
Wi-Fi Link Controller Linux Release Notes

Introduction

This release notes describes the software deliveries of the ATWILC1000 and ATWILC3000. The ATWILC1000 supports only Wi-Fi, whereas, the ATWILC3000 supports Wi-Fi and Bluetooth.

The ATWILC software releases are available on github: github.com/linux4sam

The Firmware, Demo, Tools and pre-built binaries are available on github.com/linux4wilc

The deliveries are tested against the SAMA5D4 Xplained board running on Linux Kernel 5.15 only, and may be compatible with any other Linux kernel and platform that runs Linux.

Notes: All references to the ATWILC module includes all the devices listed below, unless otherwise noted:

- ATWILC1000
- ATWILC3000

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1. ATWILC Software Architecture

The following figures illustrate the ATWILC architecture of the Wi-Fi and Bluetooth software.

Figure 1-1. ATWILC Wi-Fi Software Architecture

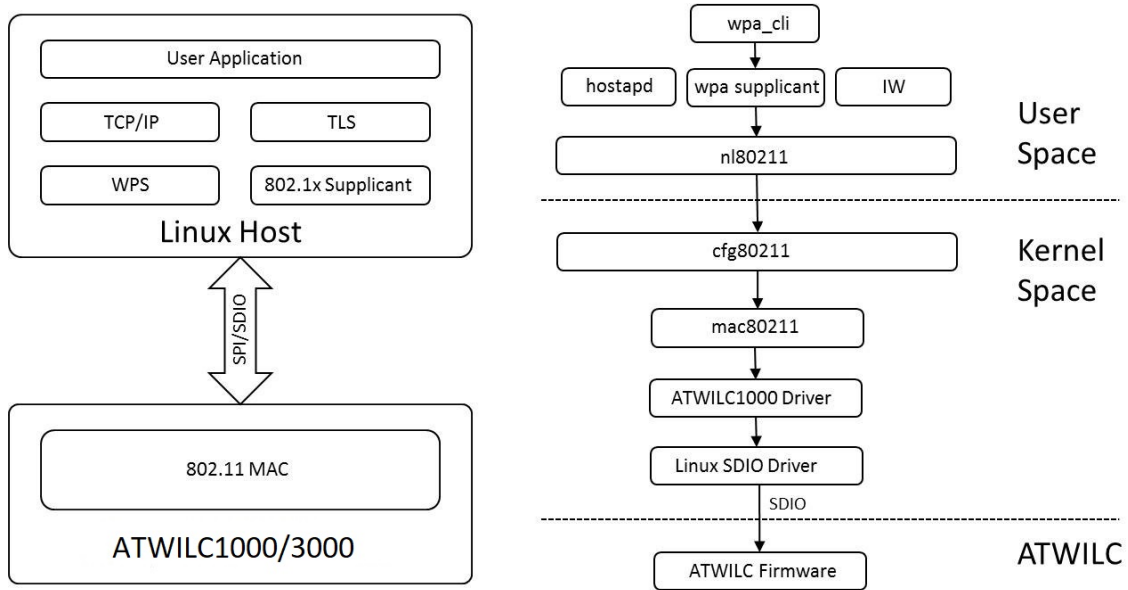
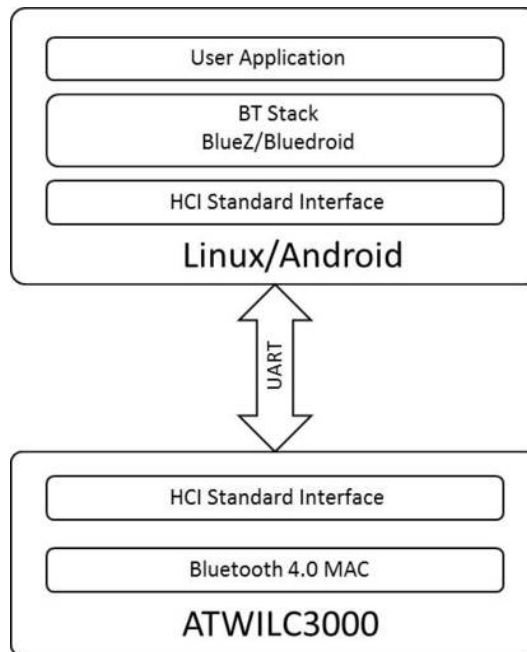


Figure 1-2. ATWILC Bluetooth Software Architecture



2. ATWILC Release Contents

The latest ATWILC Linux Release software deliverables are available on following git hub repositories.

Software/Tools	Github Location	Description
Microchip ATWILC1000/3000 Wireless Devices Firmware binaries	github.com/linux4wilc/firmware	This folder contains the following files: <ul style="list-style-type: none"> wilc1000_wifi_firmware.bin: Wi-Fi STA-P2P-AP concurrency firmware for ATWILC1000. wilc3000_wifi_firmware.bin: Wi-Fi STA-P2P-AP concurrency firmware for ATWILC3000. wilc3000_wifi_firmware_ua.bin: Wi-Fi STA-P2P-AP concurrency firmware for ATWILC3000 for the UA module. wilc3000_ble_firmware.bin: BLE firmware for ATWILC3000. wilc3000_ble_firmware_no_rtc.bin: BLE firmware for ATWILC3000 boards that does not have RTC.
Microchip ATWILC1000/3000 Linux drivers	github.com/linux4microchip/linux/tree/master/drivers/net/wireless/microchip/wilc1000	Linux driver examples for ATWILC1000 and ATWILC3000 for SAMA5D4 Xplained running Linux kernel 5.15.
ATWILC1000/3000 Tools	github.com/linux4wilc/tools	Gain builder tools for ATWILC1000/3000
ATWILC Demo Package	github.com/linux4wilc/wilc_demo	This folder contains the following files: linux_kernel_5.15_images: Pre-built Linux 5.15 image for SAMA5D4.
Microchip Linux Kernel	github.com/linux4microchip/linux	Microchip Linux kernel source tree
Buildroot	github.com/linux4sam/buildroot-at91	Buildroot for Microchip SoC (aka AT91) - use with buildroot external tree
buildroot- external- microchip	github.com/linux4sam/buildroot-external-microchip	Buildroot External for Microchip SoC (aka AT91)

3. ATWILC Release Features

The ATWILC module supports the following features.

1. Wi-Fi Station (STA)
 - IEEE 802.11 b/g/n
 - Open, Wi-Fi Protected Access (WPA)/WPA2 personal, WPA/WPA2 enterprise security and ATWILC1000 supports WPA3 Personal and Enterprise in addition to the aforementioned security suites
2. Wi-Fi Access Point (AP)
 - IEEE 802.11 b/g/n
 - Open, WPA/WPA2 personal, WPA/WPA2 enterprise security and ATWILC1000 supports WPA3 Personal and Enterprise in addition to the aforementioned security suites.
 - Supports eight stations
3. Wi-Fi Protected Setup (WPS)
 - Push Button
 - PIN
4. Wi-Fi direct
 - P2P Client
 - P2P GO
5. Concurrent modes
 - STA-STA
 - STA-AP
 - STA-P2P Client
 - STA-P2P GO
 - AP-P2P Client
6. Antenna diversity control for Wi-Fi
7. Bluetooth (ATWILC3000 only)
 - Bluetooth Low Energy (BLE) 4.0 support
 - Modes of operation: Central and peripheral support
 - Number of Connections: Supports seven clients
 - Adaptive frequency hopping
 - Coexistence with Wi-Fi
8. Power save
 - Beacon monitoring mode
 - Low-power mode when disconnected
 - Host suspend support
 - Wake-up host on wireless LAN events
9. RF version number 01.1

Note: RF version number format is xx.y, where xx: "Major" and y: "Minor". Changes in Major number requires re-tests and possibly re-certification.

4. Release Revision History

4.1 ATWILC Linux Release v15.7

The following are the bug fixes for ATWILC Linux Release v15.7

1. Migrated WILC 1000/3000 Wi-Fi driver to Linux Kernel 5.15
2. Moved compiled time legacy kernel featurization to patch
3. Fixed crash issue observed in the AP mode with latest cfg80211 netdev register API
4. Fixed possible memory corruption when VMM size is more than 64 KBytes for only WILC3000
5. Fixed interoperability WPS issue based on config request

4.2 ATWILC Linux Release v15.6

The following are the new features in ATWILC Linux Release v15.6

1. WPA3 Support (WILC1000 only)

The following are the bug fixes for ATWILC Linux release v15.6

1. Fix deprecated WEP on WILC1000/3000
2. Fix 11b RF Carrier Suppression on WILC1000
3. Fix crash issue in WILC driver while VMM transfer entries exceeding (supported) 64 slots.
4. Fix FragAttack vulnerability issues(refer below table)

Vulnerability#	Description
CVE-2020-26140	Accepting plaintext data frames in a protected network
CVE-2020-26143	Accepting fragmented plaintext data frames in a protected network
CVE-2020-24588	Accepting non-SPP A-MSDU frames
CVE-2020-24586	Not clearing fragments from memory when (re)connecting to a network
CVE-2020-26139	Forwarding EAPOL frames even though the sender is not yet authenticated
CVE-2020-26147	Reassembling mixed encrypted/plaintext fragments
CVE-2020-26146	Reassembling encrypted fragments with non-consecutive packet numbers
CVE-2020-26144	Accepting plaintext A-MSDU frames that start with an RFC1042 header with EtherType

4.3 ATWILC Linux Release v15.5

The following are the bug fixes for ATWILC Linux Release v15.5

1. Fix Command(crc7) and Data(crc16) CRC check enabling on WILC SPI bus
2. Fix WILC AP mode hang up issue
3. Fix WILC1000 - Specific AP's are not getting detected during scan
4. Fix WILC3000 SPI: Sometimes bus communication error observed during PS mode
5. Fix WILC 3000 BLE fails to start advertising under some application command sequence
6. Fix WILC1000 SPI: Fix TXQ starvation issue
7. Fix Default GPIO's values are not getting populated
8. Fix WILC SPI failure recovery mechanism issue
9. Fix Gain table settings for WILC1000 and WILC3000 UA

4.4 ATWILC Linux Release 15.4.1

The following are the bug fixes for ATWILC Linux Release v15.4.1

1. Fix network packet flow in WILC 1000/3000 WiFi Driver
2. Fix HIF instability issues in WILC 3000 - In PSM mode due to DC-DC trim values
3. Fix HIF instability issues in WILC 3000 - In WiFi-BLE co-existence
4. Fix Memory leak in WILC driver scan while connect/disconnect AP
5. Fix WiFi Driver for SDIO suspend/resume
6. Fix WILC 1000 SPI communication stall issues
7. Fix WILC 1000 SDIO failures when power save mode is enabled

4.5 ATWILC Linux Release v15.4

The following are the new features in ATWILC Linux Release v15.4

1. WILC3000: Change Gain with Temperature to avoid in-band spurs
2. Migration to Linux4SAM git

The following are the bug fixes for ATWILC Linux release v15.4

1. Fix BLE Sweyntooth Vulnerability
2. Fix SDIO OOB Interrupt
3. Update WILC1000UB Gain Table

4.6 ATWILC Linux Release v15.3.1

The following are the bug fixes for ATWILC Linux release 15.3.1:

1. Failure to wake some parts through SPI .
2. iperf stalls during longevity tests.

4.7 ATWILC Linux Release v15.3

The following are the new features in ATWILC Linux Release v15.3:

1. Reed IQ imbalance calibration data from Efuse.
2. Dynamically add network interfaces for ATWILC driver.
3. Add optional rtc_clk property to dts and use it in the driver.

The following are the bug fixes for ATWILC Linux release v15.3

1. Apply feedback comments from staging community to the driver.
2. Fix for CF-End packets on air when multiple WILC stations are connected to the same AP.
3. Fix crack Attack failure – Upgrade wpa_supplicant on buildroot to 2.7 and latest security fixes.
4. Fix memory leak when connecting/disconnecting to AP continuously.
5. Fix for Passive scanning feature.
6. Avoid controlling power save state from the driver while obtaining IP and scanning.
7. FW crash when switching between AP via link loss.
8. Fix for low Tx power when using CW Tone in the Ch/C GUI tool.
9. Clear pending interrupts while initializing/de-initializing the device.
10. WILC3000 Low Rx performance with 11n rates.

4.8 ATWILC Linux Release v15.2

The following are the bug fixes for ATWILC Linux release v15.2.

1. Regression in v15.1 while connecting to WPA AP.
2. Fix for corrupted packets reported on the Monitor mode.
3. Better consistency to find ATWILC softAP's in stations' scan results.
4. Consistent assignment of printed MAC address to wlan0.
5. Better TX performance with significant temperature changes.
6. SoftAP fails to operate correctly when its MAC address is assigned from the host.
7. Staging review fixes.
8. GPIO descriptor related changes. Requires changes on the host's Device Tree file.
9. Fix for crash from v15.1 when switching between AP and station interface.
10. Enable Antenna diversity using GPIO3 for ATWILC3000.
11. SoftAP fails to associate eighth station.
12. Improve transmission performance in noisy environment.
13. Fix regression causing degradation in BLE RX Sensitivity.
14. Fix for ATWILC firmware overwriting MAC address in received broadcast packets.
15. Incorrect pointer passed while getting IF handler.
16. Refactor `coreconfigurator.c` file to use API's provided in kernel framework.
17. High latency on receiving firmware start interrupt and intermittent lower throughput on SAMA5D4 board.
18. iPhone intermittently fails to connect to ATWILC SoftAP.

4.9 ATWILC Linux Release v15.1

The following are the new features in ATWILC Linux Release v15.1:

1. Use mainline buildroot git.buildroot.net/buildroot/ tag 2017_08.
2. Idle (Disconnected) power save mode.
3. Ability to change WILC mac address dynamically from Linux host.
4. Support for sam-ba 3.2 to flash prebuilt images.
5. CAPI Agent code added to Buildroot.
6. Support compilation against Linux 3.10 and 4.14.
7. Single kernel module is now used; either `wilc-sdio.ko` or `wilc-spi.ko` depending to the used bus.
8. Firmware binaries are now compiled as part of the Linux kernel's image, instead of the file system image. The firmware should be located on the target under `/lib/firmware/mchp`.
9. `Chip_en` and `Reset_n` GPIOs' numbers are now retrieved from the platform's device tree file (dts).
10. BLE example application (btgatt-server) for BlueZ 5.46.
11. Use Linux Style Tracing System.
12. Implement Linux community recommendations and notes.
13. Ability to change Antenna diversity GPIOs dynamically.

The following are the bug fixes for RTP:

1. Wi-Fi/BLE Power save mode.
2. Host power save (Suspend/Resume).
3. Antenna diversity.
4. Scan results should not include APs from adjacent channels.
5. Fixed concurrency regression.
6. Fixed spurious emissions issue in Wi-Fi/BLE coexistence mode.
7. Replayed packets are not discarded in the firmware.
8. Second Wi-Fi interface failure.

9. Concurrency failure.

4.10 ATWILC Linux Release v15.0

The following are new features in ATWILC Linux Release v15.0:

1. Used staging ATWILC driver
2. ATWILC3000 WFA certification.

The following are the bug fixes for RTP:

1. DUT disconnects from the AP when AP is in mixed mode.
2. Updated ATWILC1000 and ATWILC3000 gain tables
3. Autorate Algorithm enhancements

4.11 ATWILC Linux Release v14.4

The following are key enhancements and bug fixes in ATWILC Linux Release v14.4:

1. Fixed ATWILC1000 loading error.

4.12 ATWILC Linux Release v14.3

The following are key enhancements and bug fixes in ATWILC Linux Release v14.3:

1. European Telecommunications Standards Institute (ETSI) certification support to implement per channel Rx Received Signal Strength Indicator (RSSI) offset.
2. Increased BLE transmit power granularity to 7 levels.
3. Eliminate spurious emissions for BLE.
4. Avoid user setting BLE power to the level exceeding Federal Communications Commission (FCC) recommendations.
5. Fixed for low-side injection for higher channels on Bluetooth.
6. Adding support on linux to change regulatory domains.
7. Fixed to enable BT test mode from characterization GUI.
8. Added new feature to the characterization GUI to send Host Controller Interface (HCI) commands, dynamically.
9. Support for SPI on ATWILC3000 Shield board.
10. Updated porting guide and linux user guide.
11. Suspend/Resume support tested overnight.
12. Phased out ATWILC1000 RevA (ATWILC10002xx).
13. Eliminated Lint error in Wi-Fi firmware.
14. Eliminated GCC warning in Wi-Fi driver.

4.13 ATWILC Linux Release v14.2

The following are key enhancements and bug fixes in ATWILC Linux Release v14.2:

1. Fixed WEP40 and WEP104 shared authentication.
2. Antenna diversity for ATWILC3000.
3. Using latest tool chain to compile Wi-Fi firmwares.
4. [ATWILC3000] Support for WILC3000D2.
5. [ATWILC3000] Using PMU code 0x1 as recommended to pass FCC tests, and lowering sleep LDO voltage to code 0xe to minimize sleep current.

5. Limitations

1. Concurrency:
 - Multichannel concurrency is not supported. Concurrent modes have to run on the same channel.
2. P2P Client:
 - By default, the driver acts as a P2P GO to be able to select the channel to overcome the multichannel concurrency limitation.
To use the P2P client mode, the required mode has to be set in `/sys/wilc/p2p_mode`.

```
echo <mode> > /sys/wilc/p2p_mode
```

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