RED-BEET-EVAL-BOARD 2.0 Host Controller Interface Selection

Introduction

This document describes how to select SPI or Ethernet as host controller interface of RED-BEET-EVAL-BOARD 2.0 using open-plc-utilities.

Per default Ethernet is used as host controller interface. This document describes how to reconfigure the board to use SPI as host controller interface.
As well it describes how to switch it back to Ethernet interface.

General Information

Qualcomm provides the firmware (FW) for their PLC modems in binary format. All the parameters are stored in a configuration file called PIB (parameter information block), which comes as a part of the software delivery package.
The parameters of Qualcomm's QCA7006AQ on the RED-BEET 2.0 module are stored in the PIB (parameters information block) file. To read the PIB file from RED-BEET 2.0, its modification and to write the PIB back the open-plc-utilities command line tools can be used (e.g. available in the CODICO documentation area).

The host controller interface used by QCA7006AQ FW on the module is set in the PIB file.
The default host controller interface of RED-BEET-EVAL-BOARD 2.0 is Ethernet.

In order to change the interface to SPI (for example for connection to a Raspberry Pi) it is necessary to read the PIB from QCA7006AQ, modify the interface selection parameters in the file and write it back to the board.

There are two settings to select the host controller interface:

Bootloader
The host controller interface used by the bootloader is selected by a bootstrap resistor on GPIO_1. On the RED-BEET-EVAL-BOARD 2.0 you can pull-up GPIO_1 or pull-down with the microswitch SW7. This setting is only relevant in "boot-from-host" mode.

PIB
ATTENTION: The setting in the PIB overrides the bootstrapping setting!!!
By default, the RED-BEET-EVAL-BOARD 2.0 is configured to boot from internal flash. The SW7 settings are overruled by the setting in the PIB that is stored in the RED-BEET 2.0 flash.

It is strongly recommended to keep the settings of SW7 and the PIB file in sync to avoid confusion.

Change host controller interface from Ethernet to SPI:

1. Connect Ethernet cable from PC to RED-BEET-EVAL-BOARD 2.0 board's RJ45 connector
2. Power up the board via USB-C connector
3. Check communication with the board with plctool (it is assumed in the example that Ethernet interface has name **eth0**)

   ```
   plctool -i eth0 -r
   ```

   As result the MAC address and firmware version of QCA7006 is shown. For example:

   ```
   00:B0:52:00:00:01 Request Version Information
   C4:93:00:11:22:33 QCA???? MAC-QCA7006-3.3.0.29-00-20231004-CS
   ```

4. Read the PIB file from RED-BEET 2.0:

   ```
   plctool -i eth0 -p RB_eth.pib local
   ```

   The PIB is read and stored as RB_eth.pib in the working folder
5. Make a copy of RB_eth_pib and rename the file to RB_spi.pib
6. Modify following 4 parameters in RB_spi.pib in order to set "Host Type" to SPI, allow "Overriding Default Settings for Host Interface Selection" and set "SPI Slave Host Type to Ethernet over Serial":

   ```
   setpib RB_spi.pib 0x388 byte 0
   setpib RB_spi.pib 0x3C8 byte 1
   setpib RB_spi.pib 0x3C9 byte 0
   setpib RB_spi.pib 0x3CA byte 1
   ```

7. Write the SPI configured PIB file RB2_spi.pib into RED-BEET 2.0:

   ```
   plctool -i eth0 -P RB_spi.pib
   ```

8. Set SW7 to "SPI" setting (in order to make the SPI interface available in bootloader mode)
9. Connect SPI host controller via cable or directly to CN1 connector in case of Raspberry PI
10. Reboot by pressing RESETN or power cycle

Change host controller interface from SPI to Ethernet :

1. Connect a SPI host controller (see RED-BEET-EVAL-BOARD 2.0 datasheet) via SPI cable or directly to CN1 connector in case of Raspberry Pi hist controller.
2. Power up the board via USB-C connector
3. Check communication with the board with plctool (it is assumed in the example that virtual Ethernet interface created by **qcaspi** Linux driver has name **eth1**)

   ```
   plctool -i eth1 -r
   ```

   As result the MAC address and firmware version of QCA7006 is shown. For example:

   ```
   00:B0:52:00:00:01 Request Version Information
   C4:93:00:11:22:33 QCA???? MAC-QCA7006-3.3.0.29-00-20231004-CS
   ```

4. Read the PIB file from RED-BEET 2.0:

   ```
   plctool -i eth1 -p RB_spi.pib local
   ```

   The PIB is read and stored as RB_spi.pib in the working folder
5. Make a copy of RB2_spi_pib and rename the file to RB2_eth.pib
6. Modify following 4 parameters in RB_eth.pib in order to set "Host Type" to Ethernet, allow "Overriding Default Settings for Host Interface Selection" and disable "SPI Slave Host Type to Ethernet over Serial":

   ```
   setpib RB_eth.pib 0x388 byte FF
   setpib RB_eth.pib 0x3C8 byte 1
   setpib RB_eth.pib 0x3C9 byte 1
   setpib RB_eth.pib 0x3CA byte 0
   ```

7. Write Ethernet configured PIB file RB2_eth.pib into RED-BEET 2.0:

   ```
   plctool -i eth1 -P RB_eth.pib
   ```

8. Set SW7 to "ETH" setting (in order to make the Ethernet interface available in bootloader mode)
9. Connect Ethernet cable from PC or other Host controller to RED-BEET-EVAL-BOARD 2.0 board's RJ45 connector
10. Reboot by pressing RESETN or power cycle