

EE3220 System-on-Chip Design

Tutorial 0: Get Started with ARM Mbed Platform

Objective:

- ◆ To gain Hands-on experience and get familiar with the ARM Mbed tools.
- ◆ To register your own ARM Mbed account on.
- ◆ To get familiar with the function and development cycle of ARM.

In this tutorial, we are going to explore and learn about the ARM Mbed, an online development platform for ARM microcontrollers. You need to register your account and get familiar with the procedure for using the ARM development tools.

Introducing the ARM Mbed Platform

Arm® Mbed provides you with free OS in a free online IDE that can be used over an Internet link. It is an IDE platform and operating system based on 32-bit ARM Cortex-M microcontrollers. It is collaboratively developed by ARM® and its technical partners. Mbed is currently supported by over 60 partners and a community of 200,000 developers. It also provides the operating system, cloud services, tools, and developer ecosystem to make the creation and deployment of IoT solutions possible. Using Mbed we can write a program in C/C++, then compile the program, and upload the executable code to the target ARM processor. The advantage of using Mbed is that it is easy to learn and use and is supported by very large number of library functions. One of the major features of the Arm® Mbed™ systems is its web-based development environment. Just plug the device into computer using a USB cable, which will appear on your computer as a USB memory stick. Write and compile your software code using the Arm® Mbed™ Online Compiler, download the compiled code into the device, and press the onboard reset button to run.

The original ARM Mbed Compiler has recently been substituted by a more advanced online compiler/IDE called the ARM Keil Studio Cloud having more features and debugging capabilities.



What is Mbed?

Mbed makes device development quicker

1. Supported boards

Mbed platform was initially created for mbed NXP LPC1768 microcontroller board. With its vast open source community and partnership and technical support, many vendors now create Mbed enabled microcontroller boards. Such boards are configured and programmed on the Mbed platform besides their proprietary platforms and other IDEs. Currently, Mbed platform supports about 176 boards including four of the STM32 Nucleo boards.

Filters

- ☐ Mbed Enabled
- ☐ Advanced (46)
- ☐ Baseline (163)
- ☐ Pelion Device Ready (23)
- ☐ Mbed OS support
- ☐ Mbed OS 2 (99)
- ☐ Mbed OS 5.4 (49)
- ☐ Mbed OS 5.5 (51)
- ☐ Mbed OS 5.6 (57)
- ☐ Mbed OS 5.7 (55)
- ☐ Mbed OS 5.8 (61)
- ☐ Mbed OS 5.9 (64)
- ☐ Mbed OS 5.10 (96)
- ☐ Mbed OS 5.11 (109)
- ☐ Mbed OS 5.12 (110)
- ☐ Mbed OS 5.13 (109)
- ☐ Mbed OS 5.14 (114)
- ☐ Mbed OS 5.15 (117)
- ☐ Mbed OS 6.0 (89)
- ☐ Mbed OS 6.1 (89)
- ☐ Mbed OS 6.2 (91)
- ☐ Mbed OS 6.3 (94)
- ☐ Mbed OS 6.4 (94)
- ☐ Mbed OS 6.5 (95)
- ☐ Mbed OS 6.6 (95)
- ☐ Mbed OS 6.7 (96)
- ☐ Mbed OS 6.8 (97)
- ☐ Mbed OS 6.9 (97)
- ☐ Mbed OS 6.10 (99)
- ☐ Mbed OS 6.11 (100)
- ☐ Mbed OS 6.12 (103)
- ☐ Mbed OS 6.13 (103)
- ☐ Mbed OS 6.14 (103)
- ☐ Mbed OS 6.15 (105)
- ☐ Mbed OS 6
- ☐ Bare metal (49) ?
- ☐ RTOS (30) ?
- ☐ Communication
- ☐ BLE (31)
- ☐ CAN (6)
- ☐ Cellular (10)

176 results



MAX32660EVSYS

- Cortex M4F 96MHz
- 256KB Flash, 96KB SRAM



SIDK S1SBP6A Bio-processor dev kit

- Cortex-M4 100 MHz
- 2MB Flash, 256KB RAM
- BLE, TRNG, Bio-sensors



DISCO-L455I (B-L455I-IOT01A)

- Cortex-M4, 120 MHz
- 2MB Flash, 640KB SRAM
- BLE, NFC, WIFI, USB



NUMAKER-M2354

- Cortex-M23, 96MHz
- 1MB Flash, 256KB SRAM
- v8-M TrustZone, WIFI, SD S...



DISCO-WB5MMG

- Cortex-M4, BLE
- 1MB Flash, 256KB SRAM



NUCLEO-WB15CC

- Cortex-M4, BLE
- 320KB Flash, 48KB SRAM



PSoC 64 Secure Boot, Wi-Fi / BLE Pioneer Kit

- Cortex-M4, Cortex-M0
- PSoC 64, Wi-Fi / Bluetooth
- 2MB Flash, 1MB SRAM



HANI-IOT

- Cortex-M33, 100MHz
- v8-M TrustZone
- 640 KB Flash, 320 KB SRAM



GR-MANGO

- Cortex-A9, 528MHz
- 16MB OctaRAM, 16MB Oct...
- Camera, Ethernet, USB, Audio

2. Registration for using the Mbed platform

Now you need to register and create a login account for the Mbed platform.

- Go to the Mbed platform website <https://os.mbed.com/account/login>
- Click **Create an account** then
- Click **Sign up**
- Fill in the short form and click **Sign up**.
- Go to your email and confirm the registration

Log in

New to Mbed? [Create an account](#)

Email address *

Next

Only know your username? [Get an email reminder](#).



Sign up

Already have an Mbed account? [Log in](#)

Create a free Mbed account to access Mbed tools and services and contribute to the developer community.

Email address *

Username *

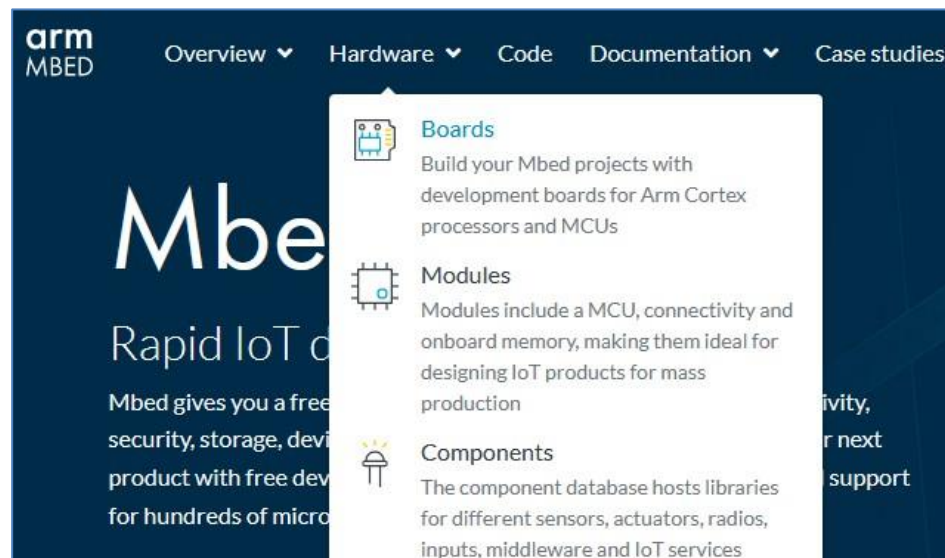
Password *

First name *

3. Getting familiar with Mbed platform

Now you need to log in to your account and explore the features, opportunities, and documentation.

- Go to the Mbed platform website <https://os.mbed.com/account/login>
- Click **Hardware**-> **Boards** button at the top of the page to view hundreds of supported boards.



176 results



- Search for the board **NUCLEO-F401RE**
- Click the board to view features.



NUCLEO-F401RE

Affordable and flexible platform to ease prototyping using a STM32F401RET6 microcontroller.



Overview

The STM32 Nucleo board provides an affordable and flexible way for users to try out new ideas and build prototypes with any STM32 microcontroller line, choosing from the various combinations of performance, power consumption and features.

The Arduino™ connectivity support and ST Morpho headers make it easy to expand the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.

The STM32 Nucleo board does not require any separate probe as it integrates the ST-LINK/V2-1 debugger/programmer.

Table of Contents

1. Overview
2. Microcontroller features
3. Board features
4. Board pinout
5. Supported shields
6. Getting started
7. Technical references
8. Known limitations
9. Tips and Tricks

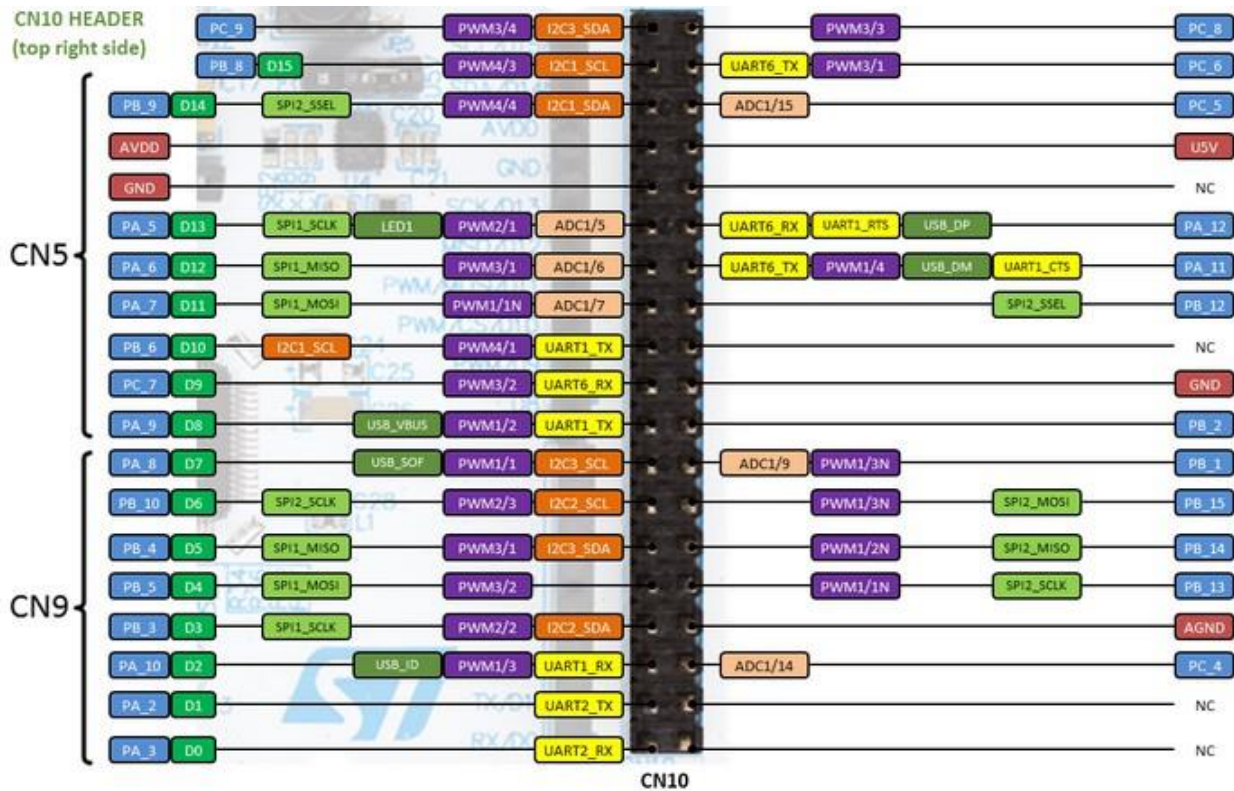
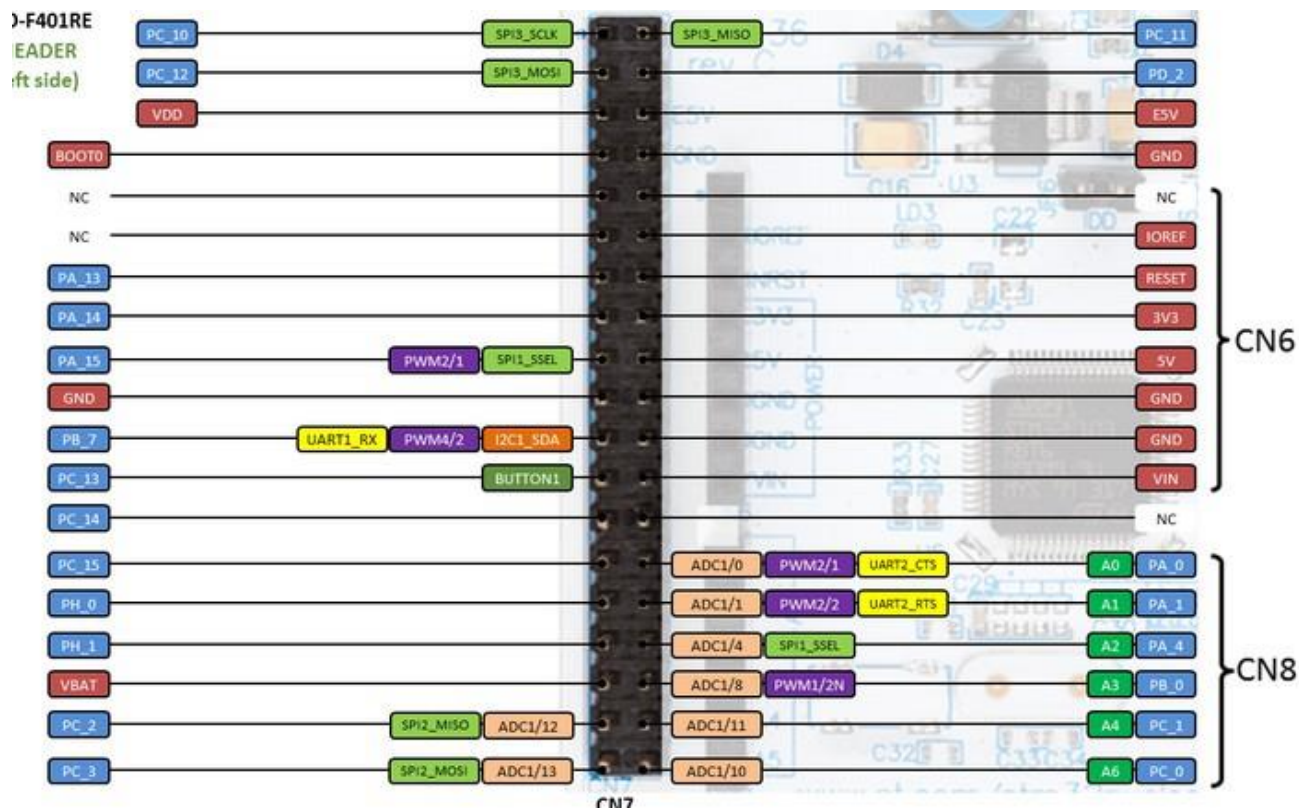
- Go through each item in the table of content, i.e. from Overview, Microcontroller features to Tips and Tricks
-

Microcontroller features

- STM32F401RET6 in LQFP64 package
- ARM®32-bit Cortex®-M4 CPU with FPU
- 84 MHz max CPU frequency
- VDD from 1.7 V to 3.6 V
- 512 KB Flash
- 96 KB SRAM
- GPIO (50) with external interrupt capability
- 12-bit ADC with 16 channels
- RTC
- Advanced-control Timer
- General Purpose Timers (7)
- Watchdog Timers (2)
- USART/UART (4)
- I2C (3)
- SPI (3)
- SDIO
- USB 2.0 OTG FS

Board features

- Two types of extension resources
 - Arduino Uno Revision 3 connectivity
 - STMicroelectronics Morpho extension pin headers for full access to all STM32 I/Os
- On-board ST-LINK/V2-1 debugger/programmer with SWD connector
 - Selection-mode switch to use the kit as a standalone ST-LINK/V2-1
- Flexible board power supply
 - USB VBUS or external source (3.3 V, 5 V, 7 - 12 V)
 - Power management access point
- User LED (LD2)
- Two push buttons: USER and RESET
- USB re-enumeration capability: three different interfaces supported on USB
 - Virtual Com port
 - Mass storage (USB Disk drive) for drag'n'drop programming
 - Debug port



4. Exploring the other menu items

- Go through the other items in the main menu especially the documentation and the case studies.

arm
MBED

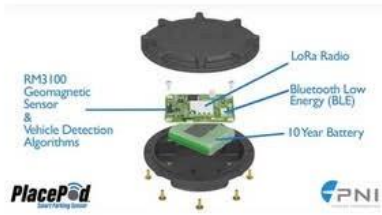
Overview ▾ Hardware ▾ Code Documentation ▾ Case studies Community ▾ Blog



Industrial transmitter
Summary

- Connectivity: Ethernet/WiFi
- MCU: Confidential
- Memory: Confidential
- Silicon vendor: STMicroelectronics ...

[Learn more](#)



Parking Sensor
Summary

- Connectivity: LoRa
- MCU: Arm Cortex M3 @ 32MHz
- Memory: ...

[Learn more](#)



Smart Speaker
Summary

- Connectivity: WiFi/NB-IoT
- MCU: Arm Cortex M4 @ 160MHz
- Memory: ...

[Learn more](#)



Electric Vehicle Charging Station
Summary

- Connectivity: Ethernet
- MCU: Arm Cortex M4 @ 120MHz
- Memory: ...

[Learn more](#)



LightGrid 2.0
Summary

- Connectivity: 6LoWPAN
- MCU: Confidential
- Memory: Confidential
- Silicon vendor: Confidential ...

[Learn more](#)



Smart Lock
Summary

- Connectivity: Bluetooth Low Energy
- MCU: Arm Cortex M0 @ ...

[Learn more](#)

We will cover more details in the next tutorial and lectures!



PSoC 64 Secure Boot,
Wi-Fi / BLE Pioneer Kit



NuMaker-IoT-M487



MultiTech Dragonfly
Nano



NuMaker-LoRaD-M252



Future Electronics
Sequana

END