Synthesis, Place-and-Route, DRC and PEX with SKY130 PDK using Cadence Design System Tools

Synthesis

- cd synth
- Add HDL to hdl subdirectory.
- Edit genus script.tcl to load in correct SV files.
- Also modify genus_script.tcl to add the timing needed any loading or input/output delays. There are also options for loading that can be changed. Right now, a FF is assumed to be at the beginning and end of the timing to constrain the timing properly.Constraint settings are found within the constraints top.sdc file.
- make synth
- All output is logged to synth.out that should be checked on completion. Reports are found within the reports directory and any mapped HDL is found in the top directory.

Place-and-Route

- Edit setup.tcl and change the design, netlist, and sdc location. These can be found by searching for mult seq in a text editor. These items should match the files done through synthesis.
- innovus_config.tcl has plugins that allow commands to be run when needed. Right now, some plugins are enabled and some are not. This file would have be edited if one would want to do an additional command. These commands can be done before or after a step -- e.g.,pre init or post init.
- To start the process, a Makefile is used. Type the following in this order: init, place, cts, postcts hold, route, postroute, signoff. For example, you could type, make init to run through a design for the init phase. If one would want to just run through route, just type make route and the scripts should run through all the scripts until the end of route provided the other steps have not been initiated.This, of course, is provided there are no errors.
- Any commands run through the pnr are in the LOG subdirectory. There is one file that lists the commands (i.e., cmd) and the other that lists output from the command or the log files (i.e., .log). Reports are found in the RPT subdirectory.
- To pull up a placed-and-routed design from the route stage , start innovus and type: restoreDesign DBS/route.enc.dat/ mult_seq. It is important that the last argument be the top-level design indicated during the synthesis stage.

DRC

- DRC can be run from the Innovus environment. For this, launch Innovus and load the design using: restoreDesign DBS/route.enc.dat/ mult_seq.
- Then type: run_pegasus_drc sky130_drcRules.pvl -mapfile streamOut.map -stream_out -merge ../sky130_osu_sc_t18/18T_ms/gds/*.gds. This command generates a temporary gds file to run drc. The merge option is used to merge the standard cell gds files with the gds of the design.
- Log files can be seen the specified run directory. Error markers can be seen in mult_seq.pegasus.ascii and the drc run summary in mult_seq.pegasus.sum.

PEX

- Go the Innovus directory (cd pnr)
- Edit the setup.tcl to add the qrcTechfile. The qrcTechfile is generated by simulating the ict file provided by the foundry using Techgen.
- Edit innovus_config.tcl to set the effort level for RC extraction. It is set to medium right now.
- make
- Results can be seen in rc_typ.spef by default.
- To run extraction from Innovus command prompt and see the output files at a different location:
    1. setExtractRCMode -engine postRoute -effortLevel <specify the effort level>
    2. extractRC
    3. rcOut -spef SPEF/<file.spef> → this stores the spef files in the specified SPEF directory.
- If no qrcTechfile is specified, RC extraction is done only at effort level ‘low’.