RSL10 CMSIS-Pack Release Notes – 3.0

July 4, 2019

RSL10 is a Bluetooth® 5 certified multi-protocol radio System-on-Chip (SoC) that brings the industry's lowest power Bluetooth low energy technology to wireless applications. The RSL10 Software Development Kit (SDK) includes the firmware, software, and documentation needed to evaluate this chip and develop applications based on RSL10. The SDK is distributed through a CMSIS-Pack, which supports the following integrated development environments:

- ON Semiconductor IDE (Eclipse)
- Arm® Keil® Vision® IDE (tested with version V5.26.2.0)
- IAR™ Embedded Workbench® (tested with version 8.32.3)

This document lists new features in this release, describes known issues, and points you to more information so you can start using the product.

What's New

Summary	Release Notes
CMSIS-Pack components for CMSIS-Drivers created	The CMSIS-Drivers have been converted into components, so the source code is no longer replicated in every sample application. In order to build applications that use the CMSIS-Drivers, the user needs to install the ARM.CMSIS pack.
CMSIS-CORE updated to version 5.5.1	In order to support FreeRTOS, the CMSIS-Core (cmsis-lib) header files have been updated to version 5.5.1.
Bluetooth Low Energy abstraction applied to peripheral_server_PRA sample project	The *peripheral_server_PRA* sample application has been refactored to use the Bluetooth Low Energy abstraction. The application is now named *ble_peripheral_server_PRA*.
Delay can now be applied to slave latency	By using the API BLE_DeviceParam_Set_SlaveLatencyDelay(uint8_t latencyDelay) after Bluetooth Low Energy initialization, an application can set a desired delay to the instant that slave latency is applied, after the time instant that is indicated in the connection indication or the connection parameter indication coming from a master device. In addition, when a non-empty packet is received or a non-empty packet is supposed to be sent, slave latency will be delayed for multiple connection intervals specified by latencyDelay. By default, slave latency delay is zero. Please note, this parameter is applied per device, not per link.
LPDSP32 applications updated to be CMSIS-Pack compatible	The RSL10/LPDSP32 sample projects (*Fibonacci* and *AudioCodecs*) have been updated to build using the RSL10 CMSIS-Pack.
Replaced the weak_prf library	The *weak_prf* library has been replaced with the *stubprf.c* file added to the Bluetooth Low Energy API component.
peripheral_server_sleep application now uses the non-light version of the stack by default	The sample application *peripheral_server_sleep* has been updated to use the non-light variant of the Bluetooth Low Energy stack by default (Debug and Release build configurations). Instructions on how to modify the project to use the light variant of the Bluetooth Low Energy stack have been added to the readme file. The light variant is no longer available through the build configurations because the *.rteconfig* file in the CMSIS-Pack is not synchronized with the build configuration.
FreeRTOS integrated into RSL10 CMSIS-Pack	Added FreeRTOS support with 3 new sample applications: *freertos_blinky*, *freertos_ble_peripheral_server_bond*, and *freertos_ble_central_client_bond*. In order to build these sample applications, the user needs to install the ARM.FreeRTOS CMSIS-Pack.
Bluetooth Low Energy abstraction applied to central_peripheral sample project	The *central_peripheral* sample application has been refactored to use the Bluetooth Low Energy abstraction. The application is now named *ble_central_peripheral*.
DMA Driver and sample application added to RSL10 CMSIS-Pack	A new DMA Driver peripheral abstraction and sample application have been added. This driver is re-used in all other CMSIS-Drivers to provide DMA support and avoid code duplication. The driver can be easily configured using the *RTE_Device.h* header file through the CMSIS Configuration Wizard.
DMA Support for I2C CMSIS-Driver added	DMA Support for the I2C CMSIS-Driver has been added. The *i2c_cmsis_driver* sample application has been updated to demonstrate the new feature. The DMA usage can be easily enabled or disabled in the sample application using the *RTE_Device.h* header file through the CMSIS Configuration Wizard.

DMA Support for SPI CMSIS-Driver added	DMA Support has been added for the SPI CMSIS-Driver. The *spi_cmsis_driver* sample application has been updated to demonstrate the new feature. The DMA usage can be easily enabled or disabled in the sample application using the *RTE_Device.h* header file through the CMSIS Configuration Wizard.
GPIO Driver now integrated into RSL10 CMSIS-Pack	A GPIO Driver peripheral abstraction and sample application have been added. The driver can be configured using the *RTE_Device.h* header file through the CMSIS Configuration Wizard GUI. See the *gpio_driver* sample application for more details.
Tx output power now consistent with datasheet	The target transmission power in the Sys_RFFE_SetTXPower function has been updated to be in the range [-17,+6] dBm, as specified by the datasheet.
DMA Support for UART CMSIS-Driver added	DMA Support has been added for the UART CMSIS-Driver. The *uart_cmsis_driver* sample application has been updated to demonstrate the new feature. The DMA usage can be easily enabled or disabled in the sample application using the *RTE_Device.h* header file through the CMSIS Configuration Wizard.
RSL10 Getting Started Guide: Migration to CMSIS-Pack added	RSL10 Getting Started Guide has been updated with instructions on how to migrate existing projects to CMSIS-Packs and vice-versa.
RSL10 HW Ref Manual: Improvements to ASRC Section	• Table 34: corrections for MODE1 (changed 0.4 to 0.84), and data added for MODE2. • added explanation about the different ASRC modes added before Table 34 • Figure 38: names for "_CNT" registers corrected by removing counters • paragraph beginning with "The audio sink clock being measured is sourced from" on page 386 put into an IMPORTANT table to stand out • register names DMA_CTRL0_SRC_ADDR_STEP_MODE and DMA_CTRL0_SRC_ADDR_STEP_SIZE in the Peripherals chapter corrected to SRC_ADDR_STEP_SIZE and SRC_ADDR_STEP_MODE, respectively
Fixed value for advDelay access is allowed	The advDelay parameter can be set to zero instead of a random value using the BLE_DeviceParam_Set_AdvDelay(0) function, allowing for an advertisement event to happen at a fixed interval. Note this is for applications that are not Bluetooth Low Energy compliant.
ON Semiconductor IDE: Sample project folder automatically refreshed after build	All the sample projects have been updated to have the refresh policy configured. Manually refreshing the projects after build is no longer necessary in the ON Semiconductor IDE (Eclipse).
Capability to increase slave latency in preferred slave latency feature added	The application now can send a request to the Bluetooth Low Energy stack to decrease and now also increase slave latency. Note that the application is responsible for saving the peer master device's slave latency to avoid asking for an increase that is more than the one set by the application.
RSL10 HW Reference Manual: added radio timing and PA power-up specifications	Documentation details regarding radio timing and PA power-up have been added to the RSL10 Hardware Reference, including calculation of timing from idle to Tx on/Rx on, delay values for PA ramp-up and ramp-down, and ramp-up steepness and duration.
CMSIS-Pack Manager plugin exception fixed	Fixed nullPointerException in the CMSIS-Pack manager plugin for the ON Semiconductor IDE (Eclipse). Now handling the exception when the list of local installed packs is empty.
Support for up to 8 simultaneous links in Bluetooth Low Energy stack	The number of possible simultaneous links has been increased to 8 for all Bluetooth Low Energy stack variants (expect the light stack which still supports only one connection). Note that applications using the non-light variant of the Bluetooth Low Energy stack need to use pre-processor CFG_CON=8.
Bluetooth Low Energy stack abstraction layers as a CMSIS-Pack component	The Bluetooth Low Energy stack abstraction layers have been converted into a CMSIS-Pack component making the code reusable across projects and no longer needs to be duplicated locally for each application.
RSL10 Getting Started Guide includes IAR instructions	RSL10 Getting Started Guide includes instructions to get started with the IAR development environment and the RLS10 IAR sample projects in the RSL10 CMSIS-Pack
Sample applications consolidated	The following sample applications have equivalent enhanced versions and have thus been removed from the RSL10 CMSIS-Pack: *I2C_master* (replaced by *i2c_cmsis_driver*) *I2C_slave* (replaced by *i2c_cmsis_driver*) *SPI_master* (replaced by *spi_cmsis_driver*) *SPI_slave* (replaced by *spi_cmsis_driver*) *simple_UART_DMA* (replaced by *uart_cmsis_driver*) *simple_UART* (replaced by *uart_cmsis_driver*) *PCM_master* (replaced by *sai_cmsis_driver*) *PCM_slave* (replaced by *sai_cmsis_driver*) *central_client* (replaced by *ble_central_client_bond*) *central_peripheral* (replaced by *ble_central_peripheral*) *peripheral_server_bond* (replaced by *ble_peripheral_server_bond*) *central_client_bond* (replaced by *ble_central_client_bond*) *peripheral_server_hrp* (replaced by *ble_peripheral_server_hrp*) *peripheral_server_pra* (replaced by *ble_peripheral_server_PRA*)

SAI Driver and sample application now integrated into RSL10 CMSIS-Pack	A new SAI (Serial Audio Interface) CMSIS-Driver and sample application been added to the CMSIS-Pack. The driver implements both PCM and I2S modes with optional DMA support.
Firmware and documentation unbundled from IDE installer	The RSL10 firmware is no longer bundled with the IDE installer. Firmware is now delivered exclusively as the CMSIS-Pack that can be imported into multiple supported IDEs.
RSL10 Getting Started Guide: Debug In Sleep Mode section added	RSL10 Getting Started Guide has been updated with instructions on how to effectively use the debugger with sleep mode.
ON Semiconductor IDE: Java runtime environment bundled	A compatible version of the Java runtime environment is bundled with the ON Semiconductor IDE, so Java no longer needs to be installed as a prerequisite.
Sys_RFFE_SetTXPower band edge emissions improvements	The power amplifier and bias configuration in the Sys_RFFE_SetTXPower function have been updated to improve band-edge emissions performance for target power values from 3 to 6 dBm.
ON Semiconductor IDE: CMSIS-Pack plugins customized	The Eclipse CMSIS-Packs plugins have been customized to: 1. Stop triggering automatic CMSIS-Pack index updates through the web 2. Have the pack root folder set by default to: C:\Users\<user_id>\ON_Semiconductor\PACK
RMP protocol works with Bluetooth Low Energy 2Mbps	Remote Mic Protocol was designed to work in coexistence with Bluetooth Low Energy at 1 Mbps but now also supports Bluetooth Low Energy link at 2 Mbps. The *remote_micLib* has been updated.
ON Semiconductor IDE: gnu-mcu-eclipse plugins updated	Upgraded the gnu-mcu-eclipse plugins in the ON Semiconductor IDE (Eclipse) to the latest version (4.5.1). This version includes multiple improvements and a new Peripheral Registers View. The *rsl10.svd* file is now configured in the debug session setup. The old *embsysreg* plugin has been removed. New instructions on how to use the new peripheral registers view are available in the *RSL10 Getting Started Guide*.
RSL10 FOTA User Guide: now includes signature validation	The *RSL10 Firmware Over the Air User's Guide* has been updated with more details regarding the signature validation procedure.
ON Semiconductor IDE: rebranded	The IDE has been re-branded as "ON Semiconductor IDE", as opposed to "RSL10 Development Tools".
Synchronization of non-connected stack activity	The application can configure the stack to receive an event called GAPM_ACT_START_IND when the controller indicates the commencement of a start advertising command, start scan command, or start connection command. To enable this event, set the `att_cfg` field in GAPM_SET_DEV_CONFIG_CMD. Note that the field `att_cfg` in struct `gapm_set_dev_config_cmd` has been renamed to `att_and_ext_cfg`.
Library linkage order issues and circular dependencies resolved	The linker expert settings in all sample projects for the ON Semiconductor IDE have been updated to make the GCC linker resolve circular dependencies. Therefore, specific library linkage order is no longer required.
sleep_RAM_retention sample application: more flexibility in selecting RTC alarm interval	The RTC configuration in the sleep_RAM_retention sample application has been updated to allow arbitrary alarm intervals.
Keil: added peripheral_server_sleep sample application	Added the peripheral_server_sleep sample application for the Keil environment.

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Bug Fixes

Summary	Release Notes
The stack answers the ATT protocol while the link is connected/disconnected	During link disconnection and reconnection, the number of available buffers between the controller and host was not communicated correctly, and this caused no buffers to be available for the L2CAP protocol. Now, at link disconnection, the controller informs the host that buffers are added, so the issue is resolved.
Incorrect RSSI value for connected mode resolved	It was reported that during scan mode, RSSI was in the expected range, while in connected mode for empty packets it was lower than expected. This issue has now been resolved.

GAPM_CANCEL_CMD description clarified	The description of the returned value for the "operation" field of GAPM_CMP_EVT has been clarified in the GAP interface specification.
Remote microphone protocol can no longer detect other transmitter packets	When the access word of a receiver in RMP had only one or two bits difference with a transmitter access word, it was possible for the receiver to detect the packets coming from this non-desired transmitter. This issue has been fixed.
Channel map is accepted	Resolved an issue which caused the channel map to be rejected in some situations while no link layer procedure was ongoing.
Behavior fixed when Bluetooth Low Energy link switches between connected and not-connected mode quickly	If the Bluetooth Low Energy link was connected and lost continuously and quickly (for example, by toggling Bluetooth on iPhones (enabling and disabling), or when the device was at the boundary of the RF link budget), the Bluetooth Low Energy stack sometimes went into a state that could not respond to the attribute protocol. This issue has been resolved.
sbrk function no longer increases heap memory by four times	A bug in the startup code, which casued the heap memory allocated to be increased by four times due to an incorrect typecasting, has been fixed. The bug was introduced in SDK 2.3.
RW-BLE-GATT-IS.pdf document updated to avoid out of order packet transmission	The specification for GATTC_CMP_EVT in the RivieraWaves GATT Interface Specification has been clarified, to prevent users from sending GATT messages (from the application to the stack) that might cause out of order packets over the air. A recommendation has been added to the document.
peripheral_server_standby: the LED now blinks to show BLE ADV/CONN is active	The LED connected to DIO6 on the Evaluation and Development Board are on and off during the active mode and standby mode, respectively. Therefore the LED now flashes at a slower or faster rate when the advertising interval (or connection interval) is decreased or increased (respectively).
Pairing with a Bluetooth Low Energy 5 device as second connection is now possible	When RSL10 was connected to a master device and then tried to connect to another central Bluetooth Low Energy 5 device and pair (smart devices such as Pixel and Samsung), the link was lost. This has been fixed.
Clarified SetTXPower function error for 0dBm and VCC_TARGET = 1.10	The call to Sys_RFFE_SetTXPower in the *peripheral_server_sleep* and *peripheral_server_standby* applications returns an error indicating that the configured VCC_TARGET may not be enough to provide the required TX power. This is expected, because in these applications we are demonstrating low power consumption by running with VCC configured to 1.10 V. Comments have been added to the applications to clarify the behavior, and the function error codes have been added to the *RSL10 Firmware Reference* manual.
ON Semiconductor IDE: Eclipse plugins check for updates has been disabled	The IDE has been updated to disable Eclipse plugins update requests by default.
Non XTAL-32 KHz-based low power clock sources can support any advertising interval/sleep internal	If a non XTAL-32KHz-based low power clock is used as the low power clock source, sleep can now be any duration. Wakeup was irregular because of an issue in the Bluetooth Low Energy stack. Now, applications can use the kernel timer to manage their timing. When there are no Bluetooth Low Energy activities, the stack goes to sleep following a kernel timer programmed by the applications. Alternatively, an application can use the `BLE_Sleep_MaxDuration_Set()` API function to set the sleep duration time before calling the `BLE_Power_Mode_Enter()` function if no BLE activity or Kernel timer is ongoing..
Sys_ASRC_Enable function updated	The Sys_ASRC_Enable function has been updated to allow enabling and disabling the ASRC
Stack Memory Corruption	Prevented a possible race conditions that could lead to memory corruption resulting in a hard fault interrupt.
Keil: calibration sample applications updated to execute initialization function	The Keil sample applications default_MANU_INFO_INIT and supplemental_calibrate have been updated to properly execute the manufacturing initialization function in NVR3.

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Known Issues

The following issues are known to be outstanding in release 3.0:

Summary	Release Notes
IAR: calibration sample applications fail to run initialization function	The IAR sample applications default_MANU_INFO_INIT and supplemental_calibrate fail to execute the manufacturing initialization function (Sys_Initialize) from NVR3.
I2C Bus error event returned in I2C CMSIS-Driver DMA Mode	I2C Bus error event returned in the I2C CMSIS-Driver sample application only when DMA Mode is enabled.

UART CMSIS-Driver clears busy status while last byte transfer is still ongoing	The UART CMSIS-Driver busy status flag is cleared once the hardware is ready to transmit or receive additional data. Therefore, the last byte transmission is still ongoing once the flag is cleared. If the application needs to know when the transfer has finished, it should account for additional time to complete the transmission of the last byte after the busy flag is cleared, based on the baud rate.
Instability in peripheral_server_sleep and peripheral_server_standy app when using pin wakeups	The peripheral_server_sleep and peripheral_server_standby applications may become unstable if wakeup by DIO pins selected.
Only one DIO interrupt debounce filter can be enabled at a time	Due to a hardware limitation, only a single DIO interrupt debounce filter can be enabled at a time.
I2C CMSIS Driver "xfer_pending" not supported	The I2C CMSIS-Driver does not support the "xfer_pending" feature due to a hardware limitation. Therefore, generating a repeated start condition on the I2C interface using the I2C CMSIS-Driver is not possible.
Remote Mic TX with Audio Shield does not work after supplemental_calibrate app	To make the *remote_mic_tx_raw* application work with the Audio Shield, erase the NVR3 program that is loaded by the *supplemental_calibrate* application.
CRC limitation with more than 88 vector table entries	The CRC function is not valid if more than 88 possible vectors are in use.
Controller privacy cannot be used with some smartphones	Because of a hardware issue, smartphones Samsung S7 and S8 do not show RSL10 advertisements when controller privacy is used. Therefore, use host privacy in these cases. When host privacy is used, you can decrease power consumption close to the level of controller privacy use by employing a new feature called "power save control". To enable it, see the new API called `GAPM_POWER_SAVE_CTRL_CMD` as specified in the GAP Interface Specification from CEVA.

Delay needed in the remote_mic_rx_raw sample application for PCM input	To have good audio quality for PCM input, add a delay in the `ASRC_out` DMA interrupt. Use a delay instruction in the `DMA_IRQ_FUNC(ASRC_OUT_IDX)(void)` function in *app_func.c* as shown below:
	
	`#if (INPUT_INTRF == PCM_RX_RAW_INPUT)`
	`  Sys_Delay_ProgramROM(100);`
	`#endif`

Spurious emissions for the remote mic protocol	The remote microphone protocol implementation on the transmitter side has spurious emission violation non-conformance with regulatory tests.
ON Semiconductor IDE: Installations can fails if path name has too many characters	If the installation path is longer than 50 characters, the installer fails with an error specifying which path is too long. When the installer tries to install some of the subfolders, the entire path length exceeds the maximum allowed by Windows. If you choose a location that is different from the default installation location, ensure that it does not exceed 50 characters.

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