RS9116W IoT Software 2.4 Release Notes – RS9116W.2.4.0.36

Wednesday, June 30th, 2021

The RS9116 wireless connectivity products are a family of SoCs and modules providing a comprehensive 2.4/5 GHz Wi-Fi and dual-mode Bluetooth 5 wireless connectivity. The RS9116 WiSeConnect™ offers a full network offload option for embedded systems with low-end host microcontrollers running an RTOS or bare metal OS. The RS9116W connects to a host MCU using UART, SPI or SDIO interfaces. A complete set of wireless, networking, and security stacks run on the RS9116W device; however, the networking stack can be bypassed if required. Communication with the host MCU is achieved with AT Commands, or alternately a simple binary API referred to as SAPI. Also, the software supports the Multi-Protocol Co-Existence Manager, Power Manager, and Host Manager entities.

2.4 Release Highlights

- Azure and AWS Cloud Connectivity Support

- Sweyntooth Vulnerabilities fixes

- Strong Cipher Suite Support

- Co-Existence Algorithm Enhancements

- ETSI V2.2.2 Certification Support

- Wi-Fi Interoperability Fixes and Enhancements

- Crystal Calibration Support (Needed for RS9116 QMS)

- Significant reorganization and refactoring of SDK compared to previous versions, in terms of directory structure, simplification of example usage, and ease of use.

Table of Contents

Introduction

This document lists changes that occur between different releases.

Guide Reference

New Features	These items are new to this release
Changes/Issues Fixed	The new items are as follows: • Changes made to existing features found in previous releases of the software. • Enhancements to existing product flow and feature set. • Bug fixes done in the Release
Deprecated Items	Features or functions or APIs that are removed from the distributed release to align with the software roadmap
Known Issues	Features or functions that do not work as planned at time of release. Work arounds may be offered to meet short term development goals, but longer-term solutions will be added in future software releases
Limitations/ Recommendations	Describes what are the limitations on product usage and recommendations for optimal use cases

Supported Products Present in This Release

- RS9116 WiSeConnect Software

Documentation References

RS9116 WiseConnect software documentation is available online at https://docs.silabs.com/rs9116-wiseconnect/latest/wifibt-wc-overview/.

The online documentation includes:
- Getting Started Guides
- SAPI Documentation
- Example Applications
- Programming Reference Manuals
- Application Notes

Support

- https://www.silabs.com/support

Release Notes – RS9116W.2.4.0.36

Wednesday 30th June 2021

Release Type

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

Release Details

- API Version (SAPI) : 1610.2.4.0.36
- Firmware Version : 1610.2.4.0.36
- Package Name : RS9116W.2.4.0.36
- Supported RTOS : FreeRTOS
- Hardware Modules/Chipsets : QMS, B00, C00, CC1, AB0, AB1, AA0, AA1
- Operating Modes Supported : Wi-Fi STA, Wi-Fi AP, Wi-Fi STA+BLE
- Additional Operating Modes Supported (Beta Quality): Wi-Fi STA+BT, Wi-Fi STA+BT+BLE

Information for Upgrading to this Release

RS9116W 2.4 release consists of two components.
- Firmware – RS9116 Firmware Binary
- SAPI Library - SAPI Library runs on Host

This release has bug-fixes, enhancements, and new features in SAPIs and Firmware. Most of the new features will have associated APIs, which are available in the latest SAPIs only. Hence, it is strongly recommended to upgrade SAPI and Firmware together.

New Features

Wi-Fi

- Azure Support for Cloud Connectivity
- AWS Support for Cloud Connectivity
- Support for Dynamic switching between AP and STA mode of Operation (see *config_feature_bit_map[16])*
- Support for Loading Certificate without requiring a reboot of chip
- Configurability Option for disabling Tx Data rates MCS5, MCS6 and MCS7
- Support for Stronger Cipher Suites
- Support for Enhanced Max PSP mode for better interoperability (see *config_feature_bit_map[26]* and refer to API *rsi_wlan_power_save_profile()*). This PSP type is supported only for STA Only mode.
- Enhancements for better interoperability – Keep alive configuration, graceful closure of previous connections.
- Enhancements to Auto Rate Algorithm
- Enhancements to Wi-Fi + BLE Co-Existence support
- Improvements to Wi-Fi + BLE provisioning examples
- WLAN EN 300 328 v.2.2.2 ETSI Certification Compliance support added for the following modules and SoC Versions: B00 1.4, QMS 1.3, QMS 1.4, CC0/CC1 1.3, CC0/CC1 1.4, AA0/AA1 1.3
- Certified Gain tables are added for these modules for different antennas, which can be configured using User Gain Table API. Default firmware configuration is for internal PCB/Chip Antenna
  - B00: Internal Antenna (Fractus FR05-S1-N-0-102) and Dipole antenna (Taoglas GW.34.5153)
  - CC0/CC1 1.4 FCC/ETSI: Dipole antenna (GW.71.5153), Dipole antenna (Inside WLAN PRO-IS 299), PCB Antenna (RSIA7), PIFA Antenna (Smarteq 4211613980), PIFA Antenna (MARS-31A8 Wi-Fi antenna)
  - CC0/CC1 1.3 : PCB antenna , Dipole antenna
  - AA0/AA1-1.3: Chip antenna, Heavy duty screw mount antenna
- Support for Chip Manufacturing Software (Crystal Calibration Support for RS9116 QMS chip integration)

Bluetooth – Common

- Resolution to Sweyntooth family of BT Vulnerabilities

Bluetooth – Classic

- Support for BT Advanced Audio Distribution Profile Source (BT alone mode only). Example Application project included for RT595 host platform

Bluetooth – LE

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Power Save

- Fixes for functional issues in power save mode at high temperature, 85°C

General

- Support for Examples on EFR Platform
- Package and Documentation Restructure

Changes/Issues Fixed

- Fixes for Memory Leak in SSL, ensuring stability for longer connection
- Resolved Issue with TCP long data transfer with low power configuration for memory configuration greater than 256k.
- Fix for setting device local name for BLE
- Fix for rsi_ble_white_list_using_adv_data() failure
- Fix for store config/auto config keep alive timeout not working.
- Fix for HID Keyboard notifications not being seen on the iOS mobile side
- Configurability support in Firmware update APIs for SAFE and FAST upgrade
- Bootup Issue at Low Temperature (refer to API *rsi_calib_write() Bit of 3*)

Deprecated Items

None

Newly Added APIs

API	Description
Wi-Fi	
`void rsi_sort_scan_results_array_based_on_rssi(struct wpa_scan_results_array)`	Sort the Scan results in scan_results_array in the order of RSSI. Application should call this API to get the scan result in sorted order.
`int32_t rsi_send_freq_offset(int32_t freq_offset_in_khz)`	Application to Provide feedback of frequency error in KHz. This is a blocking API.
`int32_t rsi_calib_write(uint8_t target, uint32_t flags, int8_t gain_offset, int32_t xo_ctune)`	RF Calibration Process. This API commands the firmware to update the existing FLASH/EFuse calibration data. This is a blocking API.

`int32_t rsi_send_feature_frame_dyn (uint32_t feature_enables)`	Select internal or external RF type and clock frequency to pass Feature enables dynamically. This is a blocking API.
`void rsi_register_wait_timeout_error_ callbacks(void(*)(int32_t status, uint32_t cmd_type) callback_handler_ptr)`	Register SAPI wait timeout handler. This is non-blocking API.
BT/BLE APIs	
`int32_t rsi_bt_a2dp_init(rsi_bt_a2dp_sbc _codec_cap_t* sbc_cap)`	Initialize A2DP profile with either user-defined audio codec params or default stack audio codec params. This is a blocking API.
`int32_t rsi_bt_avrcp_init(uint8_t* avrcp_feature)`	Set the AVRCP profile mode and enable the media player selection feature, if required. This is a blocking API.
`int32_t rsi_bt_avrcp_set_addr_player_res p(uint8_t *remote_dev_addr, uint8_t status)`	Send Addressed player response from Target to Controller. This is a blocking API.
`int32_t rsi_bt_avrcp_get_folder_items_re sp (uint8_t *remote_dev_addr, uint8_t status, folder_Items_resp_t folder_items_resp)`	Send Folder items response from Target to Controller. This is a blocking API.
`int32_t rsi_bt_avrcp_get_tot_num_items_r esp( uint8_t *remote_dev_addr, uint8_t status, uint16_t uidcntr, uint32_t numofitems)`	Send the response for the total number of items from Target to the Controller. This is a blocking API.
`int32_t rsi_bt_request_authentication(in t8_t* remote_dev_addr)`	Usually, the Authentication procedure starts from the stack once PHY Level Connection completes, but if the authentication is already disabled and if the user needs authentication after the PHY Level Connection, enable Authentication first and then call

	this API. This is a blocking API.
`int32_t rsi_bt_encryption_enable_or_disable(int8_t *remote_dev_addr, uint8_t enable_or_disable)`	Usually, Encryption procedure starts from the stack once the PHY Level Connection and authentication are completed, but users can decide whether to enable/disable encryption from the host. This is a blocking API.
`int32_t rsi_bt_per_cw_mode(struct rsi_bt_per_cw_mode_s *bt_cw_mode)`	Keep the device in continuous wave mode. Does not need to be called if transmit_mode is set to 2 - CONTINUOUS_WAVE_MODE in rsi_bt_tx_per_params_s structure.
`int32_t rsi_bt_vendor_ar_enable(uint16_t enable)`	Issue vendor-specific command for setting AutoRate in the controller on given inputs. This is a blocking API. A received event rsi_bt_on_ar_stats_t has AutoRate Stats.
`void rsi_bt_vendor_dynamic_pwr(uint16_t enable, uint8_t * remote_addr, uint8_t power_index_br, uint8_t power_index_2m, uint8_t power_index_3m)`	Issue the vendor-specific command for setting dynamic_tx_power_index in controller on given inputs. This is a blocking API.
`Int32 rsi_bt_vendor_avdtp_stats_enabled(uint16_t avdtp_stats_enable, uint32_t avdtp_stats_rate)`	Issue the vendor-specific command for setting avdtp stats enable in controller to receive the stats. This is a blocking API. A received event rsi_bt_on_avdtp_stats_t has AVDTP stats.

Modified APIs:

- n/a

Recommended Configurations and Application Development Options

- **Wi-Fi**
  - It is recommended to enable bit 16 of "Extended TCP IP Feature" bit map in opermode command for all Wi-Fi Socket Operations from host to ensure graceful handling during asynchronous closures from peer.
  - Aggregation (bit 2 of feature_bit_map) recommended to be enabled in the opermode.
  - TCP retransmission count value is recommended to be 30 or higher, so that the TCP does not disconnect while the rejoin happens.
  - For Low throughput Applications, such as Smart lock, disabling highest MCS rates, such as MCS7 and MCS6 might help reducing packet retransmissions and ensure robust connection during heavy inteference.
  - To restart the module, the application needs to call `rsi_driver_deinit` followed by `rsi_driver_init` and `rsi_device_init`. For OS cases, additionally call rsi_task_destroy(driver_task_handle) to delete the

driver task before calling `rsi_driver_deinit` and create again after `rsi_device_init` using `rsi_task_create`(..)
- o Register "Join Fail Callback" function every time when join is called, as in the rejoin failure path the callback is deregistered. If not done, this might result in a scan not functioning on rejoin failure.

- **BT/BLE**
  - o In BLE, recommended range of Connection Interval in
    - Power Save (BLE Only) – 100 ms to 1.28 s.
    - BT Classic + BLE Dual Mode is >= 200 ms.
    - Wi-Fi + BLE coex – 30 ms to 250 ms
  - o In BLE, during Connection, configuration of Scan Interval and Scan Window with same value is not recommended.
  - o In BT Classic, recommended Sniff Interval configuration during Power Save is limited to 100 ms (<= 100).
  - o In BLE, if a device is acting as Central, scan window (in set_scan_params and create_connection command) must be less than the existing Connection Interval.
  - o In BLE mode, if scanning and advertising is in progress and subsequently gets connected and moves to central role, then scanning and advertising stops. To further establish connection to another peripheral device or to a central device, application should give command for starting advertising and scanning again.
  - o Device Power save need to be disabled before BT init and de-init.

- **Co-Ex**
  - o For Wi-Fi + BLE, during Wi-Fi connection, lesser BLE scan Window and larger BLE scan Interval are recommended (1:3 or 1:4).
  - o Wi-Fi + BLE Advertising
    - o All the advertising intervals are supported as per the BT Spec. If the Wi-Fi transactions are more, you may observe a slight difference in on-air advertisements compared to the configured intervals.
    - o BLE Advertising will be aborted for those intervals which are colliding with Wi-Fi activity.
  - o Wi-Fi + BLE scanning
    - o All scan intervals are supported as per BT Spec. For better scan results, use scan-window and scan interval in 1:3 or 1:4 ratio when the Wi-Fi scan activity present.
    - o BLE scanning will be abort for those intervals which are colliding with Wi-Fi activity.
  - o Wi-Fi + BLE Central/Peripheral Connections
    - o All connection intervals are supported as per BT Spec.
    - o For stable connection, use optimal connection intervals and max supervision timeout in the presence of Wi-Fi activity.
  - o Wi-Fi + BLE Central/Peripheral Data Transfer
    - o To get better throughputs in both Wi-Fi and BLE, use medium connection intervals, such as 45 to 80 msec with Maximum supervision timeout.
    - o Make sure Wi-Fi activity should consume lesser intervals.
  - o For Wi-Fi + BT + BLE, Wi-Fi + BT, Wi-Fi + BLE operating modes, recommendation is to connect Wi-Fi ahead of BT/BLE connections, to ensure seamless stable connection for all 3 protocols.
  - o For Wi-Fi + BT + BLE, Wi-Fi + BT, Wi-Fi + BLE operating modes, if BT/BLE needs to be connected ahead of Wi-Fi connection, recommendation is to use with high supervision timeout and high connection interval for BLE; and high sniff interval for BT, to ensure seamless stable connection. This configuration will also ensure stable BT/BLE connection in the scenario where Wi-Fi connects/disconnects/rejoins.
  - o Wi-Fi + BLE Central/Peripheral Data Transfer

- **System**
  - o For User Store configuration and Configuration Save, it is recommended that power save is not enabled and saved as configuration. Otherwise, if power save is enabled and saved as configuration, module upon boot up will come up with the saved configuration and will go to power save without any indication to the host.
  - o Set Optimization level to "O0" in project settings for IDE (KEIL).
  - o Memory Configuration is mandated to be 384K for BT/BLE and Co-Ex Operating Modes
    - Usage of Low Power Flash mode bit (Bit 19 in Extended customer feature bitmap)
      - Enable this bit for Ultra low power standby associated scenarios. This results in about 20 uA lower Wi-Fi standby associated current consumption.

- o Memory Configuration in SAPIs: Default memory configuration is 384k. Users can configure it to 256/320/384k by changing the macros defined in the below two files
    - ▪ In rsi_wlan_config.h : RSI_EXT_CUSTOM_FEATURE_BIT_MAP →EXT_FEAT_256K_MODE or EXT_FEAT_320K_MODE or EXT_FEAT_384K_MODE
    - ▪ In rsi_common.c : rsi_uint32_to_4bytes(rsi_opermode->ext_custom_feature_bit_map, (EXT_FEAT_256K_MODE (or) EXT_FEAT_320K_MODE (or) EXT_FEAT_384K_MODE | RSI_EXT_CUSTOM_FEATURE_BIT_MAP));
- o Opermode commands in AT mode to be applied correctly. Wrong opermode in some cases might lead to unspecified behavior.
- o Recommended Power Save Profile (PSP) type to be set to Enhanced Max PSP for Wi-Fi alone mode and MAX PSP for Wi-Fi Co-Ex Modes.
- o Advised to disable power save during firmware upgrade and re-enable on upgrade completion.
- o Recommended to disable Power Save for High Throughput Applications.
- o Application needs to ensure that it sets RTC with correct timestamp when the feature is enabled, prior to establishing the SSL connection.
- o Timeout value should be minimum 1 second for socket select and socket receive calls. Timeout value less than 1 second is not currently supported.
- o For additional details, see "Configuration parameters" in the SAPI Reference Manual.

Known Issues

- • **Network Stack**
    - o MQTT disconnection is observed while firmware upgrade using OTAF, when power save is enabled. Advised to disable power save during firmware upgrade and re-enable on upgrade completion.
    - o Newly Added GCM Based Strong Cipher Suites will have performance issues as Hardware support is not available in the current platform.
    - o Recommended MQTT Publish payload is 1kbytes.
    - o If HTTP Server is configured in the module, MQTT client port should not be port configured on port 80.
    - o Recommend randomizing client port if Rapid connect/disconnect of MQTT session on the same client port with power save is used.
    - o Secure SSL Renegotiation not supported in Embedded Networking Stack.
    - o IPv6 support is not available in this release.

- • **Wi-Fi**
    - o If the station performs the scan in concurrent mode (Wi-Fi STA+AP), it is possible for stations connected to the AP to get disconnected. Recommended to enable AP after STA connection is completed.
    - o Issue observed with WPA2 Enterprise Connectivity using Microsoft RADIUS Server.
    - o If BG Scan is enabled along with custom feature bit map bit (8) configuration of DFS Channel support, there might be issues in getting IP address for the Wi-Fi STA.

- • **BT/BLE**
    - o Wake on Wireless not supported for BLE.
    - o BT-HID might not inter-operate with Apple devices.
    - o In Wi-Fi + BT/BLE Co-Ex mode, high Wi-Fi broadcast traffic, might cause BT/BLE disconnections.
    - o Continuous data transfer on SPP(Rx/Tx) with packet size ~800 bytes, in some scenarios might lead to BT disconnection. It is advised to introduce delay in between transfers to work around this issue.
    - o In WiFi + BT mode when there is continuous Wi-Fi data, you might observe BT not re-connecting to remote after disconnection.
    - o BT-A2DP interoperability issue might be observed with some headsets.
    - o For BLE dual role scenario issues might occur when connecting as central if the advertising is also going out for the peripheral role. Central connections can be made after the peripheral connections are established and advertising is stopped.

- • **Co-Ex**
    - o In Co-Ex Mode if power save is enabled, it stays in enabled state even after Wi-Fi disconnection. Recommended procedure in Co-Ex mode is to disable power save after every radio_init() and enable it when intended by application.

- o BLE disconnection might be observed with Wi-Fi + BLE configuration with Wi-Fi continuous data transfer for low BLE supervision timeout configured. For Supervision timeout configured with value 16 seconds, no disconnections are observed.
  - o WiFi + BLE mode WPS is not working.
  - o Wi-Fi+BLE/BLE only mode: For SPI as host interface, continuous BLE TX Notification might result in hang of host interface needing a hardware reset. Issue is not seen with discrete burst BLE data.
  - o In Wi-Fi+BT/BLE configuration, with Wi-Fi disconnects, BT/BLE reconnection issue is observed (refer to earlier section "Recommended Configurations and Application Development options" in this document).

- **Interoperability**
  - o QoS Null frames indicating going to Power Save if not acknowledged by AP, may result in AP not being in sync with the power save state, resulting in Possible disconnections.
  - o In the event of 3rd Party Access Points not sending beacons periodically, in some scenarios unicast probe requests are not sent from the module as is expected. This might result in disconnections.

- **System**
  - o There is a known issue with FAST-PSP mode, recommended to use Enhanced MAX-PSP power save.
  - o Wake on Wireless support tested only for UART AT command interface.
  - o Power Save without RAM retention is not working for SPI interface.

Limitations/Feature Not Supported

- **Wi-Fi/Network Stack**
  - o AMSDU TX is not supported.
  - o Fragmentation is not supported.
  - o AMSDU's within AMPDU is not supported.
  - o Currently module does not support Radio Measurement Requests feature of CCX V2
  - o 802.11k is not supported
  - o Short GI is not supported
  - o 802.11w is not supported
  - o 40Mhz bandwidth in 2.4 GHz band is not supported.
  - o 802.11J channels less than 16 are not supported.
  - o USB host interface and USB Power save not supported.
  - o Total MQTT Command Length, apart from MQTT Publish, should not exceed 150 bytes. This includes at+rsi (start of command) to (end of command)\r\n.
  - o Users need to configure MQTT_VERSION in rsi_mqtt_client.h based on the server configuration, only version 3 and 4 are supported.
  - o 3SSL or One TCP and 2 SSL, connections are supported concurrently in Wi-Fi only mode.
  - o SSL Curve id supported are 15-28. SSL handshake with 3rd party clients depends on this SSL Curve ID

- **BT/BLE**
  - o BT Sniff mode does not work if BT multiple slaves feature is enabled.
  - o For BLE, if the connection is established with a small connection interval (< 15 ms), simultaneous roles (i.e., Central/Peripheral + Advertising/Scanning) are not supported.
  - o BLE maximum 2 concurrent connections are supported. It can be either connection to two peripheral devices or to 1 central and 1 peripheral device.
  - o For BT Classic only 1 connection is supported at any time
  - o BLE Slave latency value is valid up to 32 only.
  - o BT-A2DP Encoder is not support in the firmware
  - o BT-A2DP not supported in AT mode
  - o User Gain Table API not available for BT/BLE Path. Limit the BT/BLE Tx power for a specific antenna using corresponding tx_power APIs

- **Co-Ex**
  - o In Wi-Fi + BLE, during Wi-Fi connection, if both BLE scan interval and window are same, an issue will occur in successfully making the Wi-Fi connection.
  - o For AT commands, Wi-Fi+BT+BLE (Opermode 9) BT+BLE(Opermode 8) are not working. However, BT, WiFi+BT modes (Opermode 5) works fine. Also, all combinations work fine with SAPI

- o WiFi STA + BT + BLE multi-protocol cases require detailed understanding of use cases and associated configurations, contact Silicon Labs Support for more details.
- o Wi-Fi AP+BLE, Wi-Fi AP+BT & Wi-Fi AP +BT+BLE modes are not supported.

Folder Structure Changes

- The following is the Directory Structure change under …/.
  - o examples
    - ▪ featured – Featured applications
    - ▪ snippets – Application Snippets
    - ▪ at_commands - TTL Scripts
  - o firmware
  - o platforms
    - ▪ efx32
    - ▪ stm32
  - o resources
    - ▪ certificates
    - ▪ scripts
  - o sapi
    - ▪ bluetooth
    - ▪ common
    - ▪ crypto
    - ▪ driver
    - ▪ include
    - ▪ network
    - ▪ rtos
    - ▪ wlan
  - o third_party
    - ▪ amazon-freertos
    - ▪ aws_sdk
    - ▪ azure_sdk
    - ▪ freertos
    - ▪ mqtt_client
    - ▪ sbc_audio_codec
  - o utilities
    - ▪ python
    - ▪ usb_cdc
    - ▪ ble_provisioning_apps

Release Notes – RS9116.WSC.2.3.0.0001

Friday 12th February 2021

Release Type

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

Release Details

- API Version (SAPI)   : 1610.2.3.0.0001
- Firmware Version   : 1610.2.3.0.0001
- Package Name   : RS9116.NB0.WC.GENR.OSI.2.3.0.0001
- Supported RTOS   : FreeRTOS
- Hardware Modules/chipsets : QMS, B00, C00, CC1, AB0, AB1, AA0, AA1
- Operating Modes Supported: Wi-Fi STA, Wi-Fi AP, Wi-Fi STA+BLE, Wi-Fi STA+BT, BT+BLE, Wi-Fi STA+BT+BLE

Information for Upgrading to Latest RS9116 Release

RS9116W 2.3 release consists of 2 main components
- Firmware
- SAPI Library

This release has bug-fixes, enhancements, and new features in SAPIs and Firmware together. Most of the new features will have associated APIs, which are available in the latest SAPIs only. Hence, it is strongly recommended to upgrade SAPI and Firmware together.

New Features

Wi-Fi

- Crystal good time configuration default value changed to 1000us from 600us, trim value to 3
- Support for Configuration of Crystal Good time to values 600us, 1000us, 2000us and 3000us in the opermode. Refer Section 5.1 in PRM for Configure Feature Bit Map.

Bluetooth – Common

-

Bluetooth – Classic

-

Bluetooth – LE

-

Power Save

-

Changes/Issues Fixed

- Changes in BLE length parameter. Refer BLE PRM section
- Fix for module not going to sleep when TCP/IP Bypass is enabled
- Fix for failure indication not going to application when data size exceeds MSS in case of SSL, as a result packets get dropped on exceeding MSS as application unable to handle the same.

- Fix for LTCP Stability issue where in data transfer stop with Firefox browser on doing refresh(ctrl+F5)
- Removed unnecessary M4 defines in de-init API
- Fix for peripheral/central disconnects in AT mode on write command
- Fix for memory leaks in SAPI during de-init
- Fix for occasional BT Crash when connected to Android phone

Deprecated Items
None

Newly added APIs
-

Modified APIs:
-

Recommended Configurations and Application Development Options

- **Wi-Fi**
  - It is recommended to enable bit 16 of "Extended TCP IP Feature" bit map in opermode command for all Wi-Fi Socket Operations from host to ensure graceful handling during asynchronous closures from Peer
  - Aggregation (bit 2 of feature_bit_map) recommended to be enabled in the opermode
  - TCP retransmission count value is recommended to be 30 or higher, so that TCP doesn't disconnect while Rejoin happens
  - For restarting the module, application needs to call rsi_driver_deinit followed by rsi_driver_init and rsi_device_init. For OS cases, additionally needs to call rsi_task_destroy(driver_task_handle)to delete the driver task before calling rsi_driver_deinit and should create again after rsi_device_init using rsi_task_create(..)
  - Register "Join Fail Callback" function every time when join is called, as in the rejoin failure path the callback is deregistered. If not done, this might result in scan not functioning on rejoin failure

- **BT/BLE**
  - In BLE, recommended range of Connection Interval in
    - Power Save (BLE Only) - 100ms to 1.28sec.
    - BT Classic + BLE Dual Mode is >= 200ms.
    - Wi-Fi + BLE coex - 30ms to 250ms
  - In BLE, during Connection, configuration of Scan Interval and Scan Window with same value is not recommended
  - In BT Classic, recommended Sniff Interval configuration during Power Save is limited to 100ms (<= 100)
  - In BLE, if a device is acting as Master/Slave, scan window (in set_scan_params and create_connection command) must be less than the existing Connection Interval
  - In BLE mode, if scanning and advertising is in progress and subsequently it gets connected and moves to master role, then scanning and advertising stops. To further establish connection to another slave device or to a master device, application should give command for starting advertising and scanning again

- **Co-Ex**
  - In Wi-Fi + BLE, during Wi-Fi connection, lesser BLE scan Window and larger BLE scan Interval are recommended
  - For Wi-Fi+BT+BLE, Wi-Fi+BT, WiFi+BLE operating modes, recommendation is to connect Wi-Fi ahead of BT/BLE connections, to ensure seamless stable connection of all 3 protocols
  - For Wi-Fi+BT+BLE, Wi-Fi+BT, WiFi+BLE operating modes, if BT/BLE needs to be connected ahead of Wi-Fi connection, recommendation is to use with high supervision timeout and high connection interval for BLE; and high sniff interval for BT, to ensure seamless stable connection. This configuration will also ensure stable BT/BLE connection in the scenario where Wi-Fi connects/disconnects/rejoins.

- **System**
  - For User Store configuration and Configuration Save, it is recommended that power save is not enabled and saved as configuration. Otherwise, if power save is enabled and saved as configuration, module upon boot up will come up with the saved configuration and will go to power save without any indication to host.
  - Set Optimization level to "O0" in project settings for IDE (KEIL, CUBE)
  - Memory Configuration is mandated to be 384K for BT/BLE and Co-Ex Operating Modes
    - Usage of Low Power Flash mode bit (Bit 19 in Extended customer feature bitmap)
      - Disable this bit for High Wi-Fi throughput use cases
      - Enable this bit for Ultra low power standby associated scenarios. This results in about 20uA lower Wi-Fi standby associated current consumption.
    - It is recommended not to enable this bit for 384k Memory configuration for this release
  - Memory Configuration in SAPIs: Default memory configuration is 384k. User can configure it to 256/320/384k by changing the macros defined in below two files
    - In rsi_wlan_config.h : RSI_EXT_CUSTOM_FEATURE_BIT_MAP →EXT_FEAT_256K_MODE or EXT_FEAT_320K_MODE or EXT_FEAT_384K_MODE
    - In rsi_common.c : rsi_uint32_to_4bytes(rsi_opermode->ext_custom_feature_bit_map, (EXT_FEAT_256K_MODE (or) EXT_FEAT_320K_MODE (or) EXT_FEAT_384K_MODE | RSI_EXT_CUSTOM_FEATURE_BIT_MAP));
  - For additional details, see "Configuration parameters" in SAPI Reference Manual

Known Issues

- **Network Stack**
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  - MQTT disconnection is observed while firmware upgrade using OTAF, when power save is enabled. Advised to disable power save during firmware upgrade and re-enable on upgrade completion
  - Issues observed with TCP long data transfer for memory configurations greater than 256kbytes. However, the issue not seen with Low power mode bit (Bit 19 in Extended Customer feature bit map) disabled
  - Recommended to avoid usage of same UDP socket port number while it is being used.
  - Issues might be observed with bi-directional SSL data stream with WPA2-AES security mode.
  - Recommended MQTT Publish payload is 1kbytes
  - If HTTP Server is configured in the module, MQTT client port should not be port 80
  - Recommend randomizing client port if Rapid connect/disconnect of MQTT session on the same client port with power save is used.
  - Secure SSL Renegotiation not supported in Embedded Networking Stack
  - IPv6 support is not available in this release
  - Issue with connectivity to FTP server when power save is enabled
  - HTTP(S) based OTAF not reporting proper error for wrong file type or empty file, however no issues with system stability by issuing such commands

- **Wi-Fi**
  - For Dual Band (2.4 & 5GHz) mode, selective scan in 5GHz channel fails. Workaround is to issue an all channel scan by specifying NULL as SSID for scan api and then go for connect command with the specific SSID
  - If station in concurrent mode (Wi-Fi STA+AP) performs scan, there is possibility for stations connected to AP getting disconnected.
  - Limited Wi-Fi scan results obtained in the Android BLE Provisioning APP
  - Connectivity issues observed in channel 149, 157, 161 & 167 in 5GHz Access Point Mode.
  - Autojoin Feature with GPIO based power save works with UULP_VBATT_GPIO_2 (HOST_BYP_ULP_WAKEUP) and UULP_VBATT_GPIO_3 (SLEEP_IND_FROM_DEV). UULP_VBATT_GPIO_0 usage as SLEEP_IND_FROM_DEV doesn't work
  - For Max Join Retry count, the failure indication code is incorrectly shown as 0Xfffffd6
  - If BG Scan is enabled along with custom feature bit map bit (8) configuration of DFS Channel support, there might be issues in getting IP address for the Wi-Fi STA

- **BT/BLE**
  - Wake on Wireless not supported for BLE
  - BT-HID might not inter-operate with Apple devices

- o In Wi-Fi + BT/BLE Co-Ex mode, high Wi-Fi broadcast traffic, might cause BT/BLE disconnections
- o BT PER Continuous mode support requires proper command sequence when run in multiple iterations

- **Co-Ex**
  - o In Co-Ex Mode if power save is enabled, it stays in enabled state even after Wi-Fi disconnection. Recommended procedure in Co-Ex mode, is to disable power save after every radio_init() and enable it when intended by application
  - o Wi-Fi + BLE operating mode configuration, BLE might disconnect with connection interval higher than 250ms
  - o BLE disconnection might be observed with Wi-Fi + BLE configuration with Wi-Fi continuous data transfer for low BLE supervision timeout configured. For Supervision timeout configured with value 16 seconds no disconnections are observed
  - o In WiFi+BT/BLE configuration, with Wi-Fi disconnects, BT/BLE reconnection issue is observed (refer to earlier section "Recommended Configurations and Application Development options" in this document)
  - o Wi-Fi+BLE/BLE only mode: For SPI as host interface, continuous BLE Tx Notification might result in hang of host interface needing a h/w reset. Issue not seen with discrete burst BLE data

- **System**
  - o There is a known issue with FAST-PSP mode, recommended to use MAX-PSP power save
  - o Wake on Wireless support tested only for UART AT command interface.
  - o For BT/BLE and Co-Ex Opermodes, in unconnected state, message-based power save is not supported
  - o Power Save without RAM retention is not working for SPI interface.

Limitations/Feature Not Supported

- **Wi-Fi/Network Stack**
  - o AMSDU TX is not supported
  - o Fragmentation is not supported
  - o AMSDU's within AMPDU is not supported
  - o Currently module does not support Radio Measurement Requests feature of CCX V2
  - o 802.11k is not supported.
  - o Short GI is not supported
  - o 802.11w is not supported
  - o 40Mhz bandwidth in 2.4GHz band is not supported.
  - o 802.11J channels less than 16 are not supported.
  - o USB host interface and USB Power save not supported.
  - o Total MQTT Command Length, apart from MQTT Publish, should not exceed 150 bytes. This includes at+rsi (start of command) to (end of command)\r\n
  - o User needs to configure MQTT_VERSION in rsi_mqtt_client.h based on server configuration, only version 3 and 4 are supported.
  - o 3SSL, One TCP and 2 SSL, connections are supported concurrently in Wi-Fi only mode
  - o SSL Curve id supported are 15-28. SSL handshake with 3rd party clients depends on this SSL Curve id

- **BT/BLE**
  - o BT Sniff mode does not work if BT multiple slaves feature is enabled
  - o When BT multiple slaves feature is enabled, Master to Slave role switch does not happen
  - o For BLE, if connection is established with small connection interval (< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported
  - o BLE maximum 2 concurrent connections are supported. It can be either connection to two peripheral devices or to 1 central and 1 peripheral device
  - o For BT Classic only 1 connection is supported at any time
  - o For BT Classic Simultaneous Slave & Master roles (Scatter-net) is not supported.

- **Co-Ex**
  - o In Wi-Fi + BLE, during Wi-Fi connection, if both BLE scan interval and window are same then there will be issue in successfully making the Wi-Fi connection.

- o For AT commands, Wi-Fi+BT+BLE (Opermode 9) BT+BLE(Opermode 8) are not working. However, BT, WiFi+BT modes (Opermode 5) works fine. Also, all combinations work fine with SAPI
- o WiFi STA + BT + BLE multi-protocol cases require detailed understanding of use cases and associated configurations, contact Silicon Labs Support for more details.
- o Wi-Fi AP+BLE/Wi-Fi AP+BT/Wi-Fi AP +BT+BLE modes are not supported

Folder Structure Changes

-

Notes – RS9116.WSC.2.1.1.0003

Thursday 24th December 2020

Release Type

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

Release Details

- API Version (SAPI) : 1610.2.1.1.0003
- Firmware Version : 1610.2.1.1.0003
- Package Name : RS9116.NB0.WC.GENR.OSI.2.1.1.0003
- Supported RTOS : FreeRTOS
- Hardware Modules/chipsets : QMS, B00, C00, CC1, AB0, AB1, AA0, AA1
- Operating Modes Supported: Wi-Fi STA, Wi-Fi AP, Wi-Fi STA+BLE, Wi-Fi STA+BT, BT+BLE, Wi-Fi STA+BT+BLE

Information for Upgrading to Latest RS9116 Release

RS9116W 2.1 release consists of 2 main components

- Firmware
- SAPI Library

This release has bug-fixes, enhancements, and new features in SAPIs and Firmware together. Most of the new features will have associated APIs, which are available in the latest SAPIs only. Hence, it is strongly recommended to upgrade SAPI and Firmware together.

New Features

Wi-Fi

- AT Command Based HTTP/HTTPS Over the Air Firmware (OTAF) Upgrade Support

Bluetooth – Common

-

Bluetooth – Classic

-

Bluetooth – LE

-

Power Save

-

Changes/Issues Fixed

- Kr00K Vulnerability Counter Measures fixes
- Fix for full duplex hang up issue
- Fix for specific channel scanning issue in Dual Band for 5 GHz
- Fix for SSL Handshake failure by exchanging supported Curve ids
- Fix for DUT Hang issue while doing continuous start and stop for PER CWMODE

- Enhancements for ability to set RTC timer at any time from host. The previous support was only having capability to start before INIT command.
- Fix for TCP Keepalive configuration to take effect
- Fix for DNS and MQTT functionality with listen interval based power save
- Changes for registering missing call back wlan_async_stats()
- Fix for Shadow error during commissioning
- Updated user gain table values for all regions
- Fix for 2Mbps mode setting for rsi_ble_setphy and rsi_ble_readphy
- Fix for BLE active scan response issue where BLE device name is not found all the time during device discovery
- Async() function support for rsi_connect()

Deprecated Items

None

Newly Added APIs

-

Modified APIs:

-

Recommended Configurations and Application Development Options

- **Wi-Fi**
  - It is recommended to enable bit 16 of "Extended TCP IP Feature" bit map in opermode command for all Wi-Fi Socket Operations from host to ensure graceful handling during asynchronous closures from Peer
  - Aggregation (bit 2 of feature_bit_map) recommended to be enabled in the opermode
  - TCP retransmission count value is recommended to be 30 or higher, so that TCP doesn't disconnect while Rejoin happens
  - For restarting the module, application needs to call rsi_driver_deinit followed by rsi_driver_init and rsi_device_init. For OS cases, additionally needs to call rsi_task_destroy(driver_task_handle)to delete the driver task before calling rsi_driver_deinit and should create again after rsi_device_init using rsi_task_create(..)
  - Register "Join Fail Callback" function every time when join is called, as in the rejoin failure path the callback is deregistered. If not done, this might result in scan not functioning on rejoin failure

- **BT/BLE**
  - In BLE, recommended range of Connection Interval in
    - Power Save (BLE Only) - 100ms to 1.28sec.
    - BT Classic + BLE Dual Mode is >= 200ms.
    - Wi-Fi + BLE coex - 30ms to 250ms
  - In BLE, during Connection, configuration of Scan Interval and Scan Window with same value is not recommended
  - In BT Classic, recommended Sniff Interval configuration during Power Save is limited to 100ms (<= 100)
  - In BLE, if a device is acting as Master/Slave, scan window (in set_scan_params and create_connection command) must be less than the existing Connection Interval
  - In BLE mode, if scanning and advertising is in progress and subsequently it gets connected and moves to master role, then scanning and advertising stops. To further establish connection to another slave device or to a master device, application should give command for starting advertising and scanning again

- **Co-Ex**
  - In Wi-Fi + BLE, during Wi-Fi connection, lesser BLE scan Window and larger BLE scan Interval are recommended

- o For Wi-Fi+BT+BLE, Wi-Fi+BT, WiFi+BLE operating modes, recommendation is to connect Wi-Fi ahead of BT/BLE connections, to ensure seamless stable connection of all 3 protocols
- o For Wi-Fi+BT+BLE, Wi-Fi+BT, WiFi+BLE operating modes, if BT/BLE needs to be connected ahead of Wi-Fi connection, recommendation is to use with high supervision timeout and high connection interval for BLE; and high sniff interval for BT, to ensure seamless stable connection. This configuration will also ensure stable BT/BLE connection in the scenario where Wi-Fi connects/disconnects/rejoins.

- **System**
  - o For User Store configuration and Configuration Save, it is recommended that power save is not enabled and saved as configuration. Otherwise, if power save is enabled and saved as configuration, module upon boot up will come up with the saved configuration and will go to power save without any indication to host.
  - o Set Optimization level to "O0" in project settings for IDE (KEIL, CUBE)
  - o Memory Configuration is mandated to be 384K for BT/BLE and Co-Ex Operating Modes
    - ▪ Usage of Low Power Flash mode bit (Bit 19 in Extended customer feature bitmap)
      - • Disable this bit for High Wi-Fi throughput use cases
      - • Enable this bit for Ultra low power standby associated scenarios. This results in about 20uA lower Wi-Fi standby associated current consumption.
    - ▪ It is recommended not to enable this bit for 384k Memory configuration for this release
  - o Memory Configuration in SAPIs: Default memory configuration is 384k. User can configure it to 256/320/384k by changing the macros defined in below two files
    - ▪ In rsi_wlan_config.h : RSI_EXT_CUSTOM_FEATURE_BIT_MAP →EXT_FEAT_256K_MODE or EXT_FEAT_320K_MODE or EXT_FEAT_384K_MODE
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  - o WiFi STA + BT + BLE multi-protocol cases require detailed understanding of use cases and associated configurations, contact Silicon Labs Support for more details.
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Folder Structure Changes

-

Release Notes – RS9116.WSC.2.1.0.0010

Friday 27th November 2020

Release Type

- Test   ☐
- Alpha   ☐
- Beta   ☐
- Production   ☑

Release Details

- API Version (SAPI)   : 1610.2.1.0.0010
- Firmware Version   : 1610.2.1.0.0010
- Package Name   : RS9116.NB0.WC.GENR.OSI.2.1.0.0010
- Supported RTOS   : FreeRTOS
- Hardware Modules/chipsets : QMS, B00, C00, CC1, AB0, AB1, AA0, AA1
- Operating Modes Supported: Wi-Fi STA, Wi-Fi AP, Wi-Fi STA+BLE, Wi-Fi STA+BT, BT+BLE, Wi-Fi STA+BT+BLE

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RS9116W 2.1 release consists of 2 main components
- Firmware
- SAPI Library

This release has bug-fixes, enhancements, and new features in SAPIs and Firmware together. Most of the new features will have associated APIs, which are available in the latest SAPIs only. Hence, it is strongly recommended to upgrade SAPI and Firmware together.

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Wi-Fi

- AT Command Based HTTP/HTTPS Over the Air Firmware (OTAF) Upgrade Support

Bluetooth – Common

-

Bluetooth – Classic

-

Bluetooth – LE

-

Power Save

-

Changes/Issues Fixed

- Changed HTTP OTAF Response Message Format with reduced parameters
  - OTAF Success Message: AT+RSI_HTTPOTARSP=Upgrade Success<CR><LF>

- o OTAF Failure Message: ERROR <error code> <CR><LF>
  AT+RSI_HTTPOTARSP=Upgrade Failed<CR><LF>
- Fix for Length field in BLE Events for GATT Write, Notify and Indication to reflect the actual length and followed by the correct set of values.
- Fix for Auto Join with Power Save not working for UULP_GPIO_2&UULP_GPIO_0 combination
- Fix for select() functionality not working due to Timeout issues related to select()
- Fix for select with shutdown in loop giving error 0x15 in the select callback
- Fix for Stored AP profile is getting cleared after Firmware Update
- Fix for additional select response coming after WLAN disconnect indication
- Fix for unable to close socket after downloading file
- Fix for Posting Send Semaphore during remote terminate is getting Assertion in OS
- Fix for rsi_dns_req() api returns success even semaphore timeout happening resulting in junk data save for dns server ip

Deprecated Items

None

Newly Added APIs

-

Modified APIs:

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Recommended Configurations and Application Development Options

- **Wi-Fi**
  - o It is recommended to enable bit 16 of "Extended TCP IP Feature" bit map in opermode command for all Wi-Fi Socket Operations from host to ensure graceful handling during asynchronous closures from Peer
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  - o For User Store configuration and Configuration Save, it is recommended that power save is not enabled and saved as configuration. Otherwise, if power save is enabled and saved as configuration, module upon boot up will come up with the saved configuration and will go to power save without any indication to host.
  - o Set Optimization level to "O0" in project settings for IDE (KEIL, CUBE)
  - o Memory Configuration is mandated to be 384K for BT/BLE and Co-Ex Operating Modes
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  - o 40Mhz bandwidth in 2.4GHz band is not supported.
  - o 802.11J channels less than 16 are not supported.
  - o USB host interface and USB Power save not supported.
  - o Total MQTT Command Length, apart from MQTT Publish, should not exceed 150 bytes. This includes at+rsi (start of command) to (end of command)\r\n
  - o User needs to configure MQTT_VERSION in rsi_mqtt_client.h based on server configuration, only version 3 and 4 are supported.
  - o 3SSL, One TCP and 2 SSL, connections are supported concurrently in Wi-Fi only mode
  - o SSL Curve id supported are 15-28. SSL handshake with 3rd party clients depends on this SSL Curve id

- **BT/BLE**
  - o BT Sniff mode does not work if BT multiple slaves feature is enabled
  - o When BT multiple slaves feature is enabled, Master to Slave role switch does not happen

- o For BLE, if connection is established with small connection interval (< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported
- o BLE maximum 2 concurrent connections are supported. It can be either connection to two peripheral devices or to 1 central and 1 peripheral device
- o For BT Classic only 1 connection is supported at any time
- o For BT Classic Simultaneous Slave & Master roles (Scatter-net) is not supported.

- **Co-Ex**
  - o In Wi-Fi + BLE, during Wi-Fi connection, if both BLE scan interval and window are same then there will be issue in successfully making the Wi-Fi connection.
  - o For AT commands, Wi-Fi+BT+BLE (Opermode 9) BT+BLE(Opermode 8) are not working. However, BT, WiFi+BT modes (Opermode 5) works fine. Also, all combinations work fine with SAPI
  - o WiFi STA + BT + BLE multi-protocol cases require detailed understanding of use cases and associated configurations, contact Silicon Labs Support for more details.
  - o Wi-Fi AP+BLE/Wi-Fi AP+BT/Wi-Fi AP +BT+BLE modes are not supported

Folder Structure Changes

- Following are the Directory Structure change under …/host/
  - o sapis(no change except the directory 'platforms' pulled out)
  - o platforms
    - ▪ STM32
      - Drivers
      - hal
      - Reference_Projects
        - o Cube_Baremetal
          - ▪ Core
          - ▪ Projects
        - o Cube_Freertos
          - ▪ Core
          - ▪ Projects
        - o Keil_Baremetal
          - ▪ Core
          - ▪ Projects
            - SPI
              - o AWS_IoT
              - o BT_Alone
              - o eap
              - o Firmware_upgrade
              - o Power_save
              - o sample_project
              - o Throughput
              - o wlan_sta_ble_bridge
              - o wlan_sta_ble_provisioning
            - UART
              - o udp_client

        - o Keil_Freertos
          - ▪ Core
          - ▪ Projects
            - SPI
              - o mqtt_client
              - o sample_project
              - o wlan_https_bt_spp_ble_dual_role
              - o wlan_https_bt_spp_ble_provisioning
              - o wlan_throughput_bt_spp_ble_dual_role
            - UART
              - o UDP_Client

Release Notes – RS9116.WSC.2.0.0.0024

Monday 19th October 2020

Release Type

- Test   ☐
- Alpha   ☐
- Beta   ☐
- Production   ☑

Release Details

- API Version (SAPI)   : 1610.2.0.0.0024
- Firmware Version   : 1610.2.0.0.0024
- Package Name   : RS9116.NB0.WC.GENR.OSI.2.0.0.0024
- Supported RTOS   : FreeRTOS
- Hardware Modules/chipsets : QMS, B00, C00, CC1, AB0, AB1, AA0, AA1
- Operating Modes Supported: Wi-Fi STA, Wi-Fi AP, Wi-Fi STA+BLE, Wi-Fi STA+BT, BT+BLE, Wi-Fi STA+BT+BLE

Information for Upgrading to Latest RS9116 Release

RS9116W 2.0 release consists of 2 main components

- Firmware
- SAPI Library

This release has bug-fixes, enhancements, and new features in SAPIs and Firmware together. Most of the new features will have associated APIs, which are available in the latest SAPIs only. Hence, it is strongly recommended to upgrade SAPI and Firmware together.

New Features

Wi-Fi

- QoS1 Support for Embedded MQTT stack
- SAPI Support for Embedded MQTT stack (SPI interface only)
- Support to add "comma" as part of Publish and Subscribe messages in MQTT
- Support for Specifying Client Port to be used for MQTT connection
- TLS1.2 Support for Enterprise Security
- 3 SSL Certificate Support for 3 Concurrent SSL sessions in Wi-Fi only mode
- Wi-Fi Statistics (idleBeaconStateMachineStats, busyBeaconStateMachineStats) Support in Wi-Fi only Operating Mode
- Support for communicating HTTP(S) response status info to host
- API support to configure User Gain Table for customer specific antenna
- Support for configurable Active high or active low interrupt for Wake-On-Wireless in UART-AT mode

Bluetooth – Common

- Enhancements to internal buffer management handling

Bluetooth – Classic

- Enhancements to SPP profile
- Fixes to GPIO based and Message based power save modes.

Bluetooth – LE

- Sweyntooth Security Vulnerability Fixes

Power Save

☐ When sleep clock source is configured to use 32KHz external clock on UULP_VBAT_GPIO_3

- o use UULP_VBAT_GPIO_0 for SLEEP_IND_FROM_DEV
- o set RS9116_SILICON_CHIP_VER in 'RS9116.NB0.WC.GENR.OSI.X.X.X\host\sapis\include\rsi_user.h' to CHIP_VER_1P4_AND_ABOVE

☐ If internal RC mode is used for sleep clock i.e. not using external clock on UULP_VBAT_GPIO_3 as sleep clock source, then below settings can be used in addition to the above

- o use UULP_VBAT_GPIO_3 for SLEEP_IND_FROM_DEV

- o set RS9116_SILICON_CHIP_VER in 'RS9116.NB0.WC.GENR.OSI.X.X.X\host\sapis\include\rsi_user.h' to CHIP_VER_1P3

Note:

      Refer to section 'Set Operating Mode-ext_custom_feature_bit_map' in RS9116W Wi-Fi AT Command Programming Reference Manual for sleep clock source configuration details

Changes/Issues Fixed

- Changed Maximum Packet Length PER Transmit for BLE to 240 bytes
- Change in supported memory configuration for BLE/BT and CoEx modes to 384k only
- Fixed SAPI driver Hang Issue on Enable/Disable of Power Save
- Support for configuring Tx Power on Set Region of Access Point
- Fixed variation in throughput when AP is in Auto Channel Mode
- Removed Content Length from default Header of HTTP POST
- Fix for rsi_dns_update () API failure
- Fix for HTTPS Example, get request was failing
- Fix for issue where module was unable to create SPP connection as Master after deinitialization and initialization
- Fix for Hang issue after Rejoin Failure
- Change to Limit BT Transmit Power to 10dB for EU region

Deprecated Items

None

Newly Added APIs

For understanding backward compatibility of Release 2.0, refer to section "Changes/Enhancements in APIs, Configurations and Mechanisms" in *AT-Command Programmers Reference Manual* and *SAPI Reference Manual*

API	Description
Wi-Fi	

`int32_t rsi_wlan_get_socket_status(int32_t sockID)`	It is used to get status for socket API, as in new driver is storing errors for each socket id, it will take sock id as input and returns error codes.
`void rsi_update_wlan_cmd_state_to_progress_state(void)`	This function is used by wireless library to update the WLAN command state to progress state.
`int32_t rsi_wlan_get_nwk_status(void)`	This function returns the WLAN Network Status
`int32_t rsi_wlan_scan_with_bitmap_options(int8_t *ssid, uint8_t chno, rsi_rsp_scan_t *result,uint32_t length,uint32_t scan_bitmap)`	This function is used to scan the access points available and posts the scan response to application. Application should call this function to get the scan results. Synchronous call
BT/BLE APIs	
`int32_t rsi_ble_start_scanning_with_values(void *rsi_ble_scan_params)`	This function requests the local device to start scanning
`int32_t rsi_ble_set_local_irk_value (uint8_t *l_irk)`	This function is used to set the local irk value
`int32_t rsi_ble_set_wo_resp_notify_buf_info (uint8_t *dev_addr,uint8_t buf_mode,uint8_t buf_cnt)`	This function is used to configure the buf mode for Notify and WO resp commands
`int32_t rsi_ble_gatt_write_response(uint8_t *dev_addr,uint8_t type)`	This function is used to send the local attribute value to remote device
`int32_t rsi_ble_gatt_prepare_write_response(uint8_t *dev_addr,uint16_t handle,uint16_t offset,uint16_t length,uint8_t *data )`	This function is used to send the local attribute value to remote device

`int32_t rsi_bt_change_pkt_type(uint8_t *remote_dev_addr, uint16_t pkt_type)`	This function is used to change the packet types in the controller after connection only.
`int32_t rsi_bt_set_bd_addr(uint8_t *dev_addr)`	This function is used to set the device BD addr
`int32_t rsi_memory_stats_enable (uint8_t protocol, uint8_t memory_stats_enable, uint32_t memory_stats_interval_ms)`	This function is used to issue vendor specific command for setting memory stats enable in controller on given inputs.
`void update_modified_mtu_size (uint16_t rem_mtu_size)`	This function is used to modify MTU size
`int32_t rsi_bt_per_cw_mode(struct rsi_bt_per_cw_mode_s *bt_cw_mode)`	This function is used to keep the device in continuous wave mode.
`void rsi_bt_pkt_change_events_register_callbacks (rsi_bt_pkt_change_stats_t bt_pkt_change_stats_event)`	This function registers the packet change indication Event callbacks
`void rsi_bt_on_chip_memory_status_callbacks_register (rsi_bt_on_chip_memory_stats_handler_t bt_on_chip_memory_stats_event)`	This function registers the memory utilization Event callbacks
Driver	

`int32_t rsi_check_and_update_cmd_state(uint8_t cmd_type,uint8_t cmd_state)`	This API is used by wireless library to check and update the cmd state to progress state.

Modified APIs:

For understanding backward compatibility of Release 2.0, refer to section "Changes/Enhancements in APIs, Configurations and Mechanisms" in *AT-Command Programmers Reference Manual* and *SAPI Reference Manual*

`rsi_wlan_get_status()`	Earlier implementation: Single API was used to get the return status of any SAPI command in case for a failure. The same API was used to get socket API status as well. Current implementation: A new API is added to get return status for socket APIs based on socket ID input. Latest SAPI driver stores response for each socket id.
`BD Address Format change in Application`	BD address input to SAPI changed from ASCII to HEX. Backward compatibility maintained through compile macro BD_ADDR_IN_ASCII in rsi_bt_config.h/rsi_ble_config.h by user.
`Powersave API Sequence Changes`	Optional for backward compatibility

Recommended Configurations and Application Development Options

- **Wi-Fi**
  - It is recommended to enable bit 16 of "Extended TCP IP Feature" bit map in opermode command for all Wi-Fi Socket Operations from host to ensure graceful handling during asynchronous closures from Peer
  - Aggregation (bit 2 of feature_bit_map) recommended to be enabled in the opermode
  - TCP retransmission count value is recommended to be 30 or higher, so that TCP doesn't disconnect while Rejoin happens
  - For restarting the module, application needs to call rsi_driver_deinit followed by rsi_driver_init and rsi_device_init. For OS cases, additionally needs to call rsi_task_destroy(driver_task_handle)to delete the driver task before calling rsi_driver_deinit and should create again after rsi_device_init using rsi_task_create(..)
  - Register "Join Fail Callback" function every time when join is called, as in the rejoin failure path the callback is deregistered. If not done, this might result in scan not functioning on rejoin failure

- **BT/BLE**
  - In BLE, recommended range of Connection Interval in
    - Power Save (BLE Only) - 100ms to 1.28sec.
    - BT Classic + BLE Dual Mode is >= 200ms.
    - Wi-Fi + BLE coex - 30ms to 250ms
  - In BLE, during Connection, configuration of Scan Interval and Scan Window with same value is not recommended
  - In BT Classic, recommended Sniff Interval configuration during Power Save is limited to 100ms (<= 100)
  - In BLE, if a device is acting as Master/Slave, scan window (in set_scan_params and create_connection command) must be less than the existing Connection Interval
  - In BLE mode, if scanning and advertising is in progress and subsequently it gets connected and moves to master role, then scanning and advertising stops. To further establish connection to another slave device or to a master device, application should give command for starting advertising and scanning again

- **Co-Ex**
  - In Wi-Fi + BLE, during Wi-Fi connection, lesser BLE scan Window and larger BLE scan Interval are recommended
  - For Wi-Fi+BT+BLE operating mode, recommendation is to connect Wi-Fi ahead of BT/BLE connections, to ensure seamless stable connection of all 3 protocols

- For Wi-Fi+BT+BLE operating mode, if BT/BLE needs to be connected ahead of Wi-Fi connection, recommendation is to use with high supervision timeout and high connection interval for BLE; and high sniff interval for BT, to ensure seamless stable connection. This configuration will also ensure stable BT/BLE connection in the scenario where Wi-Fi connects/disconnects/rejoins.

- **System**
  - For User Store configuration and Configuration Save, it is recommended that power save is not enabled and saved as configuration. Otherwise, if power save is enabled and saved as configuration, module upon boot up will come up with the saved configuration and will go to power save without any indication to host.
  - Set Optimization level to "O0" in project settings for IDE (KEIL, CUBE)
  - Memory Configuration is mandated to be 384K for BT/BLE and Co-Ex Operating Modes
    - Usage of Low Power Flash mode bit (Bit 19 in Extended customer feature bitmap)
      - Disable this bit for High Wi-Fi throughput use cases
      - Enable this bit for Ultra low power standby associated scenarios. This results in about 20uA lower Wi-Fi standby associated current consumption.
    - It is recommended not to enable this bit for 384k Memory configuration for this release
  - Memory Configuration in SAPIs: Default memory configuration is 384k. User can configure it to 256/320/384k by changing the macros defined in below two files
    - In rsi_wlan_config.h : RSI_EXT_CUSTOM_FEATURE_BIT_MAP →EXT_FEAT_256K_MODE or EXT_FEAT_320K_MODE or EXT_FEAT_384K_MODE
    - In rsi_common.c : rsi_uint32_to_4bytes(rsi_opermode->ext_custom_feature_bit_map, (EXT_FEAT_256K_MODE (or) EXT_FEAT_320K_MODE (or) EXT_FEAT_384K_MODE | RSI_EXT_CUSTOM_FEATURE_BIT_MAP));
  - For additional details, see "Configuration parameters" in SAPI Reference Manual

Known Issues

- **Network Stack**
  - MQTT disconnection is observed while firmware upgrade using OTAF, when power save is enabled. Advised to disable power save during firmware upgrade and re-enable on upgrade completion
  - Issues observed with TCP long data transfer for memory configurations greater than 256kbytes. However, the issue not seen with Low power mode bit (Bit 19 in Extended Customer feature bit map) disabled
  - Recommended to avoid usage of same UDP socket port number while it is being used.
  - Issues might be observed with bi-directional SSL data stream with WPA2-AES security mode.
  - Recommended MQTT Publish payload is 1kbytes
  - If HTTP Server is configured in the module, MQTT client port should not be port 80
  - Recommend randomizing client port if Rapid connect/disconnect of MQTT session on the same client port with power save is used.
  - Secure SSL Renegotiation not supported in Embedded Networking Stack
  - IPv6 support is not available in this release
  - Issue with connectivity to FTP server when power save is enabled

- **Wi-Fi**
  - For Dual Band (2.4 & 5 GHz) mode, selective scan in 5 GHz channel fails. Workaround is to issue an all channel scan by specifying NULL as SSID for scan API and then go for connect command with the specific SSID
  - If station in concurrent mode (Wi-Fi STA+AP) performs scan, there is possibility for stations connected to AP getting disconnected.
  - Limited Wi-Fi scan results obtained in the Android BLE Provisioning APP
  - Connectivity issues observed in channel 149, 157, 161 & 167 in 5GHz Access Point Mode.
  - Autojoin Feature with GPIO based power save works with UULP_VBATT_GPIO_2 (HOST_BYP_ULP_WAKEUP) and UULP_VBATT_GPIO_3 (SLEEP_IND_FROM_DEV). UULP_VBATT_GPIO_0 usage as SLEEP_IND_FROM_DEV doesn't work
  - For Max Join Retry count, the failure indication code is incorrectly shown as 0Xfffffd6
  - If BG Scan is enabled along with custom feature bit map bit (8) configuration of DFS Channel support, there might be issues in getting IP address for the Wi-Fi STA

- **BT/BLE**
  - Wake on Wireless not supported for BLE

- o BT-HID might not inter-operate with Apple devices
- o In Wi-Fi + BT/BLE Co-Ex mode, high Wi-Fi broadcast traffic, might cause BT/BLE disconnections
- o BT PER Continuous mode support requires proper command sequence when run in multiple iterations

- **Co-Ex**
  - o In Co-Ex Mode if power save is enabled, it stays in enabled state even after Wi-Fi disconnection. Recommended procedure in Co-Ex mode, is to disable power save after every radio_init() and enable it when intended by application
  - o Wi-Fi + BLE operating mode configuration, BLE might disconnect with connection interval higher than 250ms
  - o BLE disconnection might be observed with Wi-Fi + BLE configuration with Wi-Fi continuous data transfer for low BLE supervision timeout configured. For Supervision timeout configured with value 16 seconds no disconnections are observed
  - o In WiFi+BT/BLE configuration, with Wi-Fi disconnects, BT/BLE reconnection issue is observed (refer to earlier section "Recommended Configurations and Application Development options" in this document)
  - o Wi-Fi+BLE/BLE only mode: For SPI as host interface, continuous BLE Tx Notification might result in hang of host interface needing a h/w reset. Issue not seen with discrete burst BLE data

- **System**
  - o There is a known issue with FAST-PSP mode, recommended to use MAX-PSP power save
  - o Wake on Wireless support tested only for UART AT command interface.
  - o For BT/BLE and Co-Ex Opermodes, in unconnected state, message-based power save is not supported
  - o Power Save without RAM retention is not working for SPI interface.

Limitations/Feature Not Supported

- **Wi-Fi/Network Stack**
  - o AMSDU TX is not supported
  - o Fragmentation is not supported
  - o AMSDU's within AMPDU is not supported
  - o Currently module does not support Radio Measurement Requests feature of CCX V2
  - o 802.11k is not supported.
  - o Short GI is not supported
  - o 802.11w is not supported
  - o 40Mhz bandwidth in 2.4GHz band is not supported.
  - o 802.11J channels less than 16 are not supported.
  - o USB host interface and USB Power save not supported.
  - o Total MQTT Command Length, apart from MQTT Publish, should not exceed 150 bytes. This includes at+rsi (start of command) to (end of command)\r\n
  - o User needs to configure MQTT_VERSION in rsi_mqtt_client.h based on server configuration, only version 3 and 4 are supported.
  - o 3SSL, One TCP and 2 SSL, connections are supported concurrently in Wi-Fi only mode
  - o SSL Curve id supported are 15-28. SSL handshake with 3rd party clients depends on this SSL Curve id

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  - o BT Sniff mode does not work if BT multiple slaves feature is enabled
  - o When BT multiple slaves feature is enabled, Master to Slave role switch does not happen
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  - o In Wi-Fi + BLE, during Wi-Fi connection, if both BLE scan interval and window are same then there will be issue in successfully making the Wi-Fi connection.

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  - o WiFi STA + BT + BLE multi-protocol cases require detailed understanding of use cases and associated configurations, contact Silicon Labs Support for more details.
  - o Wi-Fi AP+BLE/Wi-Fi AP+BT/Wi-Fi AP +BT+BLE modes are not supported

Folder Structure Changes

- Following are the Directory Structure change under …/host/
  - o sapis(no change except the directory 'platforms' pulled out)
  - o platforms
    - ▪ STM32
      - Drivers
      - hal
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          - ▪ Projects
        - o Cube_Freertos
          - ▪ Core
          - ▪ Projects
        - o Keil_Baremetal
          - ▪ Core
          - ▪ Projects
            - SPI
              - o AWS_IoT
              - o BT_Alone
              - o eap
              - o Firmware_upgrade
              - o Power_save
              - o sample_project
              - o Throughput
              - o wlan_sta_ble_bridge
              - o wlan_sta_ble_provisioning
            - UART
              - o udp_client

        - o Keil_Freertos
          - ▪ Core
          - ▪ Projects
            - SPI
              - o mqtt_client
              - o sample_project
              - o wlan_https_bt_spp_ble_dual_role
              - o wlan_https_bt_spp_ble_provisioning
              - o wlan_throughput_bt_spp_ble_dual_role
            - UART
              - o udp_client

Release Notes – RS9116.WSC.1.2.24.0014

Date: Monday 8th June 2020

Release Type

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

Release Details

- API Version (SAPI) : 1610.1.2.24.0014
- Firmware Version : 1610.1.2.24.0014
- Package Name : RS9116.NB0.WC.GENR.OSI.1.2.24.0014
- Supported RTOS : FreeRTOS
- Hardware Modules/chipsets : QMS, B00, C00, CC1, AB0, AB1, AA0, AA1

New Features

Wi-Fi

- AT Command Support for MQTT (Embedded MQTT Stack Support)
- MQTT Publish command: Maximum payload length is increased to 1KB for Embedded MQTT Stack
- socket `select()` API support
- Added support for user configurable HTTP header content
- Added support for user configurable memory allocation for SSL sockets in extended TCP/IP feature bitmap
- Enhancements to LTCP Multiple Client connection
- Support for Amazon FreeRTOS wrappers for SAPI for Interoperability
- Gain Table Enhancements for Certification
- Module Initialization fix for 1.8v
- Enhancement to SAPI Library - SAPIs added for WLAN/Systems
- GRAT ARP changes done to proactively send response for missed Broadcast ARPs
- Added support for SDIO pad selection and NPSS GPIO pin configuration in case of 1.8v for SDIO

Bluetooth - Common

- Added Support for BT MAC Spoofing

Bluetooth – Classic

-

Bluetooth – LE

- Added support for whitelist feature based upon advertising payload
- Added ADV data whitelist support in core files
- Added ADV data whitelist parameters
- Bluetooth LE Stack Enhancements for BT-SIG Certification for Stack
- Bluetooth LE MTU Size negotiation with Peer Device

Changes/Issues Fixed

- Support to sustain long silent TCP connection
- Improvements for Wi-Fi connectivity in Co-Existence mode
- Issue with low power mode resulting in occasional Module Hang
- Issue in channel-144 in 5GHz band of transmitting in a wrong frequency
- Issue with SSL certificate loading with index
- Hang Issue with SSL data stream with low power mode enabled.

- Issue of `rsi_socket_connect` API returning without unlocking mutex in error path, sometime resulting in application Hang.
- Connectivity issues with LTCP socket
- WoWLAN GPIO handshake issue during power save
- Corrected default HT capabilities in WLAN Config Files
- TCP Tx Throughput Dip Issue due to Retransmission (frequent in high traffic)
- Renewed SSL Certificates included in the package
- MQTT Disconnect not working with SSL
- Default Memory Configured to 384k
- MQTT Remote Terminate happening while entering PSM2 and when Keep Alive Time is up
- Multithread Synchronization Issue with Socket `select()` Functionality
- Firmware Hang-up Issue when Bluetooth EDR PER Stop command is issued.
- Modified the Support for FreeRTOS. Now one needs to Enable `FREERTOS` Macro if FreeRTOS library is used. Also need to make "driver task handle" global in case of OS

Deprecated Items

None

Driver and Host APIs

- For Linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Newly Added APIs

`rsi_ble_conn_param_resp()`	Function to request connection params update with remote device.
`rsi_ble_white_list_using_adv_data ()`	Function to issue vendor-specific command for setting the advertise report filter in the controller based on the advertise payload.
`rsi_ble_indicate_confirm ()`	Function to send indicate confirmation to remote device.
`rsi_ble_mtu_exchange_event ()`	Function to Send MTU exchange request.
`rsi_bt_get_bt_stack_version()`	Function to know the RSSI of the connected BT/BLE device.
`rsi_gpio_pininit()`	Function for GPIO pin initialization.
`rsi_gpio_writepin()`	Function to write the TA GPIO's high or low using Command from host.
`rsi_gpio_readpin()`	Function to read the TA GPIO's using Command from host.
`rsi_driver_process_recv_data_non_rom()`	Function to processes data receive packet
`rsi_getsockopt()`	Function to get socket option
`rsi_ip_to_reverse_hex()`	IP to Reverse Hex value

| `rsi_port_yield_from_isr()` | This API is used to Yield the task |

Modified APIs

`rsi_mutex_destroy()`	Modified `mutex_destroy` for `select_mutex`.
`rsi_mutex_create()`	Modified `mutex_create` for `select_mutex`.
`rsi_ble_gap_register_callbacks()`	Updated callback with `ble_on_remote_conn_params_request_event`
`rsi_ble_smp_register_callbacks()`	Update callback with `ble_on_cli_smp_response_event`
`rsi_ble_callbacks_handler()`	Updated function with case

- `RSI_BLE_EVENT_CLI_SMP_RESPONSE`
- `RSI_BLE_EVENT_REMOTE_CONN_PARAMS_REQUEST`

| `rsi_bt_prepare_common_pkt()` | Updated function with case |

- `BLE_VENDOR_WHITELIST_USING_ADV_DATA_PAYLOAD`

| `rsi_bt_prepare_le_pkt()` | Updated function with case |

- `RSI_BLE_CMD_INDICATE_CONFIRMATION`
- `RSI_BLE_CONN_PARAM_RESP_CMD`
- `RSI_BLE_MTU_EXCHANGE_REQUEST`

| `rsi_driver_process_common_recv_cmd()` | Updated function with case |

- `RSI_COMMON_RSP_GPIO_CONFIG`

| `rsi_driver_process_wlan_recv_cmd()` | Updated function with case |

- `RSI_WLAN_RSP_SELECT_REQUEST`

`rsi_select()`	Updated function with general enhancements and bug fixes
`rsi_get_rtc_timer()`	Modified for generic usage, also removed length from API
`rsi_driver_init()`	Updated rsi_socket_select_info
`rsi_driver_deinit()`	Modified for generic usage.
`rsi_wireless_init()`	To resolve struck issue when auto config is enabled
`rsi_rx_event_handler()`	Added check for configure GPIO from host
`rsi_http_client_put_start()`	Added Macro for servers which give webpage as response to http put

`rsi_task_notify_from_isr()`	Removed API argument eAction(An enumerated type that specifies how to update the receiving task's notification value)
`rsi_task_notify()`	Removed API argument eAction(An enumerated type that specifies how to update the receiving task's notification value)
`ROM_WL_rsi_set_event_from_isr()`	Added check with FREERTOS

Known Issues

- There is a known issue with FAST-PSP mode, so it is advised not use this mode.
- Issues with SSL bi-directional data stream with WPA2-AES security mode.
- Soft reset does not work, need to call `rsi_device_init` after `rsi_wireless_deinit`.
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- In 40MHz issue in PER mode.
- In Wi-Fi + BT/BLE coex mode, high Wi-Fi broadcast traffic, might cause BT/BLE disconnections.
- IPv6 support has issues.
- Issues with BT PER Continuous mode transmission
- Power Save without RAM retention is not working for SPI interface.
- Publishing of MQTT Max Payload (8884 bytes) might cause stability issues. Max supported publish payload is 1Kbytes
- Total MQTT Command Length, apart from MQTT Publish, should not exceed 150 bytes. This includes `at+rsi` (start of command) to (end of command)\r\n
- Limited Wi-Fi scan results in the Redpine Connect App running on the Android device for BLE provisioning application.
- Comparatively Lower SSL Tx throughput observed for SPI interface
- Intermittently Packet loss observed in SSL Rx with SPI interface
- Secure SSL Renegotiation not supported in Embedded Networking Stack

Wi-Fi/Network Stack Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 802.11k is not supported.
- 40Mhz bandwidth in 2.4GHz band is not supported.
- 802.11J channels less than 16 are not supported.
- USB Power save not supported.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread are not supported
- Power save using SDIO host interface is not supported with 1.8 V power supply.
- After `rsi_wireless_deinit`, user needs to call `rsi_driver_init` and `rsi_device_init`
- User needs to configure `MQTT_VERSION` in `rsi_mqtt_client.h` based on server configuration, only version 3 and 4 are supported.

BT/BLE Recommendations

- In BLE, recommended range of Connection Interval in
  - Power Save - 100ms to 1.28sec.
  - BT Classic + BLE Dual Mode is >= 200ms.
  - Wi-Fi + BLE coex - 30ms to 4sec
- In BLE, during Connection, same values of Scan Interval and Scan Window is not recommended.
- In BT Classic, recommended value of Sniff Interval during Power Save is limited to 100ms (<= 100).
- In Wi-Fi + BLE, during Wi-Fi connection, recommending the lesser BLE scan Window and larger BLE scan Interval.

BT/BLE Limitations/Features Not Supported

- BT Sniff mode does not work if BT multiple slaves feature is enabled
- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- When BT multiple slaves feature is enabled, Master to slave role switch will not happen
- In BLE, if Advertising/Scanning are in progress, and the device moves to Slave/Master role, Advertising/Scanning will be stopped. Provide respective commands to start Advertising/Scanning while being in Slave/Master role.
- In Wi-Fi + BLE coex, if BLE Connection is established with small Connection Interval (< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported.
- In Wi-Fi + BLE, during Wi-Fi connection, if both BLE scan interval and window are same then there will be issue in successfully making the Wi-Fi connection.
- Simultaneous Slave & Master roles (Scatter-net) is not supported.
- In BLE, if a device is acting as Master/Slave, scan window (in `set_scan_params` and `create_connection` command) must be less than the existing Connection Interval.
- In BLE, if Advertising/Scanning are in progress, and the device moves to Slave/Master role, Advertising/Scanning will be stopped. Provide respective commands to start Advertising/Scanning while being in Slave/Master role.
- In BLE, if BLE Connection is established with small Connection Interval(< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported.

Folder Structure Changes

- Added following directories under …/host/sapis/platforms
  - STM_32_FreeRTOS_Projects
  - STM32_DMA
- Added following directories under "docs" folder
  - app_notes
  - cloud_webserver_guides
  - program_manuals
  - quick_start_guide
  - sapis_user_guides

Release Notes – RS9116.SW.1.2.23

Monday 2nd March 2020

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

Wi-Fi

- Added example application to load two SSL certs to RAM and establish two ssl connections
- Added support for rsi_connect API to be called in asyncronous manner, by registering a callback
- Added multiple STM32 based reference projects
- Added support to configure UART hardware flow control for working with Baudrate > 115200
- Added support to get RTC time.
- Added support to modify listen interval (powersave duration) dynamically

Bluetooth - Common

-

Bluetooth – Classic

-

Bluetooth – LE

-

Changes/Issues Fixed

- Resolved issue with hidden ssid scan/connectivity.
- Resolved issue with driver init by updating the `GLOBAL_BUF_LEN` to 15000
- Increased Global Buffer Size
- Resolved issues with multiple connections to LTCP socket
- BLE SCAN results improvements
- Improvements for calculating the RSSI for BLE scan results
- Fixed disconnection issue in BLE pairing
- BLE RX Performance improvements
- WLAN Tx EVM improvement for through
  - Updated Tx gain table and DPD enabled with per chip trained coefficients used from manufacturing RF calibration map.
  - PLL parameters update
- Temperature correction enabled.
- Added makefile for wlan_station_ble_provisioning application.

Deprecated Items

None

Driver and Host APIs

- For linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.

- Soft reset does not work, after `rsi_wireless_deinit` need to call `rsi_device_init`.
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.
- Issues with BT PER Continuous mode transmission happen

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 802.11k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.
- Thread is not supported
- USB Power save not supported.
- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Power save using SDIO host interface is not supported with 1.8 V power supply.
- After `rsi_wireless_deinit`, user needs to call `rsi_driver_init` and `rsi_device_init`
- User needs to configure `MQTT_VERSION` in `rsi_mqtt_client.h` based on server configuration, only version 3 and 4 are supported.

Folder Structure Changes

-

Release Notes – RS9116.SW.1.2.20

Friday 23rd December 2019

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

Wi-Fi

-

Bluetooth - Common

-

Bluetooth – Classic

-

Bluetooth – LE

- Added support to set the MTU size for BLE in AT mode

Changes/Issues Fixed

- Enhanced BLE Scanning Functionality

Deprecated Items

None

Driver and Host APIs

- For linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.
- Soft reset does not work, after `rsi_wireless_deinit` need to call `rsi_device_init`.
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.
- Issues with BT PER Continuous mode transmission happen

Limitations/Feature Not Supported

- AMSDU TX is not supported
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- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 1k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.

- Thread is not supported
- USB Powersave not supported.
- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Powersave using SDIO host interface is not supported with 1.8 V power supply.
- After `rsi_wireless_deinit`, user needs to call `rsi_driver_init` and `rsi_device_init`
- User needs to configure `MQTT_VERSION` in `rsi_mqtt_client.h` based on server configuration, only version 3 and 4 are supported.

Release Notes – RS9116.SW.1.2.17

Friday 19th December 2019

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

Wi-Fi

- Added support for comma in SSID for AT command mode

Bluetooth - Common

-

Bluetooth – Classic

-

Bluetooth – LE

- Added CW Mode support in AT mode

Changes/Issues Fixed

- Enhanced BLE Scanning Functionality

Deprecated Items

None

Driver and Host APIs

- For linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.
- Soft reset does not work, after `rsi_wireless_deint` need to call `rsi_device_init`.
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.
- Issues with BT PER Continuous mode transmission happen

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 802.11k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.
- Thread is not supported
- USB Powersave not supported.

- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Powersave using SDIO host interface is not supported with 1.8 V power supply.
- After `rsi_wireless_deinit`, user needs to call `rsi_driver_init` and `rsi_device_init`
- User needs to configure `MQTT_VERSION` in `rsi_mqtt_client.h` based on server configuration, only version 3 and 4 are supported.

Release Notes – RS9116.SW.1.2.14

Friday 05th December 2019

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

Wi-Fi

-

Bluetooth - Common

-

Bluetooth – Classic

- Added HID reconnect command in AT mode

Bluetooth – LE

- Added authorization support for attributes/services in add_attribute command for AT mode.

Changes/Issues Fixed

- Enhanced BLE Scanning Functionality

Deprecated Items

None

Driver and Host APIs

- For linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.
- Soft reset doesn't work, after rsi_wireless_deint need to call rsi_device_init.
- If station in concurrent mode perform scan, there is possibility for stations.connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.
- Issues with BT PER Continuous mode transmission happen

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 1k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.
- Thread is not supported
- USB Powersave not supported.

- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Powersave using SDIO host interface is not supported with 1.8 V power supply.
- After rsi_wireless_deinit, user needs to call rsi_driver_init and rsi_device_init
- User needs to configure MQTT_VERSION in rsi_mqtt_client.h based on server configuration, only version 3 and 4 are supported.

Release Notes – RS9116.SW.1.2.1

Friday 04th September 2019

Release Status

- Test   ☐
- Alpha   ☐
- Beta   ☐
- Production   ☑

New Features

Wi-Fi

-

Bluetooth - Common

-

Bluetooth – Classic

-

Bluetooth – LE

-

Changes/Issues Fixed

- Updated BT Feature bitmap for Sniff feature and Noise figure feature configurations

Deprecated Items

None

Driver and Host APIs

- For linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.
- Soft reset does not work, after `rsi_wireless_deint` need to call `rsi_device_init.`
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.
- Issues with BT PER Continuous mode transmission happen

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 802.11k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.
- Thread is not supported
- USB Powersave not supported.

- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Powersave using SDIO host interface is not supported with 1.8 V power supply.
- After `rsi_wireless_deinit`, user needs to call `rsi_driver_init` and `rsi_device_init`
- User needs to configure `MQTT_VERSION` in `rsi_mqtt_client.h` based on server configuration, only version 3 and 4 are supported.

Release Notes – RS9116.SW.1.2.0

Friday 30th August 2019

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

- Added support for 40MHz Bandwidth and continuous wave Tx in PER mode
- Added Support for soft reset in PER mode for BT Classic
- Firmware version convention is modified to have customer id
- Added support for Apple iPod Accessory Protocol 2 (iAP2)
- Added support for invalid firmware handling in SAPI arch
- Added a reference example for A2DP sink SBC
- Added chip manufacturing utility example application for NXP FRDM platform
- Added firmware version info in RPS header
- Added Ethernet to Wi-Fi bridge application
- Added example for socket select - callback implementation
- Added support for TCP Window scaling feature
- Added support for 16K SSL record handling
- Added support for IPv6 in SAPIs
- Added example for RAM dump collection for debugging
- Added firmware version in RPS header for firmware image
- Added BT profile/protocol enhancements
- Added HID profile and GATT enhancements

Changes/Issues Fixed

- Stabilized TCP RX throughput in STA + BLE coex mode
- Fixed issues with Multiple firmware upgradation through OTAF AT Command
- Added error handling for sntp command
- Added description for all the bits in feature bitmap configs
- Updated Timeout verification to be generic
- Corrected quick start guides for NXP and RS12100 platforms
- DUT is not able to send data over SPP profile when power save is enabled
- Fixed the opermode failure for BT/BLE Dual mode example
- Fixed the BLE connection issue with dual mode (Added LE L2CAP Signalling checks
- Fixed EDR Tx Power Limit Issue & BT UART Debug Prints
- Fixed connectivity issues with server socket in UDP client and TCP client
- Resolved compilation errors for STM32 project
- Resolved compilation errors ip6 app
- Fixed the issue of fixed supervision timeout of 32 seconds in case of coex mode, even respective coex nodes are not initialized
- Increased BT_CFG_HCI_CMD_TIMEOUT to wait more time for consecutive HCI Tx commands in case of power save
- Modified ble_notify & ble_indicate value SAPIs for proper mac address handling
- Fixed issue with GATT read request from remote device to host for an attribute that is created with config_bitmap set
- Resolved connectivity issues with Azure cloud
- Added error handling for zero length BLE indications
- Resolved issue with TCP ACK indication feature.
- Resolved connectivity issues after socket close command is issued
- Corrected dependencies for SAPI SDIO layer

- Fixed issue with received data for SNTP example in SAPIs
- Resolved connectivity issues with AWS server if bitmap TCP_IP_FEAT_SINGLE_SSL_SOCKET is enabled
- Enhanced stability of data transfer, when BG scan and PS are enabled.
- Stabilized BLE connection state while in powersave
- Resolved connectivity issues with Azure cloud
- Fixed hang issue when diconnect is sent after TCP socket close
- Fixed issues with deinit SAPI
- Changed bt_feature_bit_map 12 to 13 for bt_sniff_disable feature enabling

Deprecated Items

None

Driver and Host APIs

- For linux platform the Kernel versions supported are 3.6.10 to 4.5.5

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.
- Soft reset does not work, after `rsi_wireless_deinit` need to call `rsi_device_init`.
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.
- Issues with BT PER Continuous mode transmission happen

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 802.11k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.
- Thread is not supported
- USB Power save not supported.
- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Powersave using SDIO host interface is not supported with 1.8 V power supply.
- After `rsi_wireless_deinit`, user needs to call `rsi_driver_init` and `rsi_device_init`
- User needs to configure `MQTT_VERSION` in `rsi_mqtt_client.h` based on server configuration, only version 3 and 4 are supported.

Release Notes – RS9116.SW.1.1.1

Friday 18th April 2019

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

- Support for the BLE Gatt Async Call backs.
- Support for the SMP Keys storage in the host.
- Added support to show firmware version in BLE provisioning mobile app.
- A2DP Power Optimization and the Coex Enhancements.
- Added support for sending upto 8KB on TCP/IP socket.
- Added configurability to enable/disable WLAN keep alive packet transmission.
- Added support to receive large http post data.
- Added support for secondary dns server configurations in SAPIs.
- Added Certificate Bypass feature.
- Added support to configure RTS Threshold
- Added support for user to configure Gain table
- Added a dummy hal file (`rsi_hal_platform_init.c`) for ease of porting SAPIs

Changes/Issues Fixed

- Resolved glitches observed when RSI BT module is A2DP source initiator.
- Resolved issues with preauthentication in WLAN.
- Resolved kernel crashes when SDIO connector is removed
- Fixed issues with station ping example.
- Fixed hang issue when dual band BG scan with powermode 2 is used.
- Added error check for WLAN PER mode length in continuous mode.
- Fixed stack corruption issue in BT/BLE + WLAN coex mode.
- Resolved issues with higher TCP data length.
- Path for all songs is corrected in A2DP source AVRCP.
- Correct HT info field when 11J mode is used.
- Incorrect firmware version sent to host is fixed in SDIO.
- Stabilized connectivity with 16 clients in AP mode
- Resolved issues with CMD53 r/w after DUT wakes up from powersave
- Resolved issues with ULP power save in mode 8 and mode 9.
- Improved stability of BT A2DP source device
- Fixed issues with soft reset
- In AP mode corrected the number of STBC spatial stream
- Fixed issues with ACS in AP mode
- Fixed issues with BG scan during roaming
- Resolved issues with Coex performance
- Fixed issues with Wi-Fi-Direct connection in 5GHz band (Dual band module)
- In BT PER mode, RSSI value in receiver stats is updated correctly
- Fixed issues with BT/BLE powersave
- Resolved issues with DNS responses being consumed even if DNS client is disabled
- Resolved issues with AP creation when ACS is enabled for Japan and Europe region
- Resolved issues with all channel scan when 802.11J is enabled
- Stabilized HTTP put request when sent multiple times
- Corrected MGMT sequence number in Association request packet
- Improved DNS resolution time
- Fixed stability issue with wireless firmware upgradation

- Fixed issue with http data transfer with window feature enabled
- Fixed issue related to EDCA contention params configuration
- Fixed stability issue with continuous PER mode
- Improved power consumption by restricting compiler generated RO data to RAM
- Resolved issues with ARP response during powersave
- Resolved error thrown by LTCP command after disconnection & connection
- Added support for Firmware query command before rsi_wireless_init

Deprecated Items

None

Driver and Host APIs

- Added RS12100 platform support for SDIO host interface in SAPIs.
- Added RS12100 platform support for SPI companion card.
- Added FRDM-K28 platform board based applications.
- Added SDIO support for Linux Platform, verified from Kernel version 3.6.10 to 4.5.5
- Added support for `rsi_device_deinit()` and `rsi_driver_deinit()` API's.

Known Issues

- Issues with SSL data stream with low power mode enabled.
- Issues with SSL bi-directional data stream with security.
- Soft reset doesn't work, after `rsi_wireless_deinit` need to call `rsi_device_init`.
- If station in concurrent mode perform scan, there is possibility for stations, connected to AP might disconnect.
- 40MHz issue in PER mode.
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause. BT/BLE disconnections.
- Issues with IPV6.

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 802.11k is not supported.
- 2G 40Mhz is not supported.
- 11J channels less than 16 are not supported.
- Thread is not supported
- USB Power save not supported.
- BT A2DP Source Power Save + Coex is supported only for the SBC Pass through Mode.
- Low power mode is not supported in 40MHZ mode
- ZigBee & Thread is not supported
- Powersave using SDIO host interface is not supported with 1.8 V power supply.

Release Notes – RS9116.SW.1.0.5

Thursday 1st November 2018

Release Status

- Test   ☐
- Alpha   ☐
- Beta   ☐
- Production   ☑

New Features

- Added support for SPP, A2DP continous play and continous download

- ZigBee is supported

Changes/Issues Fixed

- Resolved issues with WLAN, BT coex functionality
- Resolved issues with Windows 10 client connecting to redpine AP
- Fixed issues with http put request response to get webpage

Deprecated Items

None

Driver and Host APIs

-

Known Issues

- If station in concurrent mode perform scan, there is possibility for stations connected to AP might disconnect
- AP + BLE , WLAN + Bt Dual Mode are Supported in 256KB TA Mode only.
- 40MHz issue in PER mode
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause BT/BLE disconnections

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported in concurrent mode
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 1k is not supported.
- Thread is not supported
- USB Power save is not supported
- In BLE, if Advertising/Scanning are in progress, and the device moves to Slave/Master role, Advertising/Scanning will be stopped. Provide respective commands to start Advertising/Scanning while being in Slave/Master role.
- In WLAN + BLE coex, if BLE Connection is established with small Connection Interval (< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported.
- In BLE, if a device is acting as Master/Slave, Scan Window (in `set_scan_params` and `create_connection` command) must be less than the existing Connection Interval.
- In BLE, if BLE Connection is established with small Connection Interval (< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported.
- BT Sniff mode does not work properly in Wi-Fi + BT Co-ex Mode.
- Directed Advertising is present in the Standalone- BLE Mode.
- BLE Power Save for the Longer Duration (more than 500msec) regression issues.
- BT A2DP Source role with AVRCP target role.
  - For input audio file formats has below limitations
    - MP3(.mp3) with Constant bitrate, sampling frequency of 44.1kHz
    - PCM(.wav) with sampling frequency 44.1kHz
- In BT A2DP profile source role, SBC Encoder capabilities supported for Joint Stereo & sampling frequency 44.1 KHz.
- A2DP source supported for USB and SPI interfaces only.
- While playing MP3 song will be muted for ~5 sec in between playback.
- BT A2DP profile supported configurations for the sbc bit pool is upto 35(229kbps).
- BT A2DP Power Save + Coex is supported only for the SBC Pass through Mode.

Release Notes – RS9116.SW.1.0.4

Thursday 18th October 2018

Release Status

- Test ☐
- Alpha ☐
- Beta ☐
- Production ☑

New Features

- In BLE added support for Multiple Master & Multiple Slave

Changes/Issues Fixed

-

Deprecated Items

None

Driver and Host APIs

-

Known Issues

- If station in concurrent mode perform scan, there is possibility for stations connected to AP might disconnect
- AP + BLE , WLAN + Bt Dual Mode are Supported in 256KB TA Mode only.
- 40MHz issue in PER mode
- In WLAN + BT/BLE coex mode if high Wi-Fi broadcast throughput might cause BT/BLE disconnections

Limitations/Feature Not Supported

- AMSDU TX is not supported
- Fragmentation is not supported
- AMSDU's within AMPDU is not supported
- IPV6 is not supported in concurrent mode
- IPV6 is not supported is not present in SAPI
- Currently module does not support Radio Measurement Requests feature of CCX V2
- 1k is not supported.
- Thread is not supported
- USB Power save is not supported
- In BLE, if Advertising/Scanning are in progress, and the device moves to Slave/Master role, Advertising/Scanning will be stopped. Provide respective commands to start Advertising/Scanning while being in Slave/Master role.
- In WLAN + BLE coex, if BLE Connection is established with small Connection Interval(< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported.
- In BLE, if a device is acting as Master/Slave, Scan Window (in `set_scan_params` and `create_connection` command) must be less than the existing Connection Interval.
- In BLE, if BLE Connection is established with small Connection Interval (< 15ms), simultaneous roles (i.e. Master/Slave + Advertising/Scanning) are not supported.
- BT Sniff mode does not work properly in Wi-Fi + BT Co-ex Mode.
- Directed Advertising is present in the Standalone- BLE Mode.
- BLE Power Save for the Longer Duration (more than 500msec) regression issues.
- BT A2DP Source role with AVRCP target role.
  - For input audio file formats has below limitations
    - MP3(.mp3) with Constant bitrate, sampling frequency of 44.1kHz

- ▪ PCM(.wav) with sampling frequency 44.1kHz
- In BT A2DP profile source role, SBC Encoder capabilities supported for Joint Stereo & sampling frequency 44.1 KHz.
- A2DP source supported for USB and SPI interfaces only.
- While playing MP3 song will be muted for ~5 sec in between playback.
- BT A2DP profile supported configurations for the sbc bit pool is upto 35(229kbps).
- BT A2DP Power Save + Coex is supported only for the SBC Pass through Mode.

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