SD8887S Driver/Firmware Release Note

Table of Contents

March 11, 2015

1. Package Information

- Version:**15.68.7.p20-15.29.7.p20-C3X15090 -MGPL-(FP68)**

  Multi-Function SDIO Software Release
- SOC Version 88W8887S
- Combo Firmware
  - sd8887_uapsta.bin 15.68.7.p20-15.29.7.p20
- Driver Package C3X15090
  - Wlan Driver (mlan.ko , sd8887.ko)
  - AP Driver
  - AP App
  - WPA supplicant 2.x
  - BT Driver
    - ➔ mbt8887.ko ← Char driver for KK44/Bluedroid
    - ➔ bt8887.ko ← sdio driver with bluez support
- Linux Kernel 3.10

Driver version:

- M : Indicated Marvell OS independent driver
- 3.X : indicated support for kernel version 3.x
- **Release Number:** this number tracks the incremental changes in the consequent driver releases given to QA or customers.
- **Patch Number:** Customers may want to receive a driver build based on a previous release plus specific bug fixes, or patches. It is not unusual for customers to request this when they are close to production. The patch number starts at zero (no patch), and increments as we release

subsequent builds with more bug fixes.

Firmware version:

- Following is an explanation of each digit in the versioning scheme designed for the firmware:
  - **Major Revision (first number from the left):** Tracks the main FW version.
  - **Minor Revision (second number from the left):** Tracks the chip family, firmware branch, custom projects. etc.
  - **Release Number (third number from the left):** this number tracks the incremental changes in the consequent firmware releases given to QA or customers.
  - **Patch Number (fourth number from the left):** Customers may want to receive a firmware build based on a previous release plus specific bug fixes, or patches. It is not unusual for customers to request this when they are close to production. The patch number starts at zero (no patch), and increments as we release subsequent builds with more bug fixes.

Bluetooth Host Software version:

- Bluedroid on KK44

2. Host Platform

- PXA Reference Platform running Android KK44 and Linux FC18
- Interfaces used
  1. WLAN over SDIO
  2. BT/BLE over SDIO

3. Tested HW

- WLAN SOC/RF chipset: 88W8887S

4. Features

4.1 WLAN Client Features

1. 802.11 a/b/g Features
   - Data Rates (Up to 54 Mbps)
   - Tx Rate Adaptation (ABG)
   - Tx of RTS/CTS based upon RTS Threshold
   - Fragmentation/Defragmentation

- ERP protection, Slot time, Preamble
- ERP Protection using macctrl command (RTS-CTS/Self-CTS)

2. 802.11d & 802.11h
   - 802.11d - Regulatory Domain/Operating Class/Country Info
   - 802.11h - DFS - Radar Detection and CSA
   - DFS Radar Detection Tests for FCC/FCC1/ETSI/MJKK for W53/W56 channels

3. 802.11e -QoS
   - EDCA[Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media)
   - U-APSD[Unscheduled Automatic Power save and Delivery]/ WMM-Power save

4. 802.11i - Security
   - Open and Shared Authentication
   - Auto Auth
   - WEP Security (64/128 bit)
   - WPA-PSK, WPA2-PSK Security (TKIP and AES-CCMP Encryption)
   - 802.1x EAP Authentication methods
   - (TLS, TTLS, PEAP, SIM, AKA, AKA-PRIME, FAST, LEAP)
   - Open source WPA Supplicant Support
   - Embedded Supplicant Support

5. 802.11w - Protected Management Frames (PMF)
   - PMF Require and Capable
   - Unicast Management Frames - Encrypt/Decryption -using CCMP
   - Broadcast Management Frames - Encrypt/Decryption - using BIP
   - SA Query Request/Response
   - PMF Support (Open source WPA Supplicant)
   - PMF Support (Embedded Supplicant)

6. Security WAPI
   - WAPI-PSK
   - WAPI-CERT
   - WAPI-PKCS12

7. 802.11n - High Throughput - Infrastructure Mode
   - 2.4GHz Band Operation
   - 5GHz Band Operation
   - 20MHz and 40MHz channel Bandwidth
   - Short/Long Guard Interval (400ns/800ns)
   - Green Field Operation
   - 1 Spatial stream (1x1)
   - 11n Data rates – Up to 300 Mbps (MCS 0 to MCS 15)
   - HT Duplicate mode (MCS32)
   - Tx MCS Rate Adaptation (ABGN)
   - AMPDU Tx and Rx Support
   - AMSDU-4k Tx and Rx Support
   - AMSDU-8k – Only Tx Support
   - Implicit and Explicit Beamforming
   - HT Protection Mechanisms
   - 20/40 MHz Coexistence Support

- STBC Rx
- LDPC Parity

8. General Features
   - Auto Deep Sleep
   - Host Sleep (hscfg)
   - Background Scan
   - User Defined Scan (setuserscan)
   - Specific scan (scancfg)
   - Network Scan (iwlist scan)
   - ARP Filter
   - Inactivity time out
   - Subscriber Event
   - Wakeup on Wireless (WoW)
   - Auto Response (MEF)
   - Auto Tx
   - Vendor Specific IE (Custom IE)
   - Broadcast/Multicast data Tx/Rx Support
   - Antenna Config Command Tests
   - Signal Commands Tests (RSSI/SNR)

9. Power Save Modes
   - IEEE PS (Infrastructure Mode)
   - PPS
   - Inactivity Timeout
   - Listen Interval

10. Loading Driver - Optional Parameters
    - Configuring MAC Address during driver load using init_cfg file
    - Loading Driver Using CFG80211 and mlanutl commands
    - Loading Driver Using WEXT
    - Setting Deep sleep.
    - Setting Power save

11. WPS/WSC2.0 Functionality
    - PIN Config Method - 8 Digit/4 Digit
    - PIN Config Method - Static/Dynamic PIN
    - PBC - Virtual Push Button Config Method
    - PBC Session Overlap Detection
    - STA as Enrollee
    - STA as Registrar
    - Auto PIN
    - Auto PBC
    - Configuring ER and Adding an Enrollee (UPnP)
    - Standalone ER
    - Backward Compatibility with WPS1.0 Devices
    - Using mwu_cli app with Embedded Supplicant
    - Using mwu_cli app with Opensource WPA Supplicant
    - Using wpa_supplicant

13. TDLS

- TDLS Setup(req/res/confirm)
- TDLS Teardown(send/receive)
- TDLS Discovery
  Max. 2 concurrent TDLS links supported

4.2 Access Point Features

1. 802.11 a/b/g Features
   - Data Rates (Up to 54 Mbps)
   - Tx Rate Adaptation (ABG)
   - Tx of RTS/CTS based upon RTS Threshold
   - Fragmentation/Defragmentation
   - ERP protection, Slot time, Preamble
   - Handling Associated STAs with IEEE PS - PS-Poll and Null Data

2. 802.11d & 802.11h
   - 802.11d - Regulatory Domain/Operating Class/Country Info
   - 802.11h - DFS - Radar Detection and CSA
   - DFS Radar Detection Tests for FCC/FCC1/ETSI/MJKK for W53/W56 channels

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   - EDCA[Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media)
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   - Open and Shared Authentication
   - Auto Auth
   - WEP Security (64/128 bit)
   - WPA-PSK, WPA2-PSK Security (TKIP and AES-CCMP Encryption)
   - 802.1x EAP Authentication methods (using Hostapd only)
     (TLS, TTLS, PEAP, SIM, AKA, AKA-PRIME, FAST, LEAP)
   - Opensource Host based Authenticator Support (Hostapd)
   - Embedded Authenticator Support
   - Group Key Refresh (Rekeying GTK)

5. 802.11w - Protected Management Frames (PMF)
   - PMF Require and Capable
   - Unicast Management Frames - Encrypt/Decryption -using CCMP
   - Broadcast Management Frames - Encrypt/Decryption - using BIP
   - SA Query Request/Response
   - PMF Support (Hostapd)

6. Security WAPI
   - WAPI-PSK
   - WAPI-CERT
   - WAPI-PKCS12

7. 802.11n - High Throughput
   - 2.4GHz Band Operation
   - 5GHz Band Operation
   - 20/40 MHz channel Bandwidth

- Short/Long Guard Interval (400ns/800ns)
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- 11n Data rates – Up to 300 Mbps (MCS 0 to MCS 15)
- HT Duplicate mode (MCS32)
- Tx MCS Rate Adaptation (ABGN)
- AMPDU Tx and Rx Support
- AMSDU 4K Tx/Rx Support
- AMSDU-8k Tx Support
- HT Protection Mechanisms
- 20/40 MHz Coexistence Support
- Beam formee
- Beamformer - Implicit
- Beamformer - Explicit
- SM Power save (MIMO Power save)
- LDPC Parity

8. General Features
   - Auto Deep Sleep
   - Host Sleep (hscfg)
   - Automatic Channel Selection (ACS)
   - Hidden SSID (Broadcast SSID Disabled)
   - MAC Address Filter (Allowed/Denied List)
   - Vendor Specific IE (Custom IE)
   - STA Age out Feature for non-PS clients
   - STA Age out Feature for Power save clients
   - Configurable MAX Supported Stations (Up to 10)
   - Configurable Retry Limit
   - Configurable Unicast Data Rate
   - Configurable Broadcast/Multicast Data Rate
   - Broadcast/Multicast data Tx/Rx Support
   - Antenna Config Command Tests
   - MMH Events
   - BSS Privacy Control (Packet forward Control) or AP Isolation
   - Sticky TIM

9. MMH Power Save Modes
   - Inactivity based Power save

10. Multi-BSS support
    - MAX MMH BSS = 2
    - MMH power save in MBSS scenario
    - Independent security configurations on different interfaces (All Security Methods)

11. Loading Driver - Optional Parameters
    - Configuring MAC Address during driver load using init_cfg file
    - Loading Driver Using CFG80211 and mlanutl commands
    - Loading Driver Using WEXT
    - Setting Deepsleep
    - Loading MMH configuration using uaputl.conf file

12. WPS/WSC2.0 Functionality
    - PIN Config Method - 8 Digit/4 Digit
    - PIN Config Method - Static/Dynamic PIN
    - PBC - Virtual Push Button Config Method
    - AP Setup Locked State - PIN Method
    - PBC Session Overlap Detection
    - MMH as Enrollee
    - MMH as Wireless Registrar
    - MMH as Wired ER (Bridging uap0 and eth interfaces)
    - MMH as Proxy - Configuration by ER and Adding an Enrollee (UPnP)
    - Using mwu_cli app

4.3 Simultaneous AP-STA Operation

- AP-STA functionality.
- Independent security configurations on different interfaces.
- Enhanced Power Save (AP-STA simultaneous power save)

4.4 Bluetooth Features

- BT 4.1
- BT Class 1.5 and Class 2 support
- Automatic Packet Type Selection
- 2.5 scatternet support
- Maximum of seven simultaneous ACL connections
- Maximum of three SCO/eSCO links
- On chip SBC offload for WBS
- ACL (DM1, DH1, DM3, DH3, DM5, DH5, 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5)
- SCO (HV1, HV3)
- eSCO (EV3, EV4, EV5, 2EV3, 3EV3, 2EV5, 3EV5)
- Deep Sleep
- BT A2DP/PAN traffic distinction
- Wake on BT
- Time/Spatial Coexistence with Wi-Fi

5. Testing

5.1 Test Tools

- OmniPeek Wireless Sniffer
- iperf
- Frontline BT Sniffer

6. WLAN Throughput

6.1 STA Throughput

STA Throughput - 2.4GHz Band (linksys4200)								
CBW	20MHz				40MHz			
	TCP		UDP		TCP		UDP	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
OPEN	53.50	52.80	62.50	56.80	101.00	103.00	121.00	109.00
WPA2	53.10	53.60	59.80	56.40	85.60	94.00	118.00	97.00

STA Throughput - 5GHz Band(linksys4200)								
CBW	20MHz				40MHz			
	TCP		UDP		TCP		UDP	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
OPEN	54.70	72.40	59.90	75.60	106.00	105.00	123.00	99.70
WPA2	53.90	69.30	61.80	74.20	91.60	105.00	122.00	102.00

6.2 MMH Throughput

MMH-AP-STA Throughput - 2.4GHz Band				
CBW	20MHz			
	TCP		UDP	
	Tx	Rx	Tx	Rx
OPEN	47.70	42.00	62.80	62.10
WPA2	51.80	42.90	61.50	61.50

7. Bug Fixes & Changes

Component	Area	Description
WLAN	Driver	• Code enhancement
	Firmware	• None
COEX	Firmware	• Fix Hangout VoIP video call failure issue
BT	Firmware	• None
System		• None

COEX : Hangout VoIP call failure issue in Samsung Poland

- **Root cause:**
  1) WLAN uses PS-Poll to exchange packets in BT SCO mode, but sometimes PS-Poll couldn't be sent because SCO indication was not handled properly in a state of the power save state machine.
  2) Found a case that a lot of packets were pending in WLAN Tx queue in BT SCO coex mode. It caused large latency of WLAN Tx traffic.
- **Solution:**
  1) Fix to handle SCO indication rightly in the PS state. Verified PS-Poll to be sent and BT SCO coex to be enabled in the same condition.
  2) Enhanced to handle pending packets at the beginning of WLAN time. Verified the change improved WLAN Tx latency.