Digilent Plug-in for Xilinx 11.x Tools User Manual

Revision: June 29, 2010

Overview

The Digilent Plug-in for Xilinx tools allows Xilinx software tools to directly use the Digilent USB-JTAG FPGA configuration circuitry. Xilinx Chipscope Pro and Xilinx Microprocessor Debugger (XMD) command line mode 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 11.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, CentOS, and SUSE 32-bit and 64-bit Operating Systems

Windows Installation

To begin, ensure that the Xilinx ISE Suite (11.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 *both* the Chipscope and ISE Design Suite installations.
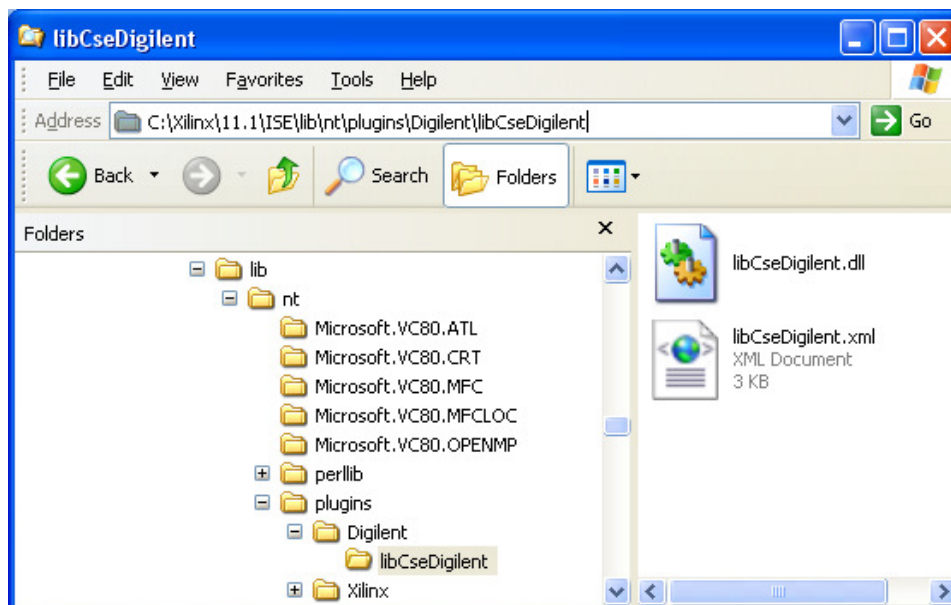
For Chipscope, the typical location is
C:\Xilinx\11.1\ChipScope\xilinx\lib\nt\plugins\Digilent\libCseDigilent
Note: For 64-bit Windows, use **nt64** in place of **nt**
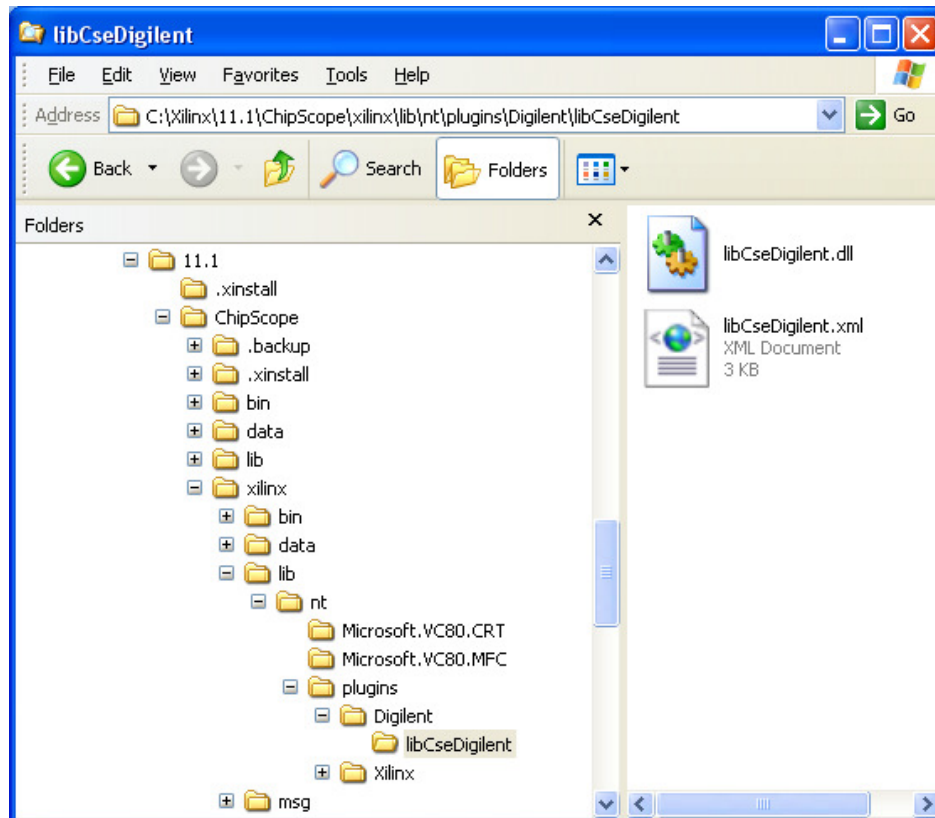
For the ISE Design Suite, the typical location is
C:\Xilinx\11.1\ISE\lib\nt\plugins\Digilent\libCseDigilent
Note: For 64-bit Windows, use **nt64** in place of **nt**

Linux Installation

To begin, ensure that the Xilinx ISE Suite (11.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 *both* the Chipscope and ISE Design Suite installations.

For Chipscope, the typical location is **$CHIPSCOPE/xilinx/lib/lin/plugins/Digilent/libCseDigilent**
Note: For 64-bit Windows, use **lin64** in place of **lin**

For the ISE Design Suite, the typical location is **$XILINX/lib/lin/plugins/Digilent/libCseDigilent**
Note: For 64-bit Windows, use **lin64** in place of **lin**
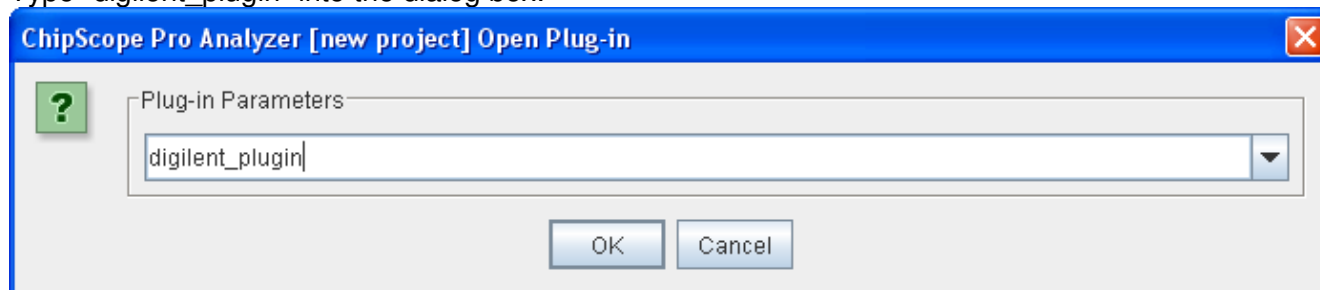
Nexys2 Demonstration Project

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

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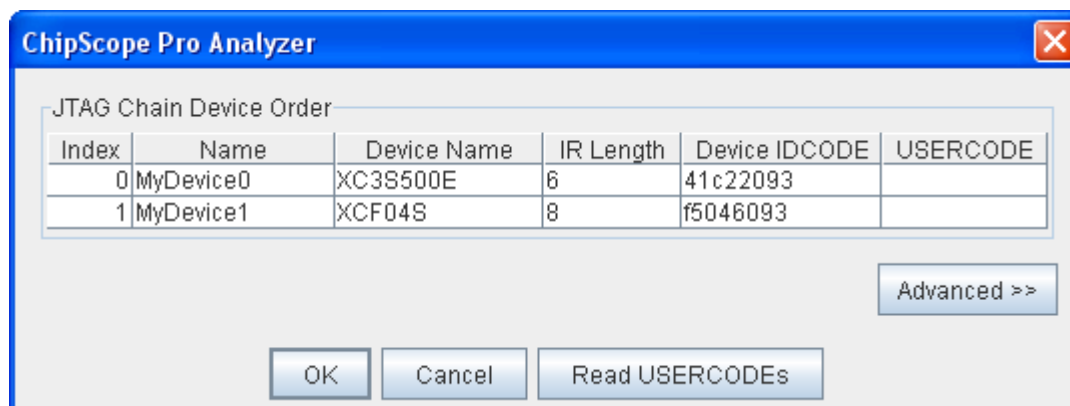
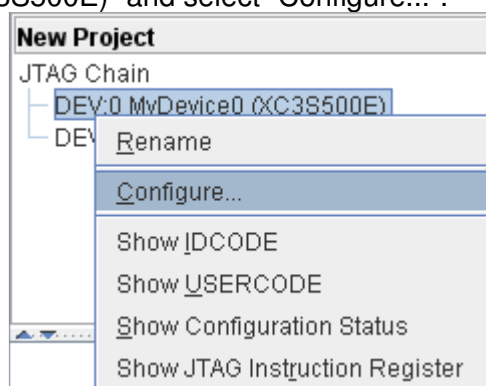Launch Chipscope Pro Analyzer and Select the "JTAG Chain→Open Plug-in…" menu item.
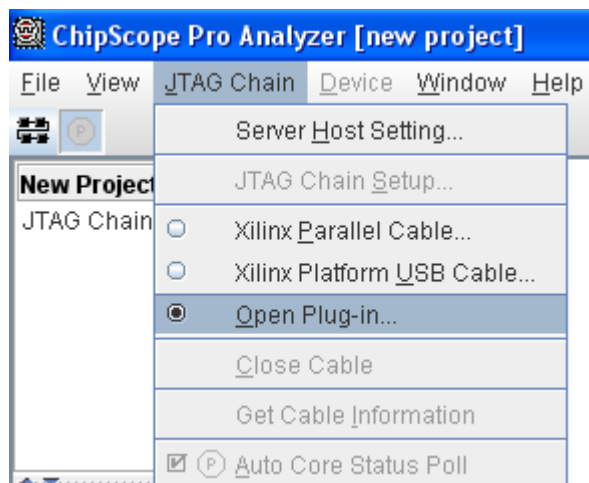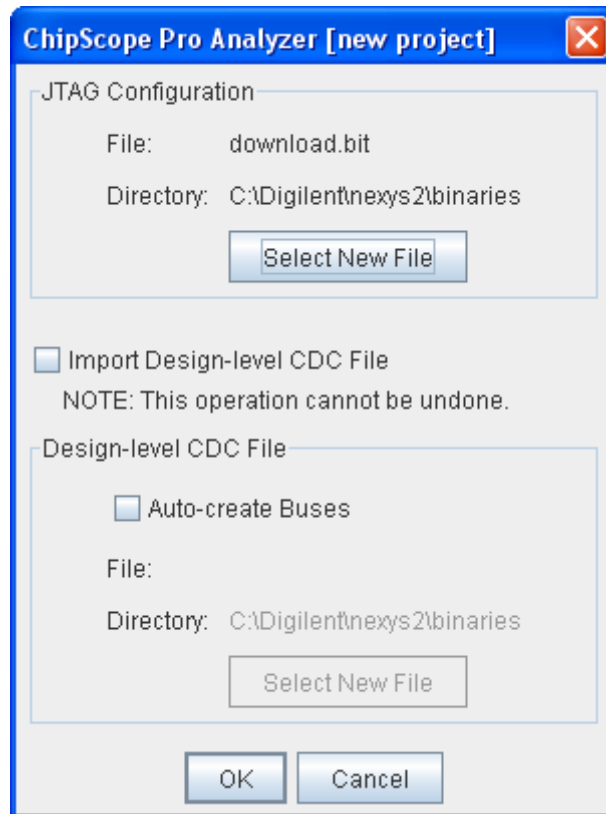

Type "digilent_plugin" into the dialog box:

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

ChipScope Pro Analyzer

JTAG Chain Device Order

Index	Name	Device Name	IR Length	Device IDCODE	USERCODE
0	MyDevice0	XC3S500E	6	41c22093	
1	MyDevice1	XCF04S	8	f5046093	

Advanced >>

OK   Cancel   Read USERCODEs

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

New Project

JTAG Chain
 — DEV:0 MyDevice0 (XC3S500E)
 — DEV

Rename

Configure...

Show IDCODE

Show USERCODE

Show Configuration Status
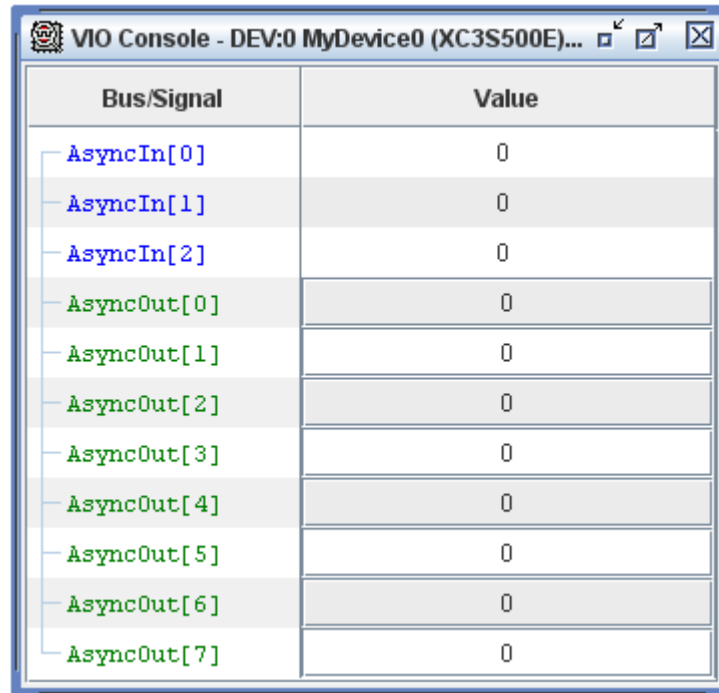
Show JTAG Instruction Register

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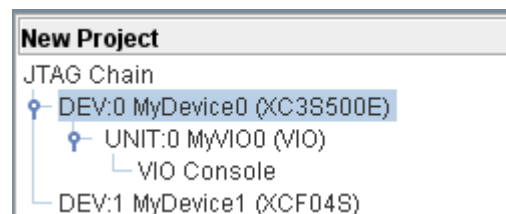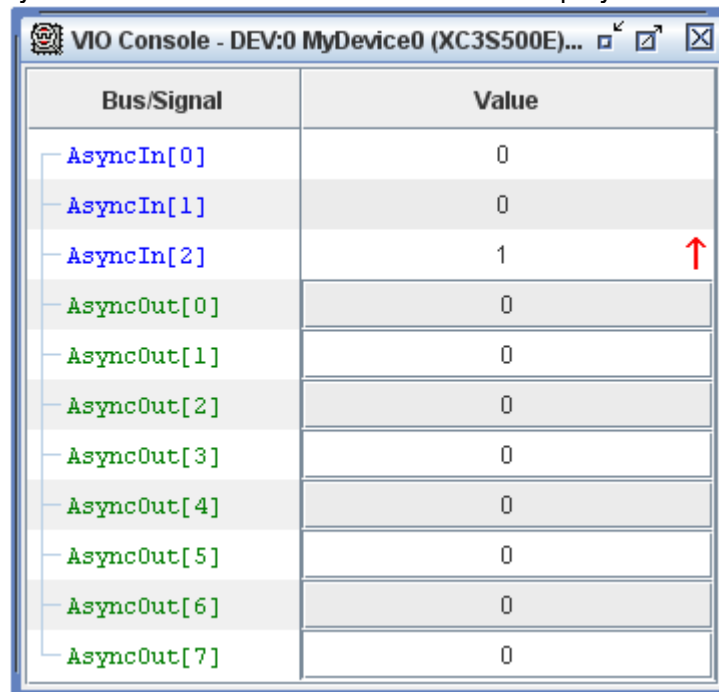
Double Click on the "VIO Console" item which brings up that window:

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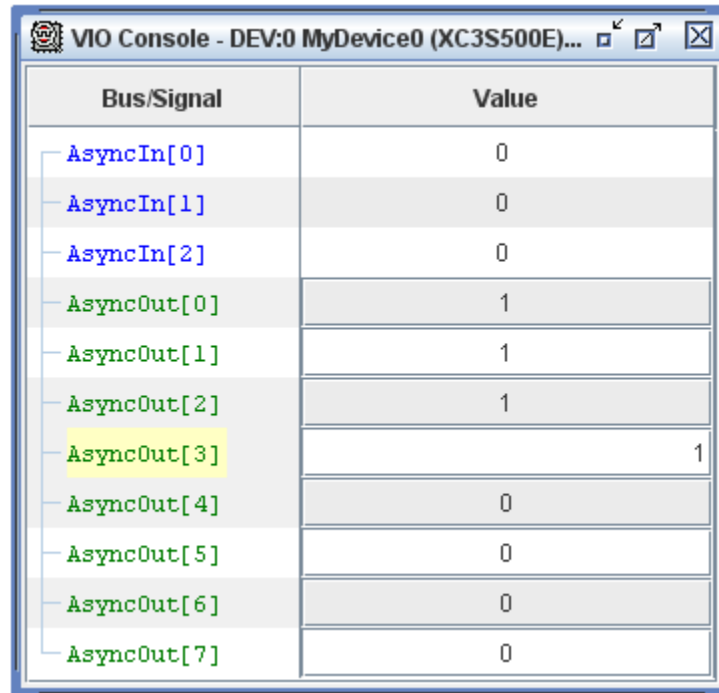
The Plug-in can also be used with Xilinx Microprocessor Debugger (XMD) command line mode. By adding the option "**–cable type xilinx_plugin modulename digilent_plugin**" to commands which interface with the hardware, XMD will utilize the Plug-in.

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

```
Xilinx Bash Shell
Xilinx EDK 11.2 Build EDK_LS2.6
Copyright (c) 1995–2009 Xilinx, Inc.  All rights reserved.

Analyzing Cygwin versions...
Xilinx tools detected Cygwin installation v1.5.17(0.129/4/2) on your machine.
This Cygwin will be used to run Xilinx tools.

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

Launch xmd

```
~ /cygdrive/c/digilent/nexys2/binaries
$ xmd
Xilinx Microprocessor Debugger (XMD) Engine
Xilinx EDK 11.2 Build EDK_LS2.6
Copyright (c) 1995–2009 Xilinx, Inc.  All rights reserved.
```

Configure FPGA

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

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 =
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
Info:Digilent Plug-in: Found one device.
Info:Digilent Plug-in: Opening device : "Nexys2", SN:10054D197402.
Info:Digilent Plug-in: JTAG frequency: 1714286 Hz.
Info:Processor started. Type "stop" to stop processor

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

XMD% stop
XMD% Info:User Interrupt, Processor Stopped at 0x0000006c
```

Connect to the Microblaze Soft Processor Debug port

Download Program executable for Microblaze to execute

Start Microblaze Executing

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
```

Read the values of the 8 Slide Switches via GPIO

```
XMD% mrd 0x81400000
81400000:   000000A5
```

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

```
XMD% exit
```

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

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

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.