Nexys 2 board tutorial

(Decoder, ISE 12.2)

Jim Duckworth, August 2010, WPI.
Digilent Adept Programming Steps added by Zoe (Zhu Fu)

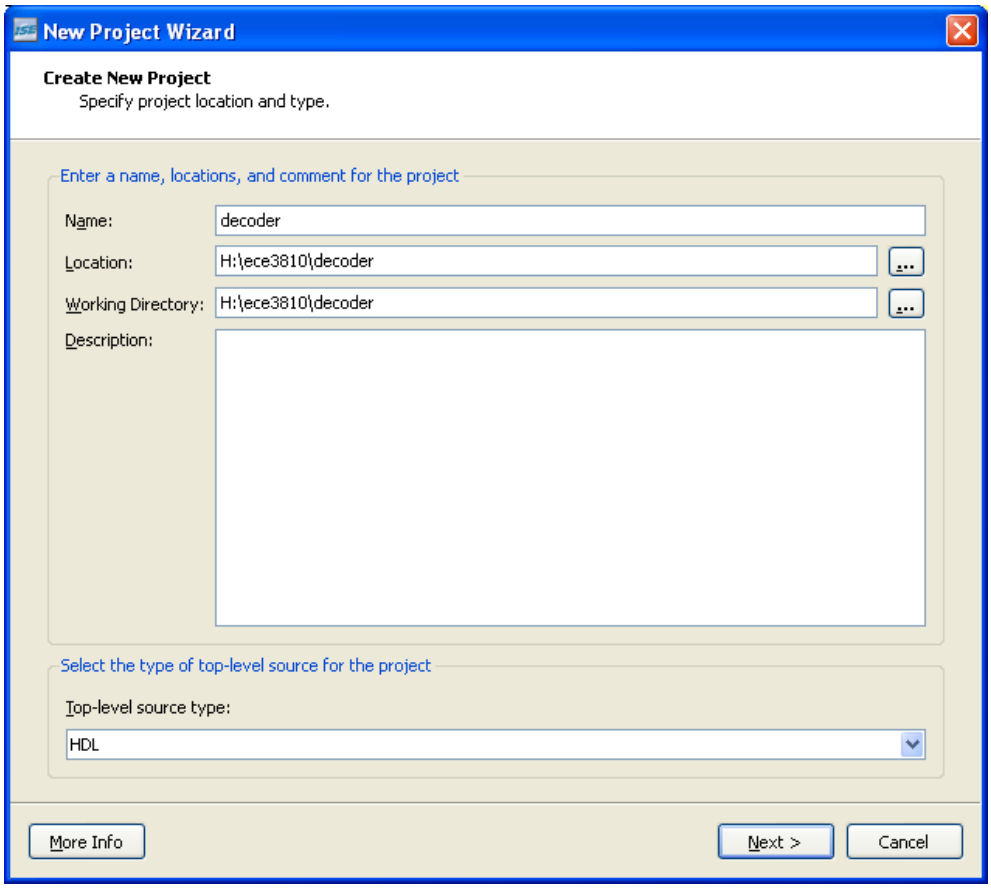
Note: you will need the Xlinx ISE Webpack installed on your compuer (or you can use the department systems).

[Note you can also review Xilinx Tutorials, for example, under Design Resources: ISE Design Suite Tutorials, and ISE Design Suite Logic Edition - Quick Tour]

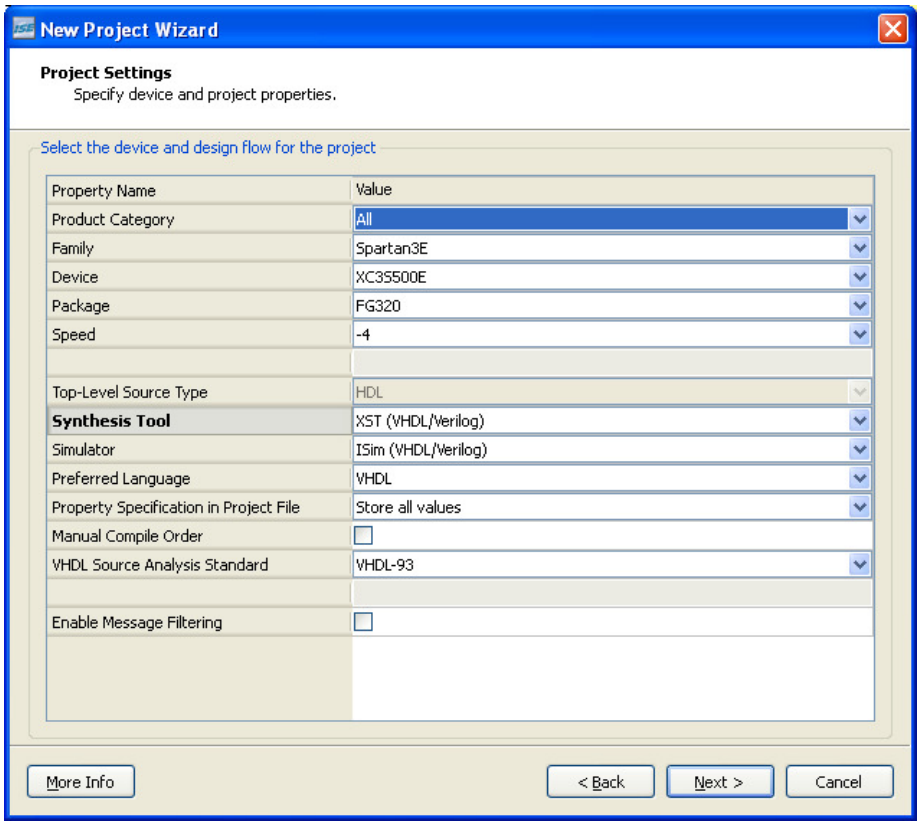
Start Xilinx ISE Design Suite,

Select **File => New Project**

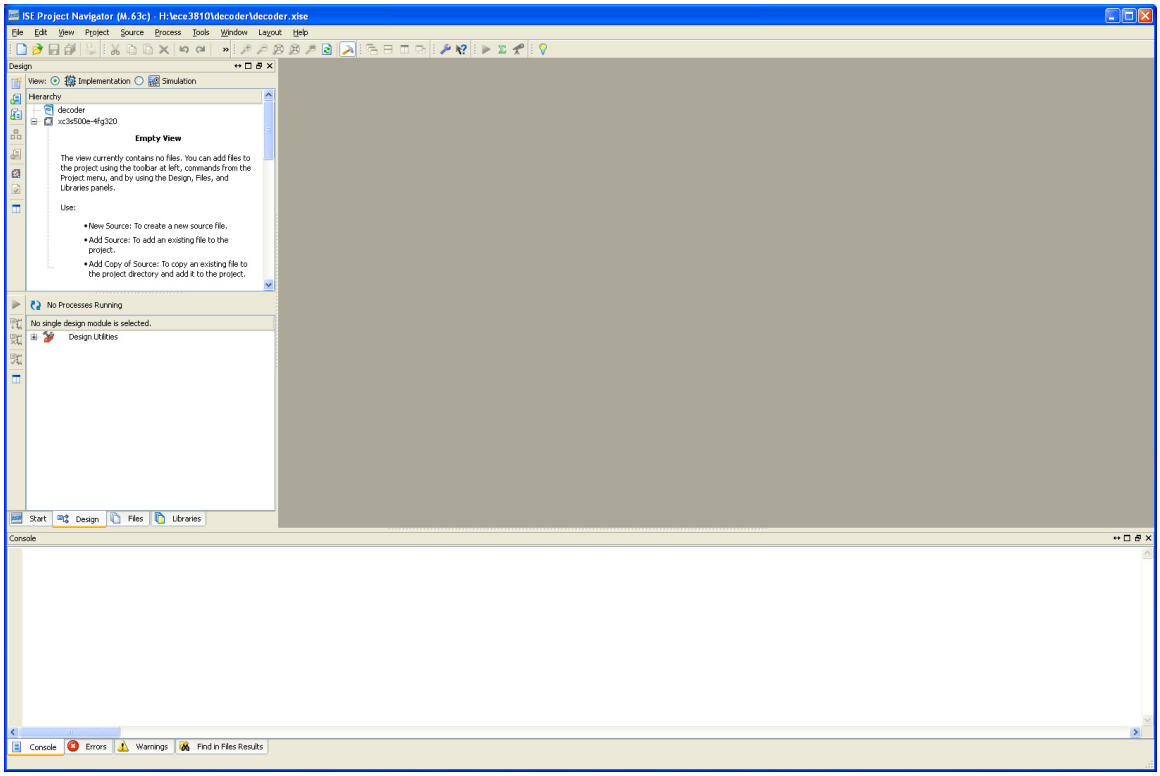
and enter "decoder" for the project name (select an appropriate location):



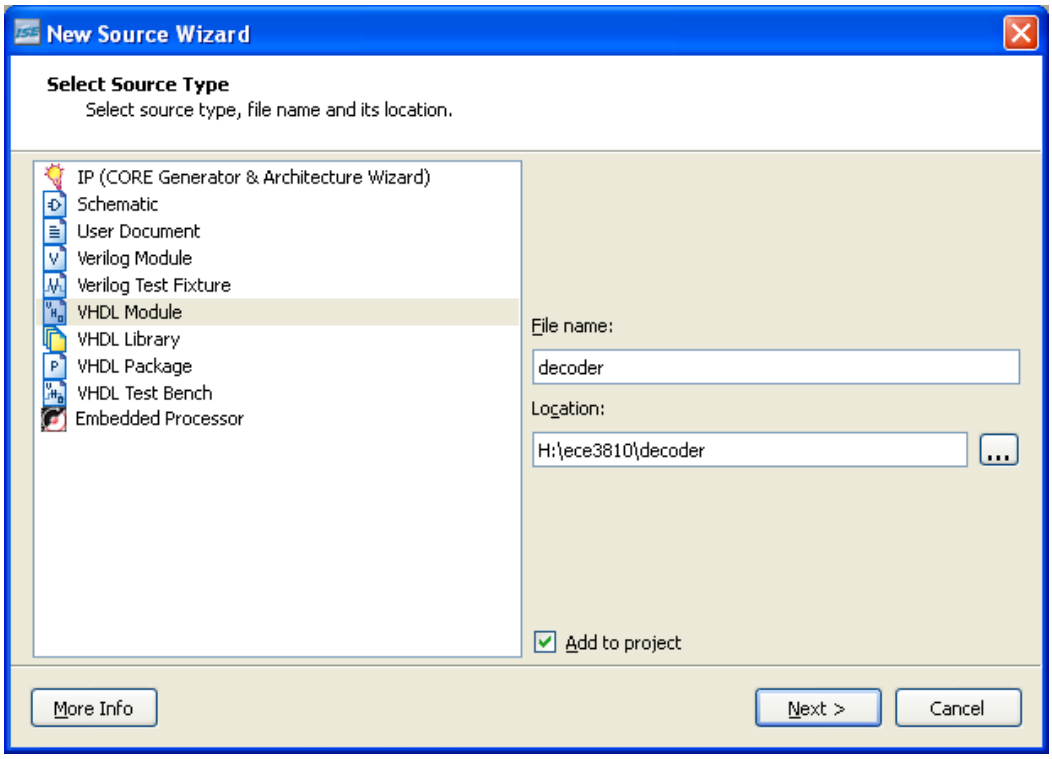
Click **Next** and carefully select the family, device, package, etc to match the FPGA on the Nexys 2 board (also select ISim for the simulator):



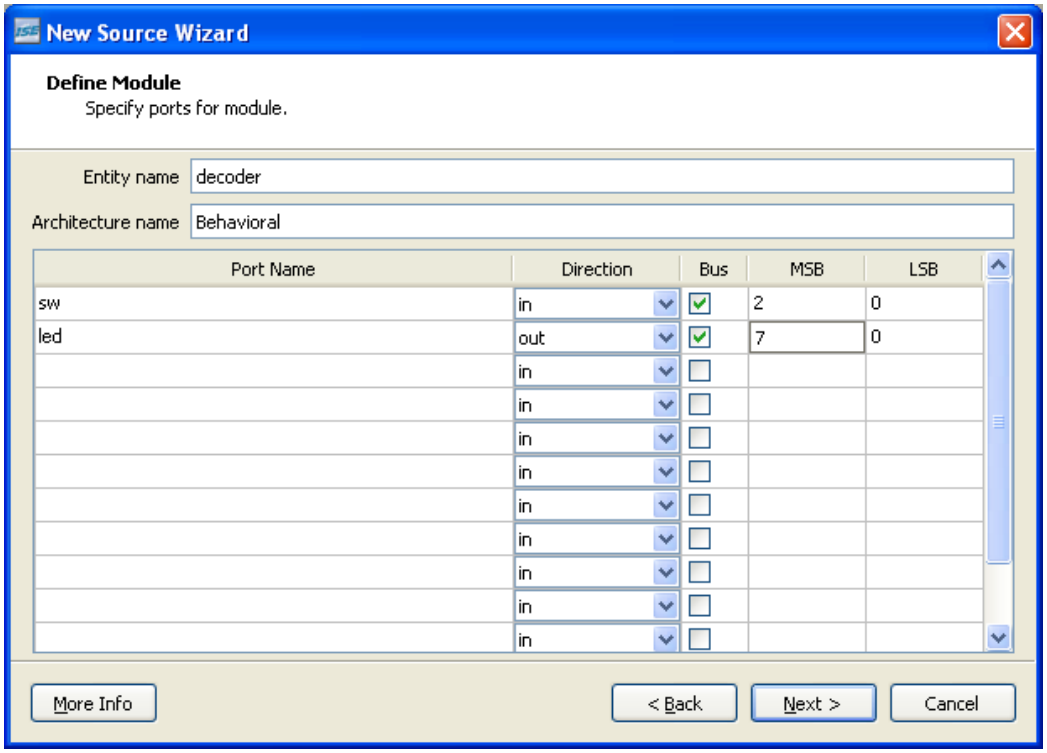
Click **Next**, and then click **Finish**



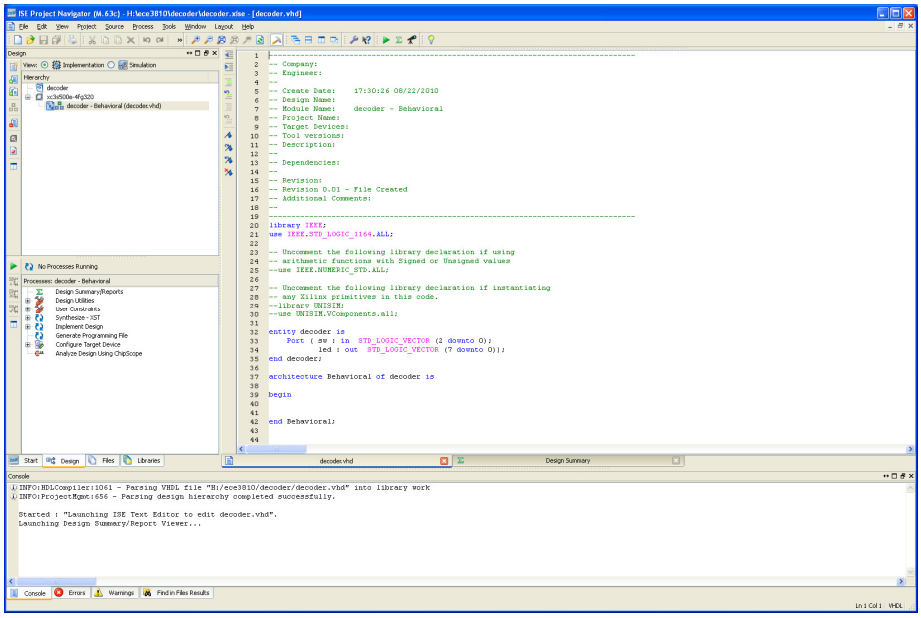
Click on **New Source** (top left icon in the Design window), select VHDL Module, and type "decoder" for name.



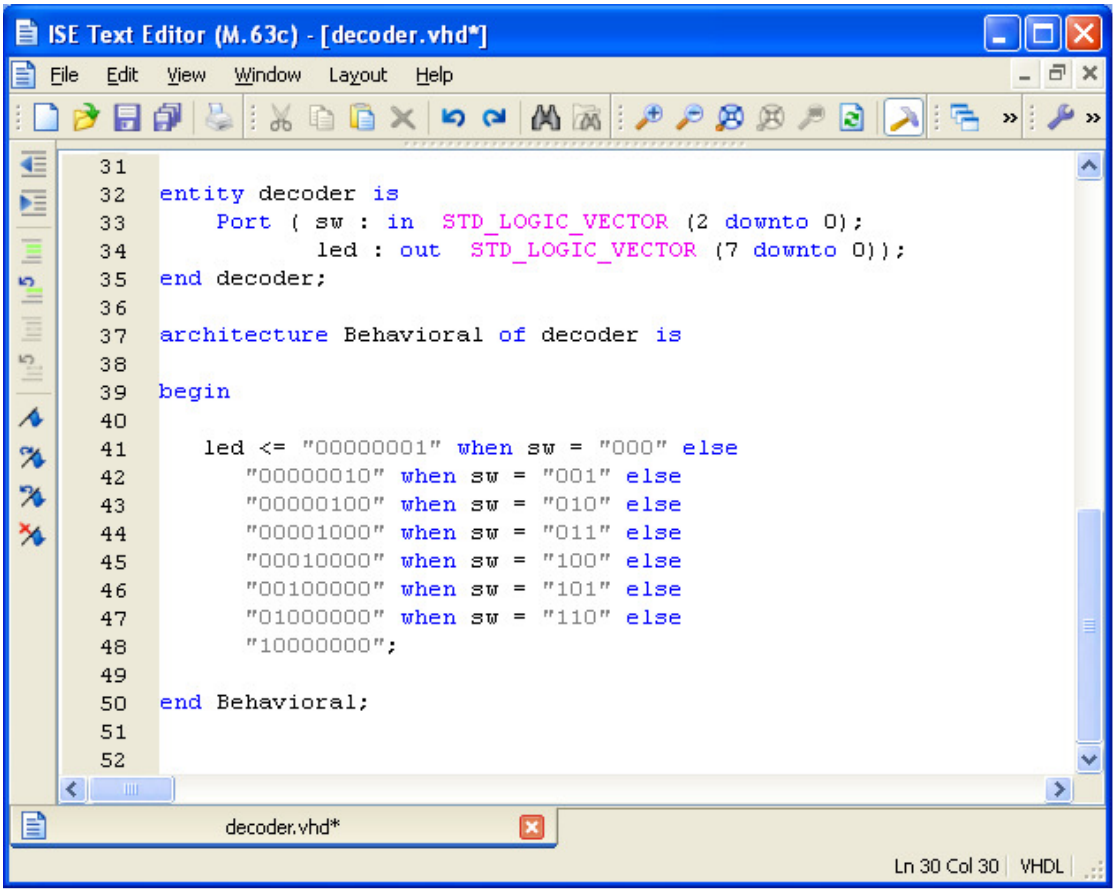
Click **Next**, and add sw and led port names, select direction, and bus size:



Click **Next**, and then **Finish.** A skeleton of your decoder VHDL source file is open for editing:



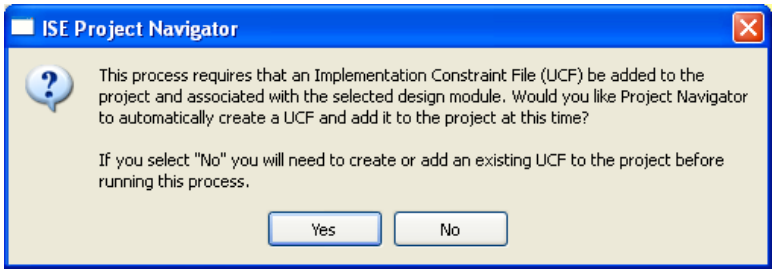
Add VHDL statements to describe the operation of the 3 to 8 decoder:



We now need to assign FPGA pins to the switches and leds so they will be connected to the correct ports on the board. This is done by creating a UCf file (User Constraints File).

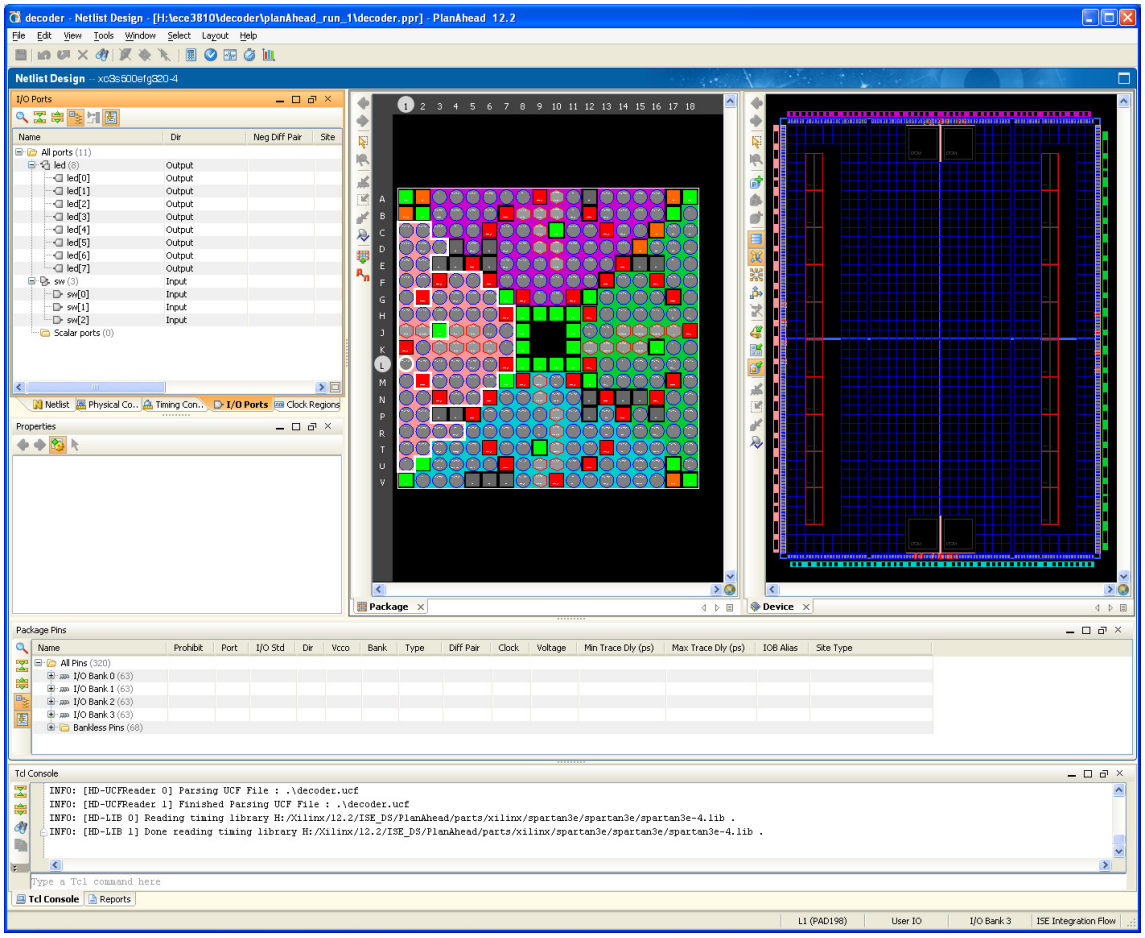
Expand the *User Constraints* process in the Processes window and double-click on the **I/O Pin Planning - Post Synthesis**.

Synthesis will run at this point (if you find errors they are probably due to syntax problems so check your source file) and eventually alert you to create a UCF file:

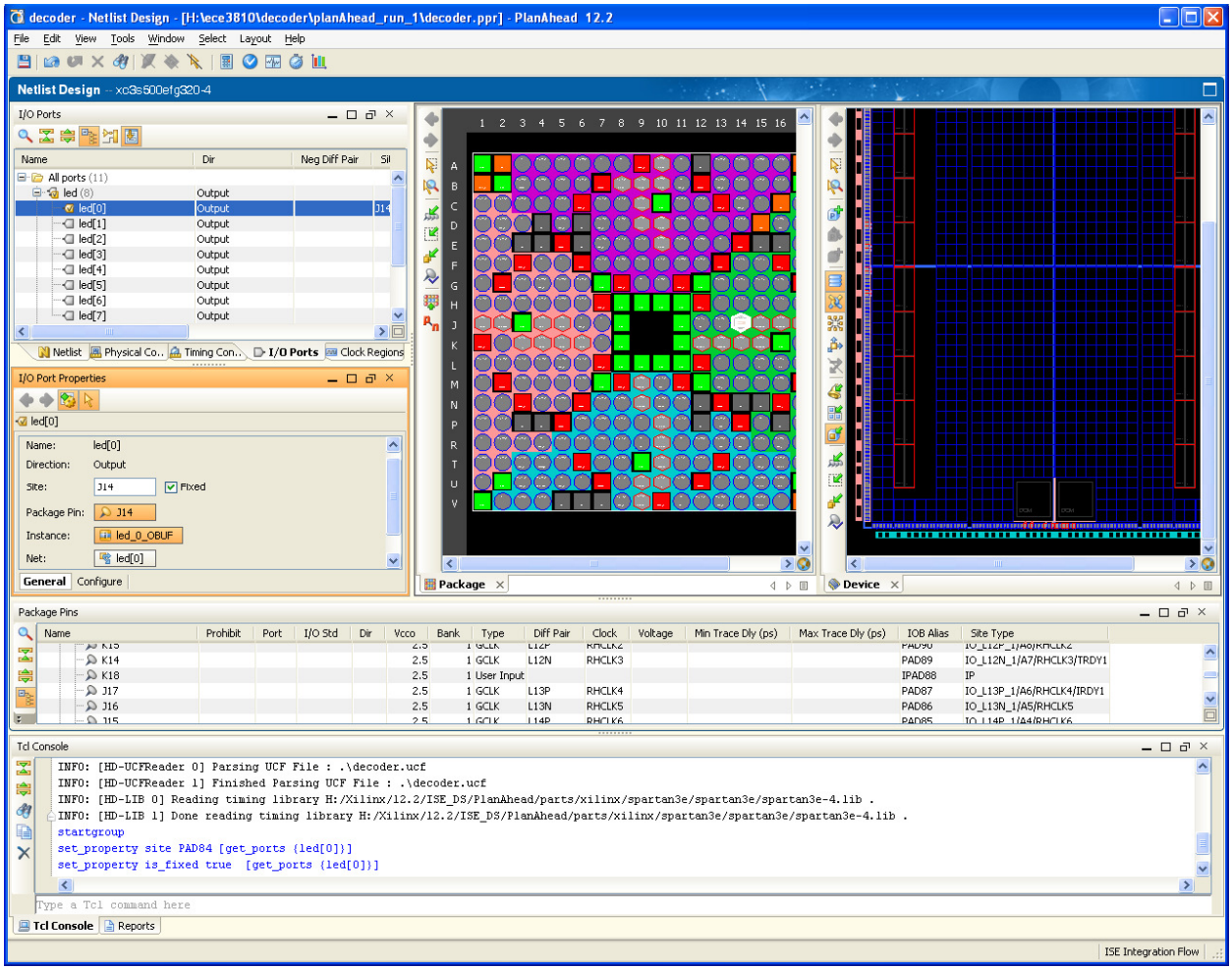


Select **Yes**

PlanAhead will now run, eventually a window will open (seclect the I/O ports tab and then expand the led and sw ports as shown:



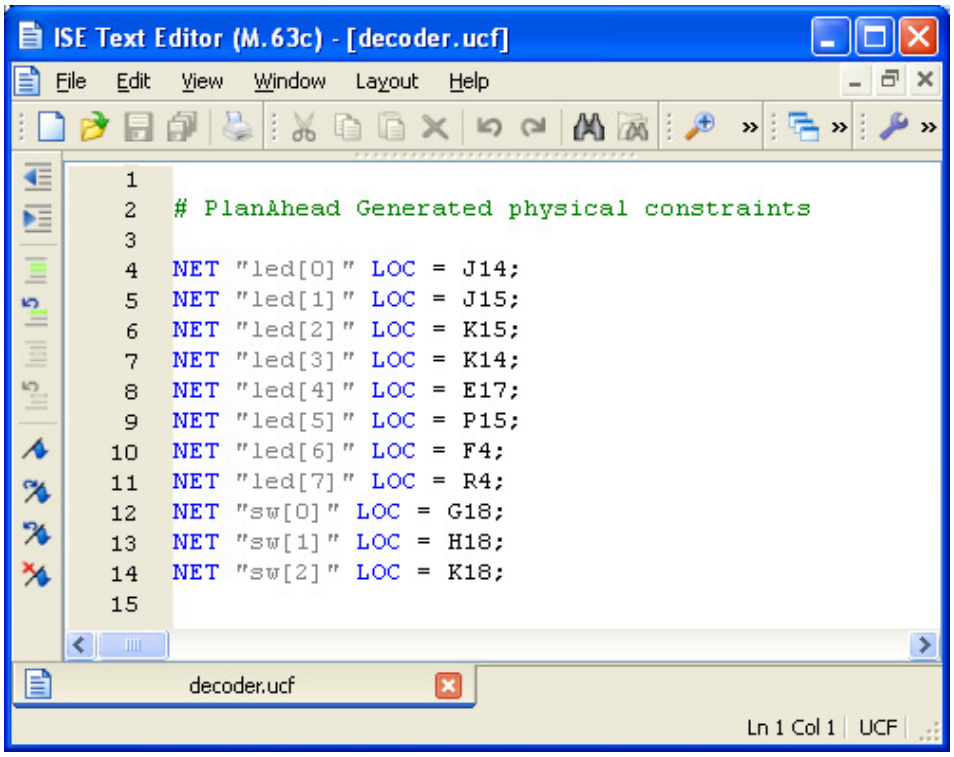
Select led[0] in the I/O ports window and drag to the package pin location J14:
The Site box in the I/O Port Properties window should be updated (instead of dragging, you can also type the site location directly).



With reference to the Nexys2 Reference Manual complete the pin information for the rest of the led and sw ports.

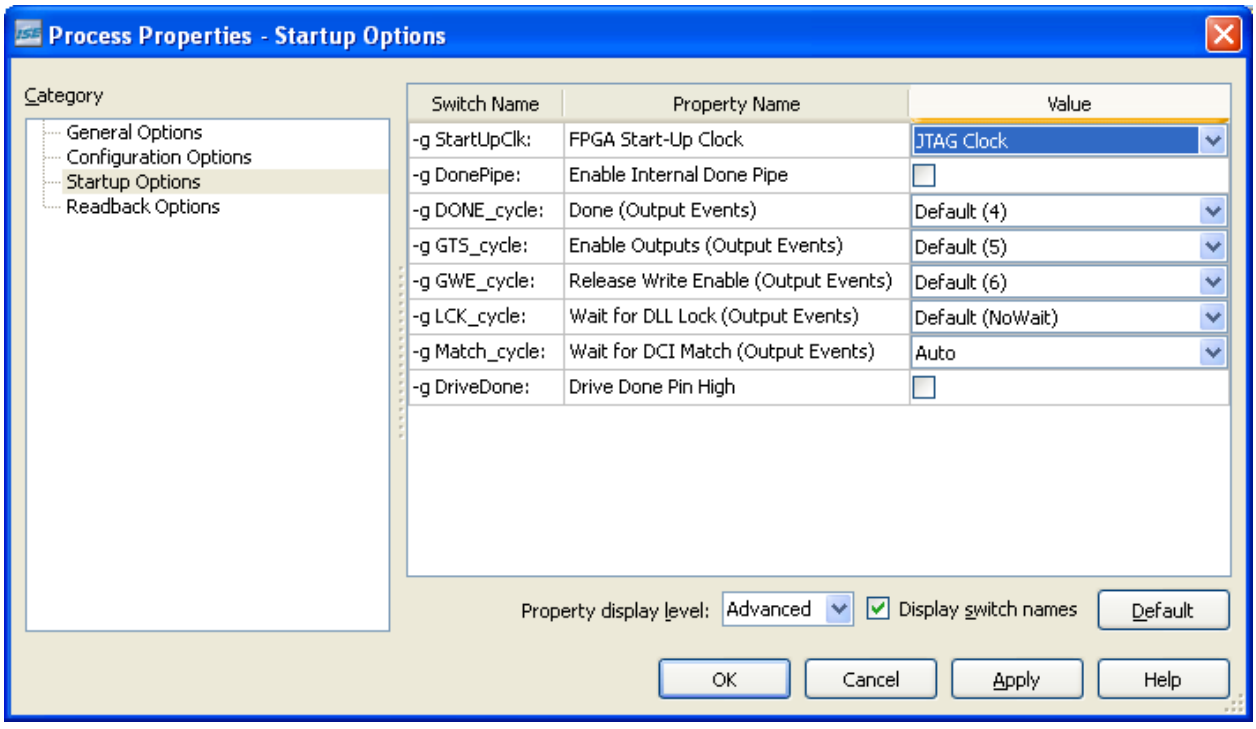
Select **File => Save Design** and exit PlanAhead.

In the Project navigator Design Hierarchy expand the decoder and you should see the new decoder.ucf file is now added. To view the UCF file, select the *decoder.ucf* and then select **Edit Constraints** (Text) in the Processes window:



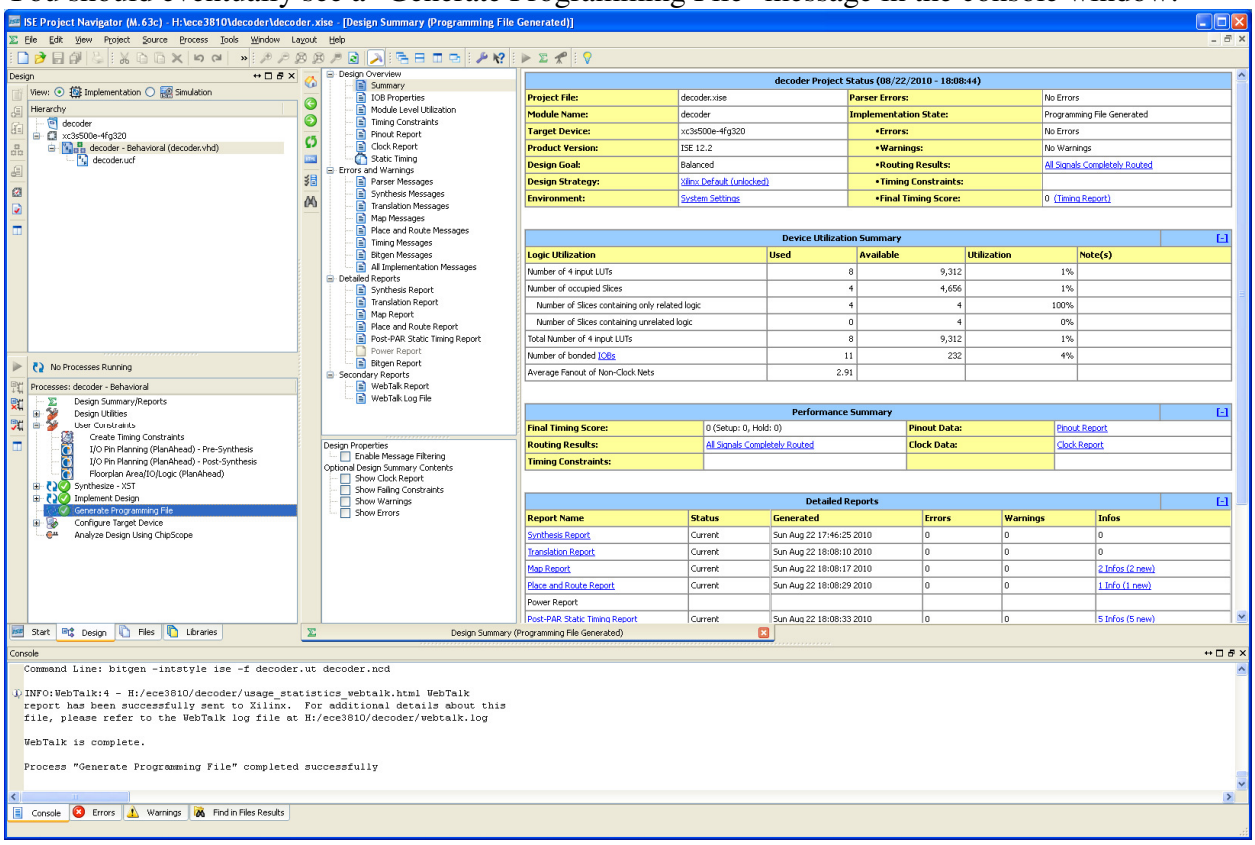
We can now complete the Synthesis, Implementation, and Generate Programming File steps. Back in the design window select the decoder-Behavioral(decoder.vhd) and then *right-click* on the **Generate Programming File** button and select the Process Properties – Startup Options.

IMPORTANT: Change the default FPGA start-up Clock from CCLK to JTAG:



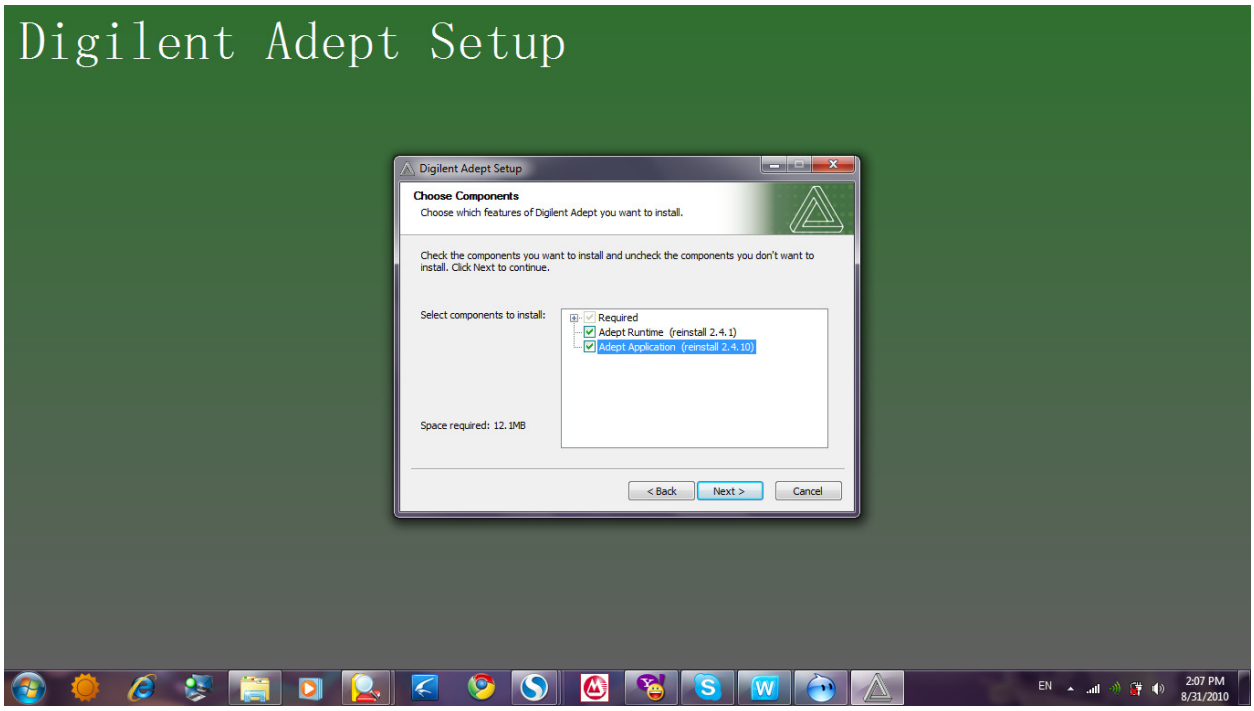
Click OK and then double click the Generate Programming Button.

You should eventually see a "Generate Programming File" message in the console window:

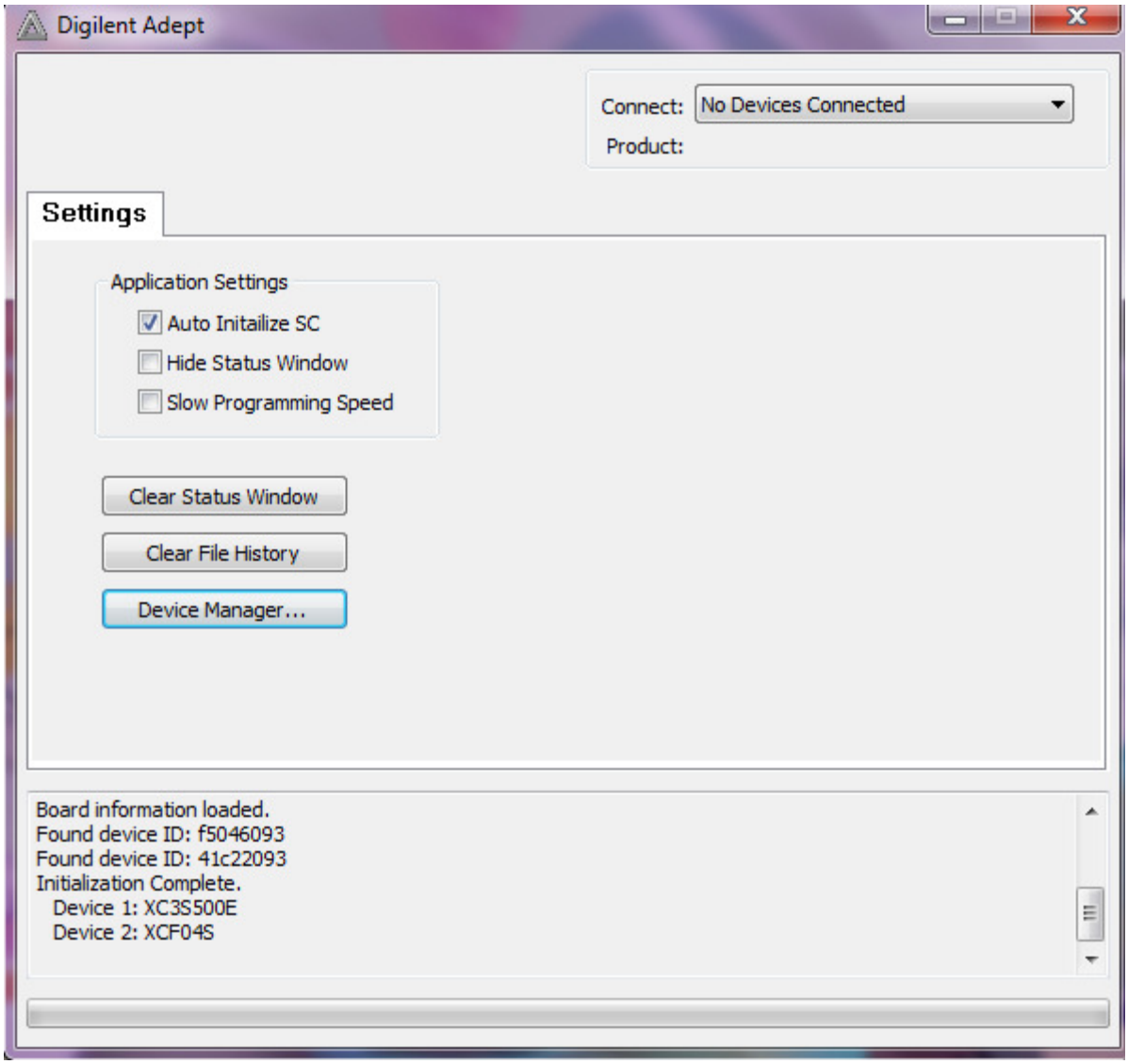


Finally, in order to program and communicate with the Nexys 2 board, you must download and install the Digilent Adept software.

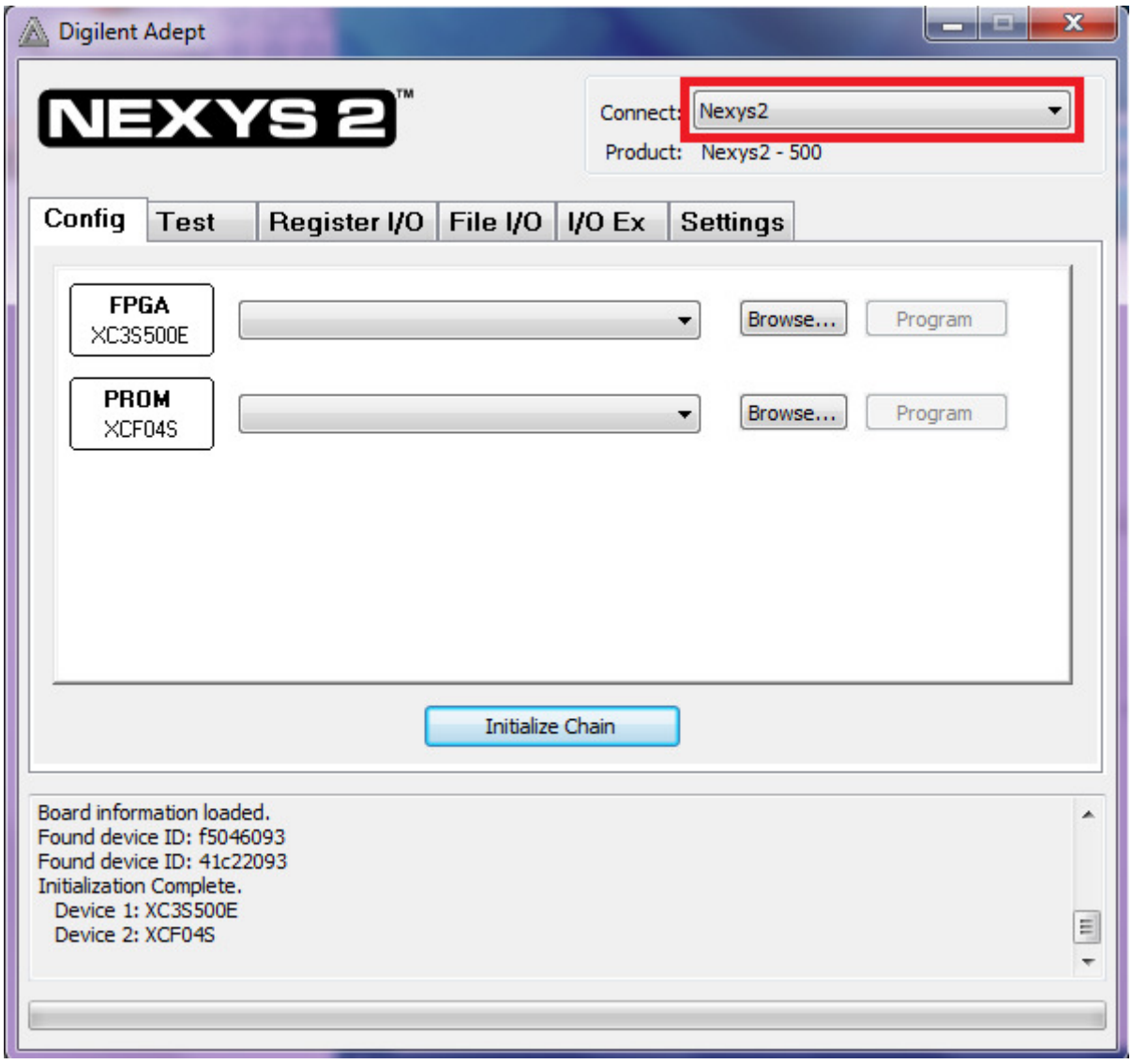
First, download the corresponding version of Adept software which supports the operating system of your computer.



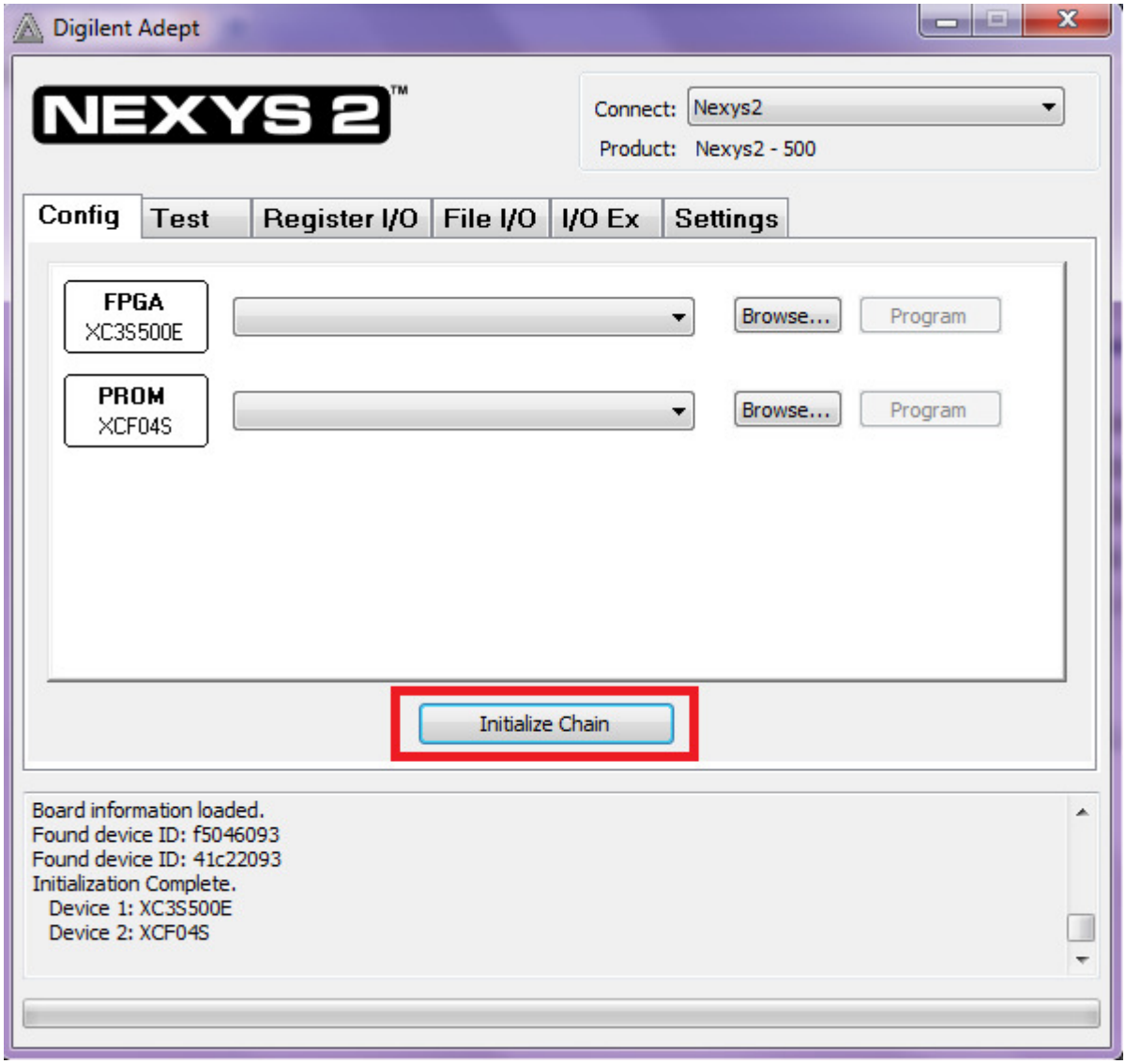
Second, install the Digilent Adept software on your computer.



Third, open Adept application after installation, a restart of your computer might be necessary.(Start > Programs > Digilent > Adept > Adept)

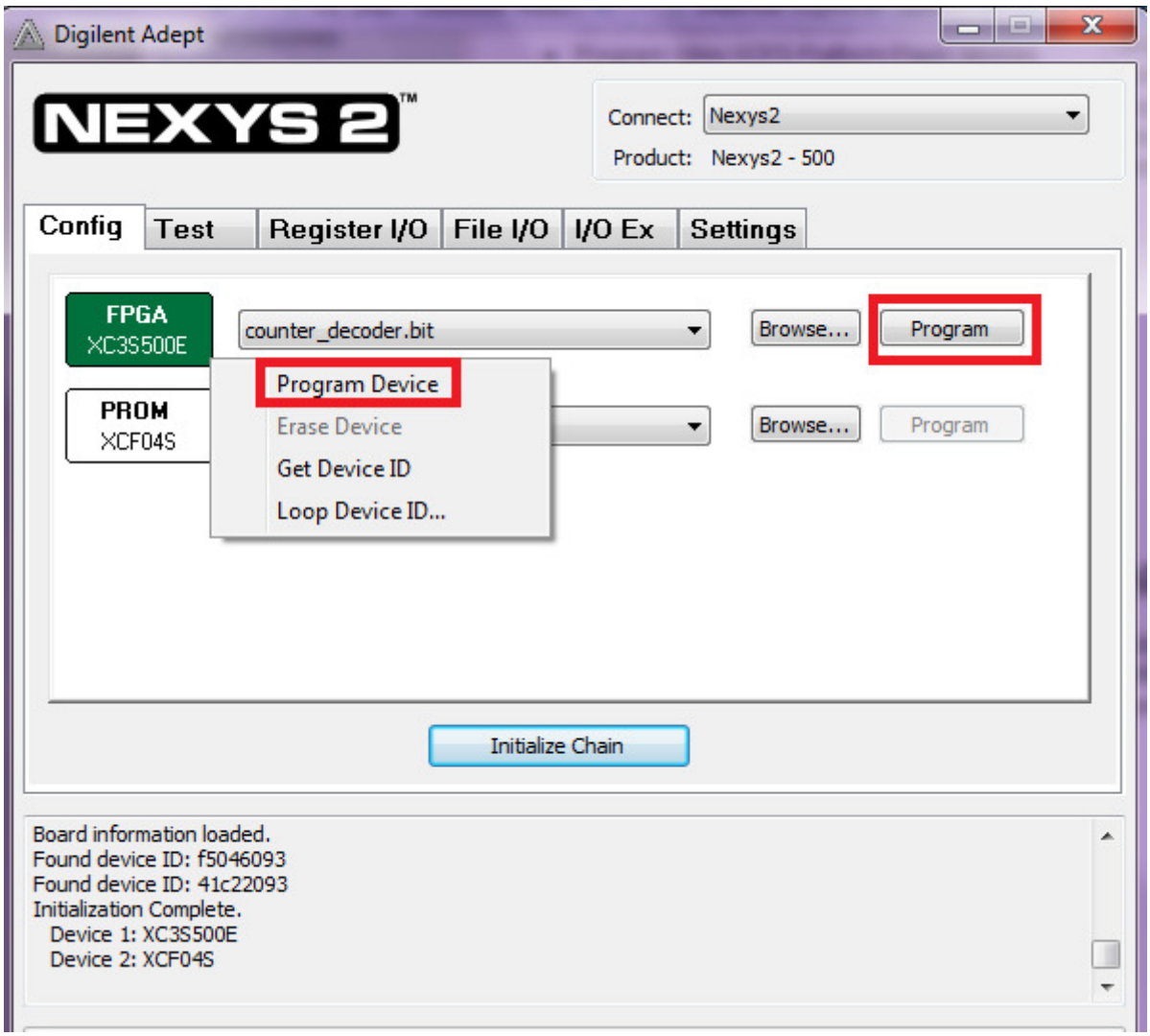


Fourth, connect your Nexys 2 board to your computer with the USB cable, if your PC is running Windows XP, you might need to wait for the operating system to recognize the board and install the USB driver for the USB port you are using. Click on the drop-down menu highlighted on the screen-shot above and select the name of the board which you are trying to communicate with, and then the Adept application should detect your board soon after.

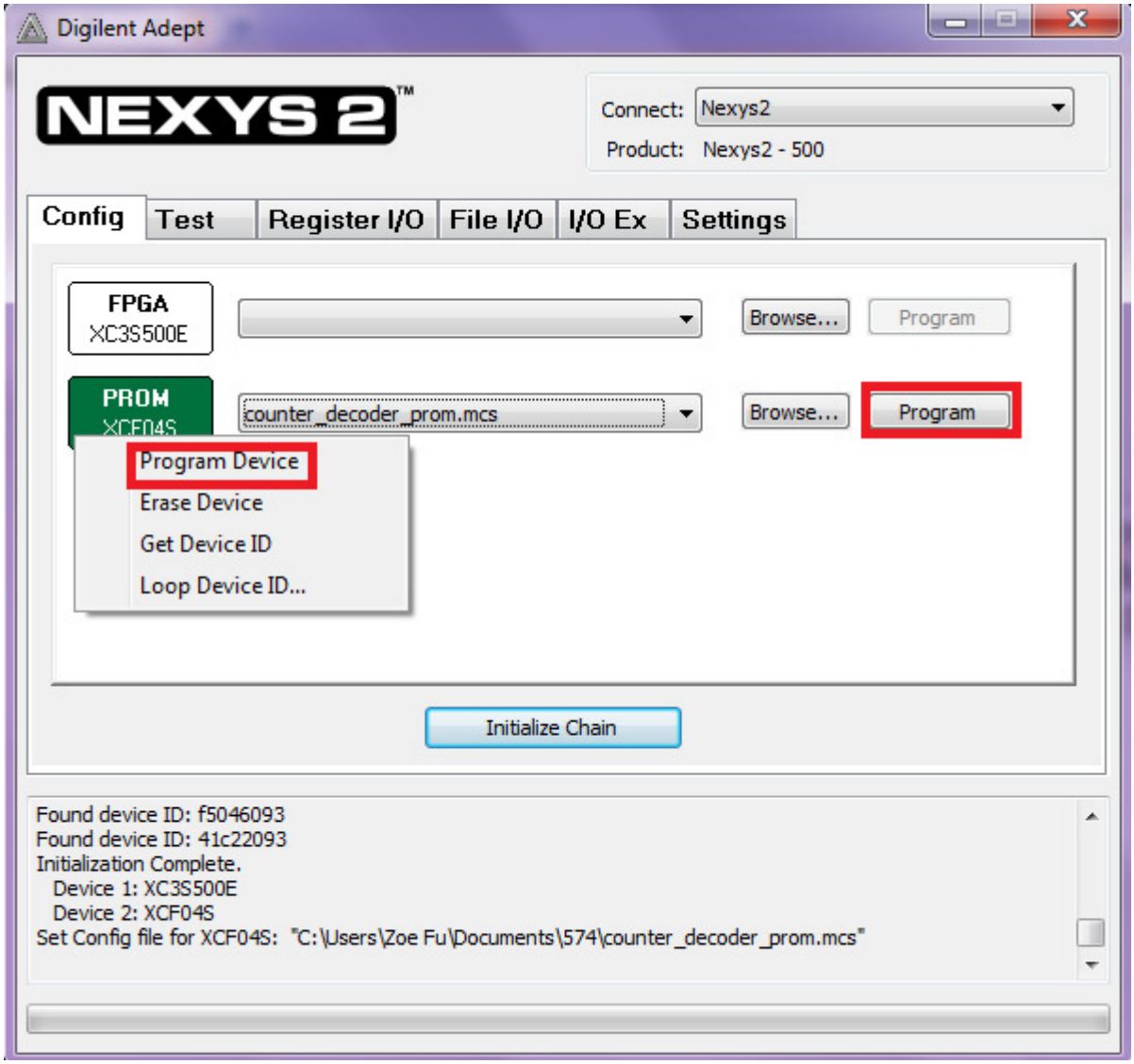


After previous steps, the chain should be initialized automatically, but you can also click on "Initialize Chain" to initialize it manually.

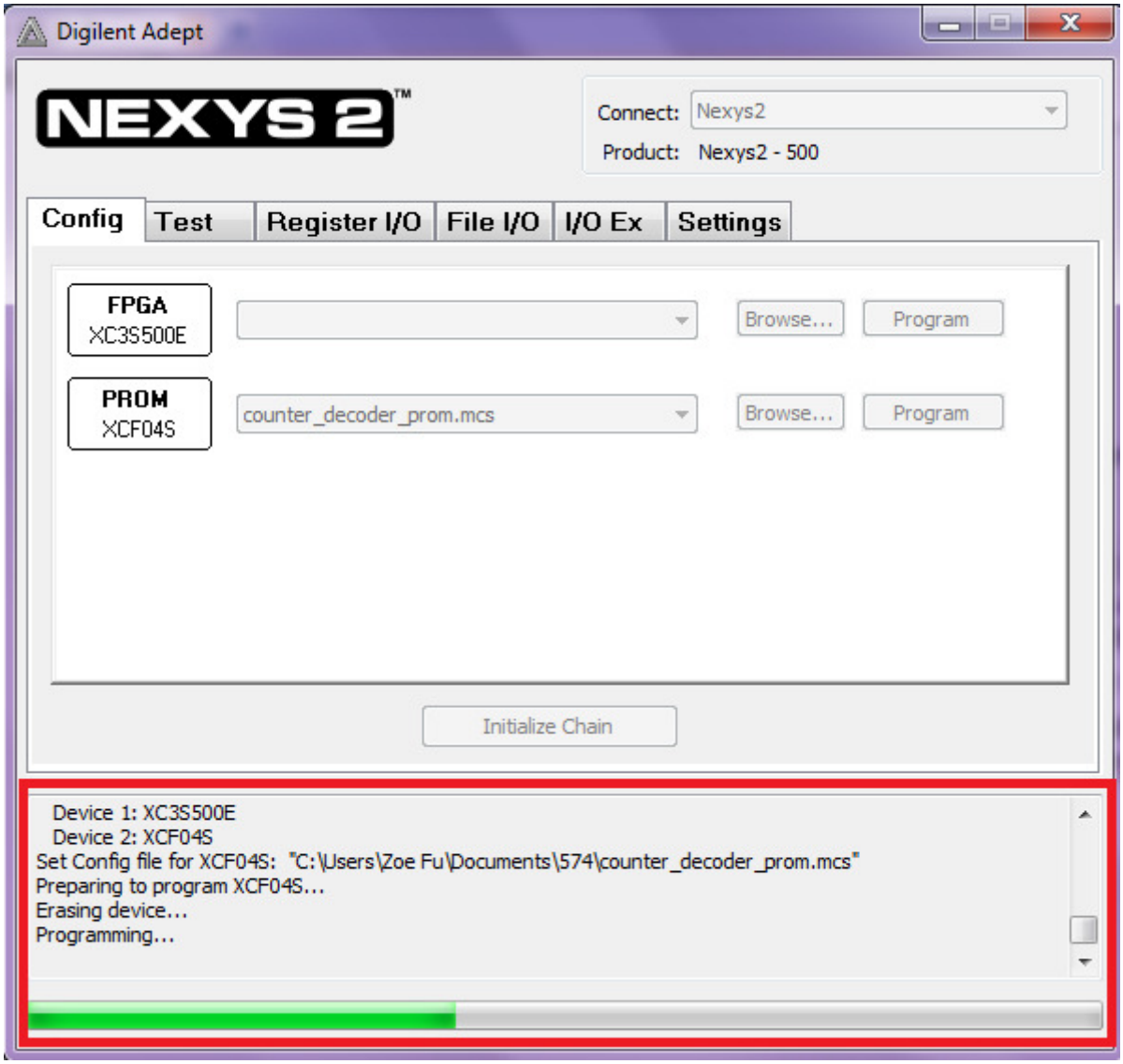
Fifth, now we are ready to program the devices!



When trying to program the FPGA, Click the Browse button nex to the FPGA device icon, select your configuration file(.bit) and click the open button. After that, program the FPGA chip by right-clicking on the FPGA device icon and select "Program Device" or simply hit the "Program" button on the right.



When trying to downloading the load to PROM, Click the Browse button nex to the PROM device icon, select your configuration file(.mcs) and click the open button. After that, program the PROM by right-clicking on the PROM device icon and select "Program Device" or simply hit the "Program" button on the right. We can also erase the PROM first before programming it.



We can check the progress of our operations in the window at the bottom of the interface.

At last, if programming successfully, we should be able to see if our projects and loads actually work fine on the board.

Advanced features or further information of Adept software in details can be found @

http://www.digilentinc.com/Data/Documents/Tutorials/Adept%20Software%20Basic%20Tutorial.pdf

Have fun!