

First Encounter Workshop 2

What you will learn - Partitioning a design and Running IPO

- Importing a design**
- Loading a top level floor plan**
- Specifying partitions**
- Creating partition pin guides for partitions**
- Committing partitions and generating pins for partitions**
- Changing partition views**
- Saving partitioned design to work directories**
- Rerunning Amoeba placement and trial route**
- Building the timing graph and slack report**
- Running IPO**
- Check timing closure**

1. TESTCASE INFORMATION

The testcase is the same one used in Workshop 1. The hierarchical instance SH17 contains 27,551 instances, SH25 contains 6,220, and SH7 contains 2,232. This leaves the top level with about 22,070 instances, subtracting the 3 partitions. The netlist format is hierarchical Verilog, and the process is 3 layers of metal. It has one clock source, MCK.

2. DESIGN IMPORT

Exit the First Encounter session from Workshop 1 before starting a new session for Workshop 2. You can use the same work directory.

Open the *Design -> Design Import...* form and load in the configuration file, `train_p.conf`. Examine the entries in the Design Import form. Click *Ok* when ready to import.

3. LOAD FLOOR PLAN AND SPECIFY PARTITIONS

Load the top-level floor plan file, `train_p.fp0`. Open the *Utility -> Design Browser...* to help you navigate through the design. The three hierarchical instances that we want to be partitions are SH17, SH25, and SH7.

Open the *Partition -> Specify Partition...* form. Specify the three partitions with the following information:

| <u>Partition Name</u> | <u>HInstance</u> | <u>Core to all directions</u> |
|-----------------------|------------------|-------------------------------|
| <your choice> | SH17 | 5 Microns |
| <your choice> | SH25 | 2 Microns |
| <your choice> | SH7 | 2 Microns |

You can leave the default selections for *Layer Blockage* and *Minimum Pin Pitch* at 2, which means that the minimum distance between generated pins is every other metal track.

Be sure to click the *Add* button for each partition and save the partition information to a file. Click *OK* when ready to load in the partition information.

Note that the partition information will get written to the floor plan file if you save the floor plan to a file or the original floor plan file you initially loaded, `train_p.fp0`. In another First Encounter session, loading this floor plan file will also specify the partitions.

4. CREATE PARTITION PIN GUIDES FOR THE PARTITIONS

The Partition Pin Guides are used to create pins for the partitions with net names or bus names of your choice. The pins are created at a specified location and in the order specified.

INFORMATION ONLY and JUST FOR READING (This section is for your reading only and down to the source command) – In order to group nets or busses, we must use several First Encounter (FE) commands to write partition pin guide information to the design database. Two net groups need to be created and nets and busses added to the net groups. Unfortunately, note that the design's netlist does not use busses which means lots of typing. If busses were used then only the bus name would be entered.

Anyway, we need to add two net groups and their nets. This is done by entering tcl commands (just keep on reading through this section and don't type anything yet):

```
createNetGroup <group_name1>; (group_name is your choice)
createNetGroup <group_name2>
```

Now to add the nets to the two group_names:

```
addNetToNetGroup group_name1 MBNK<3>
```

Do this for MBNK<2>, MBNK<1>, MBNK<0>, PMASK<0>, PMASK<1>, PMASK<2>, PMASK<3>, PMASK<4>, PMASK<5>, PMASK<6>, and PMASK<7>.

Now for group_name2:

```
addNetToNetGroup group_name2 GEADR<18>
```

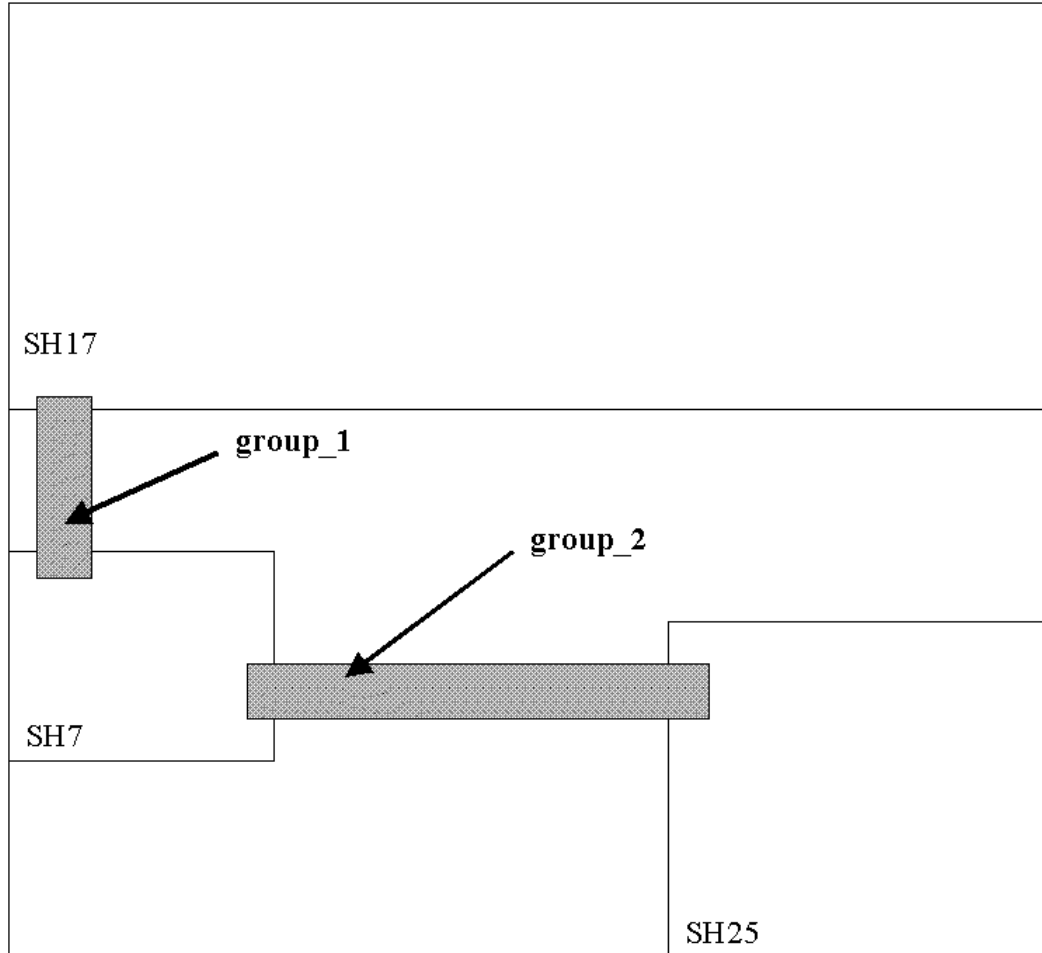
Do this for GEADR<17> to GEADR<0>.

Now if the design had busses, all you would have to enter is GEADR. The First Encounter tool will expand the bus in the floor plan file.

Instead, you can source a command file to do exactly the above. You do this by typing the FE command in the FE's console window.

```
source train_p.pinguide.cmd
```

Now you need to create the Partition Pin Guides (this floor plan object in the Tools area). Create two pin guides per the example (gray objects). Once you have added them, double click each objects and change their names to `group_1` and `group_2`. The `group_1` pin guide straddles between SH17 and SH7 and `group_2` straddles between SH7 and SH25.



5. RUN PLACEMENT AND TRIAL ROUTE

You need to run placement and trial route at the top level for a couple of reasons. First you want to know how well this partition floor plan behaves and is routable. Second, the route information is required to create the pins for the partitions. Note that these partition pins are optimally placed since placement is run for the top-level floor planning.

Open the *Place -> Place...* form and select the *Low Effort* option and click *Ok*. After placement is done, run *Trial Route*.

6. RUN PARTITION TO COMMIT PARTITION

Open the *Partition -> Partition...* form. Make sure you select *Perform Pin Assignment* and not *Derive Timing Budget* (this is to create a timing constraint file with `set_load` and `set_drive`). Now click *Ok*. You should see the three partitions committed (color of the guides change) and the three instances now have property of a block.

To view the generated the partition pins, select the *Floor Plan view* and zoom in to one of the Partition Pin Guides where it overlaps the partition.

For a vertical pin guide overlapping the horizontal side of the partition, the partition pins start from left side of the pin guide, and for a horizontal pin guide overlapping the vertical side of the partition, the pins start from the bottom side. You should see yellow colored pins. To view the pin names, select the yellow pin (turns red) and note the pin name. Note you may have to hit the Space Bar to get the pin focused.

7. VIEW INTO A PARTITION

To push into a partition, first highlight the one of the partitions in the *Floor Plan view* and then choose *Partition -> Change Partition View* menu item. Now you are only viewing in that partition. While you are down in a partition, *Change Partition View* will bring you back up to the top level. Try viewing down and back up.

As you view into each partition, note that the power strips are cut from the top-level floor plan. Also, there are the module guides and block for each partition that represents the design for this partition.

8. SAVE YOUR PARTITION

Make sure to change the partition view to the top level. Open the *Partition -> Save Partition...* form. Select your choice on *Output Format* and enter a *Partition Result Directory* name of your choice to save all the partition information to. Now select the *Timing Constraint Output* format desired, and click *Ok* when ready.

Let's see what files are created. Many files are created to support running separate First Encounter session for the top level and each partition. Change directory (cd) to your saved directory. You should see save netlist, floor plan, import configuration, etc files. These are for First Encounter and for third party tool use.

Once you have saved the partitioned design to directories, you are able to run separate First Encounter jobs for the top level and for each partition.

9. PREPARING TO RUN TIMING ANALYSIS IN THE TOP LEVEL

Normally, this is the step to exit (**DO NOT EXIT**) your First Encounter partition session, which is after saving the partitions, and then separate FE jobs are run for each partitions and lastly, the top level. But to save class time, we are going to continue in this session and prepare the top level to run timing analysis and IPO.

To prepare, make sure you change view to the top level and run

- Run Amoeba placement with *Medium Effort* selected and then
- Run trial route

Now, the top level is ready for parasitic extraction of the interconnects.

10. RUN TIMING ANALYSIS

Setting Timing Models – Open the *Timing -> Specify Operating Condition...* form and select *TYP-WORST*.

Before building the Timing Graph, you must ExtractRC and this done by using the *Timing -> ExtractRC* form (you can deselect *Save Cap to* if you want) or type the FE command *extractRC*.

Build the Timing Graph – To run setup timing analysis and to generate a slack report, open the *Timing -> Timing Analysis...* form. You can change the slack output file name to your choice but keep the *.slk* extension name. Click *Ok* when ready.

There are paths that fall outside of 12 nSec. Open the *Timing -> Slack Browser...* to highlight the paths. Just double click on the path in the slack browser to display the path.

11. RUN IPO

The In-Place Optimization form automates running the selection of IPO operations. For our exercise to have timing closure, use the form's default setting:

- Effort Level: *Medium*
- Fix Tran/Cap: *Only Critical Paths*
- Add Ports: *As Needed* and
- Route Mode: *Keep Updated*.
- Note: If you want IPO to take a longer runtime to fix timing with two passes, choose the Effort Level: *High*. If the first pass has critical paths, then the second pass of IPO will focus on the most critical paths in the slack report.

Now, click *Ok* to run IPO. This IPO selection will take about 15 minutes to run. View the slack report to see if any timing improvement was made or timing was met.

This ends the work for Workshop 2.