

ML605 System Monitor

May 2010

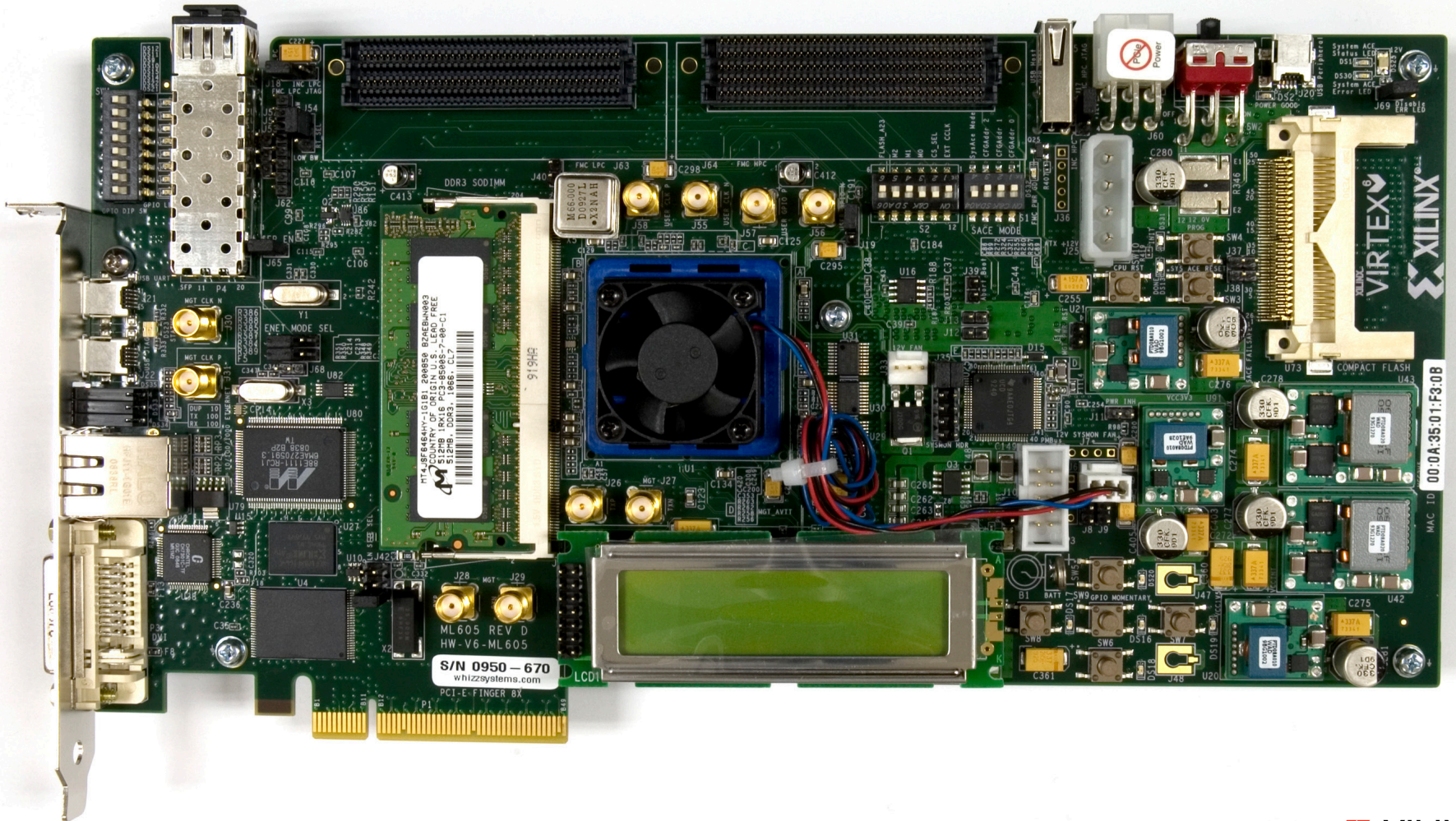
Overview

- **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



ISE Software Requirements

- **Xilinx ISE 12.1 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

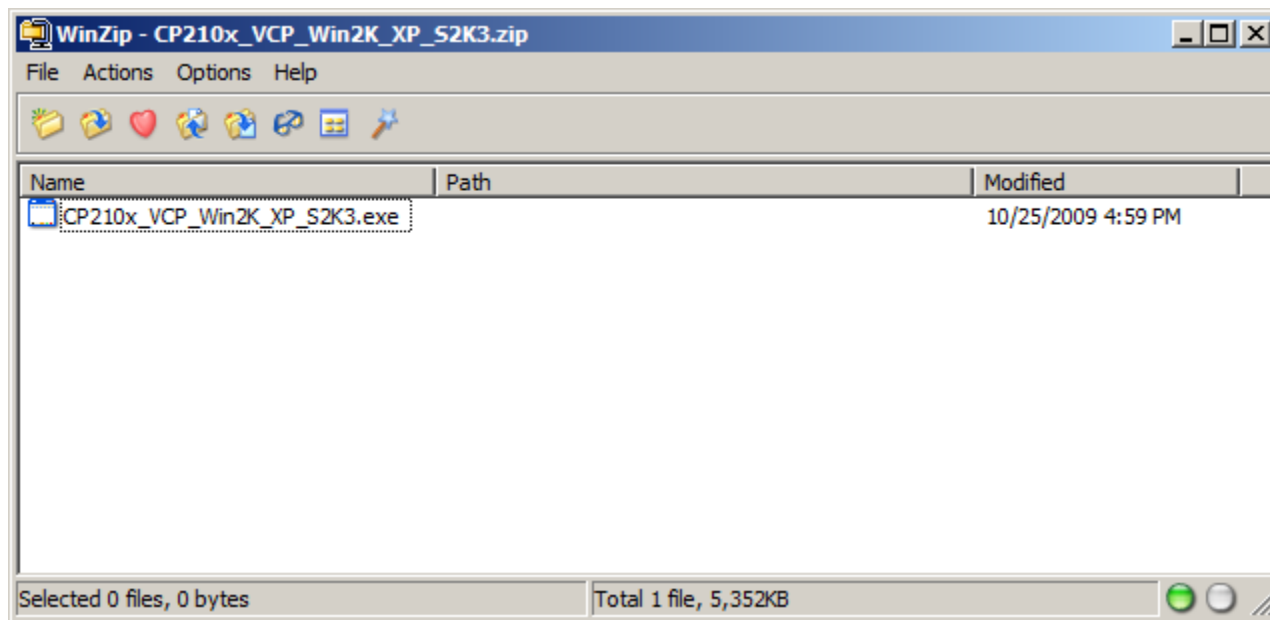


Note: Presentation applies to the ML605

ML605 Setup

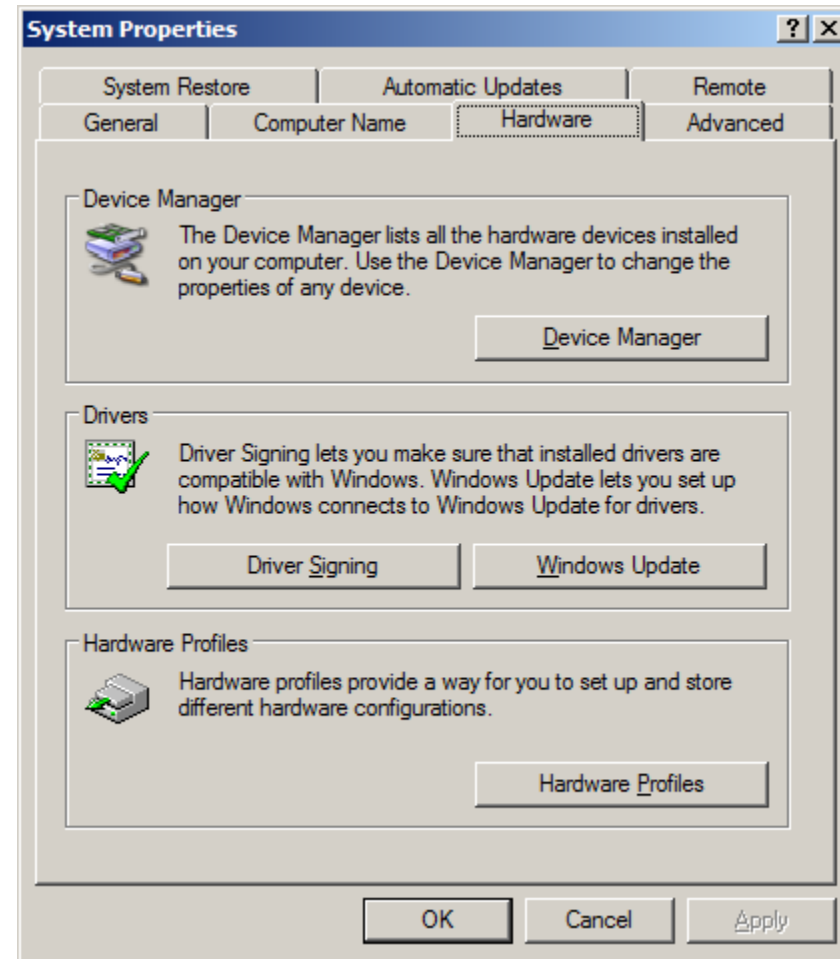
▪ Install USB UART Drivers

- https://www.silabs.com/Support Documents/Software/CP210x_VCP_Win2K_XP_S2K3.zip



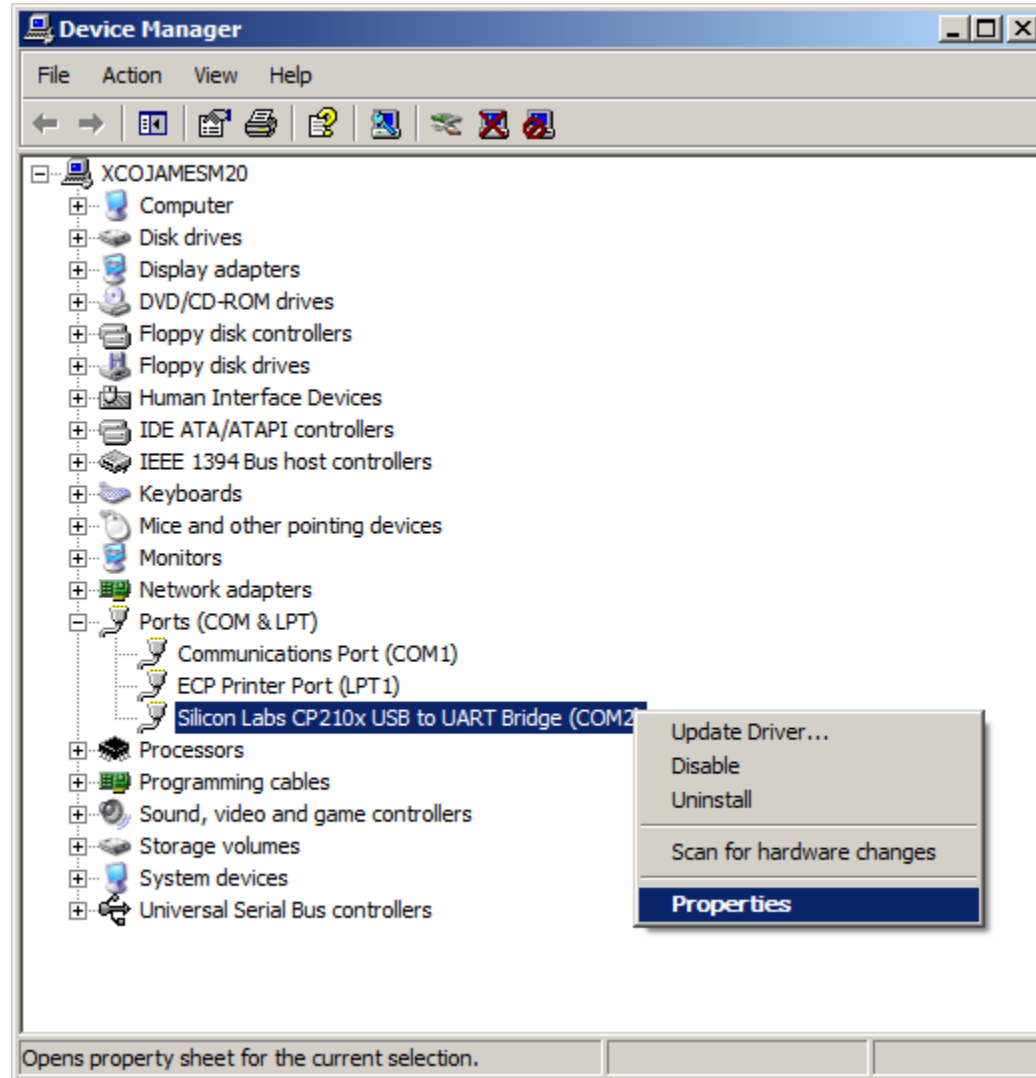
ML605 Setup

- **Right-click on My Computer and select Properties**
 - Select the Hardware tab
 - Click on Device Manager



ML605 Setup

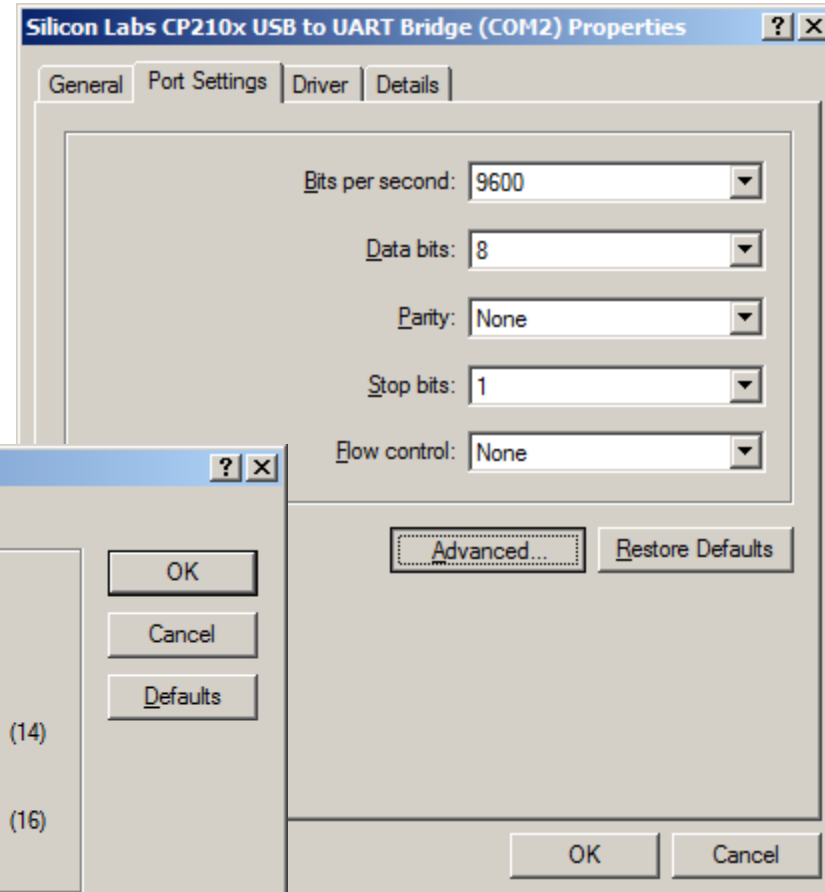
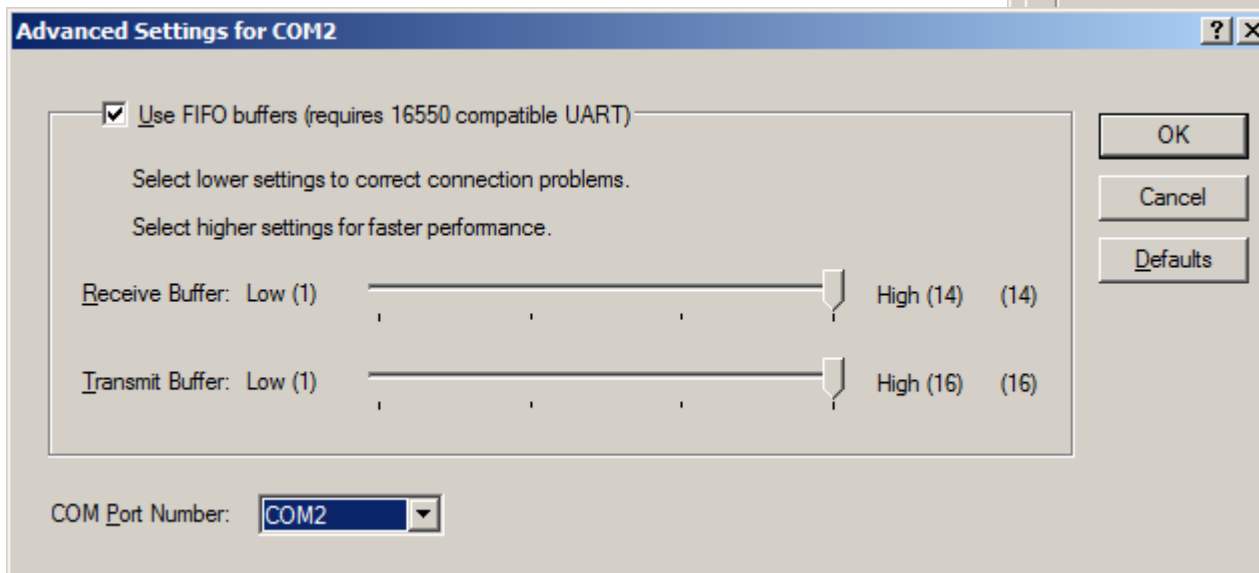
- **Expand the Ports Hardware**
 - Right-click on USB to UART Bridge and select Properties



ML605 Setup

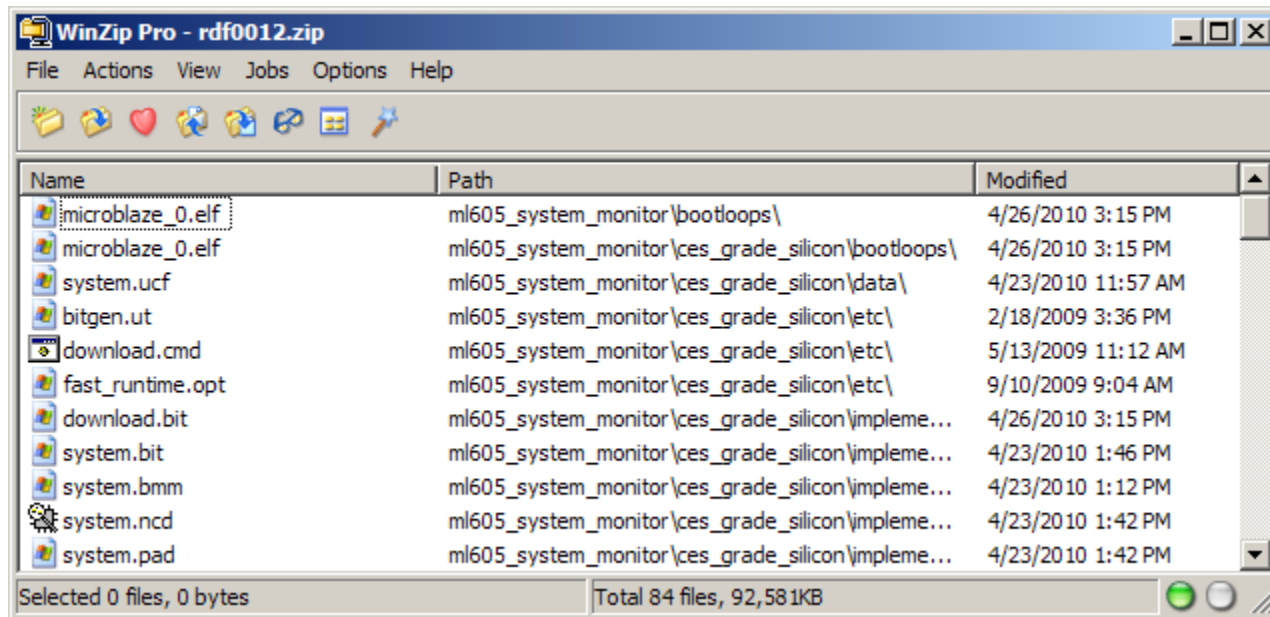
■ Under Port Settings tab

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



Running System Monitor

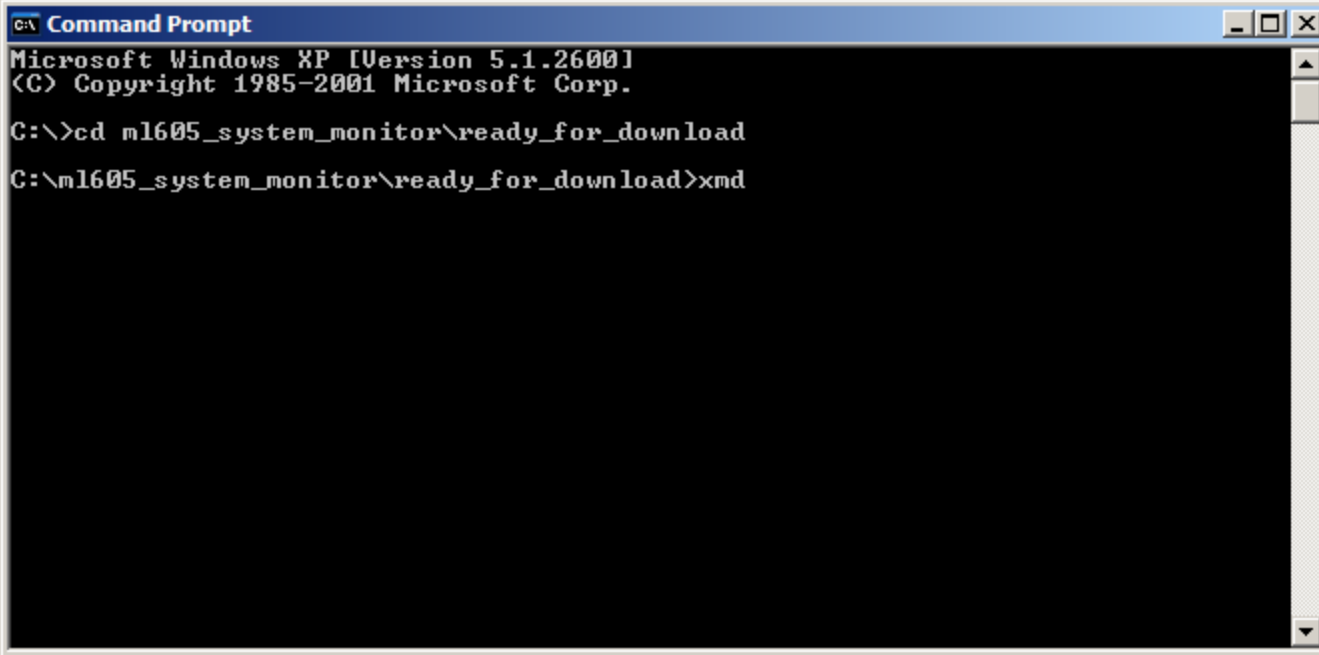
- Unzip the rdf0012.zip file to your C:\ drive
 - Available through <http://www.xilinx.com/ml605>



Running System Monitor

- **Download the System Monitor bitstream:**

```
cd ml605_system_monitor\ready_for_download  
xmd
```

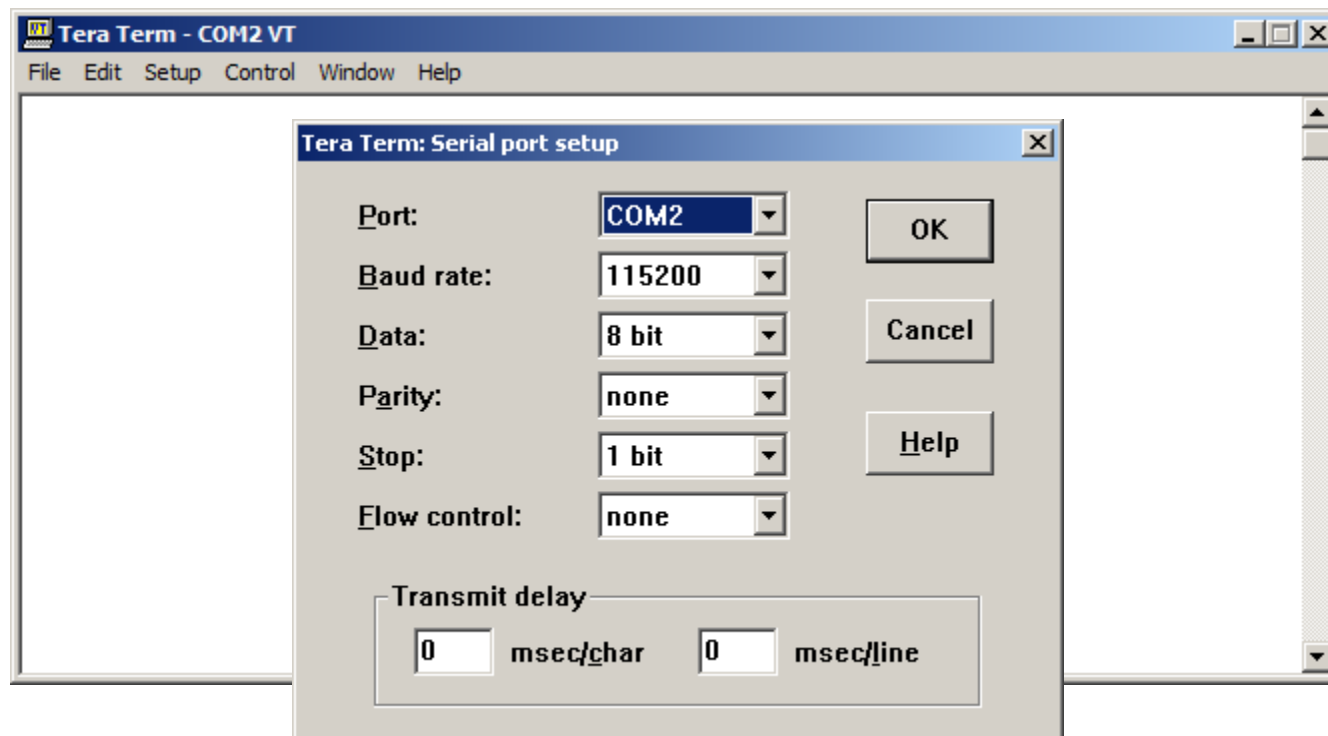


```
C:\ Command Prompt  
Microsoft Windows XP [Version 5.1.2600]  
(C) Copyright 1985-2001 Microsoft Corp.  
C:\>cd ml605_system_monitor\ready_for_download  
C:\ml605_system_monitor\ready_for_download>xmd
```

Running System Monitor

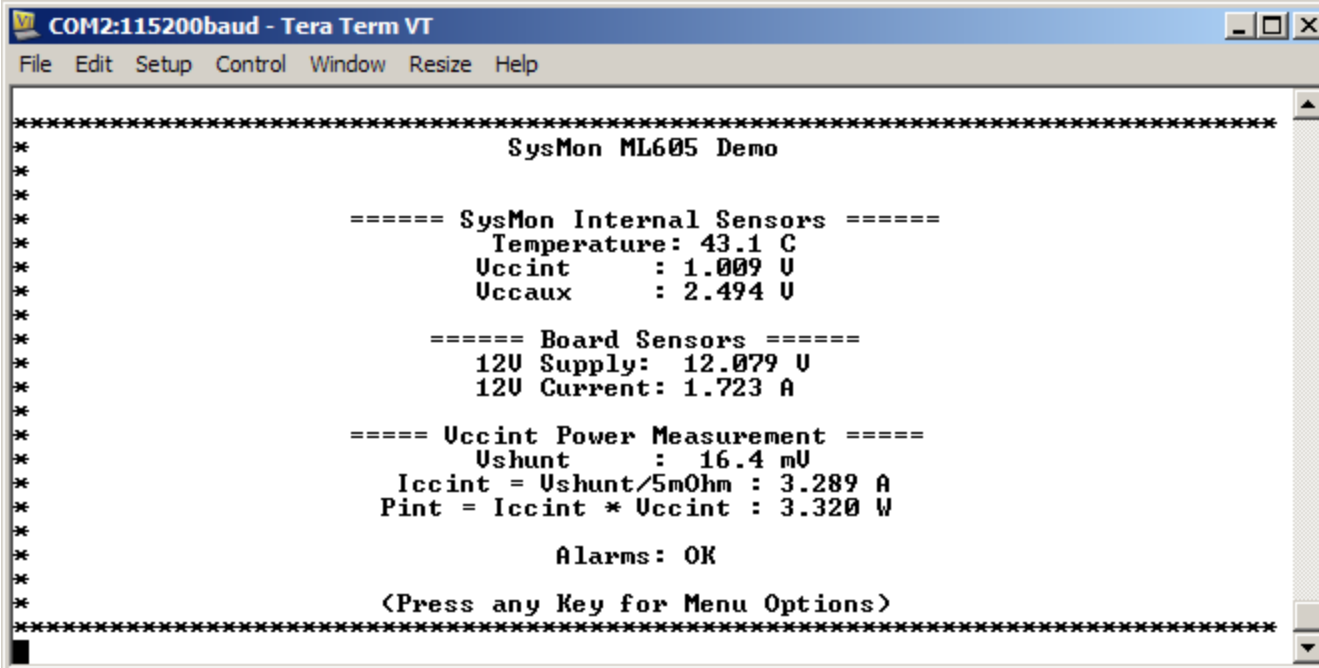
▪ Start the Terminal Program

- 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

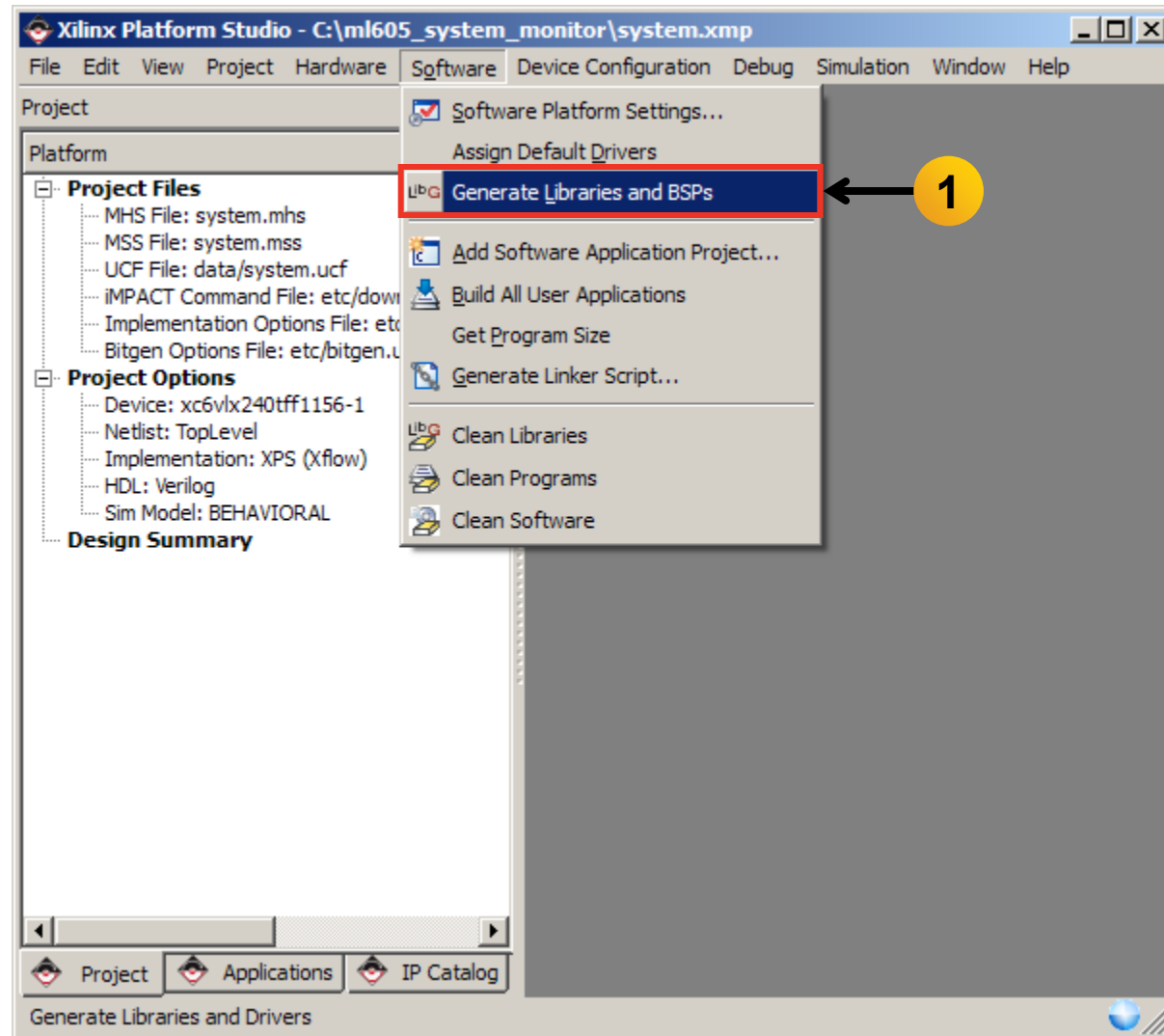
- **Temperature**

- Internal Channel

Compile ML605 System Monitor Design

Compile ML605 System Monitor Design

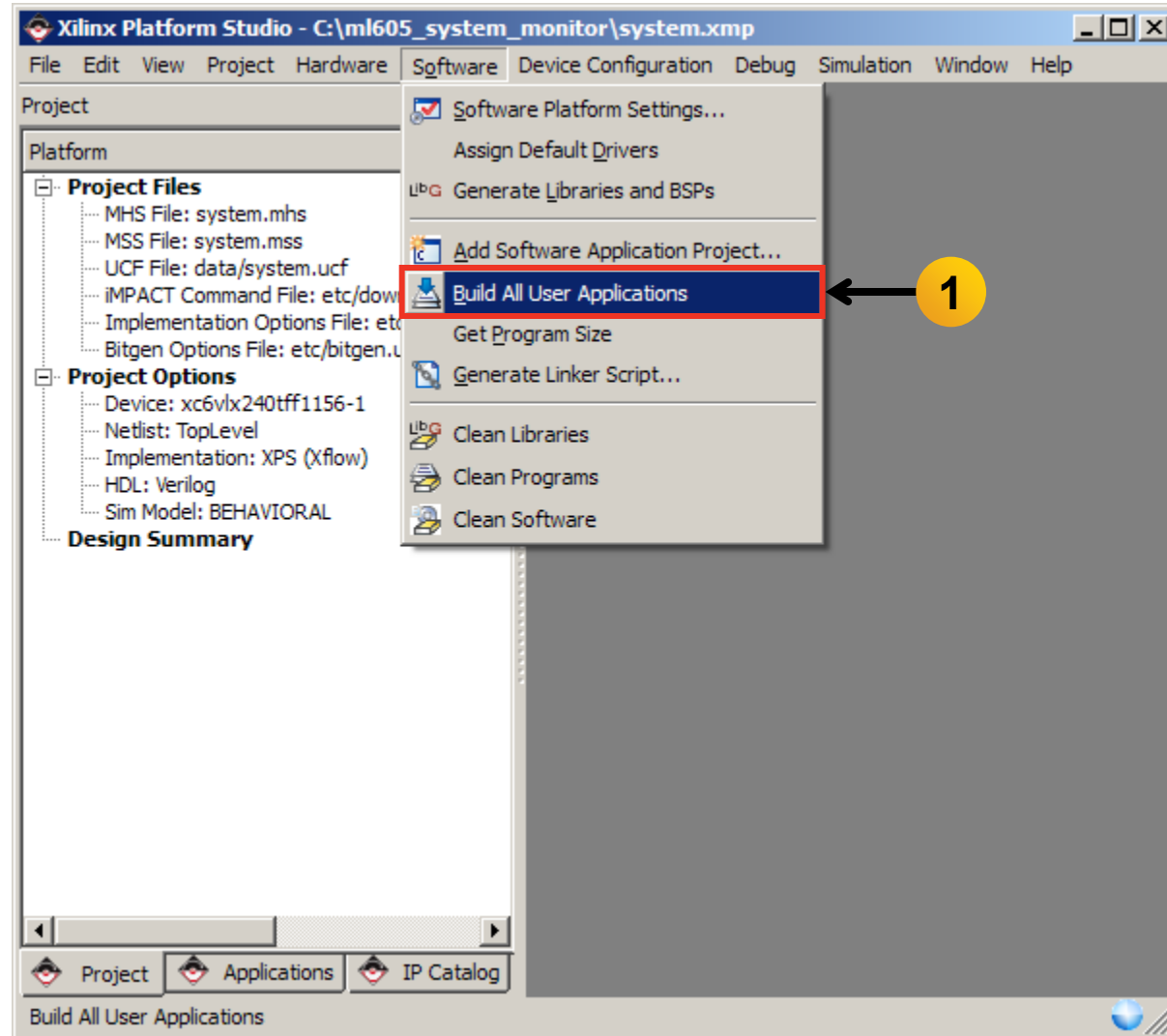
- The System Monitor Design can be compiled with EDK
- Open XPS project <design path>\system.xmp
- Generate the libraries needed to create the bitstream
 - Select **Software** → **Generate Libraries and BSPs** (1)



Compile ML605 System Monitor Design

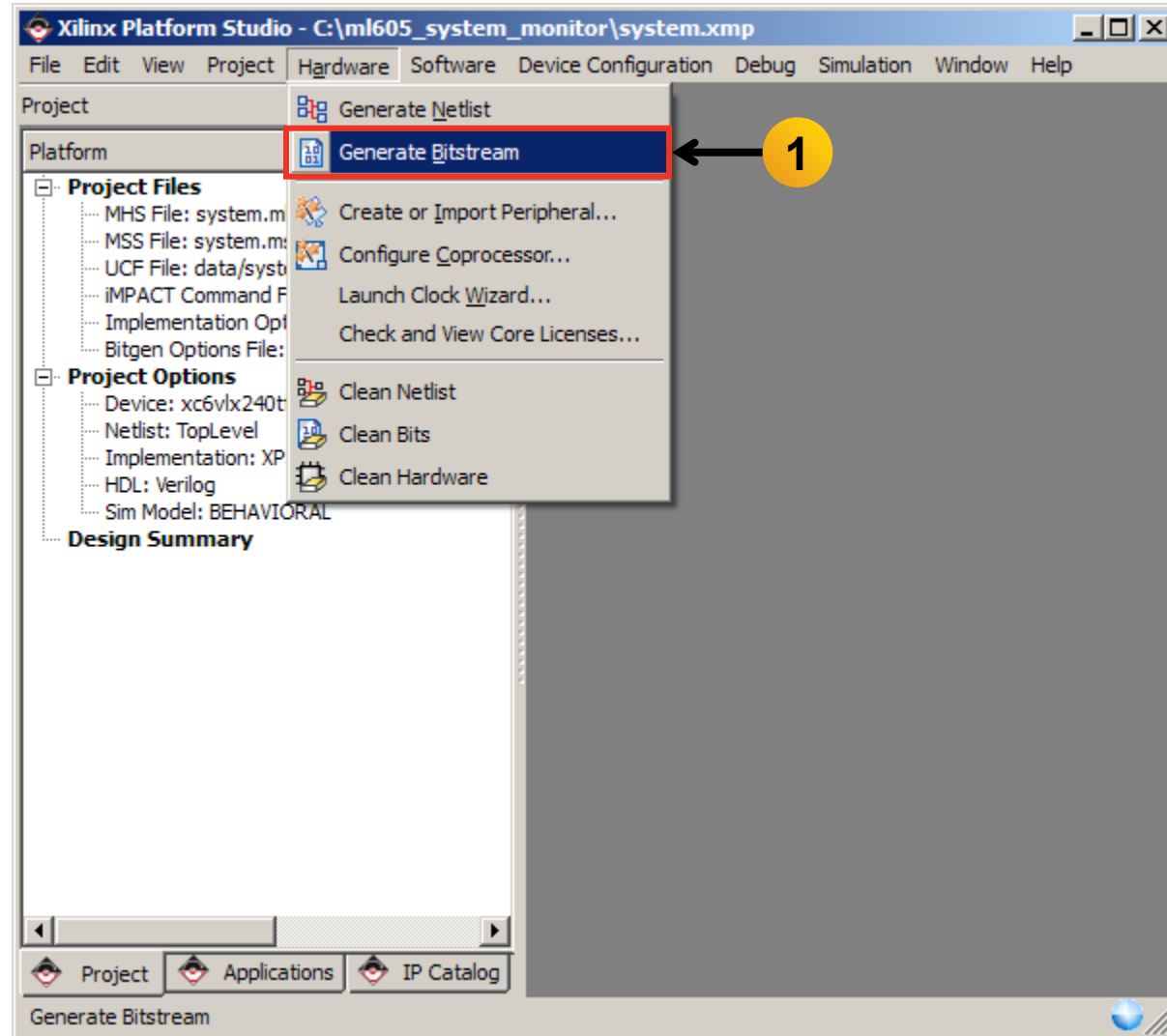
- **Compile the Software Applications and create the application ELF files**

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



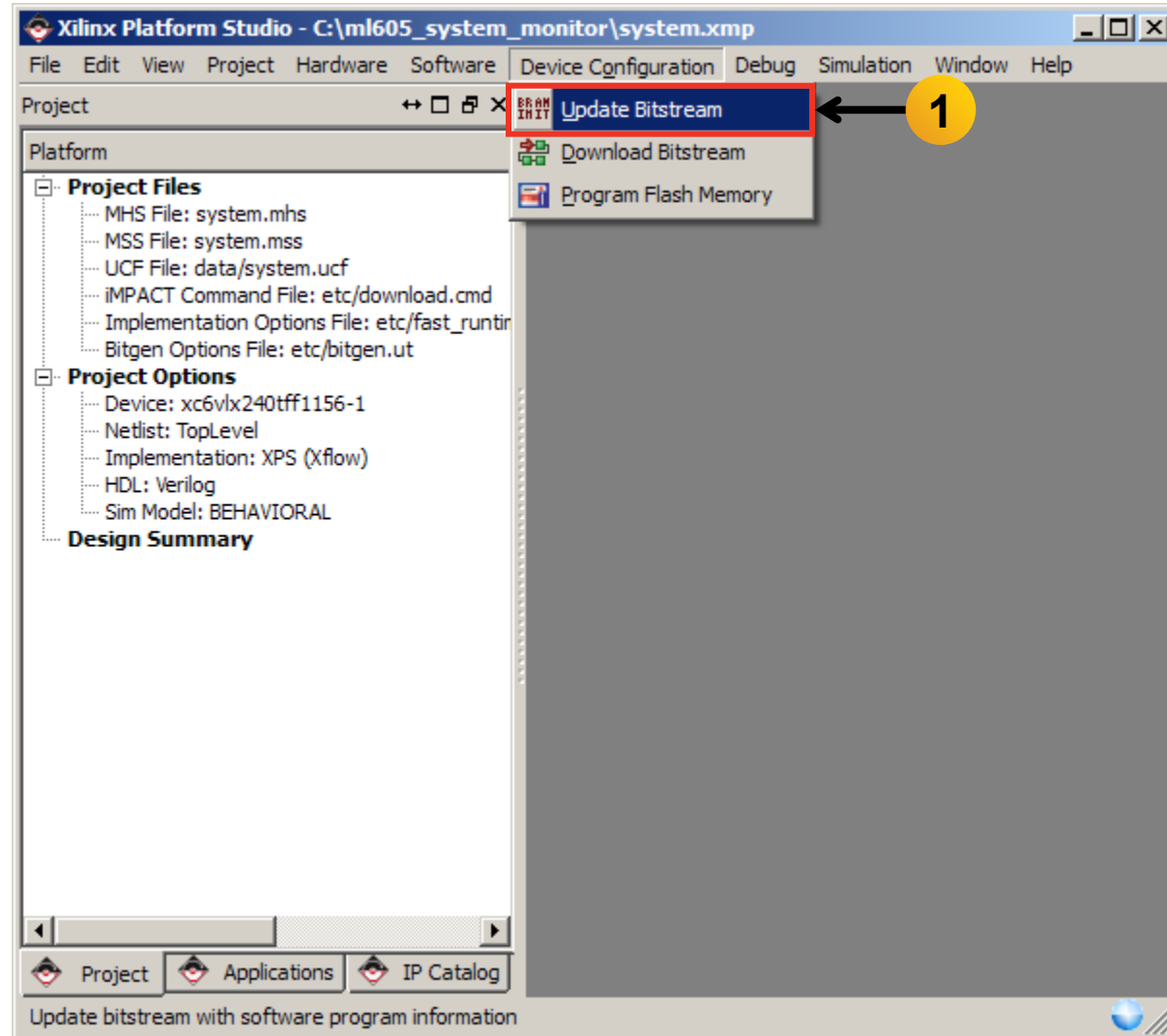
Compile ML605 System Monitor Design

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



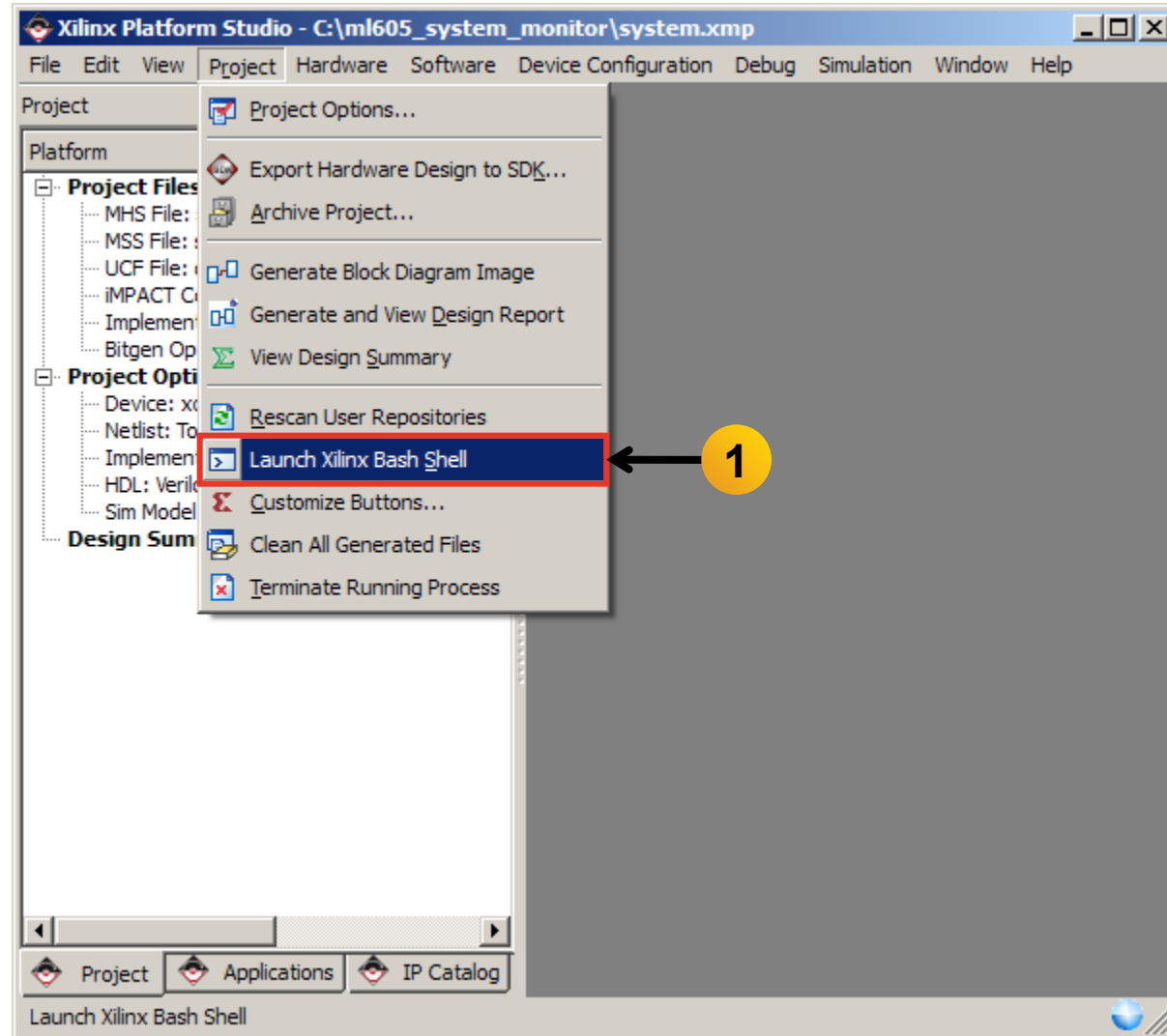
Compile ML605 System Monitor Design

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



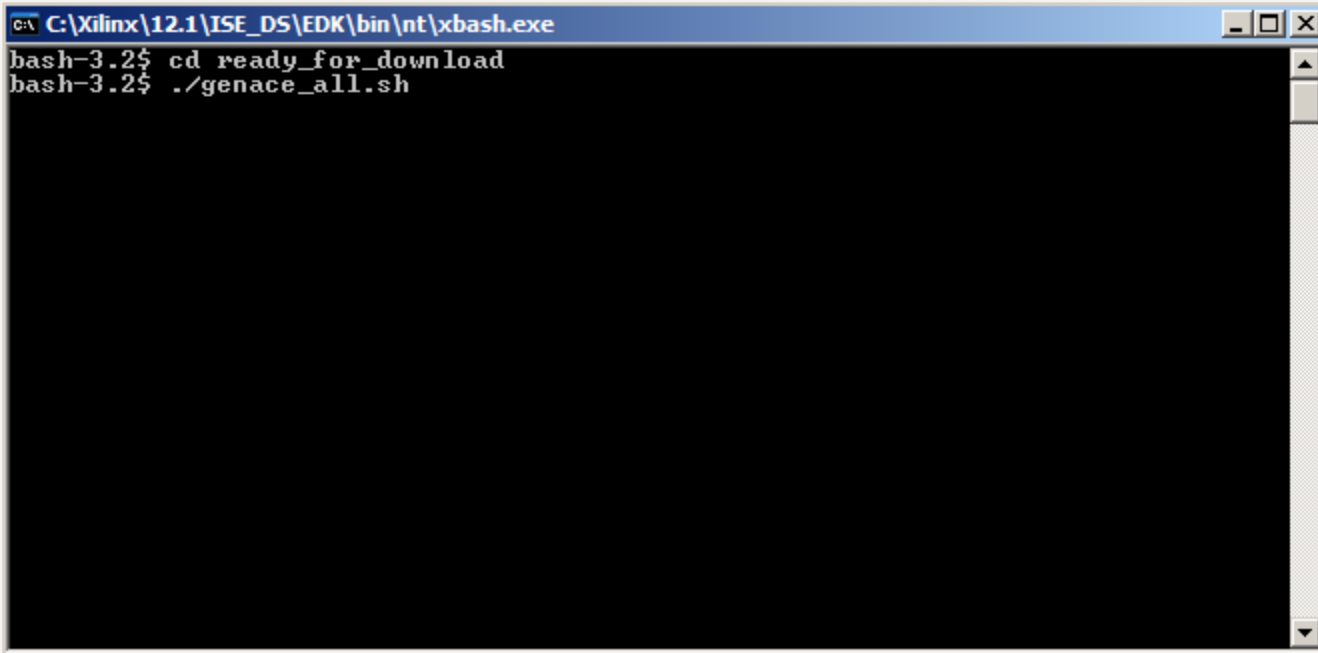
Generate System Monitor ACE File (Optional)

- **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**
- **Open**
 - `cd ready_for_download`
 - `./genace_all.sh`



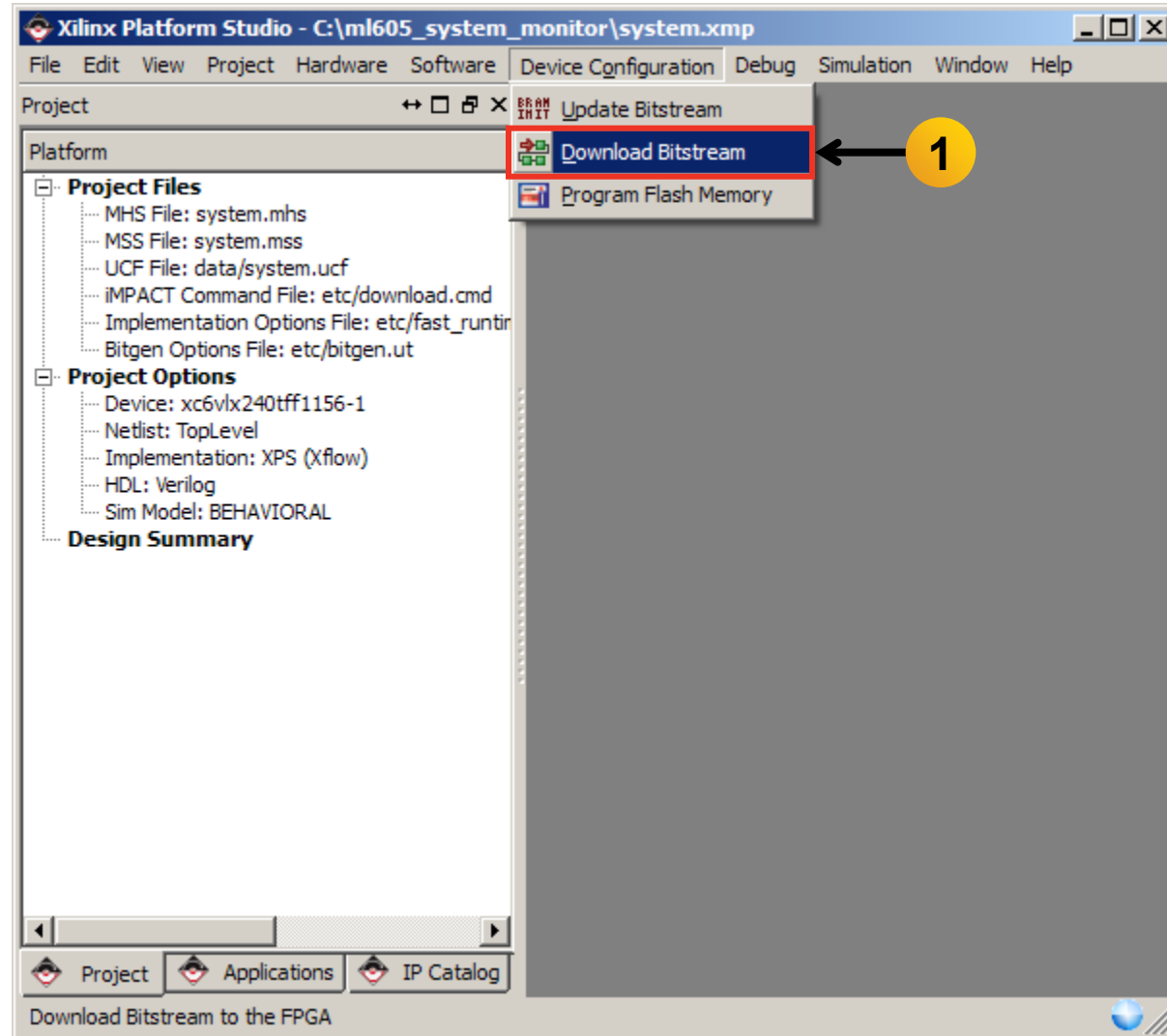
```
C:\Xilinx\12.1\ISE_DS\EDK\bin\nt\xbash.exe
bash-3.2$ cd ready_for_download
bash-3.2$ ./genace_all.sh
```

Download ML605 System Monitor Design

Download ML605 System Monitor Design

■ Download Bitstream

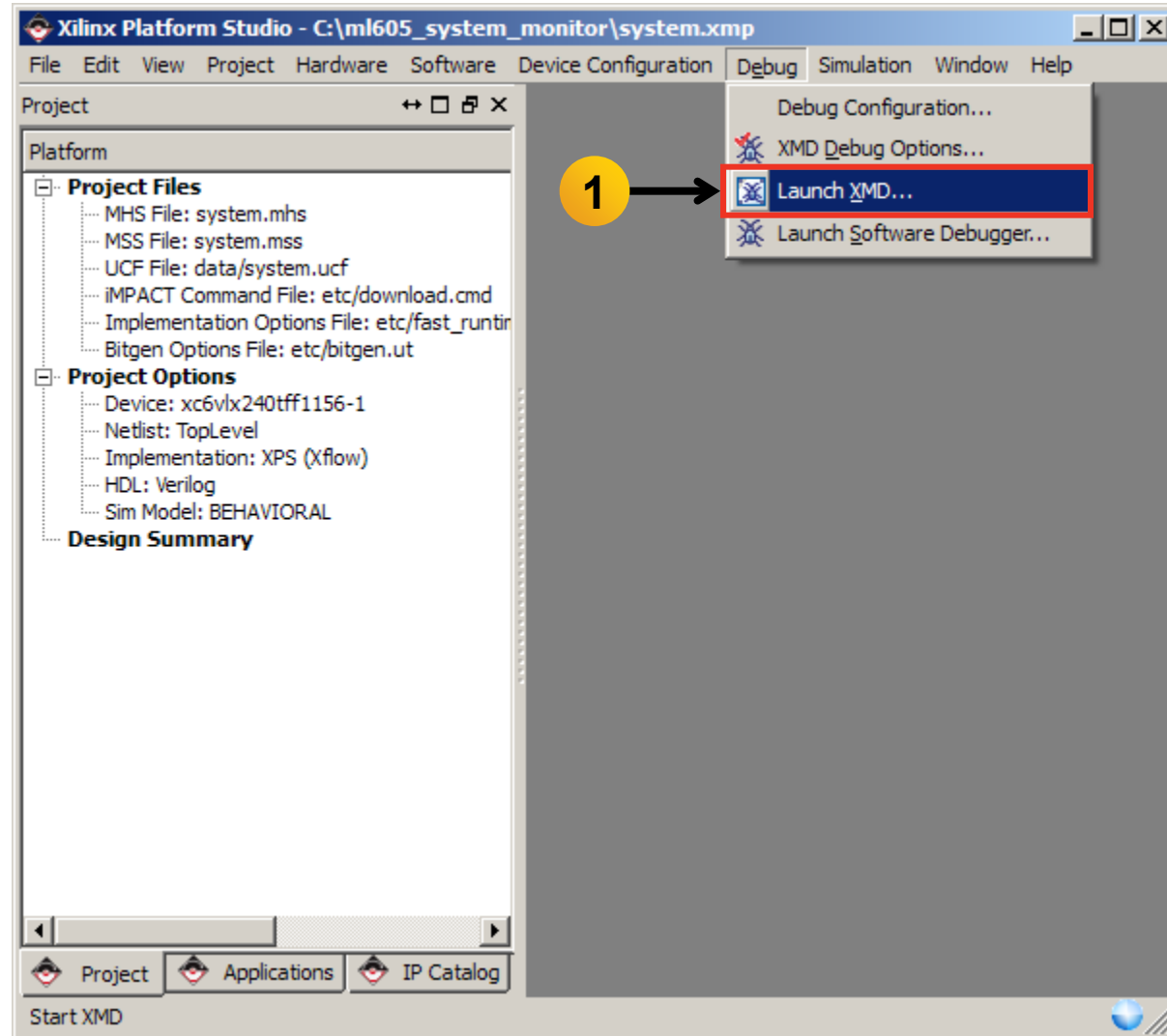
- Select Device Configuration → Download Bitstream (1)



Download ML605 System Monitor Design

- Download the System Monitor ELF with XMD

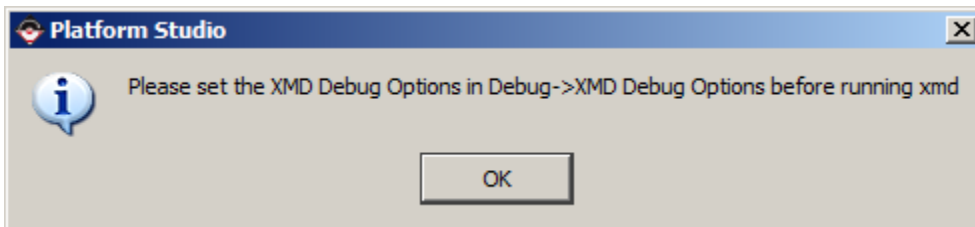
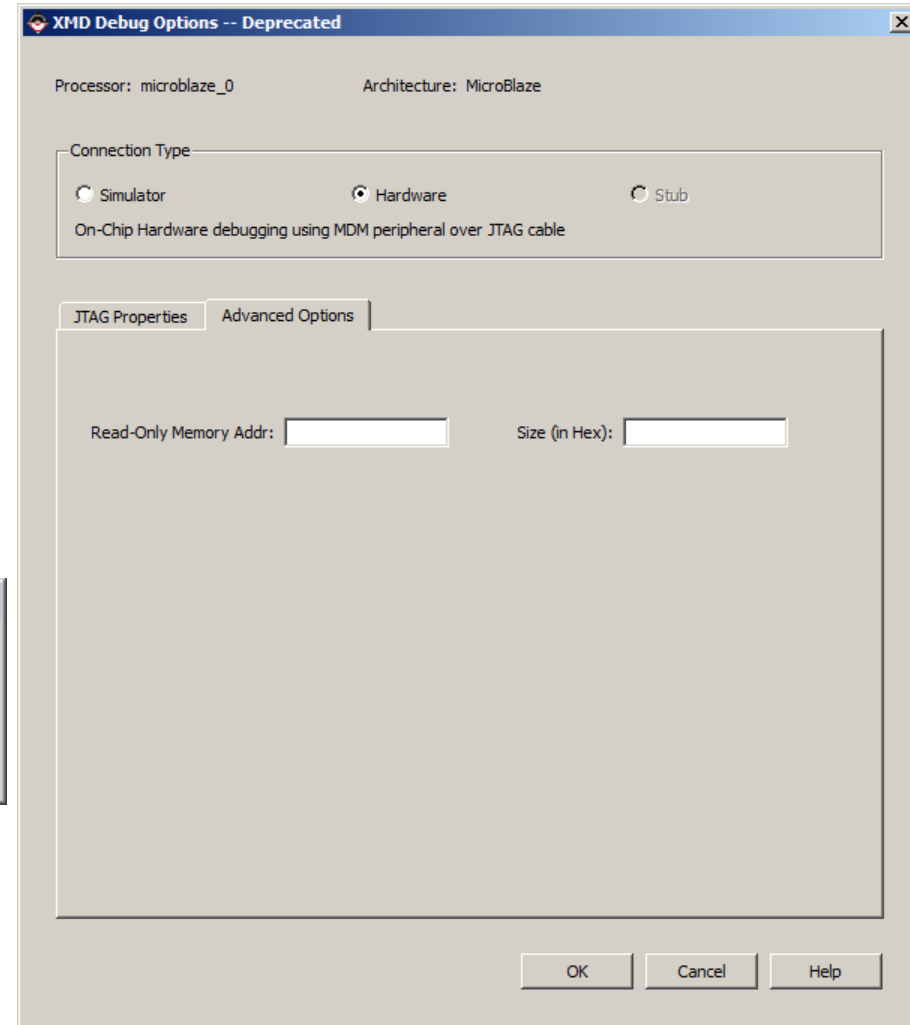
- Select **Debug** → **Launch XMD** (1)



Note: Presentation applies to the ML605

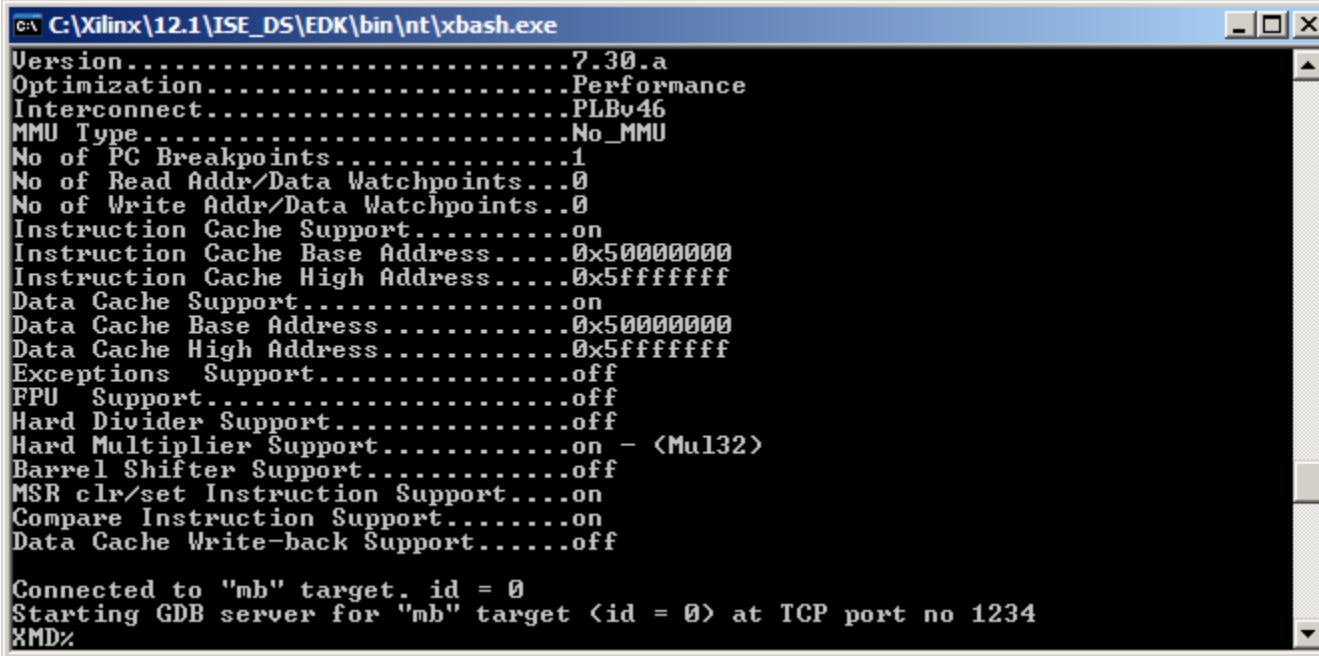
Download ML605 System Monitor Design

- 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

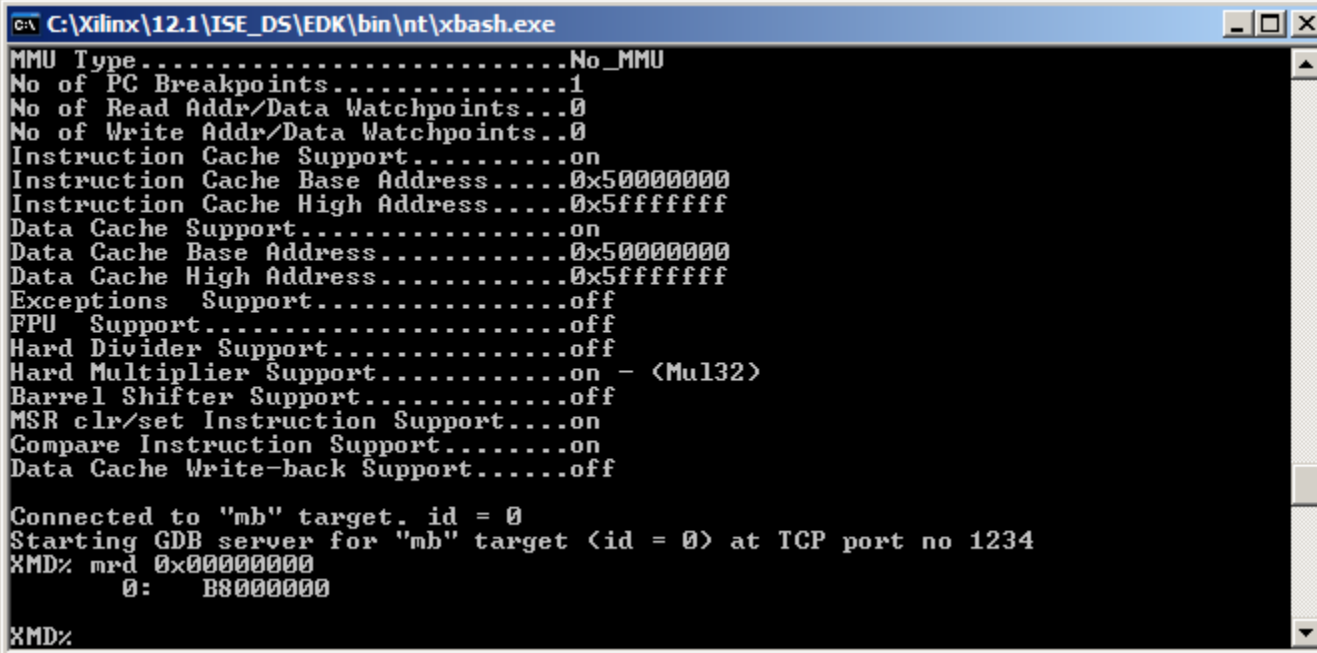


```
C:\Xilinx\12.1\ISE_DS\EDK\bin\nt\xbash.exe
Version.....7.30.a
Optimization.....Performance
Interconnect.....PLBv46
MMU Type.....No_MMU
No of PC Breakpoints.....1
No of Read Addr/Data Watchpoints...0
No of Write Addr/Data Watchpoints..0
Instruction Cache Support.....on
Instruction Cache Base Address.....0x50000000
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 `0xB0005000` as shown below



```
C:\Xilinx\12.1\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

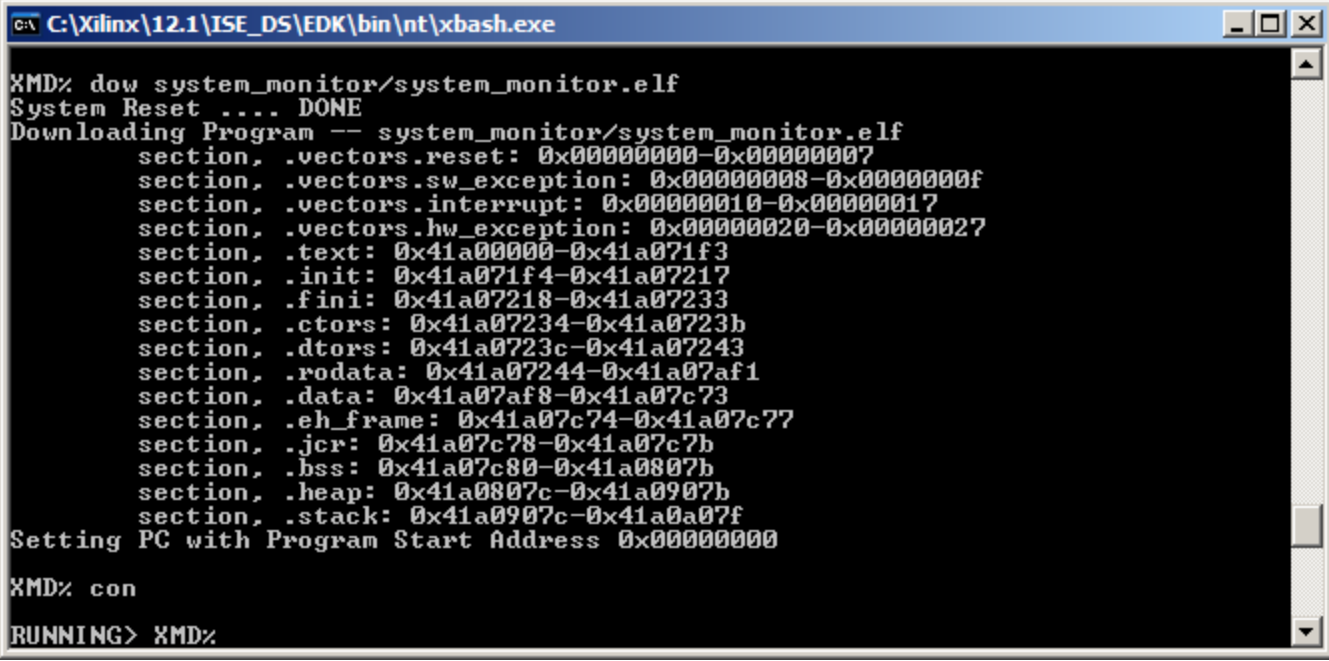
Connected to "mb" target. id = 0
Starting GDB server for "mb" target (id = 0) at TCP port no 1234
XMD% mrd 0x00000000
      0:  B8000000
XMD%
```

Download ML605 System Monitor Design

- Download and run the System Monitor ELF file:

```
dow system_monitor/system_monitor.elf
```

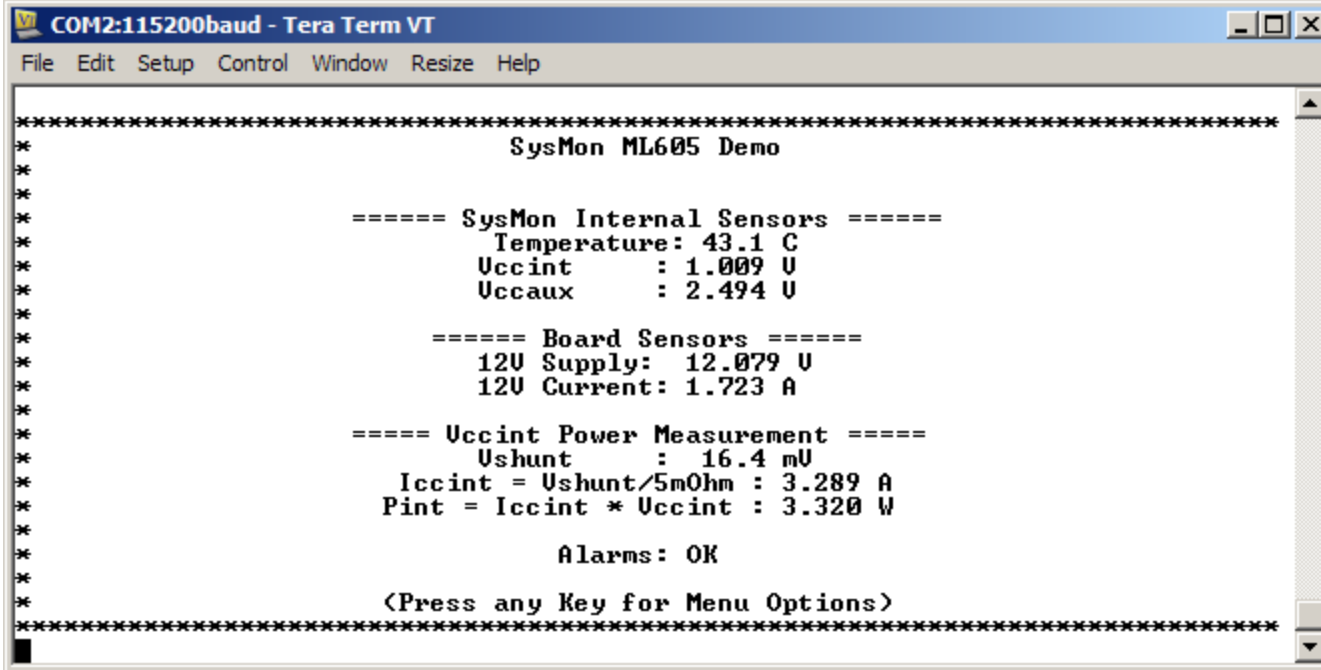
```
con
```



```
C:\Xilinx\12.1\ISE_DS\EDK\bin\nt\xbash.exe
XMD% dow system_monitor/system_monitor.elf
System Reset .... DONE
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: 0x41a00000-0x41a071f3
section, .init: 0x41a071f4-0x41a07217
section, .fini: 0x41a07218-0x41a07233
section, .ctors: 0x41a07234-0x41a0723b
section, .dtors: 0x41a0723c-0x41a07243
section, .rodata: 0x41a07244-0x41a07af1
section, .data: 0x41a07af8-0x41a07c73
section, .eh_frame: 0x41a07c74-0x41a07c77
section, .jcr: 0x41a07c78-0x41a07c7b
section, .bss: 0x41a07c80-0x41a0807b
section, .heap: 0x41a0807c-0x41a0907b
section, .stack: 0x41a0907c-0x41a0a07f
Setting PC with Program Start Address 0x00000000
XMD% con
RUNNING> XMD%
```

Download 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>          *
*****
```

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_1/chipscope_pro_sw_cores_ug029.pdf

▪ EDK Documentation

- Embedded System Tools Reference Guide

http://www.xilinx.com/support/documentation/sw_manuals/xilinx12_1/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 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