

ML605 System Monitor and USB

October 2010

Revision History

Date	Version	Description
10/05/10	12.3	Up-rev 12.2 System Monitor Design to 12.3. Added USB hardware. Added AR38127 Added ARxxxxx
07/23/10	12.2	Up-rev 12.1 System Monitor Design to 12.2. Updated SI Labs USB UART Drivers URL

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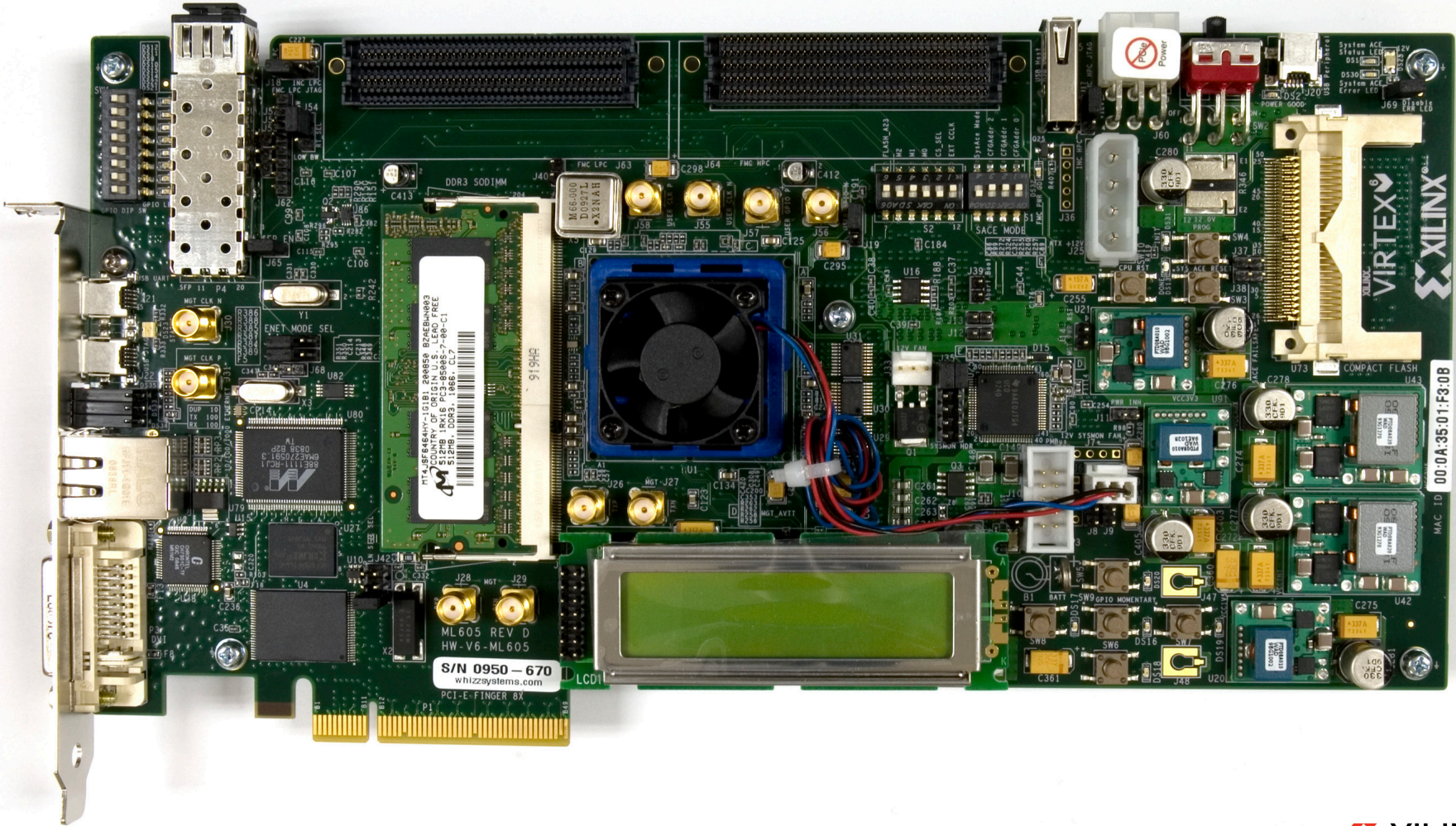
Overview

- **Virtex-6 System Monitor Capability**
- **Xilinx ML605 Board**
- **ML605 Setup**
- **Running the System Monitor**
- **ML605 System Monitor Measurements**
- **Download ML605 System Monitor Design**
- **Compile ML605 System Monitor Design**
- **References**

Virtex-6 System Monitor Capability

- **Available in all Virtex-6 Devices**
- **On-Chip Temperature Measurement ($\pm 4^{\circ}\text{C}$)**
- **On-Chip Power Supply Measurement ($\pm 1\%$)**
- **JTAG Accessible**
 - Usable before, during, and after configuration
- **Accessible from User Logic**
- **Programmable Alarms**
- **User Accessible Analog-to-Digital Converter**
 - 10-bit resolution
 - 200 kSPS (kilo-samples per second)
 - Digital Averaging

Xilinx ML605 Board



Note: Presentation applies to the ML605



ISE Software Requirements

- **Xilinx ISE 12.3 software**



ML605 Setup

- Power on the ML605 board for UART Drivers Installation
- Connect two USB Type-A to Mini-B cables to the USB JTAG and USB UART connectors on the ML605 board
 - Connect these cables to your PC

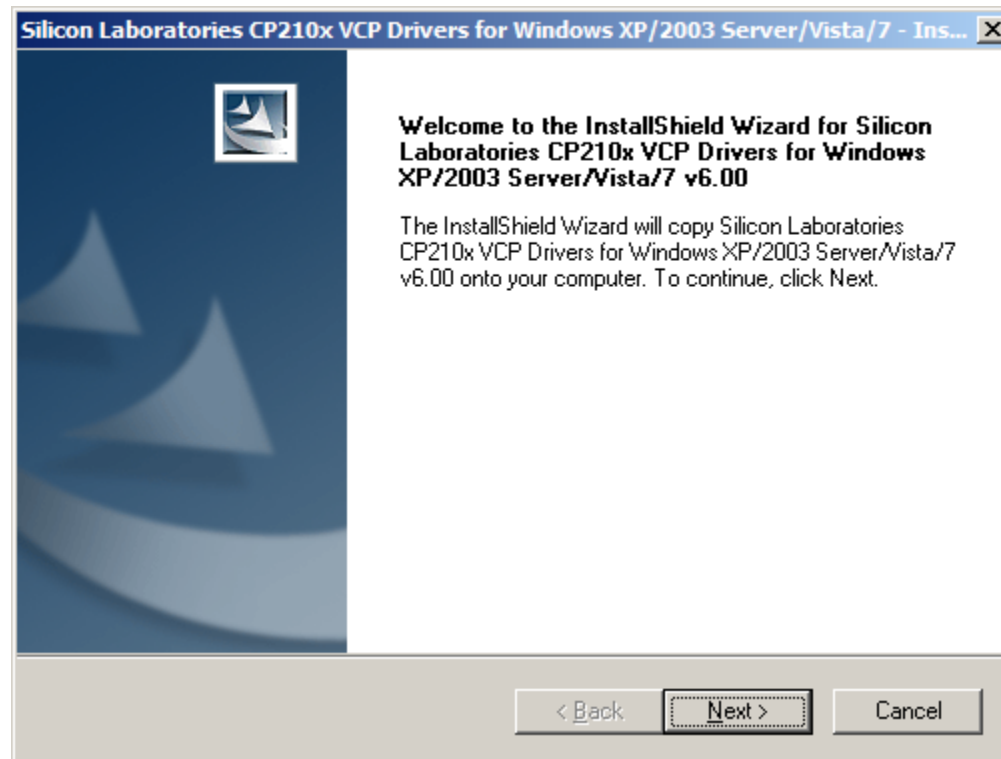


Note: Presentation applies to the ML605

ML605 Setup

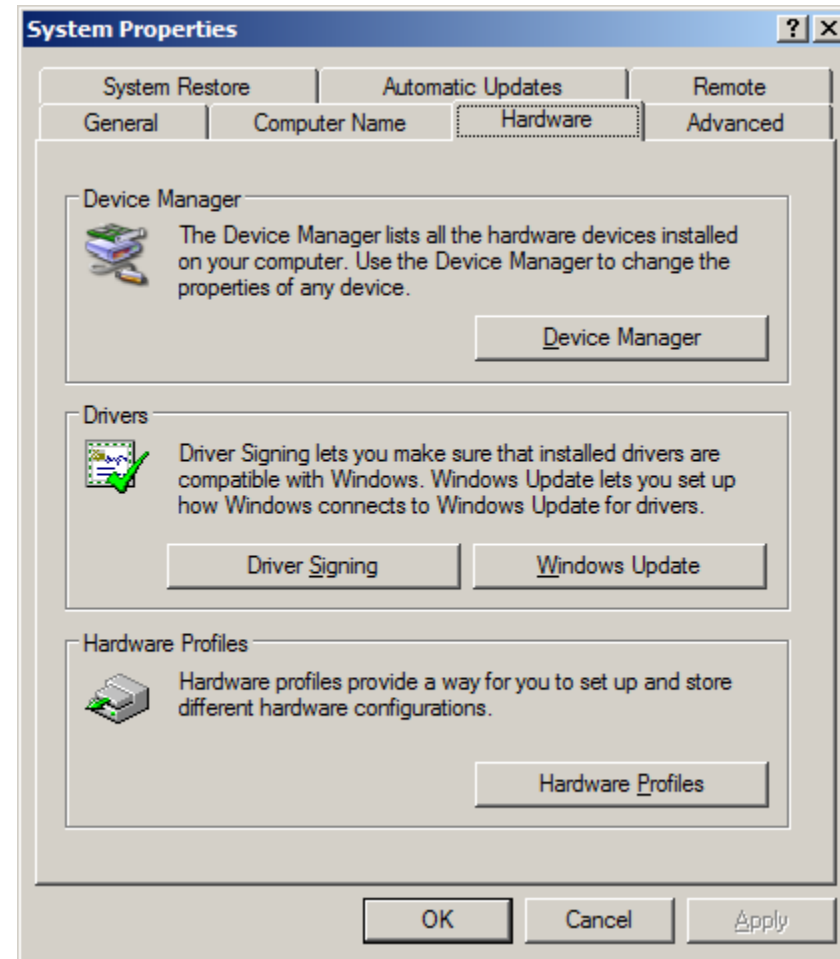
- **Install USB UART Drivers**

- [CP210x VCP Win XP S2K3 Vista 7.exe](#)



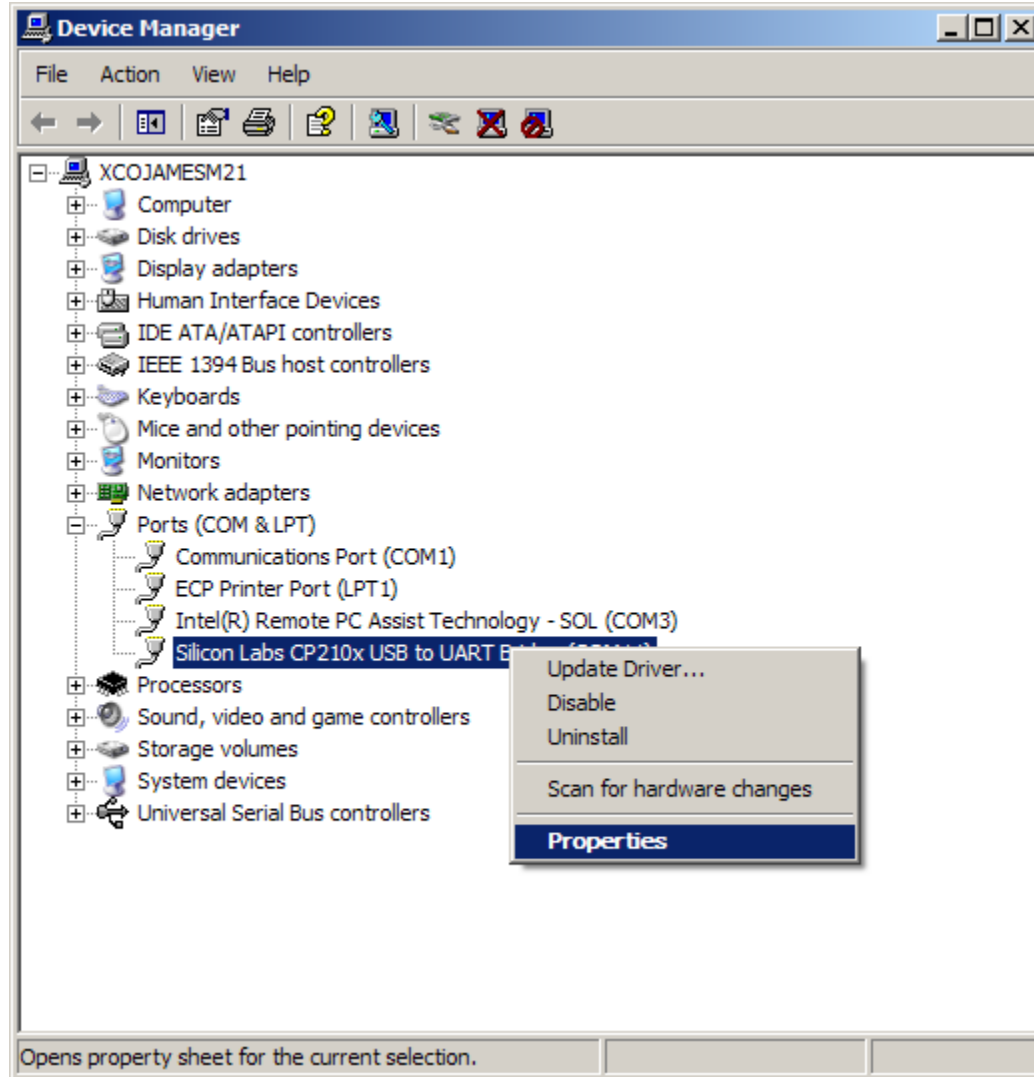
ML605 Setup

- Reboot your PC if necessary
- Right-click on My Computer and select Properties
 - Select the Hardware tab
 - Click on Device Manager



ML605 Setup

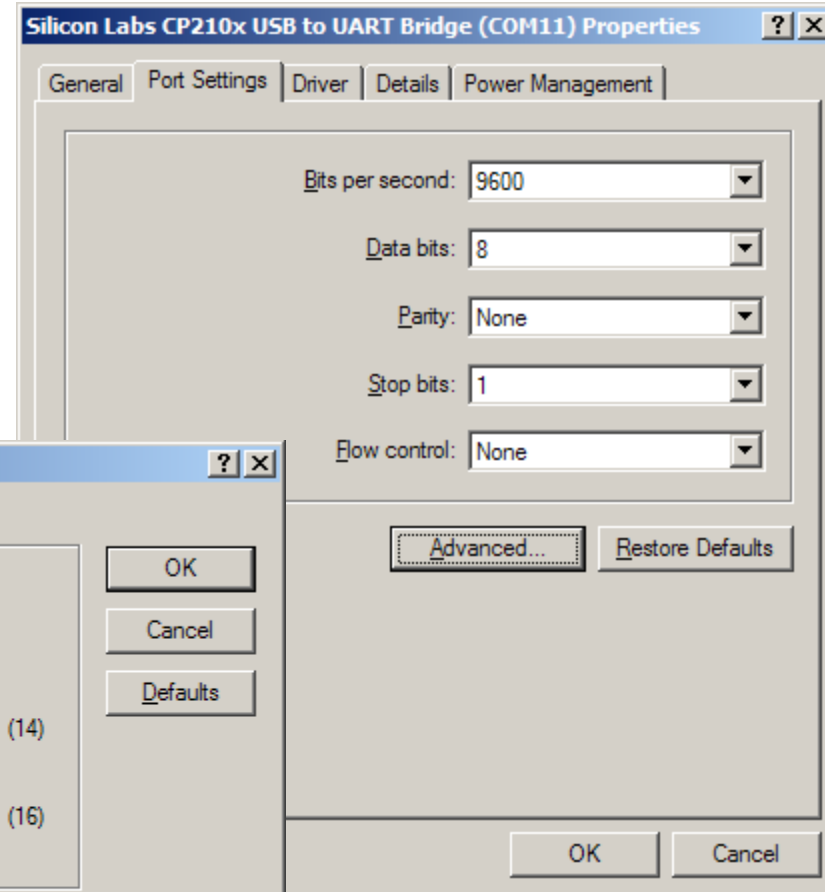
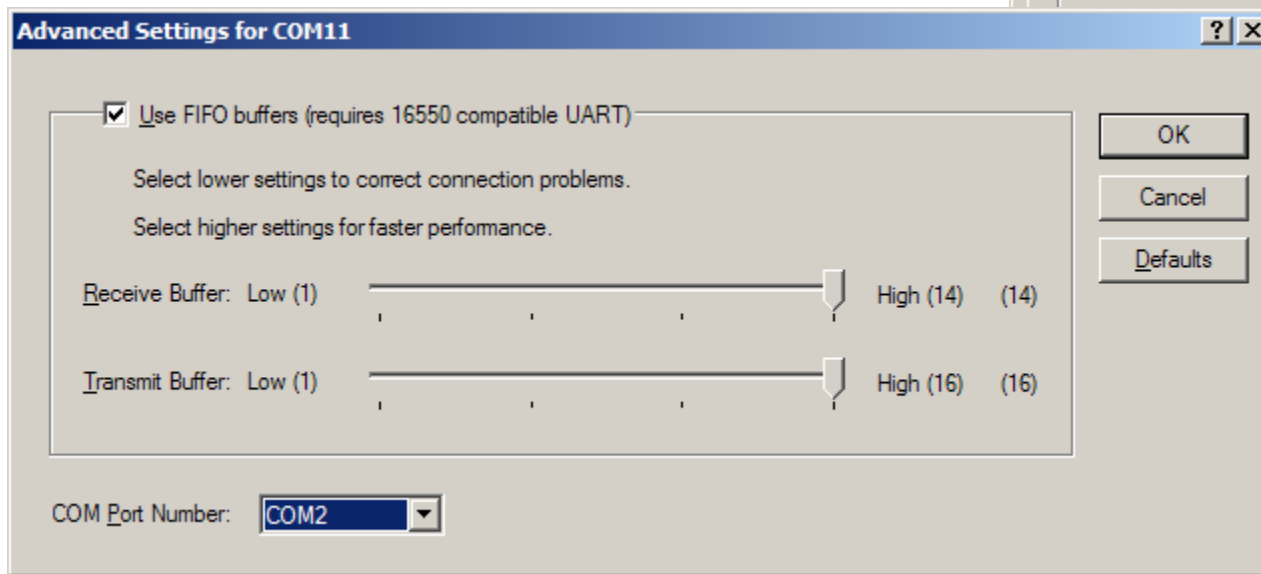
- **Expand the Ports Hardware**
 - Right-click on **Silicon Labs CP210x USB to UART Bridge** and select Properties



ML605 Setup

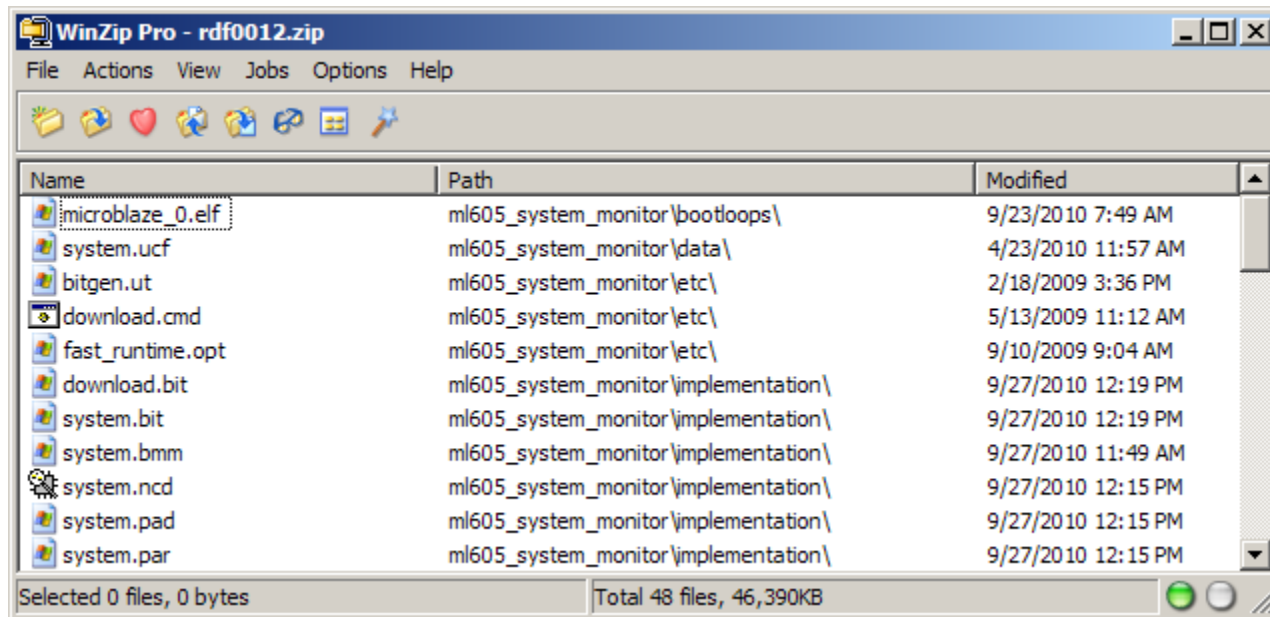
■ Under Port Settings tab

- Click Advanced
- Set the COM Port to an open Com Port setting from COM1 to COM4



Running System Monitor

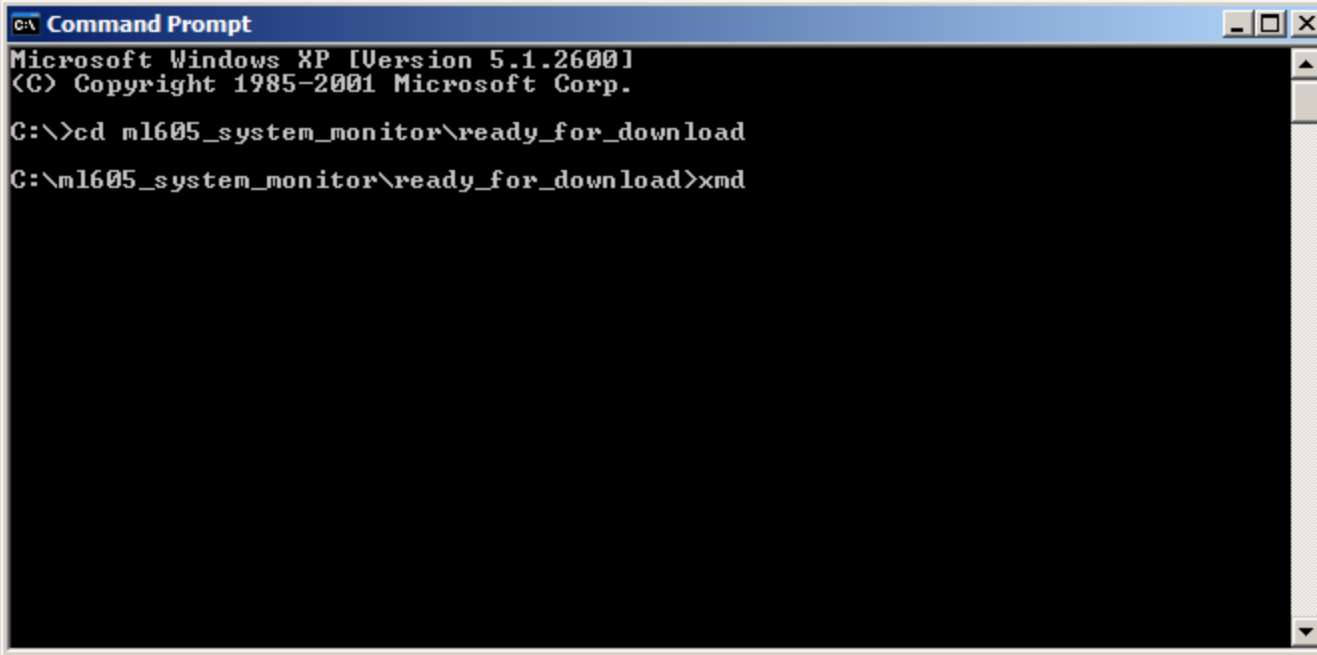
- **Unzip the rdf0012.zip file to your C:\ drive**
 - Available through <http://www.xilinx.com/ml605>



Running System Monitor

- **Download the System Monitor bitstream:**

```
cd ml605_system_monitor\ready_for_download  
xmd
```

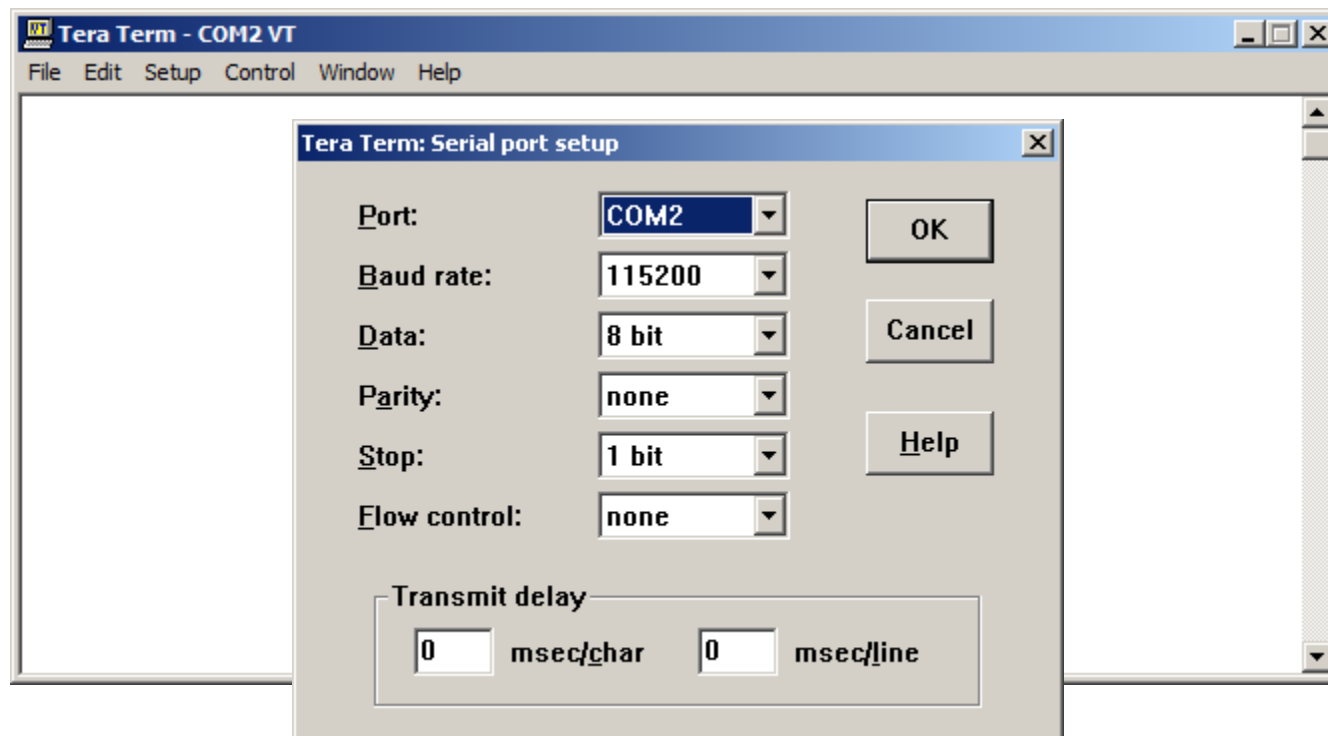


```
C:\ Command Prompt  
Microsoft Windows XP [Version 5.1.2600]  
(C) Copyright 1985-2001 Microsoft Corp.  
C:\>cd ml605_system_monitor\ready_for_download  
C:\ml605_system_monitor\ready_for_download>xmd
```

Running System Monitor

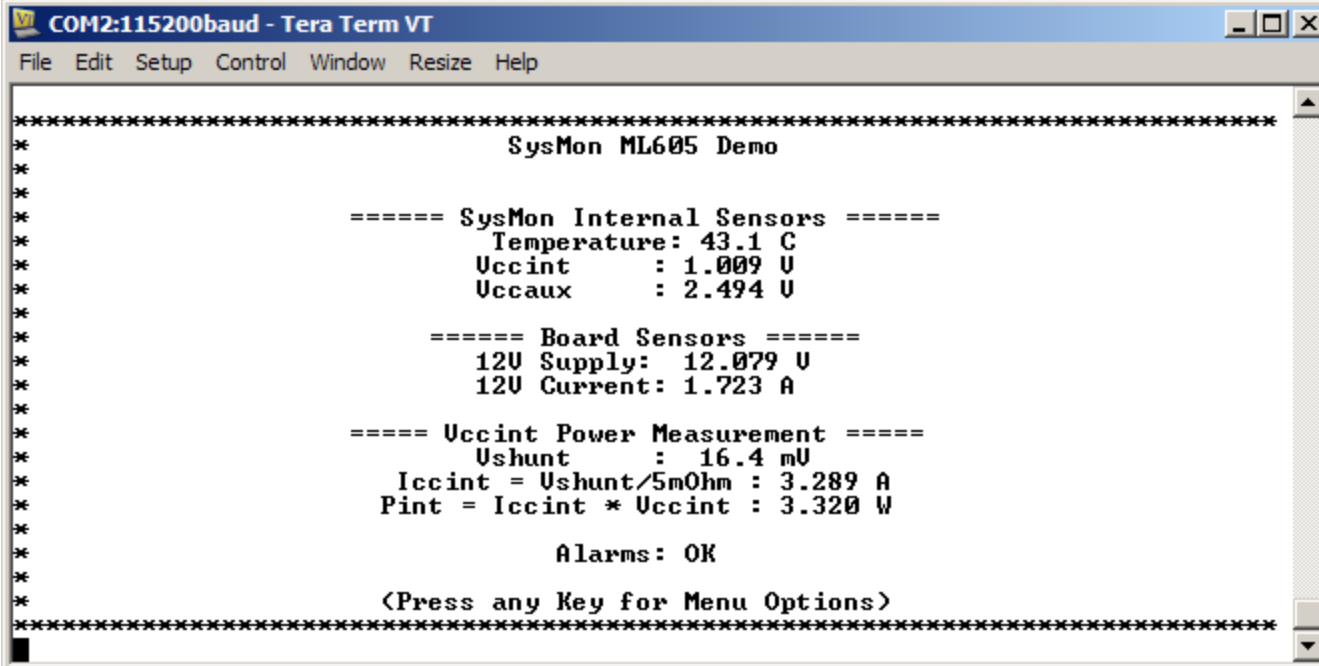
▪ Start the Terminal Program

- Select your USB Com Port
- Set the baud to **115200**
- Start after bitstream is loaded



Running System Monitor

- The System Monitor display will appear in the Terminal window



```
COM2:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help
*****
*                               SysMon ML605 Demo                               *
*                                                                           *
*          ===== SysMon Internal Sensors =====          *
*          Temperature: 43.1 C          *
*          Uccint      : 1.009 U          *
*          Uccaux     : 2.494 U          *
*                                                                           *
*          ===== Board Sensors =====          *
*          12V Supply: 12.079 U          *
*          12V Current: 1.723 A          *
*                                                                           *
*          ===== Uccint Power Measurement =====          *
*          Ushunt     : 16.4 mU          *
*          Iccint = Ushunt/5m0hm : 3.289 A          *
*          Pint = Iccint * Uccint : 3.320 W          *
*                                                                           *
*          Alarms: OK          *
*                                                                           *
*          <Press any Key for Menu Options>          *
*****
```

ML605 System Monitor Measurements

- **12V Supply**

- Voltage, VAUXP[13], VAUXN[13] – External Channel
- Current, VAUXP[12], VAUXN[12] – External Channel

- **VCCINT**

- Voltage – Internal Channel
- Current, VP, VN – External Channel

- **VCCAUX**

- Voltage – Internal Channel

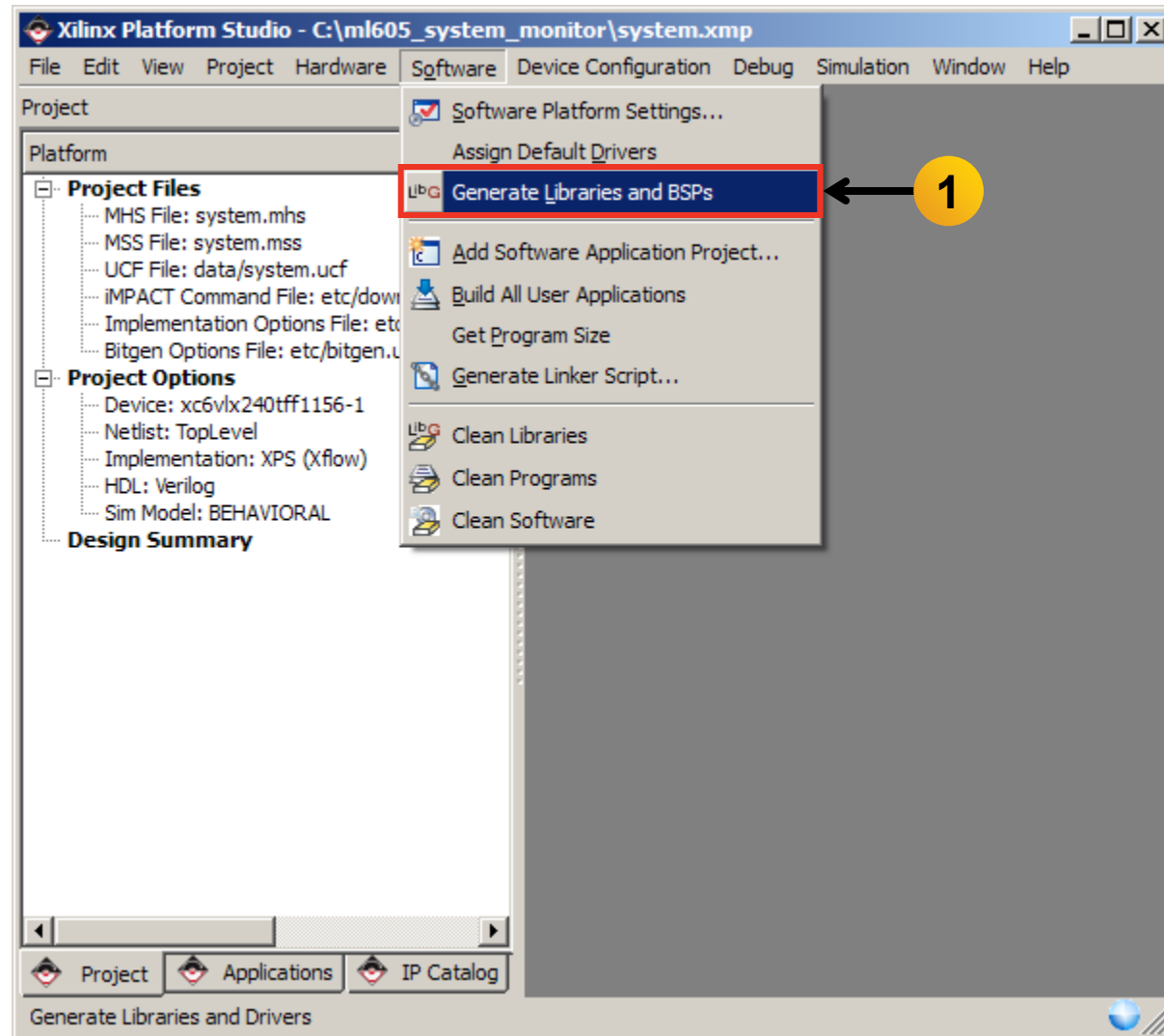
- **Temperature**

- Internal Channel

Compile ML605 System Monitor Design

Compile ML605 System Monitor Design

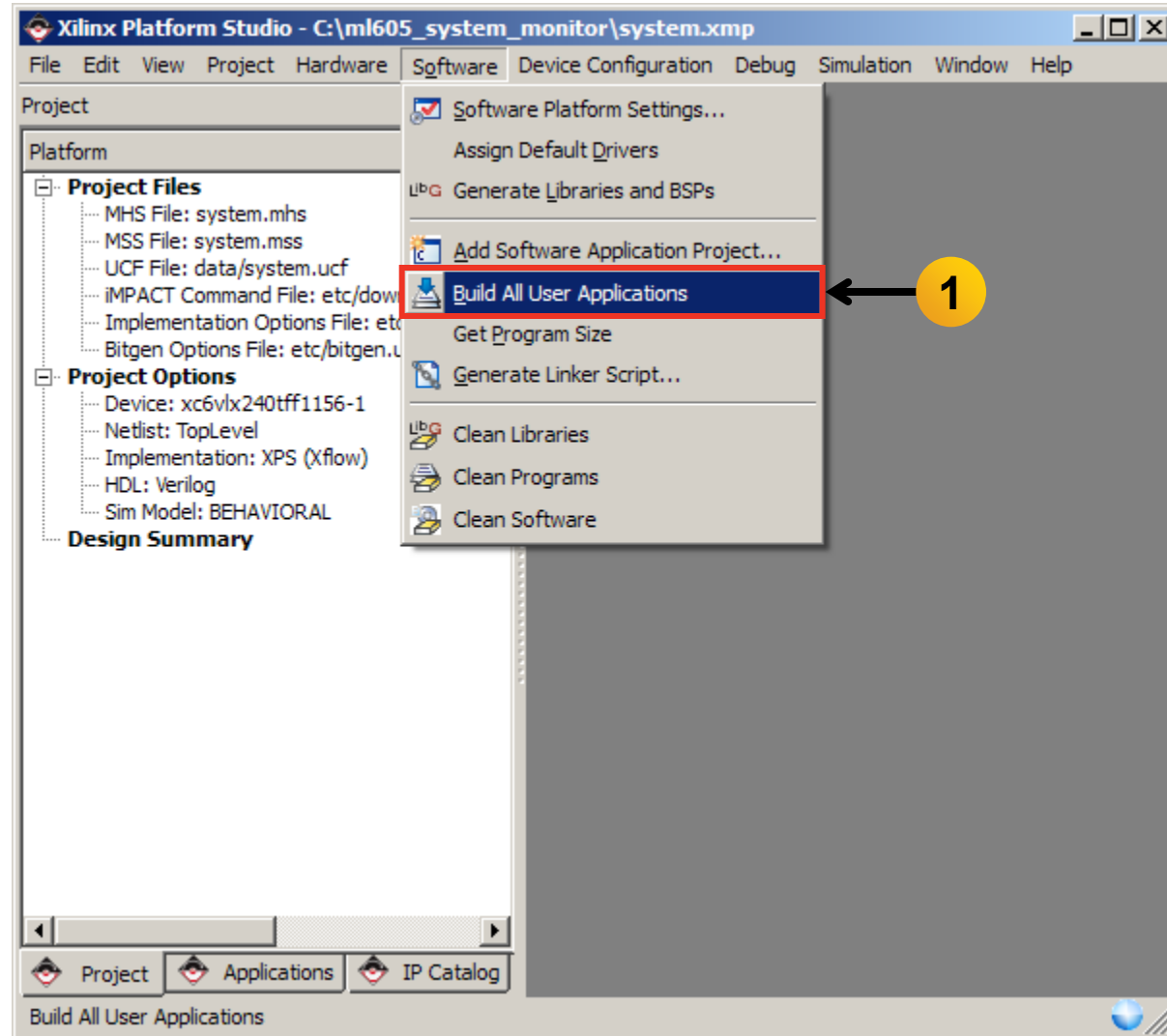
- **The System Monitor Design can be compiled with EDK**
- **Open XPS project <design path>\system.xmp**
- **Generate the libraries needed to create the bitstream**
 - Select **Software** → **Generate Libraries and BSPs** (1)



Compile ML605 System Monitor Design

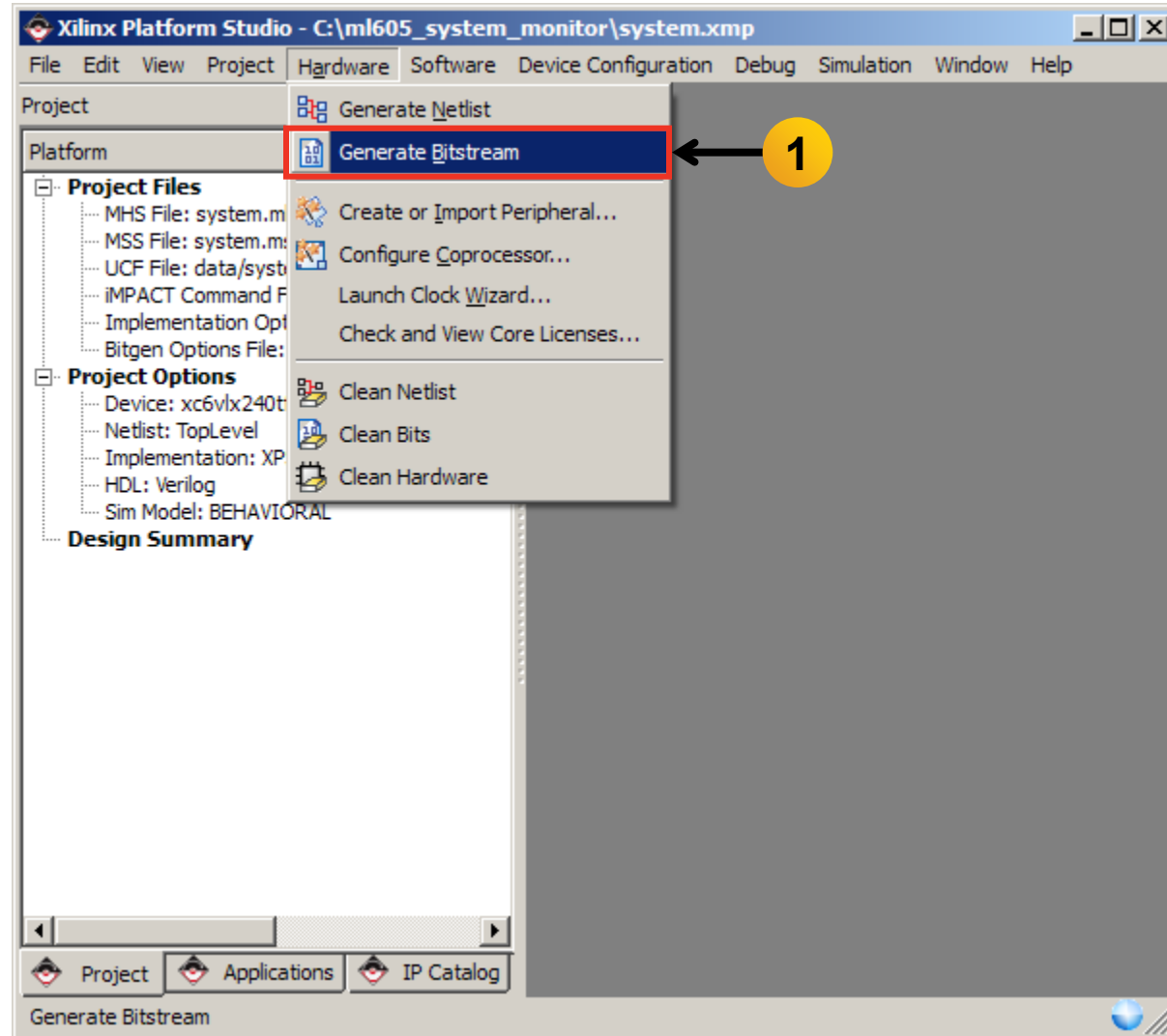
- **Compile the Software Applications and create the application ELF files**

- Select **Software** → **Build All User Applications** (1)



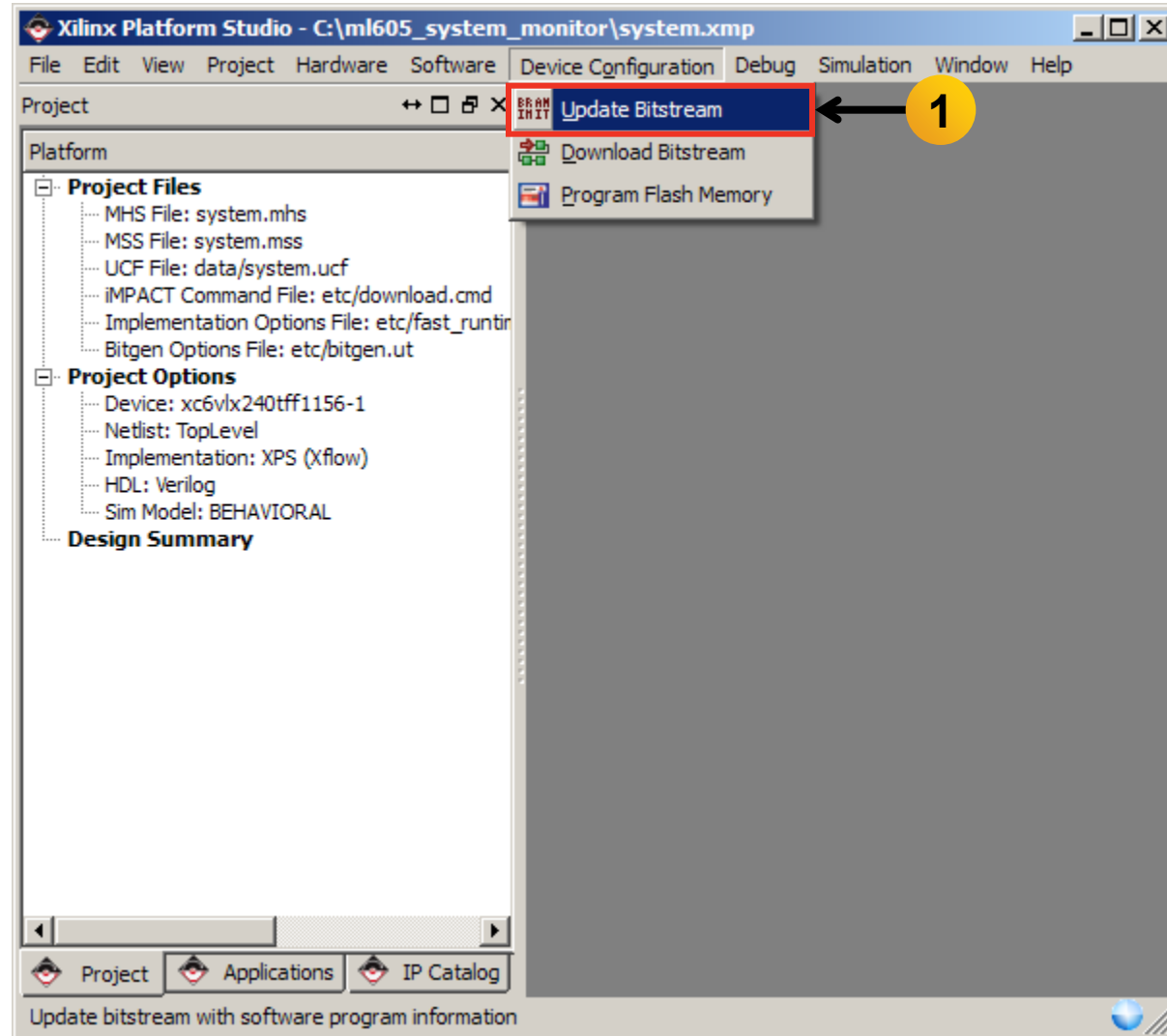
Compile ML605 System Monitor Design

- Create the hardware design, system.bit, located in <project directory>/implementation
 - Select Hardware → Generate Bitstream (1)



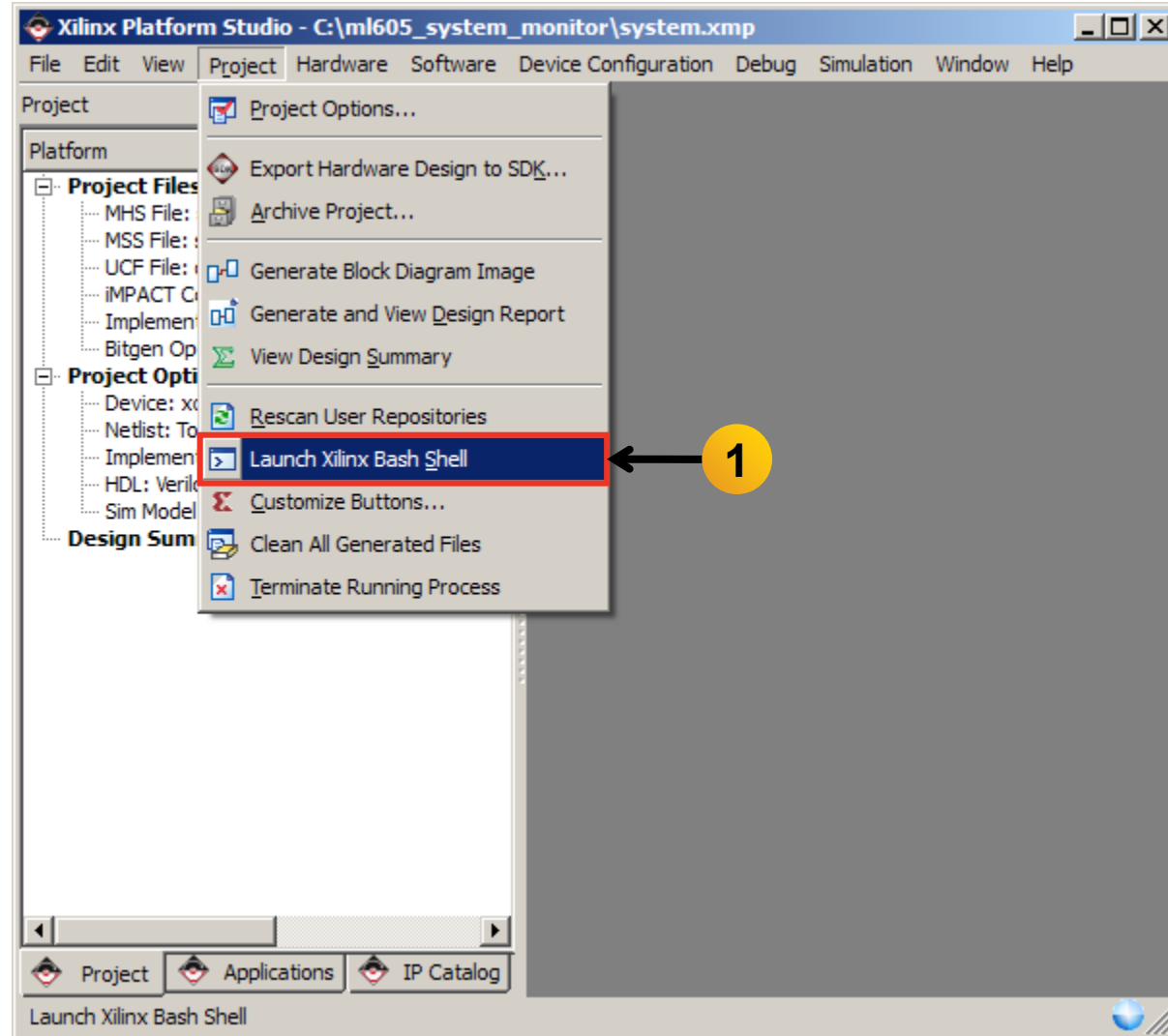
Compile ML605 System Monitor Design

- **Init memory with the bootloop ELF**
 - Update the bitstream (download.bit) with the bootloop ELF (microblaze_0.elf)
 - Select **Device Configuration** → **Update Bitstream** (1)



Generate System Monitor ACE File (Optional)

- **Convert the ELF files to S-record format and create ACE file**
 - **Select Project → Launch Xilinx Bash Shell (1)**

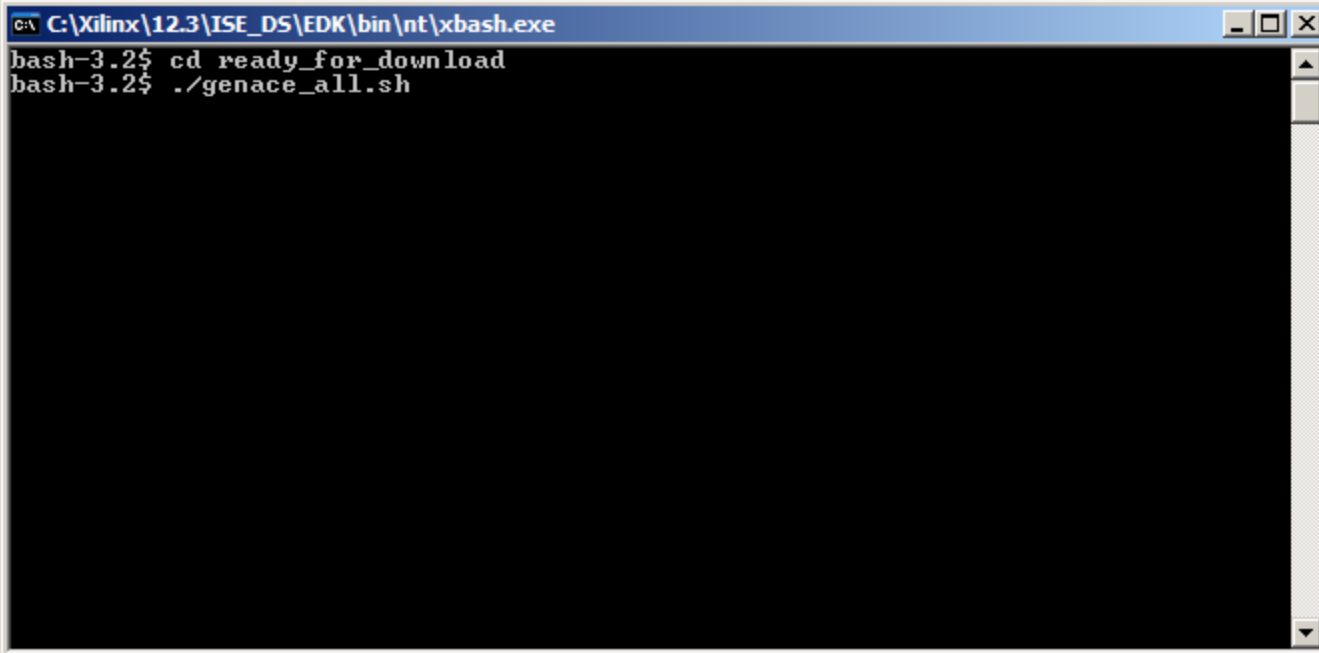


Generate System Monitor ACE File (Optional)

- **Generate the ACE file:**

```
cd ready_for_download
```

```
./genace_all.sh
```



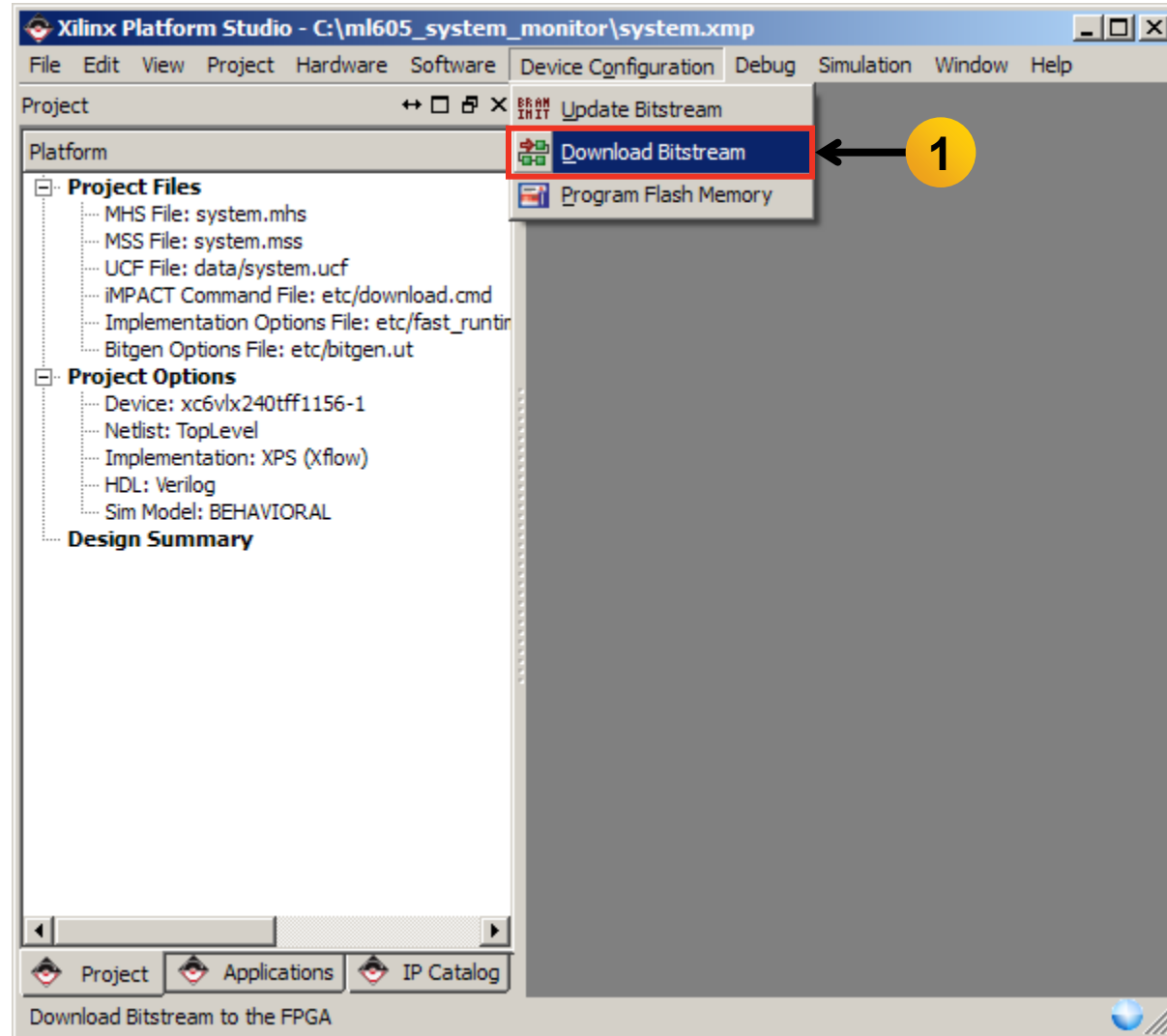
```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
bash-3.2$ cd ready_for_download
bash-3.2$ ./genace_all.sh
```

Download ML605 System Monitor Design

Download ML605 System Monitor Design

■ Download Bitstream

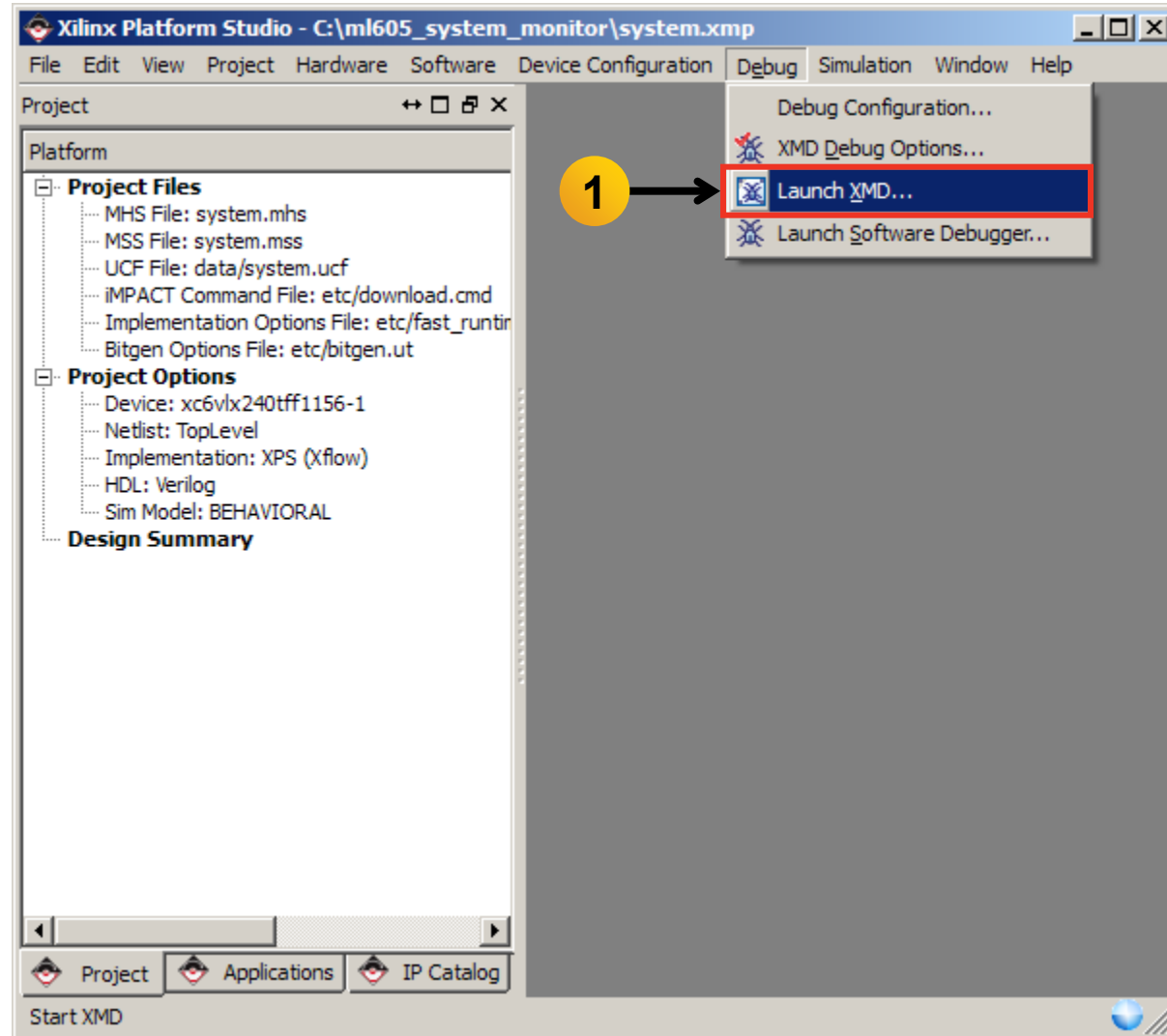
- Select Device Configuration → Download Bitstream (1)



Download ML605 System Monitor Design

- Download the System Monitor ELF with XMD

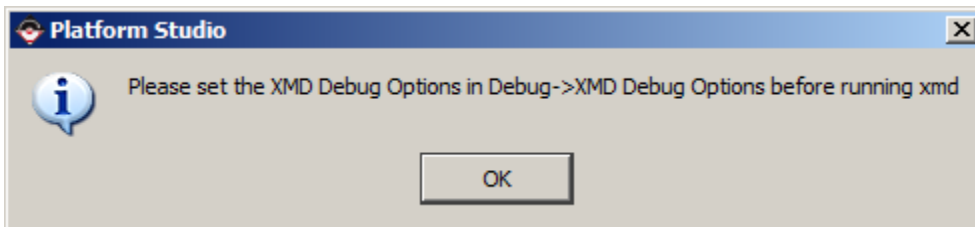
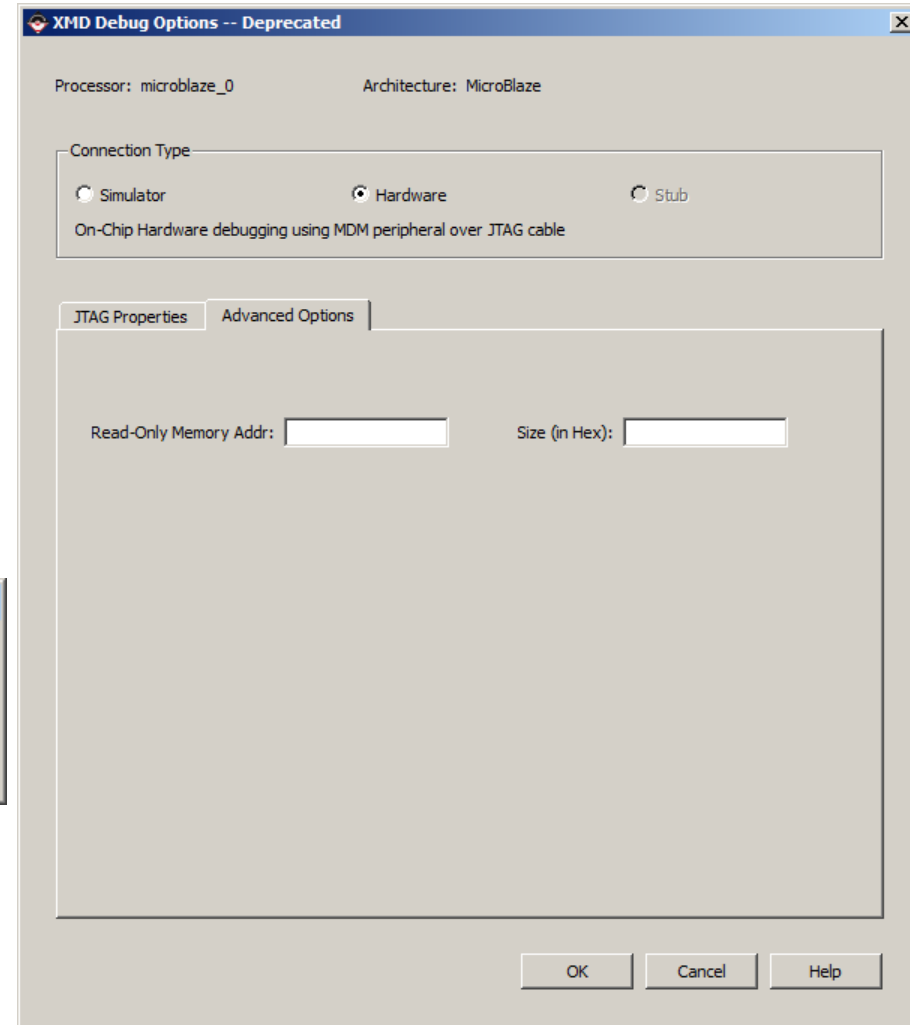
- Select **Debug** → **Launch XMD** (1)



Note: Presentation applies to the ML605

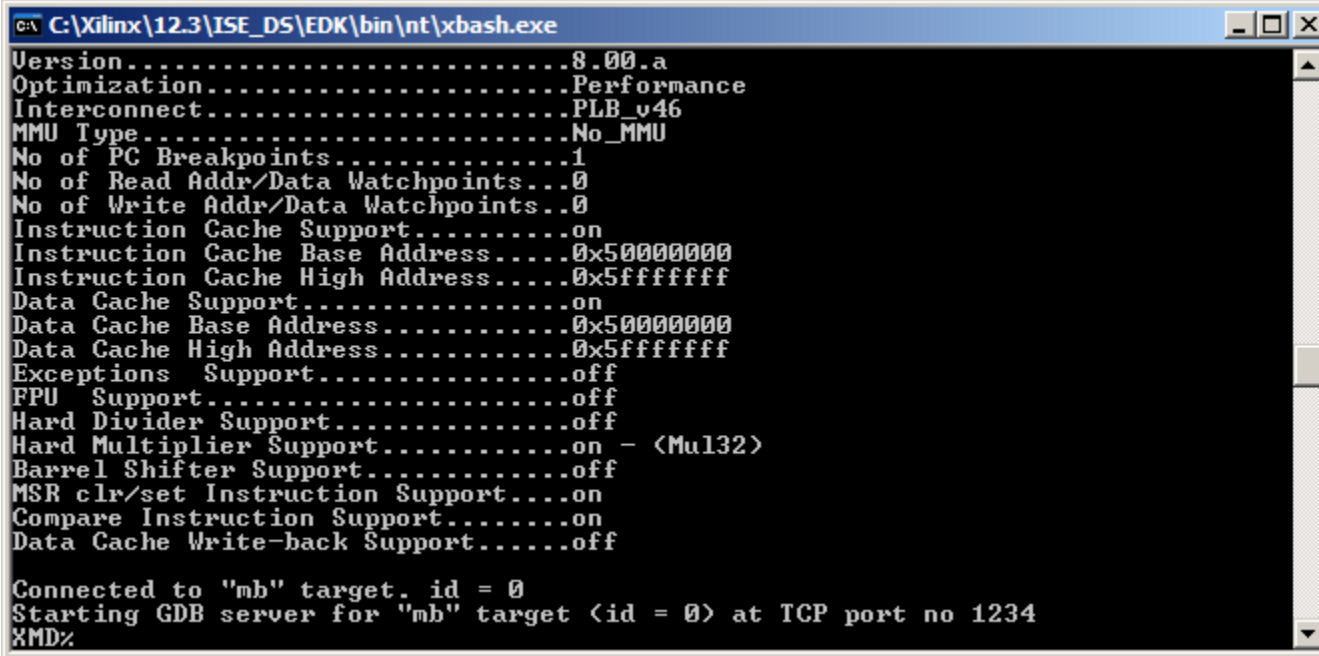
Download ML605 System Monitor Design

- The first time XMD runs on a project, the XMD Debug options must be set



Download ML605 System Monitor Design

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

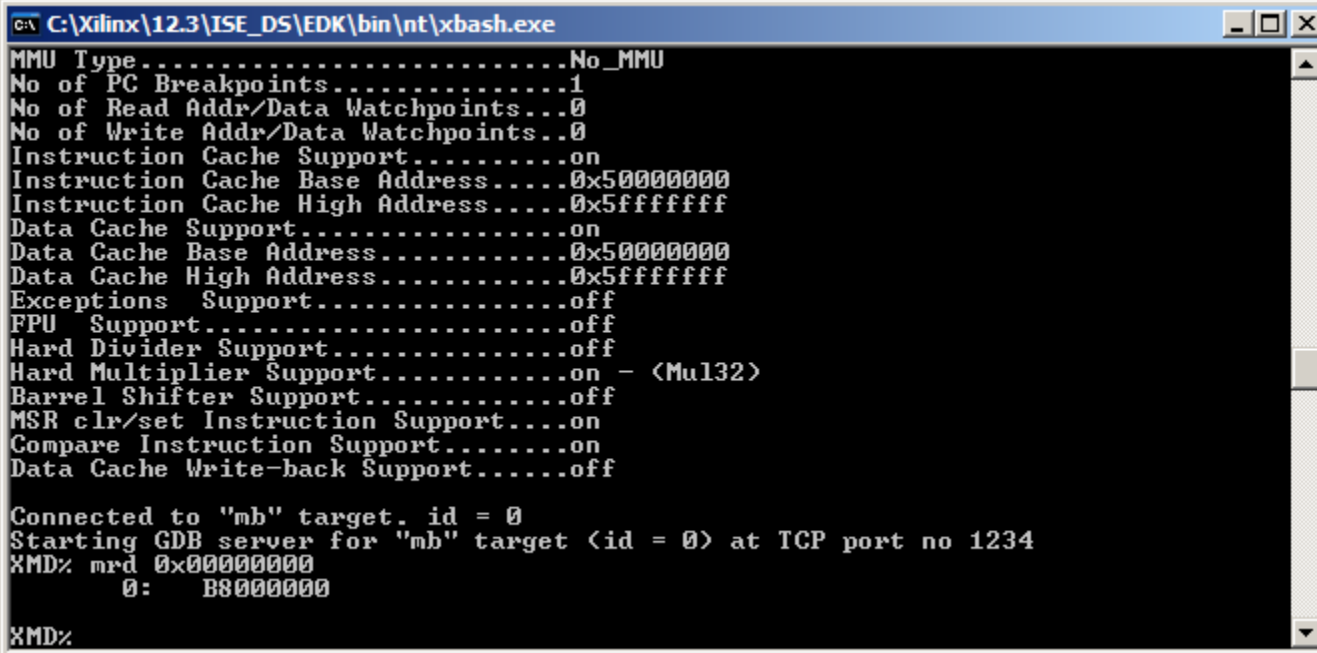


```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
Version.....8.00.a
Optimization.....Performance
Interconnect.....PLB_v46
MMU Type.....No_MMU
No of PC Breakpoints.....1
No of Read Addr/Data Watchpoints...0
No of Write Addr/Data Watchpoints..0
Instruction Cache Support.....on
Instruction Cache Base Address.....0x50000000
Instruction Cache High Address.....0x5fffffff
Data Cache Support.....on
Data Cache Base Address.....0x50000000
Data Cache High Address.....0x5fffffff
Exceptions Support.....off
FPU Support.....off
Hard Divider Support.....off
Hard Multiplier Support.....on - (Mul132)
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) at TCP port no 1234
XMD%
```

Download ML605 System Monitor Design

- 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



```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
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.....on
Instruction Cache Base Address.....0x50000000
Instruction Cache High Address.....0x5fffffff
Data Cache Support.....on
Data Cache Base Address.....0x50000000
Data Cache High Address.....0x5fffffff
Exceptions Support.....off
FPU Support.....off
Hard Divider Support.....off
Hard Multiplier Support.....on - (Mu132)
Barrel Shifter Support.....off
MSR clr/set Instruction Support...on
Compare Instruction Support.....on
Data Cache Write-back Support.....off

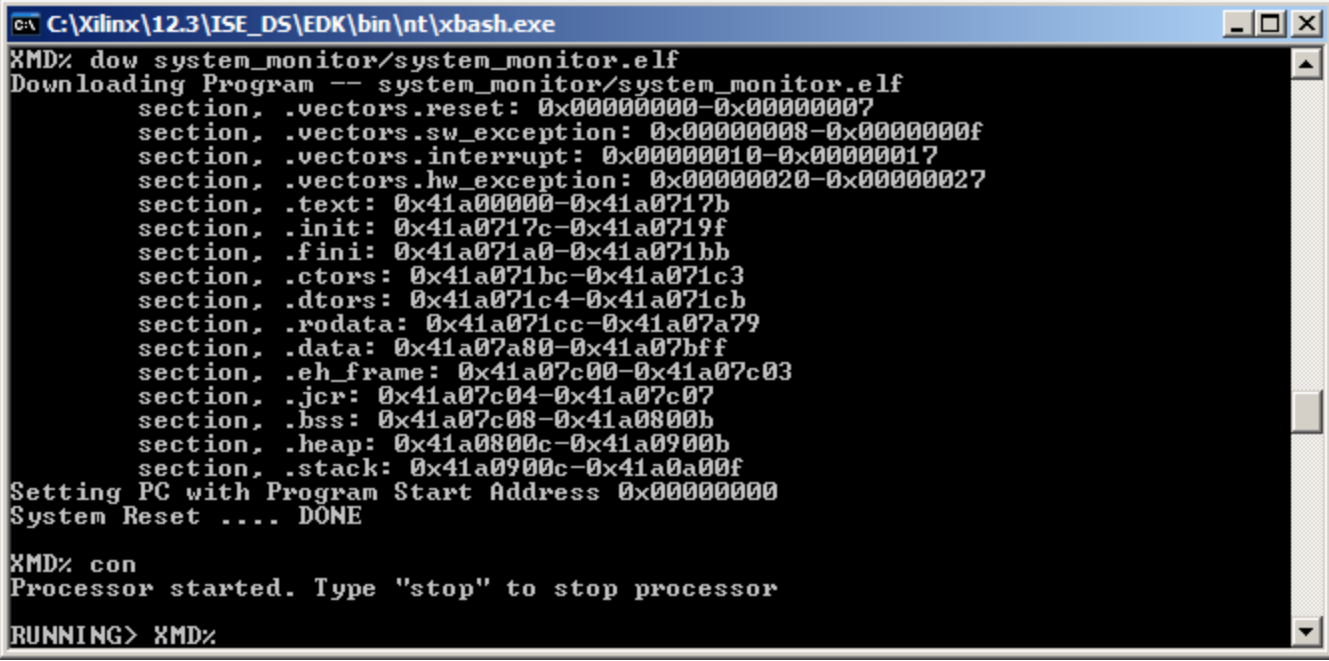
Connected to "mb" target. id = 0
Starting GDB server for "mb" target (id = 0) at TCP port no 1234
XMD% mrd 0x00000000
      0:  B8000000
XMD%
```

Download ML605 System Monitor Design

- Download and run the System Monitor ELF file:

dow system_monitor/system_monitor.elf

con



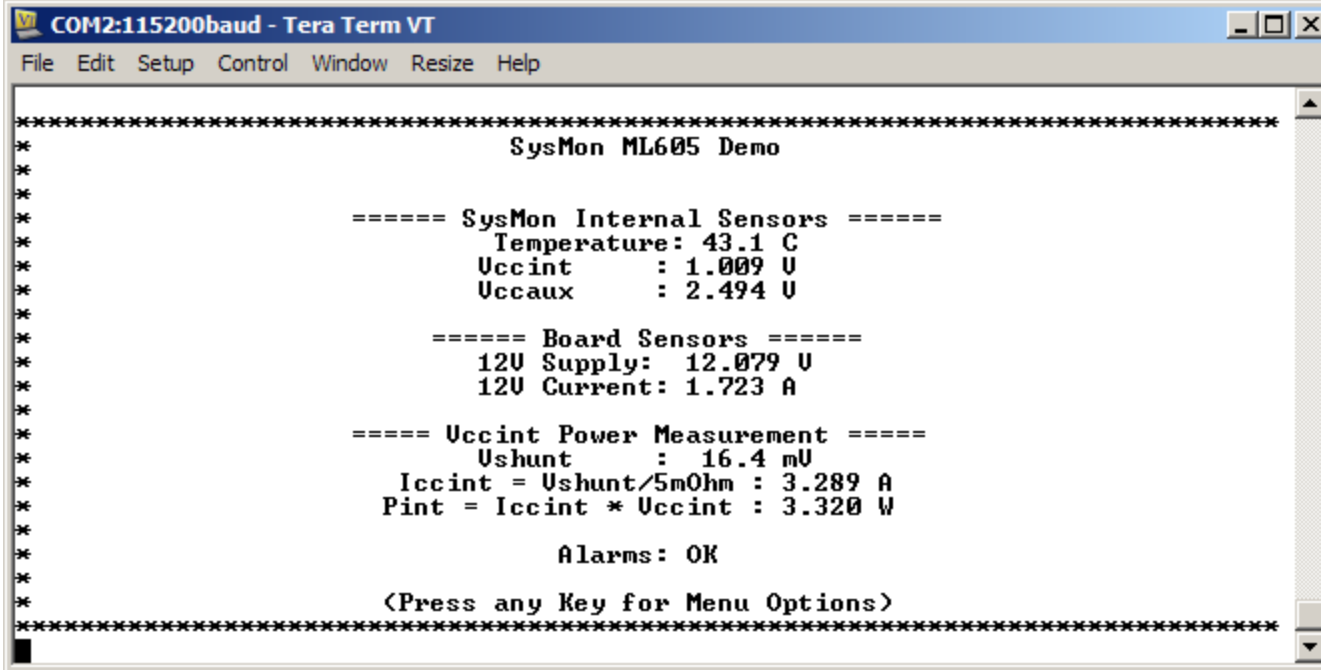
```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
XMD% dow system_monitor/system_monitor.elf
Downloading Program -- system_monitor/system_monitor.elf
section, .vectors.reset: 0x00000000-0x00000007
section, .vectors.sw_exception: 0x00000008-0x0000000f
section, .vectors.interrupt: 0x00000010-0x00000017
section, .vectors.hw_exception: 0x00000020-0x00000027
section, .text: 0x41a00000-0x41a0717b
section, .init: 0x41a0717c-0x41a0719f
section, .fini: 0x41a071a0-0x41a071bb
section, .ctors: 0x41a071bc-0x41a071c3
section, .dtors: 0x41a071c4-0x41a071cb
section, .rodata: 0x41a071cc-0x41a07a79
section, .data: 0x41a07a80-0x41a07bff
section, .eh_frame: 0x41a07c00-0x41a07c03
section, .jcr: 0x41a07c04-0x41a07c07
section, .bss: 0x41a07c08-0x41a0800b
section, .heap: 0x41a0800c-0x41a0900b
section, .stack: 0x41a0900c-0x41a0a00f
Setting PC with Program Start Address 0x00000000
System Reset .... DONE

XMD% con
Processor started. Type "stop" to stop processor

RUNNING> XMD%
```

Run ML605 System Monitor Design

- The System Monitor display will appear in the Terminal window

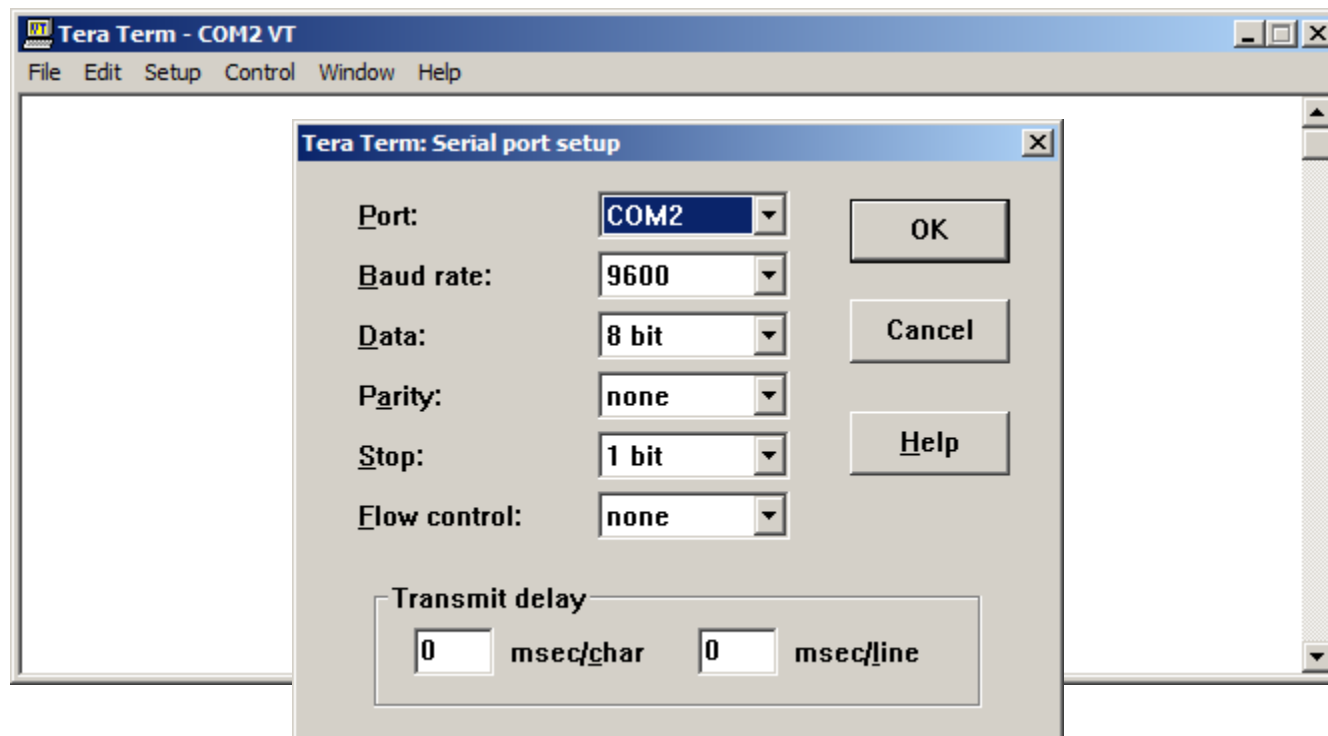


```
COM2:115200baud - Tera Term VT
File Edit Setup Control Window Resize Help
*****
*                               SysMon ML605 Demo                               *
*                                                                              *
*          ===== SysMon Internal Sensors =====          *
*          Temperature: 43.1 C          *
*          Uccint      : 1.009 U          *
*          Uccaux      : 2.494 U          *
*                                                                              *
*          ===== Board Sensors =====          *
*          12V Supply: 12.079 U          *
*          12V Current: 1.723 A          *
*                                                                              *
*          ===== Uccint Power Measurement =====          *
*          Ushunt      : 16.4 mU          *
*          Iccint = Ushunt/5m0hm : 3.289 A          *
*          Pint = Iccint * Uccint : 3.320 W          *
*                                                                              *
*          Alarms: OK          *
*                                                                              *
*          <Press any Key for Menu Options>          *
*****
```

Download ML605 USB Design

▪ Start the Terminal Program

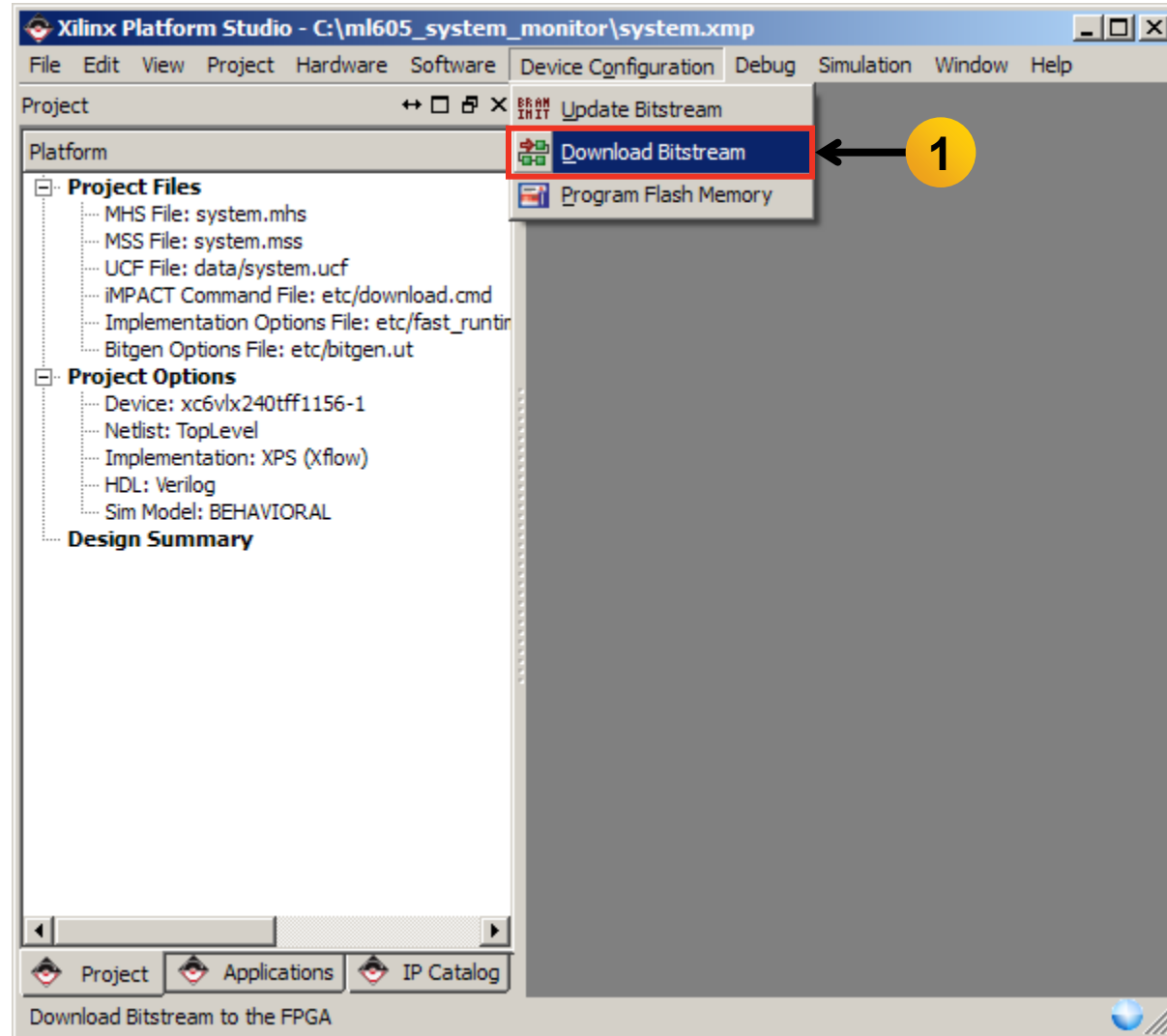
- Select your USB Com Port
- Set the baud to **9600**
- Start after bitstream is loaded



Download ML605 USB Design

■ Download Bitstream

- Select Device Configuration → Download Bitstream (1)

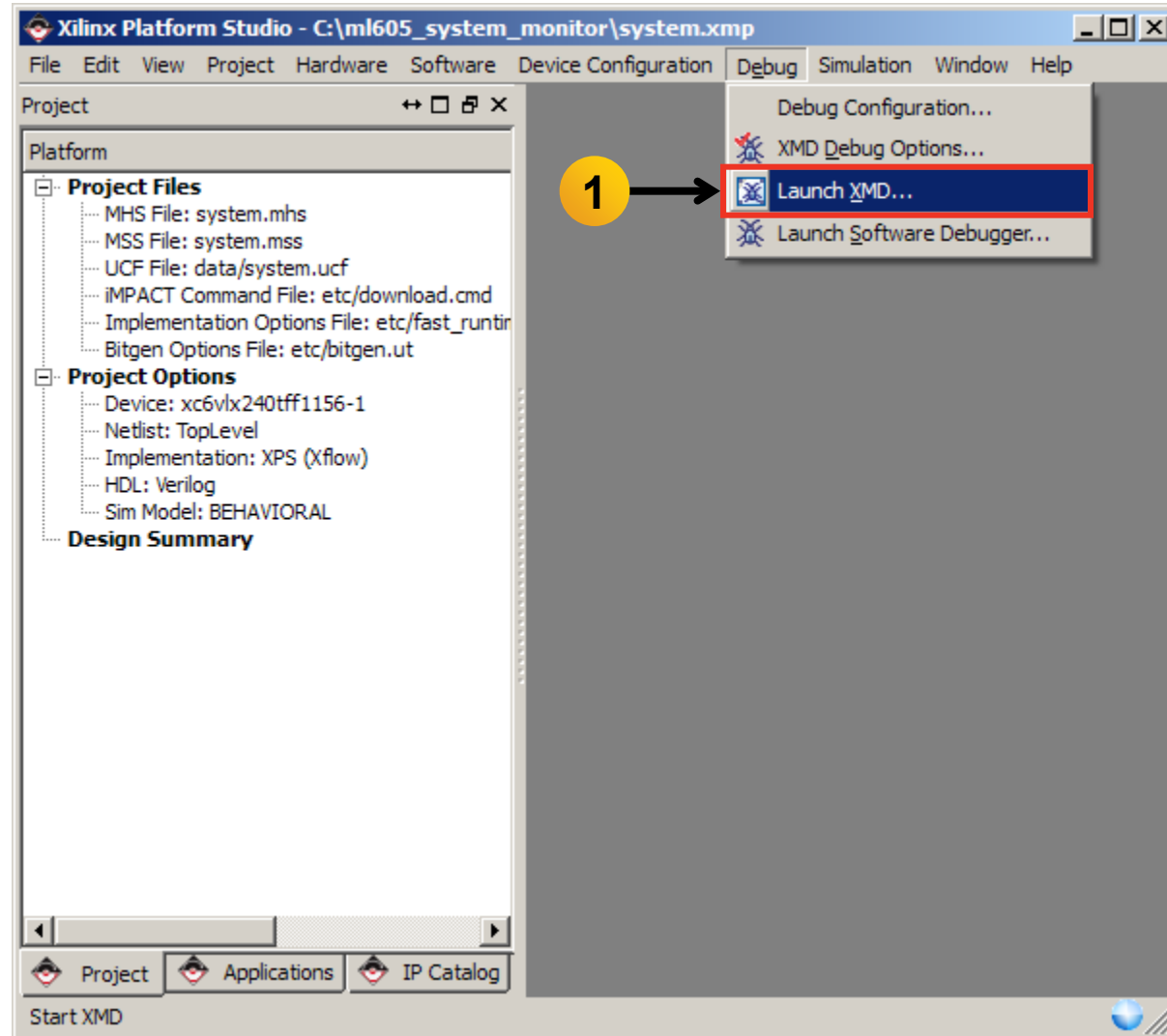


Note: Presentation applies to the ML605

Download ML605 USB Design

- Download the System Monitor ELF with XMD

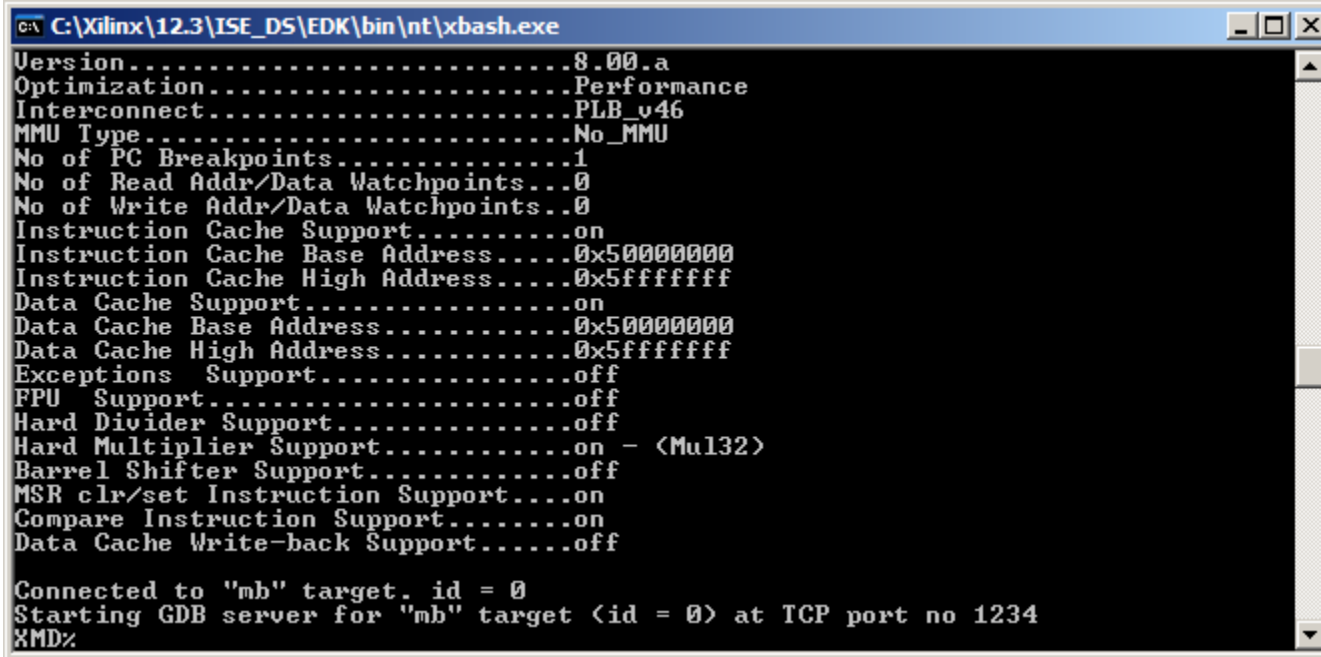
- Select **Debug** → **Launch XMD** (1)



Note: Presentation applies to the ML605

Download ML605 USB Design

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

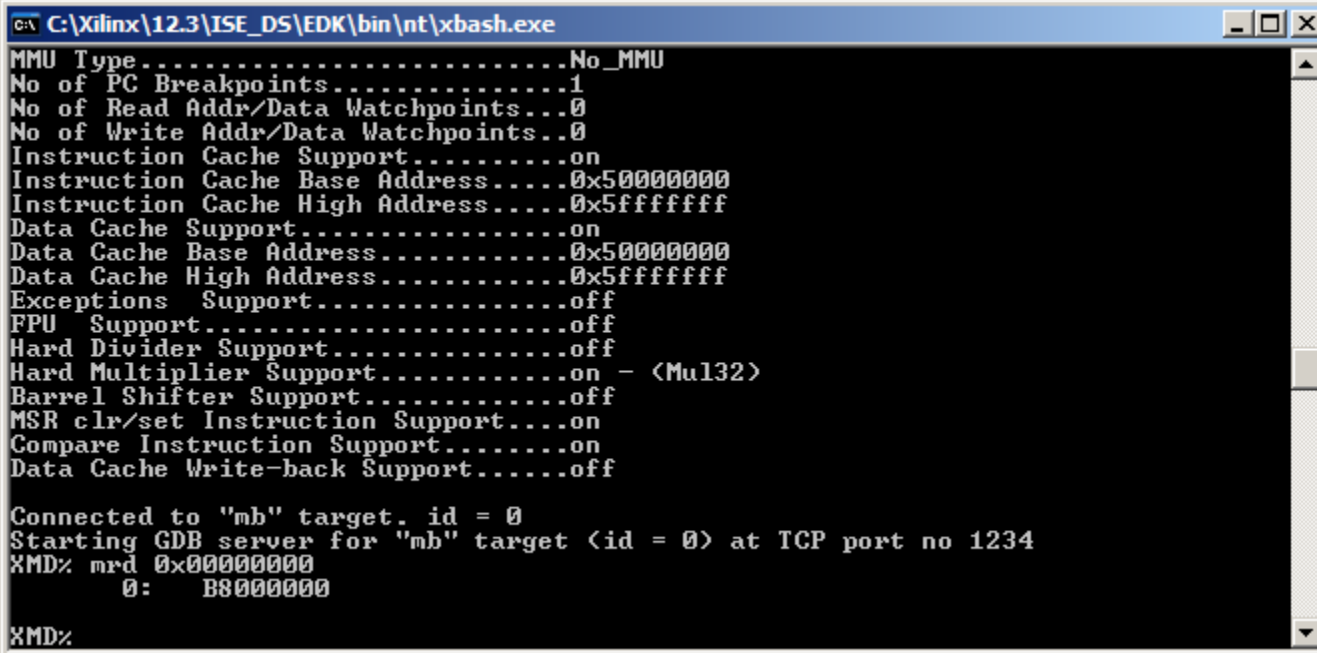


```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
Version.....8.00.a
Optimization.....Performance
Interconnect.....PLB_v46
MMU Type.....No_MMU
No of PC Breakpoints.....1
No of Read Addr/Data Watchpoints...0
No of Write Addr/Data Watchpoints..0
Instruction Cache Support.....on
Instruction Cache Base Address.....0x50000000
Instruction Cache High Address.....0x5fffffff
Data Cache Support.....on
Data Cache Base Address.....0x50000000
Data Cache High Address.....0x5fffffff
Exceptions Support.....off
FPU Support.....off
Hard Divider Support.....off
Hard Multiplier Support.....on - (Mul132)
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) at TCP port no 1234
XMD%
```

Download ML605 USB Design

- 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



```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
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.....on
Instruction Cache Base Address.....0x50000000
Instruction Cache High Address.....0x5fffffff
Data Cache Support.....on
Data Cache Base Address.....0x50000000
Data Cache High Address.....0x5fffffff
Exceptions Support.....off
FPU Support.....off
Hard Divider Support.....off
Hard Multiplier Support.....on - (Mu132)
Barrel Shifter Support.....off
MSR clr/set Instruction Support...on
Compare Instruction Support.....on
Data Cache Write-back Support.....off

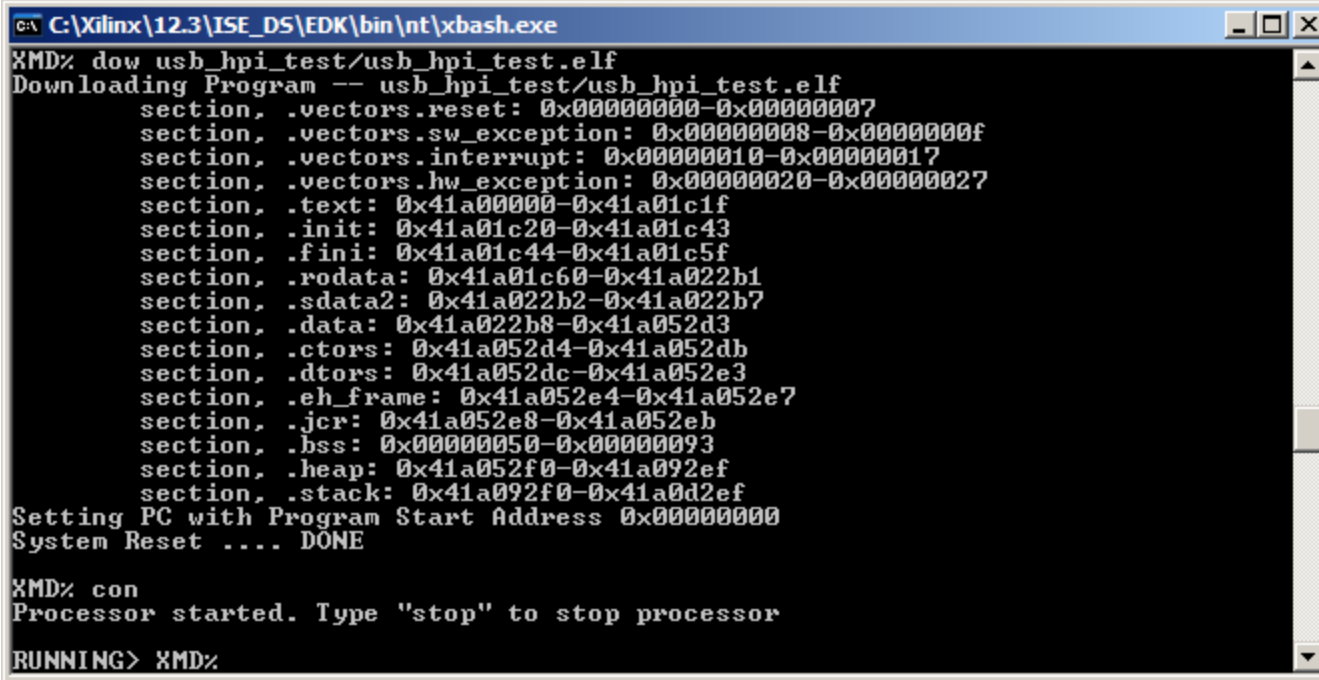
Connected to "mb" target. id = 0
Starting GDB server for "mb" target (id = 0) at TCP port no 1234
XMD% mrd 0x00000000
      0:  B8000000
XMD%
```

Download ML605 USB Design

- Download and run the USB ELF file:

dow usb_hpi_test/usb_hpi_test.elf

con



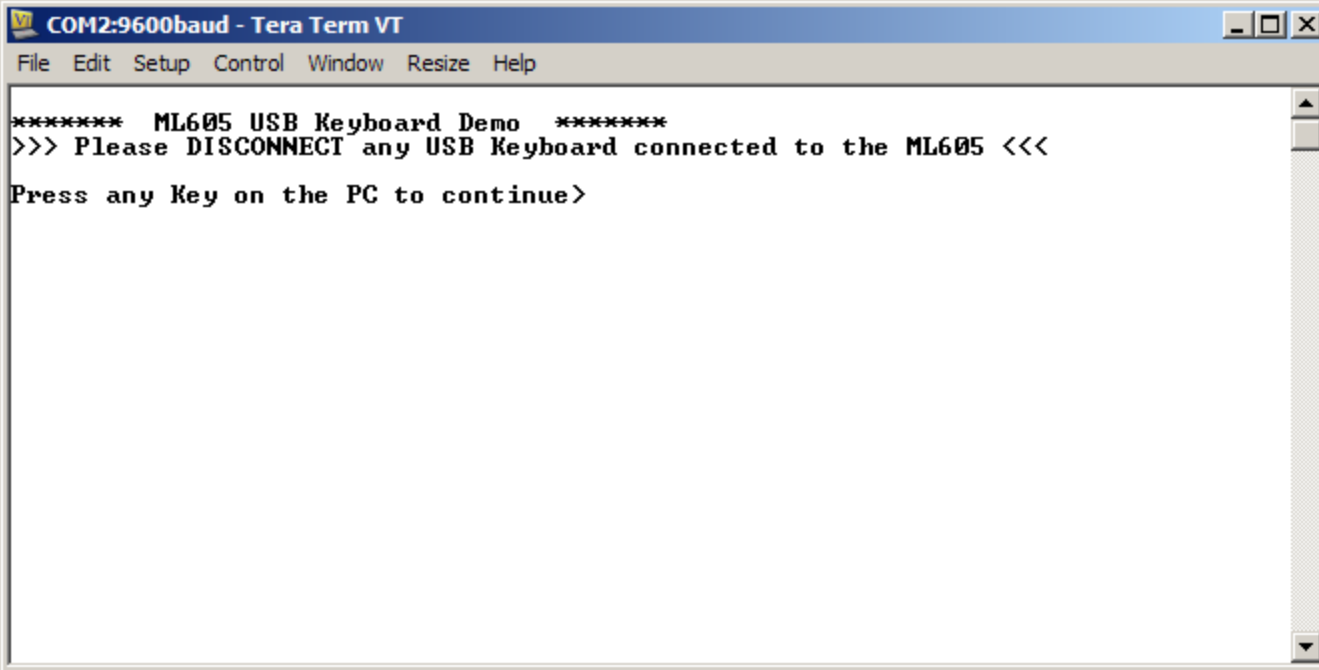
```
C:\Xilinx\12.3\ISE_DS\EDK\bin\nt\xbash.exe
XMD% dow usb_hpi_test/usb_hpi_test.elf
Downloading Program -- usb_hpi_test/usb_hpi_test.elf
  section, .vectors.reset: 0x00000000-0x00000007
  section, .vectors.sw_exception: 0x00000008-0x0000000f
  section, .vectors.interrupt: 0x00000010-0x00000017
  section, .vectors.hw_exception: 0x00000020-0x00000027
  section, .text: 0x41a00000-0x41a01c1f
  section, .init: 0x41a01c20-0x41a01c43
  section, .fini: 0x41a01c44-0x41a01c5f
  section, .rodata: 0x41a01c60-0x41a022b1
  section, .sdata2: 0x41a022b2-0x41a022b7
  section, .data: 0x41a022b8-0x41a052d3
  section, .ctors: 0x41a052d4-0x41a052db
  section, .dtors: 0x41a052dc-0x41a052e3
  section, .eh_frame: 0x41a052e4-0x41a052e7
  section, .jcr: 0x41a052e8-0x41a052eb
  section, .bss: 0x00000050-0x00000093
  section, .heap: 0x41a052f0-0x41a092ef
  section, .stack: 0x41a092f0-0x41a0d2ef
Setting PC with Program Start Address 0x00000000
System Reset .... DONE

XMD% con
Processor started. Type "stop" to stop processor

RUNNING> XMD%
```

Run ML605 USB Design

- **The USB Keyboard Demo will appear in the Terminal window**
 - Disconnect the keyboard, if needed, and press any key

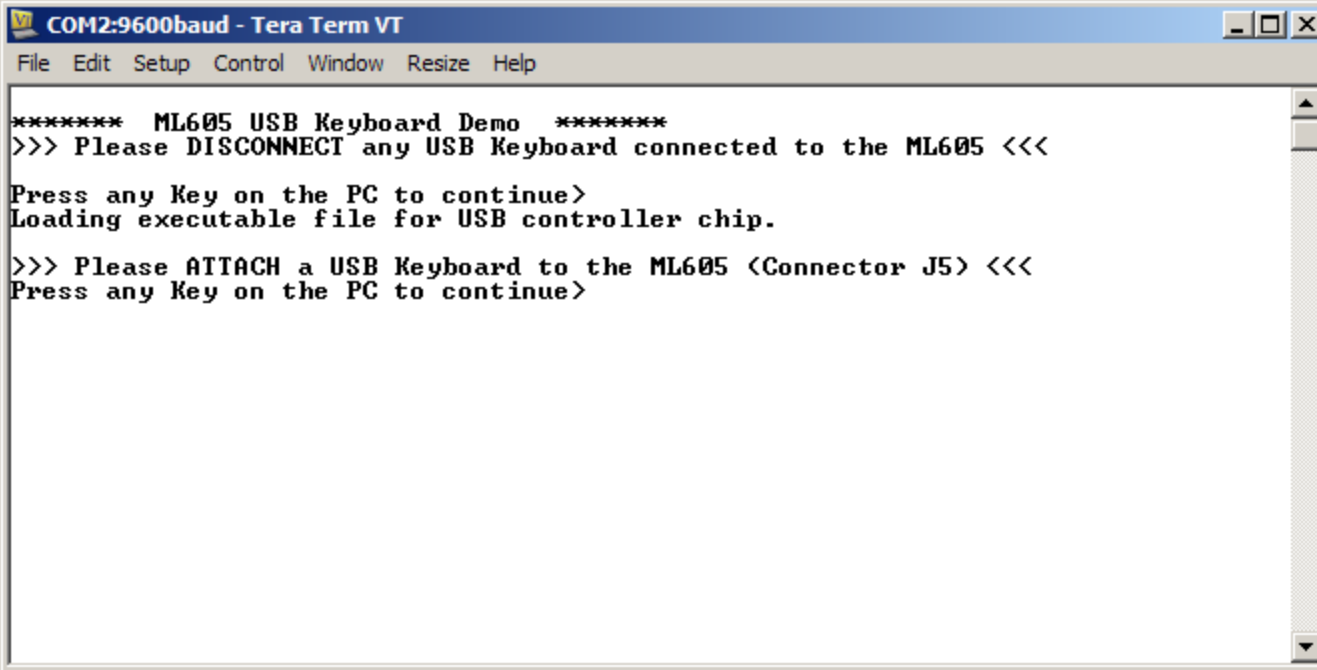


```
COM2:9600baud - Tera Term VT
File Edit Setup Control Window Resize Help
***** ML605 USB Keyboard Demo *****
>>> Please DISCONNECT any USB Keyboard connected to the ML605 <<<
Press any Key on the PC to continue>
```

Run ML605 USB Design

- **Connect a USB Keyboard**

- Press any key



```
COM2:9600baud - Tera Term VT
File Edit Setup Control Window Resize Help

***** ML605 USB Keyboard Demo *****
>>> Please DISCONNECT any USB Keyboard connected to the ML605 <<<

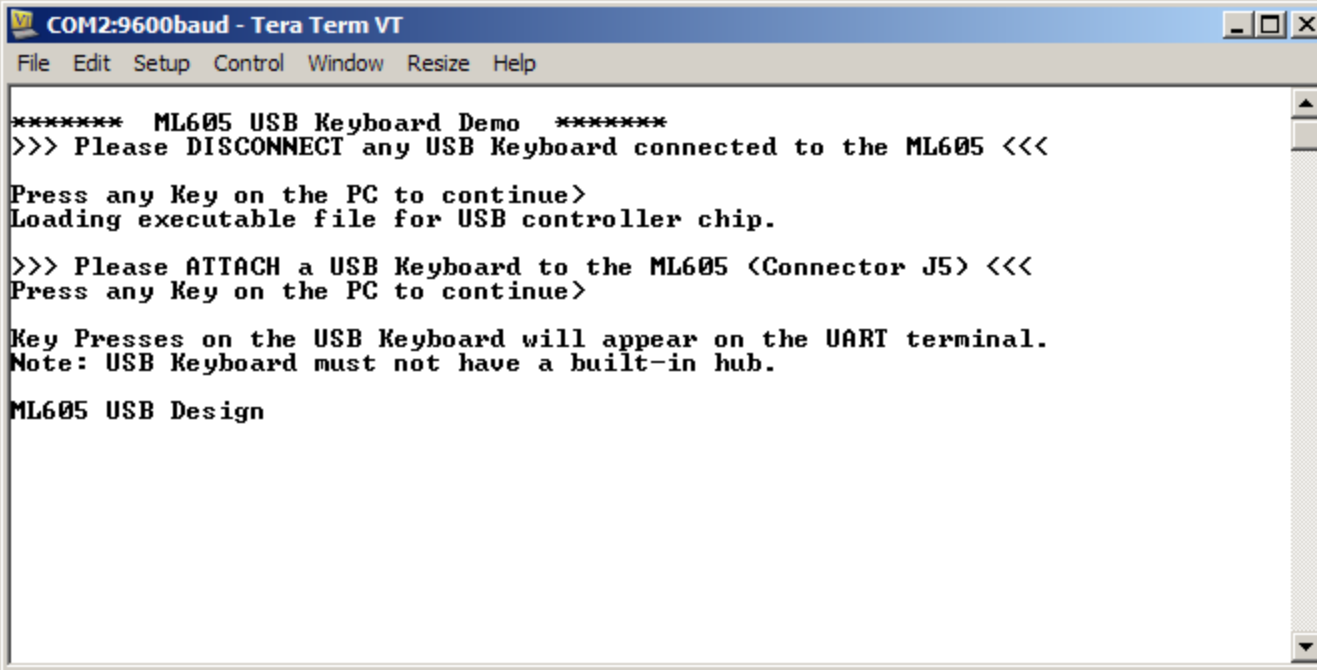
Press any Key on the PC to continue>
Loading executable file for USB controller chip.

>>> Please ATTACH a USB Keyboard to the ML605 <Connector J5> <<<
Press any Key on the PC to continue>
```

Run ML605 USB Design

- Type:

ML605 USB Design



```
COM2:9600baud - Tera Term VT
File Edit Setup Control Window Resize Help

***** ML605 USB Keyboard Demo *****
>>> Please DISCONNECT any USB Keyboard connected to the ML605 <<<

Press any Key on the PC to continue>
Loading executable file for USB controller chip.

>>> Please ATTACH a USB Keyboard to the ML605 <Connector J5> <<<
Press any Key on the PC to continue>

Key Presses on the USB Keyboard will appear on the UART terminal.
Note: USB Keyboard must not have a built-in hub.

ML605 USB Design
```


References

References

▪ Virtex-6 System Monitor

- Virtex-6 FPGA System Monitor – UG370

http://www.xilinx.com/support/documentation/user_guides/ug370.pdf

- ChipScope Pro Software and Cores User Guide

http://www.xilinx.com/support/documentation/sw_manuals/xilinx12_3/chipscope_pro_sw_cores_ug029.pdf

▪ EDK Documentation

- Embedded System Tools Reference Guide

http://www.xilinx.com/support/documentation/sw_manuals/xilinx12_3/est_rm.pdf

Documentation

Documentation

- **Virtex-6**

- Virtex-6 FPGA Family

<http://www.xilinx.com/products/virtex6/index.htm>

- **ML605 Documentation**

- Virtex-6 FPGA ML605 Evaluation Kit

<http://www.xilinx.com/products/devkits/EK-V6-ML605-G.htm>

- ML605 Getting Started Guide

http://www.xilinx.com/support/documentation/boards_and_kits/ug533.pdf

- ML605 Hardware User Guide

http://www.xilinx.com/support/documentation/boards_and_kits/ug534.pdf

- ML605 Reference Design User Guide

http://www.xilinx.com/support/documentation/boards_and_kits/ug535.pdf