

RW61x Wi-Fi/Bluetooth/802.15.4 Software Features V6 for FreeRTOS



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Revision History

Table 1: Document revision history

Revision	Date	Change details
Rev. 1	05-10-2022	Initial version
Rev. 2	08-12-2022	<ul style="list-style-type: none">▪ Add 802.15.4 features▪ Add more Bluetooth LE profiles support
Rev. 3	12-09-2022	<ul style="list-style-type: none">▪ Update Wi-Fi, Bluetooth LE and 802.15.4 features
Rev. 3.1	01-18-2023	<ul style="list-style-type: none">▪ Update Wi-Fi and Bluetooth LE features▪ Add Secure Boot feature
Rev. 4	05-23-2023	<ul style="list-style-type: none">▪ Update Wi-Fi and 802.15.4 features
Rev. 5	07-28-2023	<ul style="list-style-type: none">▪ Update Wi-Fi, Bluetooth LE, 802.15.4 and Coexistence features
Rev. 6	12-15-2023	<ul style="list-style-type: none">▪ Update Wi-Fi, Bluetooth LE and 802.15.4 features

1. Wi-Fi Features

1.1. Wireless Client Features

1.1.1. 802.11 ax - High Efficiency

- 5 GHz Band Operation
- 5 GHz band supported channel bandwidths: 20 MHz
- 11ax Data rate – Up to 114.7 Mbps(MCS0 to MCS9)
- 2.4 GHz Band Operation
- 2.4 GHz band supported channel bandwidths: 20 MHz
- OFDMA(UL/DL, 106 RU)
- TWT (Target Wakeup Time)
- OMI (Operating Mode Indication)
- Multiple BSSID IE Parsing

1.1.2. 802.11 ac - Very High Throughput

- 5 GHz Band Operation
- 5 GHz band supported channel bandwidths: 20 MHz
- 11ac Data rates - Up to 86.7 Mbps (MCS0 to MCS 8)
- MU-MIMO Beamformee (Explicit and Implicit)
- Backward Compatibility with non-VHT devices
- Tx VHT MCS Rate Adaptation

1.1.3. 802.11n - High Throughput

- 2.4 GHz and 5 GHz band operation
- 2.4 GHz band supported channel bandwidths : 20MHz
- 5 GHz band supported channel bandwidths : 20MHz
- Short/long guard interval (400 ns/800 ns)
- 1 spatial stream (1x1)
- 11n data rates – Up to 72 Mbit/s (MCS 0 to MCS 7)
- Aggregated MAC Protocol Data Unit(A-MPDU) Rx support
- HT protection mechanisms
- Tx MCS rate adaptation (BGN)

1.1.4. 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

1.1.5. 802.11d

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

1.1.6. 802.11e – QoS

- EDCA[Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media)

1.1.7. 802.11i - Security

- Embedded supplicant support

- Open security
- WPA2-PSK security (AES-CCMP encryption)
- WPA2-Enterprise security (EAP-TLS, PEAP-MSCHAPv2)
- WPA3 SAE (R3)
- Host wpa_supplicant support
 - Open security
 - WPA2-PSK security (AES-CCMP encryption)
 - WPA2-Enterprise security (EAP-TLS, PEAP-MSCHAPv2, PEAP-GTC)
 - WPA3 SAE (R3)
 - WPA3-Enterprise 192-Bit mode (EAP-TLS)

1.1.8. 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)

1.1.9. Power Save Mode

- Deep sleep
- IEEE power save (Multiple DTIM)
- U-APSD

1.1.10. General Features

- Embedded MLME
- EU adaptivity support (ETSI cert)
- Dynamic Rx Abort configuration
- DFS radar detection in slave mode (Follow AP)
- IPv6
- Scan channel gap
- Wi-Fi Software Antenna Diversity (SAD)
- TCP cloud keep alive

1.2. Mobile AP Features

1.2.1. 802.11 ax - High Efficiency

- 5 GHz Band Operation
- 5 GHz band supported channel bandwidths: 20 MHz
- 11ax Data rate – Up to 114.7 Mbps (MCS0 to MCS9)
- 2.4 GHz Band Operation
- 2.4 GHz band supported channel bandwidths: 20 MHz

1.2.2. 802.11 ac - Very High Throughput

- 5 GHz Band Operation
- 5 GHz band supported channel bandwidths: 20 MHz
- 11ac Data rates - Up to 86.7 Mbps (MCS0 to MCS 8)
- Backward Compatibility with non-VHT devices
- Tx VHT MCS Rate Adaptation

1.2.3. 802.11n - High Throughput

- 2.4 GHz and 5 GHz band operation
- 2.4 GHz band supported channel bandwidths : 20MHz
- 5 GHz band supported channel bandwidths : 20MHz
- Short/long guard interval (400 ns/800 ns)
- 1 spatial stream (1x1)
- 11n data rates – Up to 72 Mbit/s (MCS0 to MCS7)
- Tx MCS rate adaptation (BGN)
- Aggregated MAC Protocol Data Unit(A-MPDU) Rx support
- Max client support (up to 8 devices)
- HT protection mechanisms

1.2.4. 802.11 a/b/g Features

- 11 a/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

1.2.5. 802.11d

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

1.2.6. 802.11i - Security

- Embedded authenticator support
 - Open security
 - WPA2-PSK security (AES-CCMP encryption)
 - WPA3 SAE (R3)
- Host authenticator support
 - Open security
 - WPA2-PSK security (AES-CCMP encryption)
 - WPA2-Enterprise security (EAP-TLS)
 - WPA3 SAE (R3)
 - WPA3-Enterprise 192-Bit mode (EAP-TLS)

1.2.7. 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

1.2.8. General Features

- Deep sleep
- Embedded MLME
- EU adaptivity support (ETSI Cert)
- Automatic channel selection (ACS)
- Extended channel switch announcement (ECSA)
- IPv6
- Wi-Fi Software Antenna Diversity (SAD)
- Wi-Fi RF test mode

2. Bluetooth Features

2.1. Bluetooth LE Features

2.1.1. Generic Features

- Maximum 16 Bluetooth LE connections (Master role)
- Bluetooth LE - 1Mbps Support
- Bluetooth LE - Up to 5.1 Specification Support
- Bluetooth LE FW Whitelist
- Bluetooth LE Power Control
- Bluetooth LE CPU Power Save
- Bluetooth LE RF Test Mode

2.1.2. Bluetooth LE Profile Support

- BAC (Battery Service Profile)
- BAS (Battery Service)
- BPC (Blood Pressure Profile)
- BPS (Blood Pressure Service)
- CPP (Cycling Power Profile)
- CPS (Cycling Power Service)
- CSCP (Cycling Speed and Cadence Profile)
- CSCS (Cycling Speed and Cadence Service)
- CTC (Current Time Profile)
- CTS (Current Time Service)
- DIC (Device Information Profile)
- DIS (Device Information Service)
- FMP (Find Me Profile)
- GLC (Glucose Profile)
- GLS (Glucose Service)
- HID (Human Interface Device Profile)
- HIDS (Human Interface Device Service)
- HPC (HTTP Proxy Profile)
- HPS (HTTP Proxy Service)
- HRC (Heart Rate Profile)
- HRS (Heart Rate Service)
- HTC (Health Thermometer Profile)
- HTS (Health Thermometer Service)
- IPSPN (Internet Protocol Support Profile Node)
- PASP (Phone Alert Status Profile)
- PASS (Phone Alert Status Service)
- PXM (Proximity Monitor)
- PXR (Proximity Reporter)
- RSCP (Running Speed and Cadence Profile)
- RSCS (Running Speed and Cadence Service)

2.1.3. Bluetooth LE 4.0 Support

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

2.1.4. 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

2.1.5. 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

2.1.6. Bluetooth LE 5.0 Support

- Bluetooth LE 2 Mbps Support
- High Duty Cycle Directed Advertising
- Bluetooth LE Channel Selection Algorithm #2
- Bluetooth LE Adv Extension
- Bluetooth LE Long Range

2.1.7. Bluetooth LE 5.1 Support

- Bluetooth LE Control Length Extension
- Bluetooth LE Adv Channel Index
- Bluetooth LE Minor Functional Enhancement

2.1.8. Bluetooth LE 5.2 Support

- Bluetooth LE Power Control

3. 802.15.4 (Thread) Features

- IEEE 802.15.4-2006 MAC and PHY as required by Thread 1.1.1
- IEEE 802.15.4-2015 MAC and PHY as required by Thread 1.2.0
- IEEE 802.15.4-2022 MAC and PHY as required by Thread 1.3.0
- IEEE 802.15.4-2015 CSL (Coordinated Sampled Listening) transmitter
- IEEE 802.15.4-2015 Enhanced Ack
- Direct/Indirect transmission with/without ACK
- Thread 1.2.0 Enhanced frame pending, Enhanced keep-alive and Link Metrics support
- Thread 1.2.0 CSL for parent devices
- Thread device roles / types – Border router, Router, Leader and End Device (REED, FED and MED)
- Low power save for Sleepy End Device (SED)
- 802.15.4 RF test mode

4. Bluetooth + Wi-Fi + 802.15.4 Coexistence

4.1. Coex Modes (Dual ANT and Single Shared ANT)

- STA + Bluetooth LE
- AP + Bluetooth LE
- STA + OpenThread
- AP + OpenThread
- STA + Bluetooth LE (for Matter provisioning) + OpenThread

Note:

- *RW61x Wi-Fi and Bluetooth LE/802.15.4 use separate antenna in Spatial Coex mode by default in 2.4GHz band on RD board*
- *RW61x RD board needs hardware rework to use single shared antenna between Wi-Fi and Bluetooth LE/802.15.4*
- Support Antenna duty cycle configuration for Wi-Fi + OpenThread coexistence

5. Secure Boot

- Secure boot enabled wireless firmware download & execution

6. Notes

- RW610 does not support 802.15.4 features which are only available with RW612

7. Acronyms & Abbreviations

Acronyms	Definitions
AES	Advanced Encryption Standard
AP	Access Point
CCMP	Counter Mode CBC-MAC Protocol
CSL	Coordinated Sampled Listening
ERP	Extended Rate Physical
FED	Full End Device
HT	High Throughput
IMU	Inter-CPU Message Unit
MAC	Media Access Control
MCS	Modulation and Coding Scheme
MED	Minimal End Device
MLME	Mac Layer Management Entity
OMI	Operating Mode Indication
REED	Router-Eligible End Device
SAD	Software Antenna Diversity
SAE	Simultaneous Authentication of Equals
STA	Station
TWT	Target Wakeup Time
U-APSD	Unscheduled Automatic Power Save Delivery
VHT	Very High Throughput
WPA	Wi-Fi protected access

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