App Note – Perseus Firmware Update

Revision history

Revision	Date	Comments
1.0	February 2013	First edition.
1.1	April 2013	Update for release 6.2.0 of software tools
1.2	September 2013	Removed HyperTerminal references
1.3	March 2014	Add new methods for updating the Firmware and the CCE in the Perseus Flash Memory
1.4	July 2014	Procedure update for release 6.5
1.5	November 2014	Procedure update for release 6.6
1.6	October 2015	Procedure update for release 7 (new folder architecture)

Table of Contents

1 Introduction

The Perseus firmware must be updated to its latest version to access all the new features described in the Release Notes.

Take note that, starting from release 6.5, the update procedure has changed. To obtain the old procedure, please refer to the documentation contained in a previous installation of the Boards and Systems Software Tools or contact support@nutaq.com.

2 Requirements

2.1 Hardware for the Update of a Perseus in a PicoSDR or PicoDigitizer

- PicoSDR or PicoDigitizer.
- PC with BAS software tools installed.
- Mini-USB cable.
- Ethernet cable

2.2 Hardware for the Update of a Perseus in a MicroTCA Chassis

- Perseus to update
- Mestor expander (Flex or Hard Mestor)
- Mini-USB cable.
- Ethernet cable

2.3 Software

- TFTP server software
- Serial port console software, such as Putty.
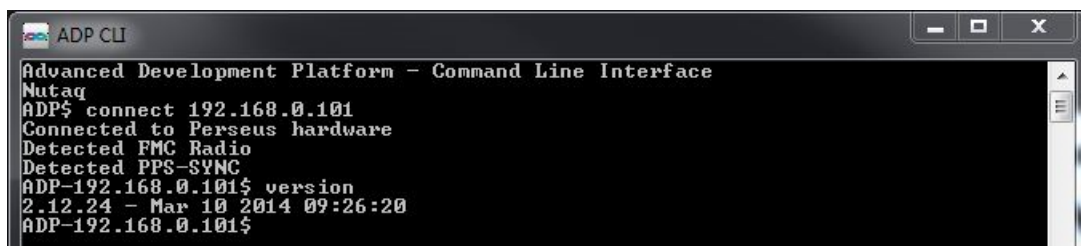- BAS Command Line Interface

3 Firmware Update Procedure

3.1 Validation of the Central Command Engine (CCE) Version

There are two ways to update the Central Command Engine (CCE) depending on which version of the CCE is currently running on the Perseus to update. Please follow these steps to find the version of the CCE present on a platform.

3.1.1 Through the Command Line Interface (CLI)

1. Open the CLI.

2. Connect to your Perseus (using the *connect* command and the Perseus IP address).

3. Enter the *version* command, the CCE version will be printed.

For more details about using CLI, please refer to the "Board & Systems Software Tools - Command Line Interface API .pdf" documentation.

3.1.2 Through the Perseus Serial Console in a MicroTCA Chassis

1. Connect a mini-USB cable between the PC and the Mestor mini-USB connector.

2. Open a serial communication software(putty) with the following configuration:

   - COM : Select the connection corresponding to the communication port (for example, COM5 x) used by the "Silicon Labs CP210x USB to UART Bridge" as validated in the Device Manager
   - Baud rate: 115200 bps
   - Data bits: 8
   - Parity: none
   - Stop bits: 1
   - Flow control: none

3. Reboot the Perseus. The entire PetaLinux boot sequence verbose will appear. Look for the CCE version right underneath the PetaLinux title.

If the displayed version is lower than 2.11.13, continue to section 3.2
If the displayed version is higher or equal to 2.11.13, skip to section 3.3

3.1.3 Through the Perseus Serial Console in a PicoSDR or PicoDigitizer

1. Connect to the PicoSDR/Digitizer

2. Run ComPortDetector.exe(%BASROOT% \utils) to know which port is connected to your Perseus.

3. Open a serial communication software(putty) with the following configuration:

   - COM : the one identified as Perseus by ComPortDetector.
   - Baud rate: 115200 bps
   - Data bits: 8
   - Parity: none
   - Stop bits: 1
   - Flow control: none

4. Reboot the Perseus. The entire PetaLinux boot sequence verbose will appear. Look for the CCE version right underneath the PetaLinux title.
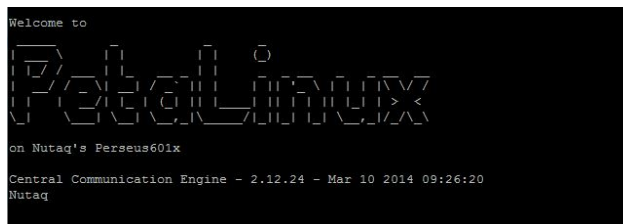

If the displayed version is lower than 2.11.13, continue to section 3.2
If the displayed version is higher or equal to 2.11.13, skip to section 3.3

3.2 Updating the CCE with a TFTP Server

1. Connect to the Perseus through the serial port as in section 3.1.2 when in a MicroTCA chassis or 3.1.3 when in a PicoSDR and PicoDigitizer.

2. Let the onboard Linux distribution start until you see the *Perseus login: line* appears, then log using:
   user: root   password: root

3. Make sure the Host PC and Perseus IP address are in the same subnet and that the TFTP server is running on the PC. The Perseus IP address can obtain by using the *ifconfig* command.

   Note:
   The Perseus IP address can be temporarily updated using the command below, where 192.168.0.101 is the desired IP address.

   ```
   ifconfig eth0 192.168.0.101 up
   ```

4. The CCE executable is retrieved through TFTP and is available in the installation in the *%BASROOT%/sdk/embedded/bin* folder.

5. Enter the following commands, where 192.168.0.100 is the IP address of the TFTP server:
   a. `tftp -g -r cce 192.168.0.100`
      This copies the CCE executable on the Perseus.
   b. `cp cce /bin`
      This copies the CCE executable to the binary folder.
   c. `chmod 777 /bin/cce`
      This gives the proper rights for the new CCE to be started on a Perseus reboot.

6. The CCE is updated and is ready to be used following a reboot of the system.

3.3 Updating the CCE with the BAS CLI

It is possible to update the Central Command Engine (CCE) with the BAS Command Line Interface. The CCE executable is available in the installation in the *%BASROOT%/sdk/embedded/bin* folder.
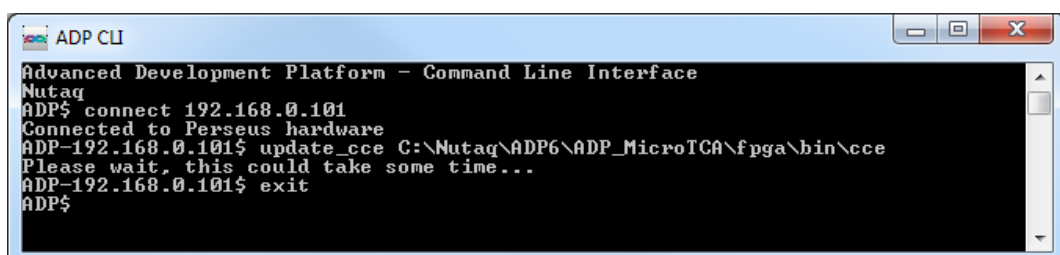
1. Connect to the Perseus through the serial port as in section 3.1.2 when in a MicroTCA chassis or 3.1.3 when in a PicoSDR and PicoDigitizer.

2. Let the onboard Linux distribution start until you see the *Perseus login: line* appears, then log using:
   user: root   password: root

3. Make sure the Host PC and Perseus IP address are in the same subnet. The Perseus IP address can be obtained by using the *ifconfig* command.

   Note:
   The Perseus IP address can be temporarily updated using the command below, where 192.168.0.101 is the desired IP address.

   ifconfig eth0 192.168.0.101 up

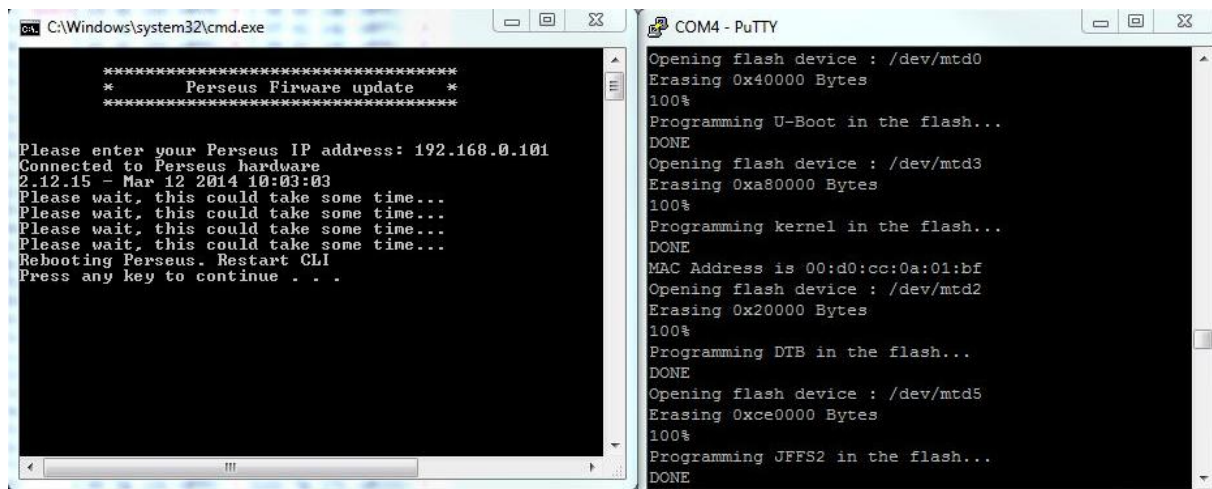4. Connect to the Perseus using CLI command(where 192.168.0.101 is the Perseus IP address):

   connect 192.168.0.101

5. To update the CCE, use the command `update_cce` followed by the CCE file name and complete path (or drag and drop the CCE file on the window), see the figure below.

6. The CCE is updated and is ready to be used following a reboot of the system.

3.4 Updating the Perseus Firmware with the Command Line Interface

It is possible to update the Firmware in the Perseus Flash Memory using BAS CLI. For this to be possible, the version 2.11.13 or later of the CCE is required in the Perseus. If a lower version is running, refer to section "Updating the Central Command Engine (CCE)" to first update the CCE to a proper version.

1. Launch PerseusFirmwareUpdate.bat (located in the *%BASROOT% \tools\support\script* folder).
2. Enter the Perseus IP address and press enter.
3. If the Perseus is connected through a serial communication link, the update commands will appear in the COM window.
4. The following figures show the expected result.

4 Perseus Recovery Through Xilinx Tools

In the case a Flash recovery is necessary on the Perseus, the following procedure can be followed:

1. Connect the host computer and the Perseus to the same Ethernet subnet.
2. Connect the FPGA JTAG pod to the Perseus.
3. Connect the USB cable to the host computer and the Perseus (FPGA JTAG POD).
4. On a PicoSDR or PicoDigitizer, connect a mini-USB between the host computer and the PicoSDR/Digitizer backplane.

    On a uTCA chassis system, connect the mini-USB cable to the host computer and the Mestor expander or Mestor expander flex.
5. Start a serial port console software.
6. Use Windows's device manager to find the COM port to use

    On a PicoSDR or PicoDigitizer, use the serial port used by the Perseus you are targeting.

    On a uTCA chassis system, select the connection corresponding to the communication port (for example, COM5 x) used by the "Silicon Labs CP210x USB to UART Bridge".

    Use a 115200 baud rate, 8 data bits, no-parity, and no flow control.
7. Through iMPACT, program the Perseus FPGA using the {FPGA_part}_rtdex_recplay_gige.bit file.

    For a Perseus601x, use *%BASROOT%\tools\bitstreams\Perseus601x* folder.

    For a double-width Perseus611x, use *%BASROOT%\tools\bitstreams\Perseus611x* folder.
8. On the Windows **Start** menu, point to **All Programs**> **Xilinx ISE Design Suite 14.7**> **EDK** and click **Xilinx Platform Studio**.
9. In the **Xilinx Platform Studio** dialog box, click **Cancel**.
10. On the **File** menu, click **Open Project**.
11. In the **Open Existing Project** dialog box, browse to the %BASROOT%\examples\rtdex_recplay\perseus601x\bsdk_gige
12. Select the rtdex_recplay_gige project and click **Open**.
13. On the **Debug** menu, click **Launch XMD**.

    Wait for the XMD command prompt to appear.
14. At the XMD command prompt to connect to the microblaze:
    - In a PicoSDR or PicoDigitizer, type ***connect mb mdm.***
    - In a uTCA chassis,
        - If the Flex Mestor is used, type ***connect mb mdm.***
        - If the Mestor breakout box is used, type

            connect mb mdm –debugdevice deviceNr 2 (2 = device id of JTAG chain).
15. At the XMD command prompt, type   ***dow %BASROOT%/sdk/embedded/bin/u-boot.elf***

    Replace %BASROOT% with its real value (for example, C:/Nutaq/bas).

    The back slash is not recognized by the XMD console, use the slash instead.
16. To start the MicroBlaze application, at the XMD command prompt, type `run`.
    Note:
    You have 5 seconds after entering the `run` command to stop the Perseus automatic boot sequence.
17. In the serial port console software window, press any key to stop the Perseus automatic boot sequence and type `printenv`.
18. Validate that the serverip, ipaddr, and ethaddr variables are configured correctly.

If they are not, update them as follows:

- "setenv serverip XXX.XXX.XXX.XXX", where the IP address is the one used by the host (where the TFTP server is installed).

- "setenv ipaddr XXX.XXX.XXX.XXX", where the IP address must be in the same subnetwork as the one used by the host (that is, the serverip value).

- "setenv ethaddr XX:XX:XX:XX:XX:XX", where the Ethernet address is the MAC address written on the Perseus card. Remove the Perseus from the chassis to see the MAC address.

- "saveenv", to save the modifications.

19. The Perseus flash holds 4 different sections that need to be updated. These sections are:

- U-boot: universal bootloader

- Kernel: Linux kernel

- JFFS2 file system: Flash file system where the CCE resides.

- DTB: OS configuration

    Note:
    Those 4 files are in the %BASROOT%/sdk/embedded/bin, configure the TFTP tool to point to %BASROOT%/sdk/embedded/bin or copy the files in the folder where the TFTP is mapped. All 4 sections need to be programmed in flash.

20. Program the U-boot section:

    a. In the XMD command prompt window type **stop** and press enter.

    b. In the XMD command prompt window type **rst** and press enter.

    c. In the XMD command prompt window type **run** and press enter.

    d. In the serial port console software window, press any key to stop the Perseus automatic boot sequence and type **run update_uboot**

    e. Wait as the file is loaded through TFTP and is written to flash.

21. Program the Kernel section:

    a. In the XMD command prompt window type **stop** and press enter.

    b. In the XMD command prompt window type **rst** and press enter.

    c. In the XMD command prompt window type **run** and press enter.

    d. In the serial port console software window, press any key to stop the Perseus automatic boot sequence and type **run update_kernel**

    e. Wait as the file is loaded through TFTP and is written to flash.

22. Program the JFFS2 file system section:

    a. In the XMD command prompt window type **stop** and press enter.

    b. In the XMD command prompt window type **rst** and press enter.

    c. In the XMD command prompt window type **run** and press enter.

    d. In the serial port console software window, press any key to stop the Perseus automatic boot sequence and type **run update_jffs2**

    e. Wait as the file is loaded through TFTP and is written to flash.

23. Program the DTB section:

    a. In the XMD command prompt window type **stop** and press enter.

    b. In the XMD command prompt window type **rst** and press enter.

    c. In the XMD command prompt window type **run** and press enter.

    d. In the serial port console software window, press any key to stop the Perseus automatic boot sequence and type **run update_dtb**

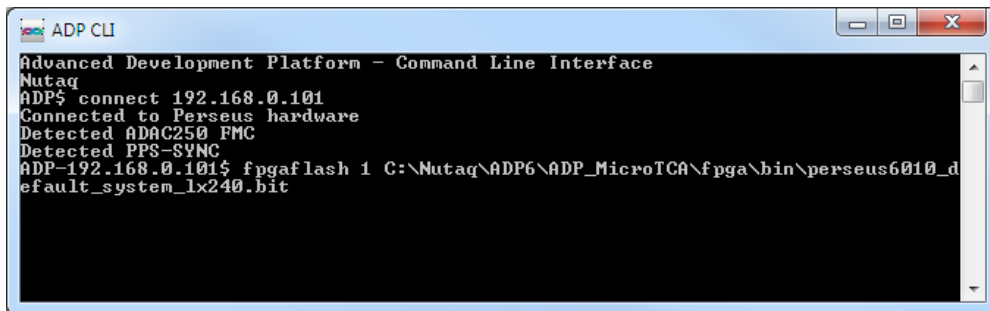   e. Wait as the file is loaded through TFTP and is written to flash.

24. In the u-boot console, enter the command **boot**.

25. Through iMPACT, program the Perseus FPGA using the {FPGA_part}_rtdex_recplay_gige.bit file.

    For a Perseus601x, it is located in the *%BASROOT%\tools\bitstreams\Perseus601x* folder.

    For a Perseus611x, it is located in the *%BASROOT%\tools\bitstreams\Perseus611x* folder.

26. To flash bitstream (with any bitstream) on the Perseus, connect to the Perseus using CLI, and use the command **fpgaflash** following the bitstream partition index and the path of the bistream (drag and drop the Bitstream on the window), see the figure below.

Flashing a bitstream using CLI

For more details about using CLI, please refer to the "Board & Systems Software Tools - Command Line Interface API.pdf" documentation.