s132_nrf52_4.x.x release notes

Introduction to the s132_nrf52 release notes

These release notes describe the changes in the s132_nrf52 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 s13x_nrf5x migration document (normally available for major releases only).

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

s132_nrf52_4.0.4

This is a production release that contains minor but important changes to the 4.0.3 release.

SoftDevice properties

- The SoftDevice Specification v4.1, available in the Nordic Semiconductor Infocenter, is applicable for this release.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.1.1 (DRGN-8649).
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **4.94 kB** (`0x13C0` bytes) This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.

Changes

- LL
  - The SoftDevice slave role now accepts overlapping peer-initiated Link Layer control procedures (DRGN-8623, DRGN-8975). The following LL control procedures can be executed in parallel with any other control procedure, except for themselves: LE Ping, Feature Exchange, Data Length Update, and Version Exchange. This is done for compatibility reasons. As a result of this, `BLE_GAP_OPT_COMPAT_MODE_2` has no effect.

- GATT
  - The SoftDevice will no longer prevent using "Write Command" on Characteristic Descriptors (DRGN-9085, DRGN-9086). This change reverts a change done for s132_nrf52_4.0.0. Note that according to the Bluetooth Core Specification v 5.0 (Vol. 3, Part G Chapter 4.12.3), when writing Characteristic Descriptors "The Attribute Protocol Write Request is used for this sub-procedure". While the SoftDevice will no longer prevent the use of the "Write Command", it is up to the application to ensure the correct procedure is used

Bug fixes

- SoftDevice
  - Fixed an issue where the SoftDevice might assert in some cases if the application delayed pulling of SoftDevice events (DRGN-8823).
- LL
  - Fixed an issue where the slave would assert if a control packet was received in the same event as it sent a LL_LENGTH_RSP packet (DRGN-9036).
  - Fixed an issue where the slave could assert if it received a PAUSE_ENC_REQ followed by an LL_ENC_REQ (DRGN-9035). This sequence of packets is illegal behavior according to the Bluetooth Core Specification v 5.0, so the slave will now disconnect in this situation.
  - Fixed an issue where the slave in some cases could disconnect with wrong disconnect reason (`BLE_HCI_DIFFERENT_TRANSACTION_COLLISION` instead of `BLE_HCI_CONN_TERMINATED_DUE_TO_MIC_FAILURE`) if master misbehaves (DRGN-8998).
  - Fixed an issue where scanner/initiator would use wrong local IRK when SoftDevice is configured to use more than one local IRK (DRGN-9072).
  - Fixed an issue which could lead to a deadlock in the Channel Map Update procedure if an unexpected disconnection occurred before the instant (DRGN-9033). The deadlock would have blocked any future Channel Map Updates.

- GATT
  - Fixed an issue where setting `gatts_conn_cfg.hvn_tx_queue_size` or `gattc_conn_cfg.write_cmd_tx_queue_size` to 0 would lead to a SoftDevice assert during connect for the last connection that fits in memory (DRGN-9056).

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.

- 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).

Known Issues

- SoftDevice
  - If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).
  - Calling `sd_ble_gap_sec_params_reply()`, `sd_ble_user_mem_reply()`, or `sd_ble_gatts_rw_authorize_reply()` more then 6 times without pulling events in between in some cases may lead to link disconnect (DRGN-8627).
- GATTS
  - When `BLE_EVT_USER_MEM_REQUEST` event is pulled by the application, incoming packet processing may be delayed in some cases until the application replies with the `sd_ble_user_mem_reply()` call (DRGN-8595).
  - The value of the attribute in `BLE_GATTS_EVT_RW_AUTHORIZE_REQUEST` event corresponding to the first Prepare Write Request on a link with heavy traffic may get corrupted if the application delays the pulling of SoftDevice events (DRGN-8595).

s132_nrf52_4.0.3

This is a production release that contains minor but important changes to the 4.0.2 release.

SoftDevice properties

- An updated SoftDevice Specification document will be available at http://infocenter.nordicsemi.com/.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.1.1 (DRGN-8649).
  - The changes from the previous version are header file modifications only.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **4.94 kB** (`0x13C0` bytes) This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.

Changes

- SoftDevice
  - It is now possible to set RCOSC accuracy to 500 ppm or 250 ppm when calling `sd_softdevice_enable` and using `nrf_clock_lf_cfg_t::source=NRF_CLOCK_LF_SRC_RC`. `nrf_clock_lf_cfg_t::xtal_accuracy` can be configured to `NRF_CLOCK_LF_XTAL_ACCURACY_250_PPM` or `NRF_CLOCK_LF_XTAL_ACCURACY_500_PPM` (DRGN-8838). All other values for `xtal_accuracy` will default to 500 ppm.
  - Interrupt priority 5 is now available to the application (DRGN-8853).
- Documentation
  - The Message Sequence Charts (MSCs) for LL Data Length Update Procedure have been corrected, extended and improved (DRGN-8722).
  - Improved documentation for `sd_ble_gap_adv_start()` (DRGN-8799).

Bug fixes

- SoftDevice
  - Fixed an issue where `sd_ble_enable()` may corrupt up to 8 bytes above the returned `app_ram_base` when the SoftDevice is configured with 0 Peripheral roles and 0 Central roles (DRGN-8802).
- GAP
  - Fixed an issue where the `BLE_GAP_DATA_LENGTH_AUTO` value for `p_dl_params->max_tx_octets` and `p_dl_params->max_rx_octets` in `sd_ble_gap_data_length_update()` might not work as expected on connections using a configuration with configured event length of 2, 3 or 4 (DRGN-8779).

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- 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).

Known Issues

- SoftDevice
  - If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).
  - Calling `sd_ble_gap_sec_params_reply()`, `sd_ble_user_mem_reply()`, or `sd_ble_gatts_rw_authorize_reply()` more then 6 times without pulling events in between in some cases may lead to link disconnect (DRGN-8627).
- GATTS
  - When `BLE_EVT_USER_MEM_REQUEST` event is pulled by the application, incoming packet processing may be delayed in some cases until the application replies with the `sd_ble_user_mem_reply()` call (DRGN-8595).
  - The value of the attribute in `BLE_GATTS_EVT_RW_AUTHORIZE_REQUEST` event corresponding to the first Prepare Write Request on a link with heavy traffic may get corrupted if the application delays the pulling of SoftDevice events (DRGN-8595).

s132_nrf52_4.0.2

This release contains minor but important changes to the 4.0.0 release

SoftDevice properties

- An updated SoftDevice Specification document will be available at http://infocenter.nordicsemi.com/.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.1.0 (DRGN-8507).
  - The changes from the previous version are header file modifications only.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **4.94 kB** (`0x13C0` bytes) This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.

Bug fixes

- GAP
  - Fixed an issue where the `conn_handle` parameter in the event `BLE_GAP_EVT_DATA_LENGTH_UPDATE_REQUEST` was not populated correctly (DRGN-8749).
  - Fixed an issue where the Softdevice would assert when `sd_ble_gap_device_identities_set()` was called while advertiser is running (DRGN-8634).
- Documentation
  - Fixed documentation for `sd_ble_gap_addr_set()` and `sd_ble_gap_privacy_set() (DRGN-8624).`
  - Fixed documentation for `sd_ble_adv_start()` (DRGN-8624).

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- 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).

Known Issues

- SoftDevice
  - If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).
  - Calling `sd_ble_gap_sec_params_reply()`, `sd_ble_user_mem_reply()`, or `sd_ble_gatts_rw_authorize_reply()` more then 6 times without pulling events in between in some cases may lead to link disconnect (DRGN-8627).
  - If the SoftDevice is configured with 0 Peripheral roles and 0 Central roles, `sd_ble_enable()` may corrupt up to 8 bytes above the returned `app_ram_base`. For applications having such a configuration, set the application RAM start to 8 bytes or more above the returned `app_ram_base` (DRGN-8802).
- GAP
  - The `BLE_GAP_DATA_LENGTH_AUTO` value for `p_dl_params->max_tx_octets` and `p_dl_params->max_rx_octets` in `sd_ble_gap_data_length_update()` does not work as expected on connections using a configuration with configured event length of 2, 3 or 4, when maximum ATT_MTU in the same connection configuration is more than 69, 147 or 225 octets respectively. In these cases `sd_ble_gap_data_length_update()` will return error code `NRF_ERROR_RESOURCES`, and not have an effect (DRGN-8779).
- GATTS
  - When `BLE_EVT_USER_MEM_REQUEST` event is pulled by the application, incoming packet processing may be delayed in some cases until the application replies with the `sd_ble_user_mem_reply()` call (DRGN-8595).
  - The value of the attribute in `BLE_GATTS_EVT_RW_AUTHORIZE_REQUEST` event corresponding to the first Prepare Write Request on a link with heavy traffic may get corrupted if the application delays the pulling of SoftDevice events (DRGN-8595).

s132_nrf52_4.0.0

The main new features of this major version, compared to the 3.0.0 version, are application control of the Data Length Update Procedure, SoftDevice configuration API extensions, support for multiple peripheral connections, support for up to 20 connections in total, and configuration of individual links including per link ATT_MTU configuration.

The updates from the previous alpha version (4.0.0-2.alpha) are minor changes and bug fixes.

Notes:

- This release has changed the Application Programmer Interface (API) from the 3.0.0 release. This requires applications to be recompiled.
- The memory requirements of the SoftDevice have changed.

SoftDevice properties

- An updated SoftDevice Specification document will be available at http://infocenter.nordicsemi.com/.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.1.0 (DRGN-8507).
  - The changes from the previous version are header file modifications only.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **4.94 kB** (`0x13C0` bytes) This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.

New functionality

- Most new features have been introduced in the previous alpha versions. See the release notes for those versions below.
- The SoftDevice now supports sleep clock accuracy values less than 20 ppm as a peripheral (DRGN-8158).

Changes

- SWI3 is no longer reserved for use by the SoftDevice and is available for the application (DRGN-8367).

Bug fixes

- SoftDevice
  - The `sd_power_pof_threshold_set` API has been fixed to support all the new levels that were introduced in nRF52

(DRGN-8348).
    - Fixed an issue where scanning or advertising with timeout greater than 256 seconds and having two host protocol timers running at the same time might lead to delayed timeouts (DRGN-7804).
- GATTC
    - It is no longer possible to issue a write command if the write command queue size is set to 0 on the config API (DRGN-8353).
- GATTS
    - It is no longer possible to issue an HVN if the HVN queue size is set to 0 on the config API (DRGN-8353).
- GAP
    - Fixed an issue where `sd_ble_gap_conn_param_update()` called in peripheral role in some cases may return NRF_ERROR_BUSY for 30 seconds after the previous procedure initiated by that call was completed (DRGN-8577).
- LL
    - Fixed an issue where using more than eight links and receiving a lot of data concurrently could lead to undefined behavior (DRGN-8433).
    - Fixed an issue where using encryption on multiple master links at the same time could cause an assert (DRGN-8532).

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 the BLE stack.
    - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- 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).

Known Issues

- SoftDevice
    - If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).
    - Calling `sd_ble_gap_sec_params_reply()`, `sd_ble_user_mem_reply()`, or `sd_ble_gatts_rw_authorize_reply()` more then 6 times without pulling events in between in some cases may lead to link disconnect (DRGN-8627).
- GATTS
    - When BLE_EVT_USER_MEM_REQUEST event is pulled by the application, incoming packet processing may be delayed in some cases until the application replies with the `sd_ble_user_mem_reply()` call (DRGN-8595).
    - The value of the attribute in BLE_GATTS_EVT_RW_AUTHORIZE_REQUEST event corresponding to the first Prepare Write Request on a link with heavy traffic may get corrupted if the application delays the pulling of SoftDevice events (DRGN-8595).
- Documentation
    - The documentation for `sd_ble_gap_addr_set()` and `sd_ble_gap_privacy_set()` states that these functions cannot be called while BLE roles are running. This is wrong, these functions can be called while in connection, but not while advertising, scanning or creating a connection (DRGN-8624).
    - The documentation for `sd_ble_adv_start()` states that a connectable advertiser cannot be started after the BLE_GAP_EVT_CONNECTED event is received. This is wrong, a connectable advertiser can be started as long as no other advertiser is running and there are fewer active Peripheral connections than configured (DRGN-8624).

s132_nrf52_4.0.0-2.alpha

This is the second alpha release of s132_nrf52_4.0.0. The main new features of this version are that the Data Length Update Procedure is initiated and responded to from application code and that the SoftDevice configuration API is extended to include global SoftDevice configurations.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- The memory requirements of the SoftDevice have changed.

SoftDevice properties

- A SoftDevice Specification document is not available for this alpha release.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1f000` bytes).
  - RAM: **5.09 kB** (`0x1460` bytes). This is the minimum required memory. The actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time.

New functionality

- LL
  - The SoftDevice can be configured to disable and enable slave latency (DRGN-8305). This allows the application to override the slave latency set by the master.
  - The SoftDevice can be configured to not disconnect if the peer initiates parallel version and feature exchange procedures (DRGN-8306).
- GAP
  - The application is given control of the Data Length Update Procedure. The application can initiate the Data Length Update Procedure and has to respond when initiated by the peer (DRGN-8297).

Changes

- BLE
  - Configuration parameters passed to `sd_ble_enable()` have been moved to the SoftDevice configuration API (DRGN-8107).

Bug fixes

- LL
  - Fixed an issue where the SoftDevice would only be able to send two packets per connection event after a Data Length Update Procedure to a LL Data Channel PDU payload size of more than 34 bytes (DRGN-8392).
  - Fixed an issue where a connection parameter update from a short connection interval to a longer connection interval when using long ATT MTUs could lead to reduced bandwidth (DRGN-8427).

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority level 1 as this can lead to undefined behavior.
- 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

- Using more than eight links and receiving a lot of data concurrently can lead to undefined behavior (DRGN-8433).
- If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).

s132_nrf52_4.0.0-1.alpha

This is the first alpha release of s132_nrf52_4.0.0. The main new features of this version, compared to the 3.0.0 version, are support for multiple peripherals, support for up to 20 connections in total, and configuration of individual links including per link ATT_MTU configuration.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- The memory requirements of the SoftDevice have changed.

SoftDevice properties

- A SoftDevice Specification document is not available for this alpha release.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **5.11 kB** (`0x1470` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- BLE
  - Support for 20 links in total with freely selectable role (Central/Peripheral) for each link (DRGN-7102, DRGN-7152, DRGN-7848).
  - The BLE bandwidth configuration and application packet concept has been replaced with per link configurable:
    - Event length (DRGN-7858)
    - Write without response queue size (DRGN-7488, DRGN-7858)
    - Handle Value Notification queue size (DRGN-7487, DRGN-7858)
  - The GPIO pin to toggle can now be the same for PA and LNA (DRGN-8354).
- GAP
  - The event length (i.e. the time set aside on every connection interval) can now be configured per link by the application (DRGN-7858).
- GATT
  - The maximum ATT_MTU can now be configured per link by the application (DRGN-7858).
- GATTC
  - The application packet concept has been replaced with a dedicated transmission queue for Write without responses. Also, the `BLE_EVT_TX_COMPLETE` event has been replaced with `BLE_GATTC_EVT_WRITE_CMD_TX_COMPLETE`. Write without response queue size can now be configured per link by the application (DRGN-7488, DRGN-7858).
- GATTS
  - The application packet concept has been replaced with a dedicated transmission queue for Handle Value Notifications. Also, the `BLE_EVT_TX_COMPLETE` event has been replaced with `BLE_GATTS_EVT_HVN_TX_COMPLETE`. Handle Value Notification queue size can now be configured per link by the application (DRGN-7487, DRGN-7858).

Changes

- SoftDevice
  - The `sd_power_ramon_set()`, `sd_power_ramon_clr()`, and `sd_power_ramon_get()` SoftDevice APIs have been replaced with `sd_power_ram_power_set()`, `sd_power_ram_power_clr()`, and `sd_power_ram_power_get()`, so the application now has access to the registers `RAM[x].POWER` instead of the deprecated `RAMON/RAMONB` (DRGN-8117).
- BLE
  - More pointers have been defined as `const` in the BLE API, allowing the application to put more data into flash instead of RAM, if desired (DRGN-6133).

Bug fixes

- SoftDevice
  - `sd_softdevice_enable()` now returns an error code if called with `fault_handler` set to `NULL` or to an invalid function pointer. If the application returns from the `fault_handler` function, the SoftDevice will do an `NVIC_SystemReset()` (DRGN-7122).
  - It is no longer required to clear `INTENSET` for `TIMER0` before the timeslot ends, if the application uses `TIMER0` inside a

timeslot scheduled with the Radio Timeslot API (DRGN-7776).
    - The SVCALL macro can now be used with the GCC C++ compiler as well (DRGN-8028).
- BLE
    - Several Doxygen documentation errors have been corrected (DRGN-7386, DRGN-7853, DRGN-8136).
- LL
    - Fixed an issue where the controller completed a procedure when it received an LL_UNKNOWN_RSP without checking if it was the expected procedure that returned the error opcode (DRGN-7999).
    - The SoftDevice no longer rejects LL_LENGTH_REQ and LL_LENGTH_RSP with parameters which are out of range according to Bluetooth 4.2 specification (DRGN-7872).
    - Fixed an issue where bit errors in the length field of an encrypted packet caused the packet to be interpreted as longer than was sent by the peer (DRGN-7898). This issue could have manifested in the following ways:
        - SoftDevice memory buffer corruption which could lead to an assert or incorrect behavior.
        - SoftDevice may send a packet with an incorrect MIC field leading to a disconnect from the peer.
- GAP
    - Two missing Advertising Data Types have been added: BLE_GAP_AD_TYPE_LESC_CONFIRMATION_VALUE (0x22) and BLE_GAP_AD_TYPE_LESC_RANDOM_VALUE (0x23) (DRGN-8101).
    - sd_ble_gap_connect() now always stops the scanner (DRGN-7679).

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 the BLE stack.
    - Applications must not modify the SEVONPEND flag in the SCR register when running in priority level 1 as this can lead to undefined behavior.
- 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

- If Data Length Extension with an LL Data Channel PDU payload size of more than 34 bytes is used, the SoftDevice is able to send only two packets per connection event. That leads to low data throughput if long connection events are used. To increase data throughput, use shorter connection events with shorter connection intervals (DRGN-8392).
- Using more than eight links and receiving a lot of data concurrently can lead to undefined behavior (DRGN-8433).
- If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).

s132_nrf52_3.0.0

The main new features of this major version, compared to the 2.0.1 version, are Configurable ATT_MTU, LE Data Packet Length Extension (DLE), LL Privacy and LE Ping. The updates from the previous alpha version (3.0.0-2.alpha) are minor changes and bug fixes.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- The memory requirements of the SoftDevice have changed.

SoftDevice properties

- An updated SoftDevice Specification document is available at http://infocenter.nordicsemi.com/.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **6.43 kB** (`0x19C0` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- All new features have been introduced in alpha versions 3.0.0-1.alpha and 3.0.0-2.alpha. See the release notes for those versions below.

Changes

- BLE
  - The length of connection events is now set to fit the configured maximum LL packet size during connection setup (DRGN-7672). In 3.0.0-2.alpha, the connection event length was increased after a DLE procedure, which would lead to collisions with other established central links. This change affects the recommended connection intervals documented in the SDS.
  - Connection Event Length Extension (enabling extra packets to be sent per connection interval) is now disabled by default and a new API has been added to enable/disable this feature (DRGN-7562).
- GAP
  - The Tx power level configuration API has been updated to support the +3dBm power level (DRGN-7644).

Bug fixes

- Fixed an issue where MIC failures may have happened if the LL payload length is increased to more than 27 bytes on an encrypted link (DRGN-7779).
- Fixed an issue where some LL payload bytes may have been lost if the LL payload length was increased to more than 27 bytes and there was a CRC error (DRGN-7777).
- Fixed an issue where the authenticated payload timeout event (`BLE_GAP_TIMEOUT_SRC_AUTH_PAYLOAD`) was not triggered for a link if the link was blocked multiple times during the authenticated payload timeout expiration (DRGN-7769).
- Fixed an issue where the SoftDevice may have asserted if DLE and Radio Notification were used together (DRGN-7710).
- FIxed an issue where the SoftDevice may have asserted during the ATT_MTU exchange procedure (DRGN-7703).
- Fixed an issue where pairing with passkey entry would fail if the keypress notification was received in the same connection event as the pairing response (DRGN-7680).

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority level 1 as this can lead to undefined behavior.
  - If the application uses TIMER0 inside a timeslot (scheduled with the Radio Timeslot API), INTENSET for TIMER0 must be cleared before the timeslot ends (DRGN-7776).
- LL

    - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
    - A broadcaster **and** a scanner cannot both be active if there are 8 connections established (DRGN-6543).
- 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

- If `sd_softdevice_enable()` is called with `fault_handler` set to `NULL`, an invalid function pointer, or a pointer to a returning function, the behavior will be undefined (DRGN-7122).
- If Connection Event Length Extension is enabled, the Radio Notification may be suppressed between connection events (DRGN-7687).
- When `sd_ble_gap_connect()` returns an error code, the scanner may be stopped (DRGN-7679). To ensure the scanner is in a known state, `sd_ble_gap_scan_stop()` should be used to stop the scanner when `sd_ble_gap_connect()` returns an error code.

s132_nrf52_3.0.0-2.alpha

This release adds features and fixes going towards the production v3.0.0 release.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- The memory requirement of the SoftDevice is changed.
- Previous alpha release was not made public, hence refer to its release notes too to get full update.

SoftDevice properties

- An updated SoftDevice Specification document is not available for this alpha release.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **5.59 kB** (`0x1660` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- Softdevice
  - The effect of connection interval on bandwidth is reduced. If free time is available, extra packets compared to the configured bandwidth will be sent in a connection interval. (DRGN-7561)
- LL
  - Data length extension feature support (DRGN-7245)
  - LE Privacy feature support (DRGN-7199)
- GATT
  - API to allow application to set the Rx MTU size during ATT MTU exchange procedure. (DRGN-7651)

Changes

- GATTC API event size increase due to ATT MTU size increase has been reduced.(DRGN-7610)
- Default timeout for LE PING is changed to API allowed max value from 30sec. (DRGN-7603)

Bug fixes

- In some cases GAP/GATT/SMP timeouts might be missed.(DRGN-7648)
- In some cases the GATTC event will occupy more memory than required. This might result in a hanging softdevice.(DRGN-7610)

Limitations

Known Issues

- If `sd_softdevice_enable()` is called with `fault_handler` set to `NULL`, to an invalid function pointer or a pointer to a returning function, the behavior will be undefined (DRGN-7122).
- Radio notification suppressed more than expected in some cases. (DRGN-7687)
- sd_ble_gap_connect may return error code but still stop scanner. (DRGN-7679)

s132_nrf52_3.0.0-1.alpha

This release changes the major version number from 2 to 3.

The main features of this release, compared to the 2.0.1 version, is the long ATT_MTU and LE ping support

Notes:

- This is a major release which has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- The memory requirement of the SoftDevice is changed.

SoftDevice properties

- An updated SoftDevice Specification document is not available for this alpha release.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **116 kB** (`0x1D000` bytes).
  - RAM: **4.22 kB** (`0x10E0` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- GAP
  - LE ping feature support. (DRGN-7015).
- GATT
  - Long ATT_MTU support (DRGN-7346)

Changes

- BLE
  - Enumeration BLE_CONN_BW_NONE is renamed to BLE_CONN_BW_INVALID
- SoftDevice
  - New interfaces added for set, get, clear for both GPREG registers (SD_POWER_GPREGRET_GET/CLEAR/SET).

Bug fixes

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority level 1 as this can lead to undefined behavior.
- LL
  - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
  - A broadcaster **and** a scanner cannot both be active if there are 8 connections established (DRGN-6543).
- 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).
- GATT
  - The maximum ATT_MTU is set during SoftDevice initialization and is applied to all connections.

Known Issues

- If `sd_softdevice_enable()` is called with `fault_handler` set to `NULL`, to an invalid function pointer or a pointer to a returning function, the behavior will be undefined (DRGN-7122).

s132_nrf52_2.0.1

This is a minor release of the s132_nrf52 Softdevice. This release provides minor bug fixes and documentation updates.

Notes:

- This SoftDevice version is compatible **only** with the latest nRF52 IC revision (Engineering C or Revision 1).

SoftDevice properties

- An updated SoftDevice Specification document is available at http://infocenter.nordicsemi.com/.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.0.0.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **112 kB** (`0x1C000` bytes).
  - RAM: **4.95 kB** (`0x13C8` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

Changes

- GATTS
  - The GATTS documentation has been updated to include additional error codes (DRGN-7252).

Bugfixes

- SoftDevice
  - Calling `sd_power_pof_threshold_set` will now configure the power-fail comparator correctly (DRGN-7280).
  - Calling `sd_ecb_block_encrypt` will no longer prevent the application from entering sleep mode (DRGN-7381).
  - The instantiation of `nrf_nvic_state_t` shown in a code example in `nrf_nvic.h` is now correctly zero-initialized (DRGN-7198).
  - Several doxygen documentation errors have been corrected (DRGN-7134).
- Link Layer
  - The supervision timeout of the slave link will no longer expire due to priority issues (DRGN-7308).
  - The Link Layer will no longer trigger an invalid assertion while performing connection parameter updates under certain circumstances (DRGN-7246).
  - The SoftDevice will now timely deliver scan response reports (DRGN-7153).
- GAP
  - Security: The SoftDevice will no longer assert during pairing/bonding using LESC numerical comparison under certain circumstances (DRGN-7235).
  - Security: The SoftDevice will now interrupt pairing procedures where the key size is smaller than the one requested by the application (DRGN-7125).

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 the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority level 1 as this can lead to undefined behavior.
- LL
  - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
  - A broadcaster **and** a scanner cannot both be active if there are 8 connections established (DRGN-6543).
- 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).

s132_nrf52_2.0.0

This is the first production release of the s132_nrf52 SoftDevice. The reason for the major version number being "2" is to align the major number with the one of the s130 SoftDevice, as these are functionally very similar.

The main feature of this release, compared to the 2.0.0-8.alpha version, is the inclusion of support for LE Secure Connections which introduces public key cryptography into the pairing mechanism.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- This SoftDevice version is compatible **only** with the latest nRF52 IC revision (Engineering C or Revision 1).

Update 1

- `sd_nvic_critical_region_enter()` is functional and provided to application as part of the `nrf_nvic.h` header file.
- `sd_nvic_critical_region_enter()` does not check for valid pointers, so the application must ensure that the supplied pointer as a parameter is valid.
- `sd_nvic_*` functions operate for all available interrupts (including those with IRQ numbers higher than 31).

SoftDevice properties

- An updated SoftDevice Specification document is available at http://infocenter.nordicsemi.com/.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.0.0.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **112 kB** (`0x1C000` bytes).
  - RAM: **4.9 kB** (`0x13C8` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- GAP
  - Support for LE Secure Connections has been added, along with all required API changes to enable it. This change requires applications making use of GAP security APIs to adapt to the new interface (DRGN-3979).
- L2CAP
  - The `sd_ble_l2cap_*` APIs now support packets longer than 23 bytes (DRGN-6649).

Changes

- SoftDevice
  - The timeslot API clock source selection API has been improved (DRGN-5882).
  - The documentation for `sd_softdevice_enable()` has been corrected to no longer state idempotence (DRGN-6910).
  - The documentation for `opt_id` in `sd_ble_opt_set()` and `sd_ble_opt_get()` has been expanded (DRGN-6912).
  - The `sd_nvic_*` API calls have changed from being SV calls to being implemented as static functions in the new `nrf_nvic.h` header file (DRGN-7131).
- BLE
  - The Message Sequence Charts (MSCs) have been corrected, extended and improved (DRGN-6529).
  - It is now possible for the application to queue outgoing packets and process incoming packets during the connection event. As a result of this more packets can be sent and received per connection event (DRGN-6785).
  - The documentation for bandwidth configuration of BLE connections has been rewritten to improve its readability (DRGN-6911).
  - A new error code, `NRF_ERROR_CONN_COUNT`, is now returned when invalid or unsupported connection counts are specified by the application (DRGN-6921).
  - Variable length fields in SoftDevice events are now defined as arrays of size 1 to ensure compatibility with a wider range of compilers (DRGN-6975).
- GATTS
  - The `ble_gatts_attr_context_t` field has been replaced with a `ble_uuid_t` in the `ble_gatts_evt_write_t` and `ble_gatts_evt_read_t` structures (DRGN-6825).
  - The documentation for `sd_ble_gatts_service_changed()` has been extended (DRGN-6986).

Bug fixes

- SoftDevice
  - Removed workaround for nRF52832 Erratum-73: The SoftDevice no longer leaves `TIMER0` running at all times which

resulted in 5 uA increased average current between BLE events (DRGN-6647).
    - ~~The `sd_nvic_critical_region_enter()` SV call will now return an error when an invalid pointer is provided as an input (DRGN-6302).~~
    - Fixed an assert that could have occurred on boot due to nRF52832 Erratum-36 (DRGN-7097).
- BLE
    - Fixed an issue where an application could invoke `sd_ble_*` SVCs without previously having called `sd_ble_enable()` (DRGN-6862).
    - Calling `sd_ble_uuid_vs_add()` with an UUID already present in the internal table will no longer fail with error code `NRF_ERROR_NO_MEM` (DRGN-6962).
- GAP
    - When trying to establish a connection as a peripheral and there is not enough memory available to honor the bandwidth configuration, the SoftDevice will return `NRF_ERROR_NO_MEM` instead of triggering a fault (DRGN-6874).
    - When disconnecting and reconnecting multiple connections, the SoftDevice will no longer return `NRF_ERROR_NO_MEM` with a valid configuration (DRGN-6875).
    - GAP will no longer trigger a fault when a connection as a peripheral is established right before the advertising timeout, or just before a call to `sd_ble_adv_stop()` (DRGN-6976).
    - GAP will no longer trigger a fault when starting a broadcaster or an observer with all configured connections established. It will instead return the new `NRF_ERROR_RESOURCES` error code (DRGN-7090).

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 the BLE stack.
    - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority level 2 or 3 as this can lead to undefined behavior.
- LL
    - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
    - A broadcaster **and** a scanner cannot both be active if there are 8 connections established (DRGN-6543).
- 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

- The address in the pc parameter of the `nrf_fault_handler_t` callback for `NRF_FAULT_ID_APP_MEMACC` might be 2 or 4 bytes higher than the one of the actual instruction that triggered the fault (DRGN-7110).
- If `sd_softdevice_enable()` is called with `fault_handler` set to `NULL`, to an invalid function pointer or a pointer to a returning function, the behaviour will be undefined (DRGN-7122).
- During LE Secure Connections pairing, when operating in the peripheral role, the SoftDevice will not automatically fail the pairing procedure if the peer's key size is smaller than the minimum key size (`min_key_size`) set during the call to `sd_ble_gap_sec_params_reply()`. Normally the full key size (16 bytes) is used in LE Secure Connections pairing procedures, so this issue should not typically manifest itself. If the application expects to interact with a peer central using a reduced key size, it should check the peer's key size in `BLE_GAP_EVT_SEC_PARAMS_REQUEST` and reply with `sd_ble_gap_sec_params_reply(BLE_GAP_SEC_STATUS_ENC_KEY_SIZE, NULL, NULL)` if the peer's key size is too small (DRGN-7125).
- ~~`sd_nvic_*` functions do not operate with interrupts with an IRQ number higher than 31.~~
- ~~`sd_nvic_critical_region_enter()` is not functional.~~

s132_nrf52_2.0.0-8.alpha

This release adds features and fixes going towards the production v2.0.0 release.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- This SoftDevice version is compatible **only** with the latest nRF52 IC revision (Engineering B).

SoftDevice properties

- An updated SoftDevice Specification document is not available for this alpha release.

- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.0.0-1.alpha.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **112 kB** (`0x1C000` bytes). This number is subject to change before the production release.
  - RAM: **4.7 kB** (`0x12B8` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- SoftDevice
  - The configuration of the 32 kHz RCOSC calibration in `sd_softdevice_enable()` has been made more flexible (DRGN-6362). It now supports more calibration intervals, and the ability to combine temperature and time triggered calibration.

Changes

- SoftDevice
  - The application priority enumeration has been removed. The application now has four interrupt priority levels available: levels 2, 3, 6 and 7 (DRGN-6350).
  - The `softdevice_assert.h` header file is no longer part of the SoftDevice API (DRGN-2548).
  - The `nrf_svc.h` header file has been updated to be compatible with all GCC versions (DRGN-6747).
  - All header files now include C++ guards (DRGN-6777).
  - Type definitions for certain basic types have been removed (DRGN-5348).
  - The number of PPI channels available for the application when the SoftDevice is enabled has been increased to 17 (DRGN-6131).
- BLE
  - The API to configure the bandwidth of BLE connections is now functional. The application can configure the bandwidth of BLE connections with the `BLE_OPT_CONN_BW_SET` option before the BLE connection is established (DRGN-6468). When using the configurable bandwidth option the application must have specified beforehand, at BLE stack initialization time, a set of connection bandwidth that includes the ones that it intends to use through this option. The `sd_ble_gap_connect()` and `sd_ble_gap_adv_start()` SV calls can now return `NRF_ERROR_NO_MEM` if there is not enough memory to honor the requested bandwidth configuration.

Bug fixes

- GAP
  - Fixed an issue where the GAP API accepted channel map updates with only one channel set. This has been done to comply with the Bluetooth specification (DRGN-6743).
  - Fixed an issue where the SoftDevice did not use optimal radio configuration values for the current IC version that resulted in a loss of 3 dB of RX sensitivity (DRGN-6000, DRGN-6157).

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.
- LL
  - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
  - The maximum amount of concurrent connections is limited to 8, with an additional broadcaster **or** scanner active. (DRGN-6543).
- 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
  - Due to nRF52832 Errata-73, the SoftDevice leaves TIMER0 running at all times which results in 5uA increased average current between BLE events (DRGN-6647).
  - When disconnecting and reconnecting multiple connections, the SoftDevice might unexpectedly return `NRF_ERROR_NO_ME`

M (DRGN-6875).
- When trying to establish a connection as a peripheral and there is not enough memory available to honor the bandwidth configuration, the SoftDevice will trigger a fault instead of returning NRF_ERROR_NO_MEM (DRGN-6874).

s132_nrf52_2.0.0-7.alpha

This release adds features and fixes going towards the production v2.0.0 release.

Notes:

- This release has changed the Application Programmer Interface (API), requiring applications to be recompiled.
- This SoftDevice version is compatible **only** with the latest nRF52 IC revision (Engineering B).

SoftDevice properties

- An updated SoftDevice Specification document is not available for this alpha release.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.0.0-1.alpha.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **108 kB** (0x1B000 bytes). This number is subject to change before the production release.
  - RAM: **4.5 kB** (0x1230 bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at sd_ble_enable() time).

New functionality

- SoftDevice
  - The sd_ecb_block_encrypt() SV call now puts the CPU to sleep while waiting for the encryption to complete. In addition, a new SV call, sd_ecb_blocks_encrypt(), has been added to perform multiple block encryptions in a single call (DRGN-6359).
- BLE
  - A new BLE_COMMON_OPT_PA_LNA option supports enable/disable switching of external Power Amplifiers and Low Noise Amplifiers using GPIO pins (DRGN-6478).
- GATTS
  - Write Commands (Write Without Response) are now subject to attribute authorization. The incoming data will not be written into the Attribute Table, requiring the application to do so itself by using sd_ble_gatts_value_set() (DRGN-2460).

Changes

- SoftDevice
  - A new MBR (2.0.0-1) is included with this release. The size has been reduced to 4KB in code memory (DRGN-6134, DRGN-6609, DRGN-5436). In order to issue the SD_MBR_COMMAND_COPY_BL and SD_MBR_COMMAND_VECTOR_TABLE_BASE_SET commands to the bootloader UICR.NRFFW[1] must be set to an address corresponding to a page in the application flash space. This page will be cleared by the MBR and used to store parameters before reset. When the UICR.NRFFW[1] field is set the page it refers to should not be used by the application. If the UICR.NRFFW[1] is set to 0xFFFFFFFF (the default) all MBR commands will return NRF_ERROR_NO_MEM and DFU will be unavailable.
  - The CPU Cache is now turned on when enabling the SoftDevice (DRGN-6479).
  - SoftDevice assert handling has been completely overhauled. The application now provides a pointer to the new nrf_fault_handler_t callback type that handles all types of unrecoverable errors. The file name and line number parameters to this callback have been replaced by parameters including the program counter of the instruction that triggered the error (DRGN-6587).
  - The SV call handler has been optimized to reduce overhead when invoking SV calls from the application (DRGN-6692).
- BLE
  - The documentation for the sd_ble_uuid_vs_add() SV call has been extended and corrected (DRGN-6169).
- GAP
  - The sd_ble_gap_tx_power_set() SV call no longer accepts a -30dBm setting, the minimum now being -40dBm (DRGN-2702).

Bug fixes

- SoftDevice

    - The whole of the RAM is no longer configured not to go into low-power mode when entering either CPU idle (WFE, WFI) or SYSTEM OFF (DRGN-6635).
    - The DebugMonitor interrupts are now correctly forwarded by the MBR (DRGN-6242).
    - Fixed an issue where the application did not return from a call to `sd_ble_app_evt_wait()` when waking up from IRQ numbers above 31 (DRGN-6205).
    - Pointers addressing the Code RAM section are now permitted as parameters to the SoftDevice (DRGN-6535).
- BLE
    - The `p_app_ram_base` pointer passed to `sd_ble_enable()` is now NULL-checked (DRGN-6719).
    - Specifying a total connection count of 0 (0 peripheral connections and 0 central connections) in `sd_ble_enable()` no longer leads to a SoftDevice assert (DRGN-6613).
- GAP
    - Fixed an issue which could cause peers to reject or drop connection parameter update requests sent by the local device if the signalling identifier was set to 0x00 (invalid value) (DRGN-6354).
- GATTS
    - The pointer checking for the system attribute access functions has been corrected. The `sd_ble_gatts_sys_attr_get()` SV call now only allows pointers to RAM and the `sd_ble_gatts_sys_attr_set()` SV call now allows pointers to both RAM and Flash memory (DRGN-6532).

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.
- BLE
    - Only the bandwidth configurations `BLE_CONN_BW_MID` for connections as a central and `BLE_CONN_BW_HIGH` for connections as a peripheral are currently allowed (DRGN-6371).
- LL
    - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
    - The maximum amount of concurrent connections is limited to 8, with an additional broadcaster **or** scanner active. (DRGN-6543).
- 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
    - The SoftDevice does not use optimal Radio configuration values for the current chip version that results in a loss of 3dB of RX sensitivity. This limitation will not be present in the S132 Production version (DRGN-6000).
    - Temperature based calibration of the RC low frequency clock source does not work. (DRGN-5429).
    - Due to nRF52832 Errata-73, the SoftDevice leaves TIMER0 running at all times which results in 5uA increased average current between BLE events (DRGN-6647).

s132_nrf52_2.0.0-4.alpha

This release changes the major version number from 1 to 2, compared to the previous alpha (1.0.0-3). This is done just to align the major number with the one of the s130 SoftDevice, as these are functionally very similar.

The main features of this release, compared to the 1.0.0-3.alpha version, are the ability to set the number, role and bandwidth of connections when initializing the BLE stack.

Notes:

- This is a major release which has changed the Application Programmer Interface (API), requiring applications to be recompiled.

SoftDevice properties

- An updated SoftDevice Specification document is not available for this alpha release.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 1.1.0-2.alpha.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
    - Flash: **124 kB** (`0x1F000` bytes).

- RAM: **4.6 kB** (`0x1268` bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time).

New functionality

- BLE
  - The application can now configure the number of connections and their roles when initializing the BLE stack (DRGN-4669). A range of 0 to 8 connections can be specified, one of which may be of the peripheral role type.
  - The application can now configure the bandwidth requirements of connections when initializing the BLE stack (DRGN-4670).
    Bandwidth configuration is optional. By default, the BLE stack will assign typical bandwidth settings to all connections depending on their role. See the Limitations section for additional information.
  - The application can now configure the number of vendor specific UUIDs when initializing the BLE stack (DRGN-6257).
    UUID count configuration is optional. By default, the BLE stack will reserve memory for 10 UUIDs .
- GATTS
  - A new SV call, `sd_ble_gatts_attr_get()`, has been added to allow retrieval of a local attribute's UUID and metadata (DRGN-6203).
  - A new SV call, `sd_ble_gatts_initial_user_handle_get()`, has been added to allow retrieval of the first valid user attribute handle in the Attribute Table (DRGN-5152).
- GATTC
  - A new SV call, `sd_ble_gattc_attr_info_discover()`, has been added to allow retrieval of remote attribute information including full 128-bit UUIDs (DRGN-6195).

Changes

- BLE
  - The public API header files now require C99 compiler support. In particular, flexible array members must be supported to correctly parse array definitions in the SoftDevice header files (DRGN-4662).
  - The documentation has been revamped and improved with additional links between functions, events and MSCs (DRGN-6366).
  - The doxygen documentation for `ble_gap_adv_params_t` and `ble_gap_adv_ch_mask_t` has been corrected (DRGN-6363).
  - The doxygen documentation for `ble_evt_hdr_t` has been corrected (DRGN-6016).
  - `sd_ble_tx_buffer_count_get()` and `BLE_ERROR_NO_TX_BUFFERS` have been renamed to `sd_ble_tx_packet_count_get()` and `BLE_ERROR_NO_TX_PACKETS`, respectively (DRGN-4670).
    In addition, `sd_ble_tx_packet_count_get()` has been updated to take a connection handle as an input parameter and to return the total number of available guaranteed application transmission packets for a particular connection.
- GAP
  - Distribution of the identity keys (`ble_gap_id_key_t`) has been aligned with the rest of the keys and no longer constitutes an exception (DRGN-6279).
  - The default device name has been changed from "nRF51822" to "nRF5x" (DRGN-6262).
  - The documentation for `sd_ble_gap_adv_data_set()` has been corrected (DRGN-5396).
- GATTS
  - The default Attribute Table size has been reduced to `0x580` bytes. (DRGN-5797)
  - The SoftDevice now allows an application to reply with the `BLE_GATT_STATUS_ATTERR_INVALID_OFFSET` and the `BLE_GATT_STATUS_ATTERR_PREPARE_QUEUE_FULL` error codes as a response to an app-handled queued write request (DRGN-5994, DRGN-6187).
  - The format used for the system attribute data is now publicly documented for application developers (DRGN-5689).
  - The documentation for `sd_ble_gatts_service_changed()` has been corrected (DRGN-6202).
- GATTC
  - The documentation for `sd_ble_gattc_read()` has been corrected (DRGN-5728).

Bug fixes

- SoftDevice
  - Fixed a problem which prevented application from enabling the Floating-Point Unit (FPU) when running from the Process Stack Pointer (PSP) (DRGN-6556, DRGN-7043).
- GAP
  - Fixed a memory leak that could appear when authenticating with invalid security parameters and could prevent further authentication attempts from taking place (DRGN-6227).
- GATTS
  - The SoftDevice will now generate an `BLE_GATTS_EVT_RW_AUTHORIZE_REQUEST` event with opcode `BLE_GATTS_OP_EXEC_WRITE_REQ_CANCEL` upon receiving an execute write request that cancels all prepared writes (DRGN-6022, DRGN-6186, NRFFOETT-1048).

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.
- BLE
  - Only the bandwidth configurations `BLE_CONN_BW_MID` for connections as a central and `BLE_CONN_BW_HIGH` for connections as a peripheral are currently allowed (DRGN-6371).
- LL
  - The peripheral role has priority over the central role when it comes to keeping the links alive.
- GAP
  - The maximum amount of concurrent connections is limited to 8, with an additional broadcaster **or** scanner active. (DRGN-6543).
- 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
  - Due to nRF52832 Errata-16, the whole of the RAM is configured not to go into low-power mode when entering either CPU idle (WFE, WFI) or SYSTEM OFF, which will result in higher power consumption than documented (FTPAN-16). This workaround will be removed for the S132 Production version as Errata-16 is no longer present in the current chip version.
  - When using the SoftDevice on nRF52832 revision Engineering B (current chip version) the device will not be able to wake up from SYSTEM OFF. The application therefore needs to avoid using SYSTEM OFF altogether (DRGN-6635).
  - The SoftDevice does not use optimal Radio configuration values for the current chip version that results in a loss of 3dB of RX sensitivity. This limitation will not be present in the S132 Production version (DRGN-6000).
  - Temperature based calibration of the RC low frequency clock source does not work. (DRGN-5429).
- GAP
  - Specifying a total connection count of 0 (0 peripheral connections and 0 central connections) in `sd_ble_enable()` leads to a SoftDevice assert (DRGN-6613).

s132_nrf52_1.0.0-3.alpha

The s132 SoftDevice for the nRF52 platform is based upon Nordic Semiconductor's s130 SoftDevice for the nRF51 platform, which in turn is based upon Nordic Semiconductor's S110 and S120 SoftDevices, extended to support concurrent LL (master and slave) and GAP (central and peripheral) roles.

This release contains several bug fixes and an updated license agreement.

New functionality

There is no new functionality in this release.

Changes

- Added the s132 SoftDevice to the license agreement (DRGN-5948).

Bug fixes

- SoftDevice
  - Fixed an issue where passing pointers to code memory above 256 kB as parameters to SoftDevice API calls would lead to an error being returned (DRGN-5834).
  - Temperature based calibration of the RC low frequency clock is now verified to work as expected (DRGN-5429).
  - Fixed an issue where the chip would not wake up via GPIO after calling SYSTEMOFF (DRGN-6001).
  - Fixed an issue where writing to the flash could cause the SoftDevice to not send packets to the peer or deliver events to the application (DRGN-5993).

Limitations

- MBR
  - The MBR in this release uses 12 kB of flash, meaning that the SoftDevice start address is 0x3000 and the SoftDevice info structure address is 0x5000. This is subject to change in future releases (DRGN-5436).
- 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 (DRGN-5197).
  - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
- LL
  - The peripheral role has priority over the central role when it comes to keeping the links alive.
- 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

There are no known issues in this release.

s132_nrf52_1.0.0-2.alpha

The s132 SoftDevice for the nRF52 platform is based upon Nordic Semiconductor's s130 SoftDevice for the nRF51 platform, which in turn is based upon Nordic Semiconductor's S110 and S120 SoftDevices, extended to support concurrent LL (master and slave) and GAP (central and peripheral) roles. The s132_nrf52_1.0.0-2.alpha is the first alpha release of s132, and these release notes list the changes and differences from s130_nrf51_1.0.0.

Notes:

- This is a major release which has changed the Application Programmer Interface (API) from the s130 for nRF51, requiring applications to be recompiled.

SoftDevice properties

- There is no SoftDevice Specification corresponding to this release, but the S130 SoftDevice Specification version 1.0 should be applicable in large parts.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 1.1.0.
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **124 kB** (`0x1F000` bytes).
  - RAM: **10 kB** (`0x2800` bytes) (default value - dependent upon configured size of the GATT Server Attribute Table).

New functionality

Since this is the first release of this SoftDevice, this section is not applicable.

Changes

- API changes from **s130_nrf51_1.0.0**:
  - New event: `NRF_EVT_FLASH_OPERATION_VERIFY_FAILED`, only available on nRF52.
  - `sd_flash_protect()` has been changed to be compatible both with nRF52 and with future nRF51 releases.
  - Platform-specific declarations, definitions and macros split out and placed in subfolders with the platform name (e.g. 'nrf52').
- Call stack usage increased from s130_nrf51_1.0.0: The application should reserve 2 kB of stack space for the SoftDevice.

Bug fixes

There are no bug fixes in this release.

Limitations

- MBR
  - The MBR in this release uses 12 kB of flash, meaning that the SoftDevice start address is 0x3000 and the SoftDevice info structure address is 0x5000. This is subject to change in future releases (DRGN-5436).
- 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 (DRGN-5197).
  - Synthesized low frequency clock source is not tested or intended for use with BLE stack.
- LL
  - The peripheral role has priority over the central role when it comes to keeping the links alive.
- 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
  - Temperature based calibration of the RC low frequency clock source does not work. (DRGN-5429)

0x19c0