phyCORE®-MPC5200B tiny Development Kit (KPCM-030)

Configuring and updating the bootloader

This Application Note provides instructions on how to create, configure and update a new bootloader for the phyCORE®-MPC5200B tiny development board.

1   System Description

1.1   Hardware Description

The following hardware is necessary for start-up of the phyCORE-MPC5200-tiny:

- phyCORE-MPC5200B tiny (PCM-030)

- Development Board for MPC5200B tiny

- AC adapter supplying 5 DC

- RS-232 null-modem cable

- cross-over Ethernet cable[1]

All PHYTEC hardware components are included in the phyCORE-MPC5200 tiny Development Kit.

---

[1] :   You may also use a straight Ethernet cable connected to a hub to establish network connection between the phyCORE-MPC5200 tiny hardware and the host-PC.

1.2 Software Description and Requirements

This Application Note for the phyCORE-MPC5200 tiny requires the use of a terminal program on the host-PC, such as Komport or Minicom for Linux, together with TFTP services. The ip address of your host should be configured with the ip address 192.168.3.10.

Information how to setup the network configuration and tftp services can be found in the QuickStart Instructions (Chapter 2 *Getting Started*). The terminal program Komport will be installed while executing the setup program on your PHYTEC Linux-PowerPC-Disc. You can find a link on your desktop to start Komport.

The Bootloader used for downloading the Linux kernel is the Universal Bootloader U-Boot. The bootloader is pre-installed on the phyCORE-MPC5200 tiny. In this application Note you will find a description how to create and update a new bootloader for phyCORE-MPC5200 tiny.

To compile a new bootloader you will have to use GNU C/C++ Cross Development Toolchain for the powerpc architecture. The GNU C/C++ Cross Development Toolchain will be installed while executing the setup program on your PHYTEC Linux-PowerPC-Disc. We assume you have executed the setup program of your PHYTEC Linux-PowerPC-Disc.

2 Getting Started

2.1 Building the bootloader

The files to build the bootloader can be found on you Linux-PowerPC-Disc in the directories Linux\u-boot\src and Linux/u-boot/patches. The src directory contains the u-boot source code from the U-Boot project homepage. The Project is hosted at sourceforge.net. The directory patches contains board specific patches to use the bootloader wit the phyCORE®-MPC5200B tiny.
The number of patches depends of the version of your Linux-PowerPC-Disc. Some patches may be combined or new fixes will be added.

- First copy the patch files from the directory Linux/u-boot/patches and the U-Boot source file from Linux/u-boot/src/ u-boot-x.y.z.tar.bz2 to your home directory.

- Extract the u-boot archive file and change to the u-boot directory:

  tar -xjvf u-boot-x.y.z.tar.bz2

  cd u-boot-x.y.z

Now you have to apply the board specific u-boot patches. In the file series you can find a list of the patches. The patches have to be applied in the order they are listed in the series file.

- Type the following commands to apply the patches.

  cat ../u-boot-1.1.4-mpc5200b-2.diff | patch -p1

  cat ../u-boot-1.1.4-mpc5200b-phytec-2.diff | patch -p1

Note: The names and number of patches may differ of the patches on your setup disk.

In the next step you have to select the configuration of your board. Type the following command to select the phyCORE-MPC5200-tiny configuration file:

make phycore_mpc5200b_tiny_config

- Type **make** to compile and build the bootloader.

After compiling the bootloader you will find the file *uboot.bin* in you source directory. This file will be written into the flash memory of the target.

2.2 Connecting the host to the target

- Connect the serial cable with the connector P1 on the target and the serial interface COM1 on your host

- Connect the cross-over Ethernet cable with the connector X23 on the target and the right network card of your host.
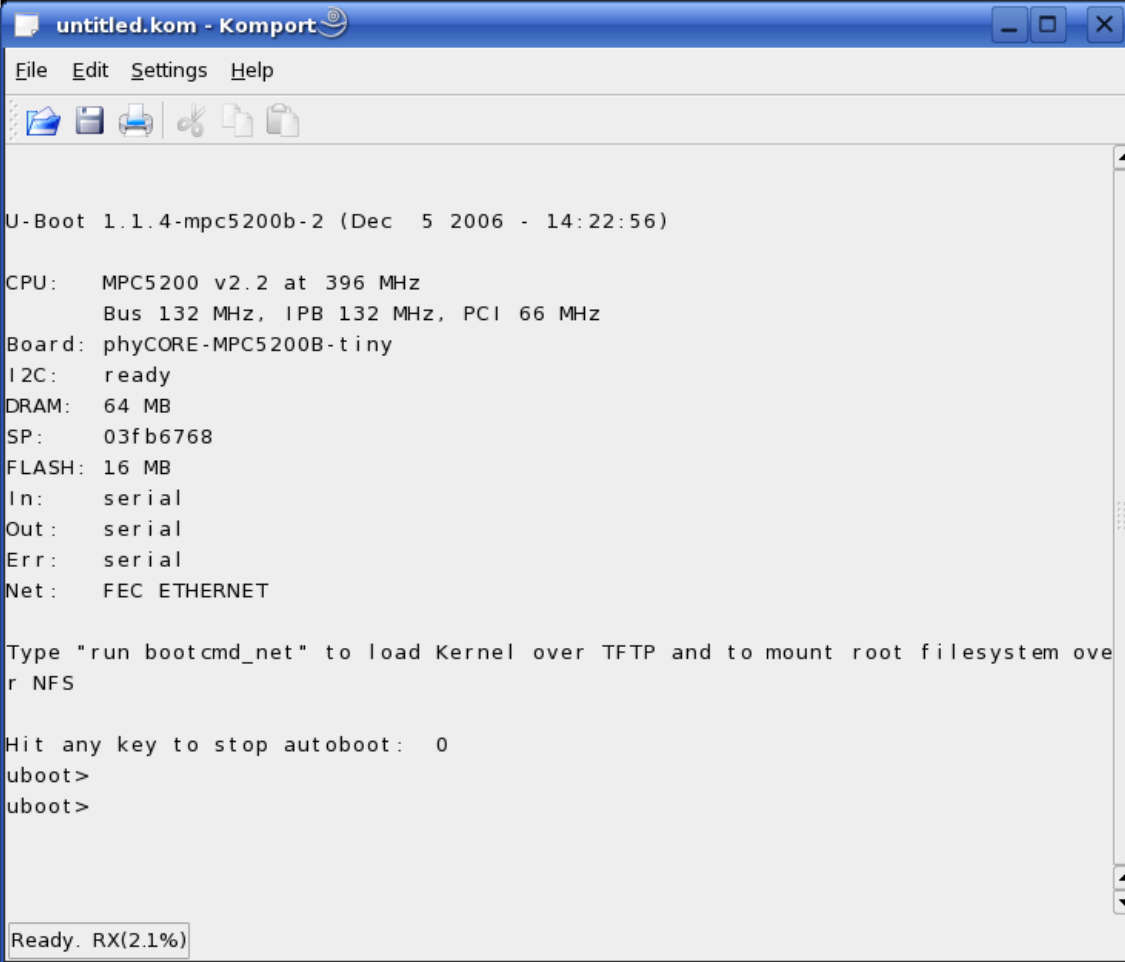

- Click on the *Komport* icon on your desktop

Komport was configured during the setup with the following configuration:

115200 baud, 1 Start bit, 8 data bits, 1 stop bit, no parity and no flow control.

If you want to use another program than Komport for serial communication, you will have to setup this program with these settings.

- Connect the AC adapter with the power supply connector X1 (12V) on your board.

```
untitled.kom - Komport                                    _  □  X

File  Edit  Settings  Help



U-Boot 1.1.4-mpc5200b-2 (Dec  5 2006 - 14:22:56)

CPU:   MPC5200 v2.2 at 396 MHz
       Bus 132 MHz, IPB 132 MHz, PCI 66 MHz
Board: phyCORE-MPC5200B-tiny
I2C:   ready
DRAM:  64 MB
SP:    03fb6768
FLASH: 16 MB
In:    serial
Out:   serial
Err:   serial
Net:   FEC ETHERNET

Type "run bootcmd_net" to load Kernel over TFTP and to mount root filesystem ove
r NFS

Hit any key to stop autoboot:  0
uboot>
uboot>



Ready. RX(2.1%)
```

- Press any key to stop autoboot.

The default ip address of the target is 192.168.3.11 and the default server ip is 192.168.3.10. If you want to setup another network configuration, you can use the following commands:

2.3 Updating the bootloader

Before the bootloader can be updated, you will have to download the image from a tftp server. This will be done in the command line of the bootloader. First the image will be copied into RAM. Then you will have to erase the part of the FLASH, where you want to copy the Kernel image.

In the default configuration you will find five partitions on the target. The first partition contains a second bootloader for rescue issues and the forth contains the default bootloader.

The five partitions have the following address ranges:

0xFF000000 - 0xFF03FFFF U-Boot-Low (256k)
0xFF040000 - 0xFF1FFFFF Kernel (1792k)
0xFF200000 - 0xFFEFFFFF Root-FS(13312k)
0xFFF00000 - 0xFFF3FFFF U-Boot (256k)
0xFFF40000 - 0xFFFFFFFF Space (768k)

The partitions for the bootloader are write protected. If you want to write to these areas you will have to unprotect them. The bootloader in the first partition is stored to restore a failed update. If the target doesn't start after an update there is the possibility to use the bootloader of the first partition to start the target.

Information on starting with the bootloader of the first partition can be found in the Hardware-Manual of the phyCORE®-MPC5200B tiny in the Chapter *The U-Boot Boot Loader*.

Note: The following steps are critical. Mistakes can cause a system, that will not start after a Reset. So be aware what you are doing in the following steps.

Do never unprotect and write to the area of the first partition. If you delete this partition you can't start your system after a failed update without a debugger.

- First copy the created uboot.bin file to the directory /tftpboot:
  cp uboot.bin /tftpboot

```
uboot> tftp 400000 u-boot.bin
Using FEC ETHERNET device
TFTP from server 192.168.3.10; our IP address is 192.168.3.11
Filename 'u-boot.bin'.
Load address: 0x400000
Loading: #############################
done
Bytes transferred = 146712 (23d18 hex)
```

- Then you can download the bootloader and write the bootloader into the RAM. Typ the following command:

  uboot> tftp 400000 u-boot.bin

The number off transferred bytes can differ from the screenshot

```
uboot> protect off fff00000 fff3ffff
..
Un-Protected 2 sectors
```

- Unprotect the flash area of the fourth partition:

  uboot> protect off fff00000 fff3ffff

```
uboot> erase fff00000 fff3ffff

.. done
Erased 2 sectors
```

- Erase the sectors of the u-boot partition:

  uboot> erase fff00000 fff3ffff

```
uboot> cp.b 400000 fff00000 $(filesize)
Copy to Flash... done
```

- Now you can copy the bootloader from RAM to FLASH:

  uboot> cp.b 400000 fff00000 $(filesize)

```
uboot> protect on fff00000 fff3ffff
..
Protected 2 sectors
```

- Protect the u-boot partition:

  protect on fff00000 fff3ffff

Press the Reset button on the target to start the target with bootloader you has updated.

2.4 Changing the configuration

Board specific configurations for the phyCORE®-MPC5200B tiny is done with the following file:

include/configs/phycore_mpc5200b_tiny.h

In this file you can find several defines to configure the board. At the beginning of this file you can find defines for some default configurations. The configuration can be activated by changing 0 to 1 or deactivated by changing 1 to 0.

FLASH with 16-Bit bus width:
CONFIG_FLASH_MPC5200_TINY_16BIT   1

16-Bit bus width for the FLASH is activated. Older Boards are using a bus with 8-Bit width (Rev.1235.0).

USB support:
CONFIG_USB_MPC5200_TINY   0

PCI support:
#define CONFIG_PCI_MPC5200_TINY   0

IDE support:
#define CONFIG_IDE_MPC5200_TINY   0

2.5 Links further information

Further information using the bootloader can be found in the OSELAS
OSELAS.BSP( ) QuickStart Manual on your PHYTEC Linux-PowerPC-
Disc in the directory doc/OSELAS. In the part Booting Linux you can find
information on the following topics:

- Default U-Boot environment

  Stand alone

  Network based

- Remote-Booting Linux

- Stand-Alone Booting Linux

- Decreasing boot time

You can also find information on the U-Boot project page and README
file in the U-Boot archive file.

http://u-boot.sourceforge.net/