ECE 154B
Project #5: Superscalar instruction dispatch

The objective of this lab is for you to understand the tradeoffs for power and energy that exist in modern out of order processors and how they compare to in-order processors.

This lab requires you to record power and energy of the processor. Wattch refers to power as 'average power usage' and energy as 'total power usage'.

Use the Wattch version of sim-outorder for simulations. Both the overall power/energy of the processor has to be reported as well as the power/energy of the individual computational units that are being used.

Take all measurements both for clock gating (the _cc0 values) and simple clock gating (_cc1 values).

You will vary several parameters of the processor system. The report should contain graphs for the power/energy variations in the outputs for 2 clocking styles vs the changing variables.

To make things clear:
* Y axis: power/energy for both
* X axis: changing variable (size/number of units)

Procedure

1) Start with the default configuration file that is generated when you perform sim-outorder with the -dumpconfig command.

2) Change from the out of order issue to in order issue and report power and energy of total processor. Do you see any changes, explain the changes you see.

3) Now using out of order issue change the number of integer and floating point units (alu as well as mult) and report changes.

4) Now go back to the default values of the integer and floating point units and change the size of the reorder buffer and report changes. The reorder buffer is known as the RUU (register update unit) in simplescalar.

5) Chose a different value from the default value of the reorder buffer, based on your analysis in 4) and perform 3) again. Observe and differences in the plot and report.

Additional hints:

6) As usual, the grading will stress on the explanation of the results more than the results itself.

7) If your graphs have inflection points, please explain them. For part 5) if the inflection points
change please report them as well.

8) Try to explain why the graphs behave the way they do and try to understand what power and energy really mean and how they are affected by processor parameters.