

Development Environment Setup Guide

WISOL

July 10, 2017

Contents

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.

- 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)

Ultra Low Power Wireless Solutions from NORDIC SEMICONDUCTOR

English | MyPage | Documentation

NORDIC
SEMICONDUCTOR
Smarter Things

About us Products Applications Support & Community Investors Popular Products

Home / Products / 2.4GHz RF / nRFgo Studio

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 Replacement products

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

[Get product updates](#)

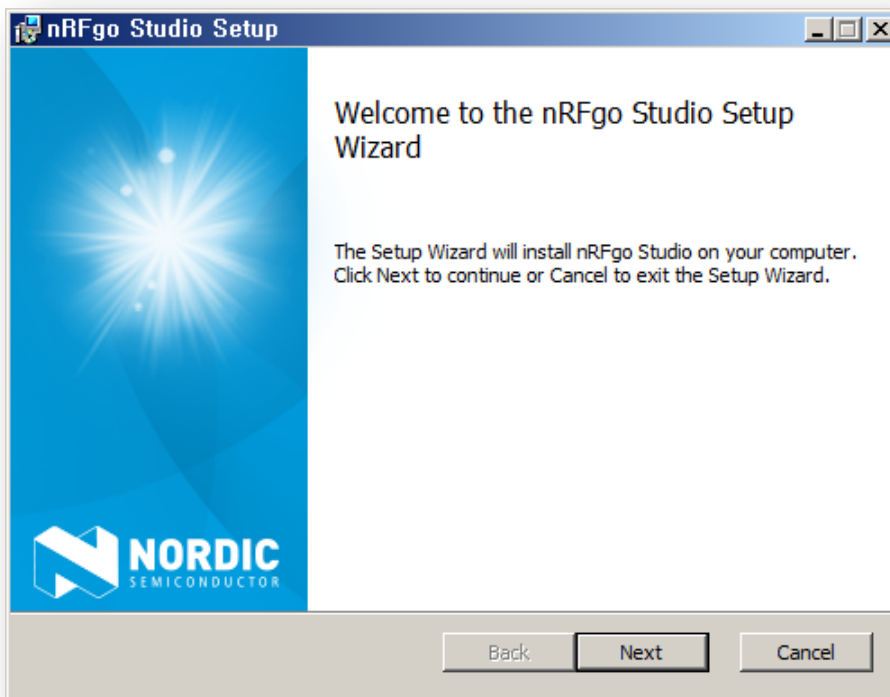
OVERVIEW **DOWNLOADS**

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

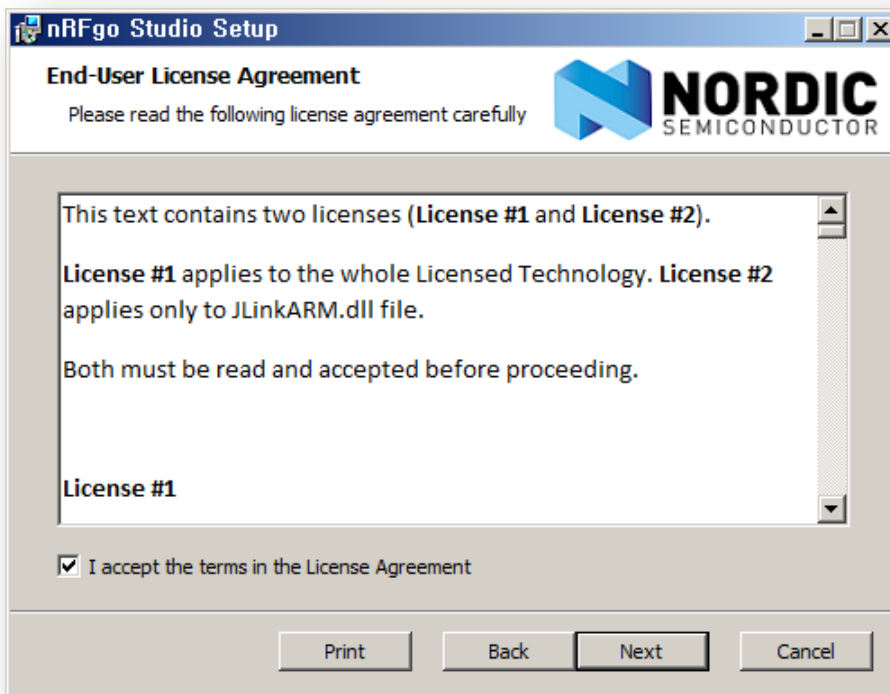
SOFTWARE		
Code	Name	Version
nRFgo Studio-Win32	Software tool for nRFgo Starter Kit and Development Kits for 32-bit (x86) Windows XP, Windows Vista, Windows 7, and Windows 8	1.21.2
nRFgo Studio-Win64	Software tool for nRFgo Starter Kit and Development Kits for 64-bit (x64) Windows Vista, Windows 7, and Windows 8	1.21.2

nRFgo Studio installation

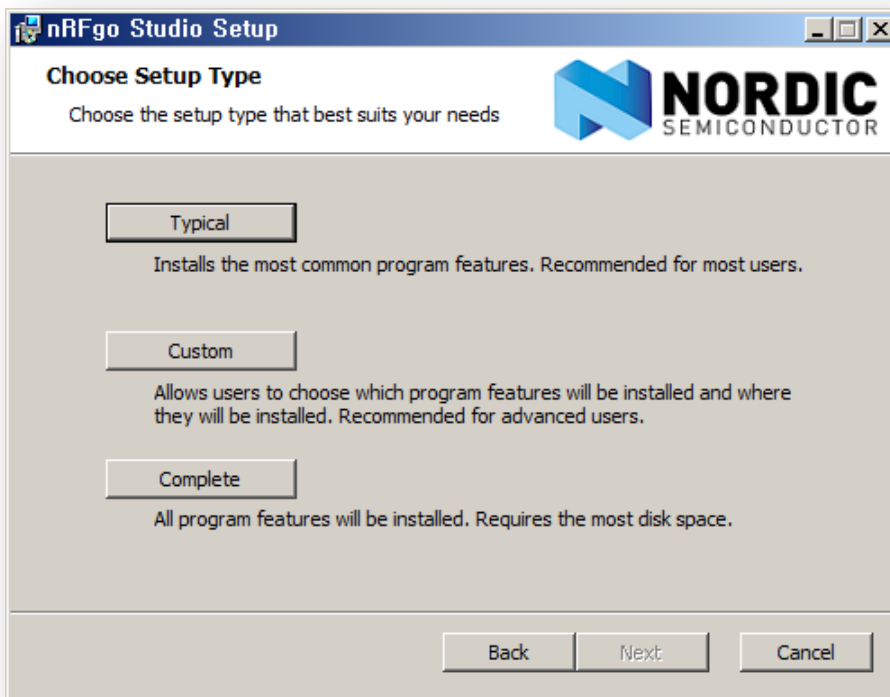
nRFgo Studio Setup



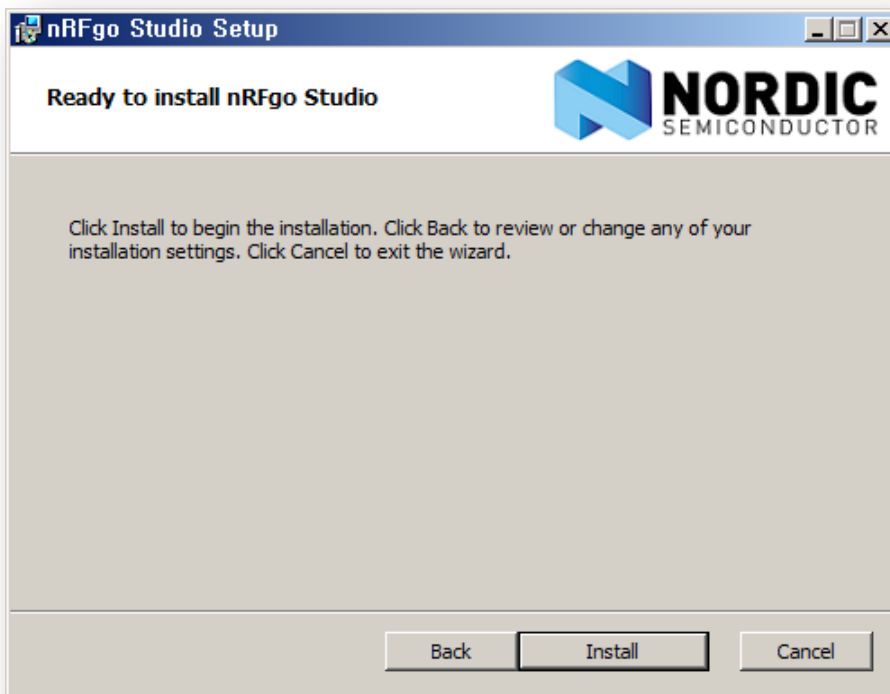
Read following license agreement



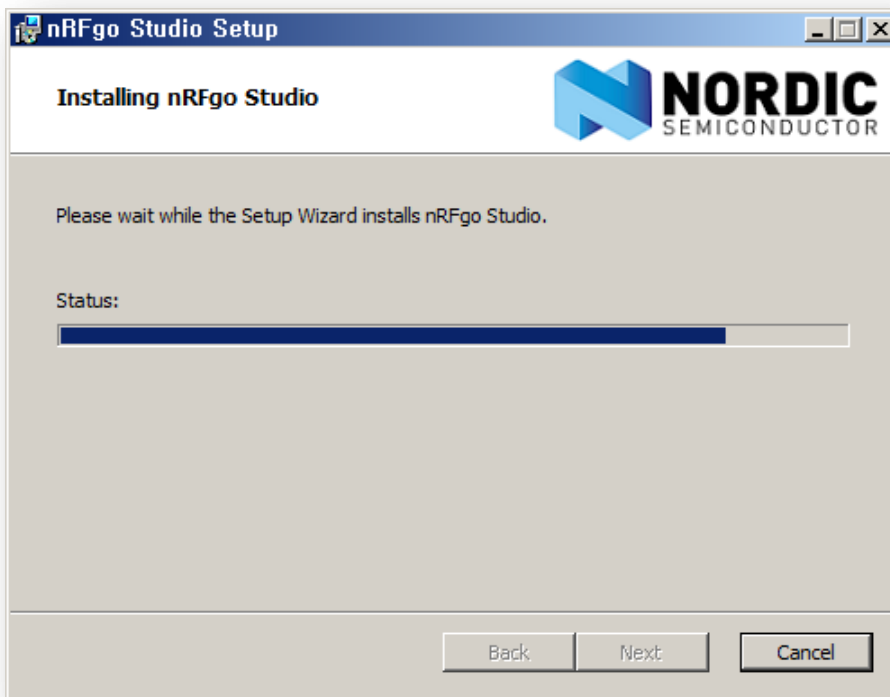
Choose setup type



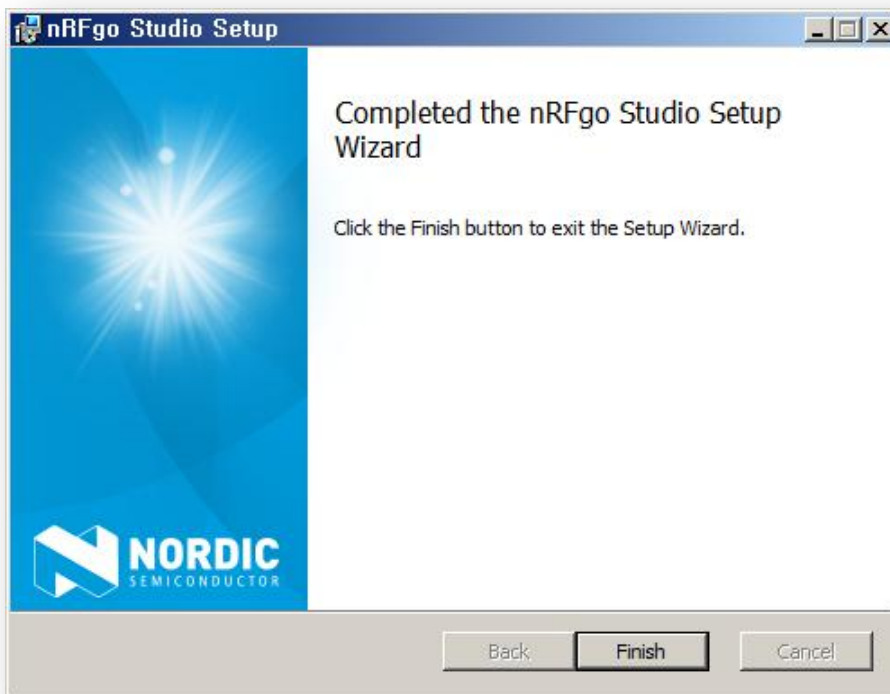
Ready to install nRFgo Studio



Installing nRFgo Studio

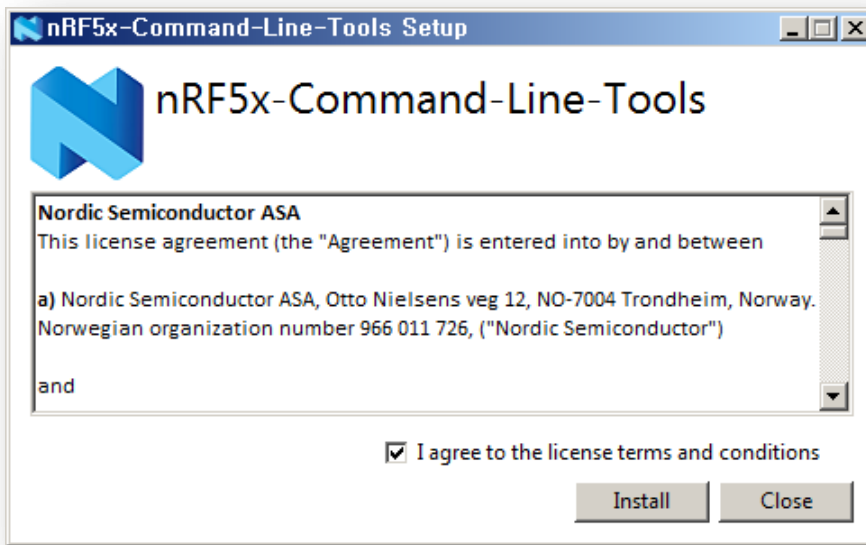


Completed the nRFGo Studio Setup

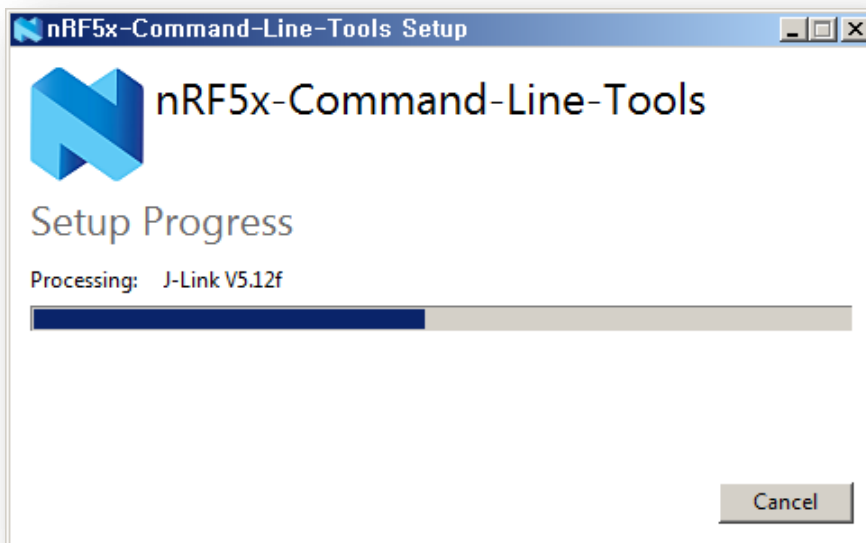


nRF5x-Command-Line-Tools

nRF5x-Command-Line_Tools Setup - 1



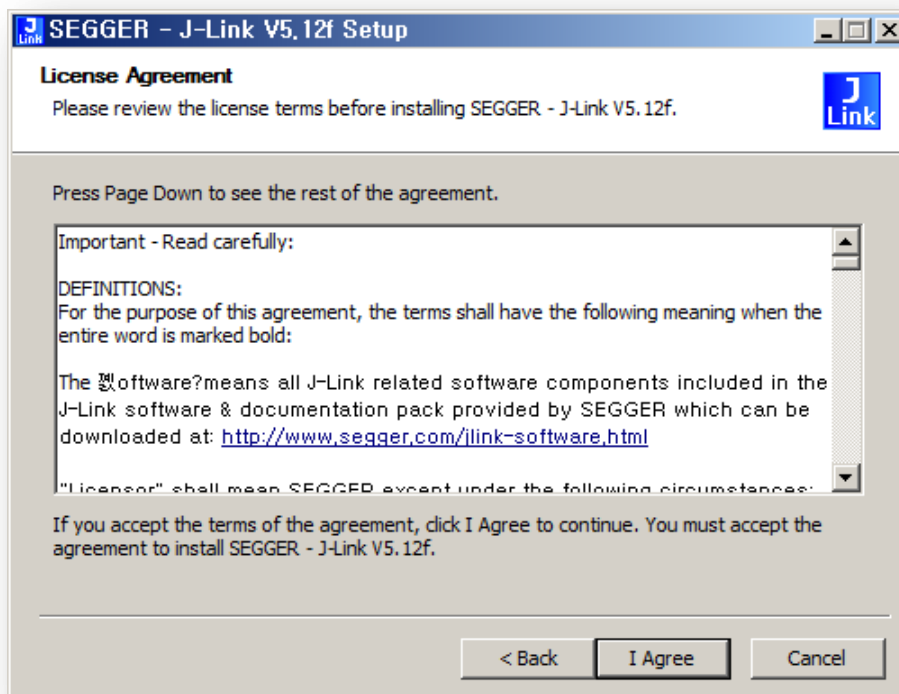
RF5x-Command-Line_Tools Setup – 2



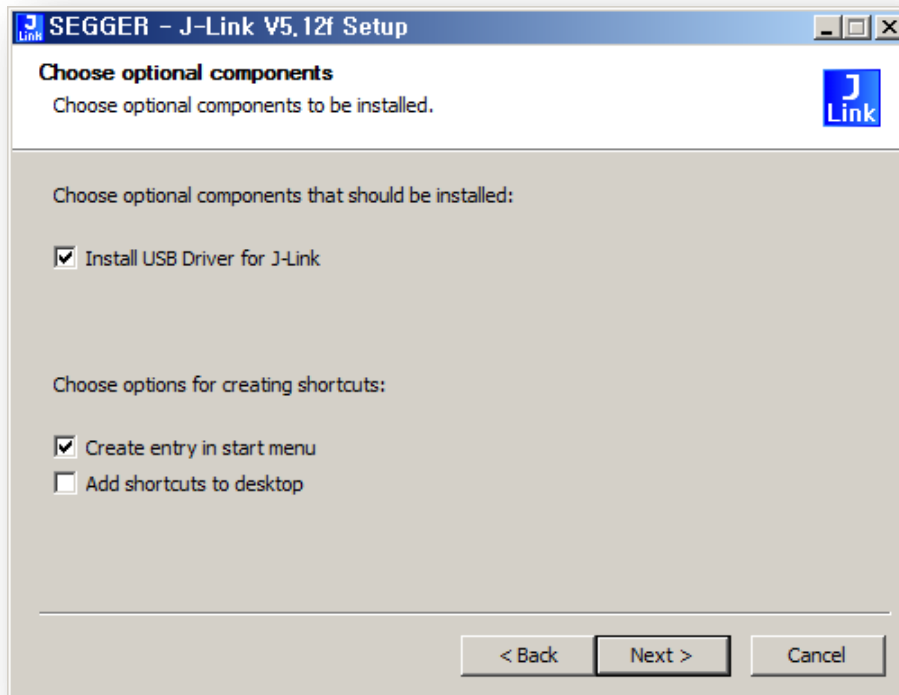
SEGGER – J-Link V5.12f Setup



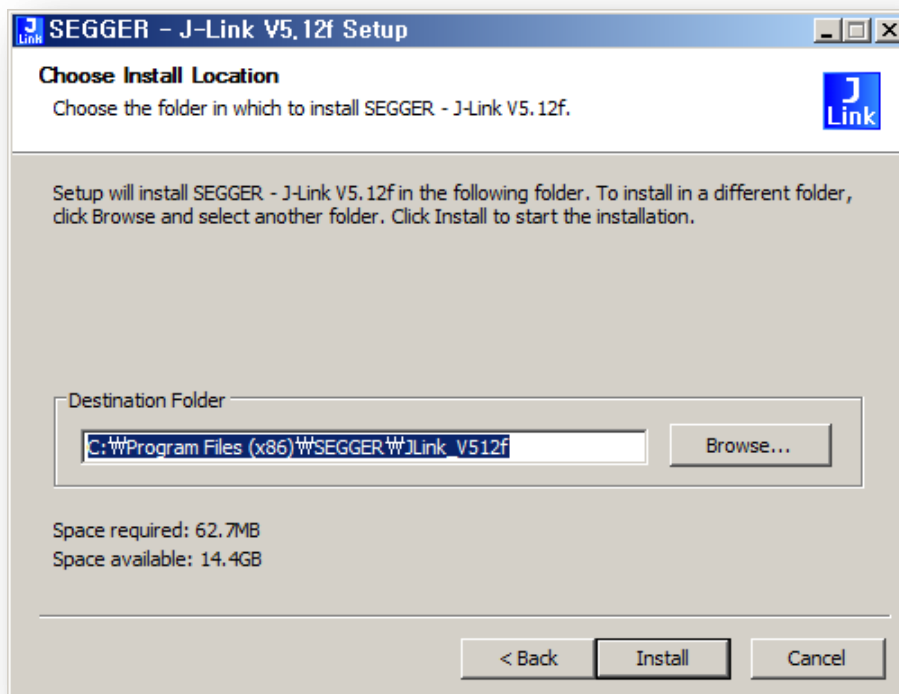
License Agreement



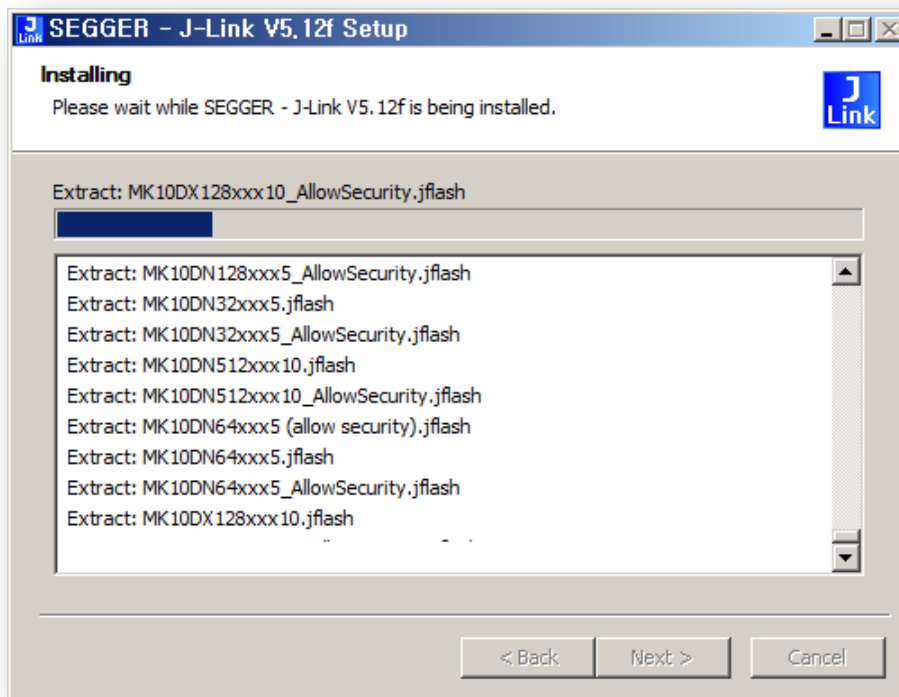
Chose optional components



Choose Install Location



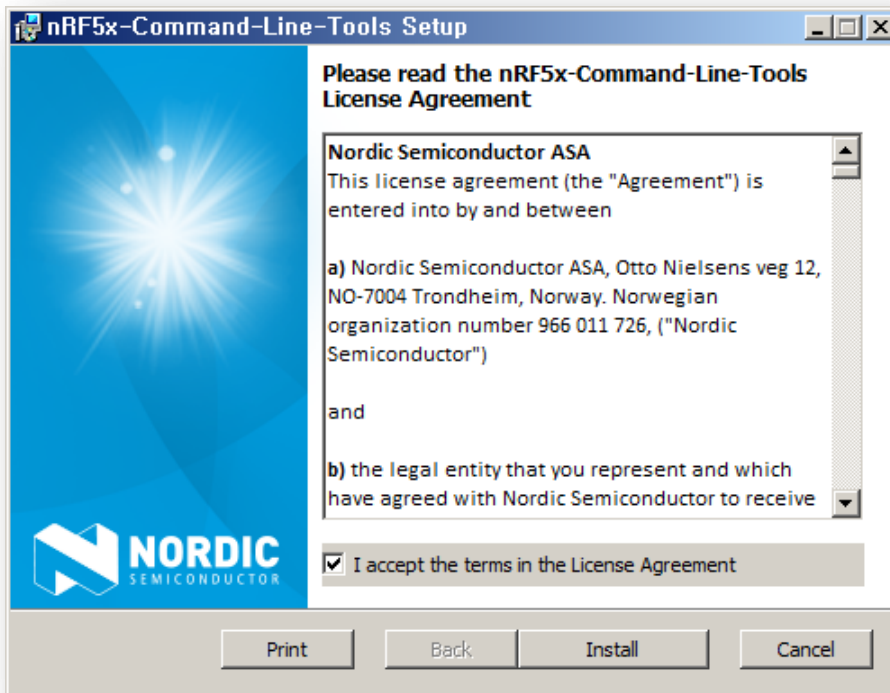
Installing



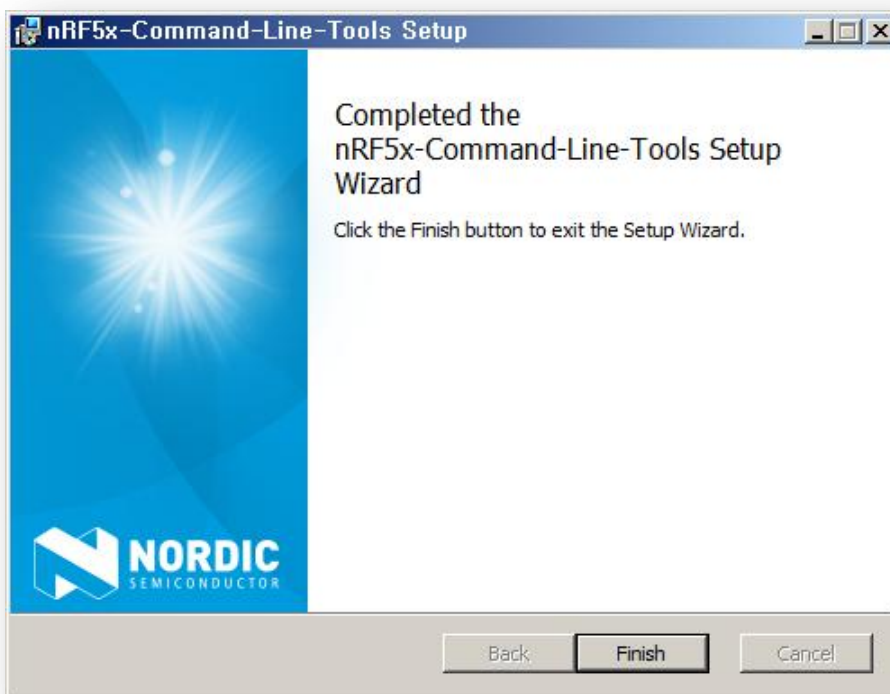
Completing SEGGER - J-Link V5.12f Setup



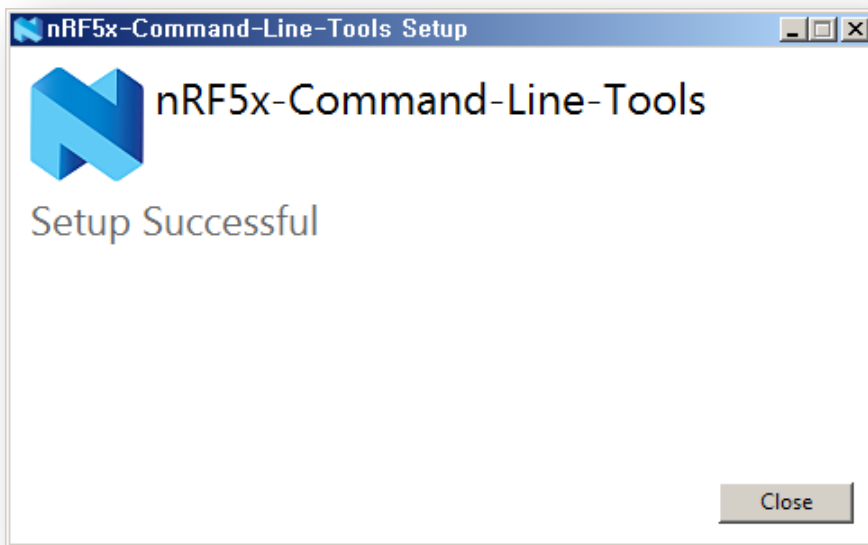
Read nRF5x-Command-Line-Tools License Agreement & Accept



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 μ 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.

Minimum Hardware Requirements

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

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

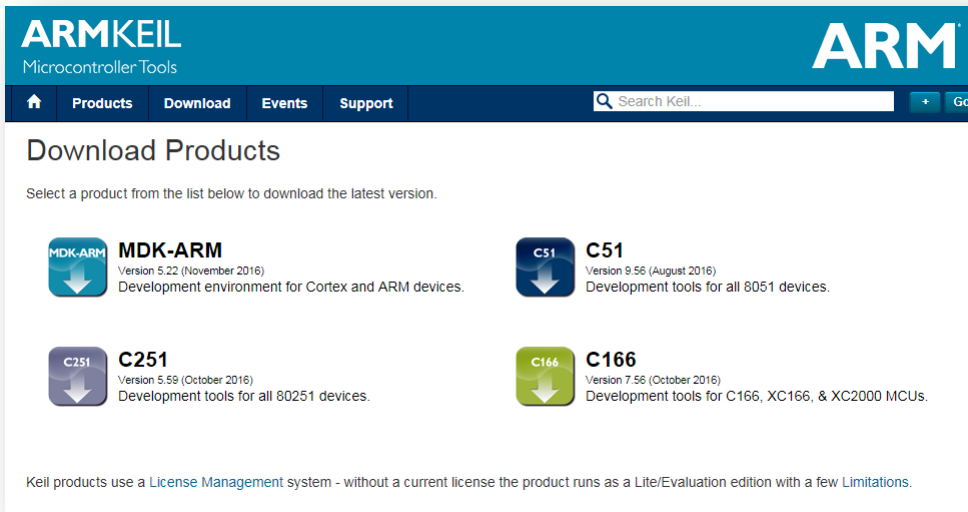
Supported Operating Systems

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



ARMKEIL MicrocontrollerTools **ARM**

Home Products Download Events Support Search Keil... Go

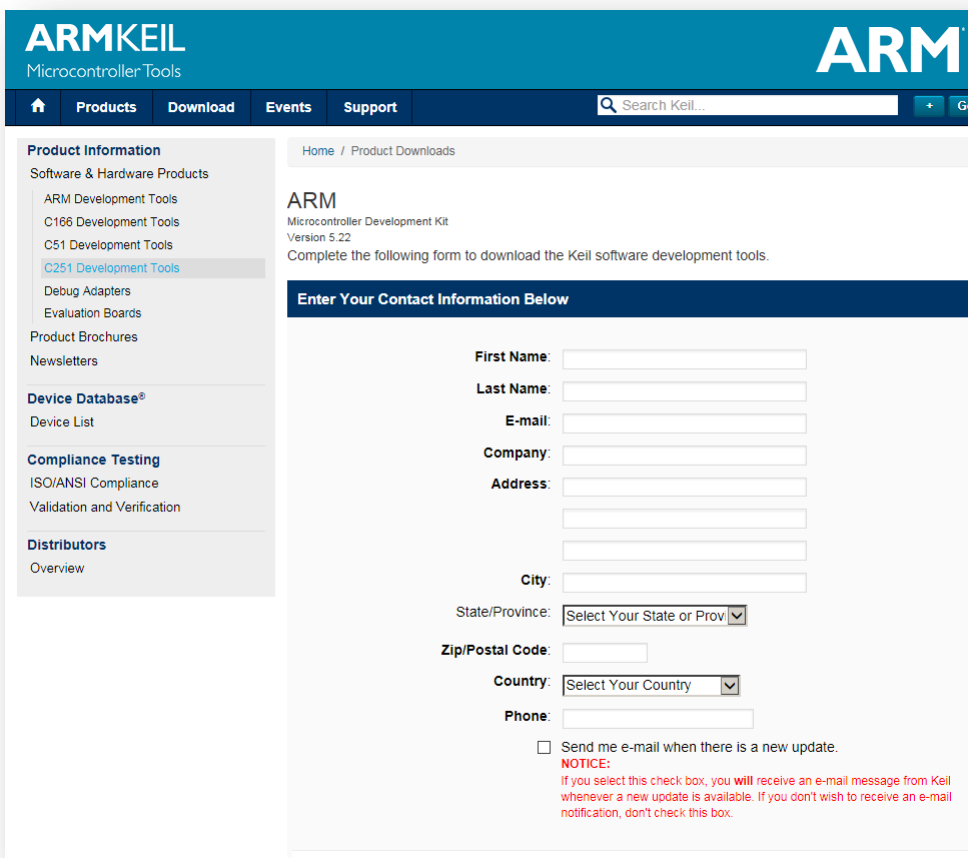
Download Products

Select a product from the list below to download the latest version.

- MDK-ARM** (Version 5.22 (November 2016))
Development environment for Cortex and ARM devices.
- C51** (Version 9.56 (August 2016))
Development tools for all 8051 devices.
- C251** (Version 5.59 (October 2016))
Development tools for all 80251 devices.
- C166** (Version 7.56 (October 2016))
Development tools for C166, XC166, & XC2000 MCUs.

Keil products use a License Management system - without a current license the product runs as a Lite/Evaluation edition with a few Limitations.

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



ARMKEIL MicrocontrollerTools **ARM**

Home Products Download Events Support Search Keil... Go

Home / Product Downloads

ARM

Microcontroller Development Kit
Version 5.22
Complete the following form to download the Keil software development tools.

Enter Your Contact Information Below

First Name:

Last Name:

E-mail:

Company:

Address:

City:

State/Province:

Zip/Postal Code:

Country:

Phone:

Send me e-mail when there is a new update.

NOTICE:
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.

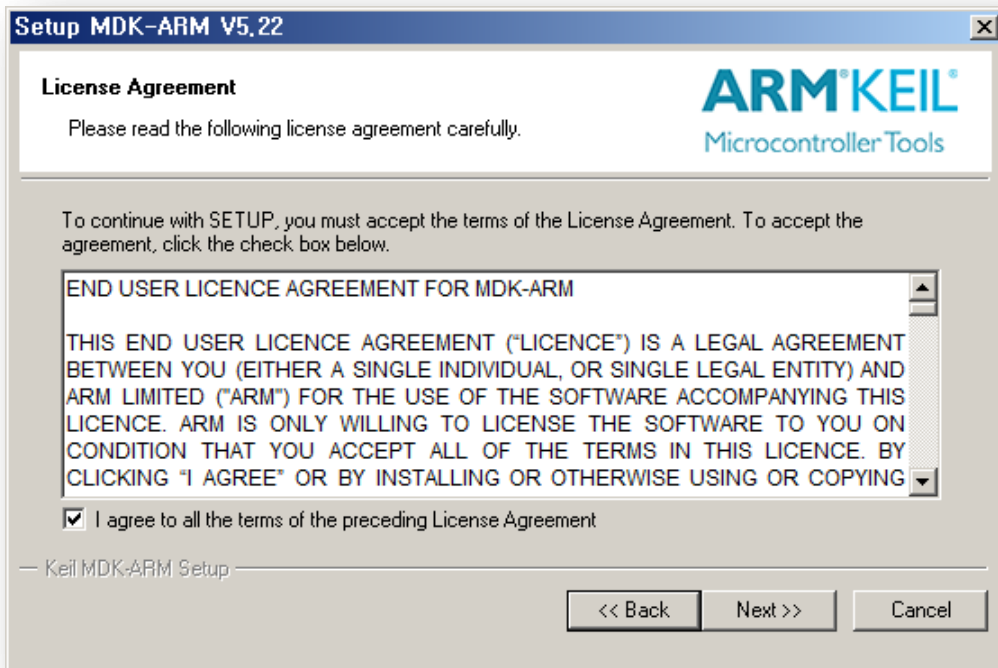
- ✓ MDK522.EXE download

The screenshot shows the ARMKEIL website interface. The top navigation bar includes 'Products', 'Download', 'Events', and 'Support'. A search bar is located on the right. The main content area is titled 'ARM Microcontroller Development Kit Version 5.22'. It provides a brief description of the kit and lists several links: 'Review the hardware requirements before installing this software.', 'Note the limitations of the evaluation tools.', 'MDK5 Overview and Introduction', and 'MDK5 Installation instructions'. Below this, there is a section for 'To install the ARM Software...' with instructions: 'Right-click on MDK522.EXE and save it to your computer.', 'PDF files may be opened with Acrobat Reader.', and 'ZIP files may be opened with PKZIP or WINZIP.'. A download button for 'MDK522.EXE (696,282K)' is visible, dated 'Friday, November 11, 2016'. A note at the bottom states: 'If you are evaluating the tools, be sure to request a quote for the full version of the tools.'

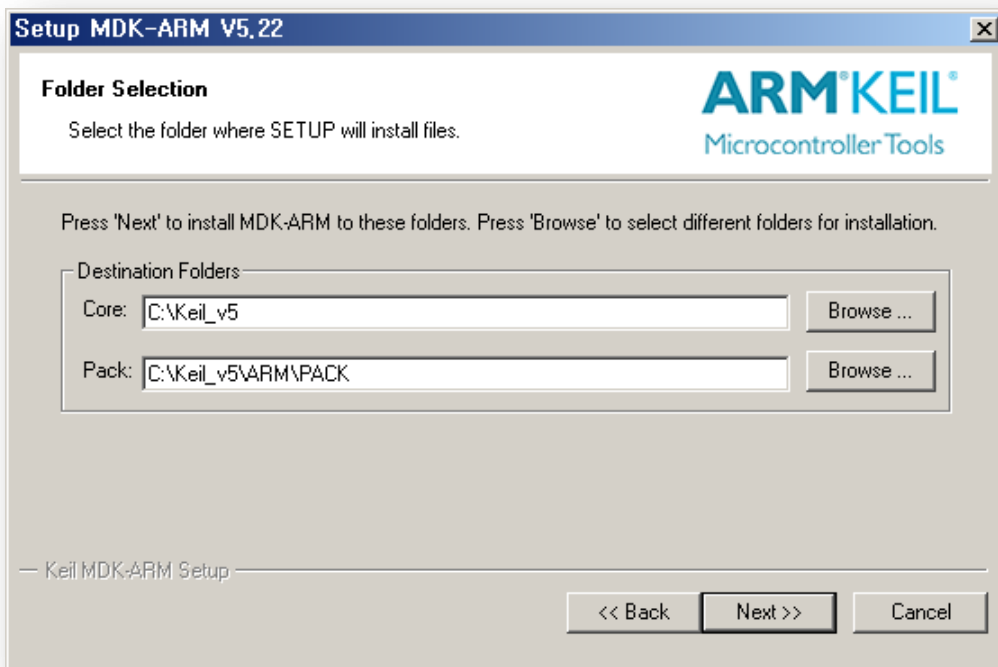
- ✓ Install MDK-ARM V5.22

The screenshot shows the 'Setup MDK-ARM V5.22' window. The title bar reads 'Setup MDK-ARM V5.22'. The main content area features the ARMKEIL logo and the text 'Welcome to Keil MDK-ARM Release 11/2016'. Below this, it states: 'This SETUP program installs: MDK-ARM V5.22'. It further explains: 'This SETUP program may be used to update a previous product installation. However, you should make a backup copy before proceeding.' It also recommends: 'It is recommended that you exit all Windows programs before continuing with SETUP. Follow the instructions to complete the product installation.' At the bottom, there are three buttons: '<< Back', 'Next >>', and 'Cancel'. The window footer reads '— Keil MDK-ARM Setup —'.

✓ License Agreement



✓ Folder Selection



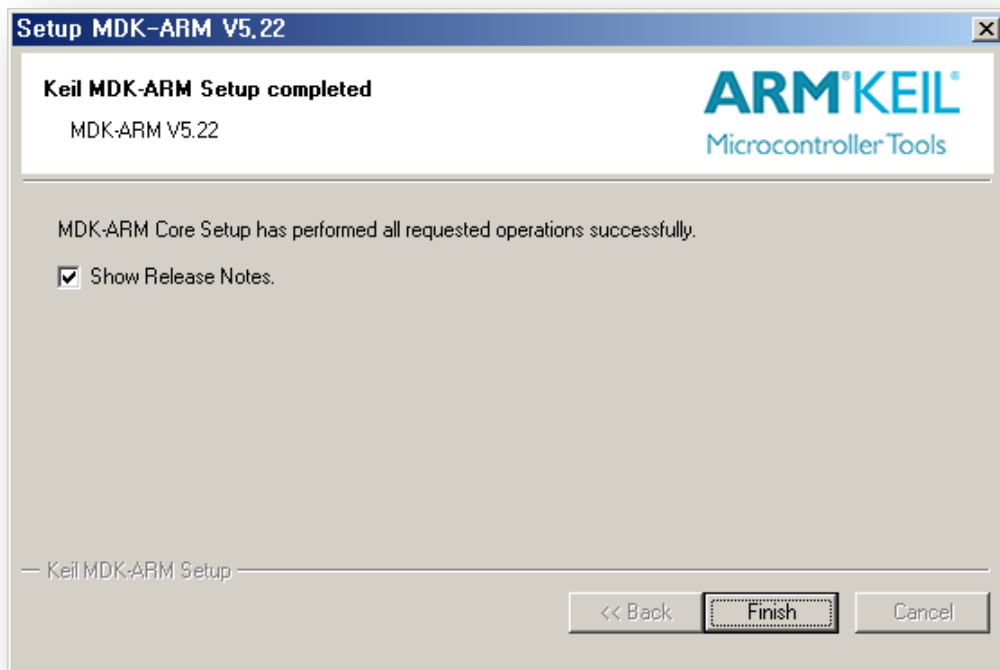
- ✓ Enter information

The screenshot shows a Windows-style dialog box titled "Setup MDK-ARM V5.22". The window has a blue title bar with a close button (X) on the right. The main content area has a white header with the "ARM KEIL" logo and "Microcontroller Tools" text. Below the header, the text "Customer Information" is followed by "Please enter your information." and a sub-instruction: "Please enter your name, the name of the company for whom you work and your E-mail address." There are four text input fields: "First Name:" with "hong", "Last Name:" with "gildong", "Company Name:" with "wisol", and "E-mail:" with "gdhong@wisol.co.kr". At the bottom left, it says "— Keil MDK-ARM Setup —". At the bottom right, there are three buttons: "<< Back", "Next >>", and "Cancel".

- ✓ Installing

The screenshot shows the same "Setup MDK-ARM V5.22" dialog box, now in the "Setup Status" step. The header is the same. The main text says "MDK-ARM Setup is performing the requested operations." followed by "Install Files ..." and "Installing cpprt_tf.l.". Below this is a progress bar with a blue indicator showing approximately 10% completion. At the bottom left, it says "— Keil MDK-ARM Setup —". At the bottom right, there are three buttons: "<< Back", "Next >>", and "Cancel".

- ✓ Keil MDK-ARM setup completed



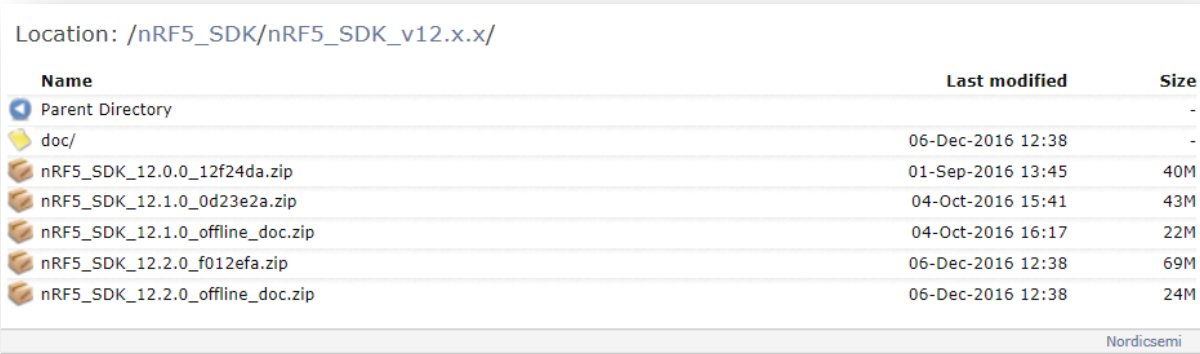
5. nRF SDK

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/>

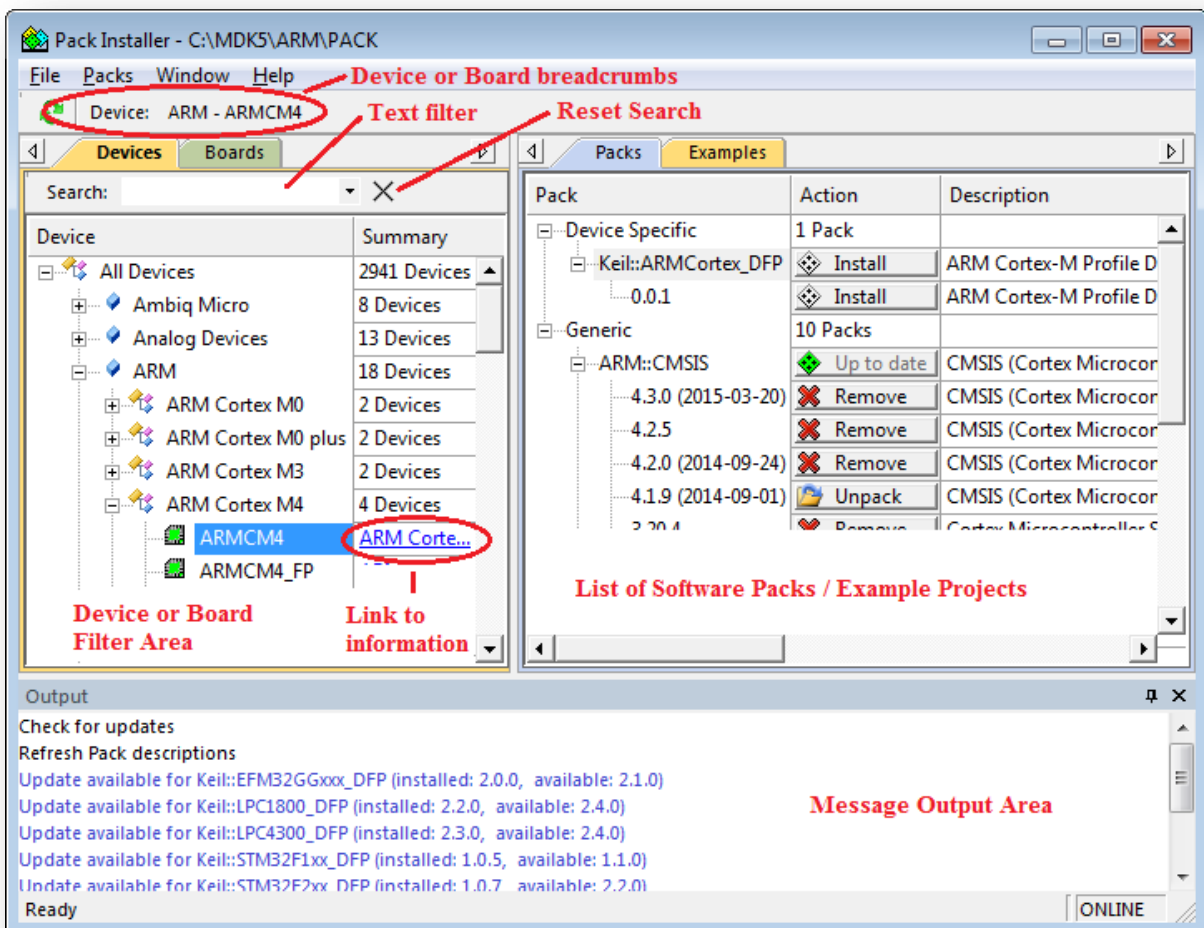
6. Keil Device Family Pack

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

 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.

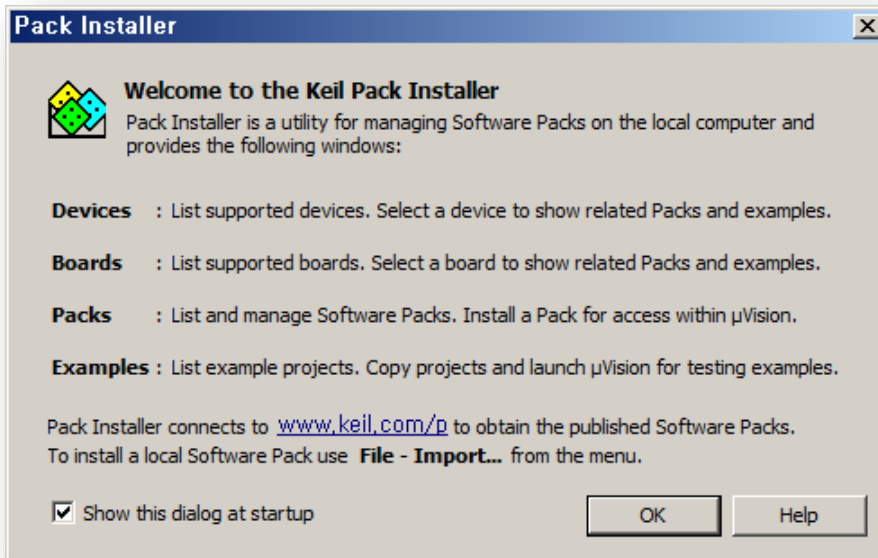
Output Window

Displays messages about executed actions. Messages have different colors.

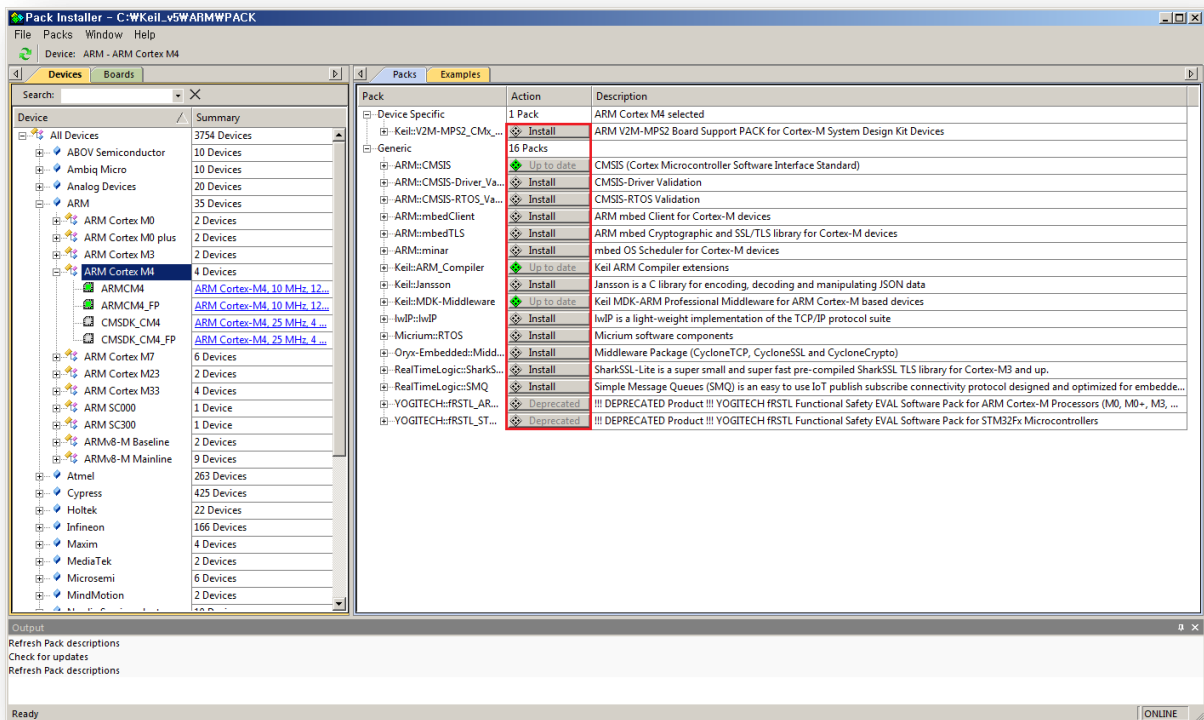
- **Black** - informative message.
- **Blue** - update message.
- **Red** - error message.

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

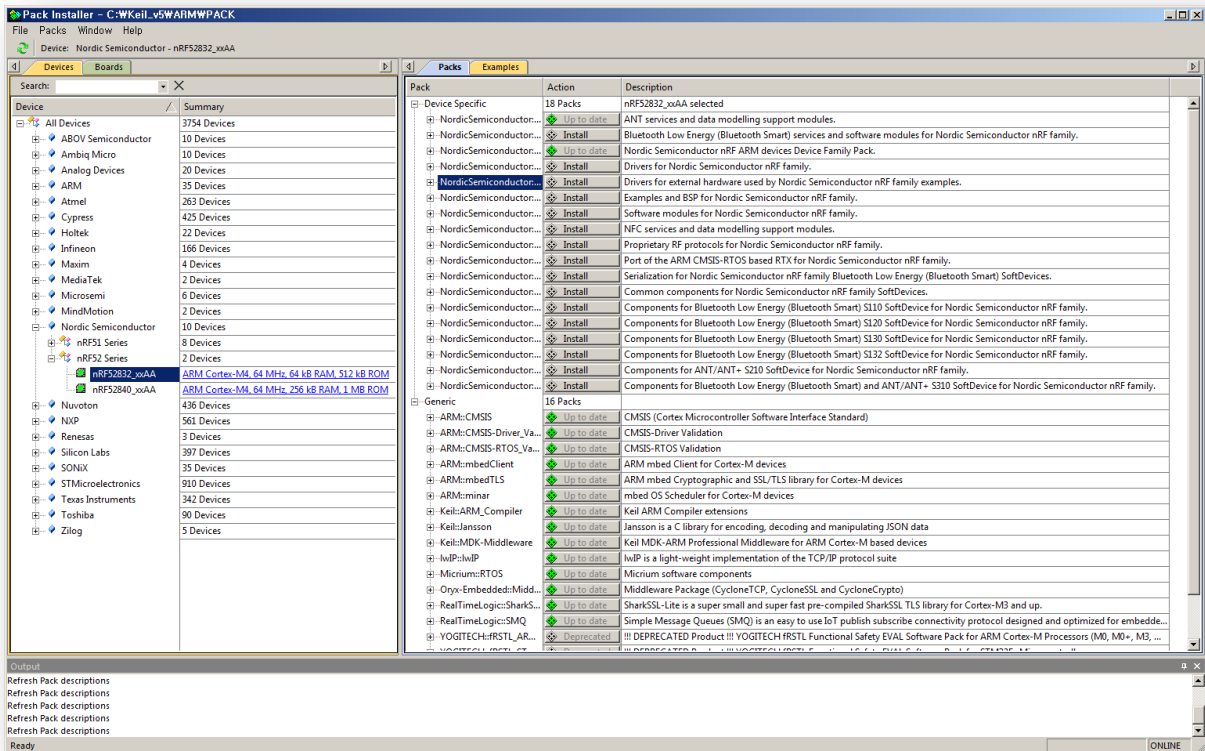
- ✓ Pack installer - 1



- ✓ 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/

8. SDK Compile

8.1 Extract the SFM20R1 SDK zip file.

Ex) SFM20R1_Delivery_SDK.zip

8.2 Run the **sigfox_cfg2_pca10040_s132.uvprojx** file from the extracted directory.

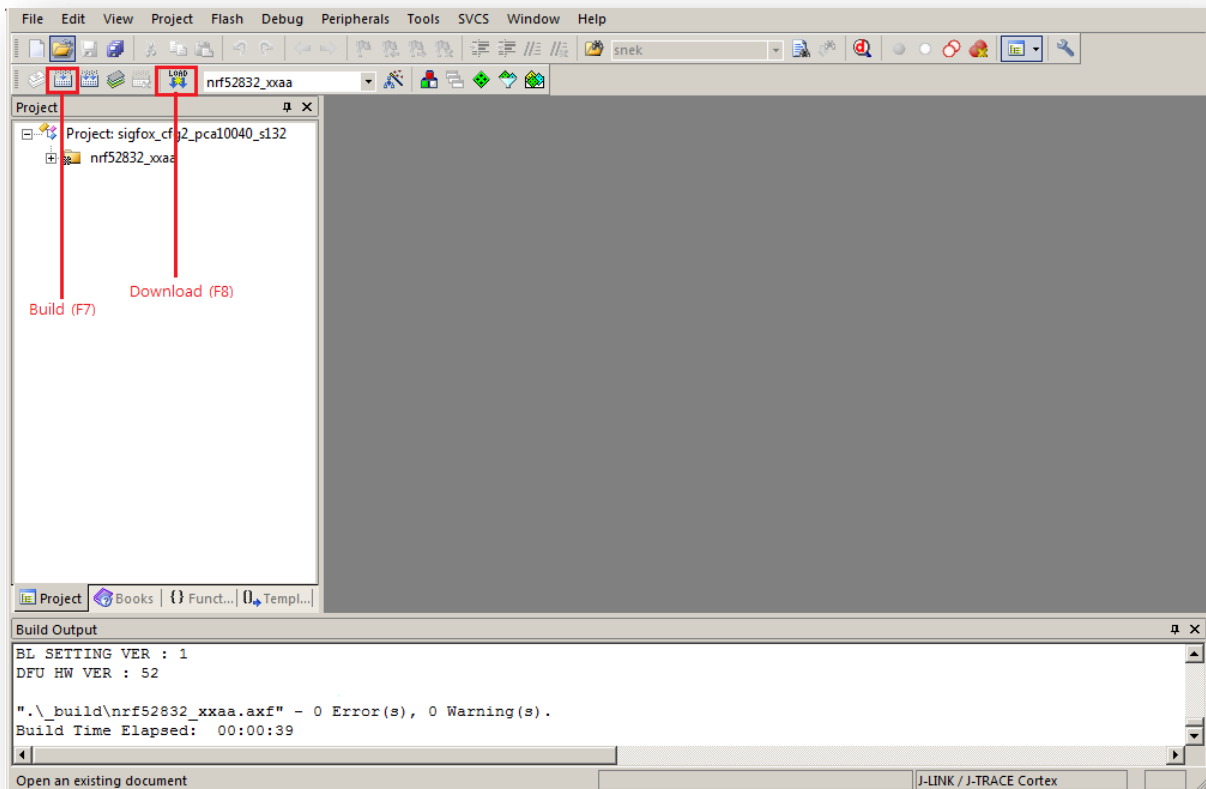
Path : development\sigfox_cfg2\source\pca10040\warm5_no_packs

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\arm5_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 binaries (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

application

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

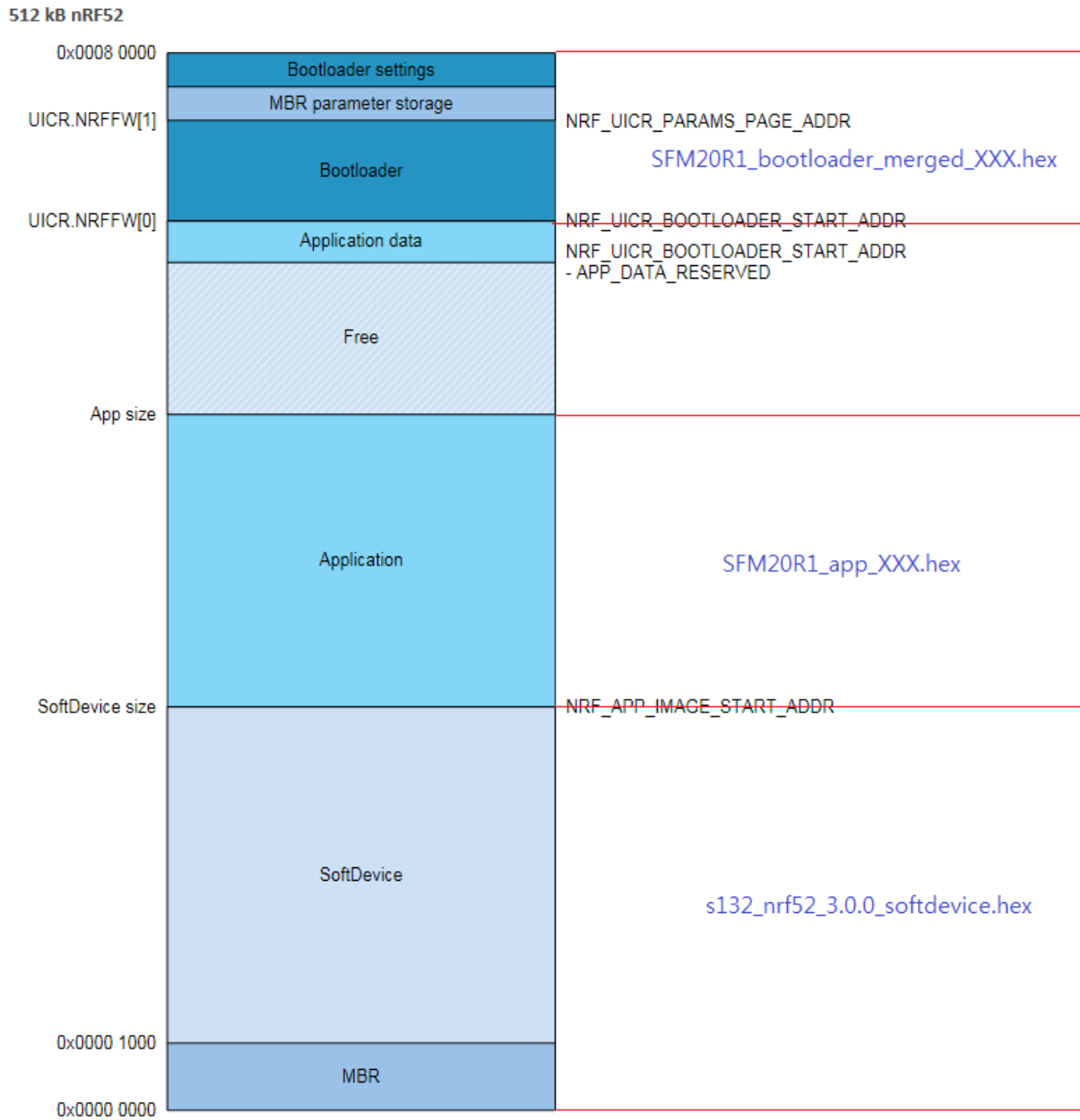
SFM20R1_bl_setting_XXX.hex : bootloader settings (application hash is included)

SFM20R1_bootloader_merged_XXX.hex : Image with boot loader and settings merged

9.2 flash memory map

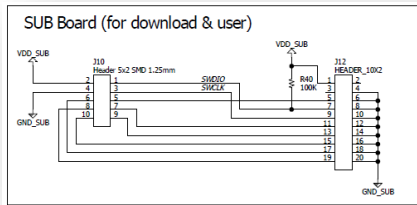
based layout (512 kB nRF52)

https://infocenter.nordicsemi.com/index.jsp?topic=%2Fcom.nordic.infocenter.sdk5.v12.0.0%2Flib_bootloader.html

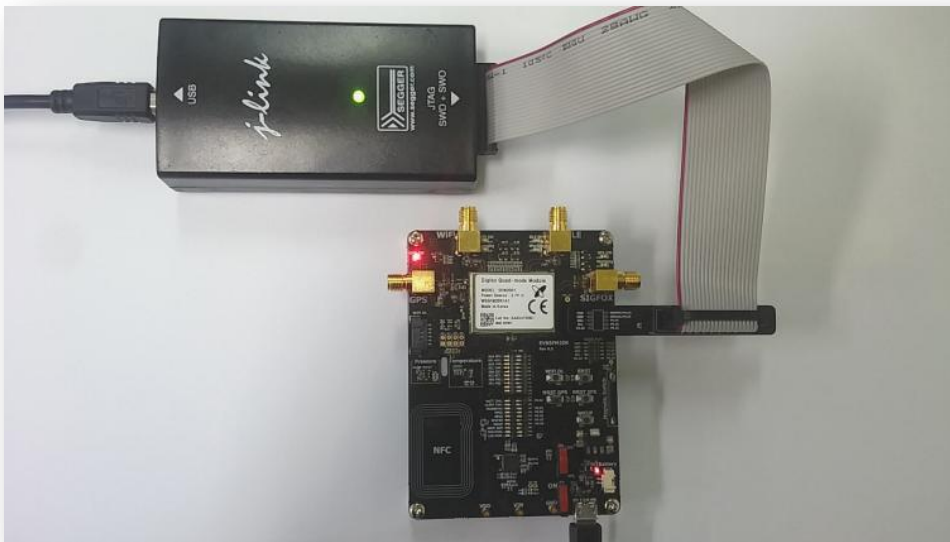


10. Flash Download

10.1 Download Jig board



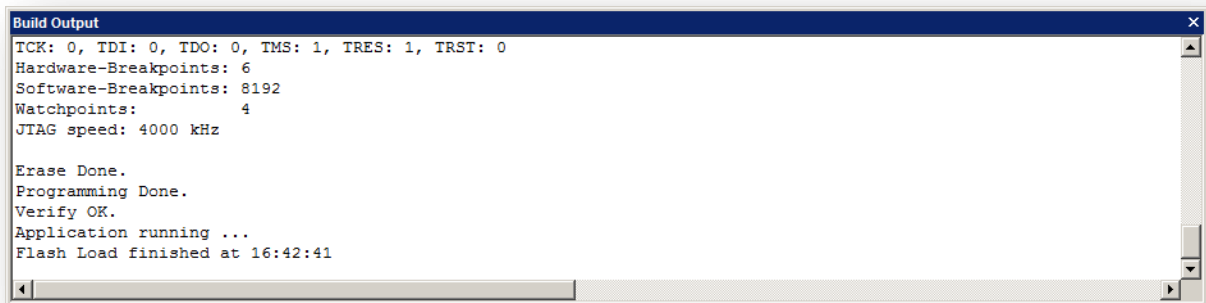
10.2 SEGGER J-Link connection



10.3 Download flash

Menu : Flash – Download (F8)

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

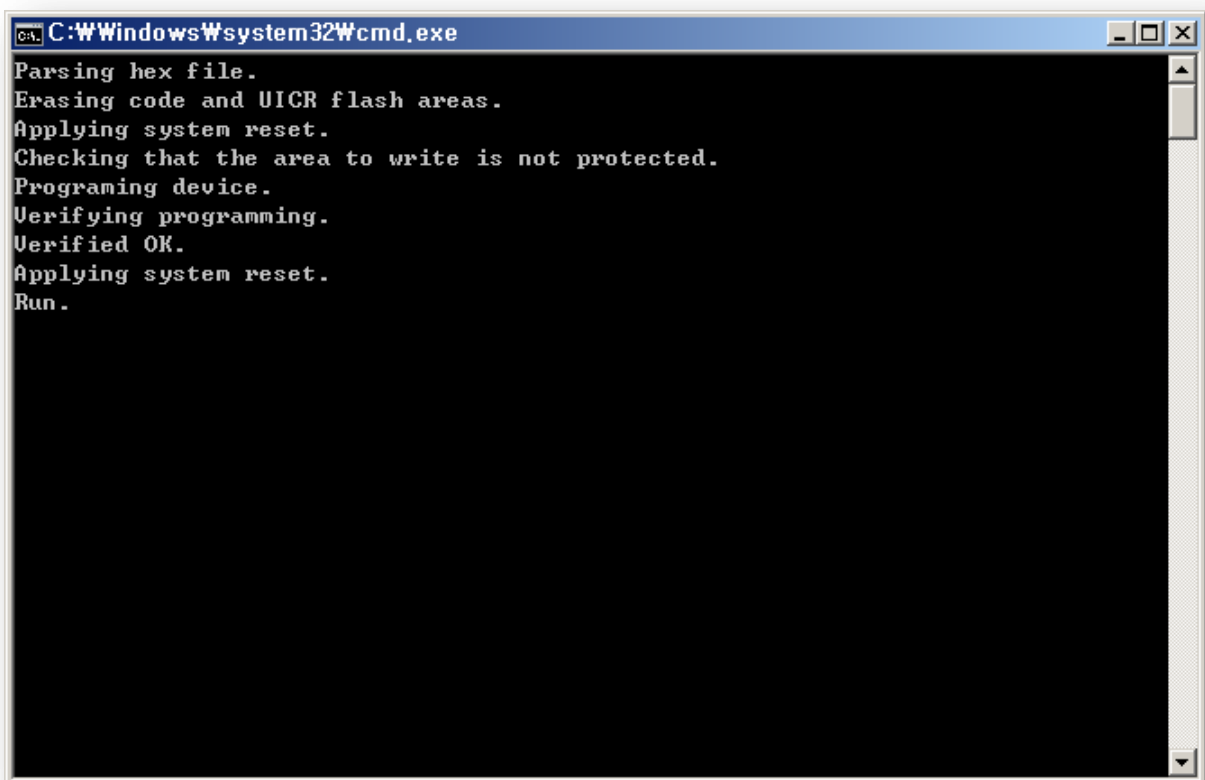


```
Build Output
TCK: 0, TDI: 0, TDO: 0, TMS: 1, TRES: 1, TRST: 0
Hardware-Breakpoints: 6
Software-Breakpoints: 8192
Watchpoints: 4
JTAG speed: 4000 kHz

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)

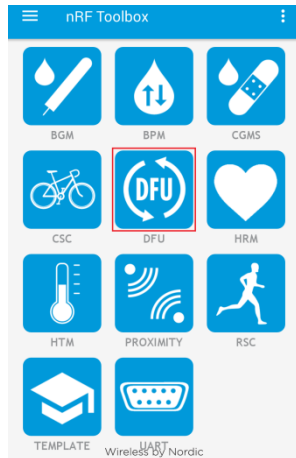
- 12.1 Prepare
 - The bootloader must be installed.
 - Use sigfox_cfg2_make_factory_image.bat to create the binaries,
 - Download the release version using SFM20R1_factory_write.cmd

Copy Update Package to Android Phone

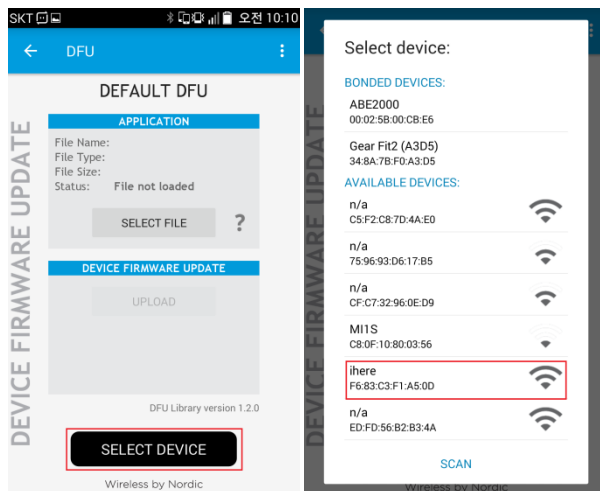
(eg. development\sigfox_cfg2\binary\SFM20R1_app_dfu_package_109_UBX.zip)

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

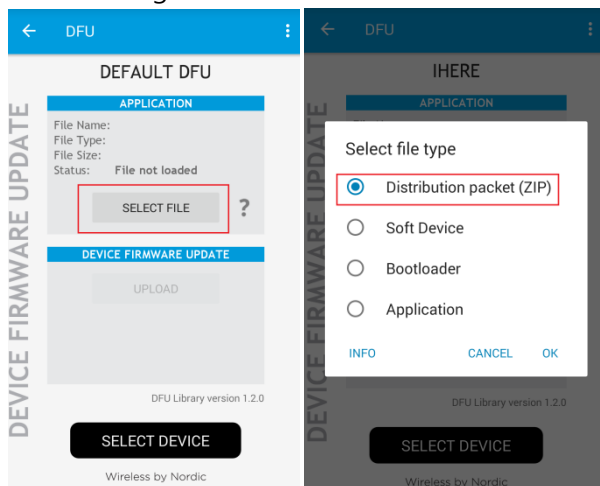
12.3 Run DFU



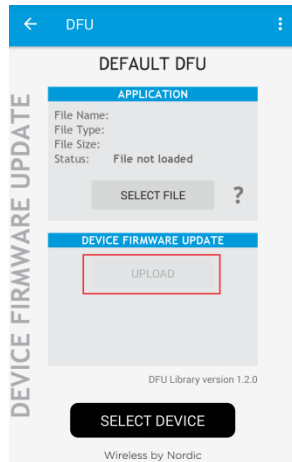
12.4 Select Device



12.5 Select Package file



12.6 Run Upload



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