NEW RADIO COMMUNICATION FOR NEW ERA

NRC7292 Standalone SDK Release Note

(v1.3.4_rev09)

Ultra-low power & Long-range Wi-Fi

Ver 1.0
Oct. 24, 2022

NEWRACOM, Inc.

NRC7292 Standalone SDK Release Note (v1.3.4_rev09)
Ultra-low power & Long-range Wi-Fi

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1 Overview

Newracom's NRC7292 is world's first IEEE 802.11ah solution in the market. The IEEE 802.11ah is the new Wi-Fi standard targeting at various IoT applications. NRC7292 offers two different modes, a host and standalone mode. The host mode needs external host like a Raspberry Pi3 used in Newracom's EVK. In this mode, NRC7292 offers 11ah Wi-Fi connectivity. Unlike a host mode, users can write their applications with APIs provided along with a standalone package and build its binary with SDK and runs on NRC7292. By using various peripheral interfaces in NRC7292, users can read sensor data and send it to the server through 11ah network. NRC7292 also provides AT commands application in standalone mode. Users can use the AT commands to utilize the 11ah Wi-Fi.

2 Contents of software release package

The software release package contains all the necessary components including the firmware library, header files, api source codes, sample codes, downloader tool, makefile and documents to make use of the latest features. Figure 2.1 and Table 2.1 show the directory structure and contents of the package, respectively. 'standalone_kr_mic' and 'standalone_kr_usn' package. Please reference 'UG-7292-003-S1G_Channel.docx'

```
..
├──standalone─── doc
│               ├─── lib
│               ├─── make
│               ├─── sdk
│               │     ├─── inc
│               │     └─── apps
│               └─── tools
│                     ├─── external_tools
│                     └─── AT_CMD_Test_Tool
├──standalone_kr_mic
└──standalone_kr_usn
```

Figure 2.1 NRC7292 standalone SDK package directory

Table 2.1 Contents of NRC7292 standalone SDK package

Directory	Description
doc	documents for standalone guide ducoument and sdk api lists
lib	nrc7292 modem library and 3rd party libraries.
make	makefiles and configuration files
sdk	standalone user sdk folder
inc	sdk api header files and sdk common header file.
apps	several kinds of reference sample applications. An AT command application is included.
atcmd_binary	ATCMD binaries
tools	tools folder
AT_CMD_Test_Tool	AT command test tool for UART interface
external_tools	The XIPFirmwareFlashTool is a firmware uploader. The DM(Diagnostic Monitor) tool can be used to perform LMAC-level TX/RX performance test and graphically monitor relevant statistics in real time. The DUT2DUT Test Program is a windows GUI(graphical user interface) tool for performing various LMAC-level TRX tests and estimating channel noise levels using NRC7292 AH modules

The information of the library released in this package is as follows.

- Library (including 3rd party)
  - Name : libmodem.a
  - Location : lib/modem
  - Version : 1.3.4 (rev09)
  - Build date : Oct. 24, 2022

3 Standalone SDK Package

3.1 General guide

The developer can use the 'UG-7292-004-Standalone SDK.pdf document for general description. This document explained setup the S/W build environment, compiling standalone binary, download binary and sample applications.
Supported API list are explained in 'UG-7292-005-Standalone SDK API.docx'. The developer can use APIs for NRC7292. The user can implement service related to Wi-Fi connection, peripherals. AT-command guide document is 'UG-7292-006-AT_Command.pdf.

3.2 Supported 3rd party libraries

The followings are 3rd party libraries included in NRC7292 standalone SDK package. 'UG-7292-005-Standalone SDK API.docx' has the descriptions and URLs for 3rd party libraries. The FreeRTOS, LwIP and Mbedtls is mandatory 3rd party libraries for standalone SDK.

- **FreeRTOS**
- **Lwip**
- **Mbedtls**
- **MQTT**
- **LibCoap**
- **cJson**
- **Mini-XML**
- **AWS (Amazon web service)**
- **TINYCBOR**
- **NVS**
- **BME680**

4 SW Release Package

4.1 Features in version 1.3.4

Followings are features included in NRC7292 software release package.

- **Build Environment**
  - Update Linux based build environment (v.1.3.0)
- **ATCMD**
  - AP roaming command (v.1.3.2)
  - FOTA command (v.1.3.2)
  - AP Roaming command (v.1.3.2)
  - Power Save (v1.3.4)
  - WPA3-SAE/OWE (v1.3.4)

4.2 Resolved issues

The table is the resolve issues since v.1.3.1.

Table 4.1 Resolved issues

Version	Description
v1.3.1	**Sending block in softap tcp server** Sending block during multiple tcp receiving and sending operations in non-blocking socket
	Fix AT+ATZ operation
	Fix the system assert when the unsupported channel is assigned in softap
v1.3.2	**Fix ToS(IP Header) to TID/AC mapping issue**
	Fixed to reflect beacon rssi value in scan results
	Fixed Background scan issue in standalone STA
	Fix an issue where UART settings are not changed with the AT+UART set command.
	Improvement downlink throughput in 4MHz
	Fix Association Timeout Issue : Set Fragment Number to be 0

v.1.3.4	**Improvement reconnection time after deep sleep**
	Fix a hang issue during modem sleep
	Fix abnormal addba/delba operation for AMPDU
	Fix an issue that the scan is repeated without reassociation
	Fix an issue that DHCP client is blocked
v.1.3.4 rev01	**Fix wakeup issues in modem sleep**
	Fix scan results flags for WPA3 in atcmd
v.1.3.4 rev02	**Fix iperf bug in raspi-atcmd-clli (v1.2.2)**
	Fix channel setting issue. Add new country code for ATCMD
v.1.3.4 rev03	**N/A**
v.1.3.4 rev04	**Added US full channels (45 Channels) for 11AH : 'a' channels and some 'g' channels**
	Added return value when buffer allocation is failed
	Fixed ATCMD FOTA download issue
	Fixed ATCMD ROAMING connection issue
	Fixed Roaming and Scan issues
	Fixed NDP Probe Request after deep sleep
	Added to set BI/SBI during connection on STA
	Fixed not enter modem sleep
v.1.3.4 rev05	**Fixed DHCP server's MTU size for fixing unintended MPDU size after association**
	Fixed scan operation with channel lists
v.1.3.4 rev06	**Exception handling of IP length mismatch**
v.1.3.4 rev07	**N/A**
v.1.3.4 rev08	**Fix TX power setting for response control frame**
v.1.3.4	**Improve the spurious emission performance in JP channels**

rev09	

4.3 Changed items

The table is the changed items since v.1.3.1.

Table 4.2 Changed items

Version	Description
v1.3.1	**Support KR MIC band (925.5-930.5) in host_kr_mic package** standalone_kr_mic package supports 925.5 – 930.5 Mhz for KR.
	Enhancement ATCMD with uart Increase the supported max baudrate (115200) using DMA
	Added i2c sensor read operation in sample_ps_tcp_client
	Added Non-tim mode deep sleep in sample_ps_standalone & sample_ps_tcp_client Assign interval for deep sleep duration
	Change temperature compensation value Temperature power offset is now linearly interpolated, etc.
v1.3.2	**RX gain table, RSSI offset, LNA Swithcing point, 2Mhz mode threshold value**
	Restructuring sf_sys_config_t data structure in FLASH
	Rename for add_network function and added remove_network in wifi api
	Added 'AT+WFOTA' and 'AT+WROAM'
v1.3.4	**Support APIs for WPA3 SAE/OWE**
	Added WPS-PBC in sample_wps_pbc
	Enhancement of stability with WDT Reset
	Support BSS Max Idle
	Support CSA (Channel Switch Announcement)
	Add new events for FOTA operation
	Add AT+WSTAINFO, AT+WSLEEP and removed AT+SLEEP, AT+WMCS
v1.3.4 rev01	**Add ATCMD sources in a package**
	Disable the default CONFIG_WPS feature in FreeRTOS.config

v1.3.4 rev02	**Add build configuration info in ATCMD logs**
v1.3.4 rev03	**Change ATCMD task priority from 0 to 2**
v1.3.4 rev04	**Update FOTA operation using json file**
	Enable NDP Probe Request by default
	Update Wi-Fi events (v1.22.4)
	Added time & wakeup api
	Added NVS to start default if CONFIG_NVS_FLASH is defined
	Sample for Power save (Non-Tim mode)
	Added API for Carrier sensing(CS) time and Pause time
	Update console print function to enable/disable print from user app
v1.3.4 rev05	**Added APIs (ATCMD & SDK API)** **: duty cycle, CCA threshold, set mcs, bss max idle**
v1.3.4 rev06	**Updated APIs and related samples** **: spi, uart, i2c**
	Added standalone board data
	Added set/get scan frequency list
	Updated an ATCMD host application
v1.3.4 rev07	**Update reverse_scrambler configuration to interoperate with HaLow certified device** To be interoperable with nrc7292_sw_pkg v1.3.4 rev04
v1.3.4 rev08	**Update AU/NZ channels according to IEEE 802.11-2020**
	Update JP channels
v1.3.4 rev09	**Enable the 1MHz TX filter for JP channel**
	Enable traveling pilot

4.4 Known issues in the release package

Table 4.3 presents all know issues in the version 1.3.4_rev09.

Table 4.3 Known issues

Category	Description
Security	First connection time for WPA3-SAE/OWE is quite long (> 15 seconds) for big number operation by SW