

# Release Notes for the QNX Neutrino 6.4.0 BSP for Atmel AT91SAM9260-EK Board#

## System requirements#

### Target system#

- QNX Neutrino RTOS 6.4.0
- Board: Atmel at91sam9260-EK Evaluation Board
- Data-Flash: AT45DCB008D (8 MB) CARD
- SDRAM: 16-bit Micron MT48LC16M16A2 (64 MB) SDRAM
- NAND Flash: Samsung K9F2G08U0A (256 MB) NAND Flash

### Host development system#

- QNX Momentics 6.4.0, one of the following host systems:
  - QNX Neutrino 6.4.0
  - Microsoft Windows Vista, XP SP2 or SP3, 2000 SP4
  - Linux Red Hat 8 or 9, Linux Red Hat Enterprise Workstation 3 or 4, Red Hat Fedora Core 3 or 4, or SUSE 10
- Terminal emulation program (Qtalk, Momentics IDE Terminal, tip, HyperTerminal, etc.)
- Windows Machine required SAM-BA application to download the image on Data-Flash.
- RS-232 serial port
- NULL-modem serial cable
- USB cable to connect board with windows Machine

## Getting Started#

### Step 1: Connect your hardware#

Connect the DEBUG port of the AT91SAM9260 board to the first serial port of your windows machine. Install the SAM-BA application provided by Atmel. Connect the board with Windows Machine using USB Cable.

### Step 2: Build the BSP#

You can build an OS image from the source code or the binary components contained in a BSP package. For instructions about building an OS image, please refer to the chapter Working with a BSP in the Building Embedded Systems manual. After Building the BSP three bin files will be created in images directory.

```
*ifs-at91sam9260.bin
*ipl-at91sam9260.bin
*ipl-ifs-at91sam9260.bin
```

mkflashimage script creates a combined IPL/IFS image as ipl-ifs-at91sam9260.bin  
The mkflashimage script:

```
#!/bin/sh
```

```
# script to build a binary IPL and boot image for ATMEL AT91SAM9260 Evaluation Kit board
```

```
# NOTE the image (ipl-ifs-at91sam9260.bin) must be built as binary, i.e. [virtual=armle,binary] in the buildfile
set -v
```

```
# Convert IPL into BINARY format
```

```
#{QNX_HOST}/usr/bin/ntoarm-objcopy --input-format=elf32-littlearm --output-format=binary -R.data ../install/armle/boot/sys/
```

```
# Pad BINARY IPL
mkrec -s4k -ffull -r ipl-tmp-at91sam9260.bin > ipl-at91sam9260.bin

# Combine the BINARY IPL with the BINARY OS Image
cat ./ipl-at91sam9260.bin ./ifs-at91sam9260.bin > ipl-ifs-at91sam9260.bin

# Cleaning up temporary files
rm -f *tmp*
```

### Step 3: Download the Bootable IFS image.#

The Boot Program integrates different programs that manage download and/or upload into the different memories of the product. First, it initializes the Debug Unit serial port (DBGU) and the USB High Speed Device Port.

- Then NAND Flash Boot program is executed. The NAND Flash Boot program searches for a valid application in the NAND Flash memory. If a valid application is found, this application is loaded into internal SRAM and executed by branching at address 0x0000\_0000 after remap.
- If no NAND Flash Boot program is found, the Data-Flash Boot program is then executed. It looks for a sequence of seven valid ARM exception vectors in a Data-Flash connected to the SPI. All these vectors must be B-branch or LDR load register instructions except for the sixth vector. This vector is used to store the size of the image to download. If a valid sequence is found, code is downloaded into the internal SRAM. This is followed by a remap and a jump to the first address of the SRAM. If no valid ARM vector sequence is found, SAM-BA Boot is then executed. It waits for transactions either on the USB device, or on the DBGU serial port.

### Install and setup SAM-BA#

1. Install "AT91-ISP v1.12.exe" .
2. Install "ActiveTcl8.5.5.0.287690-win32-ix86-threaded.exe" i.e.TCL environment which is used by SAM-BA (any other TCL environment can also be used) .
3. Connect serial cable with windows machine, and use any serial port application such as teraterm or hyperterminal, and attach it with COM device, with baud rate set as 115200. Make sure the on-board data flash and NAND flash contain no bootable images.
4. Restart the board, hyperterminal will be showing following message .

### RomBOOT

>

5. Connect usb cable with windows machine, It will prompt with a new usb hardware found message, and will try to install the corresponding driver.
6. Check device has enumerated properly by looking into device manager .
7. Start SAM-BA 2.6 with \usb\ARM0 as connection.

### Loading the IFS image using SAM-BA#

- Select the Data-Flash AT45DB/DCB tab in SAM-BA Application. Execute the Enable Data-flash on CS0 script.
- Select the ipl-ifs-at91sam9260.bin file to be sent to the target, and then press Send File. Depending on the size of your file, it will take a few seconds up to a minute.

**SAM-BA 2.6 - AT91SAM9260-EK**

File Script File Link Help

AT91SAM9260 Memory Display

Start Address:  Refresh Display format:  ascii  8-bit  16-bit  32-bit

Size in byte(s):

0x00200000	0xEA000005	0xEAF7FFFD	0xEA000003	0xEAF7FFFB
0x00200010	0xEAF7FFFA	0x00001000	0xEAF7FFFB	0xEE113F10
0x00200020	0xE3833A01	0xEE013F10	0xE3A0DC0A	0xE38DD603
0x00200030	0x01020102	0x06040604	0x00080008	0x00010003
0x00200040	0xE24CB004	0xEB00018A	0xE3A00000	0xE89DA800
0x00200050	0xE1A0C00D	0xE92DD8F0	0xE24CB004	0xE24DD004
0x00200060	0xE1A05000	0xE3E03060	0xE54B3020	0xE24B0020

DataFlash AT45DB/DCB | SRAM2 | NANDFlash | SDRAM | SRAM

Download / Upload File

Send File Name:  Send File

Receive File Name:  Receive File

Address:  Size (For Receive File):  byte(s) Compare sent file with memory

Scripts

Execute

```

-I- *(pSDRAM+0x20) = 0;
-I- 5. Write refresh rate into SDRAMC refresh timer COUNT register
-I- 6. A Normal Mode Command is provided, 3 clocks after tMRD is set
-I- *pSDRAM = 0;
-I- End of Init_SDRAM_48
(AT91-ISP v1.10) 31 % send_file (DataFlash AT45DB/DCB) "X:/pack-9260/branches/build/bsp/validate/rep/branch-9260/images/pl-ifs-at91sam9260.bin" 0x0 0
-I- Send File X:/pack-9260/branches/build/bsp/validate/rep/branch-9260/images/pl-ifs-at91sam9260.bin at address 0x0
-I- File size = 6240235 byte(s)
(AT91-ISP v1.10) 31 %
  
```

\\usb\ARM0 Board: AT91SAM9260-EK

Press the reset button, now on your terminal you will see output as follows:

RomBOOT

>

QNX Neutrino Initial Program Loader for ATMEL AT91SAM9260-EK  
Commands:

Press 'D' for serial download, using the 'sendnto' utility

Press 'F' to Boot an OS image from SPI/SERIAL flash

ATMEL AT45DB642D/AT45DCB008D SPI Flash detected.

QNX IFS image detected on page: 00000004 Offset: 000003A0 Size: 005C2240

#####Done

found image, calling image setup...

image\_setup OK, calling image start...

PIO init : DBGU, USART, NAND,

CPU0: Dcache: 256x32 WB

CPU0: Icache: 256x32

CPU0: 41069265: arm926 rev 5 100MHz

elf\_map: 1M va=fe000000 pa=20100000 sz=00100000

elf\_map: 1M va=fe000000 pa=20100000 sz=00100000

Header size=0x0000009c, Total Size=0x000004e0, #Cpu=1, Type=4

Section:system\_private offset:0x000001f0 size:0x00000068

syspage ptr user:fc404000 kernel:fc404000

cpupage ptr user:fc4047e0 kernel:fc4047e0 spacing:84

kdebug info:00000000 callback:00000000

boot pgms: idx=0

```
0) base paddr:20110000 start addr:fe03d838
ramsize:00000000 pagesize:00001000
Section:qtime offset:0x00000148 size:0x00000060
boot:00000000 CPS:0000000002faf08 rate/scale:320000000/-15 intr:1
Section:callout offset:0x000000a0 size:0x00000048
reboot:fc404658 power:fc404678
timer_load:fc40468c reload:fc4046b4 value:fc4046e0
0) display:fc404700 poll:fc404724 break:fc404748
1) display:00000000 poll:00000000 break:00000000
Section:cpuinfo offset:0x000001a8 size:0x00000020
0) cpu:41069265 flags:40000000 speed:00000064 cache i/d:1/0 name:53
Section:cacheattr offset:0x000004a0 size:0x00000040
0) flags:32 size:0020 #lines:0100 control:fc4044e0 next:255
1) flags:11 size:0020 #lines:0100 control:fc404534 next:255
Section:meminfo offset:0x000004e0 size:0x00000000
Section:asinfo offset:0x00000320 size:0x00000140
0000) 0000000000000000-00000000ffffff o:ffff a:0010 p:100 c:00000000 n:21
0020) 0000000020000000-0000000023ffffff o:0000 a:0017 p:100 c:00000000 n:28
0040) 0000000000000000-00000000ffffff o:ffff a:0010 p:100 c:00000000 n:21
0060) 0000000020000000-0000000023ffffff o:0040 a:0007 p:100 c:00000000 n:32
0080) 000000002010e108-00000000206c223f o:0000 a:0005 p:100 c:00000000 n:60
00a0) 0000000020100000-000000002010e107 o:0000 a:0007 p:100 c:00000000 n:68
00c0) 000000002010e108-00000000206c223f o:0000 a:0007 p:100 c:00000000 n:76
00e0) 0000000020000000-0000000020007fff o:0020 a:0007 p:100 c:00000000 n:84
0100) 0000000020010834-00000000200fffff o:0020 a:0007 p:100 c:00000000 n:84
0120) 00000000206c2240-0000000023ffffff o:0020 a:0007 p:100 c:00000000 n:84
Section:hwinfo offset:0x000002d8 size:0x00000048
0) size:3 tag:3 isize:3, iname:0, owner:65535, kids:1
12) size:3 tag:17 isize:3, iname:9, owner:0, kids:1
24) size:3 tag:3 isize:3, iname:37, owner:12, kids:1
36) size:4 tag:46 isize:4, iname:41, owner:24, kids:0
00 00 00 00
Section:typed_strings offset:0x00000258 size:0x00000020
off:0 type:5 string:'UNKNOWN'
off:12 type:2 string:'localhost'
Section:strings offset:0x00000278 size:0x00000060
[0]'hw' [3]'Group' [9]'unknown' [17]'Bus' [21]'memory' [28]'ram' [32]'1to1'
[37]'rtc' [41]'NONE' [46]'Device' [53]'arm926' [60]'imagefs' [68]'startup'
[76]'bootram' [84]'sysram'
Section:intrinfo offset:0x00000460 size:0x00000040
0) vector_base:00000000, #vectors:32, cascade_vector:7ffffff
cpu_intr_base:00000000, cpu_intr_stride:0, flags:0000
id => flags:8000, size:002c, rtn:fc4045a0
eoi => flags:9000, size:0028, rtn:fc4045cc
mask:fc4045f4, unmask:fc404618, config:00000000
Section:smp offset:0x000004e0 size:0x00000000
Section:pminfo offset:0x000004e0 size:0x00000000
Section:mdriver offset:0x000004e0 size:0x00000000
Section:boxinfo offset:0x000001c8 size:0x00000028
hw_flags:00000000
Section:cpu offset:0x00000128 size:0x00000020
page_flush:fc404564 page_flush_deferred:fc40459c
upte_ro:00000aae upte_rw:00000ffe
kpte_ro:0000000e kpte_rw:0000055e
mask_nc:0000000c
mmu_cr1:00051078 set:0000317f clr:00000000 -> 0005317f
```

```
System page at phys:20010000 user:fc404000 kern:fc404000
Starting next program at vfe03d838
```

```
cpu_startnext: cpu0 -> fe03d838
Welcome to QNX Neutrino 6.4 on the Atmel AT91SAM9260 Board
Starting DBGU driver...
Starting Serial USART 1 driver ...
Starting SPI driver...
Starting NAND driver...
#
```

You can test the OS simply by executing any shell builtin command or any command residing within the OS image (e.g. ls).

## Summary of driver commands#

The driver command lines below are specific to the Atmel AT91SAM9260 board. See the online docs for each driver for additional command-line options and other details.

Note: Some of the following drivers are commented out in the default buildfile. To use the drivers in the target hardware, you'll need to uncomment them in your buildfile, rebuild the image, and load the image into the board.

### Startup:#

Command:

```
startup-at91sam9260 -vvvvvvv
```

### Serial:#

Command:

```
devc-serusart -F -S -u2 -b115200 -c50000000 0xfffb0000^2,6
```

Required binaries:

- devc-serusart

Command:

```
devc-serdebug -e -F -S -b115200 -c50000000 0xffff200,1
```

Required binaries:

- devc-serdebug

### SPI:#

Command:

```
spi-master -u0 -d at91sam9xx base=0xFFFC8000,irq=12,clock=50000000
```

```
spi-master -u1 -d at91sam9xx base=0xFFFC0000,irq=13,clock=50000000
```

Required binaries:

- spi-master
- spi-at91sam9xx.so

## **Network:**<#>

Command:

```
io-pkt-v4 -dat91sam9xx syspage
```

Required binaries:

- devnp-at91sam9xx.so
- io-pkt-v4

## **MMC SD:**<#>

Command:

```
devb-mmcsd-at91sam9xx mmcsd ioport=0xFFFA8000,irq=9,bs=slot=1
```

Required binaries:

- libcam.so
- fs-dos.so
- fs-qnx4.so
- fs-ext2.so
- cam-disk.so
- io-blk.so

## **USB:**<#>

Command:

```
io-usb -d ohci ioport=0x500000,irq=20
```

Required binaries and libraries:

- io-usb
- usb
- devu-ohci.so
- libusbdi.so
- class drivers

## **ETFS NAND flash**<#>

Command:

```
fs-etfs-at91sam9xx -D addr=0x40000000,board_id=at91sam9260-ek -m /fs/etfs
```

Required binaries:

- fs-etfs-at91sam9xx
- etfsctl

**Note:** For more information about these commands, see the Neutrino Utilities Reference.

## **Known Issues for This BSP**<#>

- Network driver drops packet due to transmitter under run. A known HW limitation with the Ethernet transmitter and usage of slow SDRAM memory will cause the transmitter to generate under run and flush all packets/fragments in the transmitter queue. For more details about this problem refer to the Atmel AT91SAM9260 reference manual “EMACB Errata” for more details.