Application Note

Quick Start Guide for ATWILC3000 on SAM9N12-EK Linux system

AN-XXXX

Prerequisites

- **Hardware Prerequisites**
  - SAM9N12-EK board
  - Atmel WILC3000 evaluation board
  - USB Cable (TypeA – TypeB, for Bluetooth connection)
  - Micro USB Cable (TypeA / MicroB)
  - USB to Serial Adaptor (for DBGU port)

- **Build Prerequisites**
  - Linux Host PC
  - Linux Software Package

Introduction

The WILC3000 is a single chip IEEE 802.11 b/g/n RF, baseband, MAC, Bluetooth 4.0 and FM receiver optimized for low-power mobile applications. The WILC3000 utilizes highly optimized 802.11 – Bluetooth coexistence protocols. It provides multiple peripheral interfaces including UART, SPI, I2C and SDIO.

This quick start guide describes how to integrate the Atmel WILC3000 evaluation board via SDIO for Wi-Fi and USB to Serial for Bluetooth in SAM9N12 board. The following links also are available to get more information on Atmel wireless drivers, Linux kernel and prebuilt images.

- Atmel SAM9N12-EK: http://www.atmel.com/tools/sam9n12-ek.aspx
- Atmel Linux For SAM Site: http://www.at91.com/linux4sam
- Atmel ATWILC3000 Site: https://github.com/atwilc3000

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1. ATWILC3000 Linux Software Package

The latest WILC3000 is available on the AtmelSmartConnect. Download the ATWILC3000 driver and firmware.

```
git clone https://github.com/atwilc3000/driver.git
git cone https://github.com/atwilc3000/firmware.git
```

For more information, visit the GitHub wiki pages: https://github.com/atwilc3000/driver/wiki

2. SAM9N12 Software Package

This chapter describes how to get the SAM9N12 software package and build it. The Linux for AT91 is maintained at the Linux4Sam. See the following instructions to get BuildRoot and build it. This instruction is based on Linux console demo and Serial flash boot mode.

For more information, please visit SAM9N12 Page.

2.1 Get Buildroot source code

```
$ git clone https://github.com/linux4sam/buildroot-at91.git
$ cd buildroot-at91/
$ git checkout origin/buildroot-2013.11-at91 -b buildroot-2013.11-at91
```

2.2 Configure and build BuildRoot

You can find default configuration file, at91sam9_defconfig, in the below link.

https://github.com/linux4sam/buildroot-at91/tree/master/configs

But we also provide a patch file for configuration for convenience which includes wireless package and Linux kernel configuration also. Which means the kernel will be downloaded and compiled also.

You can find SAM9N12 software patch file here. https://github.com/atwilc3000/patch

There will be at91sam9_defconfig configuration file and others. Just copy at91sam9_defconfig to buildroot-at91/configs/ folder.

```
$ make at91sam9_defconfig
$ make
```

Compile is done, you will find flowing files in output/images/ folder.

```
rootfs.jffs2, rootfs.tar, rootfs.ubi, rootfs.ubifs, uImage
```

2.3 Kernel source code

As we mentioned above, the kernel is already compiled while building BuildRoot. SAM9N12 software package is based on the 2.6.39 Linux kernel version.

The kernel is located in output/build/linux-linux-2.6.39-at91/

3. Porting WILC3000 Wi-Fi driver to Linux kernel

This section describes how to integrate the WILC3000 driver into the SAM9N12 Linux system. The patch file for the SAM9N12 is available in https://github.com/atwilc3000/patch.

3.1 Prepare firmware and wpa_supplicant config file

Wilc3000 firmware files will be exists in the patch.

Copy wilc3000 firmware files to BuildRoot target file system. If there is no directory named firmware, just make it.

```
output/target/lib/firmware/
```

Copy wpa_supplicant.conf to BuildRoot target file system.

```
output/target/etc/
```

3.2 Patch wilc3000 driver

Patch wilc3000 driver source to Linux kernel source. The directory tree of the patch file is the same as Linux source. Just overwrite files.

The location of Linux kernel is

```
buildroot-at91/output/build/linux-linux-2.6.39-at91
```

3.3 Build Linux kernel

Once Linux kernel is compiled, the BuildRoot will neither compile kernel nor install kernel image.

You can rebuild Linux kernel by removing a few hidden history files.

```
$ cd output/build/linux-linux-2.6.39-at91
$ rm .stamp_configured .stamp_built .stamp_images_installed .stamp_target_installed
$ make clean
```

Now we will make BuildRoot again. BuildRoot will compile Linux and wilc3000.ko Wi-Fi driver and it will install in target file system.

Make in BuildRoot root directory.

```
$ cd ../../../
$ make
```

4. Flash images

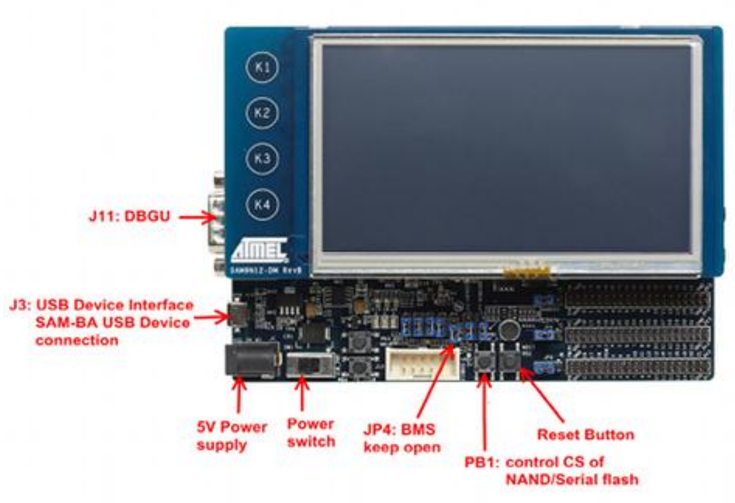
Refer to here to flash prebuilt images.

4.1 Prebuilt images

The prebuilt images are also provided in the here. Download the following Linux console demo package.

- linux4sam-buildroot-at91sam9n12ek.zip

For SAM9N12-EK board, Press down **PB1** and then power up the board; then release **PB1**. Then, the boards go to boot mode to flash the prebuilt image. Run the batch file, ***at91sam9n12ek_console_linux_serialflash.bat*** in Windows.


J11: DBGU
J3: USB Device Interface SAM-BA USB Device connection
5V Power supply
Power switch
JP4: BMS keep open
PB1: control CS of NAND/Serial flash
Reset Button
K1
K2
K3
K4

4.2 Engineering images built from source code

If BuildRoot and Kernel are successfully built, the following outputs are generated.

- output/images/rootfs.ubi
- output/images/uImage

You need to change two parameter values in at91sam9n12ek_console_linux_serialflash.tcl. Please change the value “uImage-2.6.39-m2-at91sam9n12ek.bin” to “uImage” and “buildroot_2011.05-at91_9n12_m2.ubi” to “rootfs.ubi” respectively.

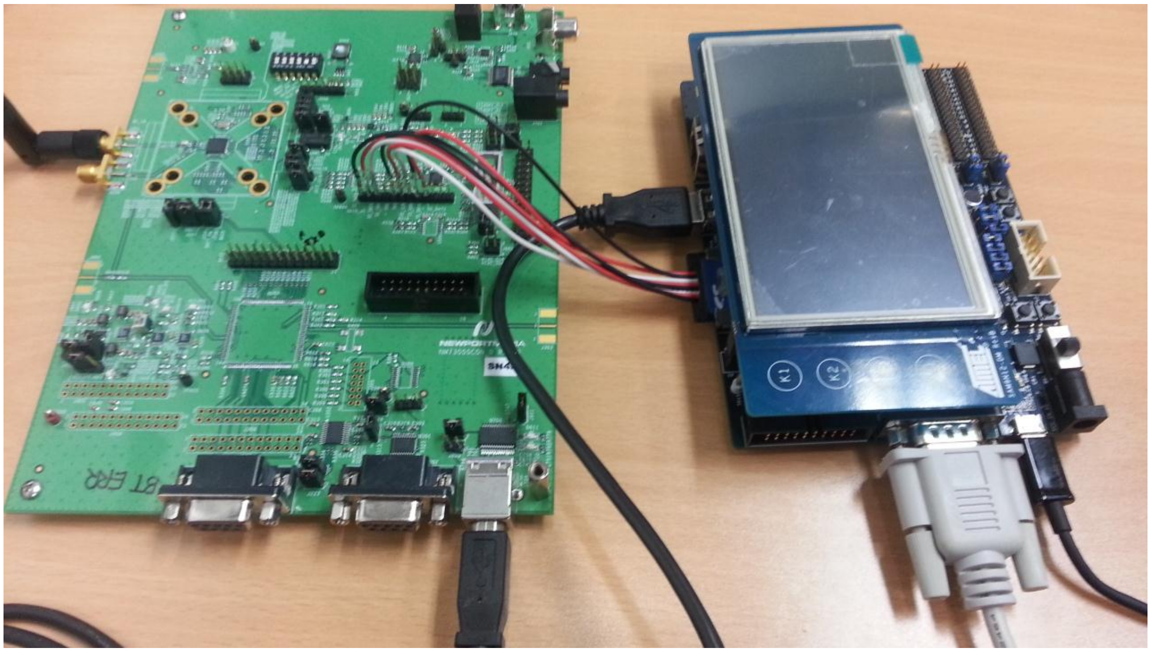
```
set kernelFile   “uImage”
set rootfsFile    “rootfs.ubi”
```

All of outputs should be downloaded to the target board. Run the batch file as done with prebuilt image.

5. Hardware Consideration

This section shows how to connect the ATWILC3000 EVB to SAM9N12 for Wi-Fi and Bluetooth. The ATWILC3000 should be connected to SAM9N12 via SDIO for WLAN and USB to Serial for Bluetooth.

Figure 1 ATWILC3000 to SAM9N12



5.1 Bluetooth

The HCI UART transport layer uses the following configurations:

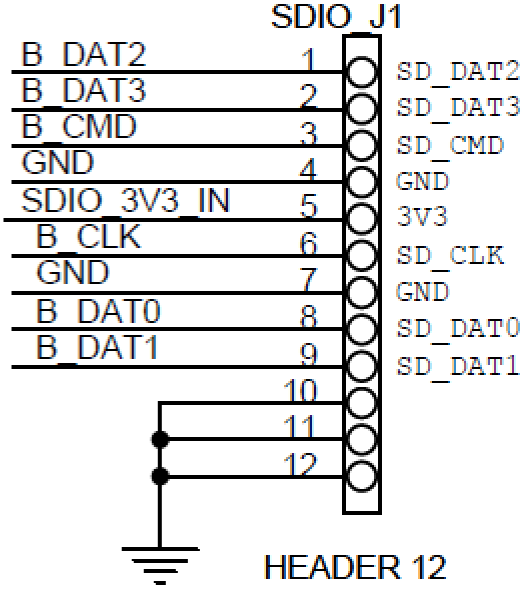
- data length: 8 bits
- parity: no parity
- stop bit: 1stop bit
- baud rate: vendor specific
- flow-off response time: vendor specific

Use a USB cable Type A – Type B to connect ATWILC3000 EVB and SAM9N12-EK. We will use USB to Serial convert for serial communication.

5.2 Wi-Fi

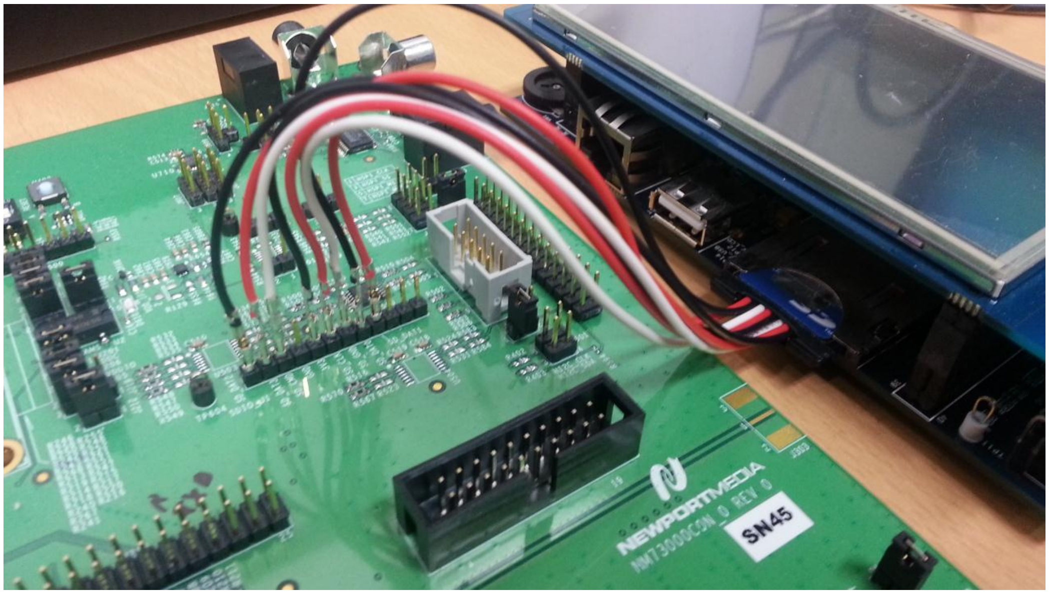
For the WLAN, the SD Card slot on the SAM9N12 should be connected to the SDIO_J1 on the ATWILC3000 EVB. The following figure is the SDIO_J1 pin on the ATWILC3000.

Figure 2 ATWILC3000 SDIO_J1 Pin



The SD_DAT0 to SD_DATA3 should be connected to support SDIO 4-bit mode. In addition, SD_CMD, SD_CLK and GND should be connected to the SAM9N12 board. The following is real picture showing how to connect ATWILC3000 EVB to SAM9N12 for SDIO interface. The SD socket is recommended like the following picture.

Figure 3 ATWILC3000 to SAM9N12 via SDIO



6. Conclusion

This Quick Start Guide described how to integrate the Atmel WILC3000 Combo driver into SAM9N12-EK board.

7. Revision history

Doc. Rev.	Date	Comments
XXXXXA	11/2014	Initial document release
	11/2014	Add wilc3000 Bluetooth
	3/2015	Update the contents

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