1. Download and open the Board_Test project from Canvas.
2. There should be two files, board_test.v and PIN_MAP.ucf
   a. board_test.v is the program we will use to test the board.
   b. PIN_MAP.ucf is the constraints file which defines the I/O-to-pin mappings. Pin names can be found in the User Manual, or the Master UCF file, both available on Canvas.
3. In Project Navigator, create a new project, and add the two files from the ZIP.
   a. Use 'Add a copy of source file' option. It's the second button underneath the 'add new source' button.
4. Open the PIN_MAP.ucf file and fill in the required information, using the User Manual.
5. With board_test.v selected, right-clickl on 'Configure Target Device' and select 'Run.'
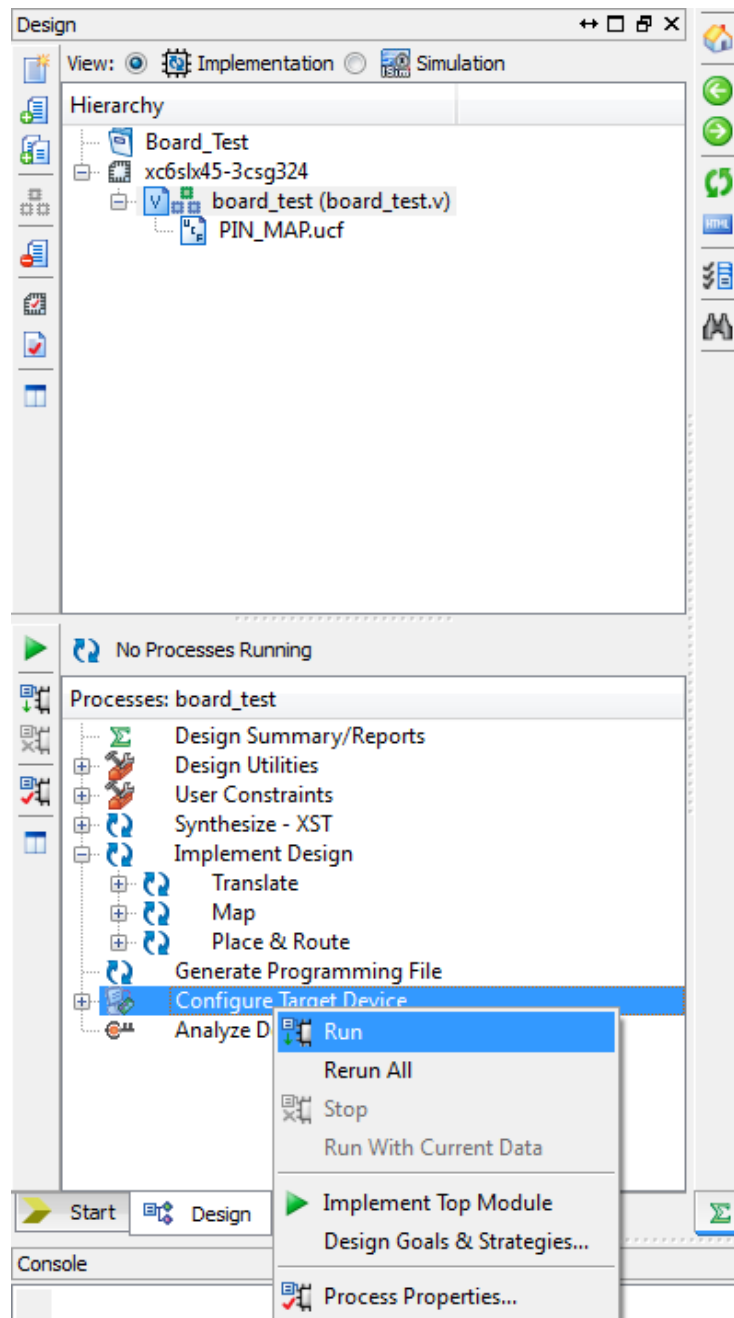
6. The program will run through the various synthesis steps. Symbols will appear next to the process names indicating the status. Green is good. Red is bad. Yellow might be bad, too. Orange means it's outdated, which isn't necessarily bad.
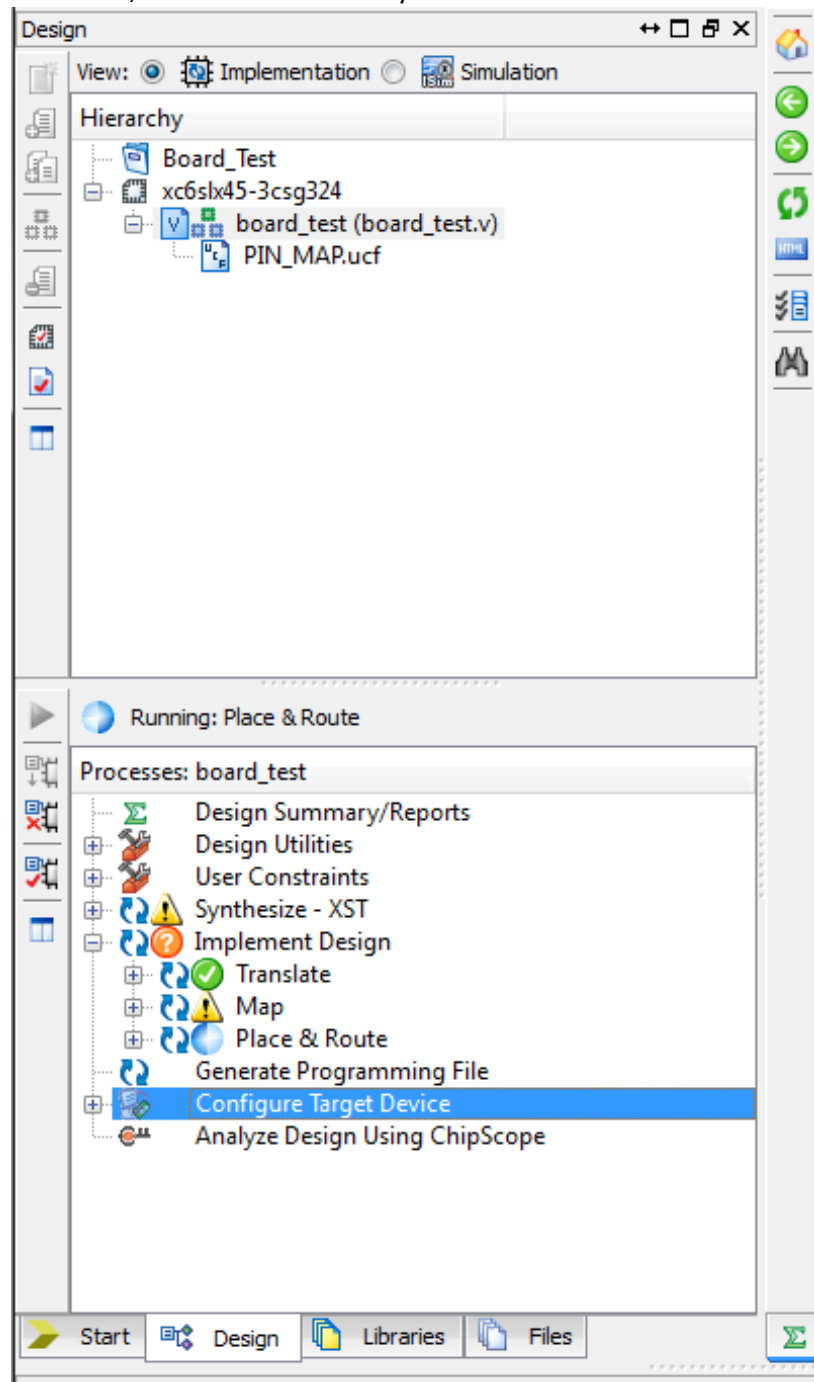

7. If you get warnings, check the log. Some warnings, such as those about Licenses, can be ignored. Others, such as 'your design is probably broken and won't work' are typically more important, and should not be ignored.

8. When it has generated the programming file, you should get a warning. It will probably look much like this:
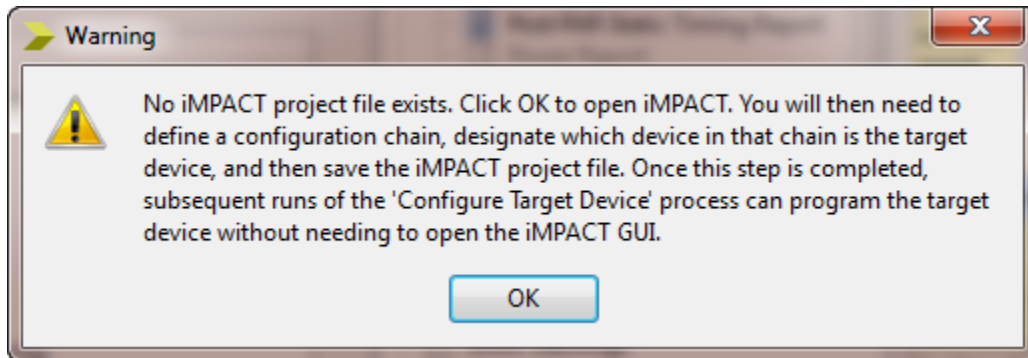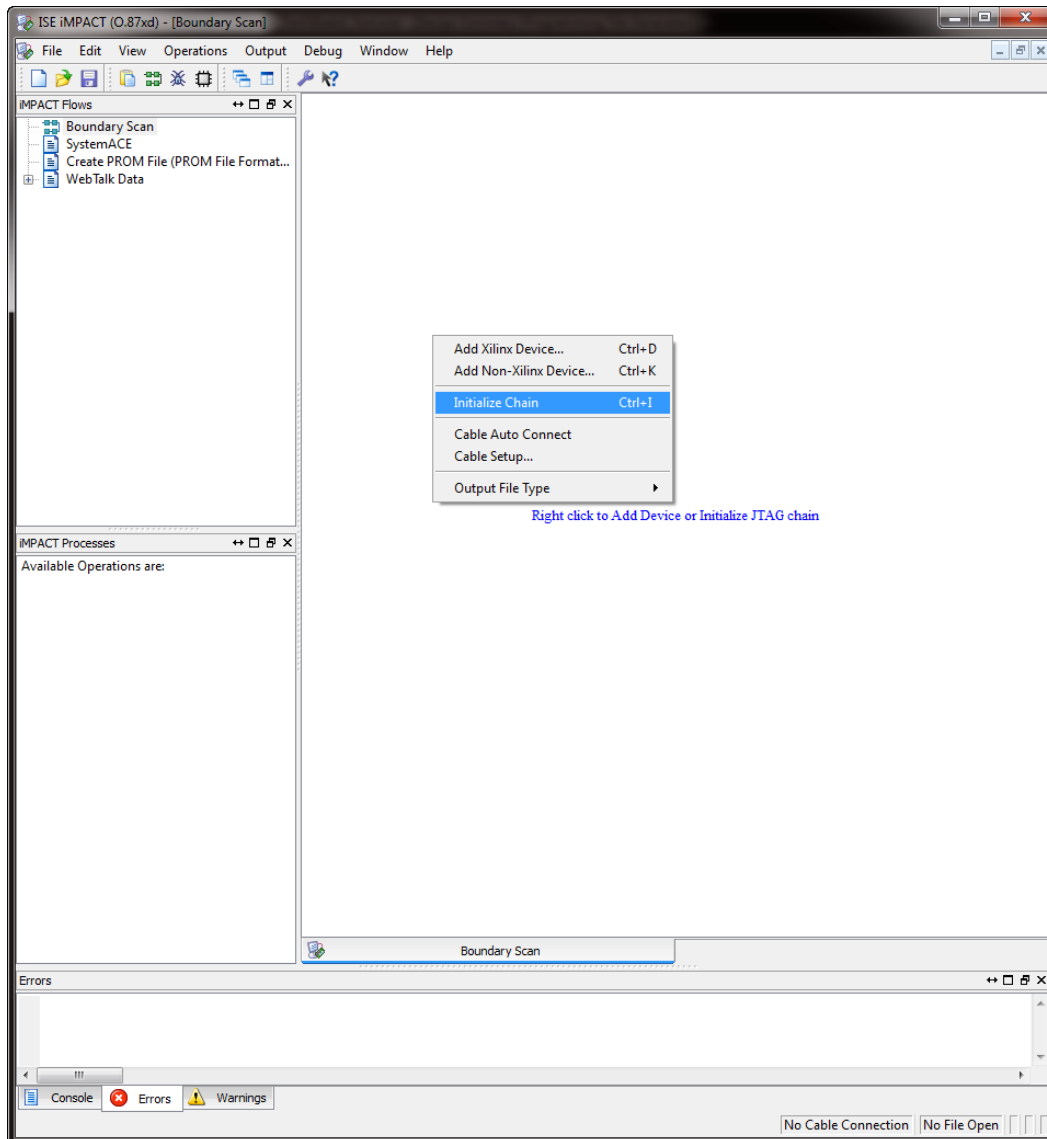

9. Go ahead and click 'OK.' The ISE iMPACT tool will open. (No, I didn't invert capslock; they actually spell it with that backwards capitalization.)
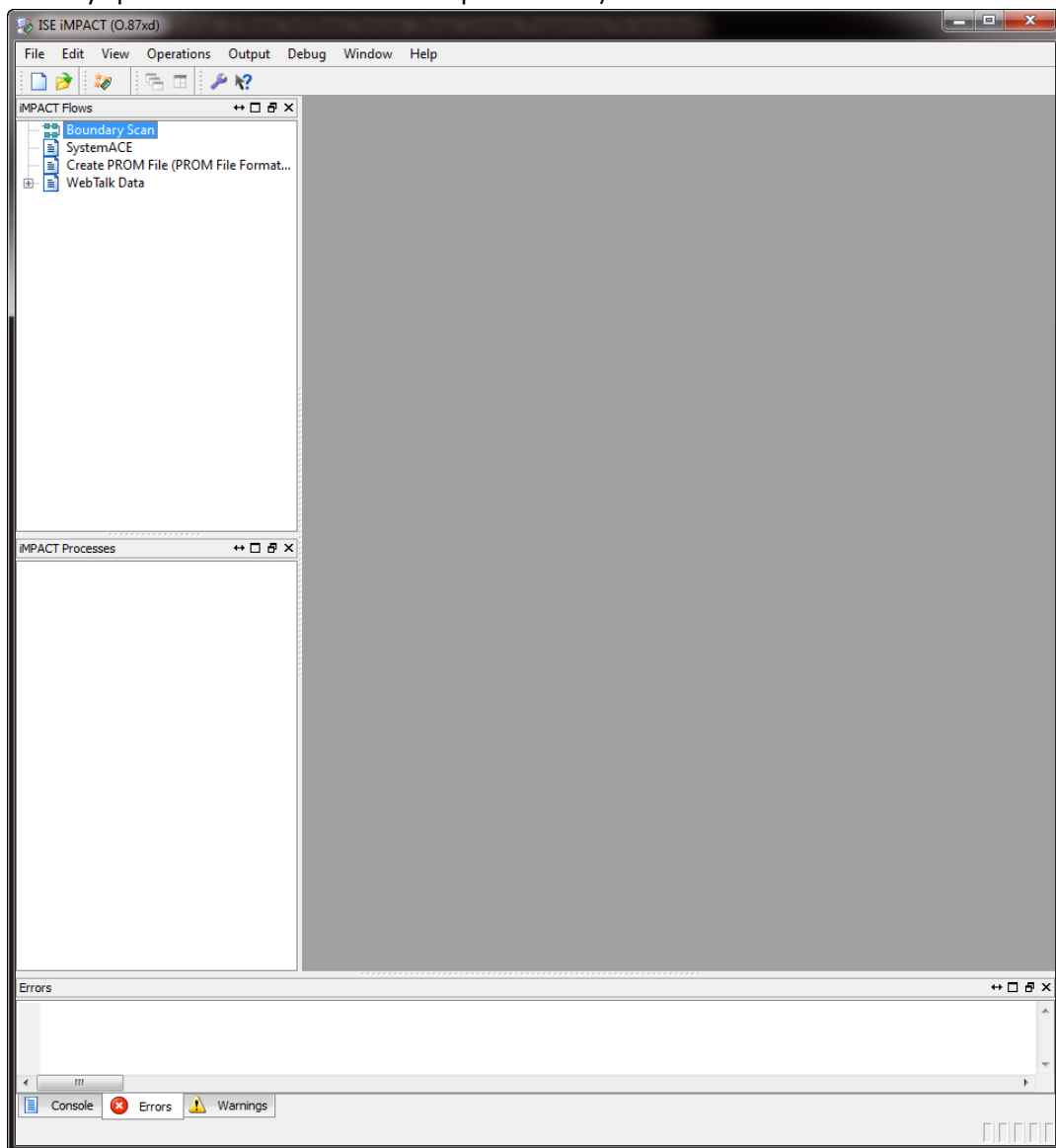

10. Double-click on 'Boundary Scan'

11. When the main panel changes to say "Right Click…", then… right click in that space and select 'Initialize Chain.'

12. A couple things will happen at this point.
    a. An overlay should appear on the screen informing you that Indentify Succeeded, and the JTAG chain information should appear. If not, something has gone terribly wrong.
        i. Is the board plugged in to the computer via USB?
        ii. Is the USB cable plugged into the PROG port on the FPGA?
        iii. Is the board plugged into power?
        iv. Is the board powered on?
        v. Is the board connected to the computer you are using?
        vi. Do you even have a board?
    b. A prompt will appear asking you if you would like to assign configuration files. You wouldn't; click 'Cancel All'.
    c. Once you dismiss that prompt, it will open the 'Device Programming Properties' window. Just click cancel on that for now.
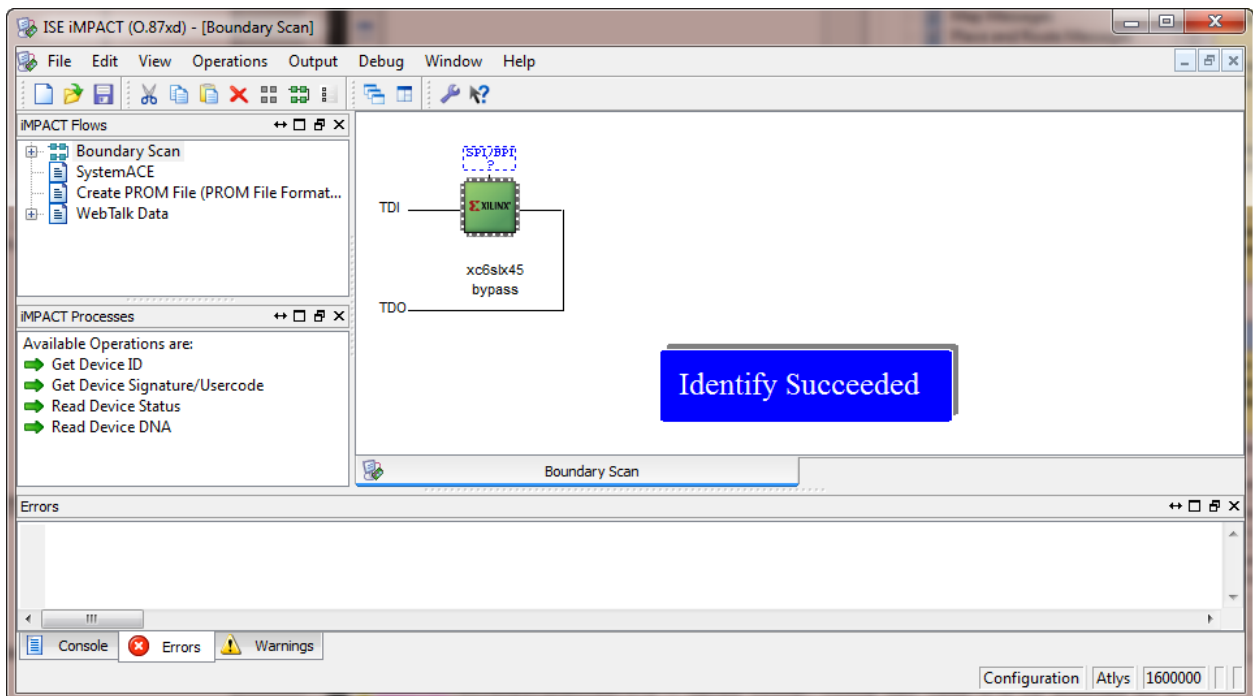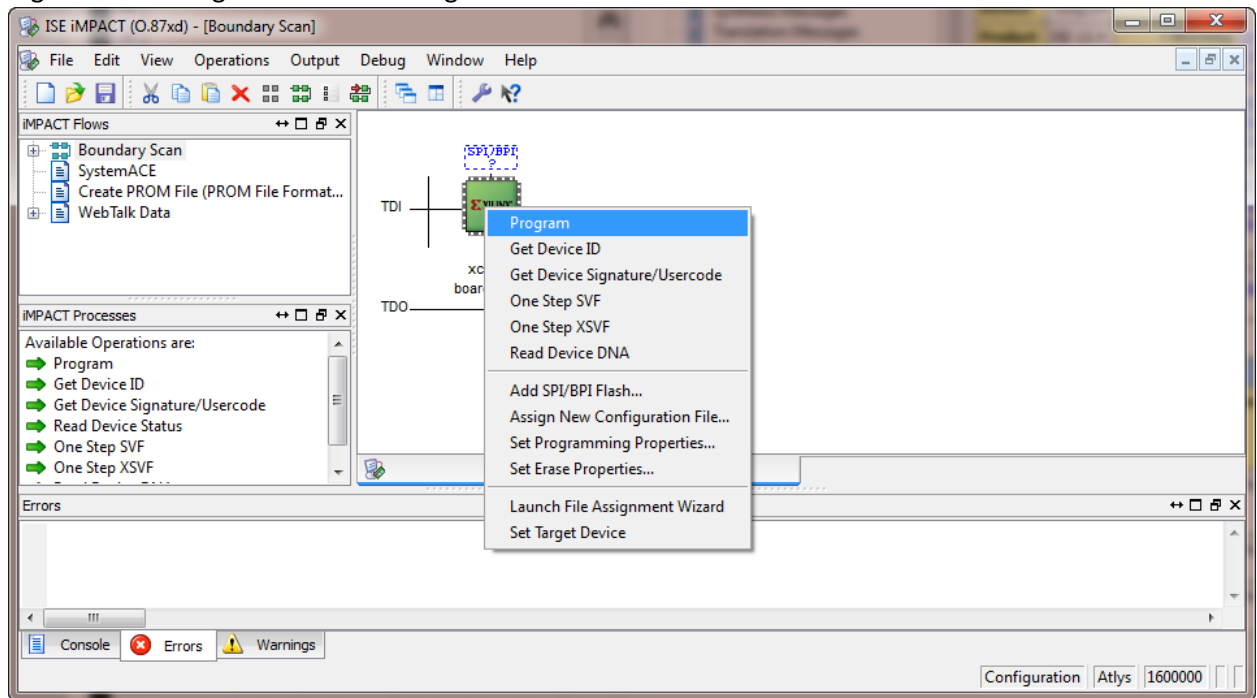
13. Right-click on the 'xc6xsl45' box and select 'Assign New Configuration File'
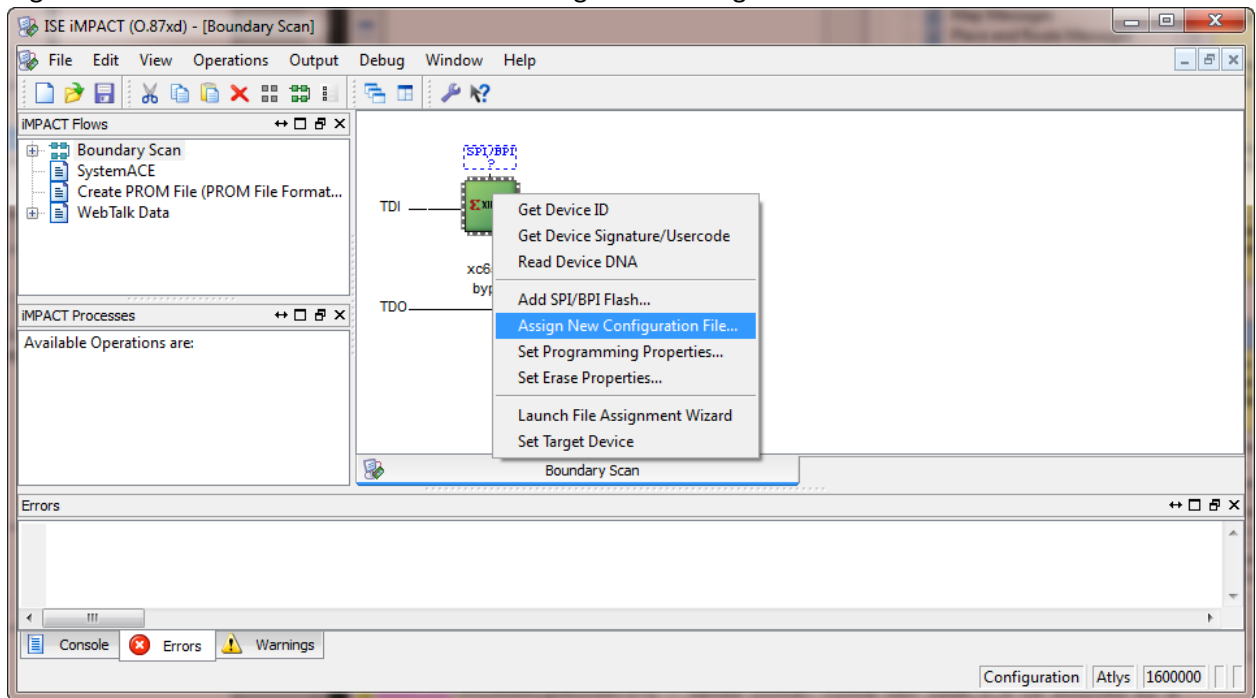
14. Navigate to the project directory, and select 'board_test.bit' file. When it asks you if you want to attach a SPI or BPI PROM, select no.

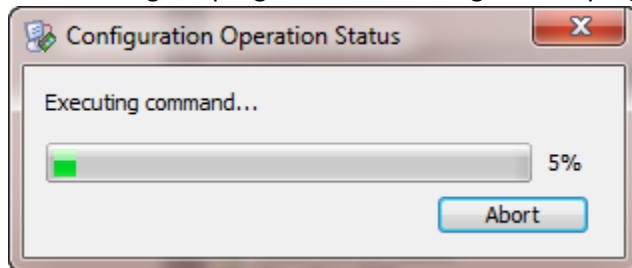15. It should now indicate that the program is associated with the device.
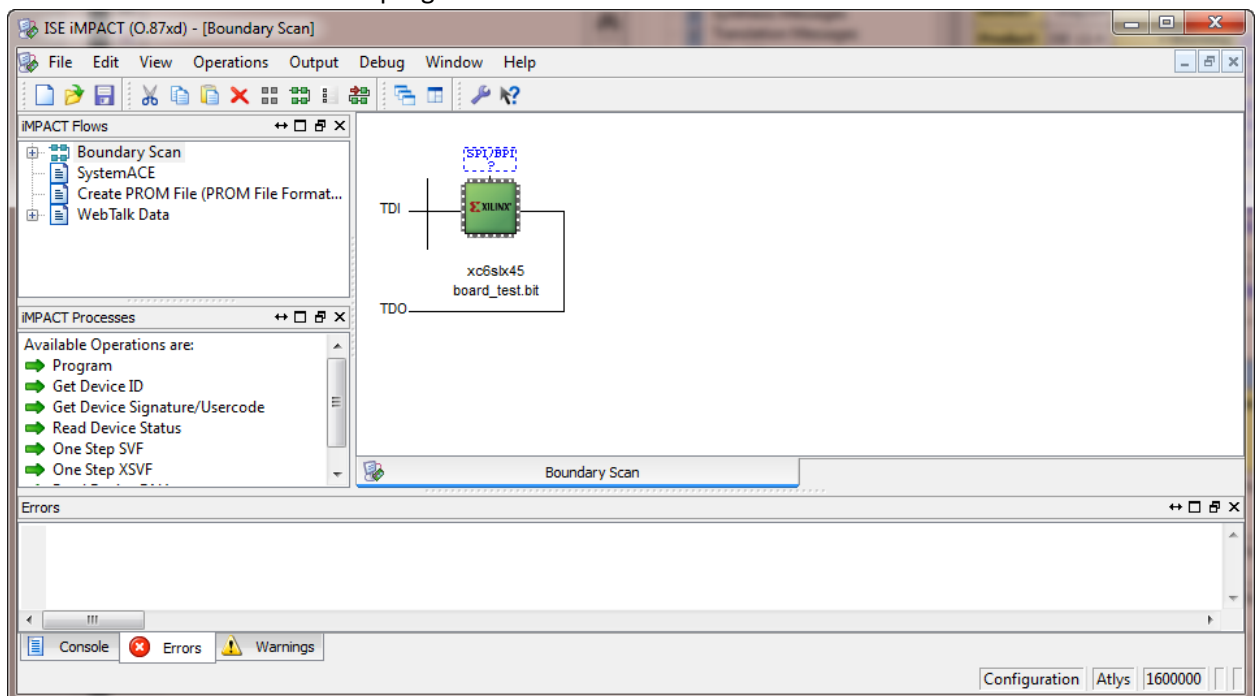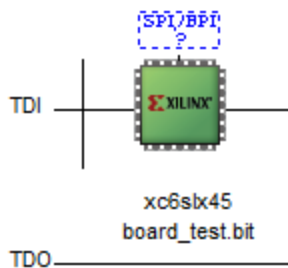
16. Right-click on it again and select 'Program.'

17. The 'Device Programming Properties' page pops up (again). This time, select 'OK'

18. You should get a progress bar indicating… well… progress.

19. Then it will tell you it succeeded (which is good).

20. The board should work as following:
    a. Pressing 'UP' lights up all the LEDs.
    b. Pressing 'DOWN' disables all the LEDs.
    c. Pressing 'LEFT' lights up only the leftmost 4 LEDs.
    d. Pressing 'RIGHT' lights up only the rightmost 4 LEDs.
    e. Pressing 'CENTER' sets the LEDs corresponding to the switches below them.
        i. Changing the switches does NOT change the LED until CENTER is pressed.