

# s110\_nrf51822 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:
  - Bugfixes
  - Changes
  - New functionality
  - 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.

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## s110\_nrf51822\_6.0.0-5.beta

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).
- GATT
  - Triggering transactions repeatedly no longer causes the GATT client to fail (DRGN-3467).

## Changes

- Softdevice
  - API facing event structures and functions now consistently 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).
  - GATT 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

- No known issues

## 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 attempts 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)
- GATT 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)
- GATT 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-preprogrammed 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 consumption 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 modified to include the parent 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 functionality: 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 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 connection 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 functions 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 function `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>