Using the BL653 and Nordic SDK v16.0.0

BL653

Application Note *v1.0*

1 INTRODUCTION

This application note is intended to help developers who want to use BL653 module to develop applications using freely available tools and the Nordic SDK. The core instructions for building, loading, and debugging firmware are available at the Nordic DevZone. This document provides additional instructions for using these tools on the Laird BL653 development kit and modules.

2 REQUIREMENTS

The following are required to complete this step-by-step guide:

- Windows 7 (or newer) machine
- BL653 development kit (product code 453-0003 or 4539-00041)
- USB A to micro USB cable (provided with BL653 development kit)

Note: Tutorials provided by Nordic Semiconductor provide the most recent supported versions of software and tools used for development. The tutorials can be found at:
https://devzone.nordicsemi.com/nordic/nordic-blog/b/blog/posts/development-with-gcc-and-eclipse

3 DEVELOPMENT ENVIRONMENT SETUP

3.1 Nordic SDK

The Nordic Software development kit offers a rich development environment and examples for the BL653 module. It can easily be used to develop applications for the BL653 when using freely available software and when C language is preferred. The SDK offers a wide selection of drivers, libraries, and examples for the module and its peripherals.

To use Nordic's SDK for BL653 development, complete the following steps:

1. Download the Nordic SDK zip file from https://www.nordicsemi.com/eng/Products/Bluetooth-low-energy/nRF5-SDK. The file is located in the **DOWNLOADS** tab.
2. Once downloaded, extract and place the SDK in a suitable location on your machine, e.g.: *D:\Work\nRF5_SDK* (Figure 1).
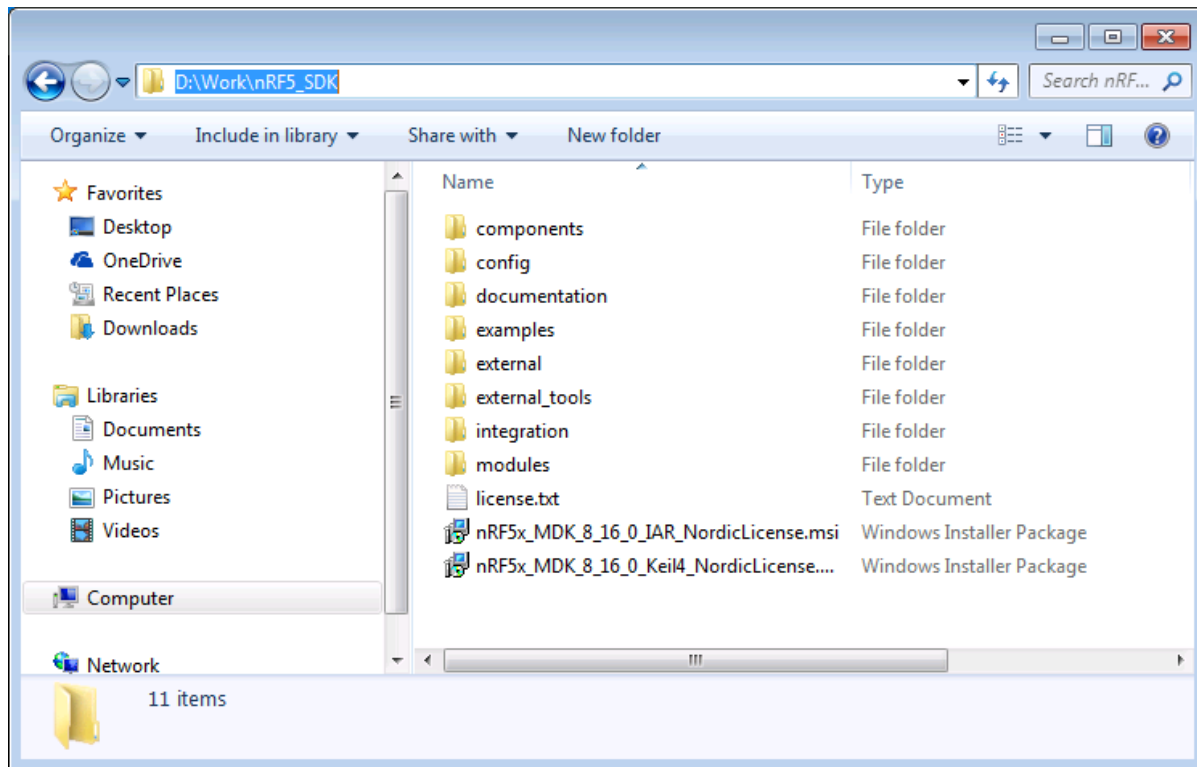
Figure 1: nRF5 SDK folder structure

Note: By default, the BL653 uses the nRF52833's on-chip RC oscillator as its clock source, as opposed to the nRF52833 development kits which use an external crystal. The difference in oscillator source should therefore be reflected in the SDK.

3. Open and edit the *nRF5_SDK\components\softdevice\common\nrf_sdh.c file* which is originally as shown in Figure 2.

```
// Notify observers about SoftDevice enable request.
if (sdh_request_observer_notify(NRF_SDH_EVT_ENABLE_REQUEST) == NRF_ERROR_BUSY)
{
    // Enable process was stopped.
    return NRF_SUCCESS;
}

// Notify observers about starting SoftDevice enable process.
sdh_state_observer_notify(NRF_SDH_EVT_STATE_ENABLE_PREPARE);

nrf_clock_lf_cfg_t const clock_lf_cfg =
{
    .source       = NRF_SDH_CLOCK_LF_SRC,
    .rc_ctiv      = NRF_SDH_CLOCK_LF_RC_CTIV,
    .rc_temp_ctiv = NRF_SDH_CLOCK_LF_RC_TEMP_CTIV,
    .accuracy     = NRF_SDH_CLOCK_LF_ACCURACY
};
```
Figure 2: Original, unchanged nrf_sdh.c

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4. Change the oscillator so that it uses the BL653 configuration as shown in Figure 3.

```
// Notify observers about SoftDevice enable request.
if (sdh_request_observer_notify(NRF_SDH_EVT_ENABLE_REQUEST) == NRF_ERROR_BUSY)
{
    // Enable process was stopped.
    return NRF_SUCCESS;
}

// Notify observers about starting SoftDevice enable process.
sdh_state_observer_notify(NRF_SDH_EVT_STATE_ENABLE_PREPARE);

nrf_clock_lf_cfg_t const clock_lf_cfg =
{
    .source       = NRF_CLOCK_LF_SRC_RC,
    .rc_ctiv      = 16,
    .rc_temp_ctiv = 2,
    .accuracy     = NRF_CLOCK_LF_ACCURACY_500_PPM
};
```

Figure 3: Changes to oscillator values in nrf_sdh.c

3.2 Eclipse

Follow Nordic's guide on installing the most up to date supported version of Eclipse.

3.3 Using gpio BUTTON4

The GPIO for BUTTON4 is connected to P0.25 on the Nordic nRF52833 devboard (PCA10100), whilst the BL653 module has BUTTON4 connection to P0.22. The rest of the pin map retains 1:1 mapping between PCA10100 and BL653-DK.

4 REFERENCE

Further information relating to different utilities used in this app note can be accessed from the following links:

- BL654 Product Page - https://www.lairdconnect.com/wireless-modules/bluetooth-modules/bluetooth-5-modules/bl653-series-bluetooth-51-802154-nfc-module
- Make - https://www.gnu.org/software/make/
- ARM Toolchain - https://launchpad.net/gcc-arm-embedded
- Eclipse - https://eclipse.org/org/
- Nordic Tutorial on using Eclipse and GCC - https://devzone.nordicsemi.com/tutorials/b/getting-started/posts/development-with-gcc-and-eclipse
- Nordic Blog on using Eclipse and GCC - https://devzone.nordicsemi.com/b/blog/posts/development-with-eclipse-and-gcc

5 REVISION HISTORY

Version	Date	Notes	Contributor(s)	Approver
1.0	01 June 2020	Initial version.	Kieran Mackey	Jonathan Kaye

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