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Tutorial 1: Introduction to Laboratory Equipment

Tutor Notes

1 Introduction

This tutorial is aimed at giving you an introduction to *Altium Designer* and the *Altium NanoBoard* as described in the first lecture. This equipment will be used for all tutorial and laboratory sessions, so it is important to become familiar with it. This tutorial also introduces the concept of design hierarchy and the use of VHDL code to describe digital designs.

At the start of the tutorial session, you will need to get a *NanoBoard Kit* from the laboratory manager and connect the NanoBoard to the computer as described in the instructions enclosed in the kit. At the end of the tutorial, you will have to disconnect the NanoBoard from the computer and return it to the laboratory manager. The laboratory manager will hold your student card while you have the NanoBoard.

This first thing to do is to ensure that all the students have got the NanoBoard kits and have correctly connected them to the computer. It may even be best to set up the NanoBoard yourself and explain to them what needs to be done. It is expected to take a little longer the first time but in subsequent tutorial sessions the students should be able to do everything themselves. You may also have to help them pack away the NanoBoard at the end of the tutorial session.

A few things to note about the Altium tools and the NanoBoard:

- The process of building a design to download to the NanoBoard does take time, so be patient.

  It is the same problem as with previous years where the vendor tools that map the design to the FPGA are quite slow. This long build process should encourage students to check their designs more carefully before doing the build process.

- The resultant files from a build process contained in the **Out** directory can be large. You may want to delete this directory when you have finished to save disc space.

  Another alternative is to do everything in the local work directory and then copy back the final design files to the student's home directory. The only problem with doing this is that it is possible to lose the design files if they are not copied back. Probably the best way is outlined on the unit web site. It is possible to change the directory into which the resultant files are placed.

- The NanoBoard is a delicate piece of hardware with exposed components. Please treat it carefully.

  Encourage students to look after the NanoBoard.

For an introduction to FPGA design using the Altium tools, refer to Lecture Notes Part II Appendix B.1 *FPGA Designer's Quickstart Guide*. The document is also available as part of the help facility or on-line:

- GU0101 FPGA Designer's Quickstart Guide
  (http://www.altium.com/files/AltiumDesigner6/LearningGuides/GU0101 FPGA Designers Quickstart Guide.pdf)

There is only one task to complete for this tutorial. You may also complete the additional tasks if you have time.

2 Main Task

Complete the attached *Getting Started with FPGA Design* tutorial provided by Altium. This tutorial is also available as part of the help facility or on-line:

- TU0116 Getting Started with FPGA Design
  (http://www.altium.com/files/AltiumDesigner6/LearningGuides/TU0116 Getting Started with FPGA Design.pdf)

The tutorial from Altium is not attached to the tutor notes. Refer to the work sheet instead.

This task is expected to take from one to one and a half hours to complete.

The complete design is also available as part of the example designs in the tutorial directories. However, students should go through the process of drawing the schematic from scratch.

3 Additional Tasks

In any remaining time, look at some of the example designs as mentioned on the first page of the attached document. You may want to specifically look at designs that use processor cores and designs which demonstrate simulation, as these are the other two aspects of the Altium tools that will be used in other tutorials sessions.

There are two specific examples the students may want to have a look at:

- *FPGA Processors / Stopwatch - TSK165B*
- *VHDL Simulation / 16Bit Group Ripple Adder*

The first one is an example using a processor core. It is just a matter of building it and downloading it. The students should then be encouraged to look at the design files.

The second is an example of simulating a VHDL design. They will have to look at the on-line help to see how to simulate it. Note that the next tutorial will focus on design verification and simulation.

To build and download any of the example designs you will first need to copy it to a writable directory. You can use either the local work directory or your own account. You need to copy the whole directory, which includes the project file and all the supporting files such as schematics and VHDL files.

It is important that students copy the whole directory. If they do not, the build process will not work since it is not possible to write to the directory where the example files are.

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