Zephyr Setup - GitHub Release

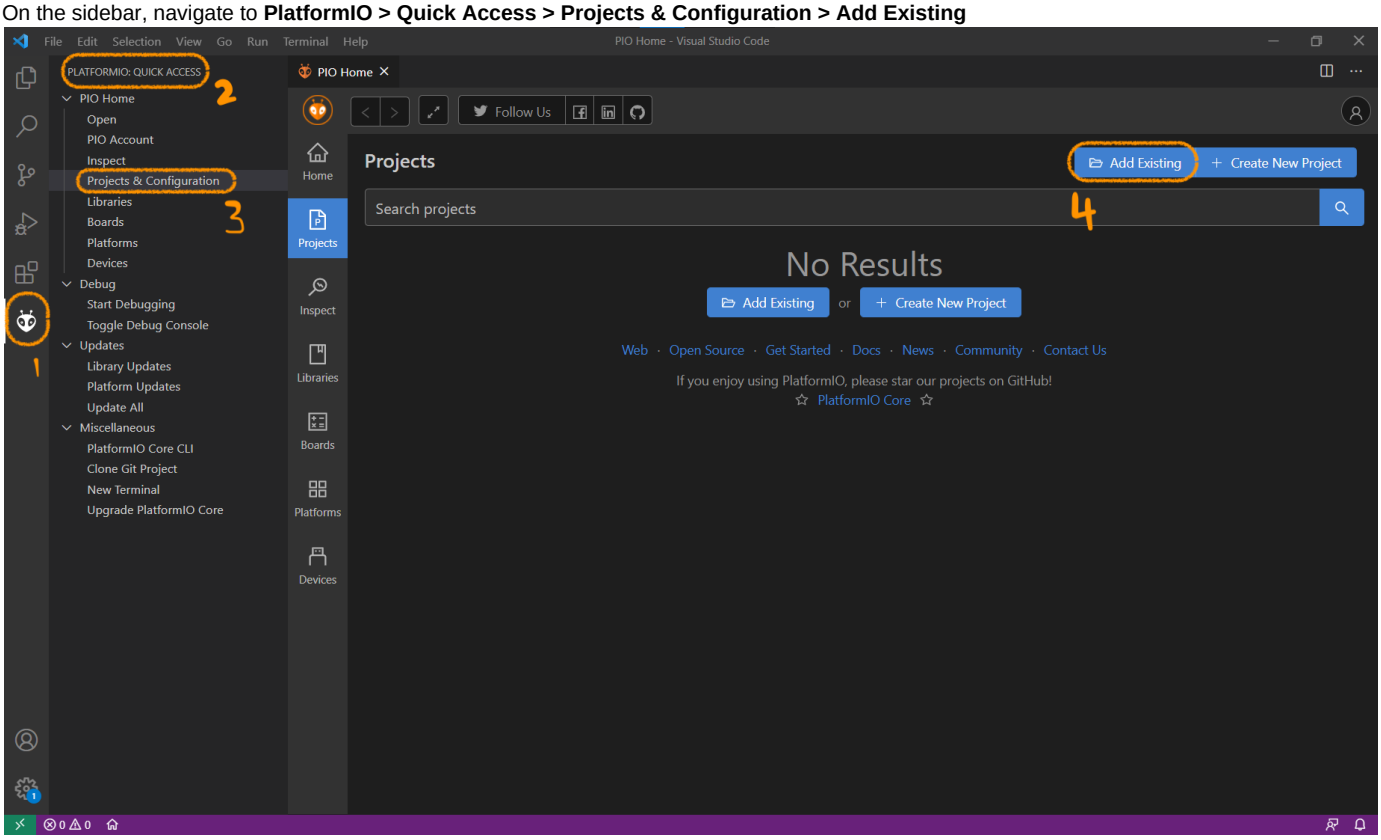
The repository uses PlatformIO to bootstrap Zephyr for ease of development and deployment of software.

1.0 Environment Requirements

- **Development Machine Operating System:** Windows, macOS or Ubuntu
  - **clang-format** *(optional; for 2.1)*: Either through snapshot builds or the downloads page.
    - For MacOS users: `$ brew install clang-format`.
  - For Windows, a few external dependencies have to be installed:
    - **libUSB**: Follow the instructions here; MinGW64 .dll will work fine for x64 systems.
- **IDE:** VSCode
  - Extensions
    - C/C++ (ms-vscode.cpptools)
    - PlatformIO IDE (platformio.platformio-ide).
      - PlatformIO provides an easy way of bootstrapping the Zephyr RTOS and has built-in support for various tools
    - DeviceTree for the Zephyr Project (trond-snekvik.devicetree)
    - Clang-Format (xaver.clang-format)
      - Requires clang-format for enforcing consistent code styling
    - Visual Studio IntelliCode (visualstudioexptteam.vscodeintellicode).
      - *Optional - for code auto-completion.*
    - Git History (donjayamanne.githistory)
      - *Optional - for visualization of git changes*
    - CMake Tools (ms-vscode.cmake-tools)
      - *Optional - manually create/modify cmake files*

2.0 Importing the Repository

On the sidebar, navigate to **PlatformIO > Quick Access > Projects & Configuration > Add Existing**



Navigate your directory and select `decada-embedded-example-zephyr`.

2.1 Extension Configuration (Optional)

It is recommended to enable automatic formatting of the source code.
With **Ctrl+Shift+P**, enter **Preferences: Open Workspace Settings**.

1. Search for **C_Cpp: Formatting** and select **clangFormat**
2. Search for **Editor: Format On Save** and select the checkbox

** Note that `clang-format` must already be installed (see 1.0).

3.0 Changing WiFi details and DECADA Credentials

Navigate to `/src/user_config.h`

Populate your WiFi credentials:

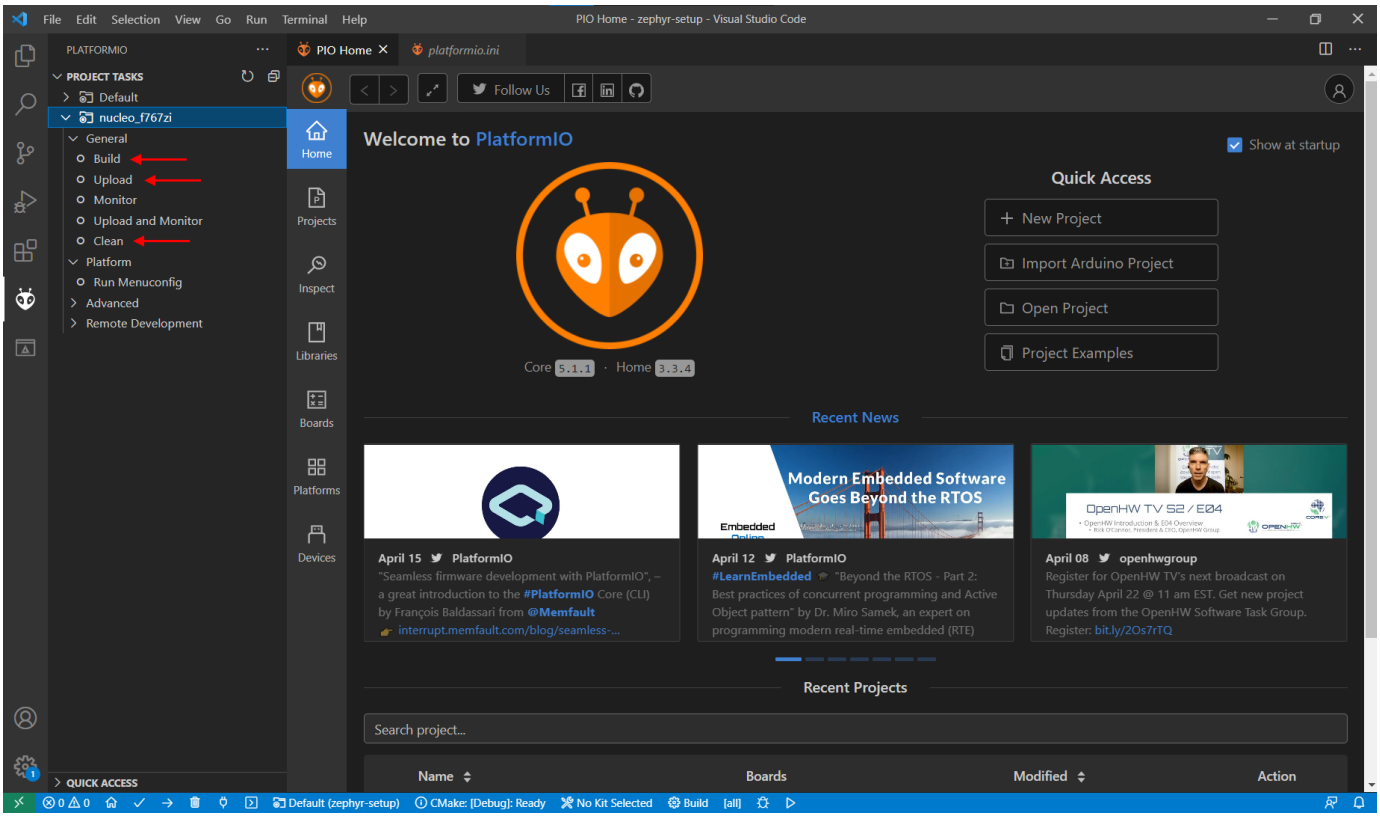
```
/**
 *      WiFi Details
 */

// Maximum of 32 characters
#define USER_CONFIG_WIFI_SSID \
        ("MyHomeWiFiNetwork")

// Between 8 - 64 characters
#define USER_CONFIG_WIFI_PASS \
        ("S3cretP4ssword*")
```

Populate your DECADA credentials:

```
/**
 *      DECADA Credentials
 */

// Root URL to access DECADA cloud API
#define USER_CONFIG_DECADA_API_URL \
        ("https://ag.decada.gov.sg")

// Organization Unit ID for DECADA cloud
#define USER_CONFIG_DECADA_OU_ID \
        ("enter_organization_unit_id_here")

// Access key for DECADA cloud application
#define USER_CONFIG_DECADA_ACCESS_KEY \
        ("enter_access_key_here")

// Access secret for DECADA cloud application
#define USER_CONFIG_DECADA_ACCESS_SECRET \
        ("enter_access_secret_here")

// Product key for DECADA cloud product
#define USER_CONFIG_DECADA_PRODUCT_KEY \
        ("enter_product_key_here")

// Product secret for DECADA cloud product
#define USER_CONFIG_DECADA_PRODUCT_SECRET \
        ("enter_product_secret_here")
```

4.0 Building and Flashing

On the sidebar, navigate to **PIO > Project Tasks > General** to build and flash (Upload) the binary. When a build problem arises due to configuration errors, it is advisable to clean the project and rebuild.



5.0 Custom Boards

To include your custom boards, additional board definitions have to be added.

5.1 Linking the Custom Board from Zephyr to PlatformIO

Under the project root, create a new `<BOARD_NAME>.json` file in `/boards`. This allows PlatformIO to recognize the target in order to build and flash properly.

- Example: `./boards/manuca_dk_revc.json`
- See Custom Embedded Boards for more details

5.2 Setting Up The Zephyr Custom Board Configs

Under `/zephyr`, create the folders `boards/<BOARD_ARCH>/<BOARD_NAME>`.
For reference, refer to the Zephyr repository. The files can be copied from a board that uses the same SoC and renamed (e.g., the MANUCA DK uses the STM32F767ZI, so custom files can be referenced from `boards/arm/nucleo_f767zi`).

- Example:
  ```
  ./zephyr/boards/arm/manuca_dk_revc/board.cmake
  ./zephyr/boards/arm/manuca_dk_revc/Kconfig.board
  ./zephyr/boards/arm/manuca_dk_revc/Kconfig.defconfig
  ./zephyr/boards/arm/manuca_dk_revc/manuca_dk_revc_defconfig
  ./zephyr/boards/arm/manuca_dk_revc/manuca_dk_revc.dts
  ./zephyr/boards/arm/manuca_dk_revc/manuca_dk_revc.yaml
  ./zephyr/boards/arm/manuca_dk_revc/support/openocd.cfg
  ```
- The `[BOARD_NAME].dts` file will require changes to reflect pin mapping on the custom board.

5.3 Setting PlatformIO Build Environment

Add the following lines the `platformio.ini` file to reflect a new environment for the target:

```
[env:<BOARD NAME>]
platform = <DEV_PLATFORM>
board = <BOARD_NAME>
framework = zephyr
build_type = debug
upload_protocol = stlink
debug_tool = stlink
platform_packages =
    toolchain-gccarmnoneeabi@<MAJOR.MINOR.BUGFIX>
```

- The list of development platforms and their configurations can be found here: <DEV_PLATFORM>
- Developers can refer to this page to see what toolchains are supported by PlatformIO

A complete example looks as such:

```
[env:manuca_dk_revc]
platform = ststm32
board = manuca_dk_revc
framework = zephyr
build_type = debug
upload_protocol = stlink
debug_tool = stlink
platform_packages =
    toolchain-gccarmnoneeabi@1.90301.200702
```

- **gnu-arm-none-eabi** **Release 9-2020-q2-update** is used as the toolchain for the GitHub example code.
- The GCC-ARM version is freeze in the example code to provide uniform development experience.

6.0 License