# Getting Started With Bibox

Tools required

- nRF Go Studio
- Keil U vision (keil V5)
- J link - programmer (should support nrf51xxx microcontroller)
- Bibox Hornbill / Tern / Snipe - hardware / development board.


- nRF Go Studio

    nRF go studio can be used for flashing Soft Device (SD) and boot loader. SD should be flashed first. The SD needs RTC0 module. The RTC0 requires 32khz LFCLK source for its working. You can either choose internal of external clock source for the RTC0. We are always using the internal clock source. So it is important to note that, when enable SD you should remember to choose the proper clock source. For example

    SOFTDEVICE_HANDLER_INIT( NRF_CLOCK_LFCLKSRC_RC_250_PPM_250MS_CALIBRATION, NULL);

    The above function will enable SD with internal clock source.Please note that all the codes given by the nordic uses internal clock source.You should change the clock source accordingly. Otherwise the application might not work.


- Keil U vision (keil V5)

    The UVision IDE combines project management, run-time environment, build facilities, source code editing, and program debugging in a single powerful environment.UVision is easy-to-use and accelerates your embedded software development. UVision supports multiple screens and allows you to create individual window layouts anywhere on the visual surface.

    The UVision debugger provides a single environment in which you may test, verify, and optimize your application code. The debugger includes traditional features like

simple and complex breakpoints, watch windows, and execution control and provides full visibility to device peripherals.

- J link

J-Link BASE is a USB powered JTAG debug probe supporting a large number of CPU cores. Based on a 32-bit RISC CPU, it can communicate at high speed with the supported target CPU . J-Link is used around the world in tens of thousand places for development and production (flash programming) purposes.

- Bibox Hornbill,Tern,Snipe - development board

Bibox is a unique and comprehensive hardware and a software platform which exposes user to inter-disciplinary functions which could be very innovative and difficult to do otherwise. The platform exposes user to an experiential learning through making real life projects. This device works with a controller fromNordic Semiconductor's nRF family of series nRF51822 Micro-controller. It comes with inbuilt Bluetooth 4.0 and it support I2C, UART, SPI and more.

  ➢ Microcontroller

  The nRF51822 is built around a 32-bit ARM® Cortex™ M0 CPU with 256kB/128kB flash + 32kB/16kB RAM for improved application performance.It provide pins to take in/output information form/to the outside world in the form of logic values.In Bibox Hornbill and Tern these pins are usually organized in groups of four.In Bibox Snipe these pins are usually organized in groups of two and referred to as a port. The Bibox use the alphabet to name these port, example Port A, Port B, etc.

  ➢ Communication Protocols

    ❖ UART Protocol

      The UART stands for universal asynchronous receiver and transmitter. It is a serial communication of two protocols. This protocol is used for transmitting and receiving the data bit by bit with respect to clock pulses on a single wire. The Bibox has two pins: TXD and RXD, which are specially used for transmitting and receiving the data serially.

In Bibox Tern hardware pins associated to UART

1. RXD– USART Receiver Pin (pin number 12, port F1)

2. TXD– USART Transmitter Pin (pin number 13, port F2)

In BIBOX Hornbill hardware pins associated to UART

1. RXD - USART Receiver Pin (pin number 17)

2. TXD - USART Transmitter Pin (pin number 18)

In Bibox Snipe hardware pins associated to UART

1. RXD – USART Receiver Pin (pin number 12, port D1)

2. TXD – USART Transmitter Pin (pin number 13, port D2)

❖ I2C Protocol

The Inter-integrated Circuit (I2C) Protocol is a protocol intended to allow multiple "slave" digital integrated circuits ("chips") to communicate with one or more "master" chips. I2C is intended for short distance communications within a single device and it requires two signal wires to exchange information.

In Bibox Hornbill and Tern    hardware pins associated to I2C

1. SCL - Serial Clock (pin number 14, port G1)

2. SDA - Serial Data (pin number 15, port G2)

In Bibox Snipe hardware pins associated to I2C

1. SCL - Serial Clock (pin number 14, port B1)

2. SDA - Serial Data (pin number 15, port B2)

❖ SPI Protocol

SPI is a common communication protocol used by many different devices.Devices communicating via SPI are in a master-slave relationship. The master is the controlling device (usually a microcontroller), while the slave (usually a sensor, display, or memory chip) takes instruction from the master. The simplest configuration of SPI is a single master, single slave system, but one master can control more than one slave.

In Bibox Hornbill and Tern hardware pins associated to SPI, to this TFT display is directly connected.

1. MISO - Master In Slave OUT (pin number 6, port B3)
2. MOSI - Master Out Slave In (pin number 7, port B1)
3. SCK - Serial Clock (pin number 5, port B2)
4. SDA - Serial Data (pin number 26, port B4)

### ➢ Software PWM

The nrf51822 doesn't have any hardware pwm modules. So it is necessary to create a software pwm library. The pwm library needs 2 timers and 4 gpiote channels for generating 4 channels of pwm signals. The maximum pwm channels possible from nrf51822 is 4, since the gpiote channels are 4. When the SD and Ble are enabled, it will have highest priority interrupts. Once the SD has been enabled it will execute its tasks in background and will bring small interrupt latency that cannot be avoided.In bibox Port A2 (pin number 2) and port A3(pin number 3) supports pwm.

### ➢ ADC (Analog To Digital Converter) of nRF51822 Microcontroller

Microcontroller cannot process the analog signals, so analog signals needs be converted to digital signals first. This conversion can be achieved using an analog to digital converter.Not every pin on a microcontroller has the ability to do analog to digital conversions. On the Bibox board Port A1(pin number 1),Port A2(pin number 2),Port A3(pin number 3),Port A4(pin number 4),Port B2(pin number 5),Port B3(pin number 6),Port B4(pin number 26) can read analog voltages.

### ➢ ERASE Button ( program erase function)

A Tact switch is connected to Pin number - 25    and this is set-up at both the Bootloader and the application file.   On press of this switch, for more than 3 seconds, erases the BISOFT uploaded program.   Whereas, on simultaneous press of the reset switch and the erase switch put the device in the Device firmware upload mode.