

# Development Environment Setup Guide

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WISOL

January 10, 2017

## Contents

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1.	Introduction.....	3
2.	Setup SDK Source .....	4
3.	nRFgo Studio .....	4
4.	Keil MDK-ARM .....	15
5.	nRF SDK .....	21
6.	Keil Device Family Pack .....	22
7.	SDK Documentation.....	26
8.	SDK Compile .....	27
9.	output and flash memory map .....	29
10.	Flash Download .....	31
11.	Release version download.....	33
12.	DFU (Device Firmware Upgrade via BLE) .....	33

## Development Environment Setup Guide

### Revision history

Revision	Date	Description
1.0	2017.01.10	Initial release
1.2	2017.01.31	Add to SDK compile & download guide
1.3	2017.02.08	Add bootloader build and flash map
1.4	2017.03.07	Add GCC compile
1.5	2017.03.10	Removed CSR
2.0	2017.03.21	Add DFU
2.01	2017.04.18	Add Setup SDK Source
2.02	2017.07.10	update " Setup SDK Source"

## Development Environment Setup Guide

### 1. Introduction

#### 1.1 Purpose

Software Development Kits (SDK) are your starting point for software development on the sigfox config2. Setting up the nRF52 Development Kit is as easy as connecting it by a USB cable to a computer.

Development environment for Cortex and ARM devices.

#### 1.2 Model & Firmware Version

Model	Firmware
CONFIG2	SFM20R1

#### 1.3 Setting up the development kit

##### - nRFgo Studio

Download and install nRFgo Studio (which includes the nRF Tools package; JLinkARM, JLink CDC, nRFjprog, and mergehex) from nRFgo Studio.

##### - Keil MDK-ARM

Download and install the latest Keil MDK-ARM from Keil MDK-ARM Development Kit.

##### - nRF5 SDK

Download and extract the latest nRF5 SDK found on [developer.nordicsemi.com](https://developer.nordicsemi.com).

##### - Keil Device Family Pack

Install the Device Family Pack that is shipped with the SDK, or let Keil install it automatically.

##### - SDK documentation

Read the information in the SDK Release Notes, and check the nRF5 SDK documentation.

## 2. Setup SDK Source

The source is distributed via AWS (git).

When you buy product, you can get an AWS account.

(<http://support.wisol.co.kr>) -> Ordering

## 3. nRFgo Studio

The Nordic nRFgo Studio is a Windows® application that enables engineers to quickly explore and evaluate radio performance and functionality. The application supports a range of radio testing, including output power and sensitivity. Engineers can also easily configure and set-up the tests to match their own specific application requirements.

nRFgo Studio is designed to be used in conjunction with the Nordic nRFgo Starter Kit and Nordic nRFgo-compatible development kits. It supports auto detection of Nordic nRFgo motherboard and radio modules. It also support the nRF51 and nRF52 evaluation kits and programming nRF5x devices through SEGGER J-Link®.

nRFgo Studio download

URL : <https://www.nordicsemi.com/eng/Products/2.4GHz-RF/nRFgo-Studio/>

DOWNLOADS Tab – Download tool (nRFgo Studio-Winxx)

The screenshot shows the Nordic Semiconductor website. The header includes the company logo, navigation links (About us, Products, Applications, Support & Community, Investors, Popular Products), and a search icon. The main content area is titled 'nRFgo Studio' and describes it as a PC application for configuring and evaluating Nordic nRF24L+ Series SoCs, nRF8000-Series and nRF51- and nRF52-Series SoCs. It features a 'Downloads' tab and a table of software versions.

**PRODUCTS**

- BLUETOOTH LOW ENERGY
- ANT™
- 2.4GHZ RF
- SUB 1-GHZ RF
- IEEE 802.15.4
- NORDIC MOBILE APPS
- 3RD PARTY BLUETOOTH LOW ENERGY MODULES
- 3RD PARTY DEVELOPMENT BOARDS, DK-PLUGIN CARDS AND ARDUINO BOARDS

**nRFgo Studio**  
PC application for configuring and evaluating Nordic nRF24L+ Series SoCs, nRF8000-Series and nRF51- and nRF52-Series SoCs  
Active

Replacement products   
[Get product updates](#)

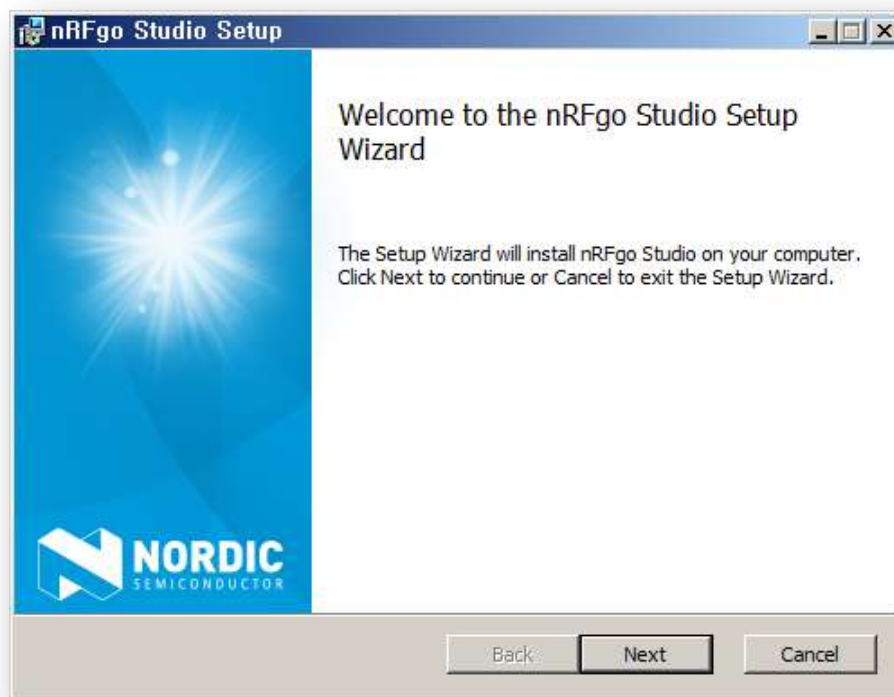
**DOWNLOADS**

**PC software**  
To aid your product development, Nordic also offers a range of tools enabling you to interact with and monitor your product.

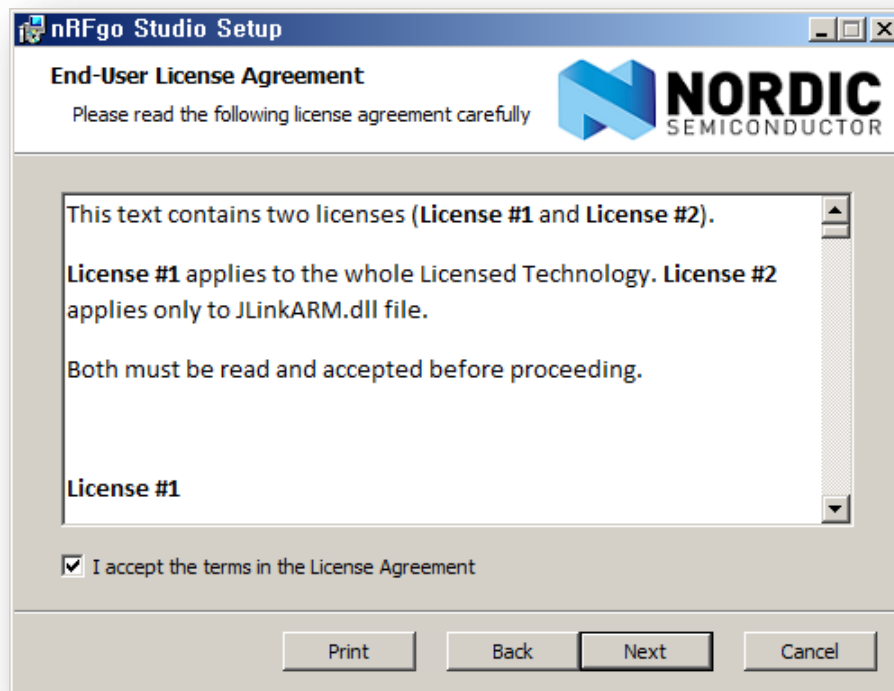
SOFTWARE		
Code	Name	Version
nRFgo Studio-Vin32	Software tool for nRFgo Starter Kit and Development Kits for 32-bit (x86) Windows XP, Windows Vista, Windows 7, and Windows 8	1.21.2
nRFgo Studio-Vin64	Software tool for nRFgo Starter Kit and Development Kits for 64-bit (x64) Windows Vista, Windows 7, and Windows 8	1.21.2

nRFgo Studio installation

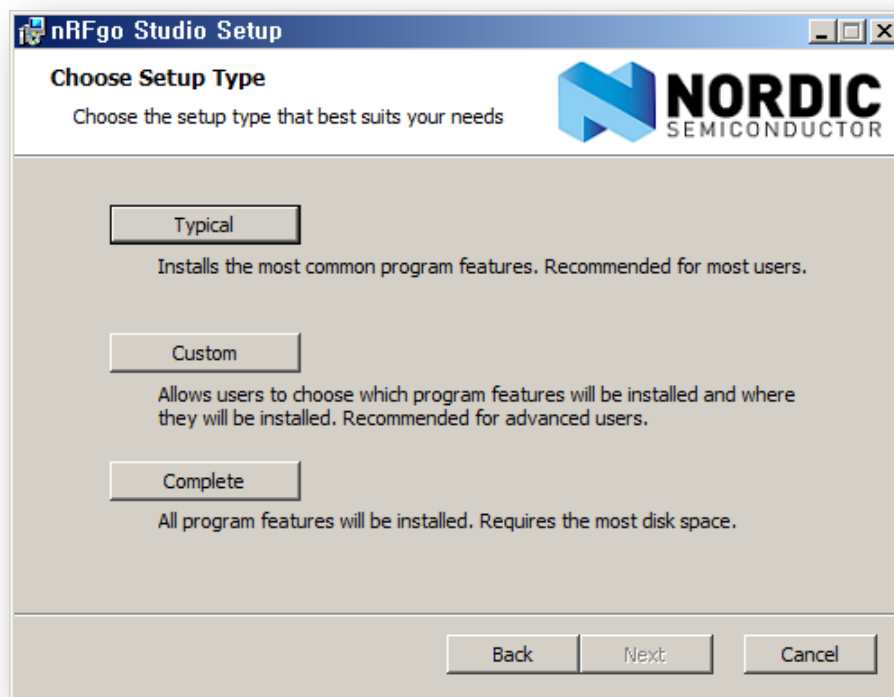
nRFgo Studio Setup



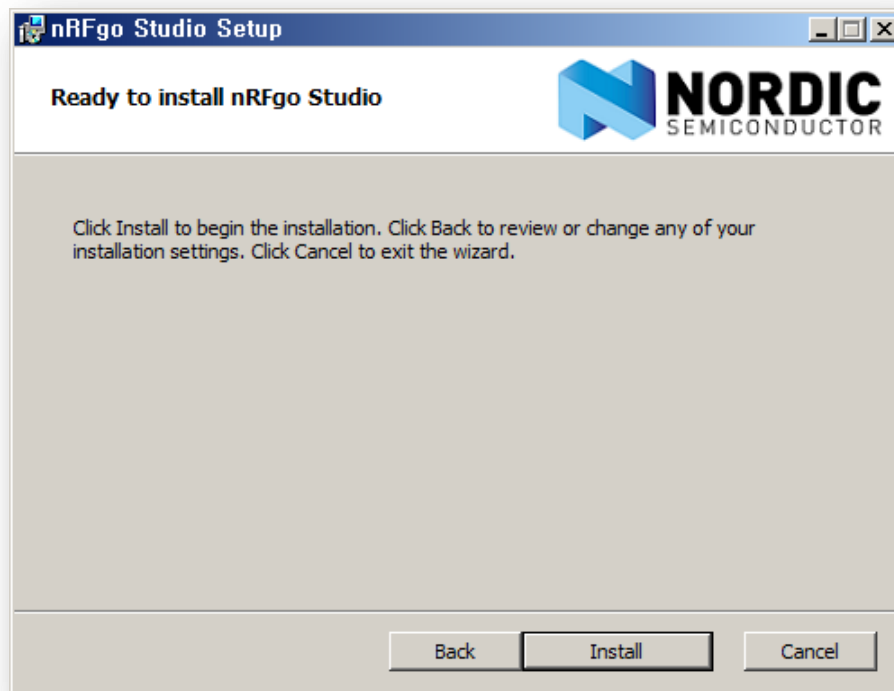
Read following license agreement



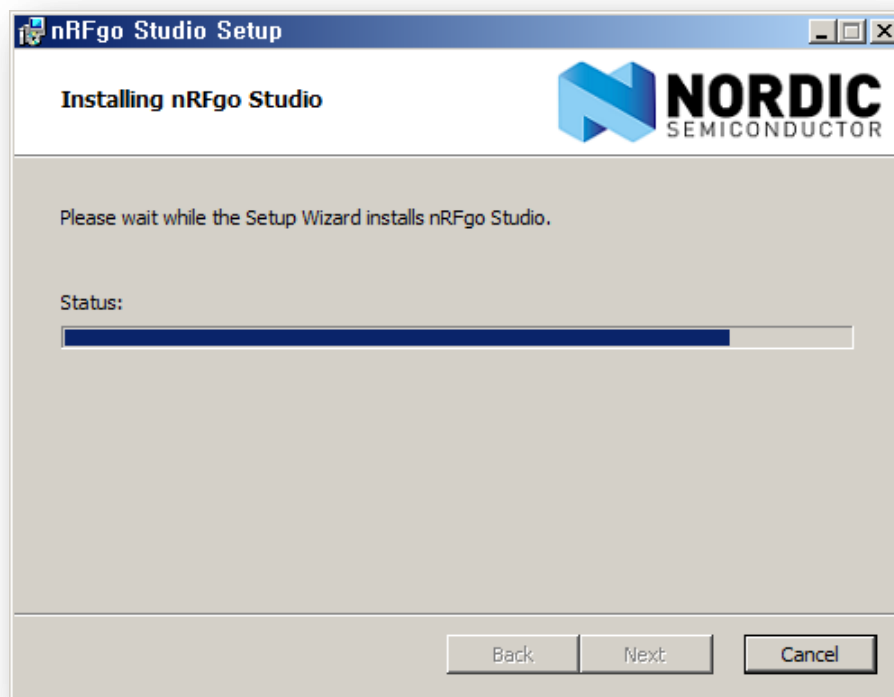
Choose setup type



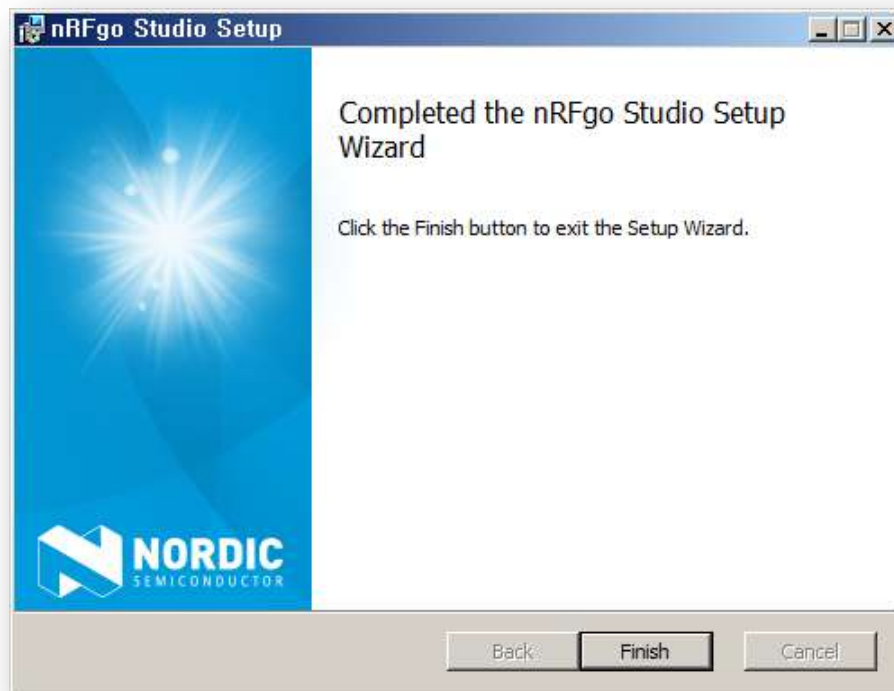
Ready to install nRFgo Studio



Installing nRFgo Studio



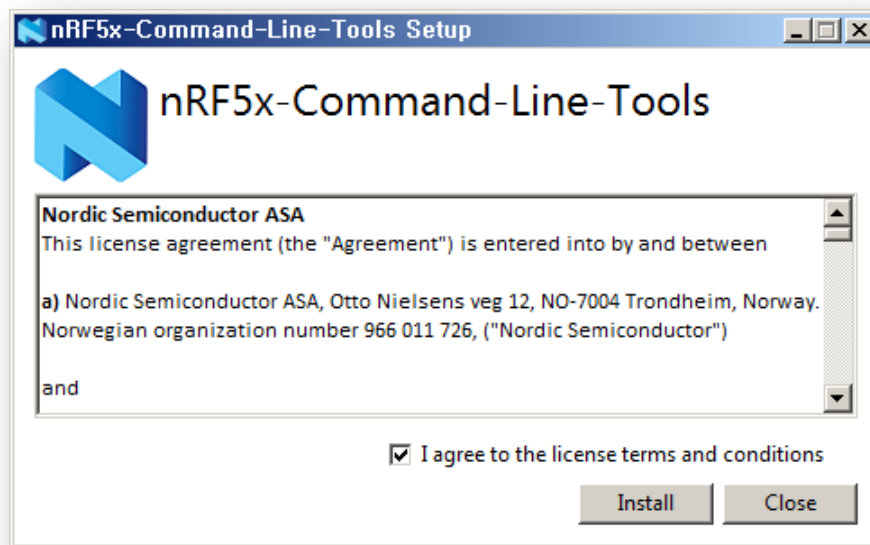
Completed the nRFgo Studio Setup



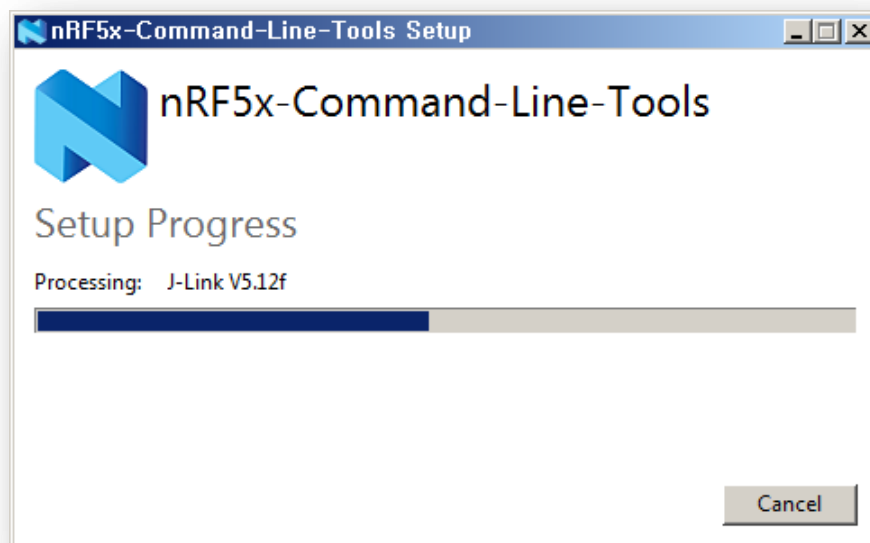
nRF5x-Command-Line-Tools



## nRF5x-Command-Line\_Tools Setup - 1



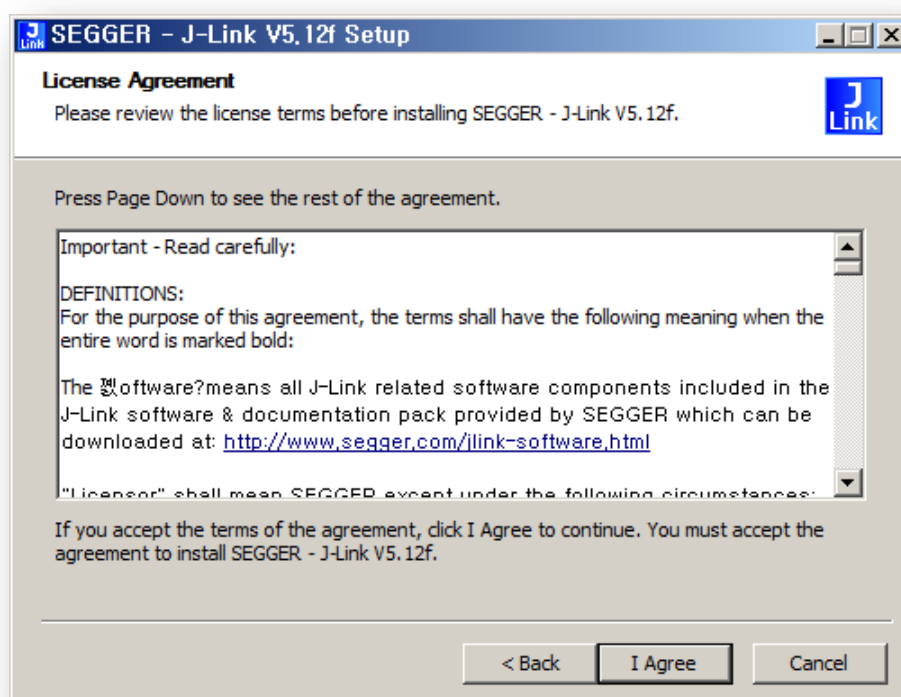
## nRF5x-Command-Line\_Tools Setup – 2



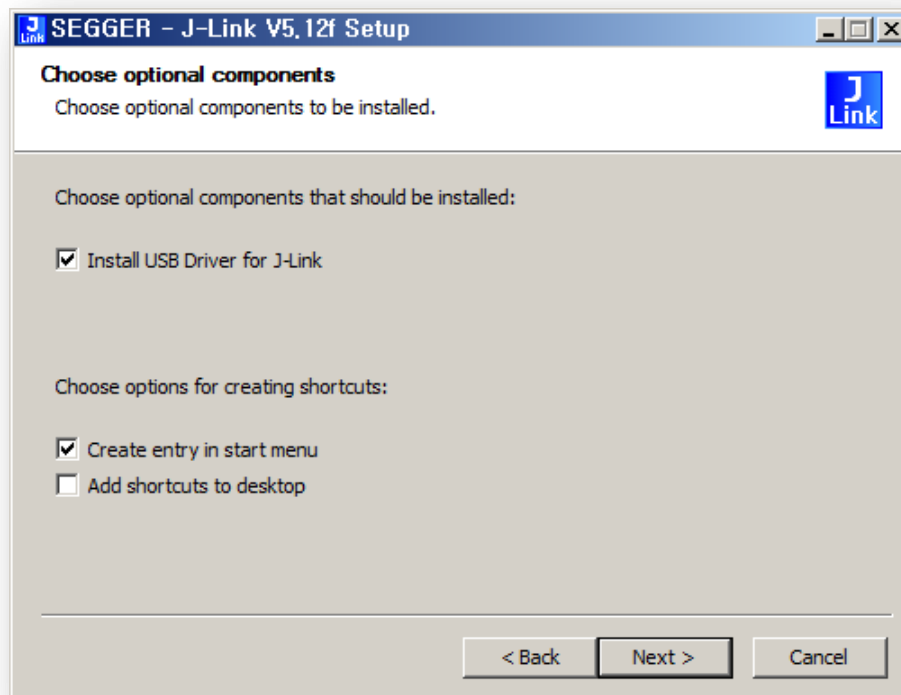
## SEGGER – J-Link V5.12f Setup



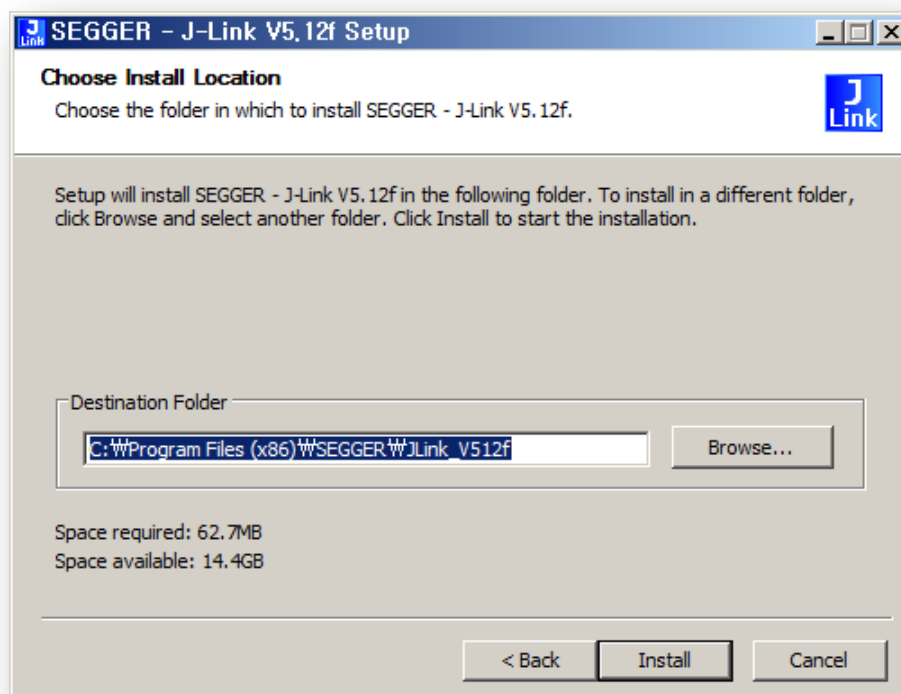
## License Agreement



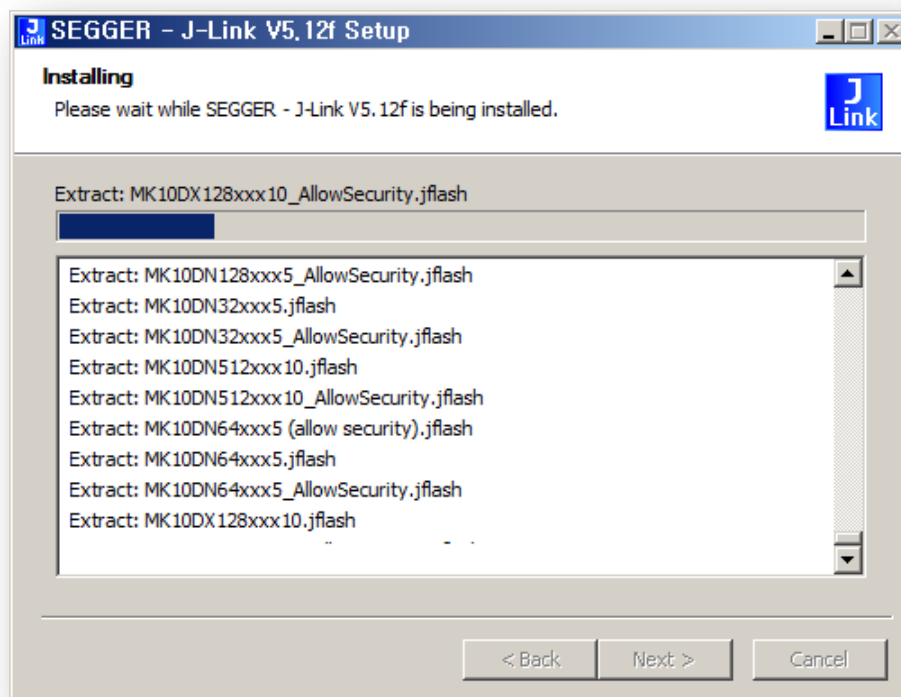
Chose optional components



Choose Install Location



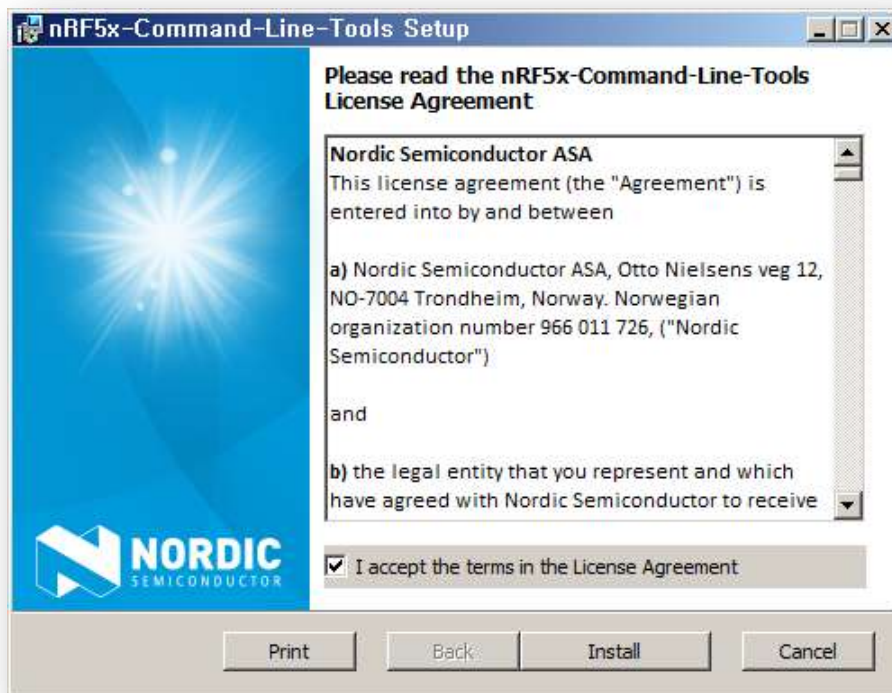
## Installing



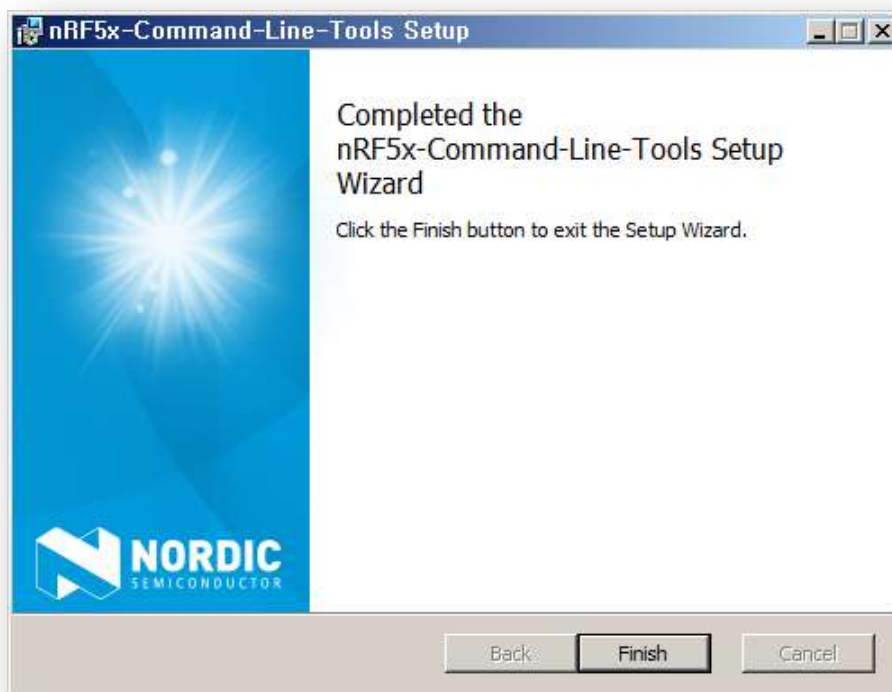
## Completing SEGGER - J-Link V5.12f Setup



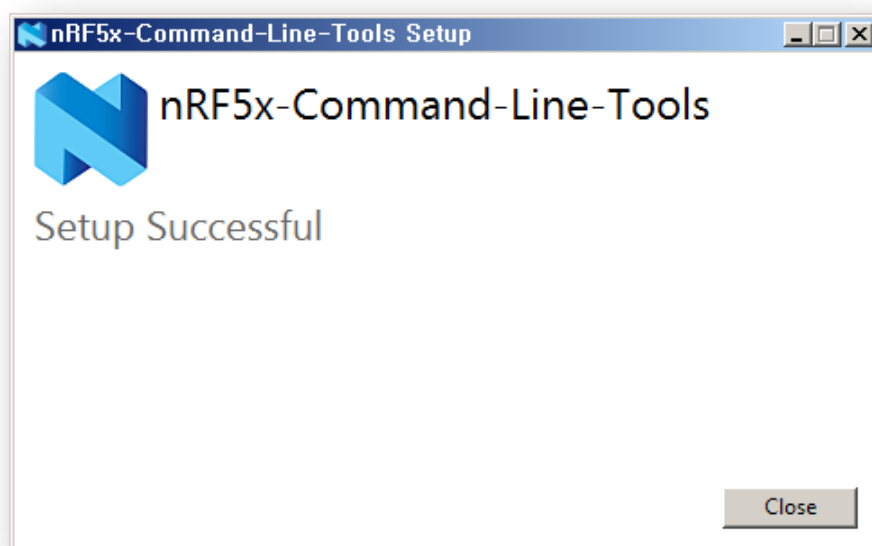
Read nRF5x-Command-Line-Tools License Agreement & Accept



Completed the nRF5x-Command-Line-Tools Setup Wizard



Setup Successful



## 4. Keil MDK-ARM

Keil MDK Version 5 is the latest release of our complete software development environment for a wide range of ARM Cortex-M based microcontroller devices. MDK includes the  $\mu$ Vision IDE/Debugger, ARM C/C++ Compiler, and essential middleware components. It's easy to learn and use.

The Keil ARM Evaluation Kit allows you to create programs for ARM7, ARM9, Cortex-M and MCU devices.

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### Minimum Hardware Requirements

- 1 GHz 32-bit or 64-bit processor
- 2 GB of system memory (RAM)
- 3 GB of available disk space

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### Recommended Hardware Requirements

- 2+ GHz 64-bit processor
- 4 GB of system memory (RAM)
- 6 GB of available disk space
- 2 Mbps or higher Internet connection for software activation, product updates and online services like the PackInstaller

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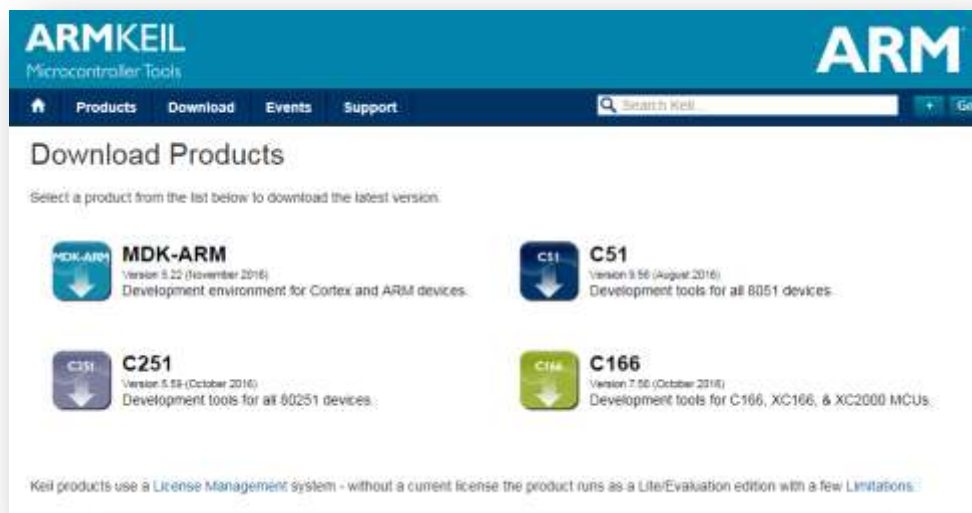
### Supported Operating Systems

32-bit and 64-bit variants of Microsoft Windows are supported:

- Windows 10
- Windows 8
- Windows 7
- Windows Vista

URL : <https://www.keil.com/download/product/>

- ✓ Keil MDK-ARM



- ✓ Enter Your Contact Information Below(Enter information & Submit)

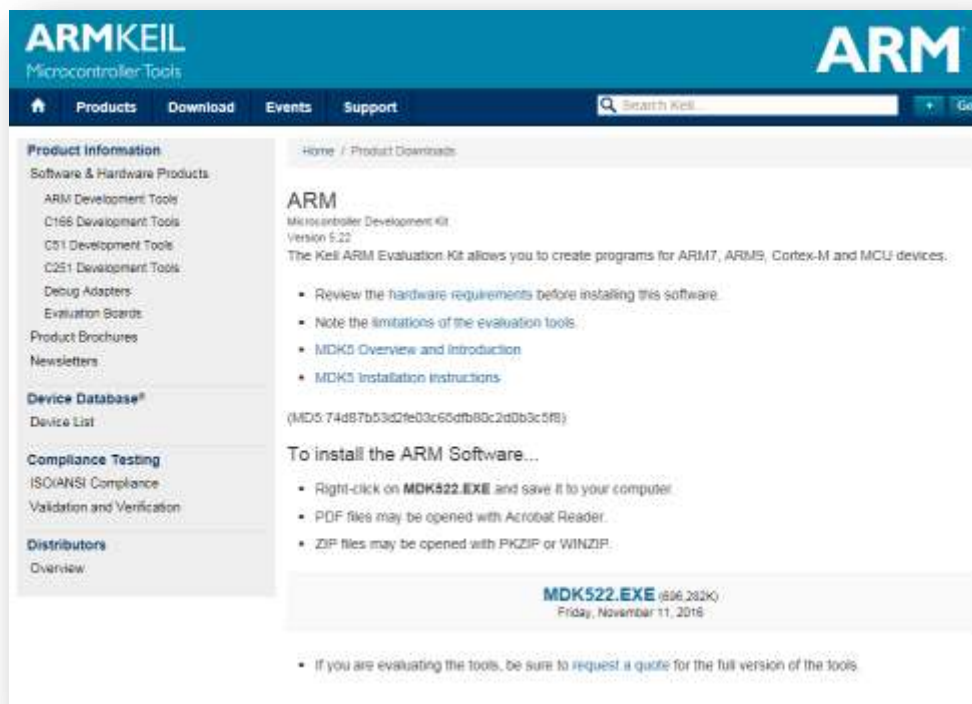
The screenshot shows the ARMKEIL Microcontroller Tools website with the 'Enter Your Contact Information Below' form. The left sidebar contains links for Product Information, Software & Hardware Products, ARM Development Tools, C166 Development Tools, C51 Development Tools, C251 Development Tools, Debug Adapters, Evaluation Boards, Product Brochures, Newsletters, Device Database, Device List, Compliance Testing, ISO/ANSI Compliance, Validation and Verification, Distributors, and Overview. The main content area is titled 'ARM Microcontroller Development Kit Version 5.22' and instructs users to 'Complete the following form to download the Keil software development tools.' The form fields are:

- First Name:
- Last Name:
- E-mail:
- Company:
- Address:
- City:
- State/Province:
- Zip/Postal Code:
- Country:
- Phone:

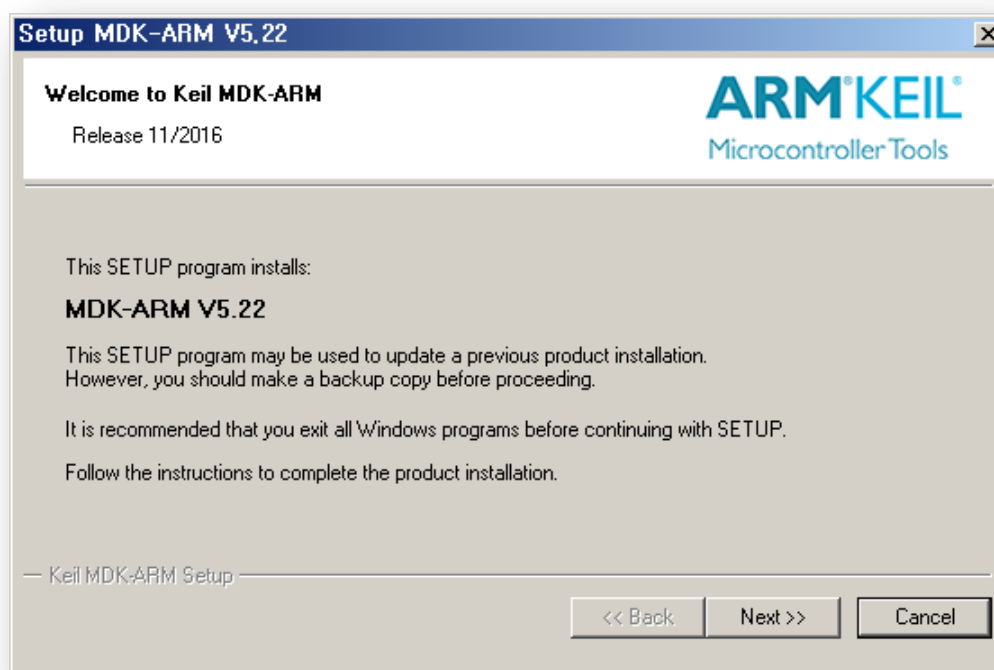
Below the form, there is a checkbox labeled 'Send me e-mail when there is a new update.' and a red 'NOTICE' section stating: 'If you select this check box, you will receive an e-mail message from Keil whenever a new update is available. If you don't wish to receive an e-mail notification, don't check this box.'



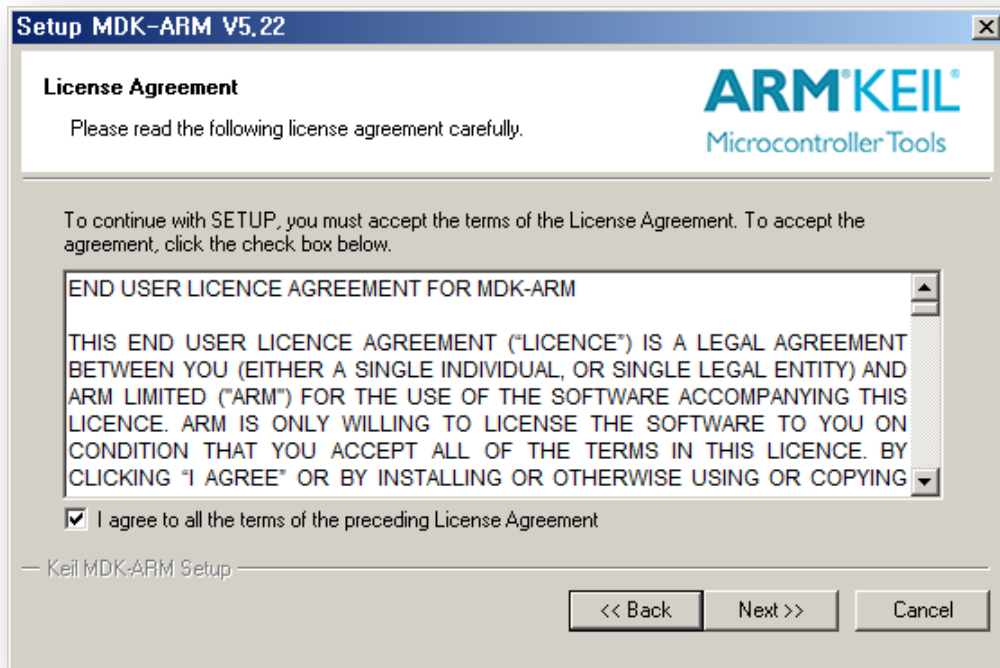
- ✓ MDK522.EXE download



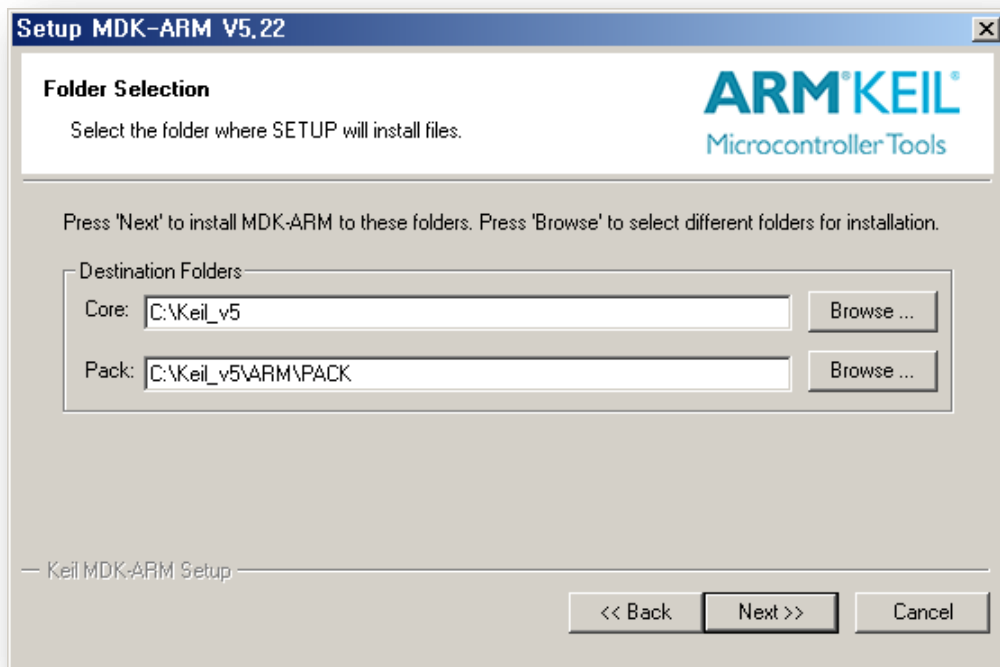
- ✓ Install MDK-ARM V5.22



## ✓ License Agreement



## ✓ Folder Selection



- ✓ Enter information

**Setup MDK-ARM V5.22**

**Customer Information**

Please enter your information.

Please enter your name, the name of the company for whom you work and your E-mail address.

First Name:

Last Name:

Company Name:

E-mail:

— Keil MDK-ARM Setup —

<< Back   Next >>   Cancel

- ✓ Installing

**Setup MDK-ARM V5.22**

**Setup Status**

MDK-ARM Setup is performing the requested operations.

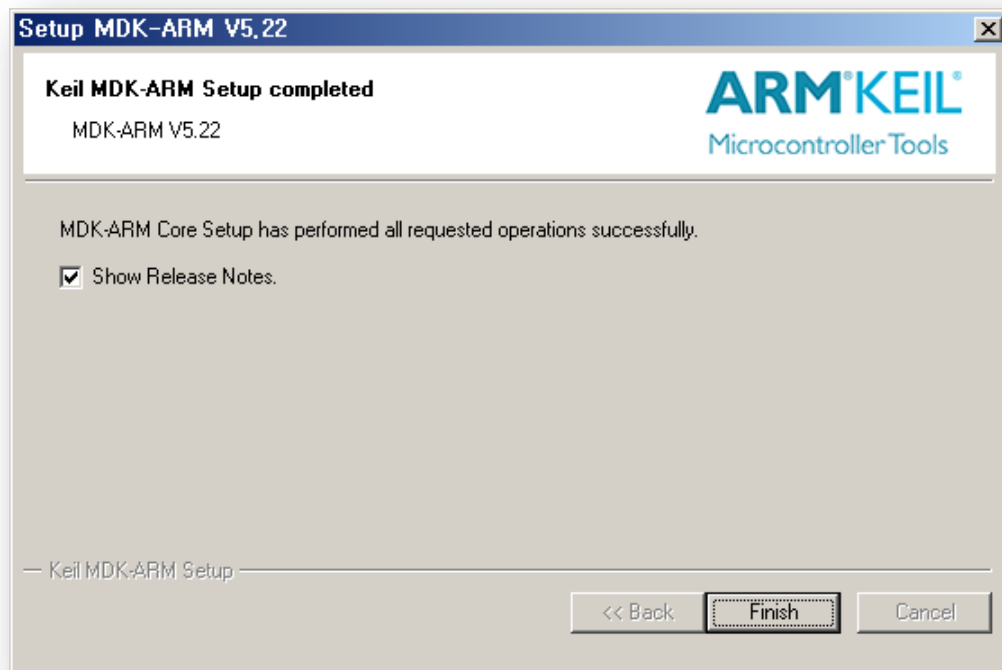
Install Files ...

Installing cpprt\_tf.l

— Keil MDK-ARM Setup —

<< Back   Next >>   Cancel

- ✓ Keil MDK-ARM setup completed



## 5. nRF SDK

The nRF5 SDK provides a rich developing environment for nRF5 Series devices by including a broad selection of drivers, libraries, examples for peripherals, SoftDevices, and proprietary radio protocols.

The SDK is delivered as a plain .zip-archive, which makes it easy to install as well as giving you the freedom to choose the IDE and compiler of your choice.

All code examples included in the SDK are tailored to compile for and run on Nordic Semiconductor's nRF5 Development Kits.

For documentation, release notes, and licenses, see the nRF5 SDK documentation overview.

Location: /nRF5\_SDK/nRF5\_SDK\_v12.x.x/

Name	Last modified	Size
Parent Directory		-
doc/	06-Dec-2016 12:38	-
nRF5_SDK_12.0.0_12f24da.zip	01-Sep-2016 13:45	40M
nRF5_SDK_12.1.0_0d23e2a.zip	04-Oct-2016 15:41	43M
nRF5_SDK_12.1.0_offline_doc.zip	04-Oct-2016 16:17	22M
nRF5_SDK_12.2.0_f012efa.zip	06-Dec-2016 12:38	69M
nRF5_SDK_12.2.0_offline_doc.zip	06-Dec-2016 12:38	24M

Nordicsemi

URL : <https://developer.nordicsemi.com/>

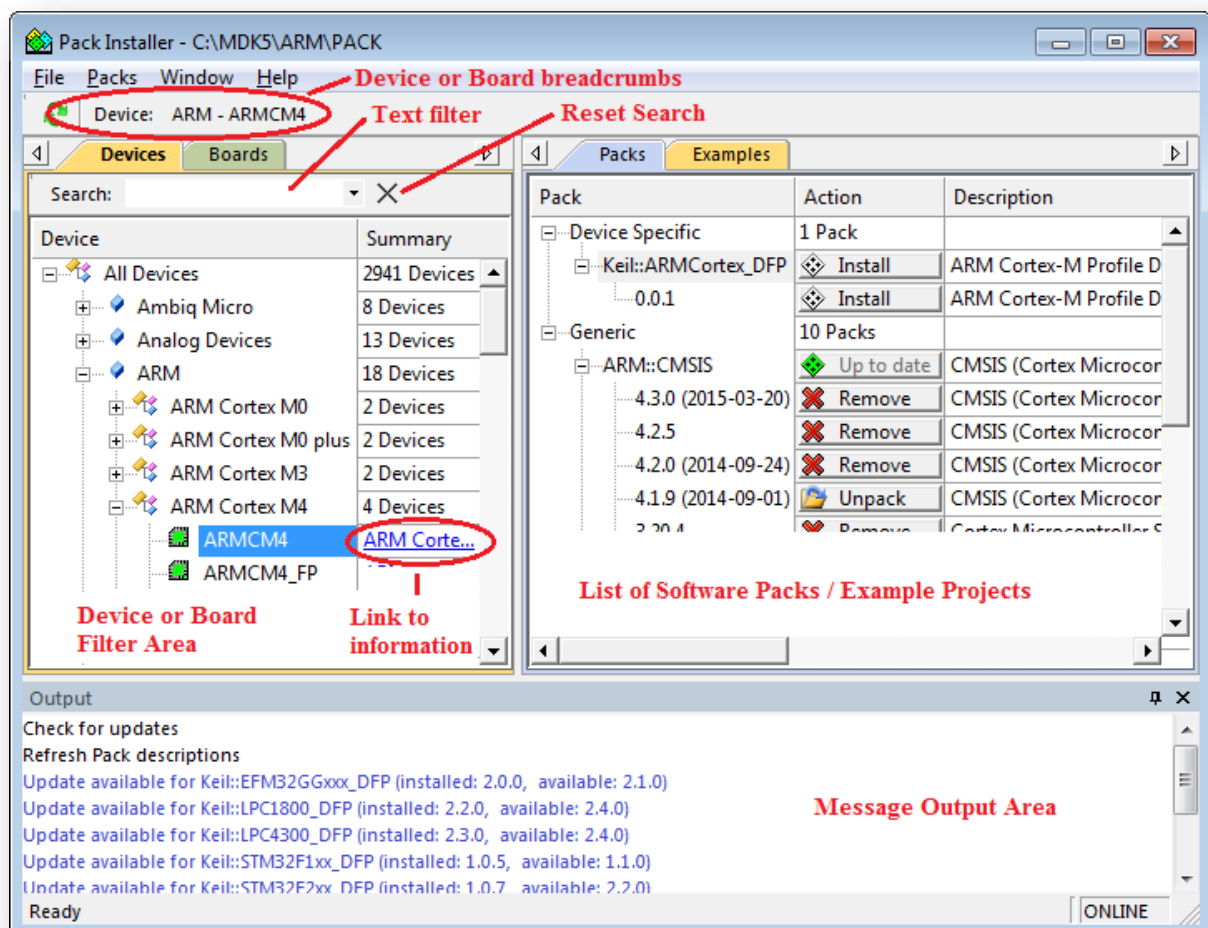
## 6. Keil Device Family Pack

The **Pack Installer** is a utility for installing, updating, and removing Software Packs, and can be launched from within µVision or standalone, outside of µVision.

 The menu **Project - Manage - Pack Installer...** starts the Pack Installer.

The Pack Installer window offers the following functionality:

- Installs, updates, or removes Software Packs and thus, Software Components. Refer to **Importing Custom Software Packs**, which also explains how Software Components relate to Software Packs.
- Lists installed Software Packs and checks for updates on the Internet. A brief release history might be displayed before updating a Software Pack.
- Lists example projects available from installed Software Packs.
- Offers filters to narrow the list of Software Packs or example projects.
- Displays the progress of the executed function in the status bar at the bottom of the window.



### Filters

Select a device or board to narrow the list of Software Packs or Example projects. Device-specific Software Packs are displayed on the top of the list. Software Components from generic Software Packs can be used with any device.

### Search

Enter an Regular Search Expression to narrow the list within the filter area.

### Reset Search

Resets the filter for the dialog Device or Boards. Resetting the filter for one dialog does not affect the other dialog. For example, resetting the filter for **Devices** keeps the **Boards** filter unchanged.

### Device/Board

Lists devices grouped by the manufacturer or board. Click on an entry to narrow the list of Software Packs or Example projects.

### Summary

Provides information about the device group. For devices, the field can provide a link to the Internet with additional information about the device, for example, to the Keil web page [www.keil.com/dd2/vendor/device](http://www.keil.com/dd2/vendor/device).

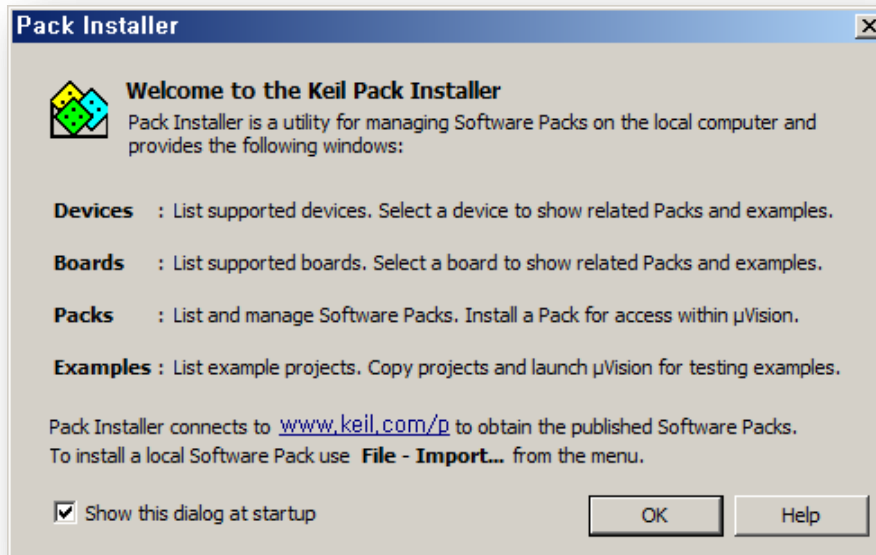
### Output Window

Displays messages about executed actions. Messages have different colors.

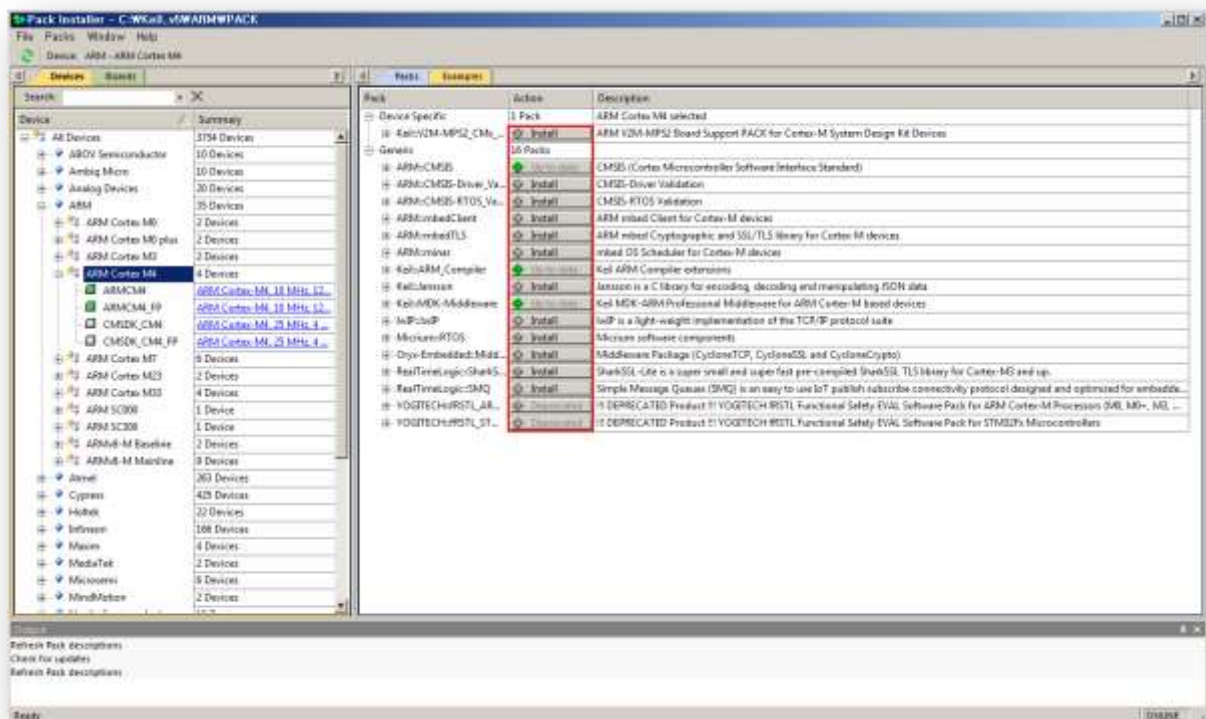
- **Black** - informative message.
- **Blue** - update message.
- **Red** - error message.

Install the Device Family Pack that is shipped with the SDK, or let Keil install it automatically.

- ✓ Pack installer - 1

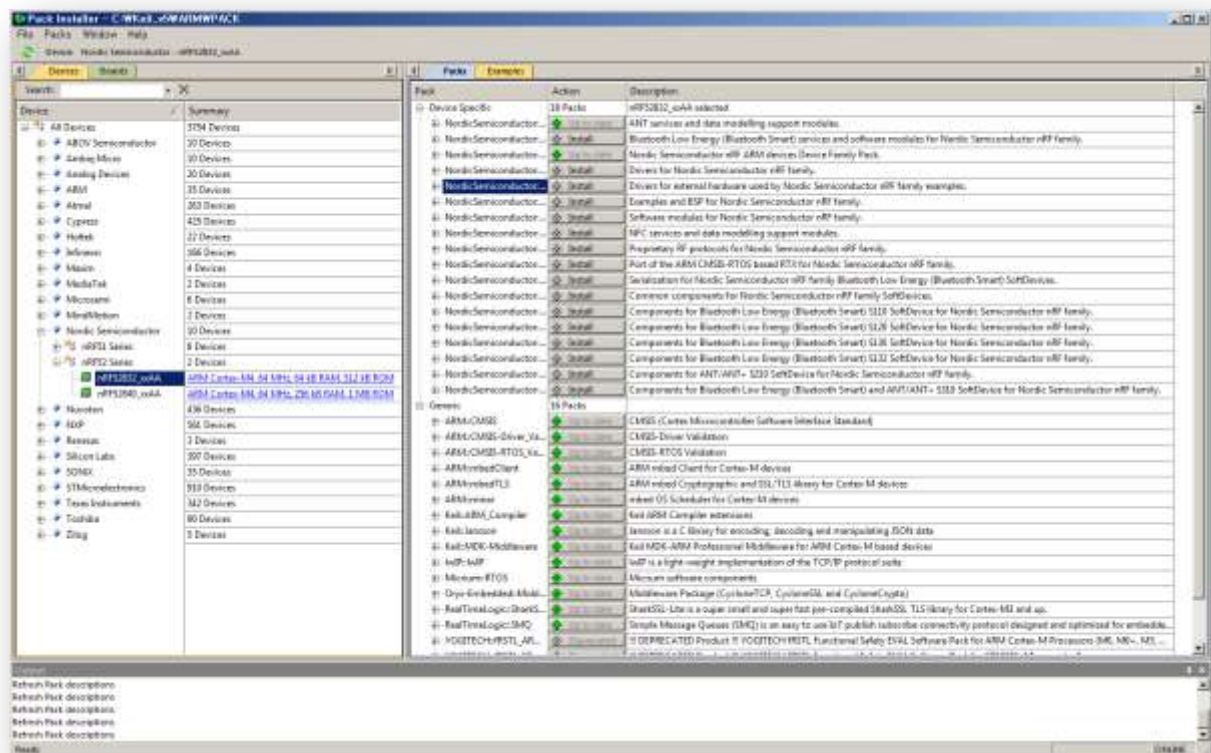


- ✓ Pack installer (ARM Cortex M4)
  - Install all





- ✓ Pack installer – 3 (Nordic nRF52)
  - Install all



## 7. SDK Documentation

The nRF5 SDK documentation includes descriptions and other reference material to help you understand the various components of the SDK. Examples are provided for development purposes only and should always be tested with your design.

See Getting Started for instructions on how to run the provided examples.

This version of the SDK supports the following SoftDevices:

URL : [https://developer.nordicsemi.com/nRF5\\_SDK/doc/](https://developer.nordicsemi.com/nRF5_SDK/doc/)

## 8. SDK Compile

### 8.1 Get SDK Source

Ex) [https://github.com/wisol-SFM/WSSF20Rx\\_12x](https://github.com/wisol-SFM/WSSF20Rx_12x)

### 8.2 Run the **sigfox\_cfg2\_pca10040\_s132.uvprojx** file from the extracted directory.

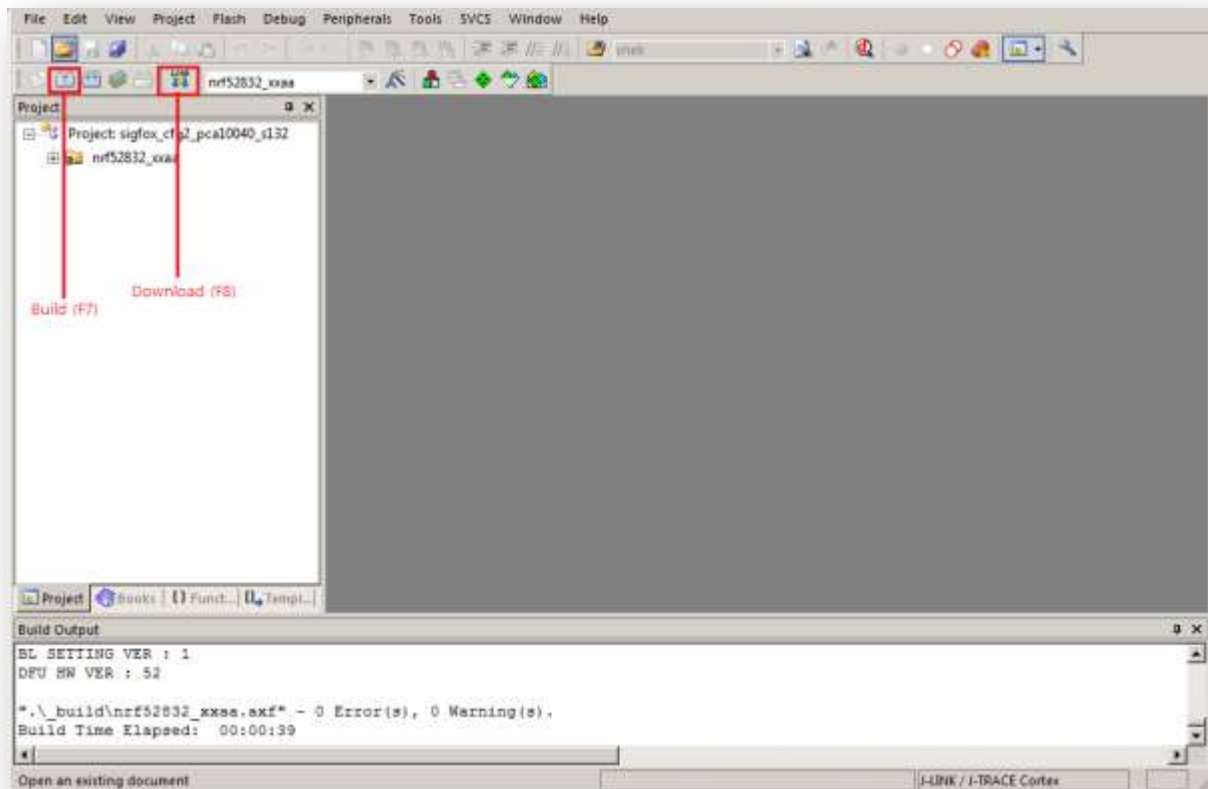
Path : development\sigfox\_cfg2\source\pca10040\warm5\_no\_packs

File : sigfox\_cfg2\_pca10040\_s132.uvprojx

⇒ The ARMKEIL tool must already be installed.

\* caution

When downloading from the tool, the bootloader is disabled.  
Use only during development.



### 8.3 Build Application

Menu : Project – Build Target (F7) or Rebuild all target files

⇒ Check the build results in the "Build Output window".

### 8.4 Build bootloader (Use version release)

Path : development\sigfox\_cfg2\source\_bootloader\_secure\pca10040\warm5\_no\_packs

File : secure\_dfu\_secure\_dfu\_ble\_s132\_pca10040.uvprojx

## 8.5 Use GCC for uVision

Path : development\sigfox\_cfg2\source\pca10040\s132\warm5\_no\_packs

File : sigfox\_cfg2\_pca10040\_s132\_gcc.uvprojx

You can use it similar to the Keil environment.

The boot loader is not supported, but you can get the same result by running sigfox\_cfg2\_make\_factory\_image.bat

## 9. output and flash memory map

### 9.1 binarys (build application -> build bootloader)

factory image write cmd for windows

SFM20R1\_factory\_write.cmd

tools for flash download by j-link

jlinkarm\_nrf52\_nrfjprog.dll

nrfjprog.dll

nrfjprog.exe

nrfjprog.ini

softdevice

s132\_nrf52\_3.0.0\_softdevice.hex

appication

SFM20R1\_app\_XXX.hex

bootloader

SFM20R1\_bootloader\_XXX.hex

\* caution

Use SFM20R1\_bootloader\_merged\_XXX.hex when downloading

factory image

SFM20R1\_factory\_XXX.hex

etc

SFM20R1\_bl\_setting\_XXX.hex : bootloader settings (application hash is included)

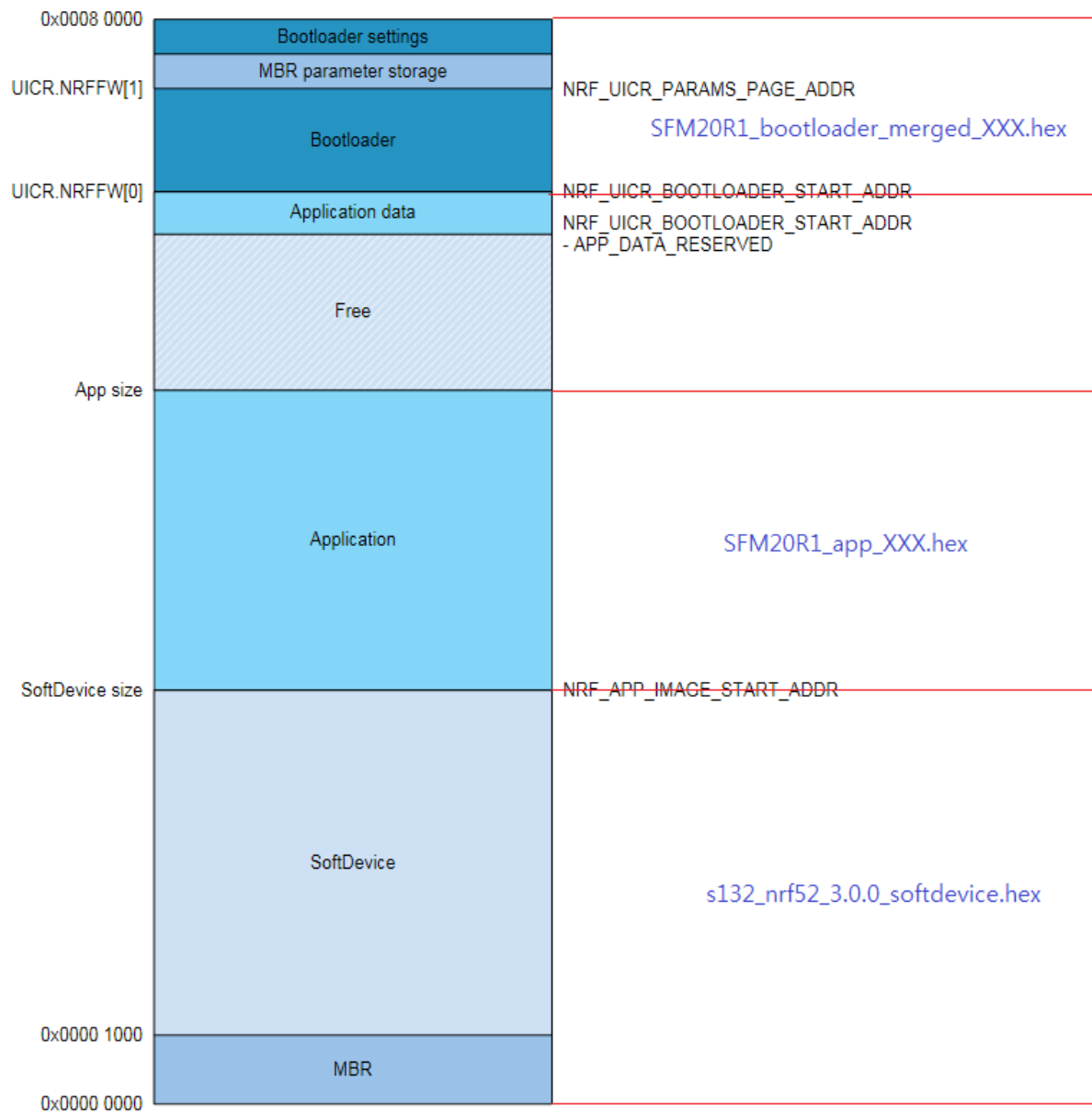
SFM20R1\_bootloader\_merged\_XXX.hex : Image with boot loader and settings merged

### 9.2 flash memory map

based layout (512 kB nRF52)

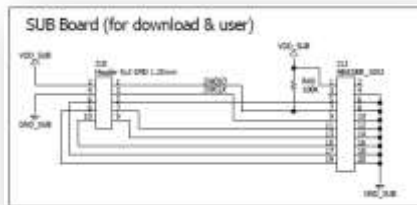
[https://infocenter.nordicsemi.com/index.jsp?topic=%2Fcom.nordic.infocenter.sdk5.v12.0.0%2Flib\\_bootloader.html](https://infocenter.nordicsemi.com/index.jsp?topic=%2Fcom.nordic.infocenter.sdk5.v12.0.0%2Flib_bootloader.html)

512 kB nRF52



## 10. Flash Download

### 10.1 Download Jig board



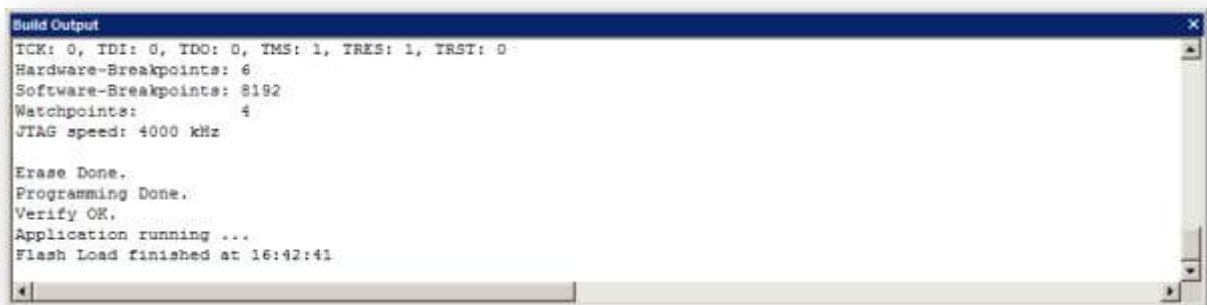
### 10.2 SEGGER J-Link connection



## 10.3 Download flash

Menu : Flash – Download (F8)

If it fails, it prints a failure log and pauses.



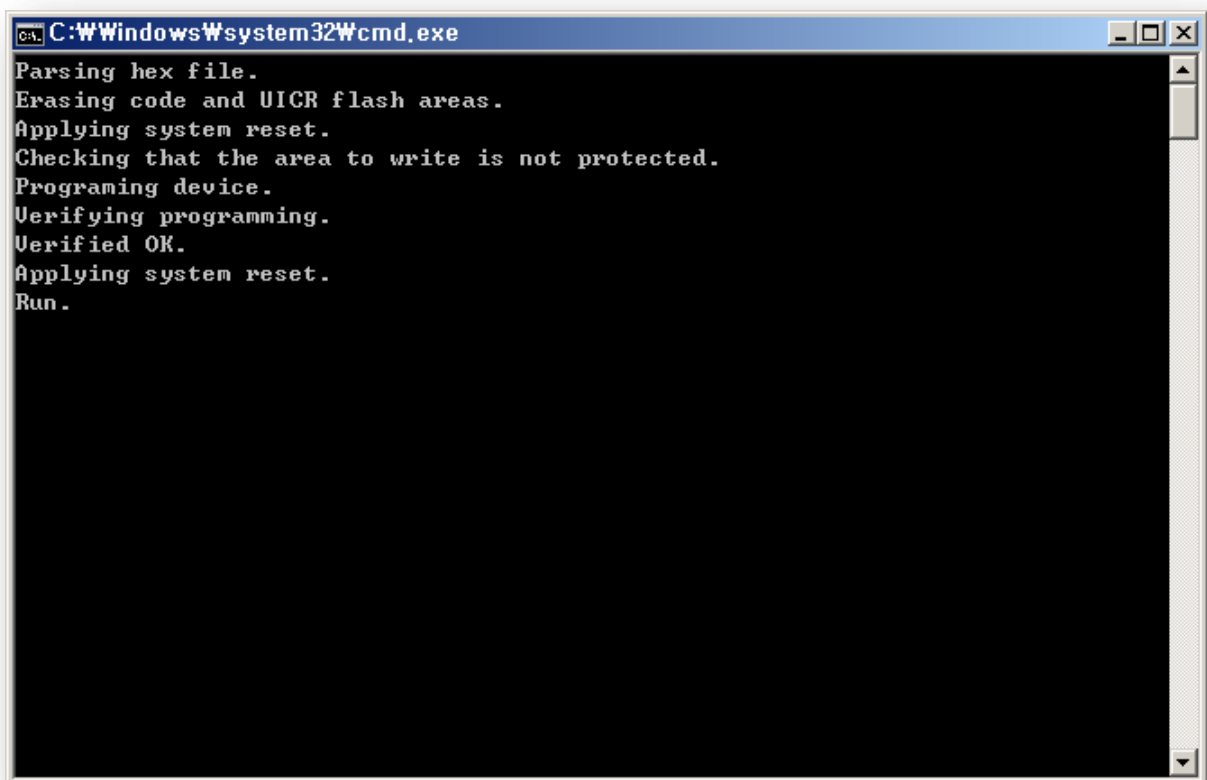
```
Build Output
TCK: 0, TDI: 0, TDO: 0, TMS: 1, TRST: 0
Hardware-Breakpoints: 6
Software-Breakpoints: 8192
Watchpoints: 4
JTAG speed: 4000 kHz

Erase Done.
Programming Done.
Verify OK.
Application running ...
Flash Load finished at 16:42:41
```



## 11. Release version download

- 11.1 Extract the release binary\_V10x\_UBX.file.  
ex ) Binary\_V10x\_UBX.zip.
- 11.2 SEGGER J-Link connection
- 11.3 Download
  - ⇒ Run **SFM20R1\_factory\_write.cmd** command to start the download.
  - When the download is successful,  
the following message is displayed and the command window closes automatically.



```
C:\Windows\system32\cmd.exe
Parsing hex file.
Erasing code and UICR flash areas.
Applying system reset.
Checking that the area to write is not protected.
Programing device.
Verifying programming.
Verified OK.
Applying system reset.
Run.
```

## 12. DFU (Device Firmware Upgrade via BLE)

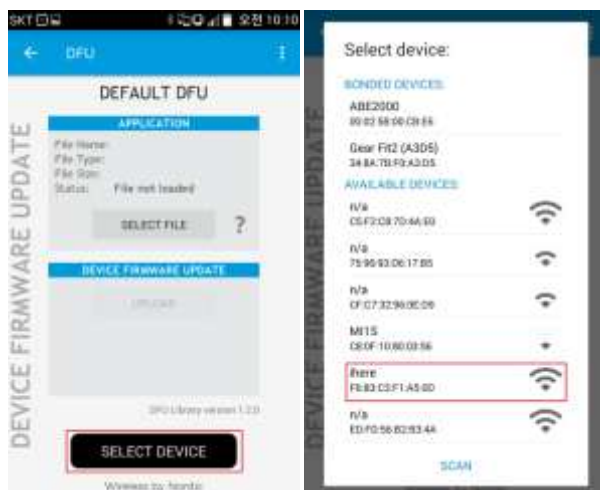
- 12.1 Prepare
  - The bootloader must be installed.
  - Use sigfox\_cfg2\_make\_factory\_image.bat to create the binaries,
  - Download the release version using SFM20R1\_factory\_write.cmd
- Copy Update Package to Android Phone  
(eg. development\sigfox\_cfg2\binary\SFM20R1\_app\_dfu\_package\_109\_UBX.zip)

12.2 Tag NFC, and run the nRF toolbox (You can download it from PlayStore)

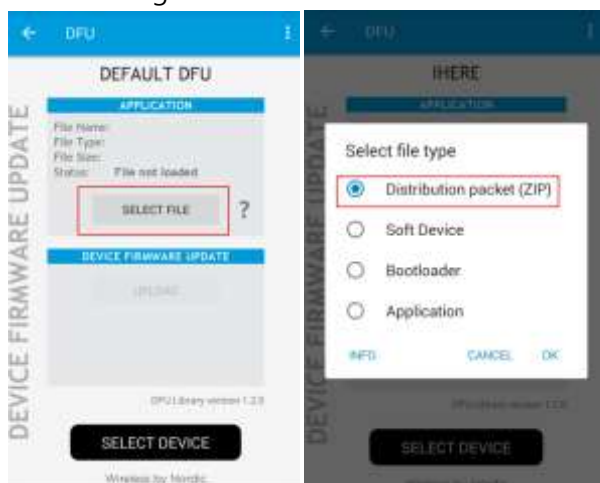
12.3 Run DFU



12.4 Select Device



12.5 Select Package file



## 12.6 Run Upload



## 12.7 Be sure to turn on the power while downloading (LED blinks)