s110_nrf51822_6.x.x release notes

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Introduction to the s110_nrf51822 release notes

These release notes describe the changes in the s110_nrf51822 from version to version.

This is how the document is laid out:

- There is one main section per new version of the s110_nrf51822. This section will describe the changes from the previous version.
- Within each main section, there are sections for:
    - New functionality
    - Changes
    - Bugfixes
    - Limitations
    - Known issues

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 available in the s110_nrf51822 migration document.

s110_nrf51822_6.2.1

This release increases the RX listening window to ensure that packets from PC BLE central protocol stacks are successfully received by the peripheral. The behavior of the BLE stack does not change and there is no change required to any applications implemented on previous s110_nrf51822_6.x.x SoftDevices.

All users of s110_nrf51822_6.x.x are recommended to update to this version of the SoftDevice.

New functionality

No new functionality in this version.

Changes

- LL
  - The maximum RX listening time after sending a packet is increased from 152us to 156us 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-4925).

Bug fixes

- LL
  - 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-4968).

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)
  - Passing pointers to RAM above 16 kB to the SoftDevice API could cause an assert at sd_ble_enable() or cause SVC calls to return NRF_ERROR_INVALID_ADDRESS. This needs to be considered when running on nRF51 chips with more than 16kB of RAM (DRGN-4927, NRFFOETT-900).

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_6.2.0

This version contains a minor change. There are no bug fixes and no changes in the API.

Bugfixes

No bugfixes in this version.

Changes:

- The API `sd_ble_gap_adv_data_set()` now allows SSP OOB data types to be present in the advertising data (DRGN-4674).

New functionality:

No new functionality in this version.

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.
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    - 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_6.1.0

Bugfixes

No bugfixes in this version.

Changes:

- Modified header files
  - ble.h
  - ble_ranges.h
  - ble_gap.h

New functionallity:

- SoftDevice
  - An Options API has been introduced to allow the application to set and get advanced configuration options for the SoftDevice (DRGN-1183).
- GAP
  - 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).
- 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_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)

s110_nrf51822_4.0.0

This section describes the changes in s110_nrf51822_4.0.0 compared to s110_nrf51822_3.0.0.

Bugfixes

- SoftDevice
  - Using 32kHz RC-oscillator as clock source might cause hard fault has been fixed (FORT-771, NRFFOETT-200)
- Link layer
  - Average current is no longer higher than expected when using slave latency. (NRFFOETT-106, DRGN-1958, DRGN-823)
- GAP
  - Fixed an assert that occurred when certain timeout events triggered on a disconnected link (DRGN-2050)
  - Stack no longer asserts if a disconnect happens during pairing (DRGN-1893)
  - Characteristic properties of the device name are now updated when a new security mode is set (DRGN-2123)
- GATTC and GATTS
  - Expected throughput of six ATT packets per connection interval is no longer limited to five. (DRGN-2043)

Changes

- Documentation
  - The release now includes a "migration document" describing how to migrate to new versions of the s110_nrf51822
- Qualification
  - Host protocol layer has been tested according to the Bluetooth conformance test specification and has been listed as a Qualified Design (QDL) (Qualified Design ID B020552).
    (Link layer was qualified as of version 3.0.0.)
- SoftDevice
  - The SoftDevice flash requirements have changed from 128kB to 80kB (80 * 1024 bytes).
- All APIs
  - All functions that trigger Supervisor Calls are now prefixed with sd_
    - All nrf_* SVCs are now named sd_*
    - All ble_* SVCs are now named sd_ble_*
- SoftDevice
  - Modified APIs
    - sd_power_pof_enable() - No longer uses callback. But gives an event which can be retrived with sd_event_get()
    - sd_softdevice_enable() - Now gives error code NRF_ERROR_SDM_INCORRECT_CLENR0 if CLENR0 is not set. (Only for non-preprogramed SoftDevice)
    - sd_radio_notification_cfg_set() - Changed the definition of the values user can select for distance of active signal, see SoftDevice specification for details (DRGN-2133, NRFFOETT-188)
- BLE
  - Added APIs
    - sd_ble_uuid_vs_add() - add a UUID to the BLE stack table, enabling the use of ble_uuid_t struct when handling UUIDs
    - sd_ble_uuid_encode() - encode ble_uuid_t structs to raw 16-bit or 128-bit UUID bytes
    - sd_ble_uuid_decode() - decode raw UUID bytes into ble_uuid_t structs
  - Removed APIs
    - ble_vs_uuids_assign() - replaced by sd_ble_uuid_vs_add()
- GAP
  - Added structs
    - ble_gatt_char_props_t - Providing bitfields for characteristic properties
    - ble_gatt_char_ext_props_t - Providing bitfields for extended characteristic properties
- GATTC
  - Removed APIs
    - ble_gattc_mtu_exchange()
  - Removed events
    - BLE_GATTC_EVT_MTU_XCHG_RSP
  - API changes
    - ble_gattc_char_t.char_props is now a bitfield instead of a raw byte
- GATTS
  - Removed APIs

        - ble_gatts_db_load()
        - ble_gatts_md_get()
        - ble_gatts_md_set()
    - Removed events
        - BLE_GATTS_EVT_MTU_UPDATE
    - API changes
        - ble_gatts_char_properties_t - Characteristic properties now use the common GATT type
        - Only a limited set of error codes can be used when handling deferred attributes

New functionality

- SoftDevice
    - Added APIs
        - sd_softdevice_forward_to_application() - Will make SoftDevice forward interrupts to application rather than bootloader.
        - sd_event_get() - Get events from hardware. Implemented events: NRF_EVENT_HFCLKSTARTED and NRF_EVENT_POWER_FAILURE_WARNING
        - sd_ecb_block_encrypt() - Encrypts a block according to specified parameters
    - Defines added to map software interrupt numbers used to signal the application to names
        - SD_EVENT_IRQn
        - SD_EVENT_IRQHandler
        - RADIO_NOTIFICATION_IRQn
        - RADIO_NOTIFICATION_IRQHandler
- BLE
    - UUID encoding and decoding is now handled inside the BLE stack (DRGN-1772, DRGN-2122, NRFFOETT-175)
- GAP
    - It is now possible to clear the advertising data and/or the scan response data (DRGN-2022)

Known issues

- SoftDevice
    - New added functionality of synthesized low frequency clock source is not tested to work with BLE stack. (DRGN-2140)
    - When advertising is stopped, either by explicit GAP API call or by GAP API configurable timeout, the CPU will remain in a busy-wait for up to one advertising interval time period. The consequence of this is that all threads at or below APP_LOW priority get blocked in this period and average current consumtpion is higher than expected. (DRGN-2018)
    - Testing of the nrf_power_dcdc_mode_set() is not complete (DRGN-2140)
    - The radio notification distance of 800 us is currently not available (DRGN-2133, NRFFOETT-188)
- GAP
    - sd_ble_evt_get() can, in rare cases (and while issuing a BLE_GAP_EVT_TIMEOUT event generated from advertising timing out), overwrite an invalid memory location (DRGN-2231)
    - Starting directed advertising twice without a connection and without the application polling the events will prevent further advertising (application event buffer overflow). Avoid this by calling sd_ble_event_get() before starting directed advertising. (DRGN-2024)
- 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)

s110_nrf51822_3.0.0 and earlier

<Release="3.0.0">

<Module>
S110 Softdevice
</Module>

<Overview>
Release of the S110 Softdevice, implementing a Bluetooth(r) Low Energy Stack on the nRF51822 IC.
</Overview>

<Requirements>
* nRF51822 IC
</Requirements>

<Compatibility>
* nRF51 SDK 3.0.0
* nRF51822
</Compatibility>

<Bugfixes>
* GAP:
- When using IRK and receiving scan requests, the filter policy BLE_GAP_ADV_FP_FILTER_BOTH does not work. (DRGN-1838)
- When using IRK, the filter policy BLE_GAP_ADV_FP_FILTER_SCANREQ does not work. (DRGN-1838)
* GATTS:
- It is currently not possible to achieve full data throughput using ble_gatts_hvx() with notifications if the connection interval is below 10ms. (DRGN-1433)
- To conform to the Bluetooth specification, no services or characteristics should be added or removed after bonding to a device (DRGN-1026)
- It is not possible to restrict attribute access based on the key size used during pairing. (DRGN-970)
* BLE
- The Softdevice will consume an event even if the application does not provide enough memory for it to fit. It is therefore strongly recommended when using this release to always call ble_evt_get() with enough memory to fit in any event that may come from the BLE stack. (DRGN-1844)
</Bugfixes>

<Changes>
Qualification:
- Link Layer is qualified, and have a QDL (Qualified Design ID: B020269).
* GATT:
- Updated BLE_GATT_STATUS_CODES defines, new status codes added
- Behaviour change: ATT timeout does not trigger disconnect anymore. Instead the ATT bearer is blocked as per the Bluetooth specification. (DRGN-1833)
* GATTC:
- Changed some structure member names and event defines
- Deprecated APIs, intended to be removed
- ble_gattc_mtu_exchange()
* GATTS:
- New APIs added
- ble_gatts_service_changed()
- Added BLE_GATTS_EVT_SC_CONFIRM event
- ble_gatts_rw_authorize_reply()
- Added BLE_GATTS_EVT_RW_AUTHORIZE_REQUEST event
- Removed APIs
- ble_gatts_rw_op_reply()
- Removed BLE_GATTS_EVT_READ_OP_REQUEST and BLE_GATTS_EVT_WRITE_OP_REQUEST event
- Deprecated APIs, intended to be removed
- ble_gatts_db_load()
- ble_gatts_md_get()
- ble_gatts_md_set()
- Renamed BLE_GATTS_SVC_TYPES to BLE_GATTS_SRVC_TYPES defines
- Renamed some BLE_GATTS_ATTR_TYPES defines

- Changed ble_gatts_attr_md_t, renamed some and added new structure members
- Renamed structure members in ble_gatts_attr_context_t
- ble_gatts_hvx() execution time has been optimized

* Softdevice:
- Added new header file, nrf_svc.h
- Changed lfclk oscillator sources values
- Added configurable RC oscillator calibration interval feature
- Removed APIs
  - nrf_power_perpower_set()
  - nrf_power_perpower_clr()
  - nrf_power_perrdy_get()
- Added APIs
  - nrf_power_gpregret_set()
  - nrf_power_gpregret_clr()
  - nrf_power_gpregret_get()
  - nrf_power_dcdc_mode_set() (see Known issues)
  - nrf_radio_notification_cfg_set()

</Changes>

<NewFunctionality>
* SOC:
  - Radio Active notification. The application can receive interrupt notifications for radio activity.
* GATTS:
  - Authorization (previously known as deferred operations). The application can individually authorize read and write operations per attribute.
  - Service Changed Characteristic. Changes in the attribute table structure can be indicated to bonded clients.
  - Attribute Value flexible location. The application can choose to place attribute values in its own memory space or continue using the stack's.
  - Access restrictions based on LTK length can be achieved using authorization.
</NewFunctionality>

<Known Issues>
* Qualification:
  - Host protocol layer has been tested according to the Bluetooth conformance test specification but has not yet been listed as a Qualified Design (QDL)
* Softdevice:
  - Average current is higher than expected when using slave latency because the 16MHz XOSC is started each interval. (NRFFOETT-106, DRGN-1958)
  - New added functionality of synthesized low frequency clock source is not tested to work with BLE stack.
  - When advertising is stopped, either by explicit GAP API call or by GAP API configurable timeout, all threads at or below APP_LOW priority get blocked for advertising interval time period (DRGN-2018)
  - Testing of the nrf_power_dcdc_mode_set() is not complete
* 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)
* GATT:
  - Expected throughput of six notification/indications per connection interval is currently limited to five. (DRGN-2043)
</KnownIssues>

<MissingFeatures>
* Window Limiting as described in Softdevice Specification Document is not implemented
</MissingFeatures>

</Release>

<Release="2.0.0">

<Module>
S110 Softdevice
</Module>

<Overview>
Release of the S110 Softdevice, implementing a Bluetooth(r) Low Energy Stack on the nRF51822 IC.
</Overview>

<Requirements>
* nRF51822 IC
</Requirements>

<Compatibility>
* nRF518 SDK 2.0.0
* nRF51822
</Compatibility>

<Bugfixes>
* Softdevice
- PPI channel groups: Currently only PPI channel group 0 is available to the application. In the future, PPI channel groups 0 and 1 will be made available. (DRGN-1543)
* GATTS:
- When calling ble_gatts_characteristic_add and it fails, it might not remove all added attributes, depending on the error code. Thus the call to add
characteristics should never fail to make sure it works. (DRGN-791)
- Stack enters Busy state if transmission of indication fails due to buffer overflow. (DRGN-1619)
- CCCD/SCCD write permissions not checked in ble_gatts_characteristic_add(). Need to check for at least write permissions with no security (DRGN-1443)
* GAP:
- When directed advertising is used, a connected event always arrives from the softDevice even if there no connection (NRFFOETT-24, DRGN-1662)
- Assert happen if the APP has issued Disconnect Cmd and at the same radio instant LTK/encryption request arrives from the peer. (DRGN-1408)
- ble_gap_adv_data_set function does not return error when an invalid (all - zeros) advertisement data is passed as argument. (DRGN-1370)
- Assert when calling set advertising data right after calling disconnect. (DRGN-1364)
- Failed GATTS characteristic_add leaves database in inconsistent state. (DRGN-791)
- If 0 is supplied as the timeout parameter of ble_gap_adv_params_t, you still get a BLE_GAP_EVT_TIMEOUT with src BLE_GAP_TIMEOUT_TYPE_ADVERTISEMENT. (DRGN-1815)
* L2CAP:
- ble_l2cap.h has "@note Not yet implemented" for APIs already implemented. (DRGN-1795)
</Bugfixes>

<Changes>
* GAP:
- ble_gap_adv_start() now requires the advertising parameters for timeout and advertising intervals both to be set to 0 when using directed advertising.
- Updates related to returning NRF_ERROR_BUSY error code for following function(s):
- ble_gap_address_set()
- ble_gap_adv_data_set()
- ble_gap_conn_param_update()
- ble_gap_tx_power_set()
- ble_gap_sec_info_reply()
- ble_gap_rssi_start()
- ble_gap_rssi_stop()
- Updates related to returning NRF_ERROR_INVALID_STATE error code for following function(s):
- ble_gap_disconnect()
- Updates related to input parameters for the following function(s):
- ble_gap_device_name_set()
- ble_gap_device_name_get()
- ble_gap_authenticate()
- ble_gap_sec_params_reply()
- Updated Discovery Mode definitions.
* GATTS:
- char_user_desc_size added to ble_gatts_char_md_t.
- New event (BLE_GATTS_EVT_TIMEOUT) added.
- Updated behaviour for ble_gatts_hvx() and ble_gatts_sys_attr_set().
* BLE:
- ble_version_get() can return error codes other than NRF_SUCCESS.
- Updated BLE error codes
- Updated BLE_APPEARANCES defines.
* Softdevice:
- API "nrf_wait_for_app_event()" is renamed to "nrf_app_event_wait()".
</Changes>

<NewFunctionality>

  * GATT Client. Note that signed write, write long and reliable write is not supported.
  * Device filtering based on Identity Resolving Key (IRK).
 </NewFunctionality>

 <Unimplemented>
 </Unimplemented>

 <KnownIssues>
  * Softdevice:
    - Host and Link Layer are not yet qualified, i.e. do not have a QDL.
    - Average current is higher than expected when using slave latency because the 16MHz XOSC is started each interval. (NRFFOETT-106)
    - New added functionality of synthesized low frequency clock source is not tested to work with BLE stack.
  * 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)
    - To conform to the Bluetooth specification, no services or characteristics should be added or removed after bonding to a device (DRGN-1026)
    - It is not possible to restrict attribute access based on the key size used during pairing. (DRGN-970)
  * GAP:
    - Currently there is no exponential backoff timer on SMP for repeated attempts, this can be implemented in the application to conform with the Bluetooth spec (DRGN-1123)
    - It is currently not possible to achieve full data throughput using ble_gatts_hvx() with notifications if the connection interval is below 10ms. (DRGN-1433)
    - When using IRK and receiving scan requests, the filter policy BLE_GAP_ADV_FP_FILTER_BOTH does not work. (DRGN-1838)
    - When using IRK, the filter policy BLE_GAP_ADV_FP_FILTER_SCANREQ does not work. (DRGN-1838)
  * BLE
    - The Softdevice will consume an event even if the application does not provide enough memory for it to fit. It is therefore strongly recommended when using this release to always call ble_evt_get() with enough memory to fit in any event that may come from the BLE stack. (DRGN-1844)
 </KnownIssues>

 <MissingFeatures>
  * Window Limiting as described in Softdevice Specification Document is not implemented
 </MissingFeatures>

</Release>

<Release="1.0.0">

 <Module>
  S110 Softdevice
 </Module>

 <Overview>
  This is the second release of the S110 Softdevice, implementing a Bluetooth(r) Low Energy Stack on the nRF51822 IC.
 </Overview>

 <Requirements>
  * nRF51822 IC
 </Requirements>

 <Compatibility>
  * nRF51 SDK
  * nRF51822
 </Compatibility>

 <Bugfixes>
  * GAP:
    - ble_gap_authenticate() can not be called again until the procedure has completed (DRGN-1027)
    - No longer asserts if the peer rejects the Connection Parameter Update Request (DRGN-1041)
    - ble_gap_conn_params_update() can not be called again until procedure has either completed or timed out (DRGN-1118)
    - Now allows pairing with MITM protection (DRGN-1150)
    - Some SMP timers were not reset upon disconnect during pairing and could cause the device to disconnect the next connection (DRGN-1289)
    - The timer for security request did not use correct resolution. (DRGN-1337)
    - No longer asserts if ble_gap_adv_start() is called with invalid parameters (DRGN-1361)

- Softdevice always sends BLE_GAP_EVT_AUTH_STATUS event when paring is complete (DRGN-1363)
- ble_gap_conn_param_update() internal state did not get updated correctly if disconnected in the middle of the procedure (DRGN-1039)
- No longer asserts during encryption when master initiates with IO_CAPS_KEYBOARD_DISPLAY and pairing and slave responds with IO_CAPS_DISPLAY_ONLY and bonding (DRGN-1367)
- No longer asserts if ble_gap_tx_power_set() is called with the (valid) value -40 (DRGN-1407)

* Softdevice fixes:
- No longer loses connection with error code 0x3E when switching to RC clocksource (DRGN-1171)

</Bugfixes>

<Changes>

* GATTS:
- ble_gatts_md_set() and ble_gatts_value_set() are now restricted to characteristic values and descriptors added by the application only (DRGN-1125)
- Possibility for persistent protocol data (CCCD, Service Changed, SCCD) between connections (DRGN-967)
- ble_gatts_char_md_t has received a char_user_desc_max_size that need to be set to equal or longer than the char_user_desc length. (DRGN-900)
- The ble_gatts_characteristic_add() and ble_gatts_descriptor_add() have been modifed to include the parrent handle (could use BLE_GATTS_HANDLE_INVALID for old behavior) (DRGN-907)

* ble_evt_get() has been modified and prepared for longer mtu sizes than 23 (DRGN-1389)
* Softdevice:
- Application can set the clock accuracy when enabling the softdevice (DRGN-1278)

</Changes>

<NewFunctionality>

* GAP:
- Application can stop pairing from proceeding by replying with an error when receiving BLE_GAP_EVT_SEC_REQUEST (DRGN-1314)
- The ability to continue pairing if application requests bonding and peer sets bonding flag to zero. (DRGN-1129)
- Whitelist functionallity: With address or resolvable random address with IRK (received during bonding) (DRGN-983)
- The application can register for RSSI events (DRGN-1351)

* Vendor Specific UUIDs (128bit UUID support) (DRGN-550)
* L2CAP:
- Can register L2CAP channels for proprietary protocols (DRGN-1119)

* GATTS:
- New function calls for persistence: ble_gatts_sys_attr_set() and ble_gatts_sys_attr_get() (DRGN-967)

</NewFunctionality>

<Unimplemented>

* GATT support for MTU sizes larger than the default 23 octets.
* Signing of GATT PDUs (Bluetooth Core spec, Vol.3, Part H, section 2.4.5), is not supported.
* GAP Privacy (Bluetooth Core spec. Vol. 3, Part C, section 10.7) is not supported.
* Loading a GATT database image is not supported. A preliminary API specification is found in the file ble_gatts.h.
* Deferring GATT operations is not supported. A preliminary API specification is found in the file ble_gatts.h.
* GATT client functions are not supported. A preliminary API specification is found in the file ble_gattc.h.

</Unimplemented>

<KnownIssues>

* Some conformance tests not passing
* Softdevice
- PPI channel groups: Currently only PPI channel group 0 is available to the application. In the future, PPI channel groups 0 and 1 will be made available.

* GATTS:
- To conform with the bluetooth specification there shall not be a secondary service that is not referenced somehow by a primary service. (DRGN-906)
- To conform with the bluetooth specification, no services or characteristics should be added or removed after bonding to a device (DRGN-1026)
- When calling ble_gatts_characteristic_add and it fails, it might not remove all added attributes, depending on the error code. Thus the call to add
characteristics should never fail to make sure it works. (DRGN-791)
- It is not possible to restrict attribute access based on the key size used during pairing. (DRGN-970)

* GAP:
- Currently there is no exponential backoff timer on SMP for repeated attempts, this can be implemented in the application to conform with the bluetooth spec (DRGN-1123)
- It is currently not possible to achieve full data throughput using ble_gatts_hvx() with notifications if the conneciton interval is below 10ms. (DRGN-1433)

</KnownIssues>

</Release>

<Release="0.6.0">

<Module>
S110 Softdevice
</Module>

<Overview>
This is the first release of the S110 Softdevice, implementing a Bluetooth(r) Low Energy stack on the nRF51822 IC. The next release is planned for Sept. 2012.
</Overview>

<Toolchain>
* Keil uVision 4.22.22.0
* lint version 9.00h
* python 2.7.2.amd64
* pywin32-216.win32-py2.7
* pyserial version not identified
* doxygen 1.7.5
* Nordic Tasks 0.2.5
* nrf51 SDK 0.13.0 check before release.
</Toolchain>

<Requirements>
* nRF51822 IC
</Requirements>

<Compatibility>
* Netlist 18
* nRF51 SDK
* nRF51822
</Compatibility>

<Bugfixes>
First release, no bug fixes.
</Bugfixes>

<Changes>
First release, no changes.
</Changes>

<NewFunctionality>
* This is the first release. All functionality is described in the online documentation.
</NewFunctionality>

<Unimplemented>
* ble_vs_uuids_assign(), defining vendor specific UUIDs, is not supported. A preliminary API specification is found in the file ble.h.
* GAP funcions for the central role are not supported (ble_gap_scan_start, ble_gap_scan_stop, ble_gap_connect, ble_gap_connect_cancel). A preliminary API specification is found in the file ble_gap.h.
* GATT supports only the default MTU size of 23 octets.
* Signing of GATT PDUs (Bluetooth Core spec, Vol.3, Part H, section 2.4.5), is not supported.
* GAP Privacy (Bluetooth Core spec. Vol. 3, Part C, section 10.7) is not supported.
* Loading a GATT database image is not supported. A preliminary API specification is found in the file ble_gatts.h.
* Deferring GATT operations is not supported. A preliminary API specification is found in the file ble_gatts.h.
* GATT client functions are not supported. A preliminary API specification is found in the file ble_gattc.h.
* Direct Test Mode (DTM, see Bluetooth Core spec, Vol. 6, Part G) will be implemented in the next release.
</Unimplemented>

<KnownIssues>
* Client Characteristic Configuration Descriptor values are not persistent across connections for bonded devices (see Bluetooth Core spec, Vol. 3, Part G, section 3.3.3.3).
* MITM protection is not supported when performing a pairing procedure without bonding.
* The function ble_gatts_hvx() can currently modify the GATT Server database and fail to send the corresponding notification or indication. Once this issue is resolved, the function will atomically write the new value to the database and send the packet.

* The fucntion nrf_softdevice_enable currently does not work with the clock_source set to NRF_CLOCK_LFCLKSRC_RC
* The application must turn on the 16 MHz clock source before the softdevice is started, and must not turn it off while the softdevice is running.
<KnownIssues>

<Release>