ATWILC3000 Getting Started

For Linux and Android Users

AN-XXXX

Prerequisites

- **Hardware Prerequisites**
  - SAMA5D3-XPLD Linux board
  - Atmel WILC3000 evaluation board (NM73000C0N_0 REV 0)
  - Micro USB Cable (TypeA / MicroB)
  - USB to Serial Adaptor (for DBGU port)

- **Build Prerequisites**
  - Linux Host PC
  - Linux Buildroot Software Package
  - ATWILC3000 prebuilt images

Introduction

The ATWILC3000 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 ATWILC3000 utilizes highly optimized 802.11 – Bluetooth coexistence protocols. It provides multiple peripheral interfaces including UART, SPI, I2C and SDIO.

This getting started guide describes how to integrate the Atmel WILC3000 evaluation board via SDIO for Wi-Fi and USART for Bluetooth in SAMA5D3-XPLD Linux board. In addition, this document shows how to run ATWILC3000 with prebuilt images provided from Atmel SmartConnect GitHub [6]. The following links also are available to get more information on Atmel wireless drivers, Linux kernel and prebuilt images.

- SAMA5D3-XPLD board: http://www.atmel.com/tools/atsama5d3-xpld.aspx
- Linux4sam: http://www.at91.com/linux4sam
- ATWILC3000 official GitHub: https://github.com/atwilc3000

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1. Getting Started

This guide provides details on the ATWILC3000 evaluation board. It is made up of 4 sections:

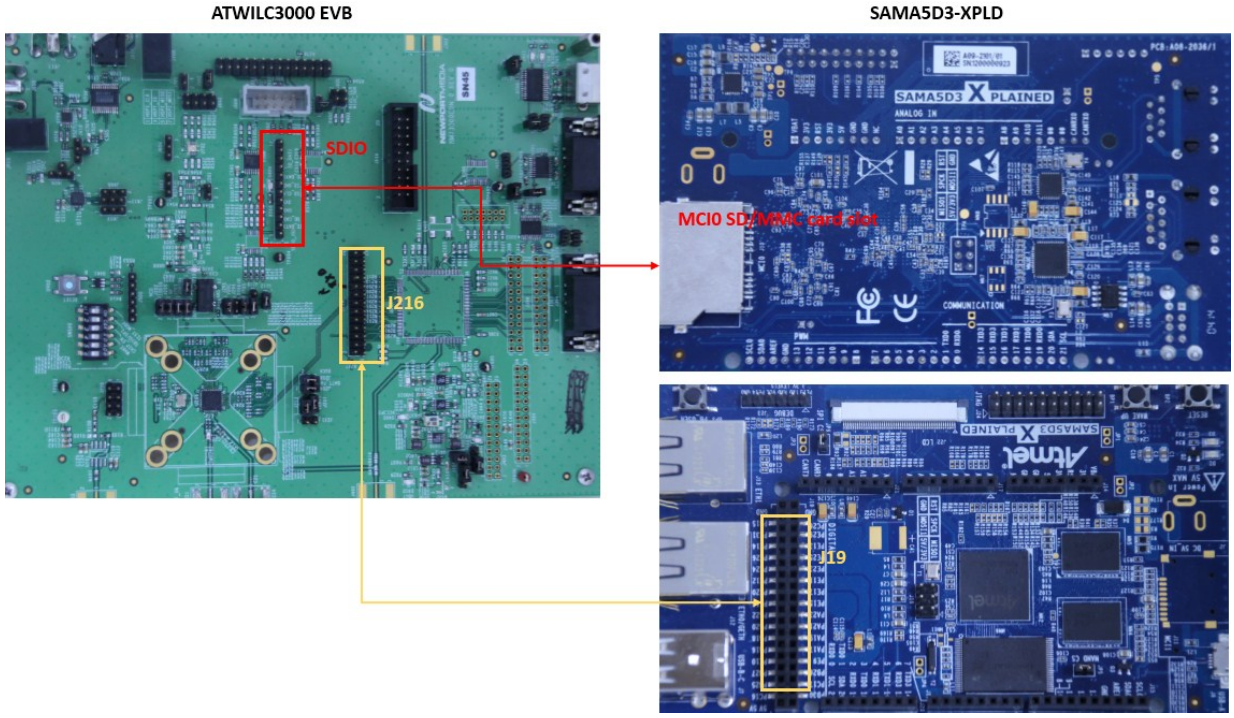
- Section 2: describes ATWILC3000 evaluation board contents and hardware configuration.
- Section 3: introduces ATWILC3000 software package.
- Section 4: provides instruction to bring up the Atmel Linux platform SAMA5D3-XPLD board.
- Section 5: introduces ATWILC3000 prebuilt image to play simple ATWILC3000 demo in the SAMA5D3-XPLD board.

The ATWILC3000 evaluation board has SDIO, SPI and UART interface for Wi-Fi and Bluetooth. This guide shows how to bring up the ATWILC3000 evaluation board with SAMA5D3-XPLD Linux board. The ATWILC3000 software package can be used for both Linux and Android platform. The ATWILC3000 Programming Guide [7] will instruct to how to integrate ATWILC3000 software package into SAMA5D4-EK Android and SAMA5D3-XPLD Linux platform.

2. Hardware Configuration

The ATWILC3000 evaluation board can be connected to SAMA5D3-XPLD board via SDIO interface for Wi-Fi and via USART for Bluetooth. Refer to the SAMA5D3-XPLD User Guide for more information [3]. As shown in Figure 1, the SDIO interface on the ATWILC3000 EVB is connected to the MCI0 SD/MMC card slot J10 at the bottom on SAMA5D3-XPLD. The UART interface on the ATWILC3000 EVB is connected to the expansion, J19 on the SAMA5D3-XPLD.

Figure 1 ATWILC3000 EVB H/W configuration with SAMA5D3-XPLD



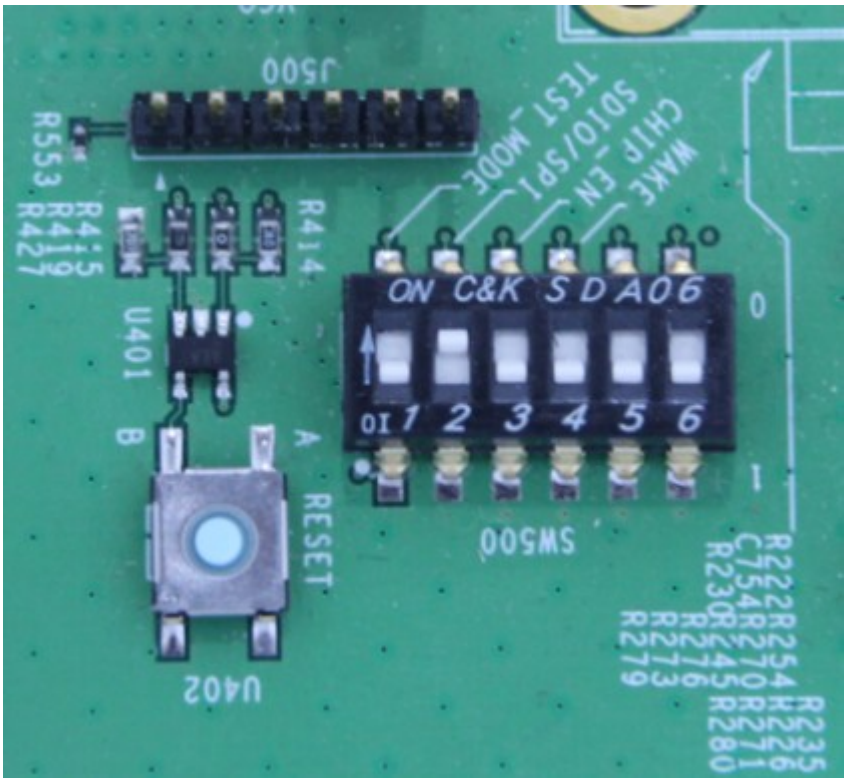
2.1 ATWILC3000 EVB

Make sure the following checklists before starting hardware configuration to bring up the ATWILC3000 with a SAMA5D3-XPLD board.

- Check if R220, R217, R218 and R219 are installed in the EVB for the SDIO interface

- Check if SDIO/SPI pin in a SW500 switch is 0 for the SDIO interface. Refer to Figure 2.
- Check if J227, J805 and J901 open for the USART interface

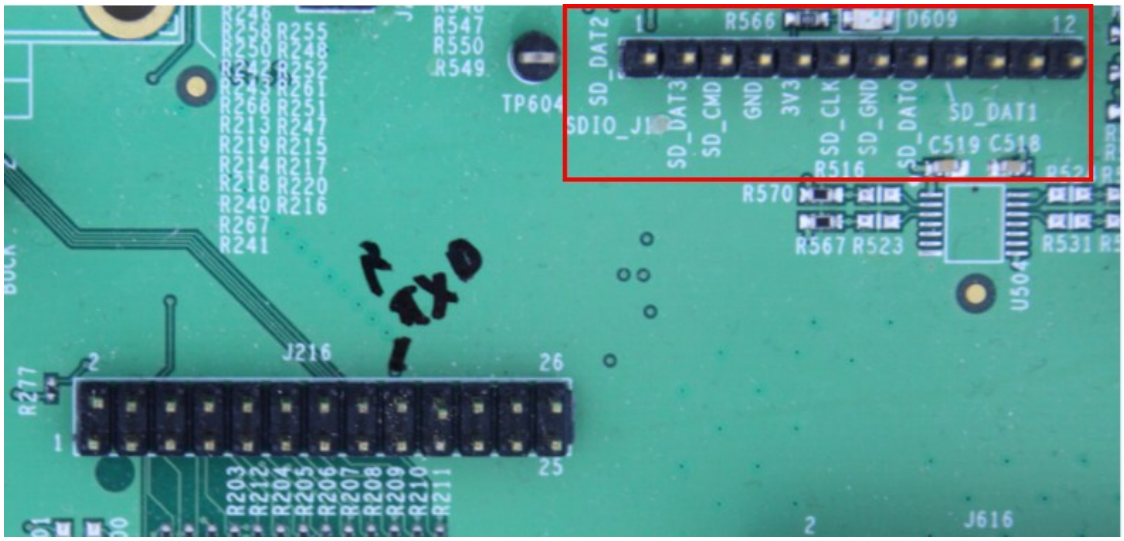
Figure 2 SW500 in ATWILC3000 EVB



2.2 SDIO

The MCI0 SD/MMC card slot J10 at the bottom on the SAMA5D3-XPLD should be connected to the SDIO_J1 on the ATWILC3000 EVB. Figure 3 shows the SDIO_J1 pin on the ATWILC3000. 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 SAMA5D3-XPLD board.

Figure 3 ATWILC3000 SDIO_J1 Pin



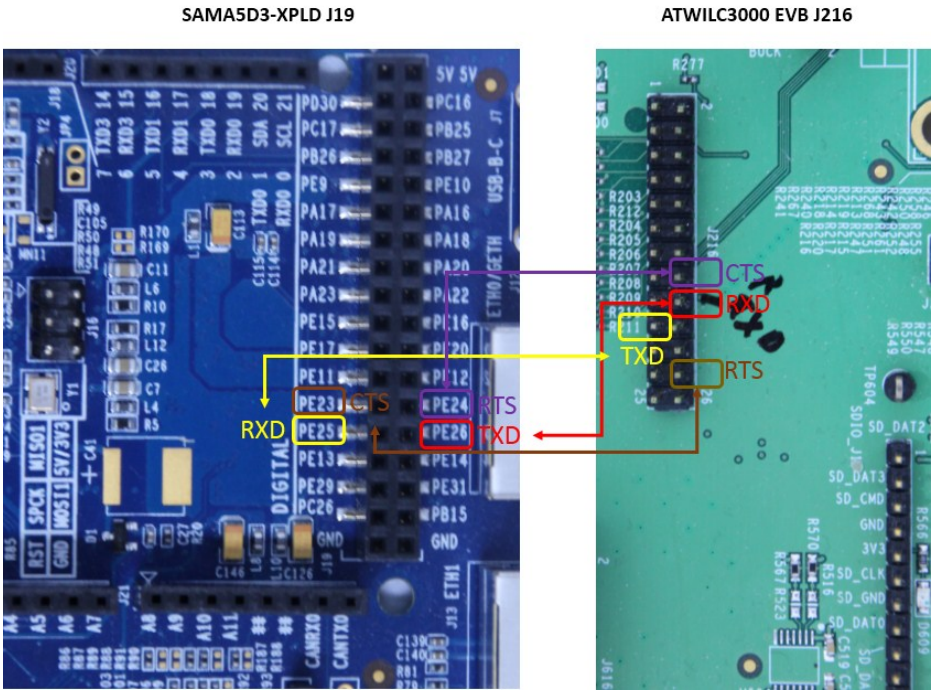
2.3 USART

The HCI UART transport layer uses the following configurations:

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

The local RXD should be connected to the remote TXD and the local RTS should be connected to the remote CTS and vice versa. For Bluetooth, the USART2 of SAMA5D3-XPLD is connected to the ATWILC3000 EVB. Figure 4 shows USART connection from the I/O expansion, J19 on the SAMA5D3-XPLD board to the ATWILC3000 J216. The expansion, J19 has the TXD2 on pin E26, RXD2 on pin E25, RTS2 on pin PE24 and CTS2 on pin PE23. The TXD2 on the SAMA5D3-XPLD should be connected to the RXD on the ATWILC3000 EVB, J216 pin18. In contrast, the RXD2 on the SAMA5D3-XPLD should be connected to the TXD on the ATWILC3000 EVB, J216 pin19. The RTS2 on the SAMA5D3-XPLD should be connected to the CTS on the ATWILC3000 EVB, J216 pin16 and the CTS2 should be connected to the RTS on the ATWILC3000 EVB, J216 pin24.

Figure 4 USART connection

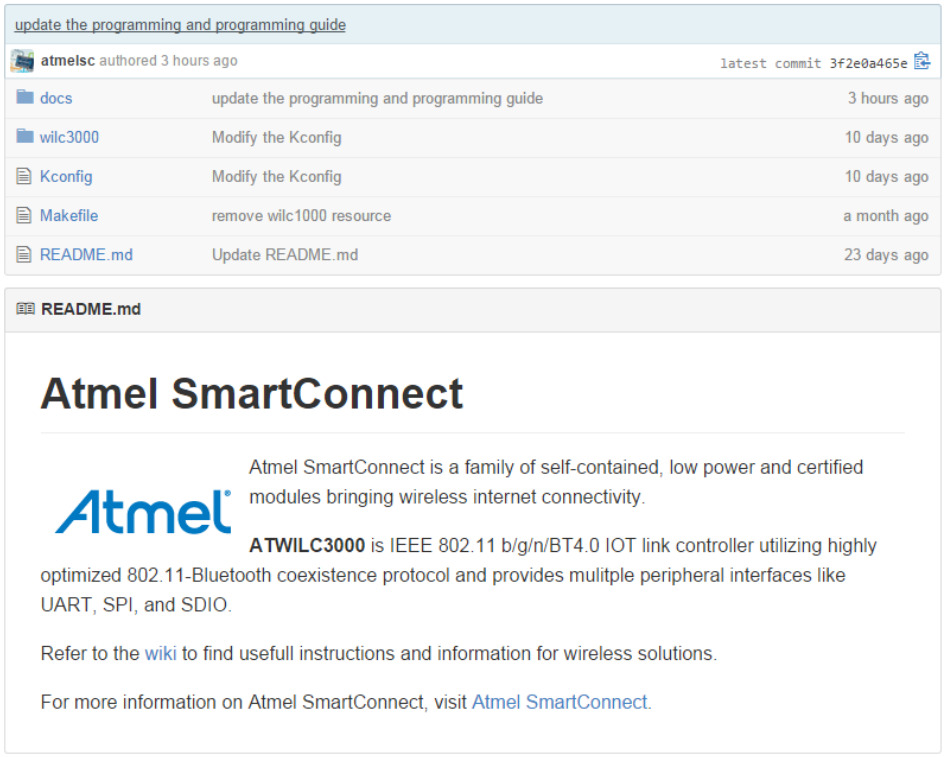


3. ATWILC3000 Linux Software Package

The ATWILC3000 resources are available on the Atmel SmartConnect ATWILC3000 GitHub [1], which hosts official releases of ATWILC3000 kernel driver and firmware. In addition, there are patch files for several Atmel AT91 SAM Android and Linux platform. For more information on Wi-Fi and Bluetooth, visit the GitHub wiki pages [2]. Download the latest ATWILC3000 driver and firmware by issuing the following commands.

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

Figure 5 Atmel SmartConnet ATWILC3000 GitHub



4. SAMA5D3-XPLD Board Software Package

The software package of SAMA5D3-XPLD Linux board [3] is maintained by Linux4sam [4]. For more information on Atmel Linux platform, visit the Linux4sam which is the main starting point for Linux OS and Atmel SAM products.

4.1 Download Buildroot

Download the Buildroot for SAMA5D3-XPLD Linux board by issuing the following commands.

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

4.2 Build rootfs images

Build the Buildroot-at91 to make new rootfs images by issuing the following command.

```
$ make sama5d3_xplained_defconfig
$ make
```

The Linux kernel source is also being downloaded while building the Buildroot-at91. For example, the kernel source is available at */buildroot-at91/output/build/linux-xxxxx* after a compile is completed. The ATWILC3000 Programming Guide [7] describes how to integrate the ATWILC3000 driver into the kernel source downloaded while compiling a Buildroot-at91.

4.3 Flash images

To flash the SAMA5D3-XPLD board with prebuilt and engineering images. The Atmel SAM-BA tool is required. Install the SAM-BA tool [5] if not installed in Linux or Windows machine.

- Prebuilt images

  The prebuilt images are provided by the Linux4sam [4]. Download the following demo package for SAMA5D3-XPLD board: ftp://www.at91.com/pub/demo/linux4sam_4.3/linux4sam-poky-sama5d3_xplained-4.3.zip. The followings are the procedures to flash images for Windows and Linux users.
  - Open JP5 to disable NAND flash memory access
  - Press BP2 reset button to boot from on-chip Boot ROM
  - For Windows users, verify that the USB connection is well established. AT91 USB to Serial converter should appear in Device Manager. Then, launch the **demo_linux_nandflash.bat** file in the demo archive.
  - For Linux users, check /dev/ttyACMx by issuing the following command. Then, launch the **demo_linux_nandflash.sh** file. If the /dev/ttyACMx that appear is different from /dev/ttyACM0, modify the **demo_linux_nandflash.sh** before launching the script.

```
$ ls /dev/ttyACM*
```

  - When the logfile.log appears, check that = Done. = is written at the end of file.
  - Press BP2 reset button to boot on the NAND flash memory and play the demo.

- Engineering images

  The following outputs are generated when Buildroot id completely compiled. All of outputs should be downloaded to the target board.

  - /buildroot-at91/output/build/linux-xxxxx/arch/arm/boot/zImage
  - /buildroot-at91/output/build/linux-xxxxx/arch/arm/boot/dts/at91-sama5d3_xplained.dtb
  - /buildroot-at91/output/images/rootfs.ubi

  Copy all of them into the demo archive directory where the demo_linux_nandflash.sh or batch file exists. Then, replace the existing files by new outputs. Modify the followings described in the **demo_linux_nandflash.tcl** file in the demo archive directory like the followings and run the batch or script file as done with prebuilt image.

```
set kernelFile "zImage"
set rootfsFile "rootfs.ubi"
```

5. ATWILC3000 demo

The prebuilt images for Atmel AT91 SAM series are available on the Atmel demo4sc GitHub [6]. These prebuilt images are provided quickly to bring up the Atmel platform with ATWILC3000. Download the SAMA5D3-XPLD prebuilt image with the following command.

```
$ git clone https://github.com/demo4sc/wilc3000_with_sama5d3_xplained_linux.git
```

Refer to the section 4.3 to flash the image to the target board. In addition, the wireless tools distributed by Linux are briefly introduced to run ATWILC3000 Wi-Fi and Bluetooth. For more information on wireless tools, refer to the ATWILC3000 Programming Guide [7].

5.1 Enable the network interface

Issue the following command to enable the network interface.

```
$ insmod /lib/modules/3.10.0/kernel/drivers/net/wireless/Atmel/wilc3000/wilc3000.ko
$ ifconfig wlan0 up
```

5.2 Scan

Scan neighboring access points by issuing iw command.

```
$ iw wlan0 scan
```

5.3 Connect

Connect to the access point. Assume that the AP is not secured and SSID is ATMEL_AP.

```
$ iw wlan0 connect ATMEL_AP
```

5.4 Attach Bluetooth

Attach serial device via UART to BlueZ stack.

```
# hciattach ttyS3 any 1500000 flow
```

Check if the HCI interface is created by issuing the command.

```
# hciconfig -a
```

5.5 Enable the Bluetooth device

Enable the ATWILC3000 Bluetooth.

```
# hciconfig hci0 up
```

5.6 Scan Bluetooth devices

```
# hcitool scan
```

6. Conclusion

This Getting Started Guide described how to quickly bring up the Atmel WILC3000 Combo driver with the SAMA5D3-XPLD Linux platforms. In addition, the ATWILC3000 prebuilt images are introduced with wireless tools to run ATWILC3000 Wi-Fi and Bluetooth. Refer to the ATWILC3000 Programming Guide for more information.

7. Revision history

Doc. Rev.	Date	Comments
XXXXXA	03/2015	Initial document release

8. References

[1] Atmel SmartConnect ATWILC3000 GitHub: https://github.com/atwilc3000

[2] Atmel SmartConnect ATWILC3000 wiki page: https://github.com/atwilc3000/driver/wiki

[3] SAMA5D3 Xplained board User Guide: http://www.atmel.com/Images/Atmel_11269_32-bit-Cortex-A5-Microcontroller_SAMA5D3-Xplained_User-Guide.pdf

[4] Atmel Linux4sam: http://www.at91.com/linux4sam/bin/view/Linux4SAM/

[5] Atmel SAM-BA tool: http://www.at91.com/linux4sam/bin/view/Linux4SAM/SoftwareTools#SAM_BA

[6] Atmel prebuilt image GitHub: https://github.com/demo4sc

[7] ATWILC3000 docs GitHub: https://github.com/atwilc3000/driver/tree/master/docs

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