s310_nrf51422 release notes

Table of Contents

Introduction to the s310_nrf51422 release notes

These release notes describe the changes in the s310_nrf51422 from version to version.

The release notes are intended to list all relevant changes in a given version. They are kept brief, to make it easy to get the overview. More details regarding changes and new features may be found in the s310_nrf51422 migration document (normally available for major releases only).

Issue numbers in parentheses are for internal use, and should be disregarded by the customer.

s310_nrf51422_2.0.0

This release adds several new features, among them support for over-the-air Device Firmware Update, support for running other protocol stacks concurrently with the BLE and ANT protocol stacks, and support for concurrent broadcasting while in an active BLE connection. The release also contains a number of changes and bugfixes. The feature set of this release corresponds to the combined feature sets of the s110_nrf51822_7.1.0 BLE SoftDevice and s210_nrf51422_4.0.1 ANT SoftDevice. The release is qualified to the Bluetooth specification version 4.1. The corresponding SoftDevice Specification is the *S310 nRF51422 SoftDevice Specification v2.0*.

Notes:

- This is a major release which has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 1.0.0.

New functionality

- **SoftDevice**
  - The SoftDevice now supports concurrent multiprotocol operation using the Concurrent Multiprotocol Timeslot API. This enables the application to run a separate radio protocol (or reserve time slots) from application space concurrently with the SoftDevice BLE and ANT protocol stacks (DRGN-1010, DRGN-4074, DRGN-3456, DRGN-3176, FORT-828).
  - The SoftDevice now contains a Master Boot Record (MBR) which enables Device Firmware Update (DFU) of the SoftDevice (in addition to the application and bootloader) over the air. The MBR API enables copying and comparing regions in flash memory and interrupt forwarding (DRGN-2282, DRGN-3738, FORT-822).
  - `RC0SC` calibration can now be configured to be temperature dependent (FORT-790).
  - The Flash API is now also available when the SoftDevice is disabled (FORT-836).
  - The SoftDevice can now be configured to forward interrupts to one of several applications using the new `sd_softdevice_vector_table_base_set()` API call (FORT-815, NRFFOETT-688).
- **BLE**
  - Common
    - An Options API has been introduced to allow the application to set and get advanced configuration options for the SoftDevice (DRGN-1183).
    - Using the Options API `sd_ble_opt_set()`, it is now possible for the application to use the CPU while the radio is active. By default in this version, and in previous versions of the SoftDevice, the CPU execution is blocked by the stack during radio activity. Note that this option cannot be used when running the SoftDevice on nRF51422 devices affected by PAN no. 44 "CCM may exceed real time requirements" and PAN no. 45 "AAR may exceed real time requirements" described in the nRF51422-PAN (DRGN-4511, DRGN-4815).
    - The application can choose not to include the Service Changed characteristic within the GATT server by using the parameters in the new `sd_ble_enable()` API call (DRGN-2879, NRFFOETT-215).
  - GAP
    - Added support for Low Duty Cycle Directed Advertising (DRGN-1760).
    - The SoftDevice now supports broadcasting while in an active connection (DRGN-810, DRGN-4008).
    - Privacy 1.1: The SoftDevice is now able to generate and refresh resolvable and non-resolvable private addresses while advertising or broadcasting. The application may set a custom IRK and an address cycle interval, but also retains the option to set addresses explicitly (DRGN-4310, NRFFOETT-579).
    - The application can now provide its own display passkey during a pairing procedure that uses the passkey entry algorithm (DRGN-4169, NRFFOETT-716).
- **ANT**
  - RSSI proximity can now be configured and used in the ANT RX scanning channel.
  - Added support to allow wildcard channel ID uplink transmissions on an ANT RX scanning channel.
  - Asynchronous TX channels are now capable of running asynchronously in the presence of other running ANT channels.
  - Channels opened with channel fast initiation option now start as soon as possible in the presence of other running ANT channels.
  - Improved RX scanning channel coexistence with application flash write and application radio timeslot scheduling.
  - Added continuous modulated transmission test mode.

Changes

- **SoftDevice**
  - The size of the SoftDevice has been changed to 116 kB.

- The SoftDevice hex file no longer contains the SoftDevice size in the UICR.CLENR0 register. This means that the SoftDevice is no longer protected by default. The updated versions of the tools (nRFgo Studio, nrfjprog) will write the SoftDevice size to the UICR.CLENR0 by default, thereby restoring default protection. Having protection enabled will not allow Device Firmware Update to a SoftDevice of a larger size than the original. Therefore, the tools make it optional to not set the UICR.CLENR0 register.
- The FWID is no longer stored in the UICR. Updated versions of the tools (nRFgo Studio, nrfjprog) compatible with this change are available as downloads from the Nordic Semiconductor web page.
- The `sd_softdevice_forward_to_application()` call has been replaced with `sd_softdevice_vector_table_base_set()` which takes the forwarding address as an argument (FORT-815, NRFFOETT-688).
- SVC number changes.
- The Radio Disable API supported in S310 version 1.0.0 is replaced by the Concurrent Multiprotocol Timeslot API.
- Flash API operation behavior is changed. Flash write/erase retries are now based on a combination of timeout values and a fixed number of retries. Total operation timeout is a combination of low priority timeout (30 ms) and normal priority timeout (100 ms). If the initial low priority flash operation could not be scheduled within low priority timeout or within 3 scheduling tries, the operation's priority is raised to normal. If then the operation could not be scheduled within the normal priority timeout, the flash operation is treated as being timed out.

- **BLE**
  - Common
    - A new API call, `sd_ble_enable()` has been added. This must be called to initialize and enable the BLE stack after invoking `sd_softdevice_enable()` and previous to any BLE activity (DRGN-2879, NRFFOETT-215).
  - LL
    - The maximum RX listening time after sending a packet is increased from 152 us to 156 us to ensure that packets are successfully received from PC central protocol stacks that have been observed to send packets later than the T_IFS time of 150+/-2 us (DRGN-4719).
  - GAP
    - The `sd_ble_gap_address_set()` API call now takes an additional argument to support Privacy 1.1 (DRGN-4310, NRFFOETT-579).
    - New advertising data types introduced by the Bluetooth specification have been added (DRGN-4311).
    - The default appearance in the GAP service is now set to be `0x0000` (DRGN-3741).
    - The link will no longer be automatically disconnected if a pairing or bonding procedure fails (DRGN-3122, DRGN-4837).
  - GATTS
    - Characteristic User Description descriptors may now be stored in application flash (if read only) or application RAM (DRGN-3745, NRFFOETT-624).
    - The application can now call `sd_ble_gatts_value_set()` with `p_value` set to `NULL` to update the length of `VLOC_USER` attributes (DRGN-3748, NRFFOETT-670).
- **ANT**
  - The `sd_ant_prox_search_set()` API call now takes an additional parameter to specify custom (non-ANT indexed) proximity values. See the API documentation (included in the nRF51 SDK documentation, and also as comments in the API header files) for more information on usage.
  - The `sd_ant_cw_test_mode()` API call requires an additional parameter to specify test mode operation (original TX carrier test mode or new continuous modulated transmission test mode).
  - Return values that were previously not documented, have been added to `ant_interface.h` for one or more APIs.

Bugfixes

- **BLE**
  - Common
    - Fixed an issue affecting nRF51 chips with more than 16 kB of RAM that could cause an assert at `sd_ble_enable()` or cause SVC calls to return NRF_ERROR_INVALID_ADDRESS when a pointer to RAM above 16 kB was supplied (DRGN-4927, NRFFOETT-900).
    - Fixed an issue where sending data after the link had been disconnected might lead to reduced maximum throughput for the next connection (DRGN-4519).
  - LL
    - Fixed an issue where stopping advertising after a flash operation is triggered and then starting advertising again could lead to undefined behavior (DRGN-3785, DRGN-3788, DRGN-4151).
    - Fixed an issue that could cause the CPU to be active on each possible connection event (ignoring slave latency) if a peripheral connection and a broadcaster were active (DRGN-4832).
    - Fixed an issue that may occur when slave latency is used. After every 65536 connection events, queued data may not be sent at the next connection event, but after slave latency has expired (DRGN-4943).
  - GAP
    - Fixed an issue where the Identity Address Information sent to the peer during a pairing procedure was not initialized (DRGN-4521). The application no longer needs to manually initialize this field.
    - Fixed an issue where the key exchange bitmaps in the `ble_gap_evt_auth_status_t` event structure could be set

incorrectly when re-bonding with an already bonded device (DRGN-3888).
        - Fixed an issue where the `offset` member in the `ble_gattc_evt_write_rsp_t` event structure was not set to 0 in case of a Write Response (DRGN-4402).
        - Fixed an issue where re-authenticating before the key distribution phase of the previous authentication procedure had finished could cause an assert (DRGN-3710, NRFFOETT-592).
    - GATTS
        - Fixed an issue where the previous value of the CCCD would be returned on a new connection (NRFFOETT-663, DRGN-3746).
- **ANT**
    - Fixed an issue where radio override settings in FICR may not get applied for NRF_1MBIT mode when running ANT.
    - Fixed an issue where specifying optional frequency hopping (FH) field in ANT advanced burst transfer parent configuration never puts the transfer parent in FH mode.
    - Added missing radio coexistence configuration capability in ANT capabilities message.
    - Fixed an issue which causes ANT RX synchronous channel potentially to drop to search if it receives a non-synchronous ANT transmission packet (e.g. mid burst packets) that matches its ID. An example case where this issue could occur is in a Shared Channel network setup. Burst transfers from a slave channel to a master channel could cause all other slave channels (tracking the same master channel) to drop to search when it is not expected to.

Limitations

- **SoftDevice**
    - If Radio Notifications are enabled, flash write and flash erase operations initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809).
    - If Radio Notifications are enabled and configured with INT_ON_ACTIVE or INT_ON_BOTH and flash write, flash erase or concurrent multiprotocol timeslots are initiated through the SoftDevice API concurrently with ANT traffic, the radio notification distance should be set to 800 µs.
    - DC/DC converter operation controlled by the SoftDevice may interfere with radio function. As a result, nrf_power_dcdc_mode should not be modified by the application. The mode must not be set to NRF_POWER_DCDC_MODE_AUTOMATIC or NRF_POWER_DCDC_MODE_ON at any time. (DRGN-2420)
- **BLE**
    - Common
        - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
    - GATTS
        - To conform to the Bluetooth specification there shall not be a secondary service that is not referenced by a primary service. The SoftDevice does not enforce this (DRGN-906).

Known Issues

- **BLE**
    - GATTS
        - The `conn_handle` member of the `ble_gatts_evt_t` structure for a `BLE_GATTS_EVT_SYS_ATTR_MISSING` event does not contain a valid connection handle (DRGN-4501). The application should store the connection handle upon connection establishment and use the stored value in subsequent `sd_ble_gatts_sys_attr_set()` calls.
        - Pointers to attribute values using the `VLOC_USER` modifier are not checked to be in a valid range (DRGN-4406). The application must provide a pointer to a valid area in RAM to avoid a Hard Fault during the processing of attribute operations.

s310_nrf51422_1.0.0

This is the initial production release of the s310_nrf51422 SoftDevice.

The s310_nrf51422 is a multiprotocol SoftDevice, containing both a Bluetooth Low Energy (BLE) protocol stack and an ANT protocol stack. These two protocol stacks can execute concurrently. The featureset of the s310_nrf51422_1.0.0 corresponds to the combined featuresets of the s110_nrf51822_6.0.0 BLE SoftDevice and the s210_nrf51422_3.0.0 ANT SoftDevice.

Bugfixes

(This is the first production release of s310_nrf51422.)

Changes

(This is the first production release of s310_nrf51422.)

New functionality

(This is the first production release of s310_nrf51422.)

Limitations

- SoftDevice
  - If Radio Notifications are enabled, flash write and flash erase operations initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809).
  - If Radio Notifications are enabled, radio disable periods initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809)
  - If Radio Notifications are enabled and configured with INT_ON_ACTIVE or INT_ON_BOTH and flash write, flash erase or radio disable periods are initiated through the SoftDevice API concurrently with ANT traffic, the radio notification distance should be set to 800 µs.
- GATTS
  - To conform to the Bluetooth specification there shall not be a secondary service that is not referenced somehow by a primary service. The SoftDevice does not enforce this (DRGN-906, DRGN-2260).
- SoftDevice
  - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
  - DCDC converter operation controlled by the SoftDevice may interfere with radio function. As a result, nrf_power_dcdc_mode should not be modified by the application. The mode must not be set to NRF_POWER_DCDC_MODE_AUTOMATIC or NRF_POWER_DCDC_MODE_ON at any time. (DRGN-2420)

Known Issues

- SoftDevice
  - Stopping advertising (either by calling sd_ble_gap_adv_stop() or by a timeout) and then starting advertising again immediately may lead to undefined behaviour. The workaround is to wait 50 ms or more from advertising is stopped until starting advertising again. (DRGN-3785)