

SD-Wi-Fi-UART-BT-IW416

# Wi-Fi and Bluetooth Software Features for FreeRTOS



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## Revision History

Table 1: Document revision history

Revision	Date	Change details
Rev. 1	31-Mar-2021	Initial release
Rev. 2	07-July-2021	<a href="#">Section 4</a> updated
Rev.3	09-Sept-2021	<a href="#">Section 1</a> updated
Rev.4	15-Mar-2022	<a href="#">Section 1.1.1 "802.11n - High Throughput"</a> : Added 40MHz for 2.4GHz client <a href="#">Section 1.1.4 "802.11i - Security"</a> : Removed WEP and WPA2 +WPA3 (SAE) mixed mode. Added WPA3 SAE (R3) <a href="#">Section 1.2.1 "802.11n - High Throughput"</a> : Added 40MHz for 2.4G AP <a href="#">Section 1.2.2 "802.11 b/g Features"</a> : Removed PS Poll and null data <a href="#">Section 1.2.4 "802.11i - Security"</a> : Added WPA3 SAE (R3) and WPA2 +WPA3 (SAE) mixed mode <a href="#">Section 1.1.7 General Features</a> : Added IPv6 <a href="#">Section 1.2.6 General Features</a> : Added IPv6

## 1. Wi-Fi Features

### 1.1. Wireless Client Features

#### 1.1.1. 802.11n - High Throughput

- 2.4 GHz and 5 GHz band operation
- 2.4 GHz band supported channel bandwidths : 20MHz, 40MHz
- 5 GHz band supported channel bandwidths : 20MHz, 40MHz
- Short/long guard interval (400 ns/800 ns)
- 1 spatial stream (1x1)
- 11n data rates – Up to 150 Mbit/s (MCS 0 to MCS 7)
- Aggregated MAC Protocol Data Unit(AMPDU) Rx support
- Aggregated MAC Service Data Unit(AMSDU)-4k Rx support
- HT protection mechanisms
- Tx MCS rate adaptation (BGN)

#### 1.1.2. 802.11 a/b/g Features

- 11 a/b/g data rates - Up to 54 Mbit/s
- Tx rate adaptation (BG)
- Fragmentation/defragmentation
- ERP protection, slot time, preamble

#### 1.1.3. 802.11d

- 802.11d - Regulatory domain/operating class/country info

#### 1.1.4. 802.11i - Security

- Embedded supplicant support
  - Open security
  - WPA-PSK, WPA2-PSK security (AES-CCMP encryption)
  - WPA + WPA2 mixed mode
  - WPA3 SAE (R3)

#### 1.1.5. 802.11w - Protected Management Frames(PMF)

- PMF require and capable
- Unicast management frames - Encryption/decryption - using CCMP
- Broadcast management frames - Encryption/decryption - using BIP
- SA query request/response
- PMF support (embedded supplicant)

#### 1.1.6. Power Save Mode

- Deep sleep
- IEEE power save

#### 1.1.7. General Features

- Embedded MLME
- EU adaptivity support (ETSI cert)
- DFS radar detection in slave mode (Follow AP)
- IPv6

## 1.2. Mobile AP Features

### 1.2.1. 802.11n - High Throughput

- 2.4 GHz and 5 GHz band operation
- 2.4 GHz band supported channel bandwidths : 20MHz, 40MHz
- 5 GHz band supported channel bandwidths : 20MHz, 40MHz
- Short/long guard interval (400 ns/800 ns)
- 1 spatial stream (1x1)
- 11n data rates – Up to 150 Mbit/s (MCS0 to MCS7)
- Tx MCS rate adaptation (BGN)
- Aggregated MAC Protocol Data Unit(AMPDU) Rx support
- Aggregated MAC Service Data Unit(AMSDU)- 4k Rx support
- Max client support (up to 8 devices)
- HT protection mechanisms

### 1.2.2. 802.11 b/g Features

- 11 b/g data rates – Up to 54 Mbit/s
- Tx rate adaptation (BG)
- ERP protection, slot time, preamble
- Handling of associated STAs with IEEE PS

### 1.2.3. 802.11d

- 802.11d - Regulatory domain/operating class/country info

### 1.2.4. 802.11i - Security

- Embedded authenticator support
  - Open security
  - WPA2-PSK security (AES-CCMP encryption)
  - WPA2+WPA3 (SAE) mixed mode
  - WPA3 SAE (R3)

### 1.2.5. 802.11w - Protected Management Frames(PMF)

- PMF require and capable
- Unicast management frames - Encryption/decryption - using CCMP
- Broadcast management frames - Encryption/decryption - using BIP
- SA query request/response

### 1.2.6. General Features

- Deep sleep
- Embedded MLME
- EU adaptivity support (ETSI Cert)
- Automatic channel selection (ACS)
- Extended channel switch announcement (ECSA)
- IPv6

## 2. Simultaneous AP-STA Operation (Same Channel)

- AP-STA functionality

## 3. Bluetooth Features

### 3.1. Bluetooth Classic Features

#### 3.1.1. General Features

- Bluetooth Class 1.5 and Class 2 support
- Maximum of seven simultaneous ACL connections
- Automatic Packet Type Selection
- Bluetooth - Up to 5.0 Specification Support
- Maximum of one eSCO connection
- Secure Simple pairing
- BR/EDR Secure Connections
- Scatternet support
- Low power sniff

#### 3.1.2. Bluetooth Packet Type Supported

- 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)

#### 3.1.3. Bluetooth Profiles Supported

- A2DP Source
- A2DP Sink
- HFP Dev
- HFP GW
- SPP Server
- SPP Client
- RFCOMM

#### 3.1.4. Bluetooth Audio Features

- PCM NBS ( Bluetooth Controller role is Master )
- PCM WBS ( Bluetooth Controller role is Master )

## 3.2. Bluetooth LE Features

### 3.2.1. Generic Features

- Maximum 16 Bluetooth LE connections (Master role)
- Bluetooth LE - 1Mbps Support
- Bluetooth LE - Up to 5.0 Specification Support
- Bluetooth LE FW Whitelist

### 3.2.2. Bluetooth LE Profile Support

- Proximity Reporter(PXR)/Proximity Monitor(PXM)
- IPSPN
- HPS
- HTP

### 3.2.3. Bluetooth LE 4.0 Support

- Low Energy Physical Layer
- Low Energy Link Layer
- Enhancements to HCI for Low Energy
- Low Energy Direct Test Mode

### 3.2.4. Bluetooth LE 4.1 Support

- Low duty Cycle Directed Advertising
- Bluetooth LE Dual Mode Topology
- Bluetooth LE Privacy v1.1
- Bluetooth LE Link Layer Topology

### 3.2.5. Bluetooth LE 4.2 Support

- Bluetooth LE secure connection
- Bluetooth LE Link Layer Privacy v1.2
- Bluetooth LE Data Length Extension
- Link Layer Extended Scanner Filter Policies

### 3.2.6. Bluetooth LE 5.0 Support

- Bluetooth LE 2 Mbps Support
- High Duty Cycle Directed Advertising



## 4. Bluetooth + Wi-Fi Coexistence

### 4.1.1. Supported Bluetooth/Bluetooth LE Profile for Coexistence

- A2DP Source
- A2DP Sink
- HFP Dev
- HFP GW
- SPP Client
- SPP Server
- Proximity Client
- Proximity Server
- RFCOMM
- IPSPN
- HPS
- HTP

### 4.1.2. Timeshare Coex Mode

- STA + Bluetooth Coex
- STA + Bluetooth LE Coex
- STA + Bluetooth + Bluetooth LE Coex
- AP + Bluetooth Coex
- AP + Bluetooth LE Coex
- AP + Bluetooth + Bluetooth LE Coex

**Note:** Timeshare Coex mode is not required when Wi-Fi is operating in 5GHz

## 5. Test Mode

### 5.1.1. Wi-Fi

- Wi-Fi transmit Continuous Wave (CW) mode
- Transmit standard 802.11 packets
- Wi-Fi receive mode

Refer to **Section: wifi\_test\_mode sample application** in the document: *UM11442-NXP Wi-Fi and Bluetooth Demo Applications for i.MX RT platforms User Guide* for more details.

## 6. Notes

None.

## 7. Acronyms & Abbreviations

Acronyms	Definitions
A2DP	Advanced audio distribution profile
AP	Access Point
HFP	Hands free profile
WPA	Wi-Fi protected access
MLME	Mac Layer Management Entity
STA	Station
HT	High Throughput
MCS	Modulation and Coding Scheme
ERP	Extended Rate Physical
SAE	Simultaneous Authentication of Equals
CCMP	Counter Mode CBC-MAC Protocol

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