Getting Started with keil mdk

# Hardware/ software Setup

1. Download Keil MDK development tool in this [link](http://www2.keil.com/mdk5/install)
2. Install the board support package in your Kei MDK. To do that, you need to visit [Nordic website](https://www.nordicsemi.com/eng/Products/Bluetooth-Smart-Bluetooth-low-energy/nRF51822-mKIT) and search for nRF51822 product -> downloads -> Nordic nRF518-SDK. You will need to create an account and register your product key (can be found in the board package) to download it.
3. Update hardware firmware for the board [optional]
   1. Make sure the “target power” switch on the board is always “on” (power from USB)
   2. Download the latest [mbed interface upgrade](https://www.nordicsemi.com/eng/nordic/download_resource/30958/1/79485694) file for the nRF51822-mkit (you can also find it under Appendix->accessory/hardware firmware)
   3. Unplug mkit from the usb.
   4. Press and hold down the reset button and connect the usb while doing so
   5. mkit should now enumerate as an MSD named "BOOTLOADER"
   6. Copy the binary to the BOOTLOADER drive.
   7. Wait until the drive dismounts and the mbed LED is flashing continuously
   8. Unplug the board and plug in again (without pressing reset button), and the board should enumerate as usual.
   9. More information can be found in this [link](http://developer.mbed.org/platforms/Nordic-nRF51822/)
4. Download the system initialization file (Appendix/accessory/s110\_nrf51822\_6.0.0\_softdevice.hex) to the board. You can do that by dragging and dropping the initialization file to the MBED driver (similar to copying file to the USB driver, without pressing reset). You only need to do it once.

Note that for all lab exercises, the Keil MDK project has been created for you, so that you can simply open and modify using Keil MKD as required. Alternatively you can also export a project from the mbed online compiler (see “exporting from mbed online compiler” section)

# Project Development with MDK

## Loading a project into MDK



Project files are displayed in File Explorer with the Microvision icon, shown above. To load a project into MDK, do one of the following:

* Menu: Within MDK, select menu item Project->Open Project…, navigate to the project directory, and select the .uvproj file.
* File Explorer: double click on the .uvproj file.

## Building The Project



Build the project using one or more of the following toolbar buttons (listed from left to right):

* Translate current file (e.g. compile or assemble)
* Build the target files whose source files have changed and create output file
* Rebuild all of the target files and create output file

## Downloading the program IMAGE to the Microcontroller PROGAM memory (FLASH MEMORY)

Download the program to the MCU flash using one of these methods:

* Toolbar button: 
* Menu: Flash->Download
* Accelerator keys: alt+a+d

Note: if the download fails, please check:

* The firmware has been installed on the board (hardware setup)
* Install Keil MDK5 legacy support (<http://www.keil.com/download/files/mdkcm510.exe>)

## Using the Debugger

Begin or end a debugger session using one of these methods:

* Toolbar button: 
* Menu: Debug->Start/Stop Debug Session
* Accelerator keys: ctrl+F5
* Note: you may need to download the program before debugging



Control the target program execution with the following toolbar buttons (shown from left to right above):

* Reset MCU
* Run program execution (F5)
* Stop program execution
* Step one line in program, entering a subroutine (F11)
* Step one line in program, executing and returning from a subroutine (F10)
* Step out of current function (ctrl+F11)
* Run to cursor (ctrl+F10)

Right-clicking on a line of code will bring up a context menu with various options, including:

* Setting and clearing breakpoints
* Adding a variable to a watch window
* Navigating to definitions or uses of symbols (functions and variables)

The View menu can be used to open different windows to help in debugging, including:

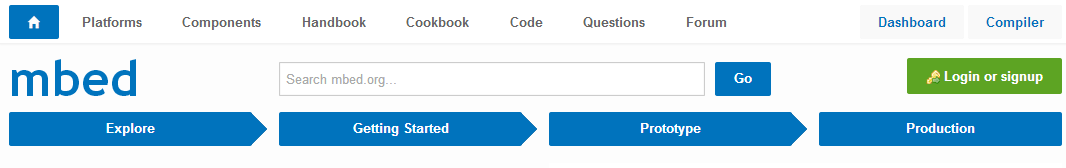
* Disassembly
* Symbols
* CPU registers
* Call stack
* Variable watch windows
* Memory windows
* System viewer (MCU and peripheral control registers)

# export from mbed online compiler

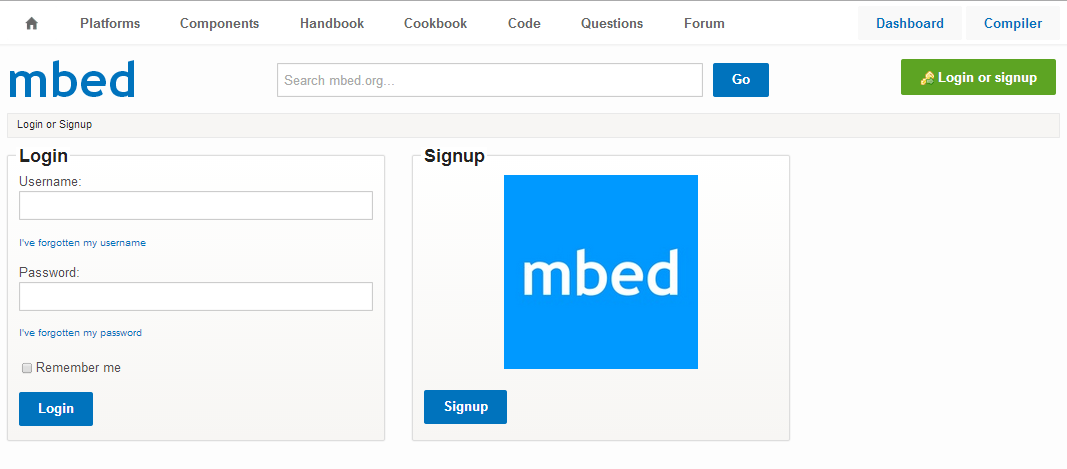
The mbed online Compiler provides a lightweight online C/C++ IDE that is pre-configured to let you quickly write programs, compile and download them to run on your mbed Microcontroller. The mbed online compiler is web based hence you don't have to install or set up anything to get running with mbed.

## create your first mbed online project

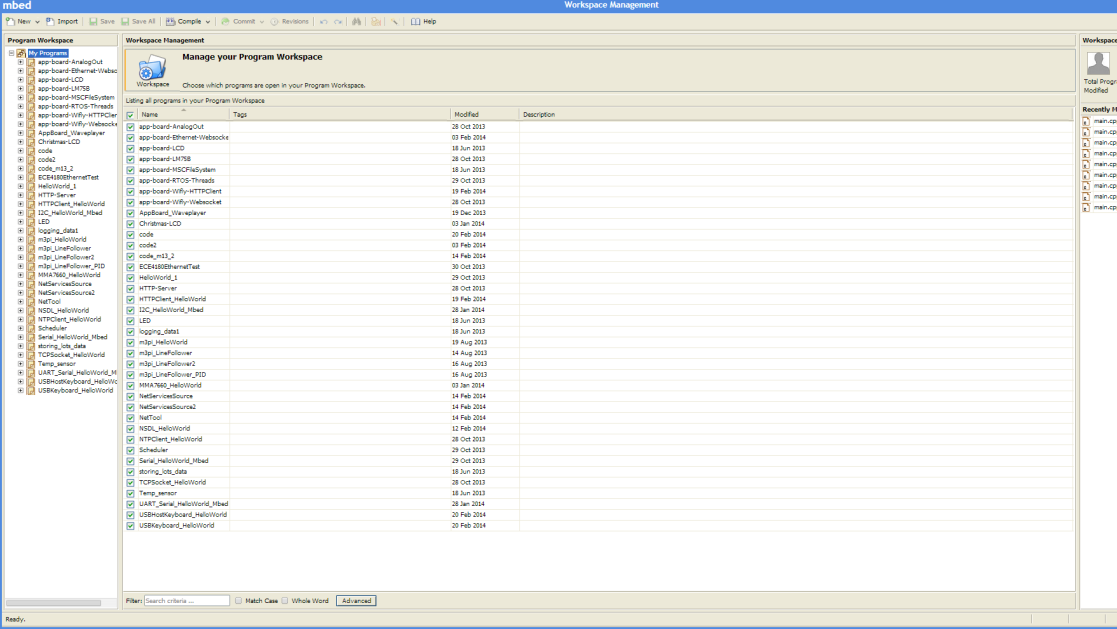
1. Go to mbed.org, and click “compiler”



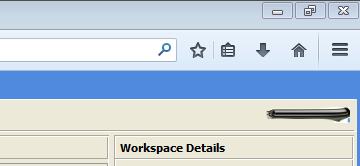
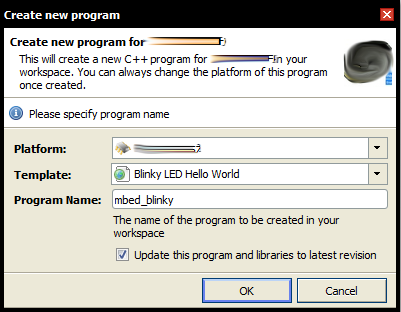
1. Register an account and then login



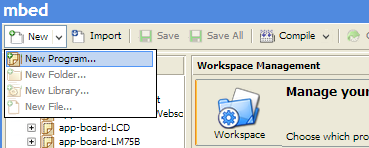
1. The main IDE of mbed online compiler will be displayed



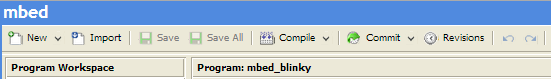
You can select the board by clicking the options on the top-right.



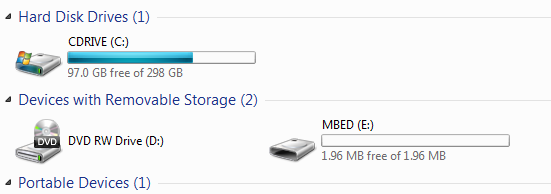
1. Create a helloworld project (blinky LED program)



1. Compile the program



1. The program file will be generated and downloaded to your default download directory (set by your web browser)
2. Connect the board to your PC via an USB cable, the mbed will appear as a removable storage device



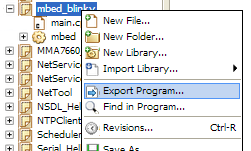
1. Copy the downloaded program file to the mbed root directory
2. Reset the mbed board, the latest copied program file will be the default program to run.

More detail can be found at <https://mbed.org/handbook/mbed-Compiler-Getting-Started>

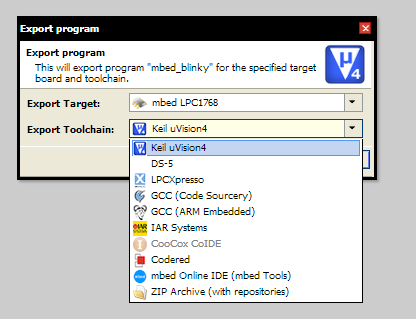
## Exporting to offline toolchains

The online project can be exported to offline toolchains, such as Keil MDK in our case.

1. Right click the project and select “export program”



1. Select Keil MDK project, and click “export”, the project folder will be downloaded to your local machine



Note: The local Keil MDK project allows you to download and debug your program (see getting started). In this set of teaching material, all the lab projects have been exported to local Keil MDK project, making it easier for you to start with.

## configure Keil settings

Note that for Nordic nRF51288 mKit, you may need to change some settings in Keil to be able to debug and flash the board.

When you download the program, you will need to change the size allocated for the flash algorithm. To find it click “Target Options”, then go to the Utilities tab and click Settings. A new window will open and by default the size will be set to 0x0800. But in order to flash the Nordic nRF51822 board you have to change it to 0x2000. Then click OK and close the options window.