ioRaptor Webinars

Agile Development with Arm Mbed OS

andreas.schmidt@thingforward.io
@aschmidt75
@thingforward

About us

- www.thingforward.io

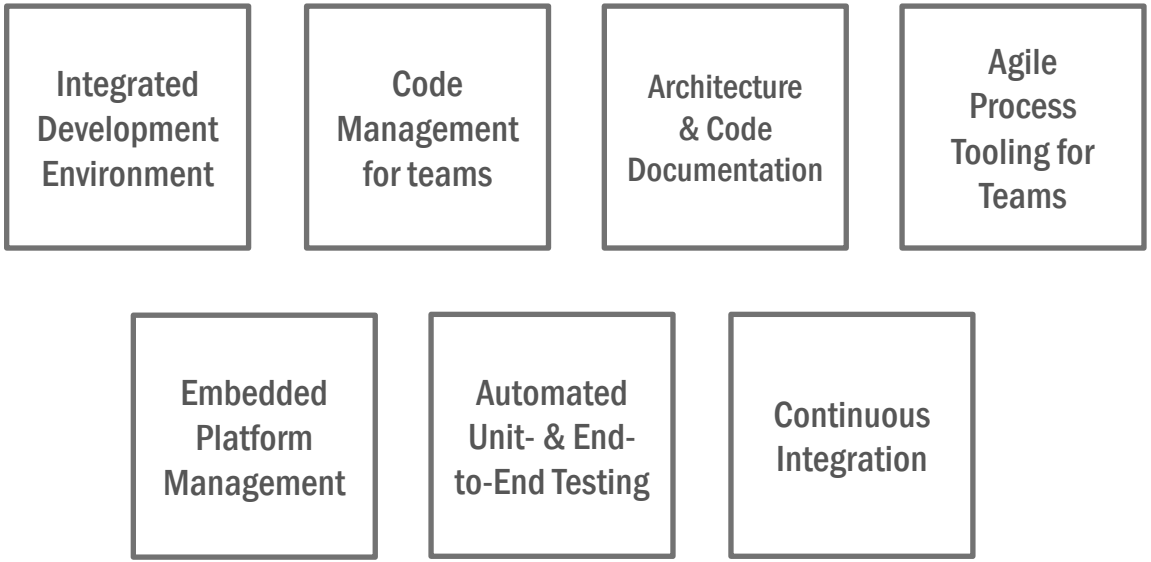
- Part of germany-based Cassini Group

- Topics:
  - IoT Architecture & Implementation projects
  - IoT Prototyping & Developer training workshops
  - Products for agile IoT software toolchains:
    - https://www.thingforward.io/ioraptor/
    - https://slyft.io
    - https://thngstruction.online

This webinar‘s objectives

- Introduce to Agile Development Workflows for IoT
- Developing for ARM Mbed OS: options for an agile dev stack
- not an intro to ARM Mbed OS, but examples will look familiar to e.g. Arduino Code

Parts of an Agile Development Workflow

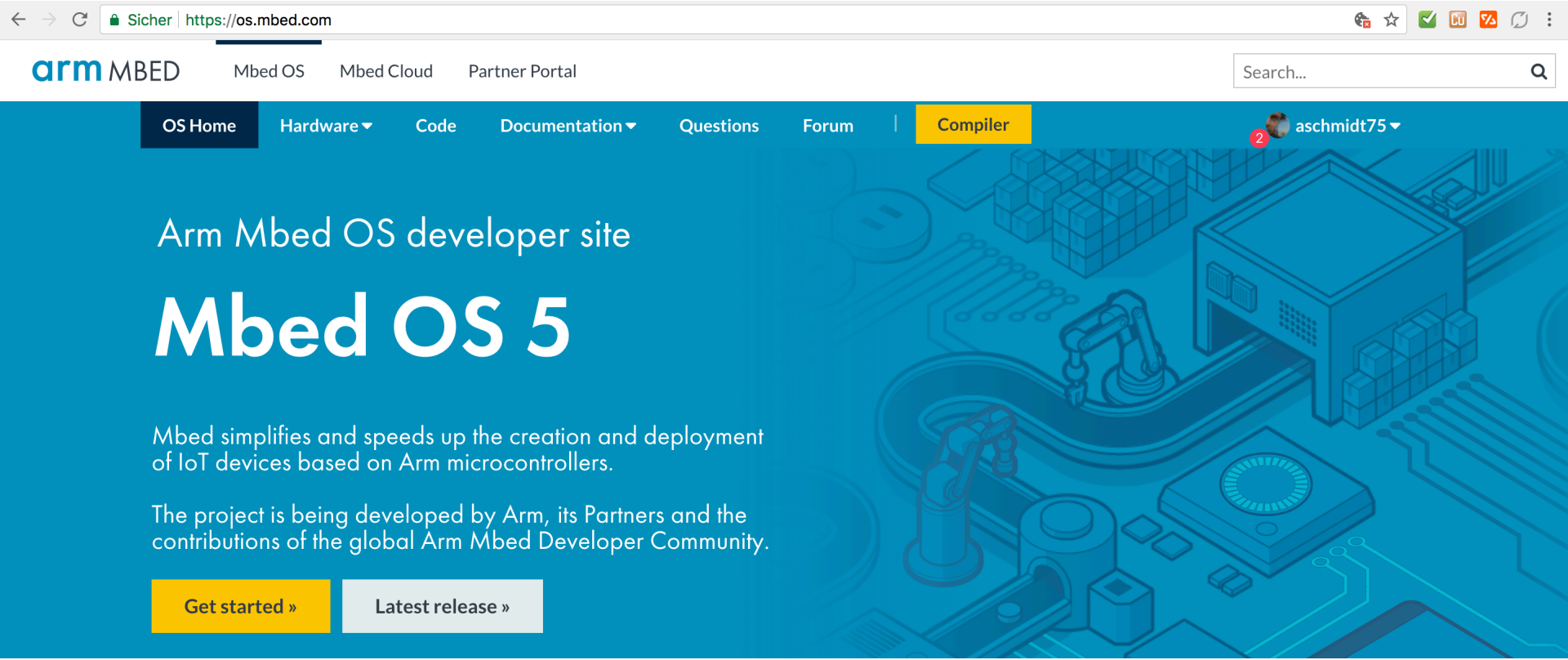


Agenda

- Short intro to ARM Mbed OS and PlatformIO
- Mbed Cloud IDE
- Locally installed toolchain (mbed-cli)
- PlatformIO for Mbed & Cloud Services
- Comparison
- Q&A

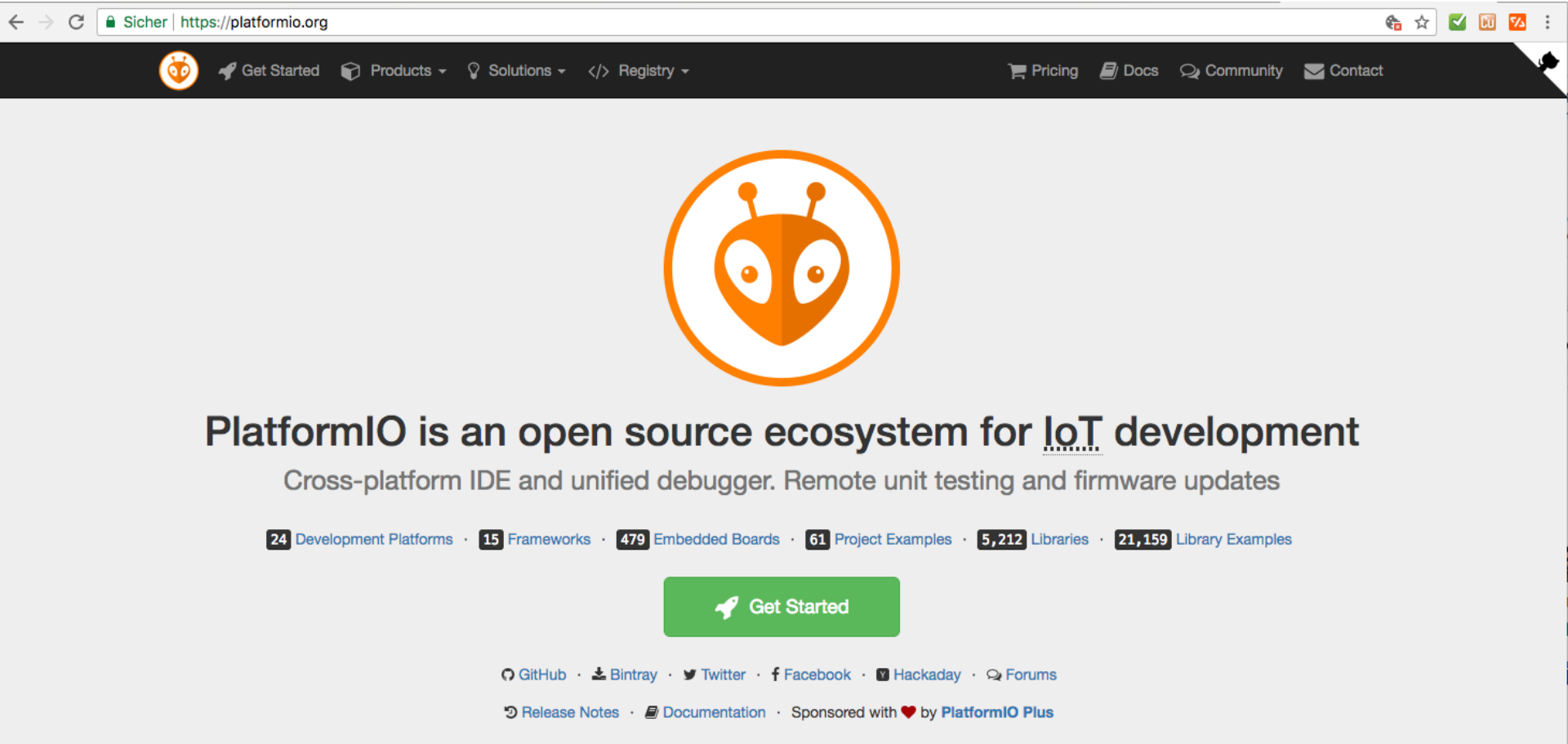
ARM Mbed OS

Thing Forward

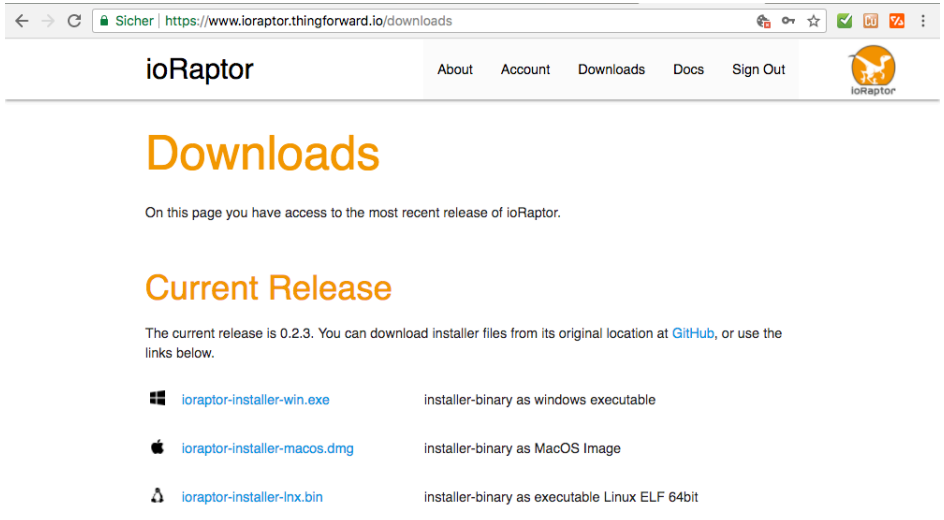


PlatformIO

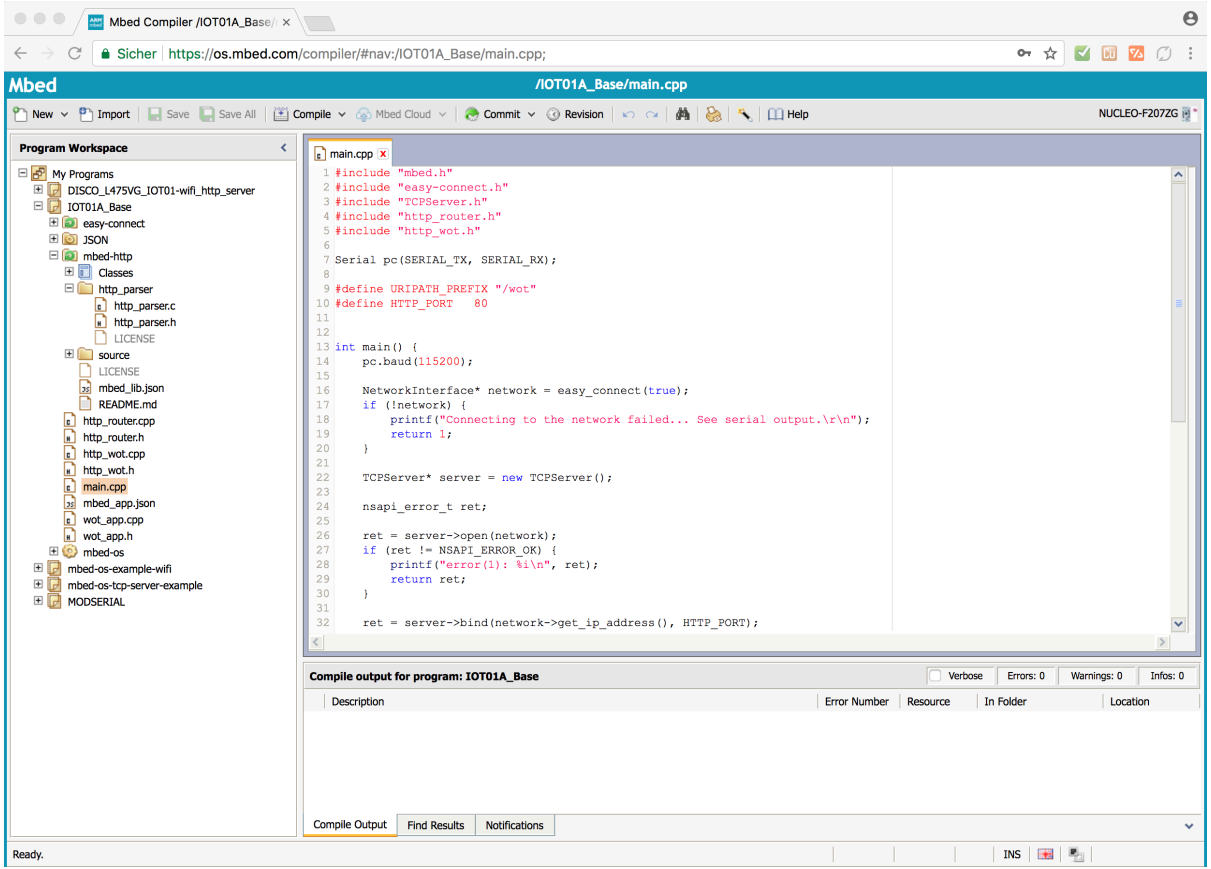
Thing Forward

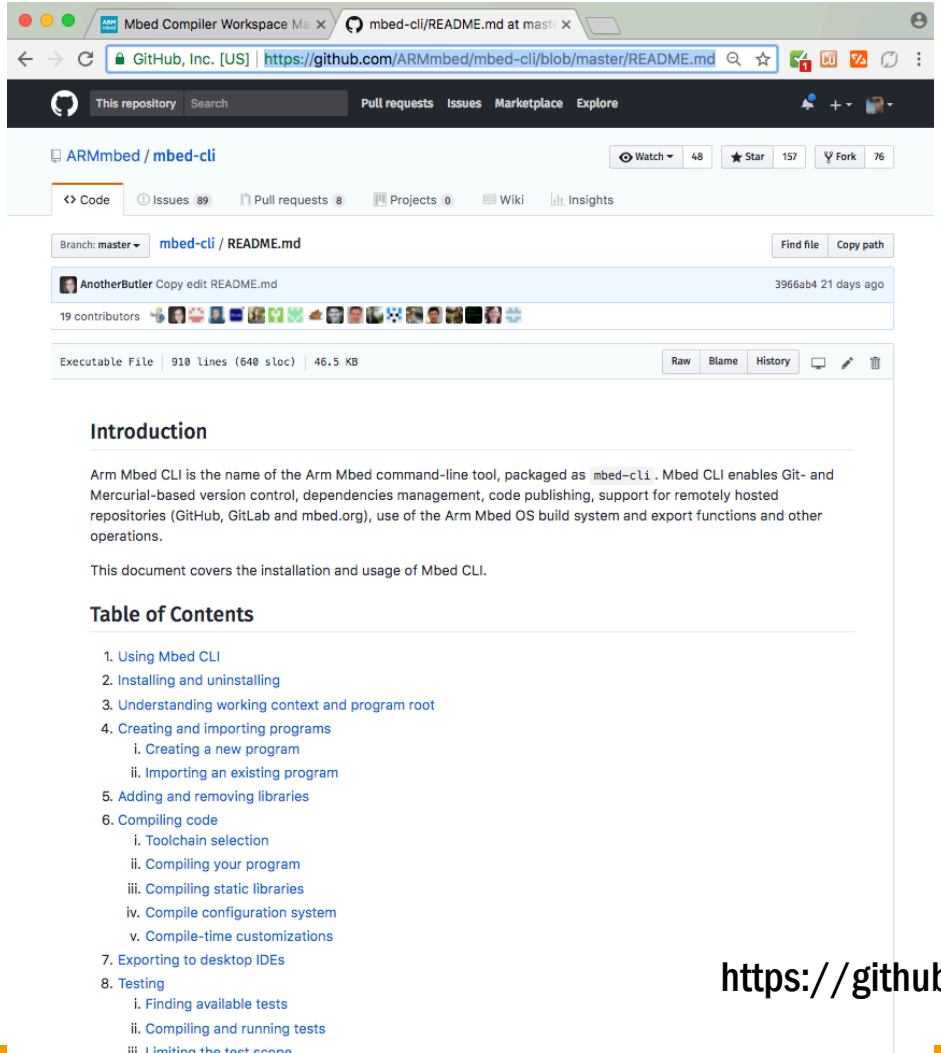


www.ioraptor.thingforward.io



Mbed Cloud IDE





https://github.com/ARMmbed/mbed-cli/blob/master/README.md

Docker-based build environment

- Follow instructions on https://github.com/thingforward/docker-mbed-cli-gcc-arm

- mkdir demo && cd demo
- mbed new --program demo
- mbed target DISCO_L475VG_IOT01A
- mbed toolchain gcc_arm
- mbed compile

mbed compile

```
Building project mbed (DISCO_L475VG_IOT01A, GCC_ARM)
Scan: .
Scan: mbed
Scan: env
Elf2Bin: mbed
+------------------+-------+-------+------+
| Module           | .text | .data | .bss |
+------------------+-------+-------+------+
| [fill]           |   149 |     0 |   15 |
| [lib]/c.a        | 37012 |  2240 |   56 |
| [lib]/gcc.a      |  3152 |     0 |    0 |
| [lib]/misc       |   296 |    16 |   28 |
| main.o           |   180 |     4 |  136 |
| mbed-os/drivers  |  1181 |     4 |  100 |
| mbed-os/hal      |  1449 |     4 |   66 |
| mbed-os/platform |  2932 |     0 |  354 |
| mbed-os/rtos     |  9102 |   168 | 5989 |
| mbed-os/targets  | 11271 |     8 |  904 |
| Subtotals        | 66724 |  2444 | 7648 |
+------------------+-------+-------+------+
Total Static RAM memory (data + bss): 10092 bytes
Total Flash memory (text + data): 69168 bytes

Image: ./BUILD/DISCO_L475VG_IOT01A/gcc_arm/mbed.bin
```

```
c018@CC-C02RN139FVH6-c018 ~/work/embedded/mbed/pio pio init -b disco_l475vg_iot01a --ide vscode

The current working directory /Users/cassini/work/embedded/mbed/pio will be used for project.
You can specify another project directory via
`platformio init -d %PATH_TO_THE_PROJECT_DIR%` command.

The next files/directories have been created in /Users/cassini/work/embedded/mbed/pio
platformio.ini - Project Configuration File
src - Put your source files here
lib - Put here project specific (private) libraries

Project has been successfully initialized!
Useful commands:
`platformio run` - process/build project from the current directory
`platformio run --target upload` or `platformio run -t upload` - upload firmware to embedded board
`platformio run --target clean` - clean project (remove compiled files)
`platformio run --help` - additional information
c018@CC-C02RN139FVH6-c018 ~/work/embedded/mbed/pio ls -al
total 24
drwxr-xr-x  9 c018  staff   288 21 Mär 18:05 .
drwxr-xr-x  8 c018  staff   256 21 Mär 18:04 ..
-rw-r--r--  1 c018  staff    84 21 Mär 18:05 .gitignore
drwxr-xr-x  4 c018  staff   128 21 Mär 18:05 .pioenvs
-rw-r--r--  1 c018  staff  1553 21 Mär 18:05 .travis.yml
drwxr-xr-x  4 c018  staff   128 21 Mär 18:05 .vscode
drwxr-xr-x  3 c018  staff    96 21 Mär 18:05 lib
-rw-r--r--  1 c018  staff   454 21 Mär 18:05 platformio.ini
drwxr-xr-x  2 c018  staff    64 21 Mär 18:05 src
c018@CC-C02RN139FVH6-c018 ~/work/embedded/mbed/pio cat platformio.ini
; PlatformIO Project Configuration File
;
;   Build options: build flags, source filter
;   Upload options: custom upload port, speed and extra flags
;   Library options: dependencies, extra library storages
;   Advanced options: extra scripting
;
; Please visit documentation for the other options and examples
; http://docs.platformio.org/page/projectconf.html

[env:disco_l475vg_iot01a]
platform = ststm32
board = disco_l475vg_iot01a
framework = mbed
```

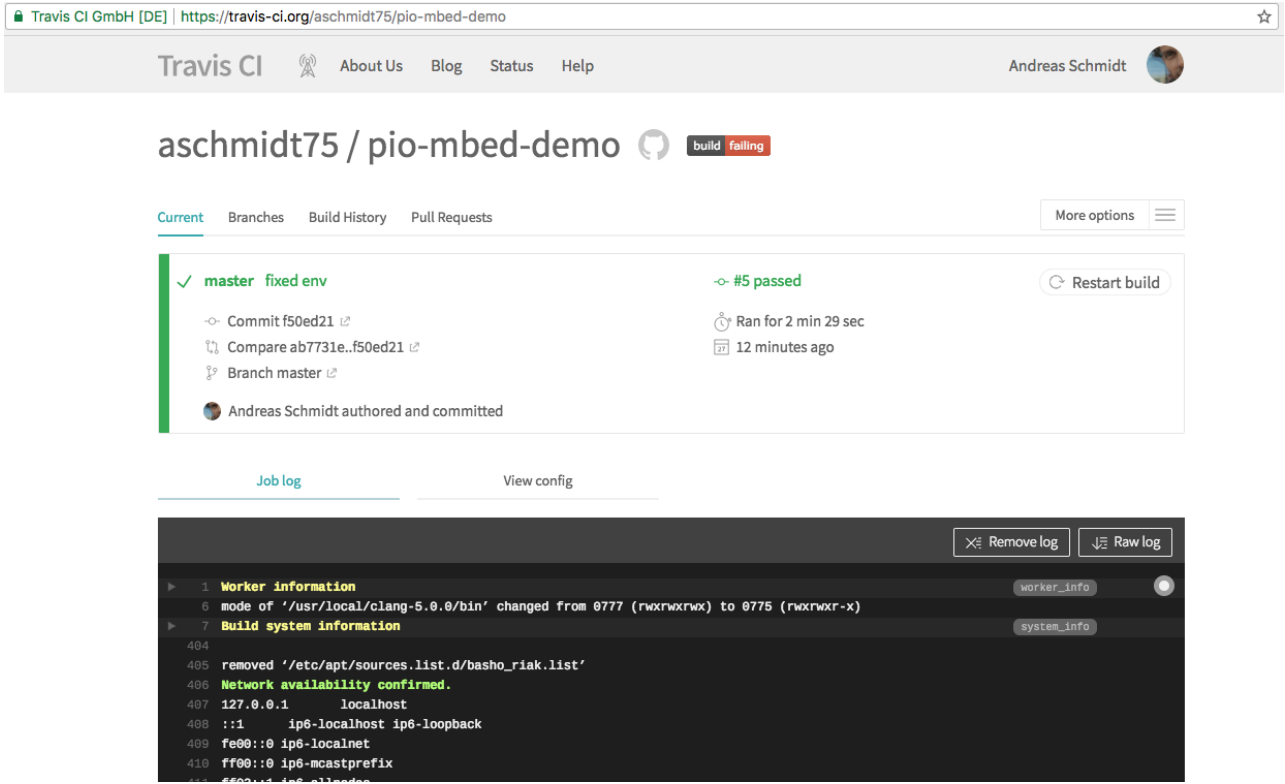
```
  update       Update installed development platforms
 c018@CC-C02RN139FVH6-c018  ~/work/embedded/mbed/pio  pio platforms frameworks mbed
mbed ~ mbed
===========
The mbed framework The mbed SDK has been designed to provide enough hardware abstraction to be
jects. It is built on the low-level ARM CMSIS APIs, allowing you to code down to the metal if r
kbook of hundreds of reusable peripheral and module libraries have been built on top of the SDK

Home: https://platformio.org/frameworks/mbed
```

```
c018@CC-C02RN139FVH6-c018 ~/work/embedded/mbed/pio pio run
[Wed Mar 21 18:12:06 2018] Processing disco_l475vg_iot01a (platform: ststm32; board: disco_l475vg_iot01a; framework: mbed)
------------------------------------------------------------------------------------------------------------------------
Verbose mode can be enabled via `-v, --verbose` option
PLATFORM: ST STM32 > ST DISCO-L475VG-IOT01A
SYSTEM: STM32L475VGT6 80MHz 128KB RAM (1MB Flash)
DEBUG: CURRENT(stlink) ON-BOARD(stlink) EXTERNAL(blackmagic, jlink)
Library Dependency Finder -> http://bit.ly/configure-pio-ldf
LDF MODES: FINDER(chain) COMPATIBILITY(light)
Collected 14 compatible libraries
Scanning dependencies...
No dependencies
Compiling .pioenvs/disco_l475vg_iot01a/FrameworkMbedCore/drivers/AnalogIn.cpp.o
Compiling .pioenvs/disco_l475vg_iot01a/FrameworkMbedCore/drivers/BusIn.cpp.o
Compiling .pioenvs/disco_l475vg_iot01a/FrameworkMbedCore/drivers/BusInOut.cpp.o
Compiling .pioenvs/disco_l475vg_iot01a/FrameworkMbedCore/drivers/BusOut.cpp.o
```

```
/Users/cassini/.platformio/packages/framework-mbed/targets/TARGET_STM/TARGET_STM32L4/device/stm32l4xx_ll_spi.
ter will break strict-aliasing rules [-Wstrict-aliasing]
*((__IO uint16_t *)&SPIx->DR) = TxData;
^
Compiling .pioenvs/disco_l475vg_iot01a/FrameworkMbedCore/targets/TARGET_STM/us_ticker_32b.c.o
Compiling .pioenvs/disco_l475vg_iot01a/src/main.cpp.o
Generating LD script .pioenvs/disco_l475vg_iot01a/STM32L475XX.ld.link_script.ld
Linking .pioenvs/disco_l475vg_iot01a/firmware.elf
Calculating size .pioenvs/disco_l475vg_iot01a/firmware.elf
Building .pioenvs/disco_l475vg_iot01a/firmware.bin
text       data     bss     dec     hex filename
40180      2508    1508   44196    aca4 .pioenvs/disco_l475vg_iot01a/firmware.elf
========================================================================= [SUCCESS] Took 46.32 seconds ================
```

Build via Travis-ci + PlatformIO



Comparison

	Mbed Cloud IDE	Mbed-cli local toolchain	PlatformIO
Ease of use (“Getting started”)	++	o	+
Required Experience Level (Dev+Ops)	low	high	medium
Control of build chain	-	++	+ (SCONS)
Control of code repositories	o	++	++
CI/CD integration options	-	o	++

Thank you!

andreas.schmidt@thingforward.io
@aschmidt75

www.thingforward.io
@thingforward

Andreas Schmidt, Digital Incubation & Growth GmbH

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