Digilent Plug-in for Xilinx 12.x Tools User Manual

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Overview

The Digilent Plug-in for Xilinx tools allows Xilinx software tools to directly use the Digilent USB-JTAG FPGA configuration circuitry. For 12.x, Xilinx Impact, Chipscope Pro, EDK Xilinx Microprocessor Debugger (XMD) command line mode, and EDK Software Development Kit (SDK) are currently supported by the Plug-in. Refer to http://www.xilinx.com/ for more information about these Xilinx design tools. Demonstration Designs for the Nexys2 and Basys2 boards are provided to verify correct operation of the plug-in.

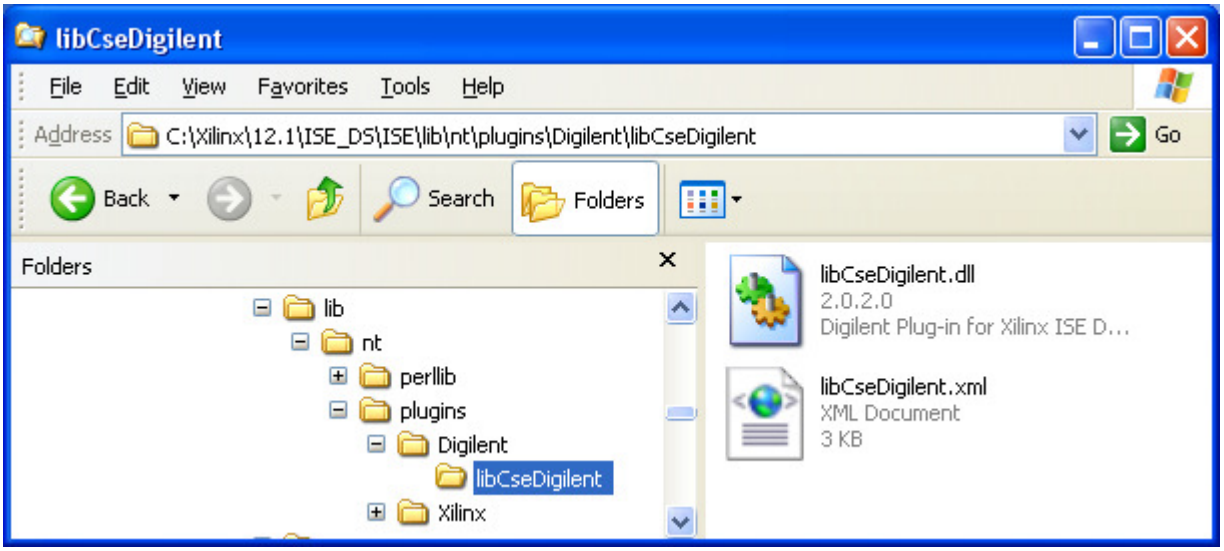
Software Versions Tested:
Xilinx ISE Design Suite Version 12.x only (Refer to http://www.digilentinc.com/ for versions of the plugin for later Xilinx ISE versions)
Digilent Adept System 2.4 (or Digilent Runtime 2.3 for Linux) or greater
Supported Operating Systems:

- Microsoft Windows 32-bit and 64-bit Operating Systems
- Linux: Red Hat and CentOS 4.8, 5.4 (x86/x64), and SUSE 11.2 (x86/x64)

Windows Installation

To begin, ensure that the Xilinx ISE Suite (12.x only) and Digilent Adept System 2.4 (or greater) is installed on the host computer. The Plug-in files "libCseDigilent.dll" and "libCseDigilent.xml" must be copied into the ISE Design Suite installation.

For the ISE Design Suite, the typical location is
C:\Xilinx\12.1\ISE_DS\ISE\lib\nt\plugins\Digilent\libCseDigilent
Note: For 64-bit Windows, use **nt64** in place of **nt**



Linux Installation

To begin, ensure that the Xilinx ISE Suite (12.x only) and Digilent Adept Runtime 2.3 (or greater) is installed on the host computer. The Plug-in files "libCseDigilent.so" and "libCseDigilent.xml" must be copied into the ISE Design Suite installation.

For the ISE Design Suite, the typical location is **$XILINX/lib/lin/plugins/Digilent/libCseDigilent**
Note: For 64-bit Linux, use **lin64** in place of **lin**

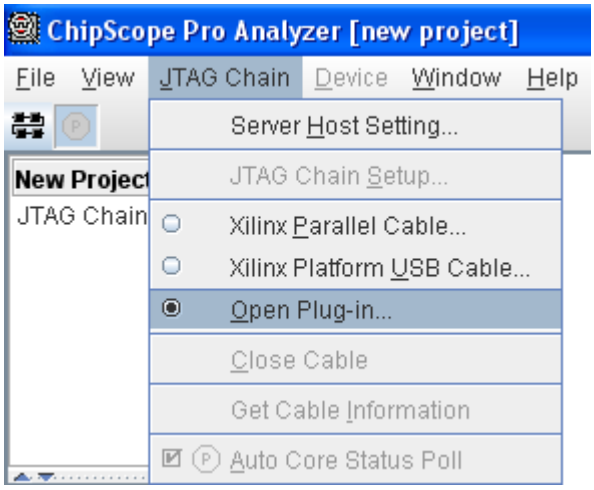
Nexys2 Demonstration Project

The Nexys2 Demonstration Project can be used to verify correct installation and operation of the Plug-in.

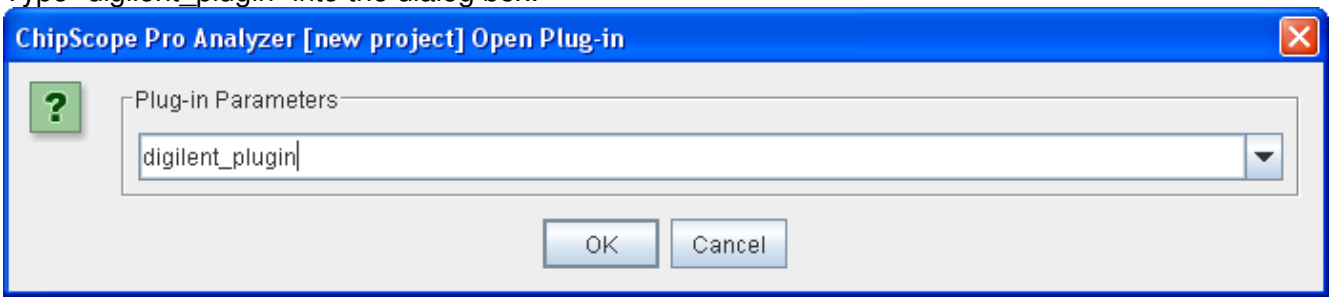
Chipscope Pro Setup

The Nexys2 Demonstration Project is a Xilinx EDK design with an embedded Chipscope Pro Virtual IO module. Refer to http://www.xilinx.com/ for more information about these Xilinx design tools.

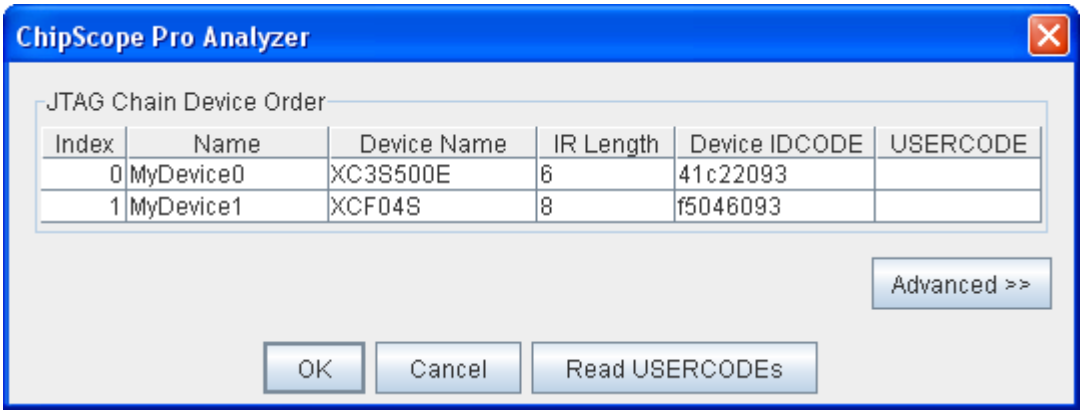
Launch Chipscope Pro Analyzer and Select the "JTAG Chain→Open Plug-in…" menu item.



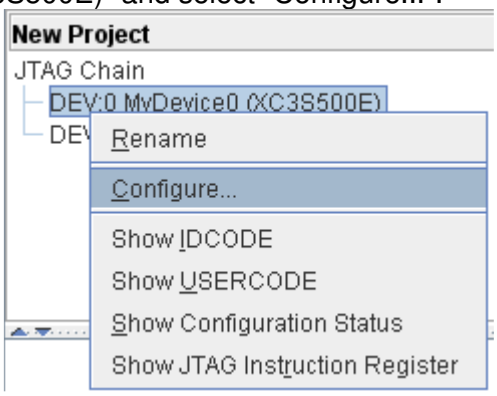
Type "digilent_plugin" into the dialog box:



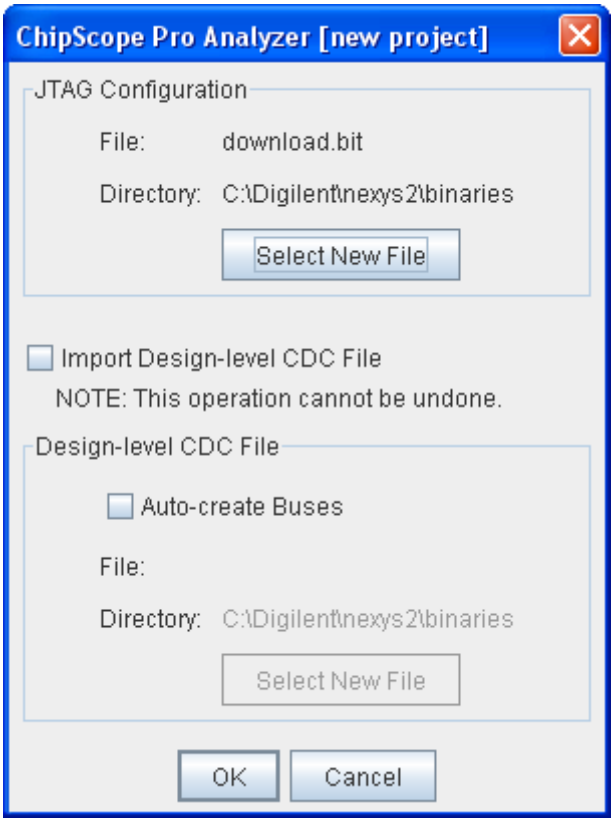
Chipscope Pro Analyzer will automatically detect the devices on the Nexys2 board:



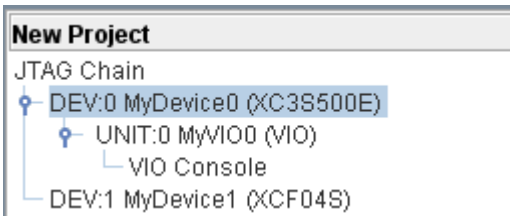
Right Click on "MyDevice0 (XC3S500E)" and select "Configure...":



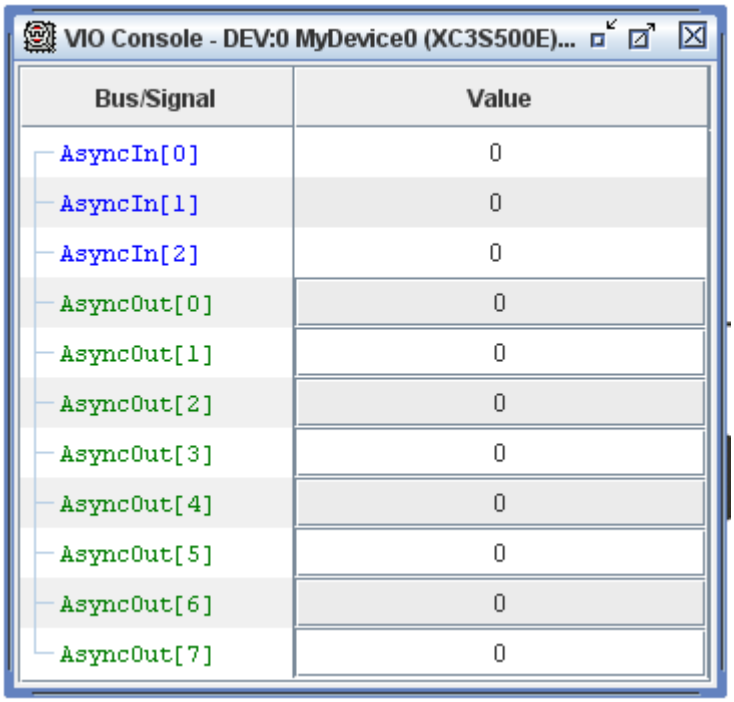
Select the "download.bit" file in the nexys2\binaries directory:



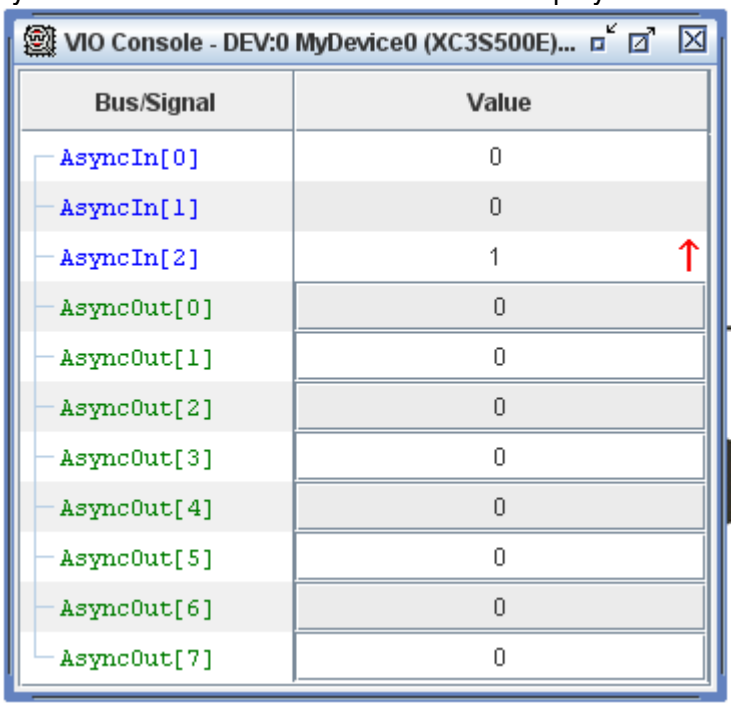
After selecting "OK", Chipscope Pro Analyzer will configure the FPGA with the "download.bit" configuration file. After successful configuration, the Yellow "Done" LED should be light on the Nexys2 board. The GUI will show there is one VIO Console device attached:



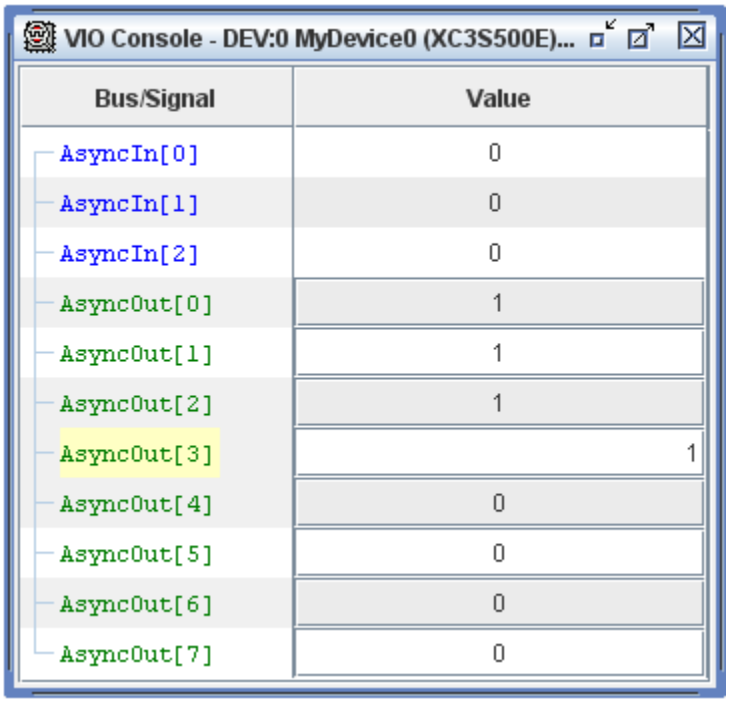
Double Click on the "VIO Console" item which brings up that window:



Press BTN3 on the Nexys2 board and notice the VIO Console displays that action.



The AsyncOut values are connected to the 8 LEDs on the Nexys2 board. Click on any of the Value cells to change their contents. The following configuration lights up 4 LEDs in a row:



Close Chipscope Pro Analyzer. This concludes the Chipscope Pro part of the Demonstration Project. While only the Virtual IO Console was used in this design, any Chipscope Pro module can be utilized to assist in debugging the design.

Xilinx Microprocessor Debugger (XMD) Setup

The Plug-in can also be used with Xilinx Microprocessor Debugger (XMD) command line mode. By adding the option "**`-cable type xilinx_plugin modulename digilent_plugin`**" to commands which interface with the hardware, XMD will utilize the Plug-in.

Note: Answer Record #35580 contains an updated XMD version for 12.1:
http://www.xilinx.com/support/answers/35580.htm

Here is an annotated example iteration. Launch the EDK Bash Shell and type the following commands in **bold**.

```
Xilinx Bash Shell
Xilinx EDK 12.1 Build EDK_MS1.53b
Copyright (c) 1995-2010 Xilinx, Inc.  All rights reserved.

~
$ cd /cygdrive/c/digilent/nexys2/binaries

~ /cygdrive/c/digilent/nexys2/binaries
$ xmd
Xilinx Microprocessor Debugger (XMD) Engine
Xilinx EDK 12.1 Build EDK_MS1.53d
Copyright (c) 1995-2009 Xilinx, Inc.  All rights reserved.

XMD%
XMD% fpga -f download.bit -cable type xilinx_plugin modulename digilent_plugin
```

Launch xmd

Configure FPGA

```
Fpga Programming Progress .......Done

JTAG chain configuration
-----------------------------------------------------
Device   ID Code         IR Length    Part Name
 1       41c22093            6         XC3S500E
 2       f5046093            8         XCF04S

Successfully downloaded bit file.
XMD% connect mb mdm -cable type xilinx_plugin modulename digilent_plugin

MicroBlaze Processor Configuration :
-------------------------------------
Version.............................7.20.a
Optimization........................Area
Interconnect........................PLBv46
MMU Type............................No_MMU
No of PC Breakpoints................1
No of Read Addr/Data Watchpoints...0
No of Write Addr/Data Watchpoints..0
Instruction Cache Support..........off
Data Cache Support..................off
Exceptions  Support.................off
FPU  Support........................off
Hard Divider Support................off
Hard Multiplier Support............on - (Mul32)
Barrel Shifter Support..............off
MSR clr/set Instruction Support....on
Compare Instruction Support........on
Data Cache Write-back Support......off

Connected to "mb" target. id = 0
Starting GDB server for "mb" target (id = 0
XMD% dow executable.elf
System Reset .... DONE
Downloading Program -- executable.elf
        section, .vectors.reset: 0x00000000-0x00000003
        section, .vectors.sw_exception: 0x00000008-0x0000000b
        section, .vectors.interrupt: 0x00000010-0x00000013
        section, .vectors.hw_exception: 0x00000020-0x00000023
        section, .text: 0x00000050-0x000005eb
        section, .init: 0x000005ec-0x0000060f
        section, .fini: 0x00000610-0x0000062b
        section, .rodata: 0x0000062c-0x00000661
        section, .sdata2: 0x00000662-0x00000667
        section, .data: 0x00000668-0x00000777
        section, .ctors: 0x00000778-0x0000077f
        section, .dtors: 0x00000780-0x00000787
        section, .eh_frame: 0x00000788-0x0000078b
        section, .jcr: 0x0000078c-0x0000078f
        section, .bss: 0x00000790-0x000007b3
        section, .heap: 0x000007b4-0x000009b7
        section, .stack: 0x000009b8-0x00000db7
Setting PC with Program Start Address 0x00000000

XMD% read_uart
Connected to MDM UART Target
XMD% con

RUNNING> XMD% -- Entering main() --
-- Exiting main() --

XMD% stop
XMD%
```

Connect to the Microblaze Soft Processor Debug port

Download Program executable for Microblaze to execute

Display UART output in XMD

Start Microblaze Executing

Stop Microblaze Execution

Display Microblaze registers

```
XMD% rrd
     r0: 00000000      r8: 00000000     r16: 00000000     r24: 00000000
     r1: 00000d88      r9: 00000000     r17: 00000000     r25: 00000000
     r2: 00000668     r10: 00000000     r18: 00000000     r26: 00000000
     r3: 00000000     r11: 00000000     r19: 00000000     r27: 00000000
     r4: 00000000     r12: 00000000     r20: 00000000     r28: 00000000
     r5: 00000000     r13: 00000790     r21: 00000000     r29: 00000000
     r6: 00000000     r14: 00000000     r22: 00000000     r30: 00000000
     r7: 00000000     r15: 000003a8     r23: 00000000     r31: 00000000
     pc: 0000006c     msr: 00000000
XMD% mrd 0x81400000
81400000:   00000069

XMD% mrd 0x81400000
81400000:   00000095

XMD% exit

~ /cygdrive/c/digilent/nexys2/binaries
```

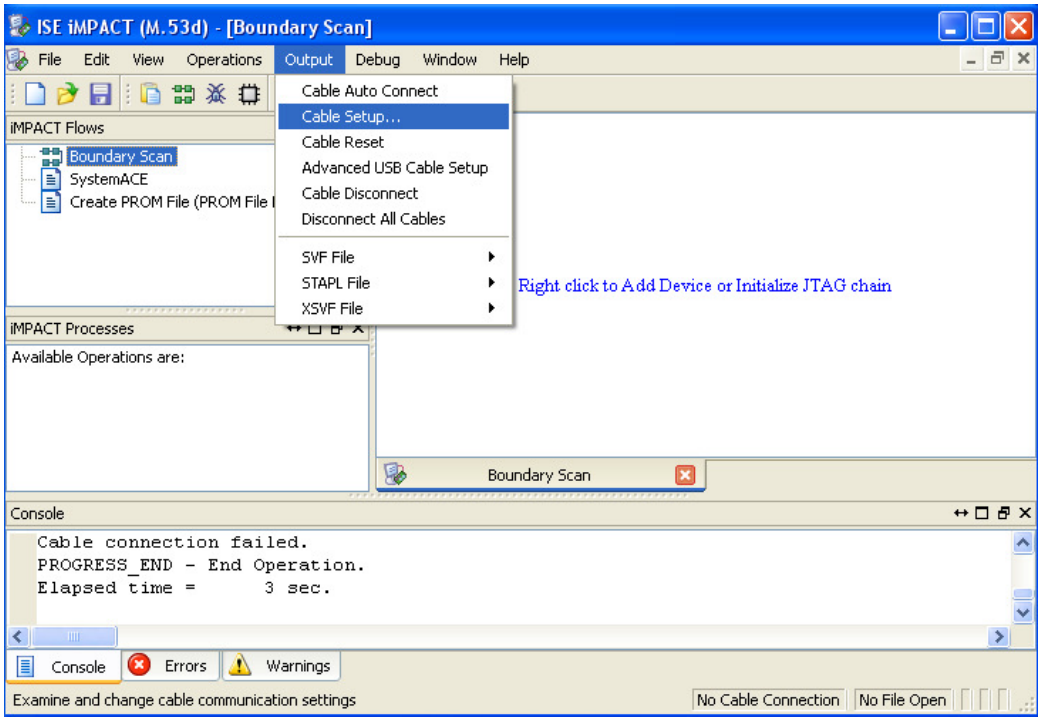
Read the values of the 8 Slide Switches via GPIO

Manually Change the Slide Switch positions and re-read the values

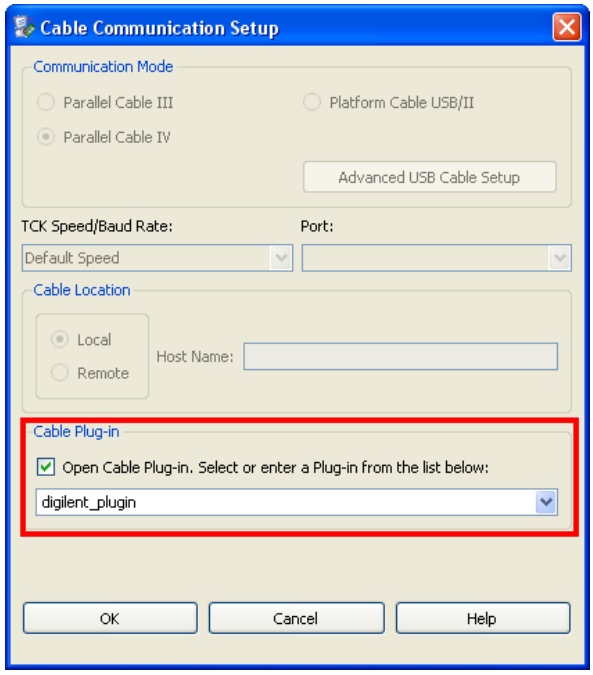
This concludes the Xilinx Microprocessor Debugger (XMD) part of the Demonstration Project.

Impact Setup

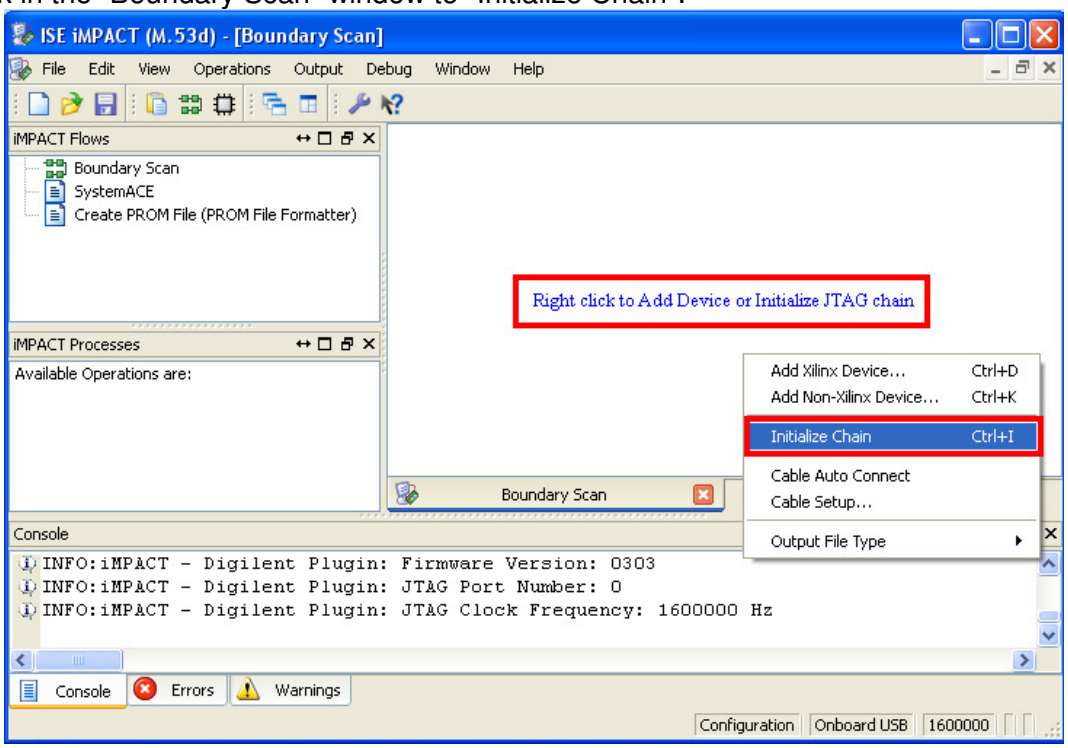
Xilinx Impact is used to download FPGA bitstreams to FPGA boards. The following steps show how to use Impact with the Plug-in. First, launch Impact and Select "Output→Cable Setup…" menu item.



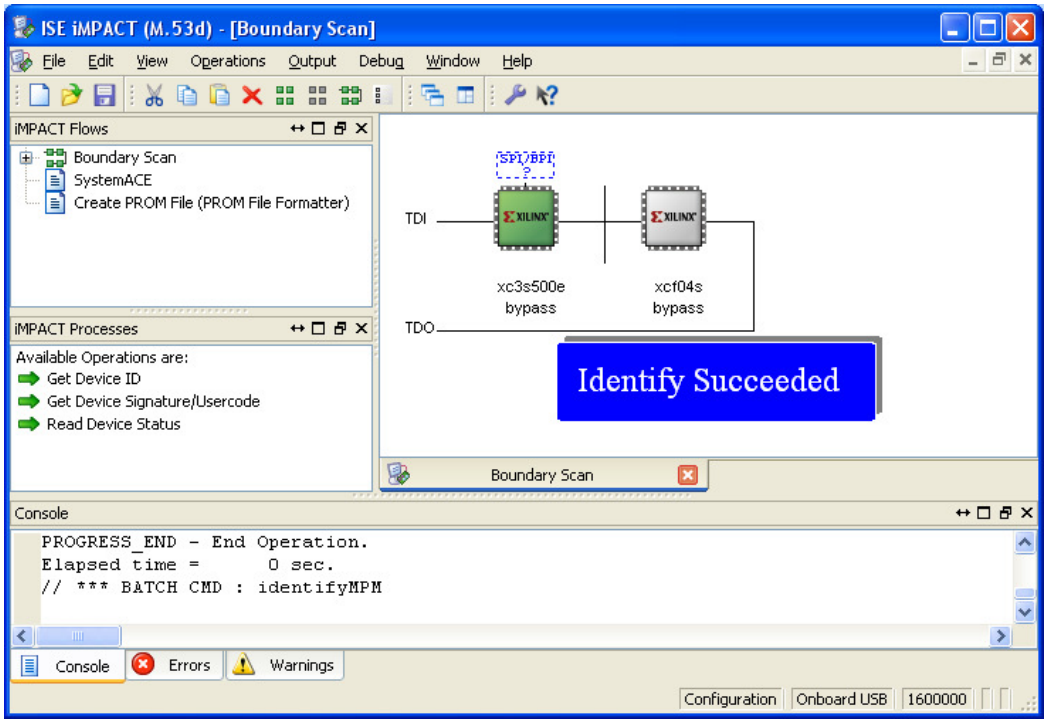
Select "Open Cable Plug-in" and type in "digilent_plugin":



Right Click in the "Boundary Scan" window to "Initialize Chain":

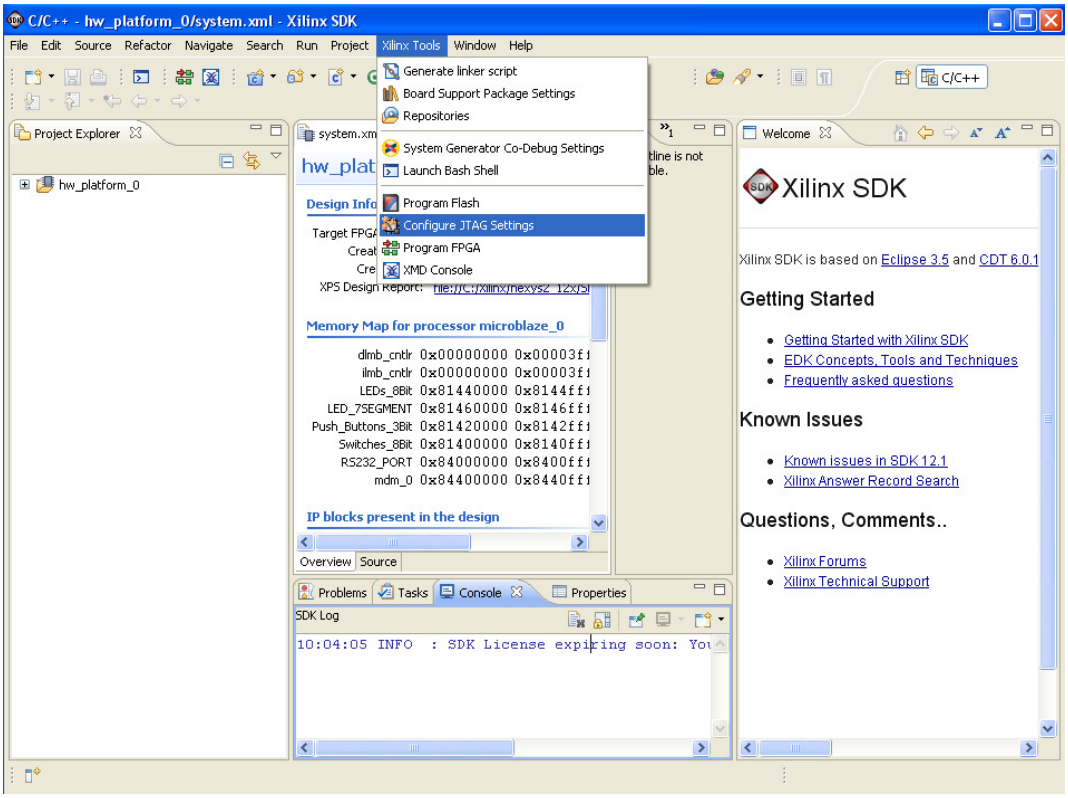


Impact is now ready to communicate with the FPGA on the board:

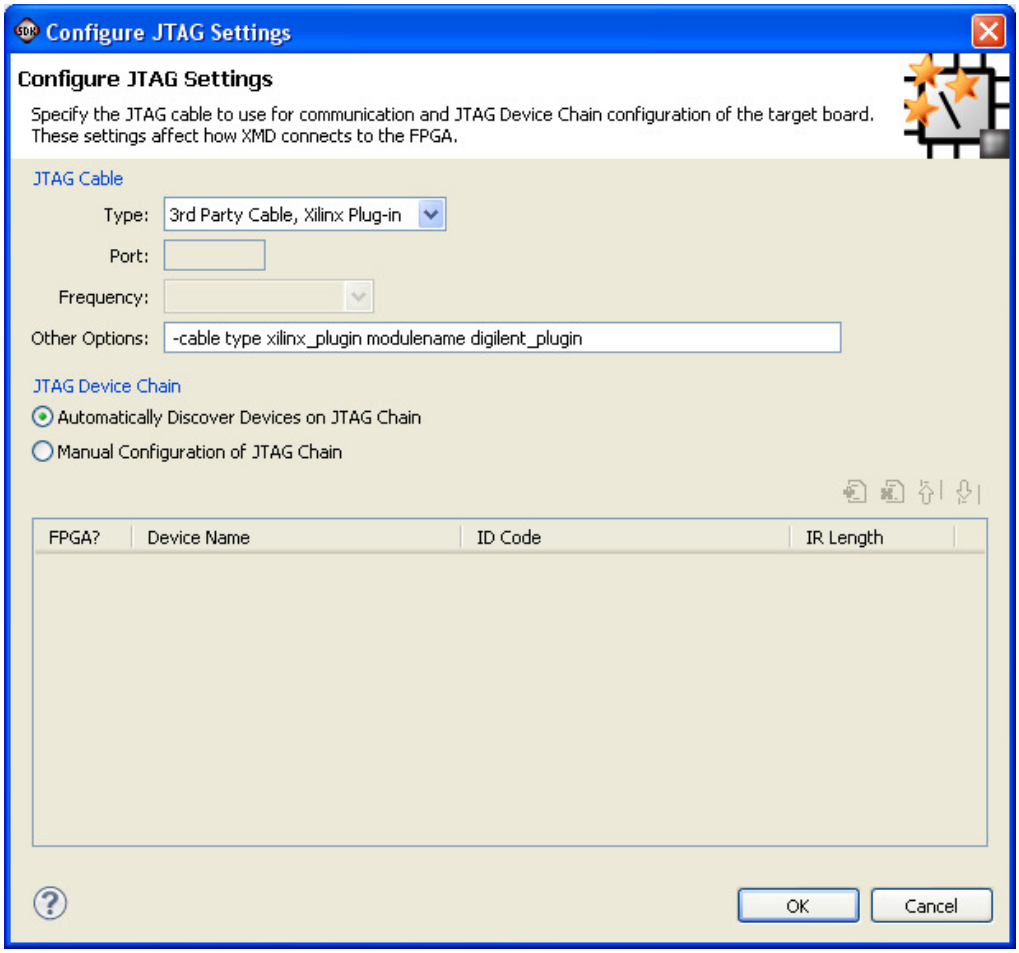


EDK Software Development Kit (SDK) Setup

The following steps show how to use the EDK Software Development Kit (SDK) with the Plug-in. First, launch SDK and Select "Xilinx Tools → Configure JTAG Settings" menu item.



Select "3rd Party Cable, Xilinx Plug-in" and type in "-cable type xilinx_plugin modulename digilent_plugin" into the "Other Options:" field.



SDK is now setup to use the Plug-in to communicate with the FPGA on the board.

Basys2 Demonstration Project

The Basys2 Demonstration Project can be used to verify correct installation and operation of the Plug-in. It is functionally equivalent to the Nexys2 design. Please follow the procedure documented in the Nexys2 Demonstration Project section above.