ML510 Dual MicroBlaze Processor Hardware Build

February 2009

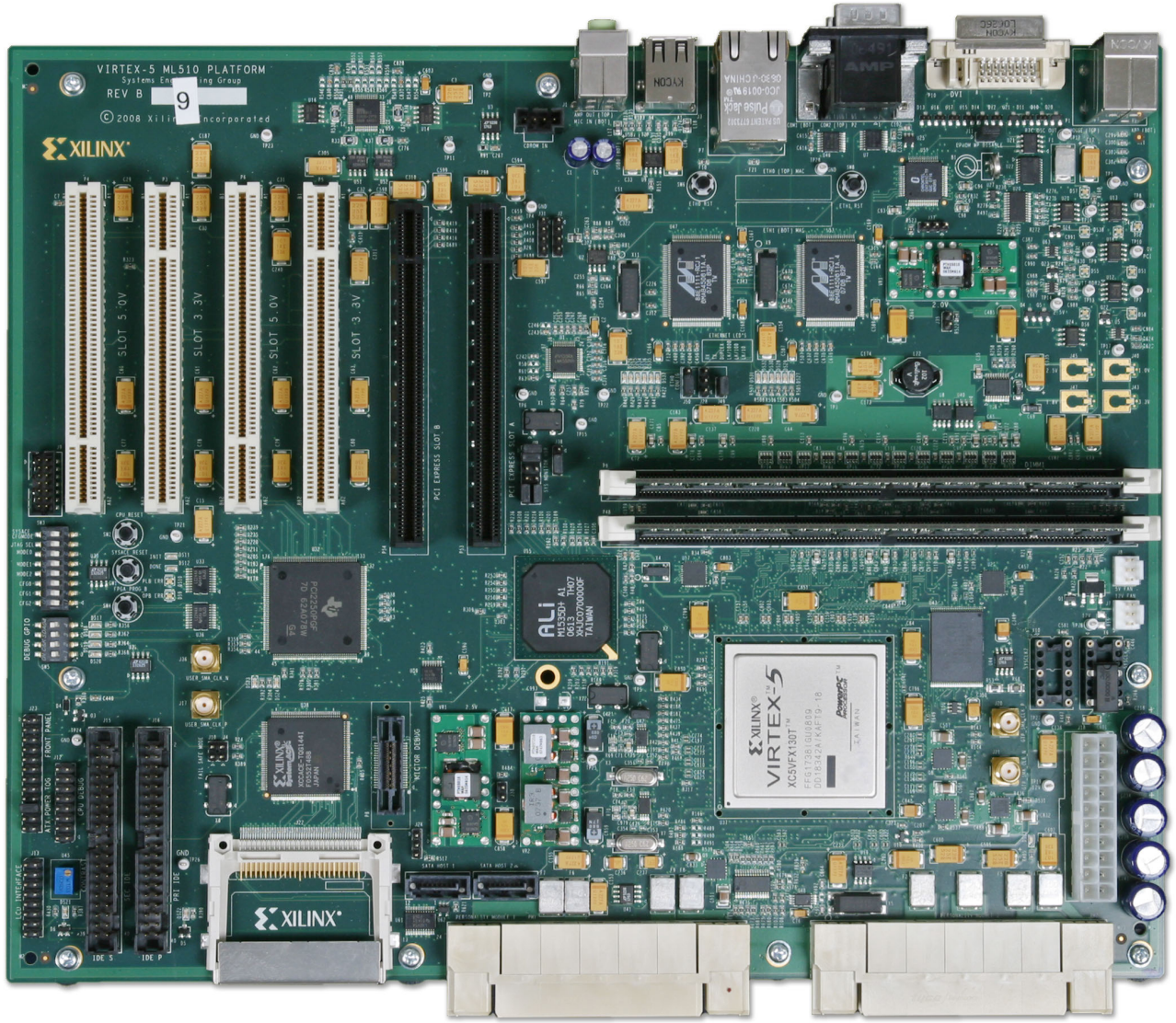
XILINX®

Overview

- Hardware Setup
- Software Requirements
- Download Bootloop Bitstream
- Download Application to MB_0
- Download Application to MB_1

Note: This Presentation applies to the ML510

Xilinx ML510 Board



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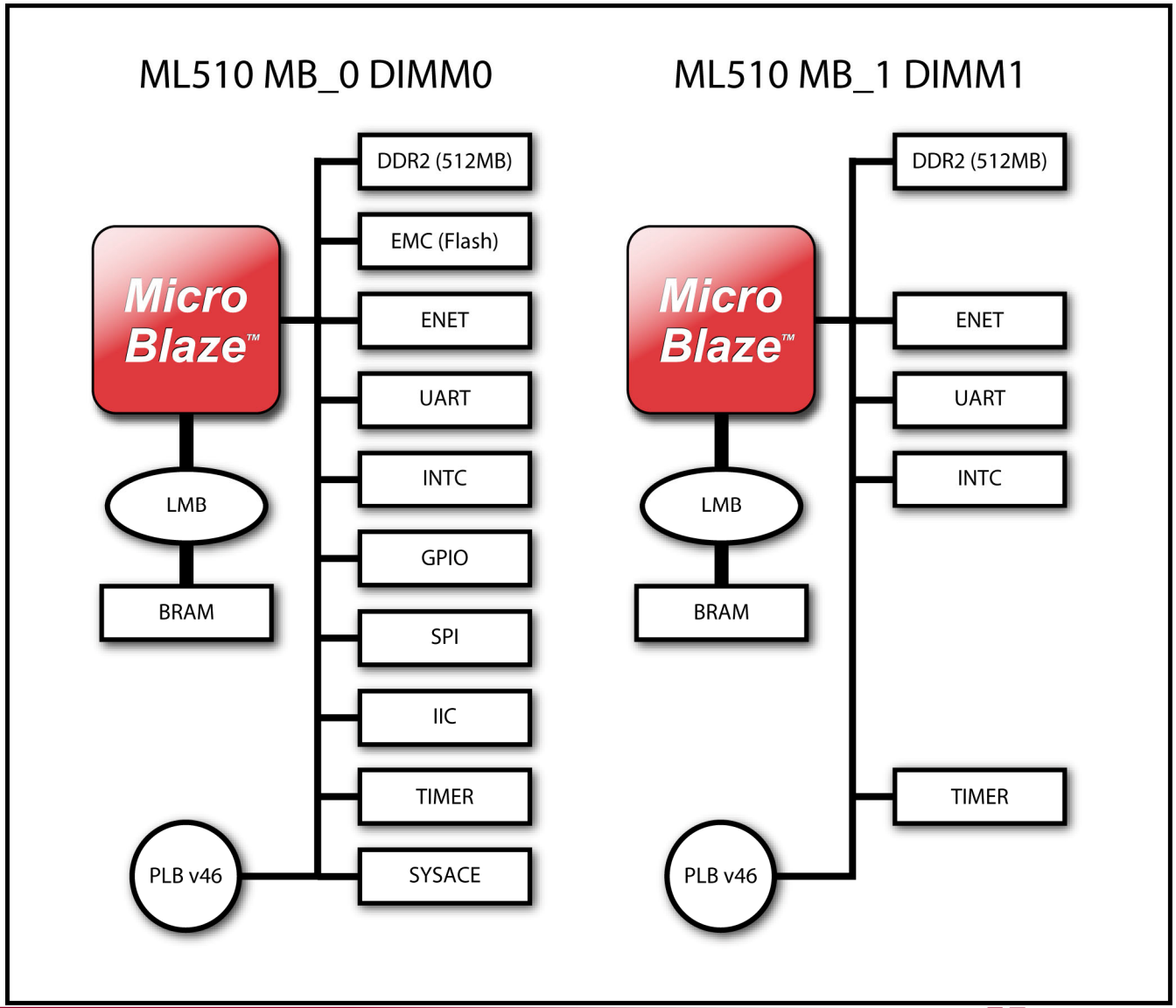
ML510 Dual MB Hardware

- MB_0:
  - DDR2 Interface
  - BRAM
  - EMC (Flash)
  - Networking
  - UART
  - Interrupt Controller
  - GPIO
  - SPI
  - IIC
  - Timer
  - System ACE
- MB_1:
  - DDR2 Interface
  - BRAM
  - Networking
  - UART
  - Interrupt Controller
  - Timer



Note: Presentation applies to the ML510

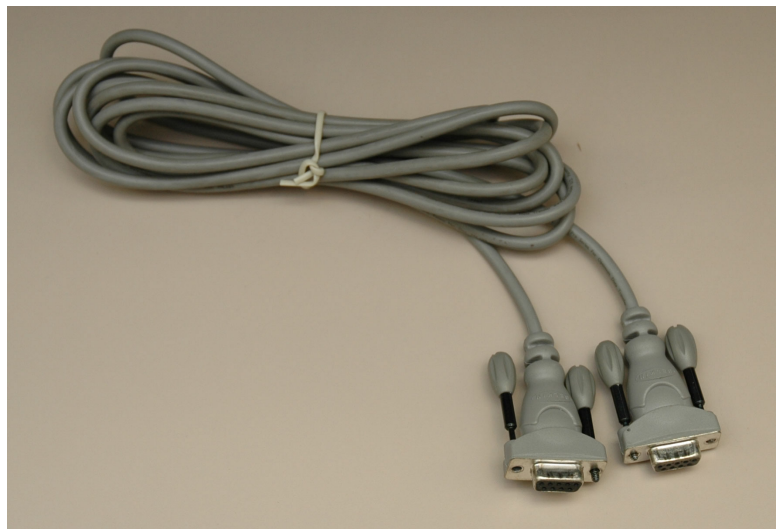
Additional Setup Details

- Refer to ml510_overview_setup.ppt for details on:
  - Software Requirements
  - ML510 Board Setup
    - **Equipment and Cables**
    - **Software**
    - **Network**
  - Terminal Programs
    - **This presentation requires the 9600-8-N-1 Baud terminal setup**

Hardware Setup

- Connect the Xilinx Platform Cable USB to the ML510 board

- Connect the RS232 null modem cable to the ML510 board
  - Connect to the COM1 and COM2 ports on the ML510 board



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ISE Software Requirement

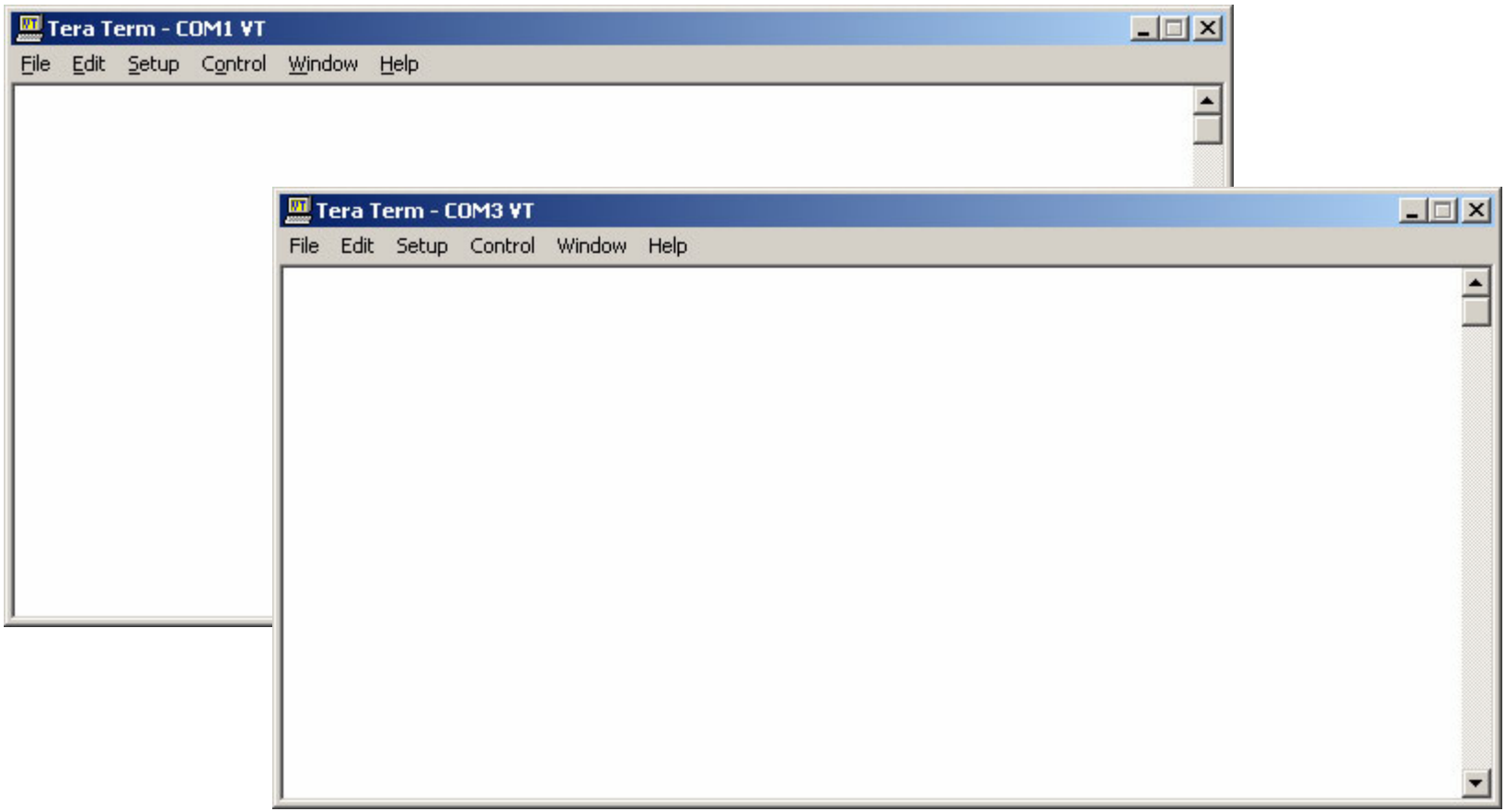
- Xilinx ISE 10.1i SP3 software

EDK Software Requirement

- Xilinx EDK 10.1i SP3 software

Software Setup

- Start a Terminal Program for each UART:



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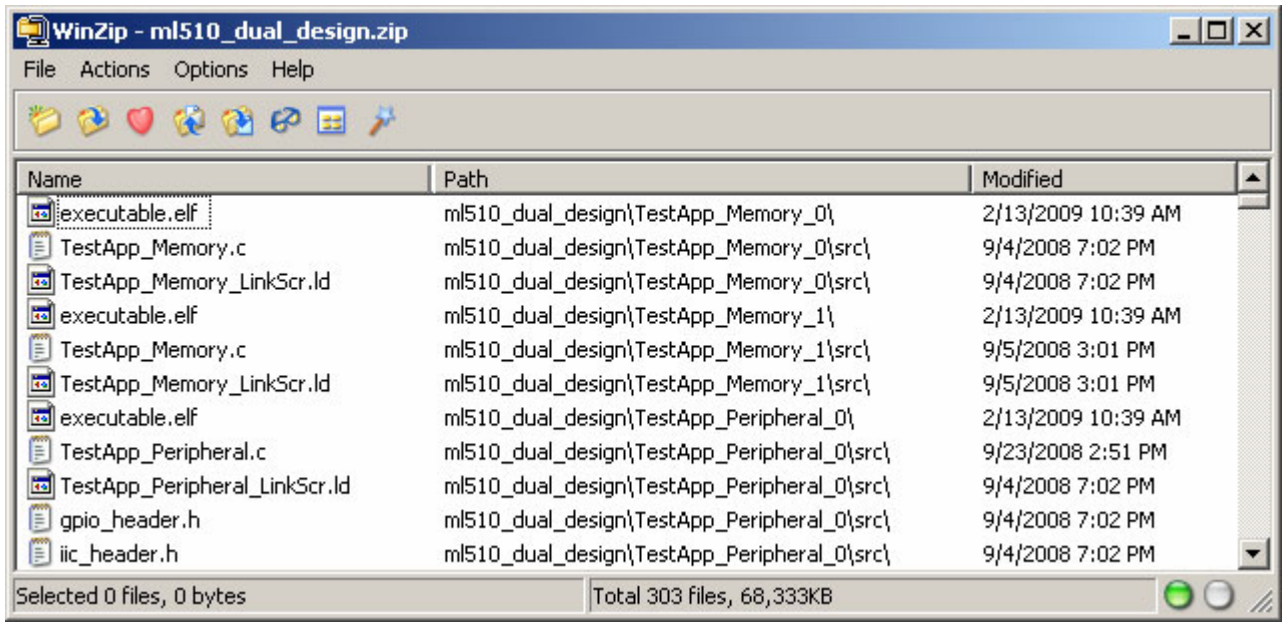
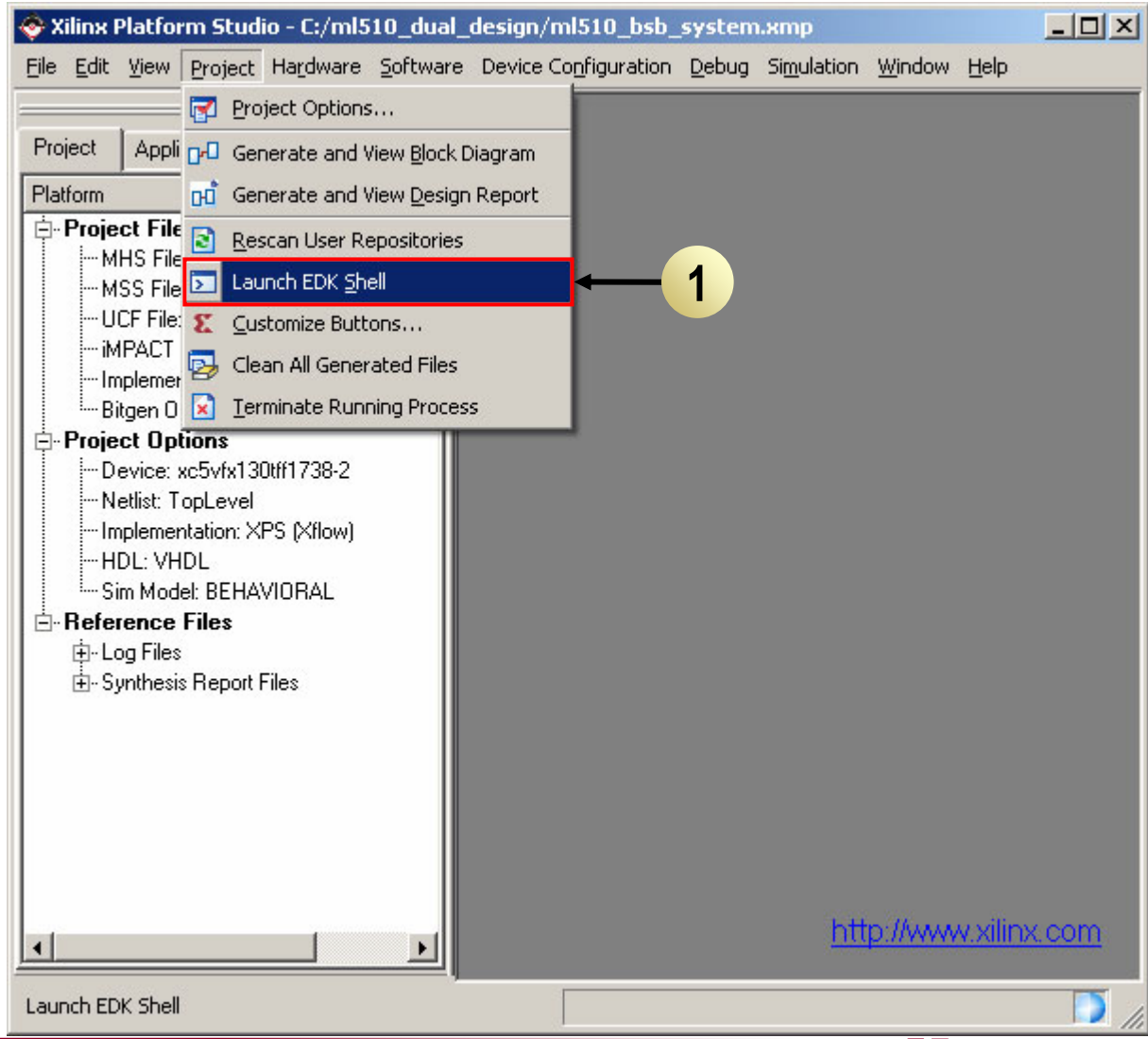
Extracting the Design

- Unzip the ml510_dual_design.zip file
  - This creates ISE and EDK project directories



Run Xilinx Platform Studio

- Launch XPS project <design path>\ ml510_bsb_system.xmp
  - Select **Project → Launch EDK Shell** (1)



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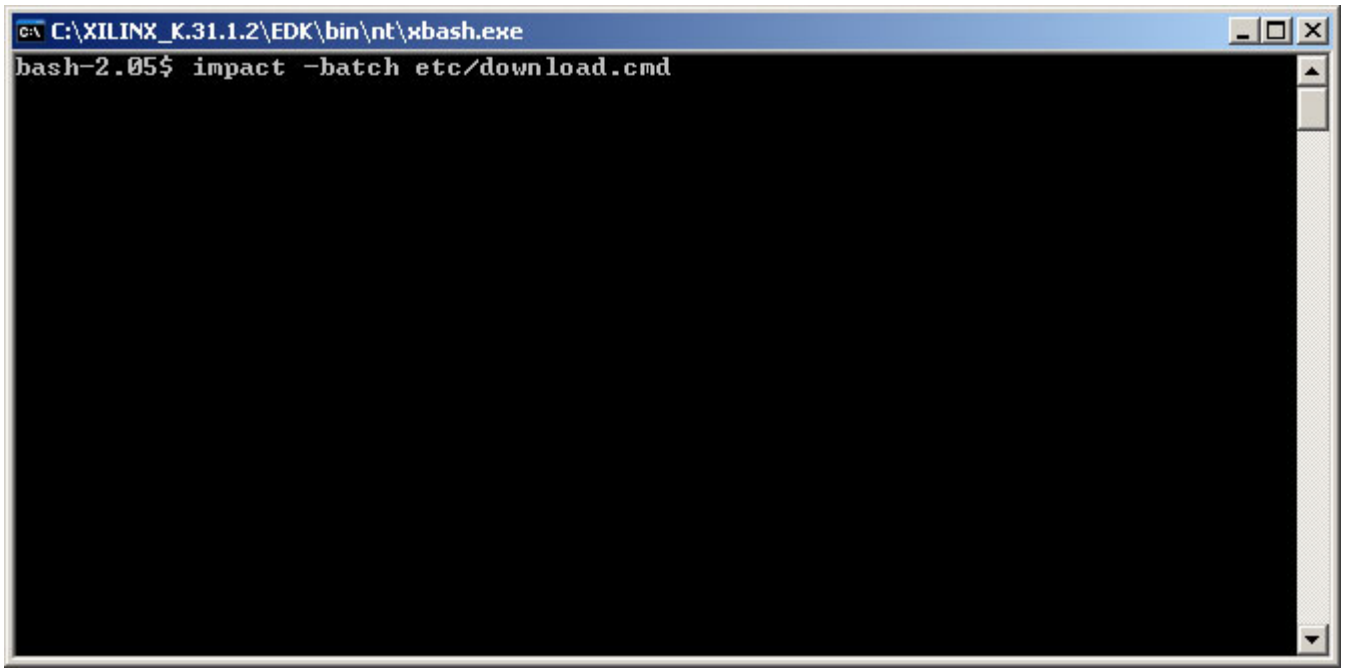
Download Bitstream

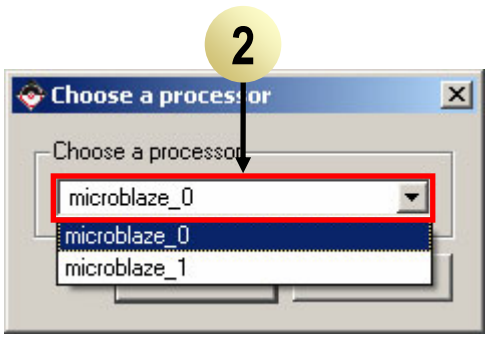
- Download the bitstream:

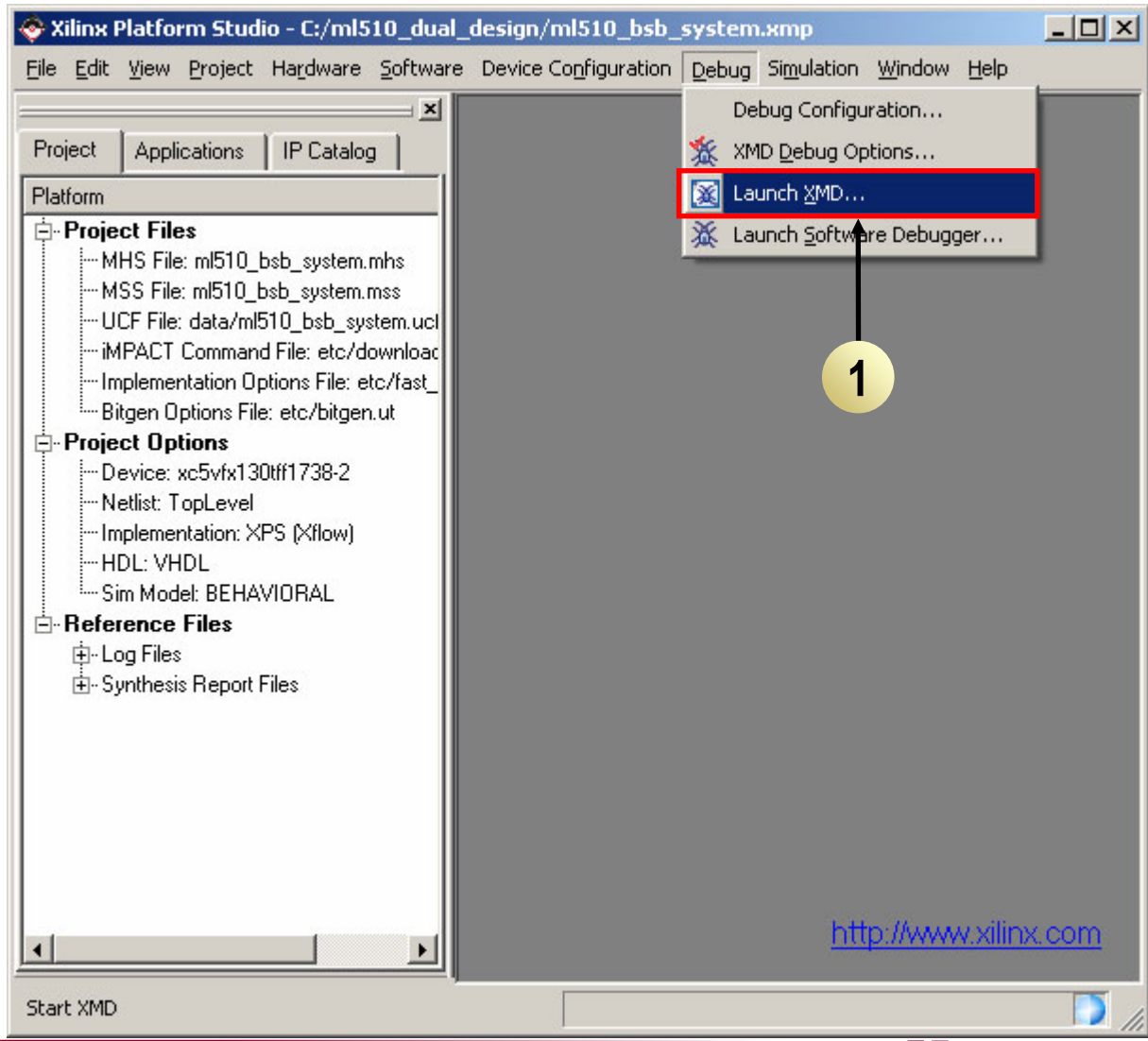
  impact -batch etc/download.cmd



Loading Bootloop into BRAM

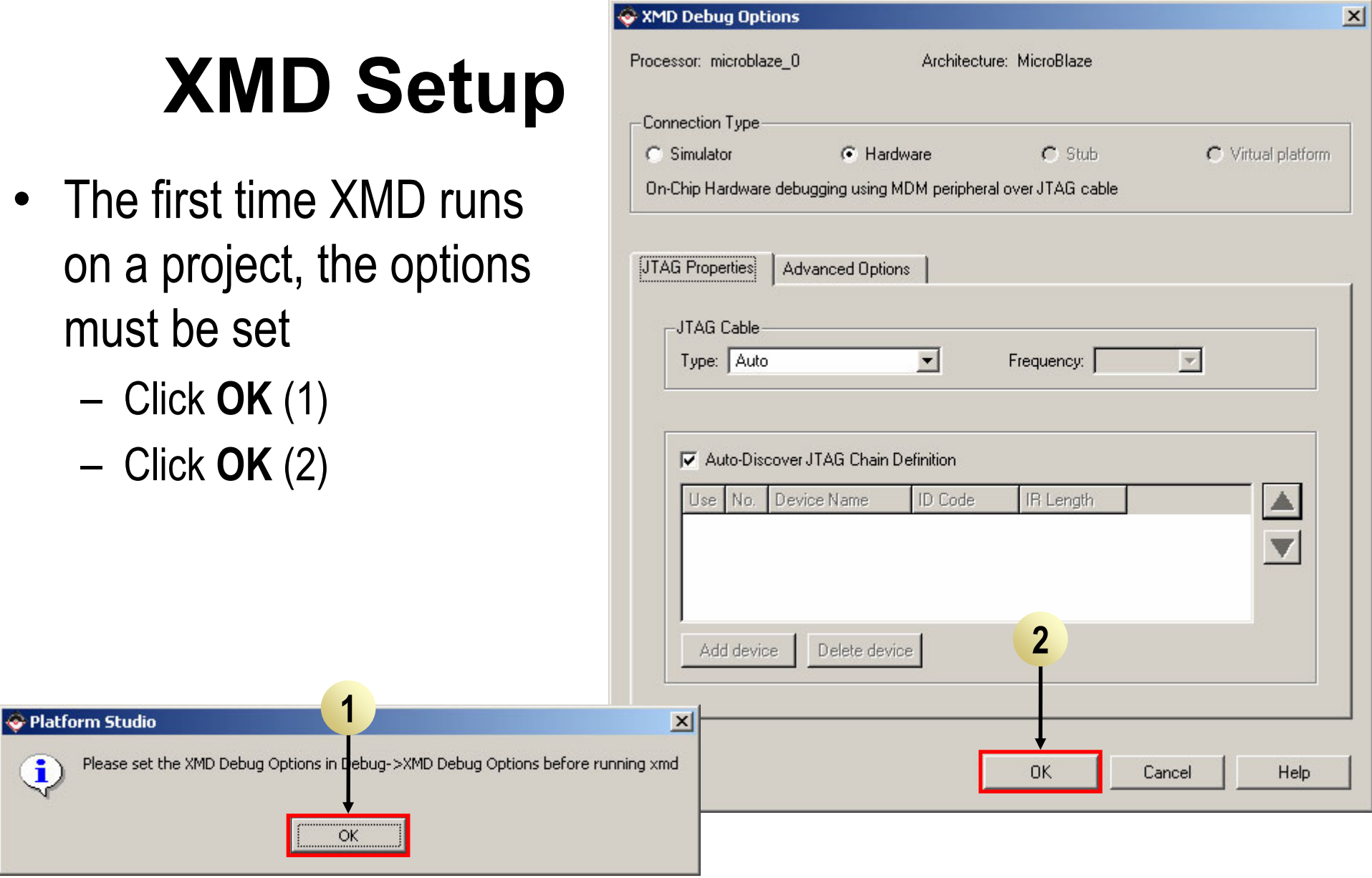
- A memory read can be executed to test if bootloop was successfully loaded
  - Select **Debug → Launch XMD** (1)
  - Select **microblaze_0** (2)





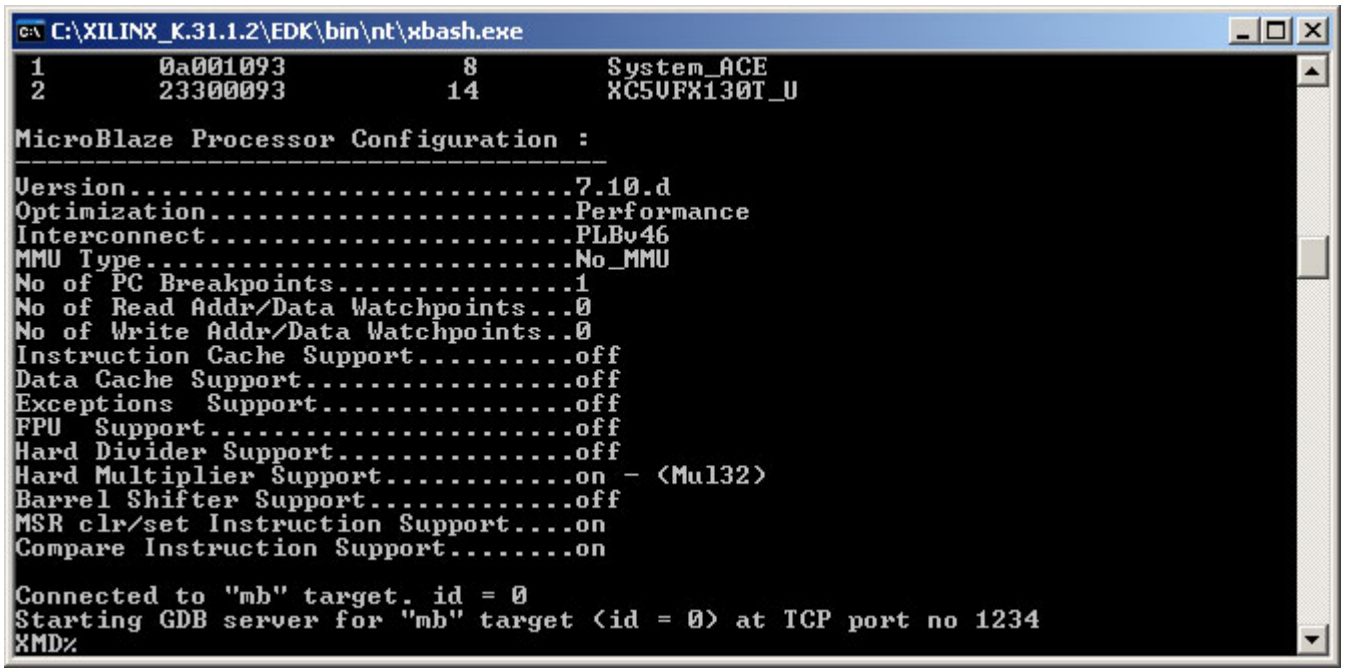
XMD Setup

- The first time XMD runs on a project, the options must be set
  - Click **OK** (1)
  - Click **OK** (2)



Loading Bootloop into BRAM

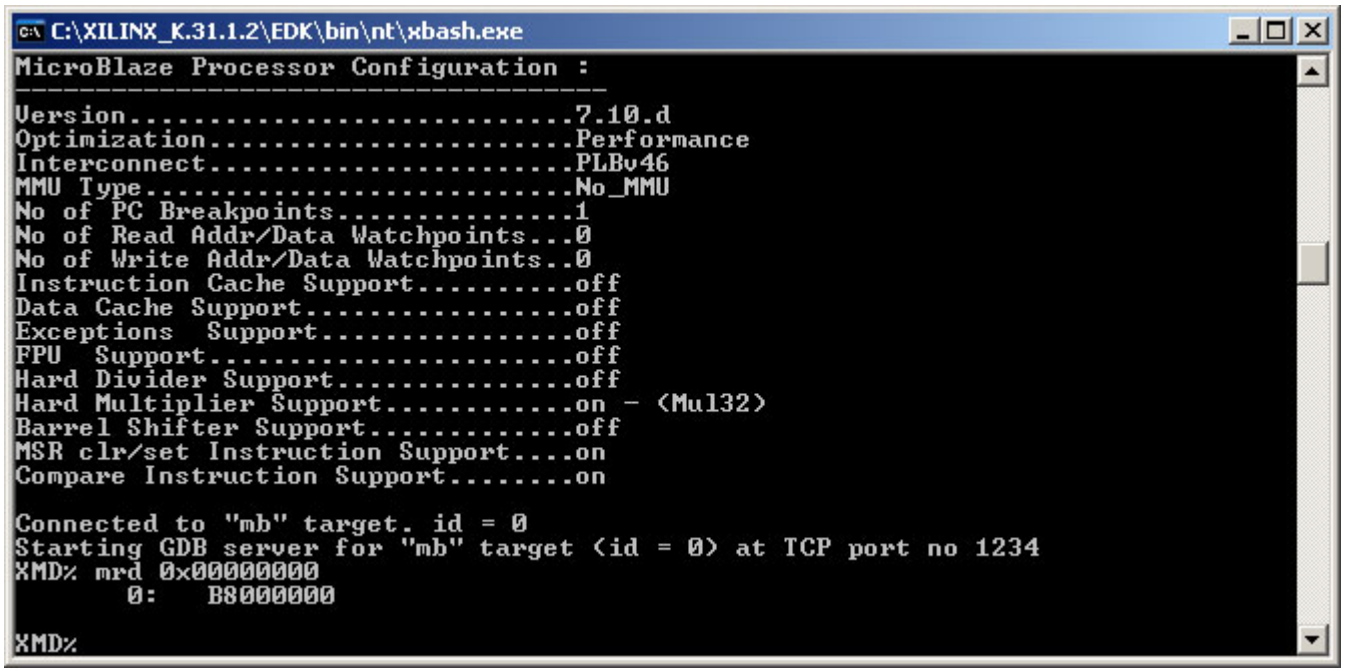
- XMD opens and connects to the processor, using the default options



Note: Presentation applies to the ML510

Loading Bootloop into BRAM

- To execute a memory read, type **mrd 0x00000000**
- This will read the memory address at the reset vector; the value should be **0xB8000000** as shown below



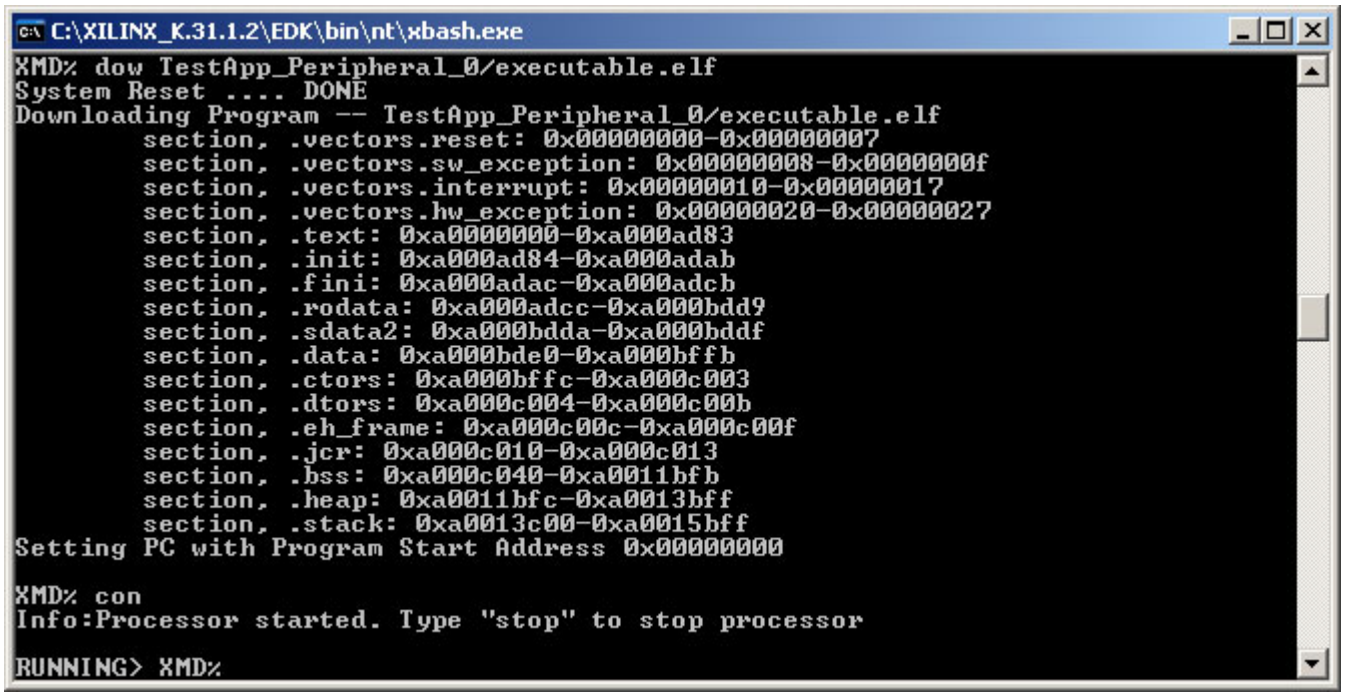
Note: Presentation applies to the ML510

TestApp_Peripheral

- Download and run the TestApp_Peripheral elf file:

  dow TestApp_Peripheral_0/executable.elf

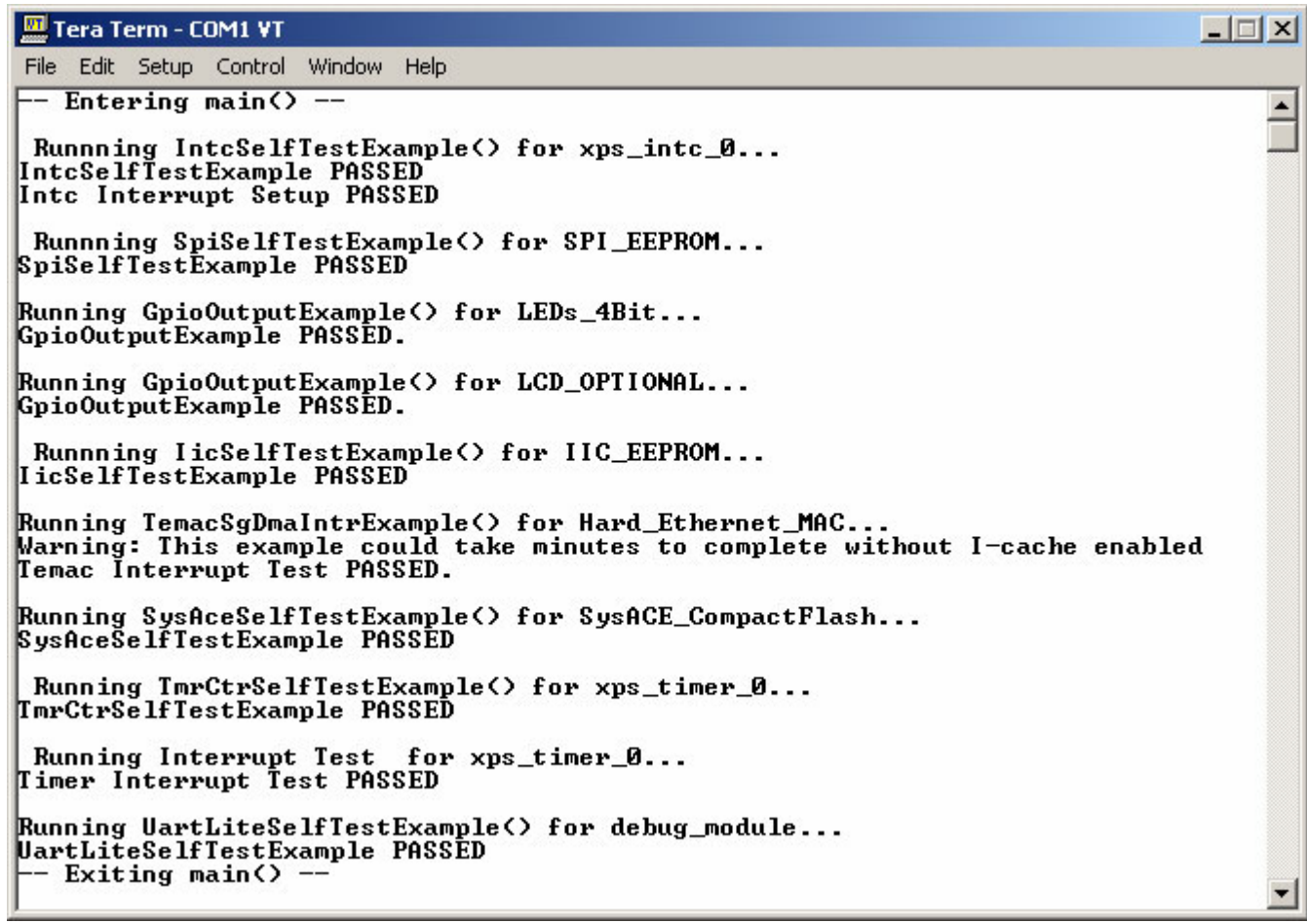
  con



Note: TestApp_Peripheral must be downloaded with xmd due to its size

Download the Bitstream

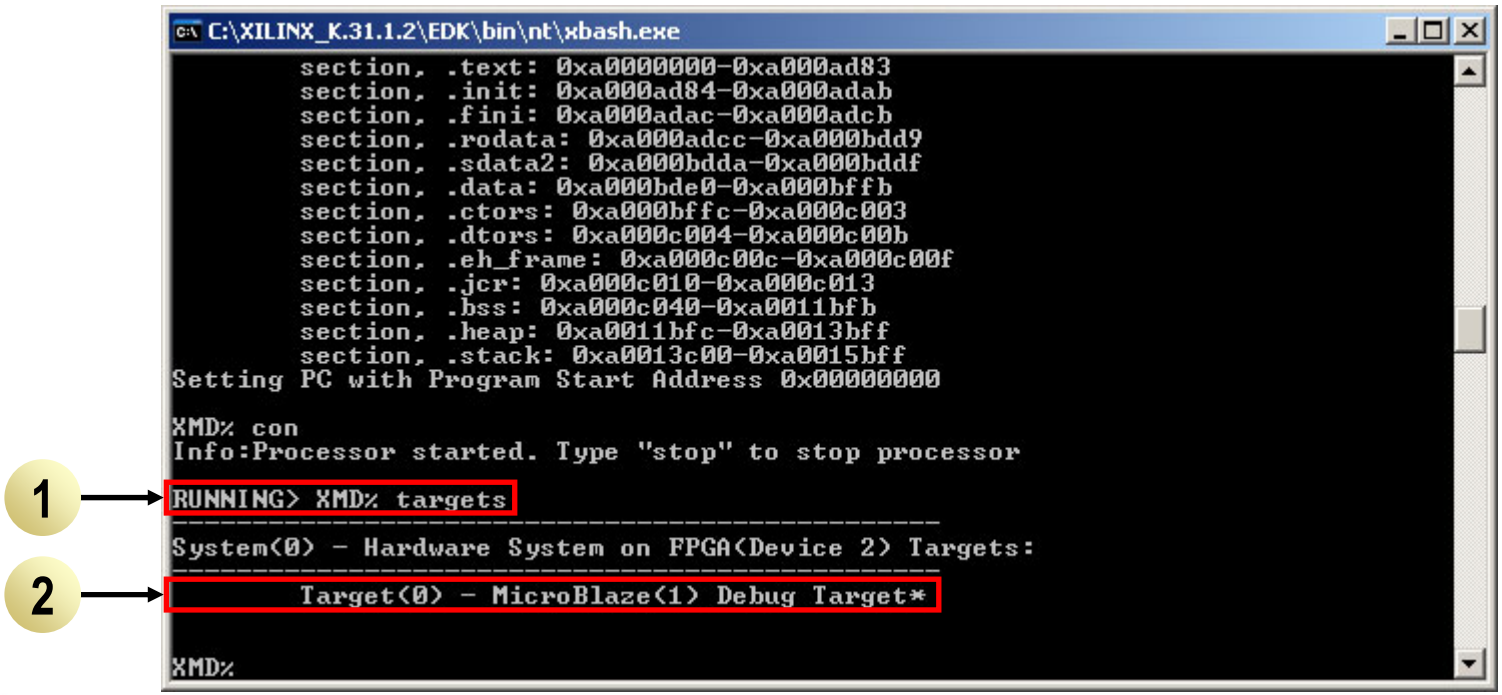
- View the output of a successful bitstream download in the terminal window



Note: Presentation applies to the ML510

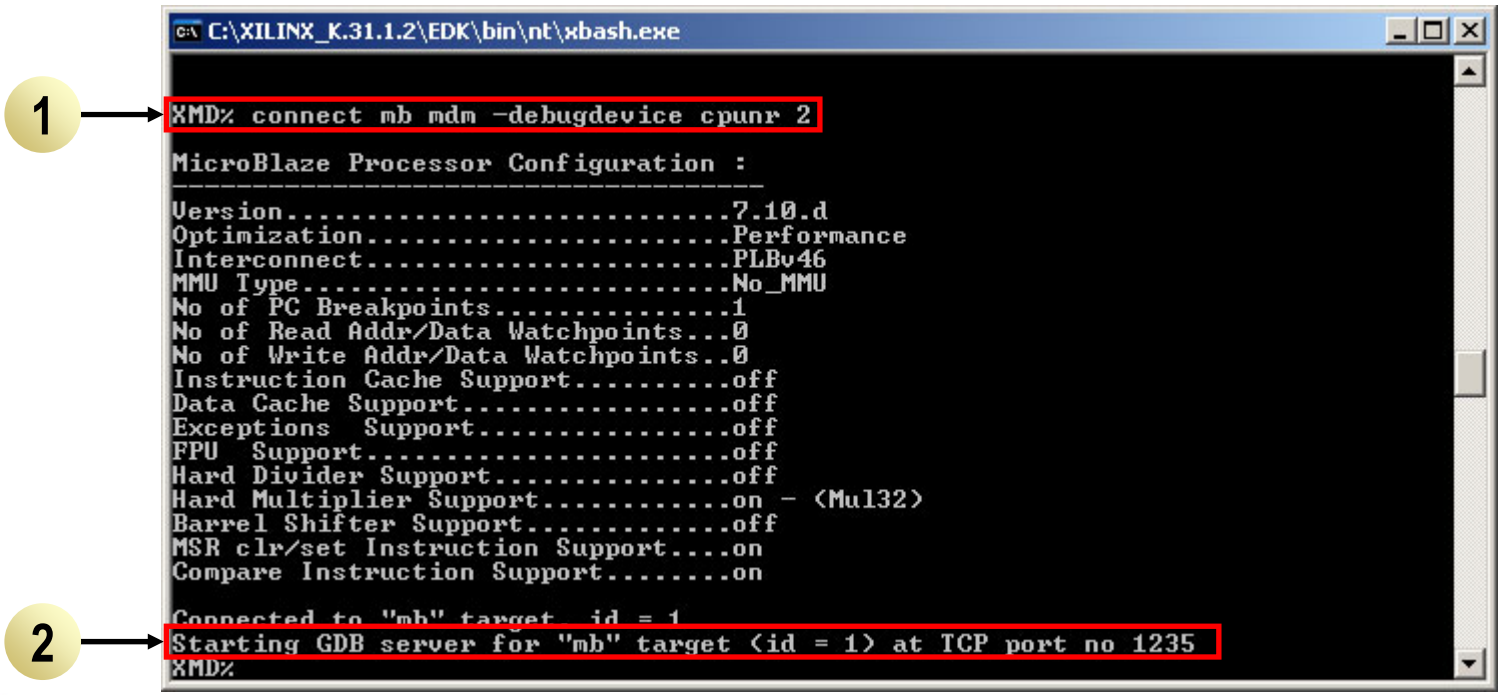
Create 2nd Target in XMD

- Type **targets** (1) to view the current target, 0 (2)



Create 2nd Target in XMD

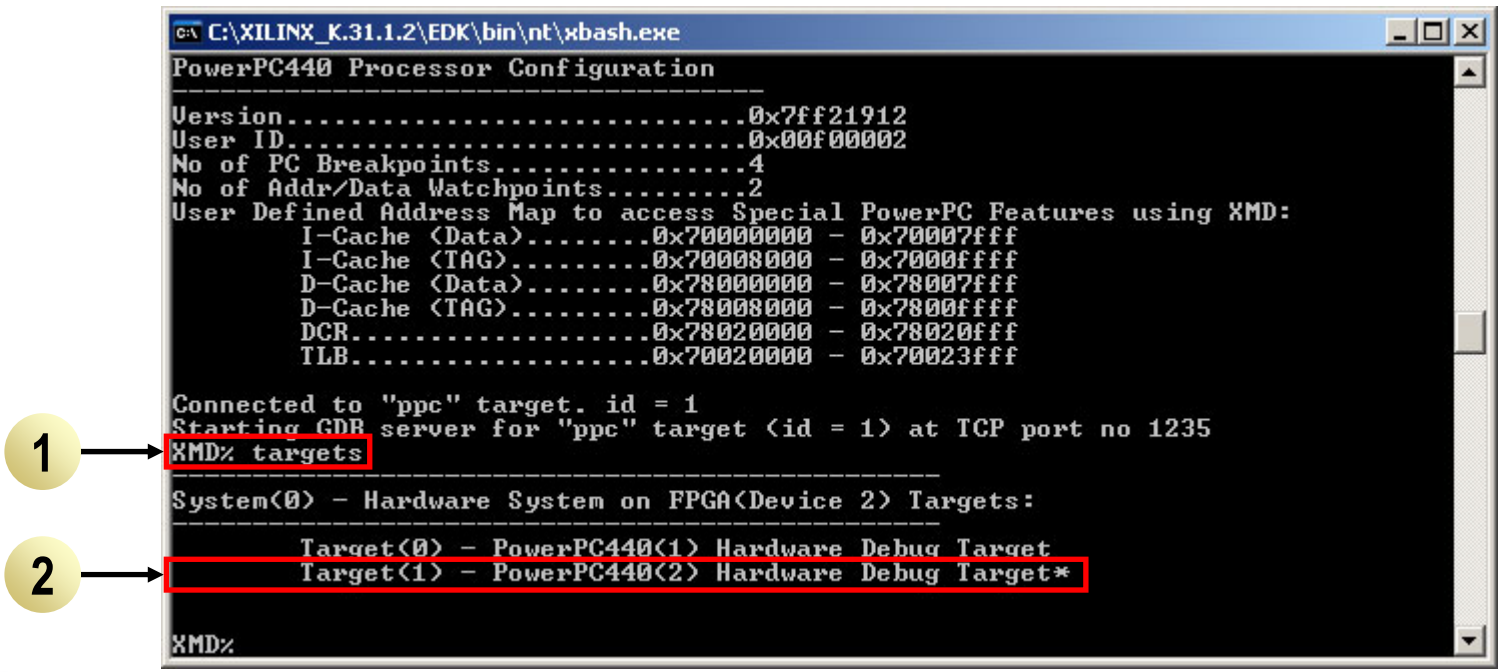
- Type **connect mb mdm -debugdevice cpunr 2** (1) to connect to the second cpu
- XMD connects to the 2nd processor
  - Note that this attaches through port 1235 (2)



Note: Presentation applies to the ML510

Verify Bootloop in BRAM

- Type **targets** again (1); target 1 is now selected (2)



Verify Bootloop in BRAM

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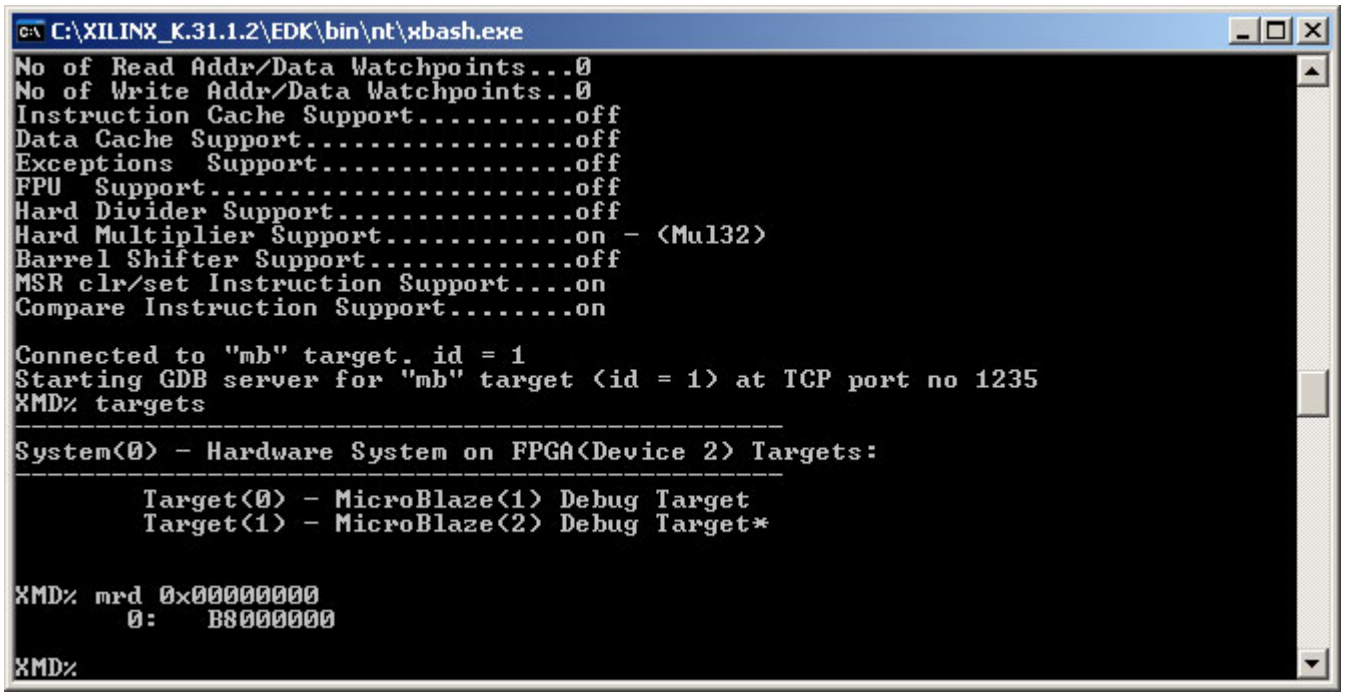
- This will read the memory address at the reset vector; the value should be **0xB8000000** as shown below



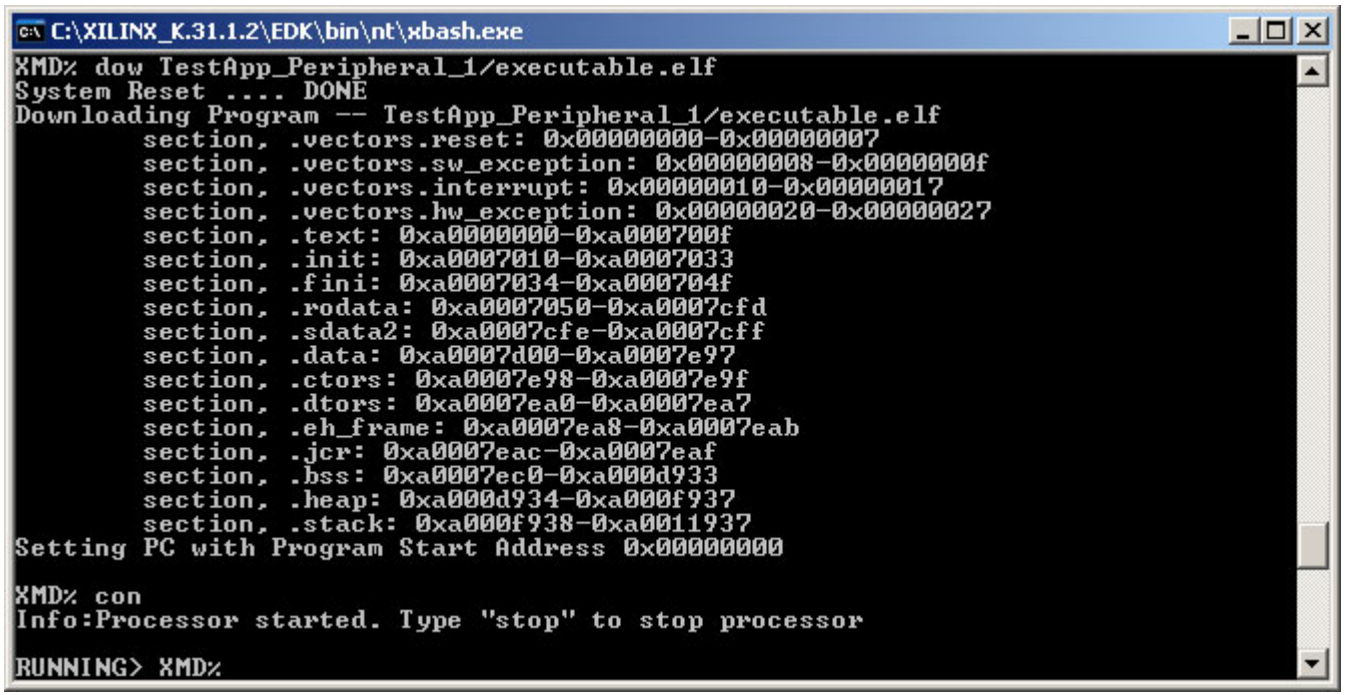
Note: Presentation applies to the ML510

Download ELF File

- Download the 2nd TestApp Peripheral ELF file from XMD

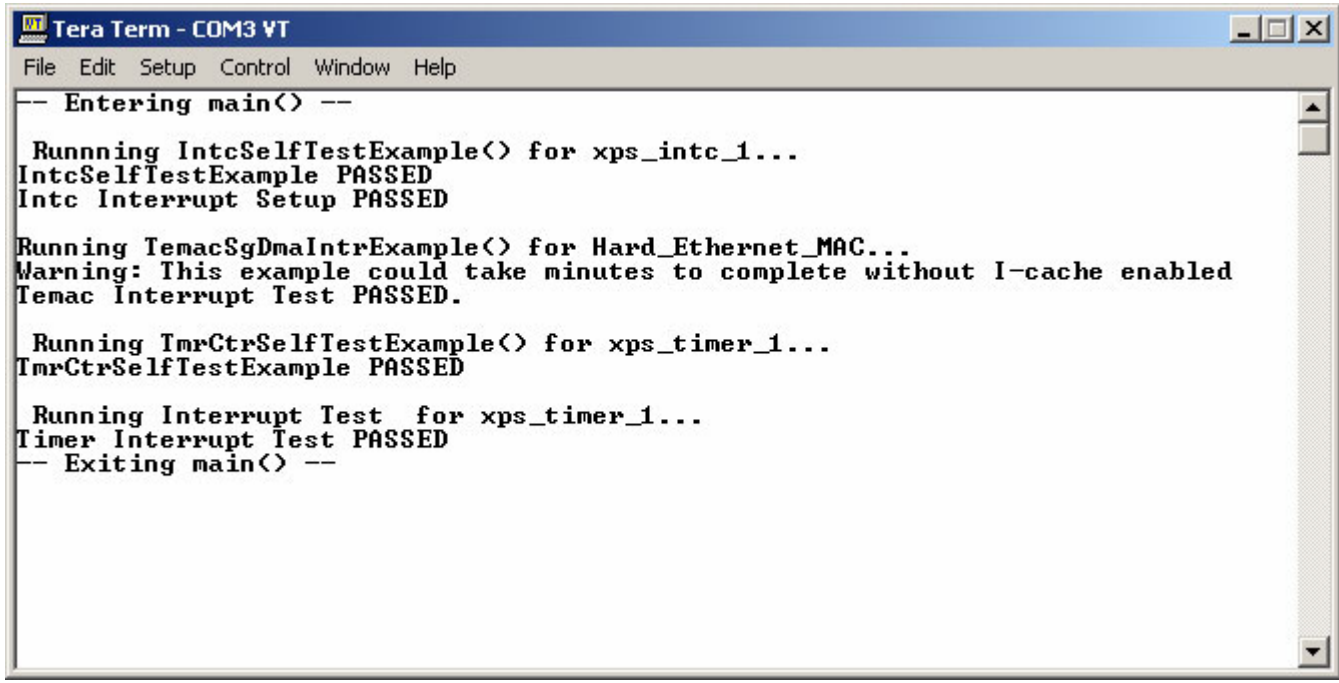
  dow TestApp_Peripheral_1/executable.elf

  con



Download the Bitstream

- View the output of a successful bitstream download in the terminal window



Documentation

- Virtex-5
  - Silicon Devices
    http://www.xilinx.com/products/silicon_solutions
  - Virtex-5 Multi-Platform FPGA
    http://www.xilinx.com/products/silicon_solutions/fpgas/virtex/virtex5
  - Virtex-5 Family Overview: LX, LXT, SXT, and FXT Platforms
    http://www.xilinx.com/support/documentation/data_sheets/ds100.pdf
  - Virtex-5 FPGA DC and Switching Characteristics Data Sheet
    http://www.xilinx.com/support/documentation/data_sheets/ds202.pdf

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Documentation

- Virtex-5
  - Virtex-5 FPGA User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug190.pdf
  - Virtex-5 FPGA Configuration User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug191.pdf
  - Virtex-5 System Monitor User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug192.pdf
  - Virtex-5 Packaging and Pinout Specification
    http://www.xilinx.com/support/documentation/user_guides/ug195.pdf

Documentation

- Virtex-5 RocketIO
  - RocketIO GTP Transceivers
    http://www.xilinx.com/products/silicon_solutions/fpgas/virtex/virtex5/capabilities/RocketIO_GTP.htm
  - RocketIO GTX Transceivers
    http://www.xilinx.com/products/silicon_solutions/fpgas/virtex/virtex5/capabilities/RocketIO_GTX.htm
  - RocketIO GTP Transceiver User Guide – UG196
    http://www.xilinx.com/support/documentation/user_guides/ug196.pdf
  - RocketIO GTX Transceiver User Guide – UG198
    http://www.xilinx.com/support/documentation/user_guides/ug198.pdf

Documentation

- Design Resources
  - ISE Development Tools and IP
    http://www.xilinx.com/ise
  - Integrated Software Environment (ISE) Foundation Resources
    http://www.xilinx.com/ise/logic_design_prod/foundation.htm
  - ISE Manuals
    http://www.xilinx.com/support/software_manuals.htm
  - ISE Development System Reference Guide
    http://toolbox.xilinx.com/docsan/xilinx10/books/docs/dev/dev.pdf
  - ISE Development System Libraries Guide
    http://toolbox.xilinx.com/docsan/xilinx10/books/docs/virtex5_hdl/virtex5_hdl.pdf

Documentation

- Additional Design Resources
  - Customer Support
    http://www.xilinx.com/support
  - Xilinx Design Services:
    http://www.xilinx.com/xds
  - Titanium Dedicated Engineering:
    http://www.xilinx.com/titanium
  - Education Services:
    http://www.xilinx.com/education
  - Xilinx On Board (Board and kit locator):
    http://www.xilinx.com/xob

Documentation

- Platform Studio
  - Embedded Development Kit (EDK) Resources
    http://www.xilinx.com/edk
  - Embedded System Tools Reference Manual
    http://www.xilinx.com/support/documentation/sw_manuals/edk10_est_rm.pdf
  - EDK Concepts, Tools, and Techniques
    http://www.xilinx.com/support/documentation/sw_manuals/edk_ctt.pdf

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Documentation

- PowerPC 440
  - PowerPC 440 Processor
    http://www.xilinx.com/powerpc
  - Embedded Processor Block in Virtex-5 FPGAs Reference Guide – UG200
    http://www.xilinx.com/support/documentation/user_guides/ug200.pdf
  - PPC440 Virtex-5 Wrapper – DS621
    http://www.xilinx.com/support/documentation/ip_documentation/ppc440_virtex5.pdf
  - DDR2 Memory Controller for PowerPC 440 Processors – DS567
    http://www.xilinx.com/support/documentation/data_sheets/ds567.pdf

Documentation

- MicroBlaze
  - MicroBlaze Processor
    http://www.xilinx.com/microblaze
  - MicroBlaze Processor Reference Guide – UG081
    http://www.xilinx.com/support/documentation/sw_manuals/mb_ref_guide.pdf

Documentation

- Memory Solutions
  - Demos on Demand – Memory Interface Solutions with Xilinx FPGAs
    http://www.demosondemand.com/clients/xilinx/001/page_new2/index.asp#35
  - Xilinx Memory Corner
    http://www.xilinx.com/products/design_resources/mem_corner
  - Additional Memory Resources
    http://www.xilinx.com/support/software/memory/protected/index.htm
  - Xilinx Memory Interface Generator (MIG) 2.2 User Guide
    http://www.xilinx.com/support/documentation/ip_documentation/ug086.pdf
  - Memory Interfaces Made Easy with Xilinx FPGAs and the Memory Interface Generator
    http://www.xilinx.com/support/documentation/white_papers/wp260.pdf

Documentation

- ChipScope Pro
  - ChipScope Pro 10.1i Serial IO Toolkit User Manual
    http://www.xilinx.com/ise/verification/chipscope_pro_siotk_10_1_ug213.pdf
  - ChipScope Pro 10.1i ChipScope Pro Software and Cores User Guide
    http://www.xilinx.com/ise/verification/chipscope_pro_sw_cores_10_1_ug029.pdf

Documentation

- Ethernet
  - Virtex-5 Embedded Tri-Mode Ethernet MAC Wrapper Data Sheet
    http://www.xilinx.com/support/documentation/ip_documentation/v5_emac_ds550.pdf
  - Virtex-5 Embedded Tri-Mode Ethernet MAC Wrapper Getting Started Guide
    http://www.xilinx.com/support/documentation/ip_documentation/v5_emac_gsg340.pdf
  - Virtex-5 Tri-Mode Ethernet Media Access Controller User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug194.pdf
  - LightWeight IP (lwIP) Application Examples – XAPP1026
    http://www.xilinx.com/support/documentation/application_notes/xapp1026.pdf

Documentation

- PLB v4.6 IP
  - Processor Local Bus (PLB) v4.6 Data Sheet – DS531
    http://www.xilinx.com/support/documentation/ip_documentation/plb_v46.pdf
  - Multi-Port Memory Controller (MPMC) – DS643
    http://www.xilinx.com/support/documentation/ip_documentation/mpmc.pdf
  - XPS Multi-CHannel External Memory Controller (XPS MCH EMC) – DS575
    http://www.xilinx.com/support/documentation/ip_documentation/xps_mch_emc.pdf
  - XPS LocalLink TEMAC – DS537
    http://www.xilinx.com/support/documentation/ip_documentation/xps_ll_temac.pdf
  - XPS LocalLink FIFO – DS568
    http://www.xilinx.com/support/documentation/ip_documentation/xps_ll_fifo.pdf

Documentation

- PLB v4.6 IP
  - XPS IIC Bus Interface – DS606
    http://www.xilinx.com/support/documentation/ip_documentation/xps_iic.pdf
  - XPS SYSACE (System ACE) Interface Controller – DS583
    http://www.xilinx.com/support/documentation/ip_documentation/xps_sysace.pdf
  - XPS Timer/Counter – DS573
    http://www.xilinx.com/support/documentation/ip_documentation/xps_timer.pdf
  - XPS Interrupt Controller – DS572
    http://www.xilinx.com/support/documentation/ip_documentation/xps_intc.pdf
  - Using and Creating Interrupt-Based Systems Application Note
    http://www.xilinx.com/support/documentation/application_notes/xapp778.pdf

Documentation

- PLB v4.6 IP
  - XPS General Purpose Input/Output (GPIO) – DS569
    http://www.xilinx.com/support/documentation/ip_documentation/xps_gpio.pdf
  - XPS External Peripheral Controller (EPC) – DS581
    http://www.xilinx.com/support/documentation/ip_documentation/xps_epc.pdf
  - XPS 16550 UART – DS577
    http://www.xilinx.com/support/documentation/ip_documentation/xps_uart16550.pdf
  - PLBV46 to DCR Bridge Data Sheet – DS578
    http://www.xilinx.com/support/documentation/ip_documentation/plbv46_dcr_bridge.pdf

Documentation

- IP
  - Local Memory Bus Data Sheet – DS445
    http://www.xilinx.com/support/documentation/ip_documentation/lmb_v10.pdf
  - Block RAM Block Data Sheet – DS444
    http://www.xilinx.com/support/documentation/ip_documentation/bram_block.pdf
  - Microprocessor Debug Module Data Sheet – DS641
    http://www.xilinx.com/support/documentation/ip_documentation/mdm.pdf
  - LMB Block RAM Interface Controller Data Sheet – DS452
    http://www.xilinx.com/support/documentation/ip_documentation/lmb_bram_if_cntlr.pdf
  - Device Control Register Bus (DCR) v2.9 Data Sheet – DS406
    http://www.xilinx.com/support/documentation/ip_documentation/dcr_v29.pdf

Documentation

- IP
  - JTAGPPC Controller Data Sheet – DS298
    http://www.xilinx.com/support/documentation/ip_documentation/jtagppc_cntlr.pdf
  - Processor System Reset Module Data Sheet – DS402
    http://www.xilinx.com/support/documentation/ip_documentation/proc_sys_reset.pdf
  - Clock Generator v2.0 Data Sheet – DS614
    http://www.xilinx.com/support/documentation/ip_documentation/clock_generator.pdf
  - Util Bus Split Operation Data Sheet – DS484
    http://www.xilinx.com/support/documentation/ip_documentation/util_bus_split.pdf

Documentation

- ML510
  - ML510 Overview
    http://www.xilinx.com/ml510
  - ML510 Evaluation Platform User Guide – UG356
    http://www.xilinx.com/support/documentation/boards_and_kits/ug356.pdf
  - ML510 Reference Design User Guide – UG355
    http://www.xilinx.com/support/documentation/boards_and_kits/ug355.pdf
  - ML510 Quickstart Tutorial
    http://www.xilinx.com/products/boards/ml510/docs/ml510_quickstart.pdf

Documentation

- ML510
  - ML510 Schematics

    http://www.xilinx.com/support/documentation/boards_and_kits/ml510_schematics.pdf
  - ML510 Bill of Material

    http://www.xilinx.com/support/documentation/boards_and_kits/ml510_bom.xls