ANT_S332_nrf52832_0.9.1.alpha release notes

Contents

ANT_S332_nrf52832_0.9.1.alpha

The ANT_S332_nrf52832_0.9.1.alpha SoftDevice for the nRF52 platform is based upon the ANT_S212_nrf52832_0.9.1.alpha(ANT) SoftDevice and S132 v2.0.0 (BLE) SoftDevice combined.

SoftDevice Properties

- An updated SoftDevice Specification for the S132 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 is as follows:
    - Flash: **156kB** (0x27000 bytes) This number is subject to change before the production release.
    - RAM: **6.02kB** (0x1780 bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at `sd_ble_enable()` time)

Compatibility

Compatible with Rev C and Rev 1

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.
- **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).
  - 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 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).
  - 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.

- **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).
  - 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 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.

ANT_S332_nrf52832_0.6.0.alpha

The ANT_S332_nrf52832_0.6.0.alpha SoftDevice for the nRF52 platform is based upon the ANT_S212_nrf52832_0.6.0.alpha(ANT) SoftDevice and S132 v2.0.0-7.alpha (BLE) SoftDevice combined.

Notes:

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

SoftDevice Properties

- There is no SoftDevice Specification corresponding to this release. The S310 SoftDevice Specification v3.0.0 and S132 SoftDevice Specification v0.5 are applicable in large parts. Both are available on the [Nordic Infocenter](#).
- 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 is as follows:
    - Flash: **164kB** (0x29000 bytes) This number is subject to change before the production release.
    - RAM: **5.664kB** (0x1620 bytes) (minimum required memory - actual requirements are dependent upon the configuration chosen at sd_ble_enable() time)

Compatibility

Tested on Eng Rev B.

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).

ANT_S332_nrf52832_0.5.0.alpha

The ANT_S332_nrf52832_0.5.0.alpha SoftDevice for the nRF52 platform is based upon the ANT_S212_nrf52832_0.5.0.alpha(ANT) SoftDevice and S132 v2.0.0-4.alpha (BLE) SoftDevice combined.

Notes:

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

SoftDevice Properties

- There is no SoftDevice Specification corresponding to this release. The S310 SoftDevice Specification v3.0.0 and S132 SoftDevice Specification v0.5 are applicable in large parts. Both are available on the [Nordic Infocenter](https://www.thisisant.com).
- 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 is as follows:
    - Flash: **164kB** (0x29000 bytes)
    - RAM: **5.664kB** (0x1620 bytes)

Compatibility

Tested on Eng Rev B.

New functionality

ANT functionality in the ANT_S332_nrf52832_0.5.0.alpha SoftDevice for the nRF52 platform is equivalent to the content in the Nordic ANT_S332_nrf52832_0.3.0.alpha SoftDevice. BLE content is equivalent to the functionality in the Nordic S132 v2.0.0-4.alpha (BLE) SoftDevice.

- **SoftDevice**
    - A variable called `p_license_key` has been added to the `sd_softdevice_enable()` call for the SoftDevices that include ANT. If this license key is set incorrectly the SoftDevice will not enable. An evaluation key can be found in nrf_sdm.h which will enable the full stack, however you may use the evaluation key for non-commercial use only, under the terms described in the license.pdf file included in the root directory of the ANT_S332 .zip file. It is a requirement to obtain and use a commercial use license key with the S332 in any product that is sold or otherwise distributed for revenue-generating purposes. Commercial use license keys will be made available by ANT Wireless. Further information about obtaining a license key can be found here: https://www.thisisant.com/developer/ant/licensing

- **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).
- **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 a `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**
    - 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).

ANT_S332_nrf52832_0.3.0.alpha

The ANT_S332_nrf52832_0.3.0.alpha SoftDevice for the nRF52 platform is based upon the ANT_S212_nrf52832_0.3.0.alpha(ANT) SoftDevice and S132 v1.0.0-3.alpha (BLE) SoftDevice combined.

Notes:

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

SoftDevice Properties

- There is no SoftDevice Specification corresponding to this release. The S310 SoftDevice Specification v3.0.0 and S132 Softdevice Specification v0.5 are applicable in large parts. Both are available on the Nordic Infocenter.
- 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 is as follows:
    - Flash: **164kB** (0x29000 bytes)
    - RAM: **11.52kB** (0x2D00 bytes)

Compatibility

The ANT_S332_nrf52832_0.3.0.alpha is restricted to use with nRF52832 IC rev Engineering A.

New functionality

ANT functionality in the ANT_S332_nrf52832_0.3.0.alpha SoftDevice for the nRF52 platform is equivalent to the content in the Nordic S310_nrf51422_3.0.0 SoftDevice. BLE content is equivalent to the functionality in the Nordic S132 v1.0.0-3.alpha (BLE) SoftDevice.

Changes

- API changes from **S310_nrf51422_3.0.0**
    - 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')

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).
- **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**
    - FPU must be enabled in application.