

Power Estimation

Motivation and introduction

In this exercise, you will learn how to estimate the power consumption on gate-level accuracy for different processors and different applications which were generated in the previous sessions. Then you will compare the power results for a certain clock period. We will use the basis CPU and the CPU which supports the bgeu instruction. The applications which will be used are basis bubble sort algorithm **bs_basis**, the bubble sort algorithm which uses bgeu instruction **bs_bgeu** and the optimized version of the bubble sort algorithm **bs_bgeu_opt**. Before you start the exercises, read the Power Estimation tutorial to get a close view about the software tools that will be used.

The different processors and applications, mentioned previously can be combined to form 3 versions as following:

Version1: basis CPU **dlx_basis** with basis bubble sort algorithm: **bs_basis**

Version2: CPU which supports the instruction bgeu **dlx_bgeu** with bubble sort algorithm which uses bgeu instruction: **bs_bgeu**

Version3: CPU which supports the instruction bgeu **dlx_bgeu** with optimized version of the bubble sort algorithm: **bs_bgeu_opt**

Exercises

- 1) Generate the power report (PowerResult.rpt) for the 3 versions defined in the introduction and determine the total power for every version.
- 2) Compute the total execution time [ms] for every version.
- 3) Compute the energy required for every version and fill in the bellow table with the results.
- 4) Does using bgeu instruction minimize the required energy? Version3 uses application which needs less number of clock cycles than Version2; is it also power and/or energy optimized version compared to Version2?
- 5) Repeat 1-4, but instead of taking the default of 50 MHz, use the individual maximum CPU frequency. This frequency has to be configured in two places: **(1)** In **tb_ASIPMeister.vhd** (search for **CLK_HALF_PERIOD**; e.g. 10 ns half period = 20 ns period = 50 MHz). **(2)** In **XPower** (before you load the vcd file).

Note: For the power simulation turn of the checkbox “Do Time Based Power Analysis”, then the simulation runs significantly faster, but you won’t get Peak Power.

	Total Power [mW]	Peak Power [mW]	Execution Time [ms]	Energy [nJ]
Version1 50 MHz				
Version2 50 MHz				
Version3 50 MHz				
Version1b Max. Frequency				
Version2b Max. Frequency				
Version3b Max. Frequency				