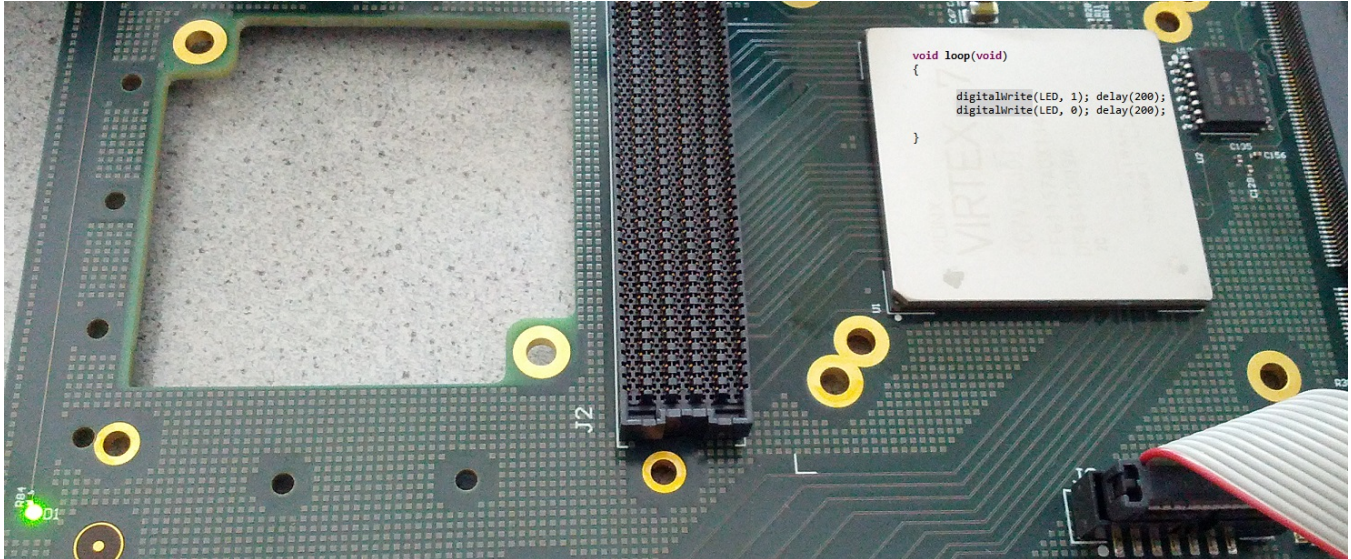


Arduino with VIRTEX-7

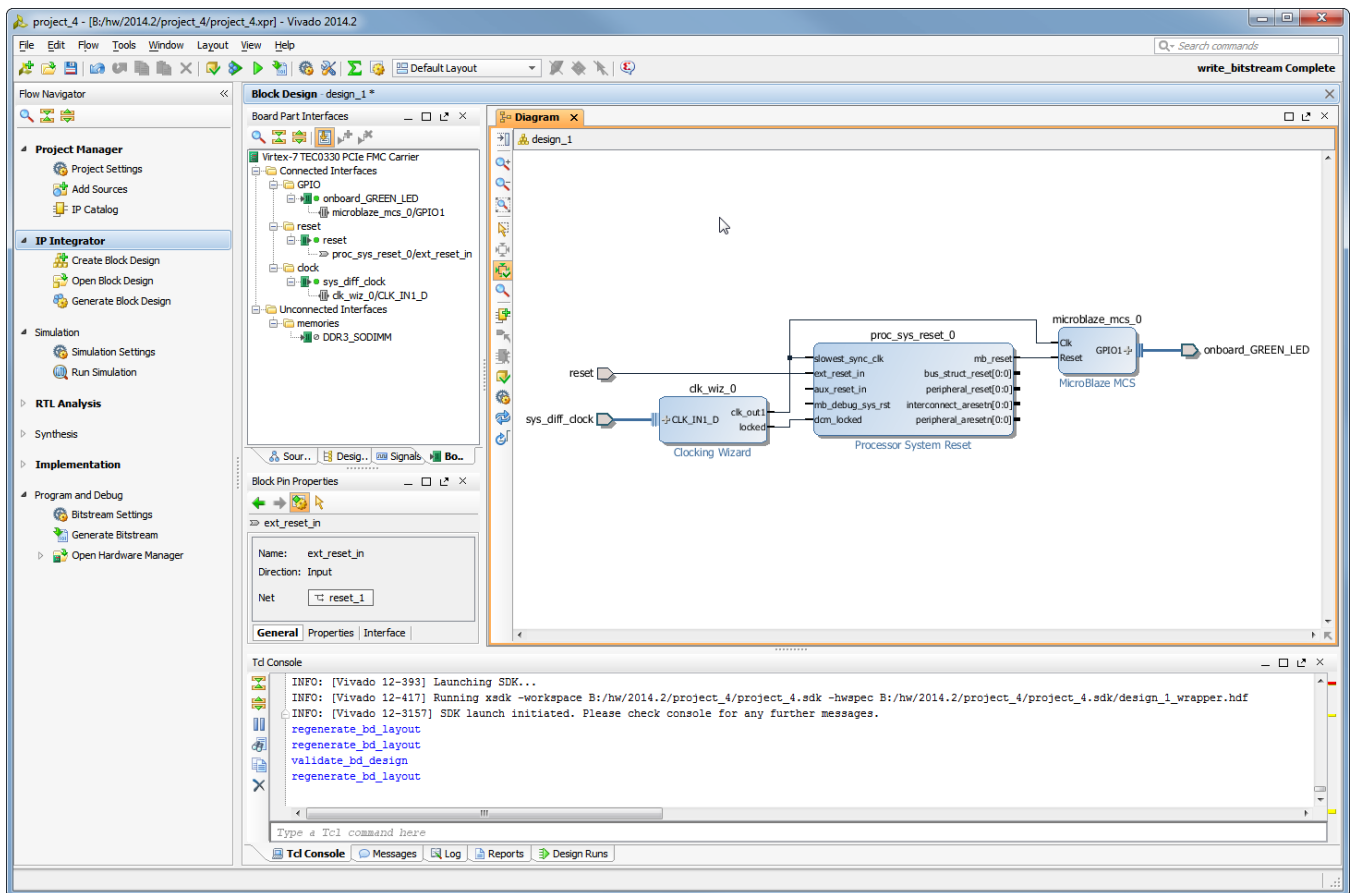


Why should anyone want to run Arduino code on Virtex-7 ever you may ask? Let's look the prices first: as of current listing XC7VX330T-2FFG1157C costs 3204 USD or 2366 EUR.

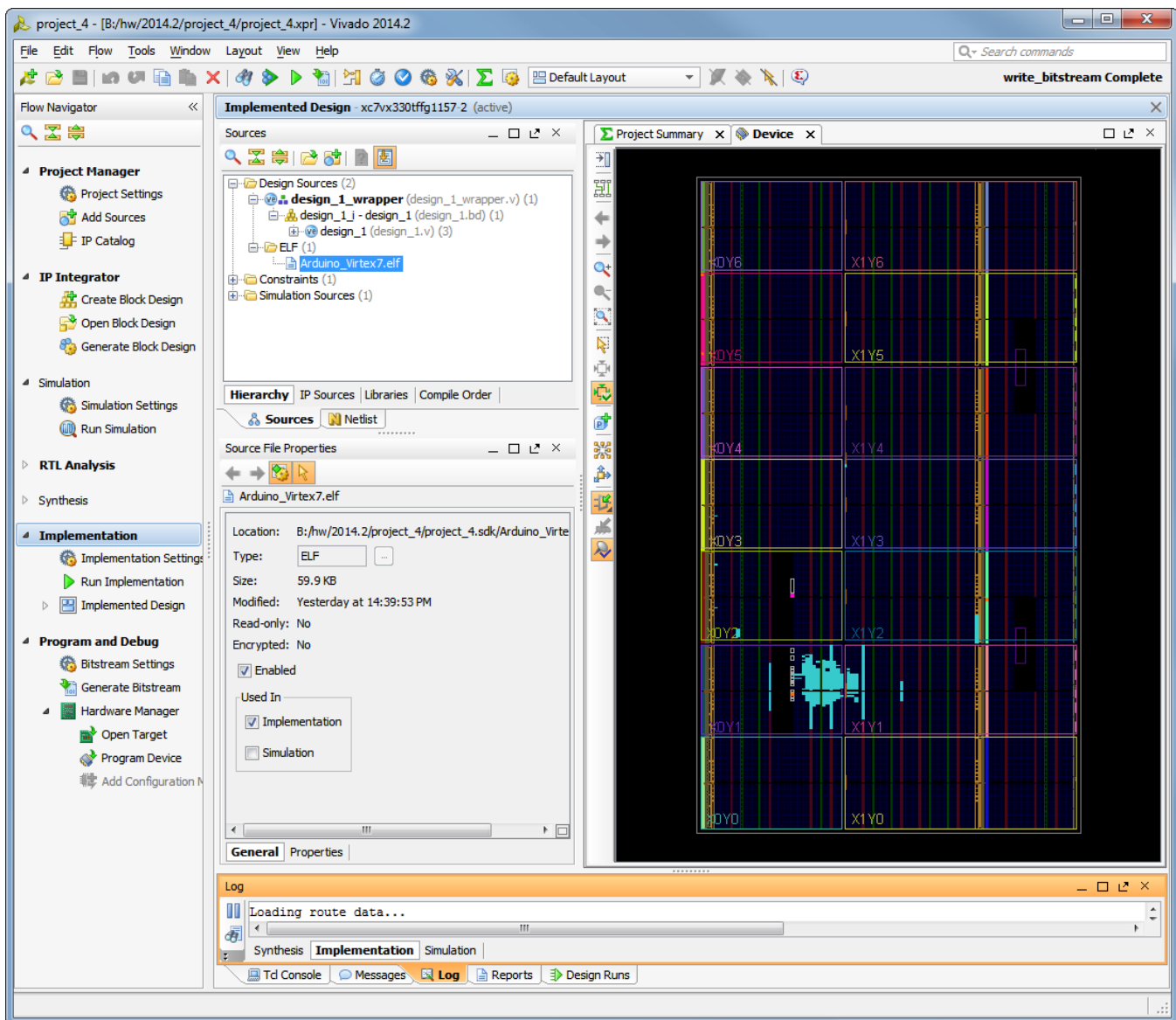
On my desk there is a PCB board that did come from our Vapor Phase oven yesterday. On the board there is a LED. This LED blinks, it says hello, I am alive. There is a chip on the board, and on that it reads: XC7VX330T-2FFG1157C

Lets look closer how the LED was made to Blink. Why it makes sense I tell another day.

Step 1: Hardware Design



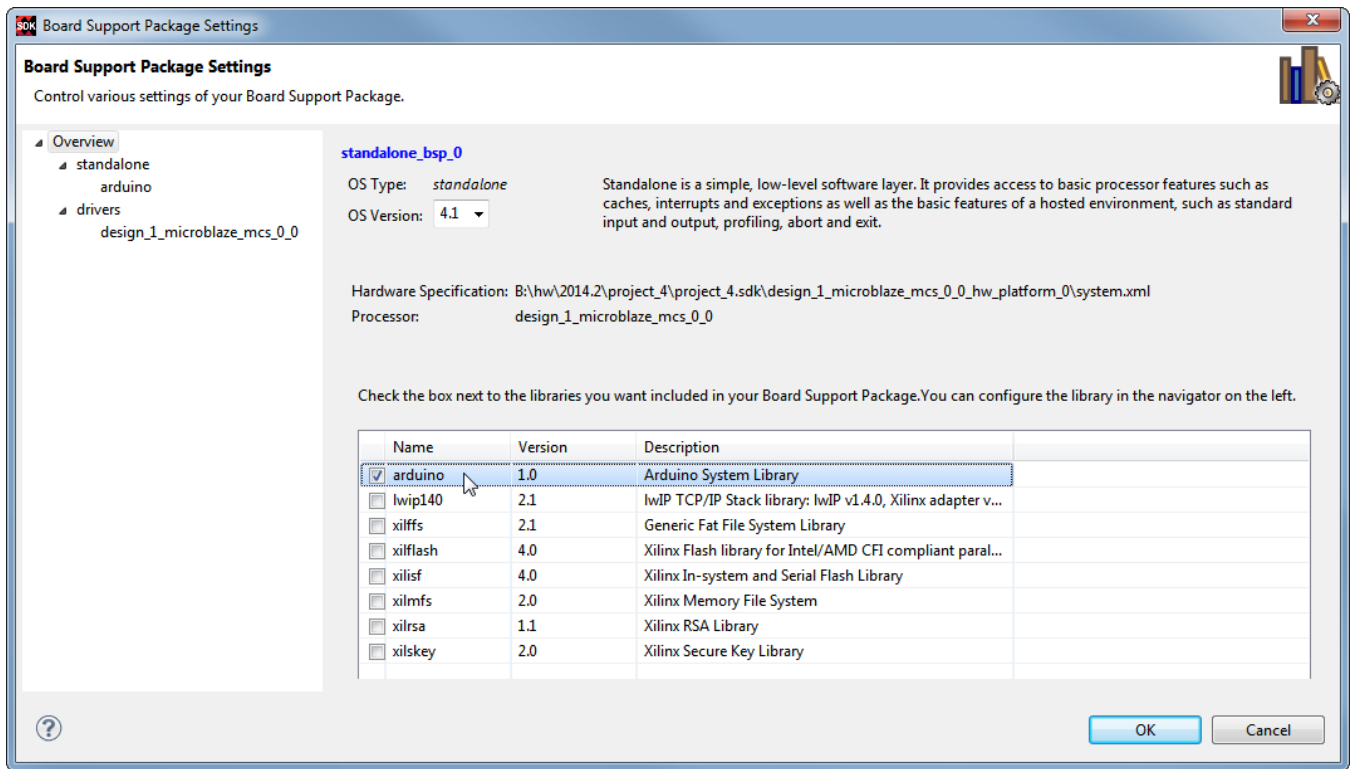
I have dropped Xilinx Microblaze MCS onto the Block design. all the Interface ports to the real hardware (clock, reset and LED) are connected automatically using Vivado Board Part Interface flow. So for making this hardware design, there is nothing to look in any documents, just select the Board to work with, and go. All constraints are managed by Vivado. We can now just run generate bitstream.



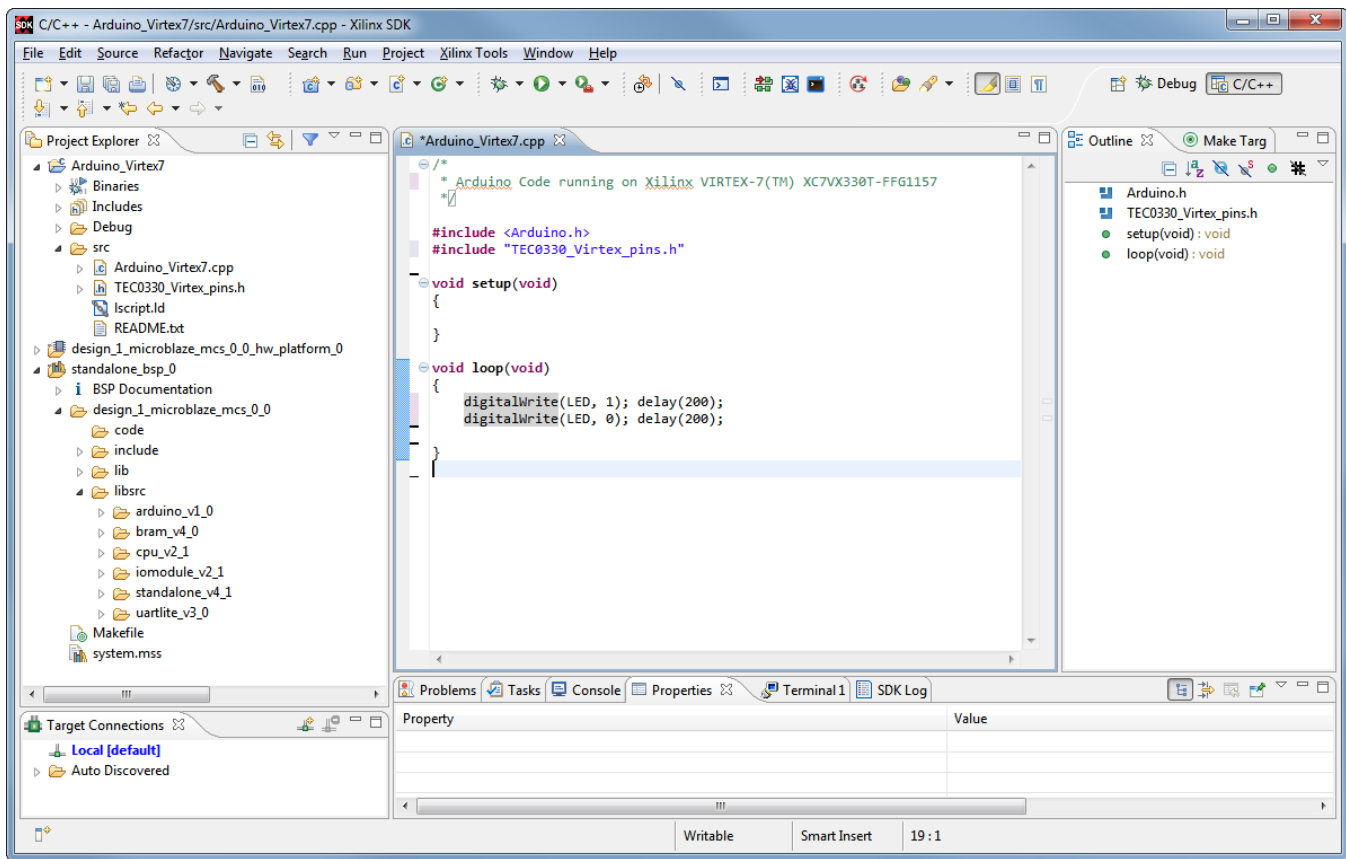
Design is implemented, we go to software design flow now.

Step 2: From Hardware to Software

As soon as Vivado has generated the output products and bitstream we can move from Hardware design to Software. In Vivado Export and Launch SDK. We create new BSP and select Arduino System Library to be included.



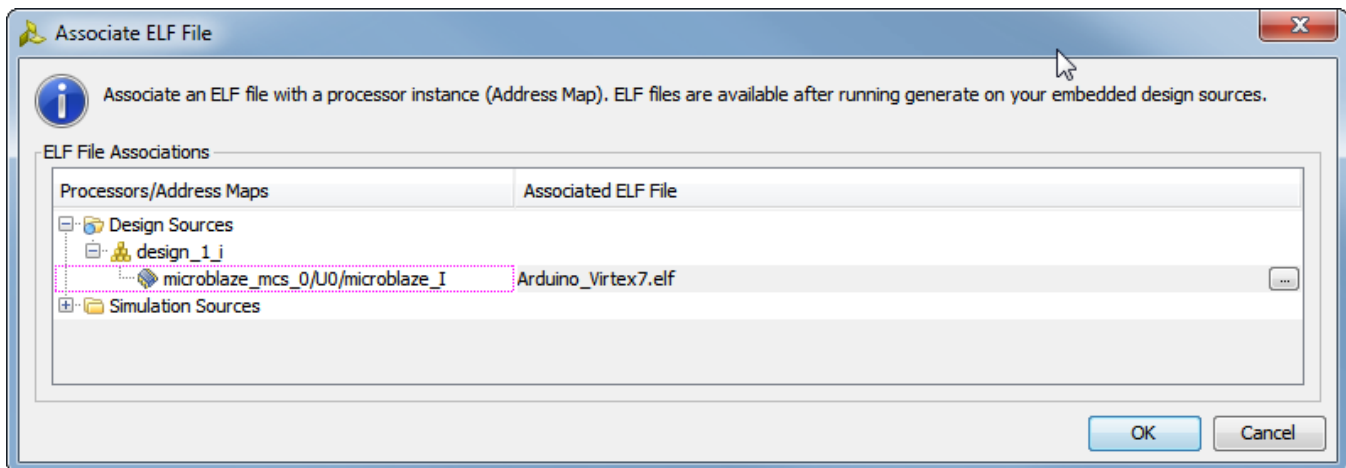
Now we are ready to write some Arduino Code! A LED Blinky would do for now.



Done, we select debug-as and start in Debugger. LED Blinks!

Flash Programming

How about Programming the Arduino code into the Flash memory so that it starts when FPGA loads? First we have to tell Vivado what Software file we want to use, so we associate the proper ELF File.



Now we tell Vivado what Flash Memory is used on our board:

Choose a configuration memory part. This can be changed later.

Device: xc7vx330t_0

Filter

ManufacturerMicron

Density (Mb)All

Typespi

WidthAll

Reset All Filters

Select Configuration Memory Part

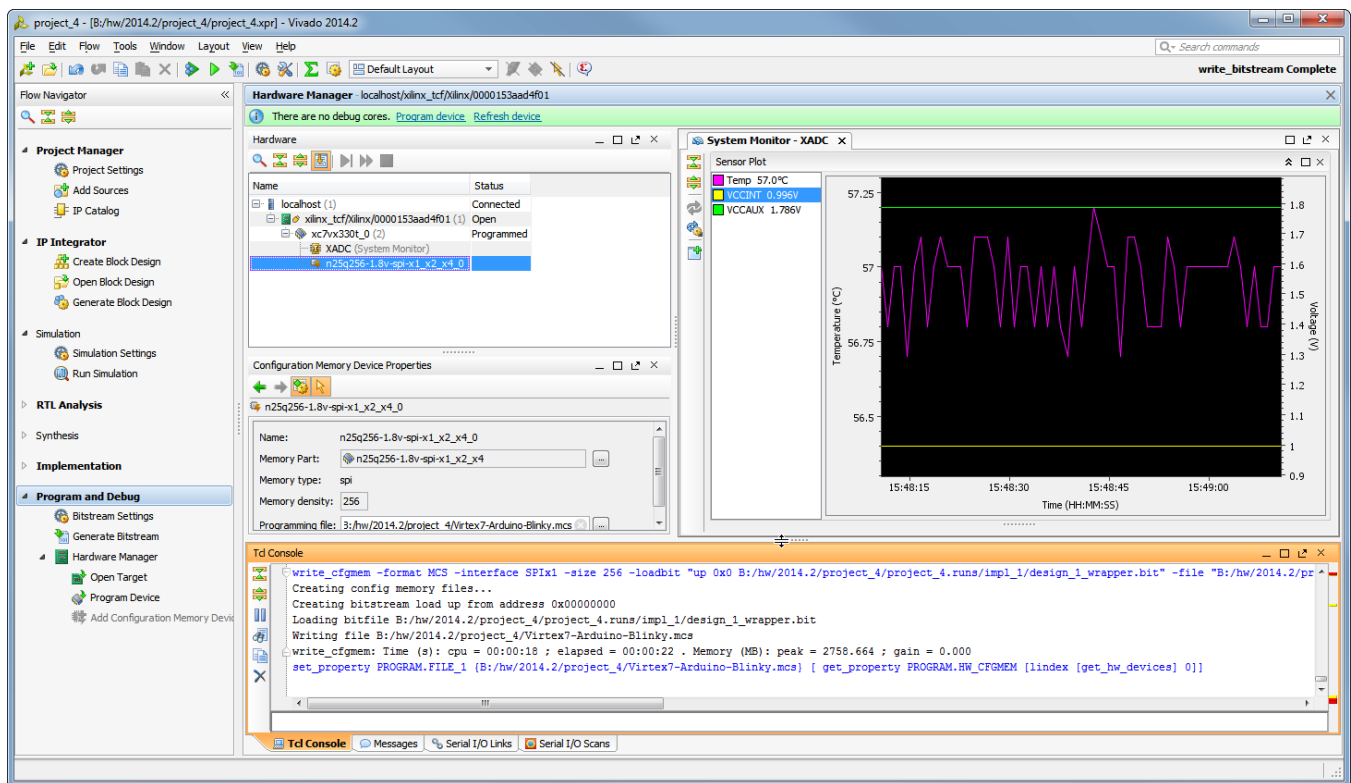
Search:

Name	Part	Manufacturer	Alias	Family	Type	Density (Mb)	Width
n25q256-1.8v-spi-x1_x2_x4	n25q256-1.8v	Micron		n25q	spi	256	x1_x2_x4
n25q128-1.8v-spi-x1_x2_x4	n25q128-1.8v	Micron		n25q	spi	128	x1_x2_x4
mt25ql512-spi-x1_x2_x4	mt25ql512	Micron		mt25qu	spi	512	x1_x2_x4
mt25qu512-spi-x1_x2_x4	mt25qu512	Micron		mt25qu	spi	512	x1_x2_x4

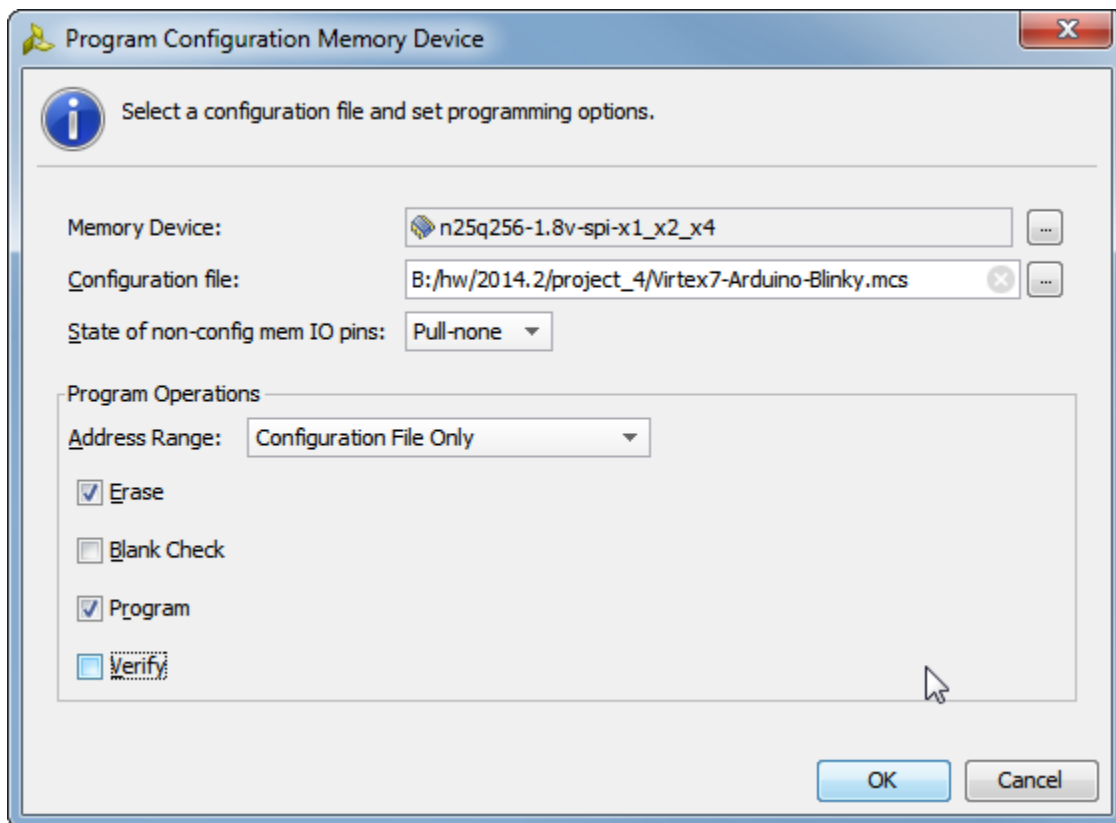
OK

Cancel

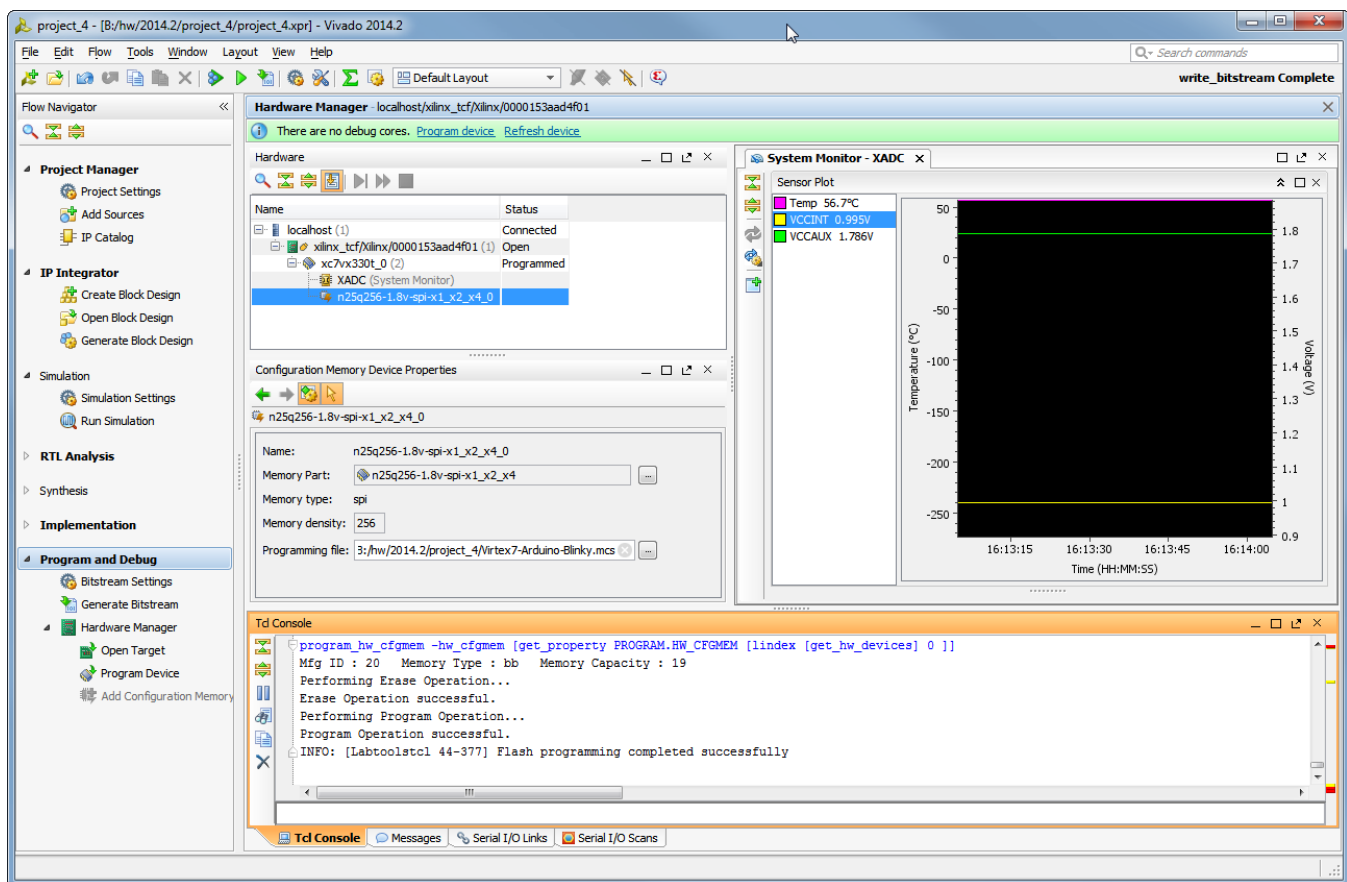
And ready we are to write the Flash memory. Almost.. there is one step still required that currently is not available from the menus. So single line of TCL code should be executed.



So the BIT file is converted to MCS and ready for flashing!



Click OK to Program..



And ready we are. Now lets try power cycle - power off, power on.. and LED Blinks again.

Xilinx Virtex-7 has configured itself with Arduino Code and Says "Blink..Blink" to all of us.

And what did I miss in the process? I forgot to set the bitstream options, so it did take painfully long (About 1 minute to load the bitstream!) to start after cold restart. So here some screenshots of the property settings:

Q

General

Configuration

Configuration Modes

Startup

Encryption

Readback

Configuration

Configuration Setup

Configuration Rate (MHz)66

Enable external configuration clock and set divide valueDISABLE

Configuration Voltage1.8

Configuration Bank Voltage SelectionGND

BPI Configuration

1st Read cycle1

Page Size (bytes)1

Synchronous ModeDISABLE

SPI Configuration

Enable SPI 32-bit address styleNO

Bus width4

Enable the FPGA to use a falling edge clock for SPI data captureNO

MultiBoot Settings

Load a fallback bitstream when a configuration attempt failsDISABLE

Starting address for the next configuration in a MultiBoot setup0X00000000

Enable the IPROG command in BitstreamENABLE

Specify the internal value of the RS[1:0] settings in the Warm Boot Start Address00

Enable whether the RS[1:0] tristate is enabled by setting the option in the Warm Boot Start AddressDISABLE

Watchdog Timer value in Configuration mode0X00000000

Configuration Pin Settings during User Mode

Cclk PinPULLUP

DONE PinPULLUP

INIT PinPULLUP

M0 PinPULLUP

M1 PinPULLUP

M2 PinPULLUP

PROGRAM PinPULLUP

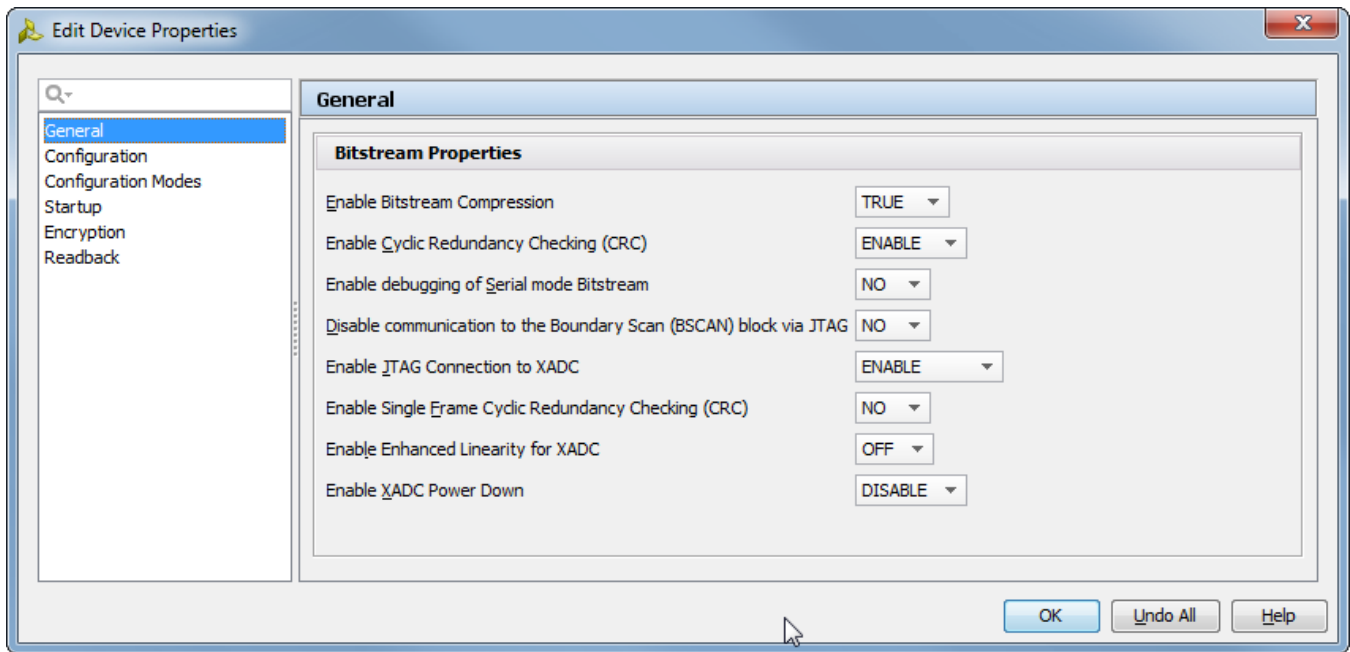
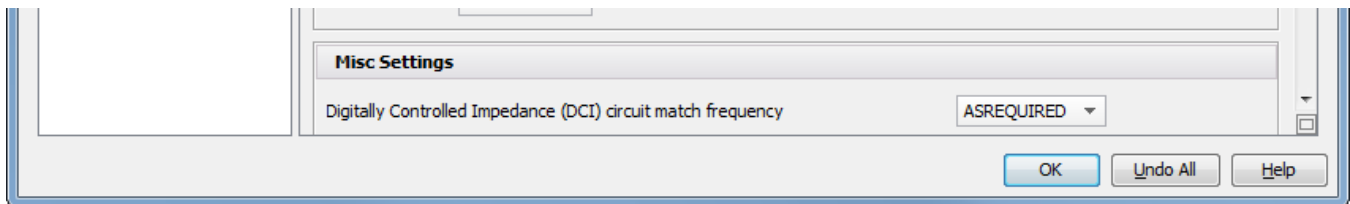
TCK PinPULLUP

TDI PinPULLUP

TDO PinPULLUP

TMS PinPULLUP

Unused IOB PinsPULLDOWN



A small hint: those properties are not always accessible, so if you can not find them, just run the flow and open implemented design.