s110_nrf51 release notes

Table of Contents

Introduction to the s110_nrf51 release notes

These release notes describe the changes in the s110_nrf51 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 s110_nrf51 migration document (normally available for major releases only).

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

s110_nrf51_8.0.0

The main features of this release are the ability to set the size of the GATT Server Attribute Table when initializing the BLE stack, the possibility for the application to be notified when the SoftDevice receives scan requests, and the ability to disable RF channels for advertising. Changes to CPU availability during radio events, DC/DC converter configuration, and PPI channel allocations have been made to take advantage of the nRF51 series IC revision 3. The BLE API has been aligned to that of the S120 SoftDevice.
Notes:

- This is a major release which has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- This SoftDevice version is not Production tested on all IC revisions, and is **not compatible with nRF51 IC revision 1**. Users of the SoftDevice **must verify the compatibility of their SoftDevice/IC combination** for development and for production. Compatibility information is found in the nRF51 Series Compatibility Matrix, which can be downloaded from the Nordic Semiconductor web page.

SoftDevice properties

- The SoftDevice Specification corresponding to this release is the S110 SoftDevice Specification v2.0.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 1.0.1.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **96 kB** (`0x18000` bytes).
  - RAM: **8 kB** (`0x2000` bytes) (default value - dependent upon configured size of the GATT Server Attribute Table).

New functionality

- SoftDevice
  - The application can now configure the amount of memory reserved for the GATT Server Attribute Table when initializing the BLE stack (DRGN-3744).
    Configuration is optional. By default, the RAM reserved for the Attribute Table will be `0x700` bytes. This is the same default allocation as in the S110 v7.1.0.
- GAP
  - The application can now configure the SoftDevice to deliver events when scan request packets are received (DRGN-2880, NRFFOETT-281).
  - The application can now selectively disable RF channels used for advertising (DRGN-2598, NRFFOETT-179).

Changes

- SoftDevice
  - The default behaviour is now that the application can use the CPU while the radio is active. In previous versions of the S110, the CPU execution was blocked by the SoftDevice during radio activity. Note that this new default setting is incompatible with running this SoftDevice on nRF51 series IC revision 2 (devices affected by PAN #44 "CCM may exceed real time requirements" and PAN #45 "AAR may exceed real time requirements" described in the nRF51822-PAN). If you plan to run S110 v8.x on devices affected by these PANs, you will need to enable mutual exclusion between the radio and the application by means of the `sd_ble_opt_set()` SV call and the `BLE_COMMON_OPT_RADIO_CPU_MUTEX` option (DRGN-4511). (For IC revision information, see the nRF51 Series Compatibility Matrix, downloadable from the Nordic Semiconductor web page.)
  - The DC/DC converter usage has been simplified by deprecating the `AUTO` option. The DC/DC converter is now supported when running the SoftDevice on nRF51 series IC revision 3 (DRGN-2420, DRGN-4622). (For IC revision information, see the nRF51 Series Compatibility Matrix, downloadable from the Nordic Semiconductor web page.)
  - 6 previously reserved PPI channels have been freed and may be used by the application (DRGN-5082).
  - A set of new macros have been introduced to access the SoftDevice info structure directly from hex or bin SoftDevice images (DRGN-4642).
- GAP
  - RSSI events can now be controlled by the application by setting a report frequency and threshold (DRGN-3598).
  - The SoftDevice can now accept an LTK distributed by a Central during bonding (DRGN-4998).
  - The `BLE_GAP_EVT_CONNECTED` event now includes the device's own address which allows the application to find out which address was used to establish a particular connection. This can be useful when using privacy features (DRGN-5016).
  - The GAP advertising timeout source macro has been renamed.
  - The `ble_gap_opt_t` instance inside `ble_opt_t` has been renamed from `gap` to `gap_opt` (DRGN-4511).
  - The GAP security interface has been redesigned and improved. Please refer to the migration document for further information.

- GATTS
  - `sd_ble_gatts_value_set()` and `sd_ble_gatts_value_get()` now take a connection handle as an input parameter (DRGN-4988).
  - The system attribute data (CCCDs) can now be separately retrieved and restored for user and system attributes (DRGN-5112).

Bug fixes

- SoftDevice
  - Fixed an issue where the SoftDevice current consumption could remain high (1 mA) after disabling the SoftDevice when running on RC LFCLOCK (DRGN-5472, NRFFOETT-968).
- GAP
  - Fixed an assert that could happen if the peer sent two consecutive pairing requests (DRGN-5081).
  - Fixed an assert that could happen if the peer sent an out of sequence key distribution packet and a new pairing request (DRGN-5503).
- GATTS
  - When adding an attribute with `vloc == VLOC_USER` the SoftDevice now correctly initializes its initial length to the one provided in the `init_len` parameter (DRGN-5216, NRFFOETT-936).
  - The `sd_ble_gatts_value_set()` SV call now accepts pointers to values residing in flash memory (DRGN-4609).
  - When adding a writable attribute with `vloc == VLOC_USER` the SoftDevice will now make sure that the pointer provided refers to a value stored in RAM (DRGN-4406).
  - The `sd_ble_gatts_sys_attr_get()` call now returns an error if no system attributes exist in the GATT Server Attribute Table (DRGN-5310).
  - Fixed an issue where the `conn_handle` member of the `ble_gatts_evt_t` structure for a `BLE_GATTS_EVT_SYS_ATTR_MISSING` event did not contain a valid connection handle (DRGN-4501, DRGN-4617).
- GATTC
  - The `sd_ble_gattc_char_value_by_uuid_read()` SV call can no longer return `NRF_ERROR_INTERNAL` if an invalid UUID type is provided (DRGN-4715).
- LL
  - Fixed an assert that could be triggered if the local clock and/or peer clock accuracy are lower (less accurate) than declared (DRGN-5153, NRFFOETT-987).
  - Fixed an issue where disconnection with reason `0x3E` could be received during connection parameter update (DRGN-4862).
- L2CAP
  - Fixed an issue where the wrong LL PDU length was used for data over the air when an L2CAP command reject packet was sent (DRGN-5480).

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).
  - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
  - On nRF51 series IC revision 2 and earlier, 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).
- 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).

Known Issues

- SoftDevice
- If Radio Notifications are configured while the SoftDevice is not in an idle state, the SoftDevice may in some situations assert (DRGN-5556, NRFFOETT-986). The workaround is to only configure Radio Notifications when the SoftDevice is in an idle state with no protocol stack or other SoftDevice activity in progress, as described in the API and in the S110 SoftDevice Specification v2.0.

s110_nrf51822_7.1.0

This release adds the Low Duty Cycle Directed Advertising feature, an option to run the CPU while the radio is being used, an increase to the RX listening window when receiving packets, and bug fixes.

Users implementing HID applications or applications using a concurrent peripheral and broadcaster are recommended to update to this version of the SoftDevice.

New functionality

- SoftDevice
  - 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 nRF51822 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 nRF51822-PAN (DRGN-4511, DRGN-4815).
- GAP
  - Added support for Low Duty Cycle Directed Advertising (DRGN-1760).

Changes

- 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+/-2us (DRGN-4719).
- GAP
  - The link will no longer be automatically disconnected if a pairing or bonding procedure fails (DRGN-3122, DRGN-4837).

Bug fixes

- BLE
  - Fixed an issue, effecting 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 that could cause an assert if slave latency was used for a peripheral connection over which data was being transferred, and a broadcaster was active (DRGN-4807, DRGN-4820, NRFFOETT-880).
  - 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 an invalid passkey was used when the application set the static passkey with ascii characters outside the range 0x30 to 0x39. The static passkey setting in the options API will now return NRF_ERROR_INVALID_PARAM if this occurs (DRGN-4886).

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).

    - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
    - 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).
- 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).

Known Issues

- 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.

s110_nrf51822_7.0.0

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 SoftDevice BLE protocol stack and support for concurrent broadcasting while in an active connection. A full description of the new functionality is given below. The release also contains a number of changes and bugfixes. This release is qualified to the Bluetooth specification version 4.1.

Notes:

- This is a major release which has changed a limited part of the Application Programmer Interface, requiring applications to be recompiled.
- This SoftDevice version is not Production tested on all chip variants. Please see the "nRF51822 Compatibility Matrix" for SoftDevice version suitability for development and/or production. (The "nRF51822 Compatibility Matrix" can be found in the white paper nWP-018, in the downloads section on the nRF51822 product page within the Nordic Semiconductor web page.)

Bugfixes

- SoftDevice
  - Fixed an issue where stopping advertising after a flash operation is triggered and then starting advertising again could lead to undefined behaviour (DRGN-3785, DRGN-3788, DRGN-4151).
  - The Concurrent Multiprotocol Timeslot API (which first appeared in the 7.0.0-2.alpha release) priorities are now correctly named.
- GAP
  - 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).

Changes

- SoftDevice
  - The size of the SoftDevice has been increased to 88 kB.
  - 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 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` register by default, thereby restoring default protection. Having protection enabled will not allow Device Firmware Update to a SoftDevice of larger size than the original, therefore the tools make it optional to not set the `UICR.CLENR0` register.
  - 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.
- BLE
  - 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).
- 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 specification have been added (DRGN-4311).
  - The default appearance in the GAP service is now set to be `0x0000` (DRGN-3741).
- 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).

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 from application space concurrently with the SoftDevice BLE protocol stack (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 itself (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 available also when the SoftDevice is disabled (FORT-836).
  - An Options API has been introduced to allow the application to set and get advanced configuration options for the SoftDevice (DRGN-1183).
  - 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
  - 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
  - The SoftDevice now supports broadcasting while in a 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).

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).
  - 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)
- 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).

Known Issues

- GAP
  - The Identity Address Information sent to the peer during a pairing procedure needs to be initialized manually by the application (DRGN-4521). This can be achieved by setting a public or a random static device address with the `sd_ble_gap_address_set()` API call. If the application wants to use the factory default random static address, it may retrieve it with the `sd_ble_gap_address_get()` API before setting it.
- 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.
  - Writable attribute values using the `VLOC_USER` modifier are not checked against RAM boundaries (DRGN-4406). The application must provide a pointer to a valid area in RAM to avoid a Hard Fault during the processing of incoming write operations.

s110_nrf51822_6.0.0

This release adds support for Write Long Characteristics/Descriptors and support for Reliable Writes to the GATT client and server. This release also supports an increased number of Vendor Specific 128 bits UUIDs. The SoftDevice interface has been extended with asynchronous flash memory write and erase support.

This is a major release which has changed a limited part of the Application Programmer Interface, requiring applications to be recompiled.

As of the time of this release, s110_nrf51822_5.0.0 and s110_nrf51822_5.2.1 remain supported releases of the S110 SoftDevice. Users wishing to take advantage of new features or resolved limitations in this release should upgrade to s110_nrf51822_6.0.0.

This SoftDevice version is not Production tested on all chip variants. Please see "nRF51822 Compatibility Matrix" for SoftDevice version suitability for development and/or production. (The "nRF51822 Compatibility Matrix" can be found at the nRF51822 product page at the Nordic Semiconductor web page.)

Bugfixes

- SoftDevice
  - SVC handler now checks SPSEL and will use the Process Stack Pointer (PSP) if SPSEL=1. Previously the SVC handler only supported the use of the Main Stack Pointer (MSP) and using the PSP would result in undefined behavior (NRFFOETT-317, NRFFOETT-426, FORT-787).
  - Fixed hard fault handler issue that could corrupt the LR register or give invalid return address if hard fault triggered when SoftDevice was disabled (NRFFOETT-478, FORT-793).
  - ECB, CCM and AAR peripherals are now properly reset at SoftDevice reset (DRGN-3305, FORT-797).
  - Resolved a bug affecting S110_nrf51822_5.1.0 and S110_nrf51822_5.2.0 where the advertiser (undirected or directed) stopped sending advertisement packets for a period of approximately 15 seconds (DRGN-3128). The device would recover and continue advertising, though as a result, connections to a peer device might appear to take an extended amount of time. There were no events generated by the SoftDevice indicating the advertiser stalled, so the application would have no knowledge that the SoftDevice was not sending packets. This issue had a low probability of occurrence and might remain undetected in development and testing.
- GAP
  - Fixed an issue where, on a bonded device using IRK based whitelisting, the white list was not effective until after the first advertising event (NRFFOETT-515, DRGN-3141, DRGN-3239).
  - Fixed an issue where the SoftDevice would assert if sd_ble_gap_sec_params_reply() was called after disconnect (DRGN-3129).
  - Fixed an issue where calling sd_ble_gap_rssi_stop() after connection had ended would cause an assert. In addition, RSSI will now be stopped automatically when the connection ends (NRFFOETT-499, DRGN-3131).
- GATTC
  - Triggering transactions repeatedly no longer causes the GATT client to fail (DRGN-3467).

Changes

- Softdevice
  - API facing event structures and functions now consistenly use "evt" in their names (DRGN-2232).
  - SVC number ranges adjusted (DRGN-3147, FORT-798).
  - Updates and improvements to internal radio scheduling (DRGN-3223, DRGN-2790, DRGN-2781, DRGN-2768, DRGN-2762, DRGN-2363, DRGN-3542).
- GAP
  - sd_ble_gap_device_name_get() now returns the full length of the name if the name is longer than the buffer provided (DRGN-3009).
  - The GAP device name permissions can now be set to writable regardless of name length (DRGN-3551).
  - The peer address field has been removed from the BLE_GAP_EVT_DISCONNECTED event (DRGN-2638).
  - Passkey missing responses during pairing using BLE_GAP_AUTH_KEY_TYPE_NONE in sd_ble_gap_auth_key_reply are now fully supported (DRGN-2540, NRFFOETT-290).
  - Documentation of min_conn_interval and max_conn_interval in ble_gap_conn_params_t clarified (NRFFOETT-451, DRGN-1040).
  - Reason codes for sd_ble_gap_disconnect() documented (NRFFOETT-526, DRGN-3235).
- GATT
  - sd_ble_gatts_value_get() now returns the full length of the value if the value is longer than the buffer provided (DRGN-3009).
  - GATTC events now include the handle from the error response when applicable (DRGN-1966).

- The maximum number of 128-bit Vendor Specific UUIDs has been increased to 10 (DRGN-3055).
- sd_ble_uuid_vs_add() now checks whether the UUID was previously added and therefore redundant (NRFFOETT-359, DRGN-2881).

New functionality

- Softdevice
  - Asynchronous flash memory write and erase support added to the SoftDevice interface. This interface can be safely used during active BLE connections (FORT-788).
  - Temperature sensor support added to the SoftDevice interface (FORT-790).
  - Faster SoftDevice enable when using RCOSC and 32k Clock source (DRGN-2390, FORT-792).
  - SoftDevice is now unprotected unless CLENR0 in UICR is set (FORT-791).
- GATTS
  - Support for the Write Long Characteristic Values and Descriptors procedures (DRGN-2920).
  - Support for the Reliable Writes procedure (DRGN-2920).
- GATTC
  - Support for the Write Long Characteristic Values and Descriptors procedures (DRGN-3499, NRFFOETT-606).
  - Support for the Reliable Writes procedure (DRGN-3499, NRFFOETT-606).

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).
- 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) after a flash operation is started and then starting advertising again before the flash operation is complete may lead to undefined behaviour (DRGN-3785).
    Note: The nRF51 SDK does use flash operations in the bond manager and in the Alert Notification service.
    Workarounds are:
    - Either wait 50 ms or more from stopping advertising until starting advertising again.
    - Or wait until the flash operation end event (NRF_EVT_FLASH_OPERATION_SUCCESS or NRF_EVT_FLASH_OPERATION_ERROR) has been received before starting advertising again.

s110_nrf51822_5.2.0

This release addresses some minor limitations in the SoftDevice, and adds compatibility for future hardware revisions of the nRF51822.

Bugfixes

No bugfixes in this version.

Changes

- GAP
  - Increased maximum device name length from 20 to 31 characters (DRGN-2802). Note limitation below.
  - Added "-30" dBm as new valid radio power parameter in sd_ble_gap_tx_power_set(). The value "-40" dBm still exists, but is deprecated. If used, it will still behave as in previous releases and give the minus 30dBm mode of the nRF51822 chip (DRGN-2869, DRGN-2702).

New functionality

No new functionality in this version.

Limitations

- GAP
  - If the GAP device name is longer than 20 bytes, then its permissions cannot be set to writable.
  - Key missing notification during pairing using BLE_GAP_AUTH_KEY_TYPE_NONE in sd_ble_gap_auth_key_reply is currently not supported, the application can ignore or disconnect instead (DRGN-2540).
- GATTS
  - To conform to the Bluetooth specification there shall not be a secondary service that is not referenced somehow by a primary service. (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

- GAP
  - In the BLE_GAP_EVT_DISCONNECTED event, the peer address field in the event structure is invalid, and must not be used (DRGN-2638).

s110_nrf51822_5.1.0

Summary: This version improves interrupt latency during advertising, especially for directed advertising (see "Changes" below). It also fixes a bug affecting channel map update (see "Bugfixes" below). Users of the the softdevice should upgrade to this version if affected by any of these issues.

Bugfixes

Link layer

Fixed a bug causing the new channel map to be used immediately if a channel map update is received before an event counter wraparound and the instant is after the wraparound (DRGN-2629).

Changes

- Link layer
    - The application is now allowed to run during directed advertising by allocating CPU time to the application between each advertising packet transmission. Interrupt latency has been reduced for all types of advertising (DRGN-2597).

New functionality

No new functionality in this version.

Limitations

- GAP
    - Key missing notification during pairing using BLE_GAP_AUTH_KEY_TYPE_NONE in sd_ble_gap_auth_key_reply is currently not supported, the application can ignore or disconnect instead (DRGN-2540).
- GATTS
    - To conform to the Bluetooth specification there shall not be a secondary service that is not referenced somehow by a primary service. (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

- GAP
    - In the BLE_GAP_EVT_DISCONNECTED event, the peer address field in the event structure is invalid, and must not be used (DRGN-2638).
    - The "-40" dBm radio power parameter in sd_ble_gap_tx_power_set() corresponds to, and will give, the minus 30 dBm mode of the nRF51822 chip (DRGN-2702).

s110_nrf51822_5.0.0

Bugfixes

- SoftDevice
  - The Random Number generator is now stopped earlier to improve power savings (DRGN-1455)
  - The radio notification distance of 800us is now available (DRGN-2133, NRFFOETT-188)
- Link Layer
  - Current consumption is reduced and Application Low interrupts are no longer prevented from executing for a period after stopping advertising (DRGN-2018, NRFFOETT-233)
  - Fixed a possible malfunction and lockup related to packet transmission queueing (DRGN-2319, NRFFOETT-250, DRGN-2365)
  - Fixed a possible malfunction when performing undirected connectable advertising after a successful directed advertisement (DRGN-2472)
  - Fixed a possible malfunction when stopping advertising (DRGN-2441)
- BLE
  - The stack will no longer stall if the application fails to retrieve pending events (DRGN-2396)
  - Fixed an issue that could cause the application to receive invalid data in events (DRGN-2294)
- GAP
  - Fixed an issue where the stack would fail to advertise after two directed advertising attemps with no connection established (DRGN-2024)
  - Fixed the SMP implementation to allow for LTK encryption during an ongoing pairing procedure (DRGN-2019)
  - Unlimited advertising timeout is no longer accepted when performing limited advertising (DRGN-2236, DRGN-2410)
- GATTC and GATTS
  - The UUID encoding and decoding functions now correctly check the UUID type value (DRGN-2357)
  - gatts_descriptor_add() no longer returns wrong handle value (DRGN-2313)

Changes

- SoftDevice
  - Lower stack interrupts are extended by a “CPU Suspend” state during radio activity to improve link integrity. This means lower stack interrupts will block application and upper stack processing during a Radio Event for a time proportional to the number of packets transferred in the event (DRGN-2320). Therefore, current consumption during radio activity is higher than in previous releases.
- GAP
  - The stack will no longer issue a BLE_GAP_EVT_AUTH_STATUS when the connection is closed before a pairing procedure has completed (DRGN-2164)
- GATTC and GATTS
  - ATT packet headers are now checked strictly by the stack, dropping non-conformant packets (DRGN-2274, NRFFOETT-222)

New functionality

(No new functionality in this version)

Improvements

- The API documentation now includes Message Sequence Charts that illustrate the operation of most calls and events (DRGN-614, NRFFOETT-234)

Limitations

- SoftDevice
  - nrf_power_dcdc_mode must not be set to NRF_POWER_DCDC_MODE_AUTOMATIC while advertising. Only NRF_POWER_DCDC_MODE_OFF and NRF_POWER_DCDC_MODE_ON can be used while advertising. To use the DCDC

converter while in a connection, nrf_power_dcdc_mode should be NRF_POWER_DCDC_MODE_OFF while advertising, then when connected, nrf_power_dcdc_mode_set() can be used to change the mode to NRF_POWER_DCDC_MODE_AUTOMATIC. (DRGN-2420)
    - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
- GAP
    - Key missing notification during pairing using `BLE_GAP_AUTH_KEY_TYPE_NONE` in `sd_ble_gap_auth_key_reply` is currently not supported, the application can ignore or disconnect instead (DRGN-2540)
- GATTS
    - To conform to the Bluetooth specification there shall not be a secondary service that is not referenced somehow by a primary service. (DRGN-906, DRGN-2260)

Known Issues

(No known issues in this version)