 unithd 5520 27200 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_7 unithd 5520 29920 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_8 unithd 5520 32640 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_9 unithd 5520 35360 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_10 unithd 5520 38080 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_11 unithd 5520 40800 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_12 unithd 5520 43520 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_13 unithd 5520 46240 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_14 unithd 5520 48960 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_15 unithd 5520 51680 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_16 unithd 5520 54400 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_17 unithd 5520 57120 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_18 unithd 5520 59840 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_19 unithd 5520 62560 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_20 unithd 5520 65280 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_21 unithd 5520 68000 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_22 unithd 5520 70720 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_23 unithd 5520 73440 N DO 1412 BY 1 STEP 460 0 ;
ROW ROW_24 unithd 5520 76160 FS DO 1412 BY 1 STEP 460 0 ;
ROW ROW_25 unithd 5520 78880 N DO 1412 BY 1 STEP 460 0 ;

```

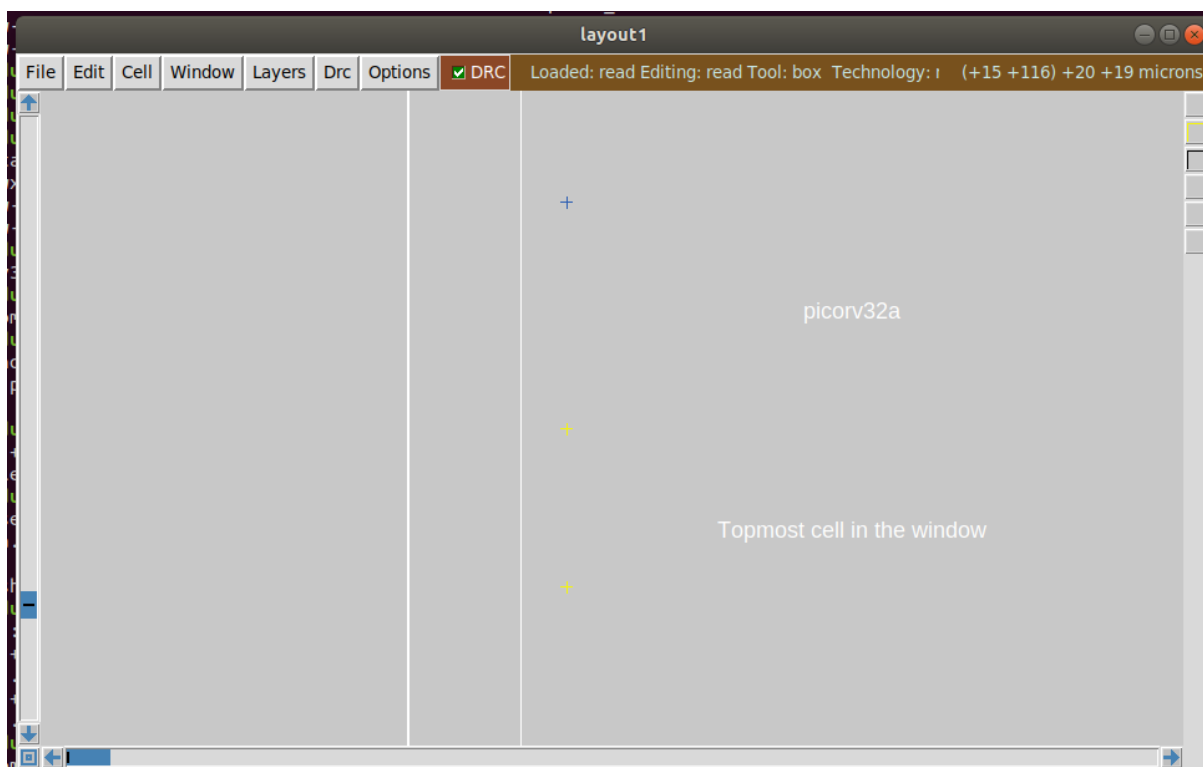
Open floorplan in Magic

- Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/ **date_time**/ results/floorplan\$ magic -T /home/vsduser/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.tech/ magic/ sky130A.tech.lef read ../../tmp/merged.lef def read picorv32a.floorplan.def &

```

Activities  Terminal  Fri 21:46
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan
File Edit View Search Terminal Help
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 3-verilog2def_openroad_runtime.txt
-rw-r--r-- 1 vdsuser vdsuser 1043 Jan 31 20:54 4-ioPlacer.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 4-ioPlacer_runtime.txt
-rw-r--r-- 1 vdsuser vdsuser 1198 Jan 31 20:54 5-tapcell.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 5-tapcell_runtime.txt
-rw-r--r-- 1 vdsuser vdsuser 8950 Jan 31 20:54 7-pdn.log
-rw-r--r-- 1 vdsuser vdsuser 12 Jan 31 20:54 7-pdn_runtime.txt
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/logs/floorplan$ cd ../../
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50$ cd results
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results$ cd floorplan
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$ ls -ltr
total 2644
lrwxrwxrwx 1 vdsuser vdsuser 29 Jan 31 20:20 merged_unpadded.lef -> ../../tmp/merged_unpadded.lef
-rw-r--r-- 1 vdsuser vdsuser 2436735 Jan 31 20:54 picorv32a.floorplan.def
-rw-r--r-- 1 vdsuser vdsuser 266915 Jan 31 20:54 picorv32a.floorplan.def.png
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$ less pic
orv32a.floorplan.def
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$ pwd
/home/vdsuser/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/31-01_14-50/results/floorplan$ magic -T
/home/vdsuser/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.tech/magic/sky130A.tech.lef read ../../tmp/merged.lef def re
ad picorv32a.floorplan.def &
[1] 3108

```

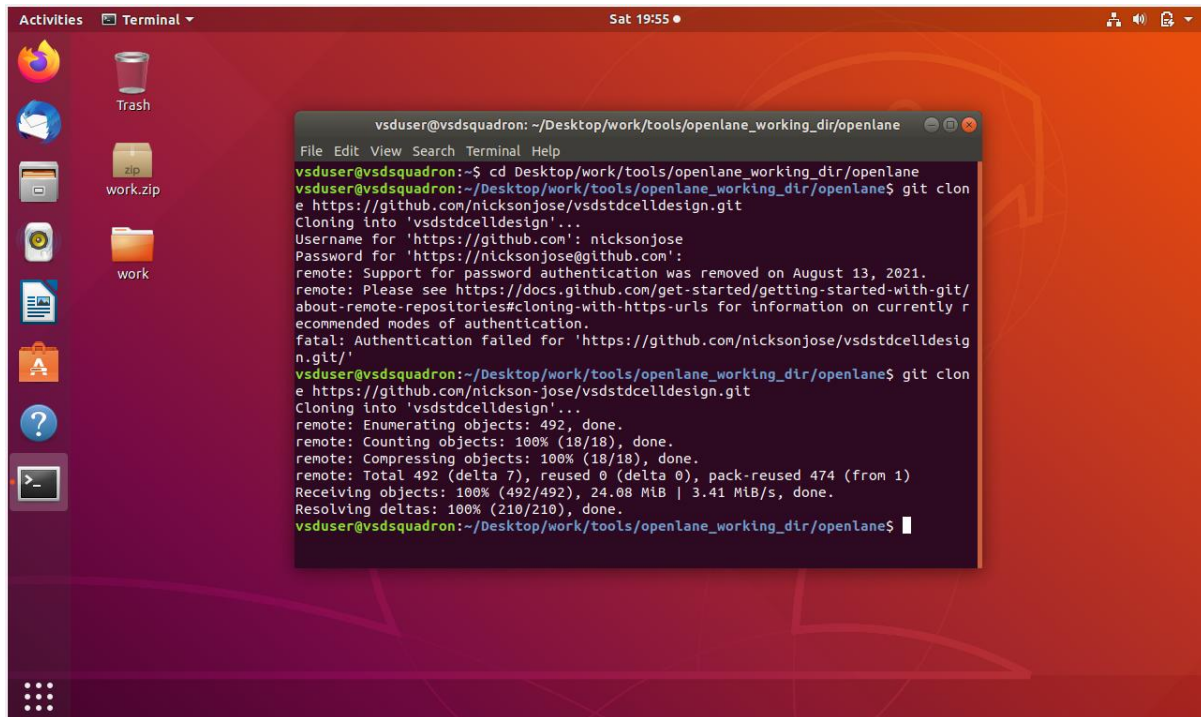


Placement

- Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/ **date_time/** results/floorplan\$ cd ../placement/
- Desktop/work/tools/openlane_working_dir/openlane/designs/picorv32a/runs/ **date_time/** results/ placement\$ magic -T /home/**vdsuser**/Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.tech/ magic/ sky130A.tech.lef read ../../tmp/merged.lef def read picorv32a.placement.def &

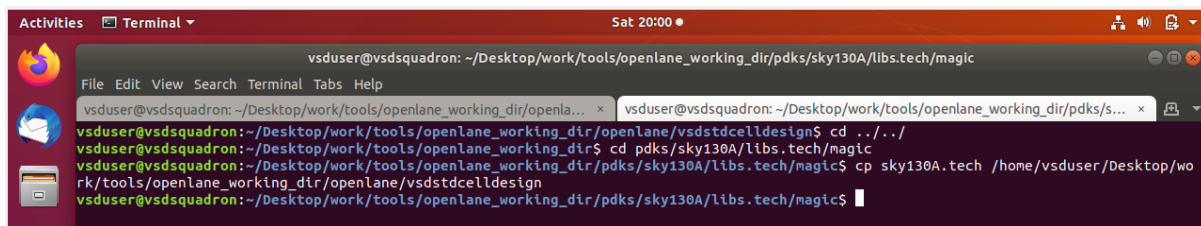
Cloning github vdsstdcelldesign

- Desktop/work/tools/openlane_working_dir/openlane\$ git clone <https://github.com/nickson-jose/vdsstdcelldesign.git>



Copying sky130A.tech library to from pdk to vsdstdcell design

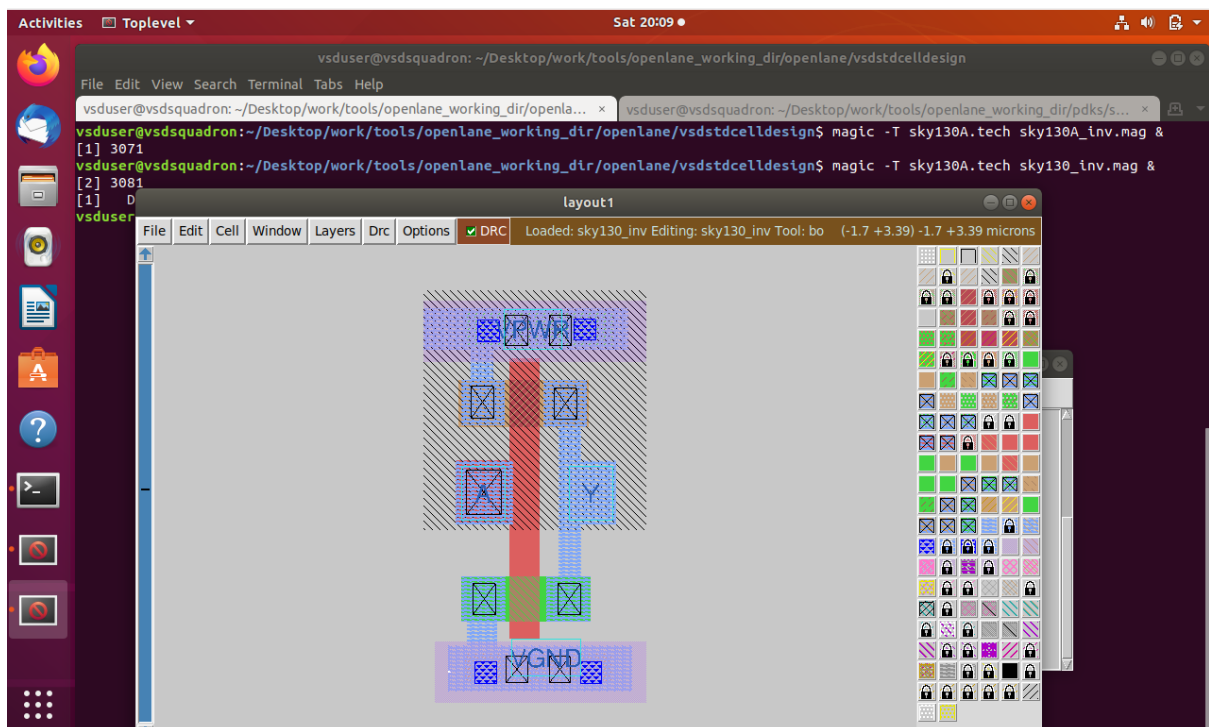
Desktop/work/tools/openlane_working_dir/pdks/sky130A/libs.tech/ magic\$ cp sky130A.tech
/home/vsduser/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign/




```
Activities Terminal Sat 20:00
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign
File Edit View Search Terminal Tabs Help
vdsuser@vdsquadron: ~/Desktop/work/tools/openlane_working_dir/openlane$ git clone https://github.com/nickson-jose/vsdstdcelldesign.git
Username for 'https://github.com': nicksonjose
Password for 'https://nicksonjose@github.com':
remote: Support for password authentication was removed on August 13, 2021.
remote: Please see https://docs.github.com/get-started/getting-started-with-git/about-remote-repositories#cloning-with-https-urls for information on currently recommended modes of authentication.
fatal: Authentication failed for 'https://github.com/nicksonjose/vsdstdcelldesign.git/'
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane$ git clone https://github.com/nickson-jose/vsdstdcelldesign.git
Cloning into 'vdsstdcelldesign'...
remote: Enumerating objects: 492, done.
remote: Counting objects: 100% (18/18), done.
remote: Compressing objects: 100% (18/18), done.
remote: Total 492 (delta 7), reused 0 (delta 0), pack-reused 474 (from 1)
Receiving objects: 100% (492/492), 24.08 MiB | 3.41 MiB/s, done.
Resolving deltas: 100% (210/210), done.
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane$ cd vdsstdcelldesign
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign$ ls -ltr
total 44
-rw-rw-r-- 1 vdsuser vdsuser 13525 Feb  1 19:54 README.md
-rw-rw-r-- 1 vdsuser vdsuser 11357 Feb  1 19:54 LICENSE
drwxrwxr-x 2 vdsuser vdsuser 4096 Feb  1 19:54 Images
drwxrwxr-x 2 vdsuser vdsuser 4096 Feb  1 19:54 extras
drwxrwxr-x 2 vdsuser vdsuser 4096 Feb  1 19:54 libs
-rw-rw-r-- 1 vdsuser vdsuser 2716 Feb  1 19:54 sky130_inv.mag
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign$ pwd
/home/vdsuser/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign$ ls -ltr
total 180
-rw-rw-r-- 1 vdsuser vdsuser 13525 Feb  1 19:54 README.md
-rw-rw-r-- 1 vdsuser vdsuser 11357 Feb  1 19:54 LICENSE
drwxrwxr-x 2 vdsuser vdsuser 4096 Feb  1 19:54 Images
drwxrwxr-x 2 vdsuser vdsuser 4096 Feb  1 19:54 extras
drwxrwxr-x 2 vdsuser vdsuser 4096 Feb  1 19:54 libs
-rw-rw-r-- 1 vdsuser vdsuser 2716 Feb  1 19:54 sky130_inv.mag
-rwxr-xr-x 1 vdsuser vdsuser 136710 Feb  1 19:59 sky130A.tech
vdsuser@vdsquadron:~/Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign$
```

Opening the layout in Magic

```
Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign$ magic -T sky130A.tech sky130_inv.mag &
```



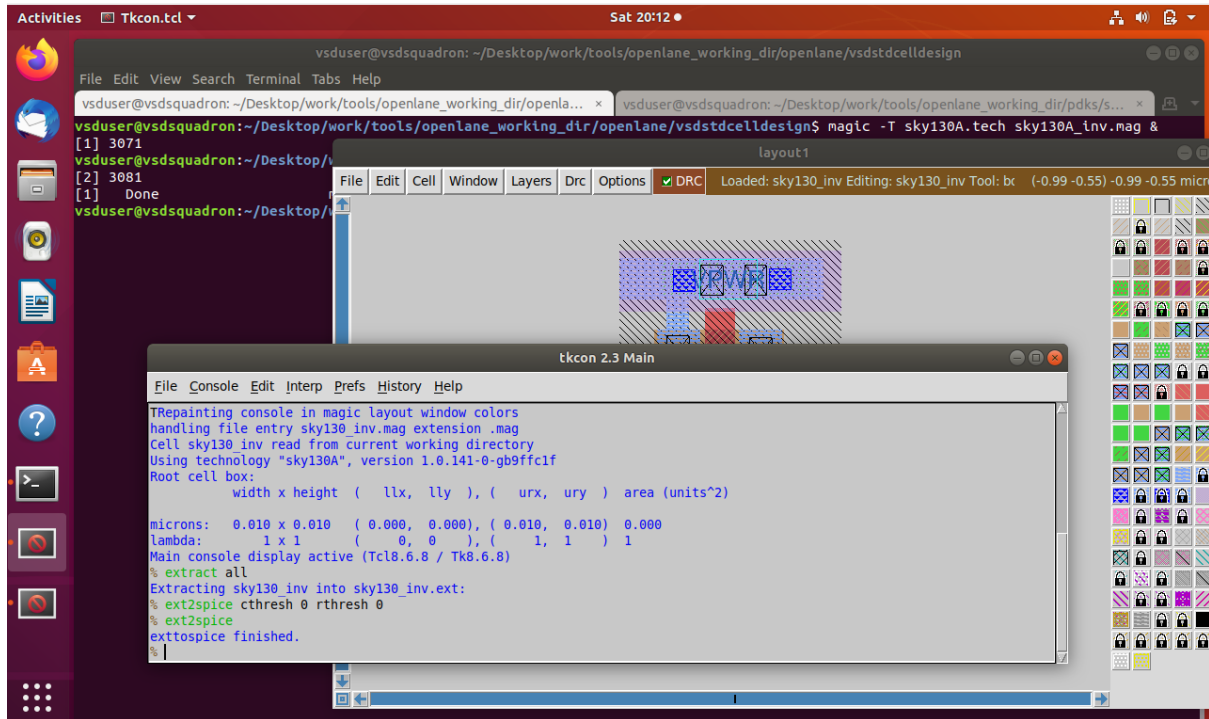
Extracting layout to Spice file

Type the following commands in tkcon after opening magic

% extract all

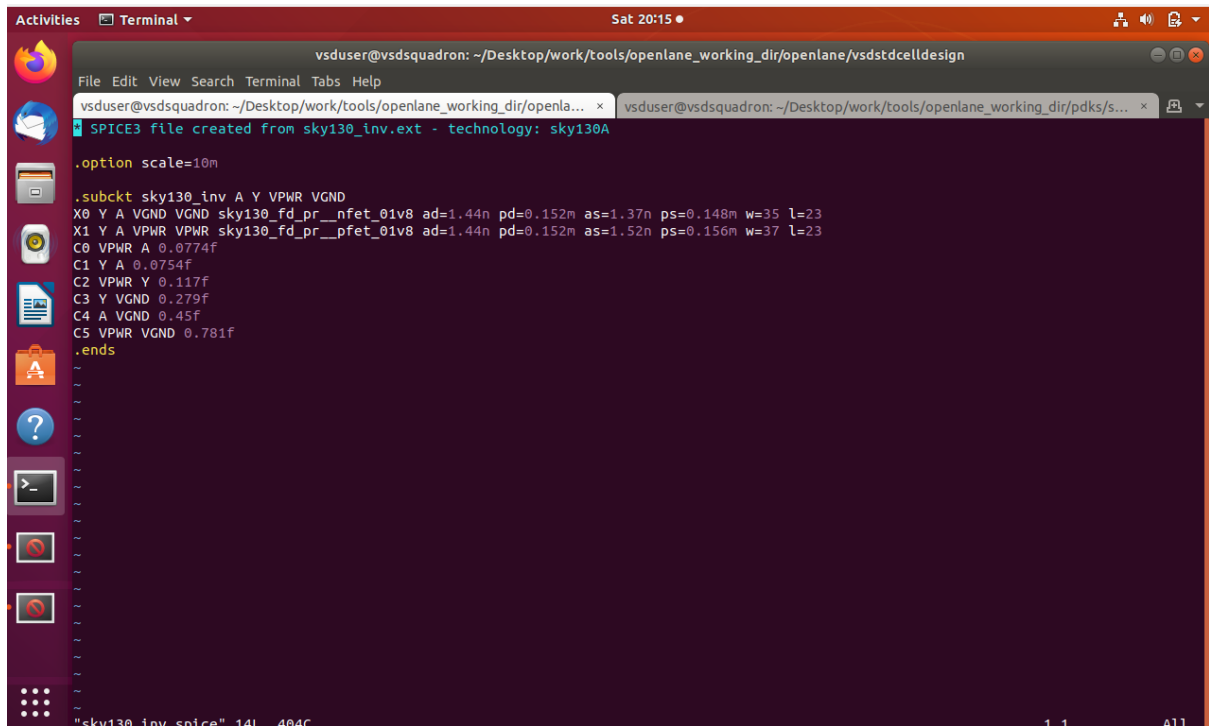
% ext2spice cthresh 0 rthresh 0

% ext2spice



Open the extracted spice file from layout

Desktop/work/tools/openlane_working_dir/openlane/vsdstdcelldesign\$ vim sky130_inv.spice



Type **I** to get INSERT mode in spice file

To save a program in the Linux terminal, you can use the `:wq` command in the vim editor.

Steps

1. Open the terminal
2. Open the file using the `vim` editor
3. Press `i` to enter insert mode
4. Type your program
5. Press `ESC`
6. Type `:wq` to save the file

