Release Notes for the QNX Neutrino 6.4.1 BSP for Freescale P2020RDB#

1.System Requirements#

Target Requirements

1. QNX Neutrino RTOS 6.4.1
2. Board version: P2020RDB
3. P2020 processor
4. 1GB DDR SDRAM
5. 16 MB NOR flash

Host Requirements

1. QNX Momentics 6.4.1
2. Truncated Message Copy Issue — SMP PowerPC Kernels Patch Patch ID 1636. Download link
3. Terminal emulation program (Qtalk, Momentics IDE Terminal, tip, HyperTerminal, etc.)
4. RS-232 serial port and serial cable, or a USB-to-serial cable
5. Ethernet link

2.System Layout#

Start	End	Item
0x00100000		OS Image Loaded
0x00000000	0x3FFFFFFF	RAM
0xC0000000	0xDFFFFFFF	PCIe1 Memory
0xA0000000	0xBFFFFFFF	PCIe2 Memory
0x80000000	0x9FFFFFFF	PCIe3 Memory
0xE0000000	0xE7FFFFFF	Promjet
0xEF000000	0xEFFFFFFF	Nor Flash (on eLBC)
0xF0020000	0xF002FFFF	PCIe1 IO
0xF0010000	0xF001FFFF	PCIe2 IO
0xF0000000	0xF000FFFF	PCIe3 IO
0xF0030000	0xF012FFFF	NAND Flash Bank 1 (eLBC Chip Select 1)

3.Getting Started#

3.1 Building the BSP#

You can build a BSP OS image from the source code or the binary components contained in a BSP package. For instructions about building a BSP OS image, please refer to the chapter Working with a BSP in the Building Embedded Systems manual.

3.2 Connect your Hardware#

Connect the serial cable to the serial port of the P2020RDB board to the first serial port of your host machine. There is 1 serial port on P2020RDB. Use the one which is near the boundary of the board. Usually you should see some Uboot output on the console when you connect cable to the correct port. If you have a Neutrino host with a serial mouse, you may have to move the mouse to the second serial port on your host, because some terminal programs require the first serial port.

The correct terminal settings of the program handling serial connection should be:

baudrate	115200
data	8 bit
parity	none
stop	1bit
flow control	none

3.3 Setup your environment#

1. Power on your target. You should see the u-boot output on your console. 2. Conenct an ethernet cable to any of the 3 PHY port available on the back side of the board.

4. Boot the IFS image#

You can use TFTP download (the default) or serial download to transfer an OS image to the board, as described below.

4.1 Boot via tftp#

This method requires that you put the raw image generated by BSP (by default at $BSP_ROOT/images/ifs-p2020rdb.raw) to a TFTP server. This server must be reachable via board and preferably should be on the same LAN. As soon as u-boot starts, press any key so that u-boot stops and doesnt boot the prebuild linux kernel. Configure u-boot parameters as follows:

```
=> setenv ipaddr 10.90.74.214
=> setenv serverip 10.90.74.42
=> setenv bootfile ifs-p2020rdb.raw
=> setenv loadaddr 0x100000
=> setenv bootcmd 'tftpboot $loadaddr $bootfile; go $loadaddr'
=> setenv bootdelay 2
=> saveenv
Saving Environment to Flash...
Un-Protected 1 sectors
Erasing Flash...
flash erase done
Erased 1 sectors
Writing to Flash... done
Protected 1 sectors
=> boot
```

4.1 Boot via serial#

This method requires an SREC image. You have to modify the buildfile to create this format. Change this:

[virtual=ppcbe-spe,raw] to this:

[virtual=ppcbe-spe,srec] Rebuild the image. On your target, type:

```
=>: setenv loads_echo 0
=>: saveenv
=>: loads
```

On your host, copy the image to the serial port that's connected to the board. For example, on a Neutrino host: cp ifs-p2020rdb.srec /dev/ser1 On a Windows host, you can use Hyperterminal's transfer feature to copy the image as a text file.

```
## First Load Addr = 0x00100000
## Last  Load Addr = 0x0023955B
## Total Size      = 0x0013955C = 1283420 Bytes
## Start Addr      = 0x00101E38
=>:
```

Type **`go start_addr`**

At this point, you should see output similar to this when it finishes downloading:

```
## Starting application at 0x00100000 ...
Welcome to QNX Neutrino 6.4.1 on the PowerPC P2020RDB board
#
```

Congratulations! QNX 6.4.1 kernel is running on your system. You can test the OS simply by executing any shell builtin command or any command residing within the OS image (e.g. ls). Once the initial image is running, you can update the OS image using the network and flash drivers. For sample command lines, please see the " Driver Command Summary" section.

5. Writing the IPL and IFS images to flash using the boot loader#

P2020RDB supports bank switching in the NOR Flash. i.e. The upper half of the flash can appear as the lower half and vice-versa. The upper half of the NOR flash has the U-Boot image in the last 1MB. Another boot loader image i.e. IPL can be placed in the last 64KB of the lower half of the NOR flash. So both the boot loader images, U-Boot and IPL can simultaneously be placed in the NOR flash.

The IPL image (ipl-p2020rdb) which was built is an SREC image. We should convert it to a Binary image using the QNX utility ntoppc-objcopy. Run the following command at the same location where we ran the "make" command to build the IFS image:

```
ntoppc-objcopy --input-format=srec --output-format=binary install/ppcbe/boot/sys/ipl-p2020rdb images/ipl-p2020rdb.bin
```

On your target board, you can use U-BOOT to transfer an IPL image ipl-p2020rdb.bin and an IFS image ifs-p2020rdb.raw to the target board RAM, and then program it to the flash.

1.Use tftp to download the images:

```
=> tftp 0x100000 ifs-p2020rdb.raw
Speed: 1000, full duplex
Using eTSEC1 device
TFTP from server 10.90.74.42; our IP address is 10.90.74.214
Filename 'ifs-p2020rdb.raw'.
Load address: 0x100000
Loading: ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
         ##################################################################
```

```
	#################################################################
	#################################################################
	#################################################################
	#################################################################
	#################################################################
	#################################################################
	#################################################
done
Bytes transferred = 5582464 (552e80 hex)

=> tftp 0x700000 ipl-p2020rdb.bin
Speed: 1000, full duplex
Using eTSEC1 device
TFTP from server 10.90.74.42; our IP address is 10.90.74.214
Filename 'ipl-p2020rdb.bin'.
Load address: 0x700000
Loading: #############
done
Bytes transferred = 65536 (10000 hex)
```

2.Use protect to turn off the flash protection:

```
=> protect off all
Un-Protect Flash Bank # 1
```

3.Use erase to erase the first 6 MB of the second half of the flash (for IFS image) (from 0xef800000 to 0xefdfffff):

```
=> erase 0xef800000 0xefdfffff

..................................................... done
Erased 48 sectors
```

Though the IPL image is 64 KB, we erase 128 KB of the flash, because NOR flash can be erased only sector wise and each sector is 128 KB

4.Use erase to erase the last 128 KB of the first half of the flash (for IPL image) (from 0xef7e0000 to 0xef7fffff):

```
=> erase 0xef7e0000 0xef7fffff

. done
Erased 1 sectors
```

5.Use cp.b to program the IPL image and the IFS image to flash:

```
=> cp.b 0x100000 0xef800000 0x552e80
Copy to Flash... 9....8....7....6....5....4....3....2....1....done
=>
=> cp.b 0x700000 0xef7f0000 0x10000
Copy to Flash... 9....8....7....6....5....4....3....2....1....done
```

6. Switch off the target and change the switch setting of SW4(8) from 0 to 1. This switch setting, bank swithches the NOR flash.

Now the IFS image will be at the start of the flash i.e. at 0xEF000000 and the IPL image will be in the last 64 KB of the flash i.e. at 0xEFFF0000. Now switch on the target. IPL image will start booting from the NOR flash as below:

```
Welcome to QNX Neutrino IPL on the Freescale P2020RDB board
Scanning for image        @ 0xEF000000
Found image               @ 0xEF000100
Jumping to startup        @ 0x0010376C
board_smp_init: 2 cpu
Looking for Config EEPROM on i2c,0 @ I2C address 0x00000050 ... found
Validating contents ... Error, no signature
System page at phys:0000b000 user:0000b000 kern:0000b000
Starting next program at v0014ff2c
Welcome to QNX Neutrino 6.4.1 on the PowerPC P2020RDB board
#
#
```

6. Creating a flash partition#

Follow the description mentioned below for NAND flash and NOR flash

7. Driver Command Summary#

Component	Buildfile Command	Required Binaries	Required Libraries	Source Location
Startup	startup-p2020rdb -v -c0xFFE00000 -t50000000 -D0xffe04500	startup-p2020rdb	libstartup.a	src/hardware/startup/boards/p2020rdb
Serial	devc-ser8250 -e -c600000000 -b115200 0xffe04500,25 waitfor /dev/ser1 reopen /dev/ser1	devc-ser8250	none	src/hardware/devc
USB	io-usb -d ehci-p2020 ioport=0xFFE22100,irq=15 & waitfor /dev/io-usb/io-usb 10 devb-umass&	devu-ehci-p2020.so	libusbdi.so io-blk.so io-usb usb devb-umass libcam.so fs-dos.so fs-qnx4.so fs-ext2.so cam-disk.so	"prebuiltonly"
I2C	i2c-mpc8572 -i26 -p0xffe03000 --u0 (for controller 1) i2c-mpc8572 -i26 -p0xffe03100 --u1 (for controller 2)	i2c-mpc8572	none	src/hardware/i2c/mpc8572
SMP	PATH=:/proc/boot:/bin:/usr/bin LD_LIBRARY_PATH=:/proc/boot:/lib:/usr/	procnto-booke-smp	none	prebuilt

	lib:/lib/dll procnto-booke-smp -v			
PCI	pci-p2020	pci-p2020	none	/src/hardware/pci
Network	io-pkt-v4-hc -dmpcsec -p tcpip-v6 ipsec -dmpc85xx mac=00112233AABB,emu_phy=0	io-pkt-v4-hc ifconfig	devnp-mpc85xx.so	/src/hardware/devnp
NOR Flash	devf-generic -s 0xEF000000,16M,,,128k,1 -r	devf-generic flashctl	libmtd-flash.a	/src/hardware/flash
NAND Flash	fs-etfs-p2020rdb512 -e fs-etfs-p2020rdb512 -m /fs/etfs	fs-etfs-p2020rdb512 etfsctl	.	/src/hardware/etfs
RTC	rtc -v ds3232 /dev/i2c0 rtc -s -v ds3232 /dev/i2c0	rtc date	libutil.a libutilS.a	/src/utils/r/rtc

USB#

devb-umass& (This will exit if it doesn't find any mass storage device, so start this only after plugging in a device)

Network#

To start network driver without encryption, run:

```
io-pkt-v4-hc -dmpcsec -p tcpip-v6 ipsec -dmpc85xx
mac=00112233AABB,emu_phy=0
```

you should see following output when you run ifconfig

```
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
tsec0: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        capabilities rx=7<IP4CSUM,TCP4CSUM,UDP4CSUM>
        capabilities tx=0
        enabled=0
        address: 00:11:22:33:aa:bb
        media: Ethernet none
tsec1: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        capabilities rx=7<IP4CSUM,TCP4CSUM,UDP4CSUM>
        capabilities tx=0
        enabled=0
        address: 00:11:22:33:aa:bc
        media: Ethernet none
tsec2: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        capabilities rx=7<IP4CSUM,TCP4CSUM,UDP4CSUM>
        capabilities tx=0
        enabled=0
        address: 00:11:22:33:aa:bd
        media: Ethernet none
```

To bring a network interface up, type following command

```
ifconfig tsec0 10.90.74.214/24 up
```

Here 10.90.74.214 is the IP address assign to your target and 24 is the netmask bits (i.e. 255.255.255.0) The LEDs of the RJ45 ports corresponding to an enabled interface shall glow periodically. This can be used to identify the correct port corresponding to each tsec.

PCI#

run **pci-p2020** to enable PCI functionality on your board. This server supports both PCI and PCI-ex devices. To use a PCI or PCI-express device on P2020RDB, the device should be connected to the slot before PCI server is run. To detect whether the connect device is detected successfully or not, run following command line utility

```
pci -v
```

This shall output all PCI devices currently detected on your system.

RTC#

The RTC used in P2020RDB board is DS3232. Make sure the i2c driver is up and running before running the RTC utility, as the RTC DS3232 is connected to the first i2c bus.

If the i2c driver is not running, issue the following command

```
i2c-mpc8572 -i26 -p0xffe03000 --u0
```

To run the RTC utility, use the following command:

```
rtc -v ds3232 /dev/i2c0
```

This command updates the current time and date from the hardware clock in the board.

To set the hardware clock in the board with the current date and time, use the following command:

```
rtc -s -v ds3232 /dev/i2c0
```

NAND Flash#

Run

```
fs-etfs-p2020rdb512 -e
```

to erase the NAND device and to create an empty file system that is ready to use. The factory marked bad blocks are not erased. Blocks that become bad during normal use are also skipped during the erasing.

After the erase of the NAND device, run the following command

```
fs-etfs-p2020rdb512 -m /fs/etfs
```

This command sets the directory /fs/etfs as the mount point.

NOR Flash#

Run

```
devf-generic -s 0xEF000000,16M,,,128k,2,1 -r
```

to run the generic Flash filesystem driver on your board. After running this command, two partitions will get created. Normally the file names are as below: /dev/fs0 which is the default mountpoint for socket 0 and /dev/fs0p0 which has the raw access for socket 0, partition 0.

After these partitions get created, we should erase and format the flash using the flashctl utility.

The commands are as follows:

```
flashctl -p /dev/fs0 -o 0 -l 15M -ev
```

This command erases the nor flash starting from an offset of 0 to 15MB.

Though the nor flash is 16MB, we erase only 15MB as the last 1MB of flash contains the u-boot image.

After giving the above command, slay the driver using the `slay devf-generic` command and then restart it again.

The Nor flash is erased now and we can mount the given flash filesystem partition as the filesystem mountpoint /flash using the command below:

```
flashctl -p /dev/fs0p0 -o 0 -l 15M -f -n /flash
```

After this command is successfully run, slay the driver and restart it again. This formats the nor flash and mounts it over the filesystem mountpoint /flash.

We can create multiple filesystem partitions based on our requirement.

8. Known Issues#

1. eTSEC2-SGMII is not supported
2. errors while loading the BSP into the IDE (Ref# 73518,71146 - SPE issues with the IDE have been resolved in IDE 4.7 included in SDP 6.5.0). Workaround:
   - In IDE BSP perspective, open the System Builder Projects view, right click on the system builder project "bsp-freescale-p2020-rdb", select "Properties", select "Search Paths" from the left panel, select "System Files" tab at the right panel, change the first path which has "install/PLATFORM/boot/sys" in it, change the PLATFORM variable to "ppcbe". Now select "DLLs" tab at the right panel, change the first path which has "install/PLATFORM/lib/dll" in it, change the PLATFORM variable to "ppcbe-spe". Rebuild the system builder project.
3. Enable the kprintf trace which gives the clock values, in the startup/boards/p2020rdb/main.c. Whatever the CCB clock reported by startup, please use it as the clock input for the devc-ser8250 driver. This issue will be fixed in the next release of the BSP (Ref# 75148).
4. While testing the NOR flash driver, please do not erase the first sector (128KB) of the NOR flash (0xEF000000 to 0xEF01FFFF) , as it contains the Firmware for the Vitesse Switch VSC7385 in the first 8KB. As you can erase the NOR flash, only sector wise, do not erase the first sector of the NOR flash. In case you erase it, the ethernet will not work on the eTSEC1 (Remember there are 3 eTSECs (1, 2, 3))
5. if you are using 6.4.1 SDP with 4.6 IDE then for successful debugging using gdb download gdb update update 5 from http://community.qnx.com/sf/frs/do/viewRelease/projects.toolchain/frs.gdb.gdb_6_8_u5