University of Pennsylvania
Department of Electrical and Systems Engineering
Electronic Design Automation

ESE535, Spring 2008   Assignment #5   Monday, March 24th

Due: Monday, April 7th, beginning of class.

Resources   You are free to use any books, articles, notes, or papers as references. Provide citations in your writeup as appropriate.

Collaboration   Please work independently on this assignment. You may discuss general algorithmic strategies for the coding project and help each other with the compiler, build environment, and debugging, but each student should develop his or her own solution. If you do discuss strategy or getting debugging help, please acknowledge it in your writeup.

Writeup   Writeup should be in an electronically readable format (HTML or PDF preferred— I do not want to decipher handwriting or hand-drawn figures). State any assumptions you need to make.

Problem

Optimize your placement routine to produce, legal, low delay designs when routed using `vpr4.3` on the provided 4 cluster, 4-LUT architecture.

- This time you are responsible for supporting IOs/cluster of 10 for clusters of 4 4-LUTs.

- Your goal is to outperform `t-vpack/vpr` packing and placement.

- You may choose the timing parameters to `cplace` which you think are most appropriate to achieve your goal.

Turnin:

1. Your code (tar file ready to unpack and make like the one provided for you on assignment 3)

2. Writeup for your placer, including:

   (a) Summary of your results on the provided benchmark set. (table with columns: benchmark, t-vpack/vpr place delay, your optimized assignment 5 place delay, % improvement, you placement runtime in seconds; a final row should summarize the geometric mean of your improvements across the benchmark set. You may have multiple absolute delay/% improvement/runtime columns if you have results under different options worth reporting. For this assignment all delays should be the routed delays reported by `vpr`.)

   (b) Explanation of your placement algorithm. This should be stand alone from your assignment 4; it is possible you will be using a different approach than you used in assignment 4.

   (c) Explanation of any tuning, benchmarking, and profiling you performed to arrive at your current solution. Where appropriate show quantitative graphs or tables.

   (d) Documentation for running your version of `cplace` including description of all new options you have added to `cplace`.

Benchmarks

Pickup the benchmark directory in `assign5.tar` from `~ese535/spring2008/assign5.tar` on `eniac`. Unpack it as subdirectories of your `cplace` directory by running `tar -xvf assign5.tar` in your `cplace` directory. This will produce four subdirectories, one for `vpr`, one for `t-vpack`, one (`assign5_vpr`) with a `makefile` for running the benchmarks through `t-vpack` and `vpr` for clustering and placement, and one (`assign5_cplace`) for running your placement routine then using `vpr` for routing. As with assignment 4 you will need to modify the `assign5_cplace/makefile` to specify the appropriate options for your placement routine. You will need to build `t-vpack` and `vpr` before using them (`cd vpr; make; cd ../t-vpack; make`).

Note: With the new IOs/cluster limit, the automatically calculated array size in `cplace` may be too small for a successful placement.