

Lab 7 Lecture - In depth Exploration of Floorplanner and XPower

Objectives:

1. In-depth analysis of Floorplanner.
2. In-depth analysis of XPower.

Overview:

In this lab we are going to implement a very simple vhdl code into a SpartanXL (FPGA) and analyze how it is mapped into the hardware resources (CLBs, I/O, etc) of the FPGA. Once you have a complete understanding of how this is done (by means of the tutorial) you will then redo the task on a different set of code. Lastly you will explore how much power the device would use by means of a software package called XPower.

FLOORPLANNER

In your previous lab you were exposed to Floorplanner. We used it to do nothing more than look into the device. It is actually a graphical tool that is used to display or edit the design layout – how the logic goes onto the FPGA. The floorplan is actually the layout of the design on the silicon of the FPGA. You can use Floorplanner to increase productivity and design performance. You can also use it to partition design sub-systems into general areas on the die (layout). By being able to specify exactly where the logic and inputs/outputs go onto the device you can determine where the most heat will be, increase performance speed, and many other things.

XPOWER

Power consumption is critical in device design. Due to the nature of the course we have left out the worry and concern about how much power the device is using. We will delve into it now. As you can imagine, power is directly related to heat and many other concerns for design engineers. How much power is consumed is directly related to how long your batteries will last in your cell phone or in any other portable device.

The software we will use to calculate this power consumption is called XPower and it is part of the ISE package. Some of this information comes from the XPower tutorial on the Xilinx website.

The Xilinx website is a tremendous source for technical information. You cannot remember everything that is shown to you but the key is to remember where you can go to quickly access the information you need. XPower calculates power based on the observation that dynamic power consumption in CMOS circuits is primarily due to switching activity. Each element such as a LUT that can switch has a capacitance model associated with it. Clocks and input signals have frequencies assigned to them. This is another area we really have not delved too deeply into before. Although it is important to have software that makes the hardware do what we want, another associated quality is the hardware's ability to process data into and out of it as quickly as possible. The speed of data processing is directly related to its power consumption. To that end, we as users specify to our device how fast (at what frequency) we want it to perform at. XPower calculates the power as a summation of the power consumed by each element in the design.