

# MetaWear

Wearable and Connected devices product solution

## Firmware Development Guide v1.0

### Contents

- Setting up MetaWear for Firmware Development
- Nordic nRF51822 Firmware Development

## Table of Contents

1	Introduction .....	3
2	Nordic nRF51822 Information.....	3
2.1	Features .....	3
2.2	Applications.....	4
3	MetaWear Firmware Development .....	4
3.1	Components Needed .....	4
3.2	Basic Setup .....	6
3.3	Nordic Tools and Development Toolchains .....	7
3.4	Firmware Support .....	7
4	Revision History.....	8

# 1 Introduction

MetaWear is a complete development and production platform for wearable and connected device applications. It features a powerful ARM processor and sensors, providing energy efficient Smartphone communication and central processing. The MetaWear board comes with pre-loaded firmware such that all sensors and on-board peripherals are controllable via an iOS or Android App.

Now you can add intelligence to your products and upgrade your devices so that they are compatible with the Internet of Things.

The MetaWear platform runs on the **nRF51822** Nordic SOC.

## 2 Nordic nRF51822 Information

The **nRF51822** is a powerful, highly flexible multi-protocol SoC ideally suited for *Bluetooth*® low energy and 2.4GHz ultra low-power wireless applications. The **nRF51822** is built around a 32-bit ARM® Cortex™ M0 CPU with 256kB flash + 16kB RAM. The embedded 2.4GHz transceiver supports *Bluetooth* low energy as well as 2.4GHz operation, where the 2.4GHz mode is on air compatible with the nRF24L series products from Nordic Semiconductor.

**nRF51822** supports *Bluetooth* low energy protocol stack, available free of charge.

### 2.1 Features

- Single chip, highly flexible, 2.4GHz multi-protocol device
- 32-bit ARM Cortex M0 CPU core
- 256KB flash 16KB RAM
- Supports *Bluetooth* low energy protocol stacks
- Thread safe and run-time protected
- Event driven API
- On air compatible with nRF24L series
- 3 data rates (2Mbps/1Mbps/250kbps)
- +4dBm output power
- -93dBm sensitivity, *Bluetooth* low energy
- PPI system for maximum power-efficient applications and code simplification
- Flexible power management system with automatic power management of each peripheral
- Configurable I/O mapping for analog and digital I/O

## 2.2 Applications

- Mobile phone accessories
- Wearables
- Beacons
- Recharge wireless charging monitoring
- PC peripherals
- Consumer Electronics (CE) remote controls
- Proximity/Alert sensors
- Sports, fitness and healthcare sensors
- Smart RF tags
- Toys and electronic games
- Intelligent domestic appliances
- Industrial and commercial sensors

## 3 MetaWear Firmware Development

For those interested in developing firmware for the **nRF51822** SOC from Nordic, you will need a few tools as well as a schematic for the MetaWear board.

### 3.1 Components Needed

1. Conn 10 position Header:

[http://www.digikey.com/product-search/en?KeyWords=609-3729-ND&WT.z\\_header=search\\_go](http://www.digikey.com/product-search/en?KeyWords=609-3729-ND&WT.z_header=search_go).



**Example 1** Connector Header

2. **nRF51822** Development Kit:

<http://www.digikey.com/product-detail/en/NRF51822-DK/1490-1009-ND/4626373>.



**Example 2** *nRF51822 Development Kit (nRF51822-DK)*

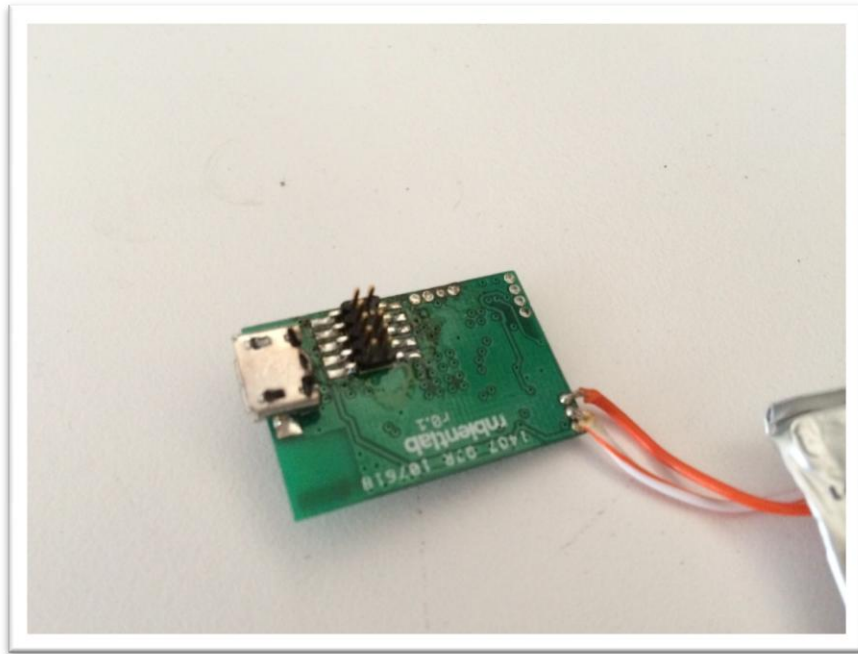
The **nRF51822** development kit enables you to do more advanced development. The development kit provides you with USB dongles to act as peer devices and a stand alone segger Jlink Lite programmer and debugger that enables programming/debugging on the MetaWear board.

The development kits are supported by pre-qualified Bluetooth Smart stacks available as an extensive library and code example support in the nRF51 Software Development Kit supporting all the devices in the nRF51 series.

For more details and product related downloads, go to the [nRF51822 Development Kit](#) page.

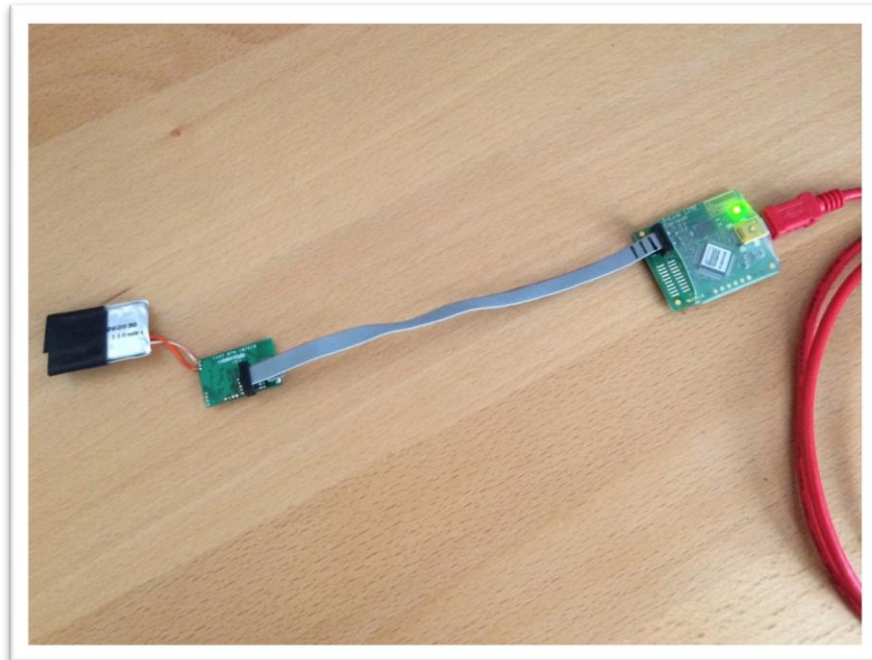
## 3.2 Basic Setup

1. Solder the header to the debug port on the back of the MetaWear board.



**Example 3** MetaWear with Debug Connector Attached

2. Attach the DK from Nordic to the MetaWear board.



**Example 4** MetaWear attached to debugger/programmer

3. Start developing firmware with the right Toolchain and get started with Nordic code.

In order to get access to Nordic's documentation you will need to create a user ID and login to their website. You might need a code you received from the DK purchase in order to do this.

### 3.3 Nordic Tools and Development Toolchains

You are responsible for all the fees and equipment necessary for firmware development on the **nRF51822** SOC from Nordic.

Development toolchains:

- The Keil MDK-ARM is a complete software development environment for Cortex™-M, Cortex-R4, ARM7™ and ARM9™ processor-based devices. MDK-ARM is specifically designed for microcontroller applications, it is easy to learn and use, yet powerful enough for the most demanding embedded applications.  
MDK-ARM is available in four editions: MDK-Lite, MDK-Cortex-M, MDK-Standard, and MDK-Professional. All editions provide a complete C/C++ development environment and MDK-Professional includes extensive middleware libraries. <http://www.keil.com/arm/mdk.asp>
- IAR Embedded Workbench for ARM is an easy-to-use integrated development environment with project management tools and editor. It includes a highly optimizing C/C++ compiler and the comprehensive C-SPY Debugger with simulator and hardware debugging support. Its innovative Power Debugging technology enables testing and tuning for power optimization. Detailed information and free evaluation licenses are available at [www.iar.com/ewarm](http://www.iar.com/ewarm).

### 3.4 Firmware Support

Mbientlab does not currently support individual firmware development for the nRF51822 Nordic SOC.  
**Do not direct any questions regarding firmware development on our forum.**

Please use the support provided by Nordic including their staff, forum, and email.

For development partnerships and custom firmware development inquiries please take a look at [www.mbientlab.com/businesssolutions](http://www.mbientlab.com/businesssolutions). Email us at [hello@mbientlab.com](mailto:hello@mbientlab.com) to receive a quote.

## 4 Revision History

Date	Version	Change Description
August 11, 2014	1.0	Initial Draft

**Table 1** *Revision History*