

# Mbed OS の 最新状況と展望

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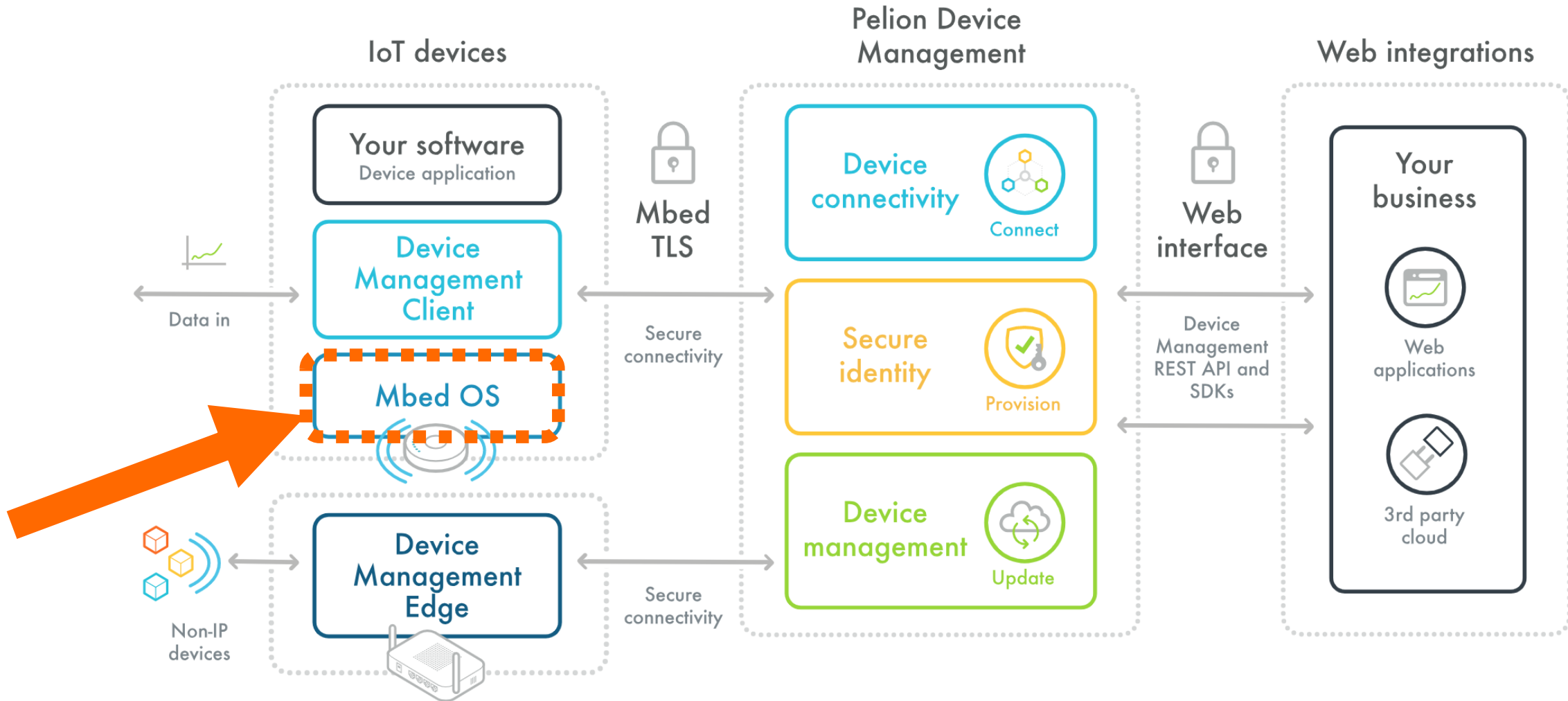
Arm

#Arm The Symposia

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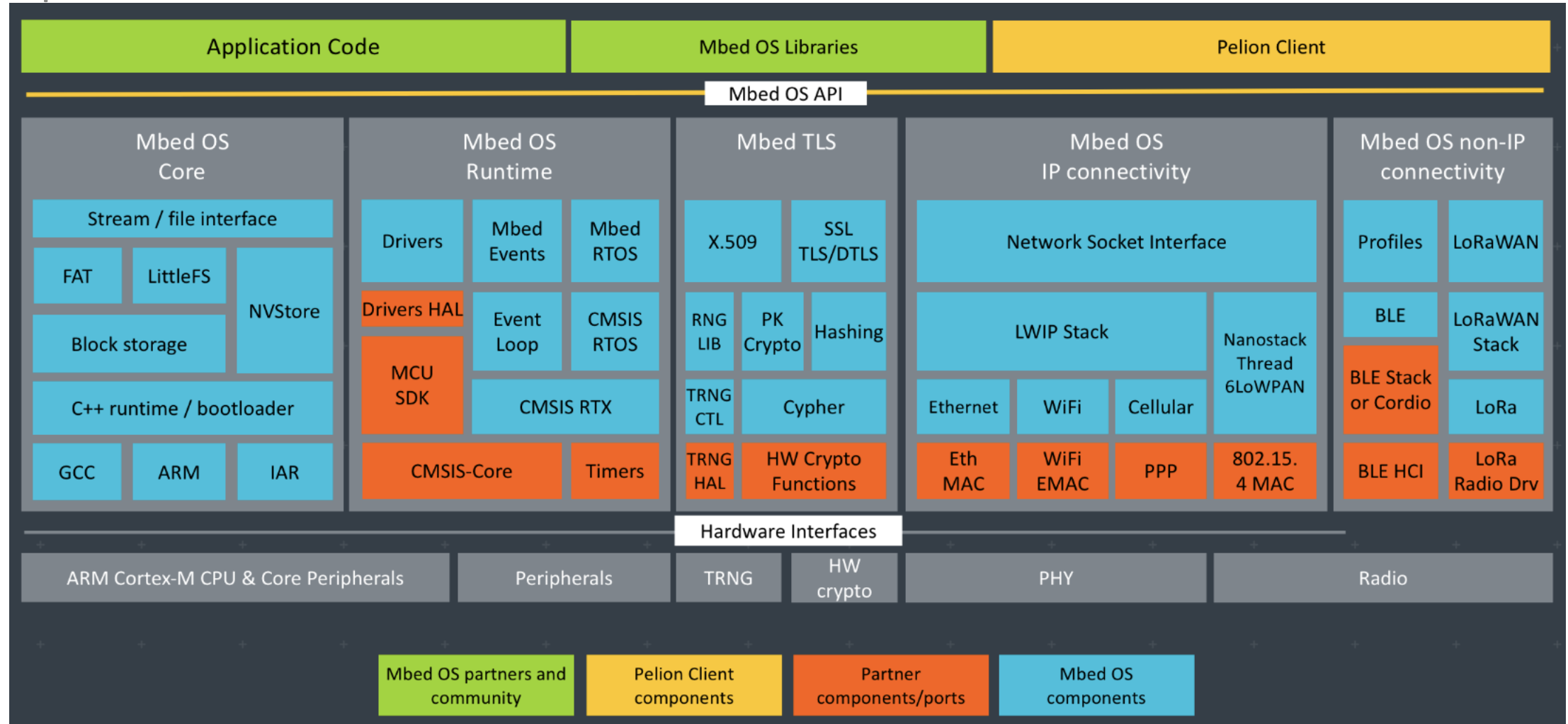
# Mbed OS?



# What is Mbed OS?

# What is Mbed OS?

## Components

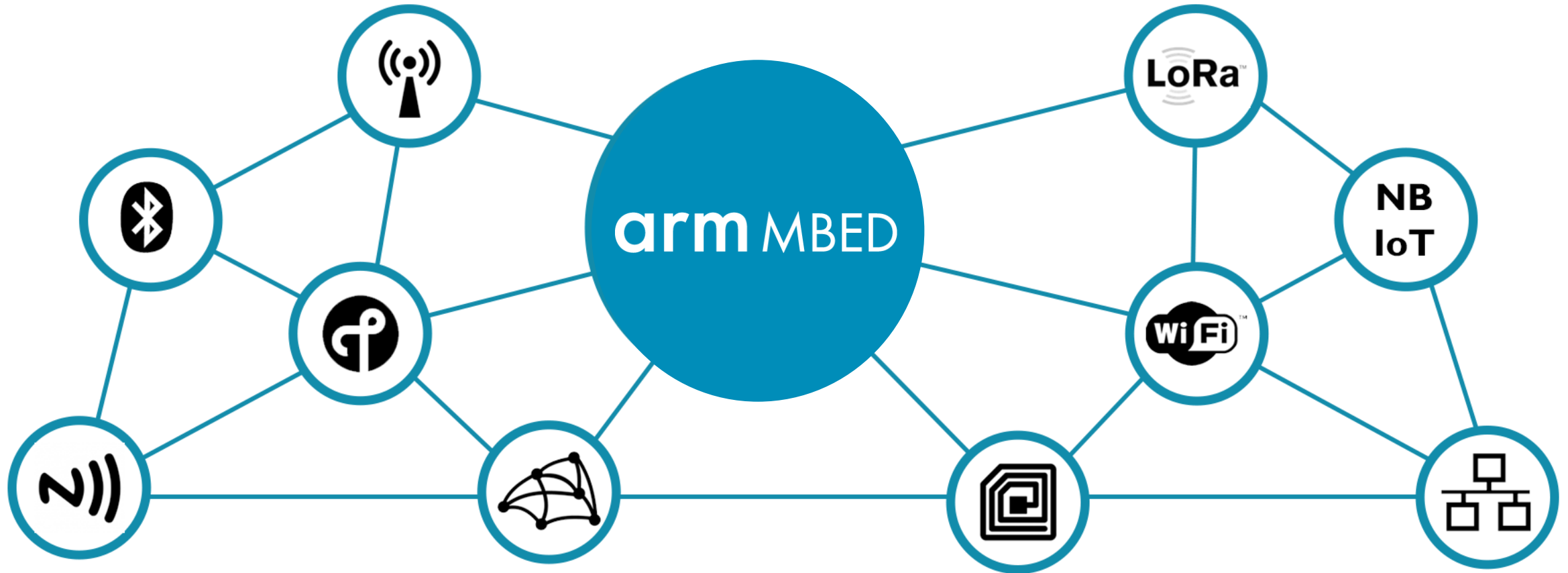


#Arm Tech Symposia

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# What is Mbed OS?

Connectivity



# What is Mbed OS?

## Security

### Partition Management

Separate partitions communicating through limited secure channels

Good for information hiding

Good for damage control

### Crypto Features

All crypto hardware is abstracted

Guarantee that crypto hardware is automatically used where present

All crypto functions are easily accessible for developers

### Transport Layer Security

Protect data in transit: authentication, integrity, confidentiality

Use TLS, a battle-tested protocol for secure communication

Library is lightweight, modular, and documented



# What is Mbed OS?

## Tools

Free core tools provide compilation, test and collaboration workflows.

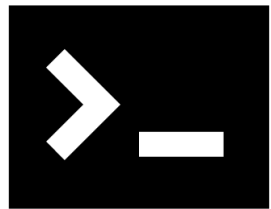
3<sup>rd</sup> party partner industry tools support.

Active Developer Website: [os.mbed.com](https://os.mbed.com)

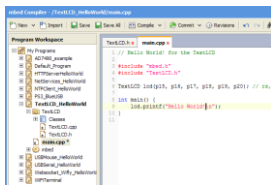
## Mbed OS IDEs and toolchains



## Mbed OS core tools



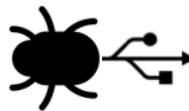
**Mbed CLI**  
Command Line Interface



**Mbed Compiler**  
Free Online IDE



**Mbed Greentea**  
Porting Testsuite and CI



**Mbed pyOCD**  
CMSIS-DAP Debug Library



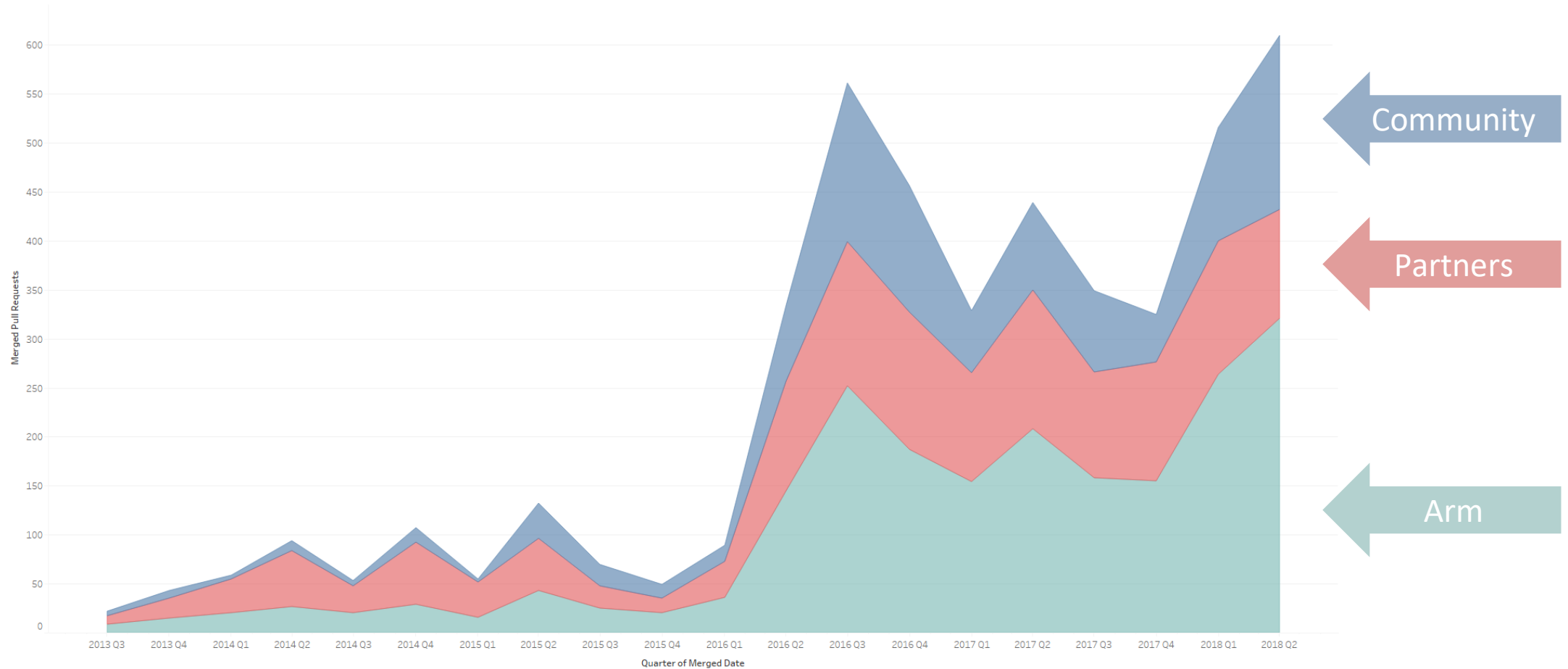
**Mbed DAPLink**  
CMSIS-DAP Debug Firmware

## Mbed OS DVCS support



# Who is Mbed OS?

Mbed OS Contributions Over Time







# How did we get here?

# Mbed OS releases

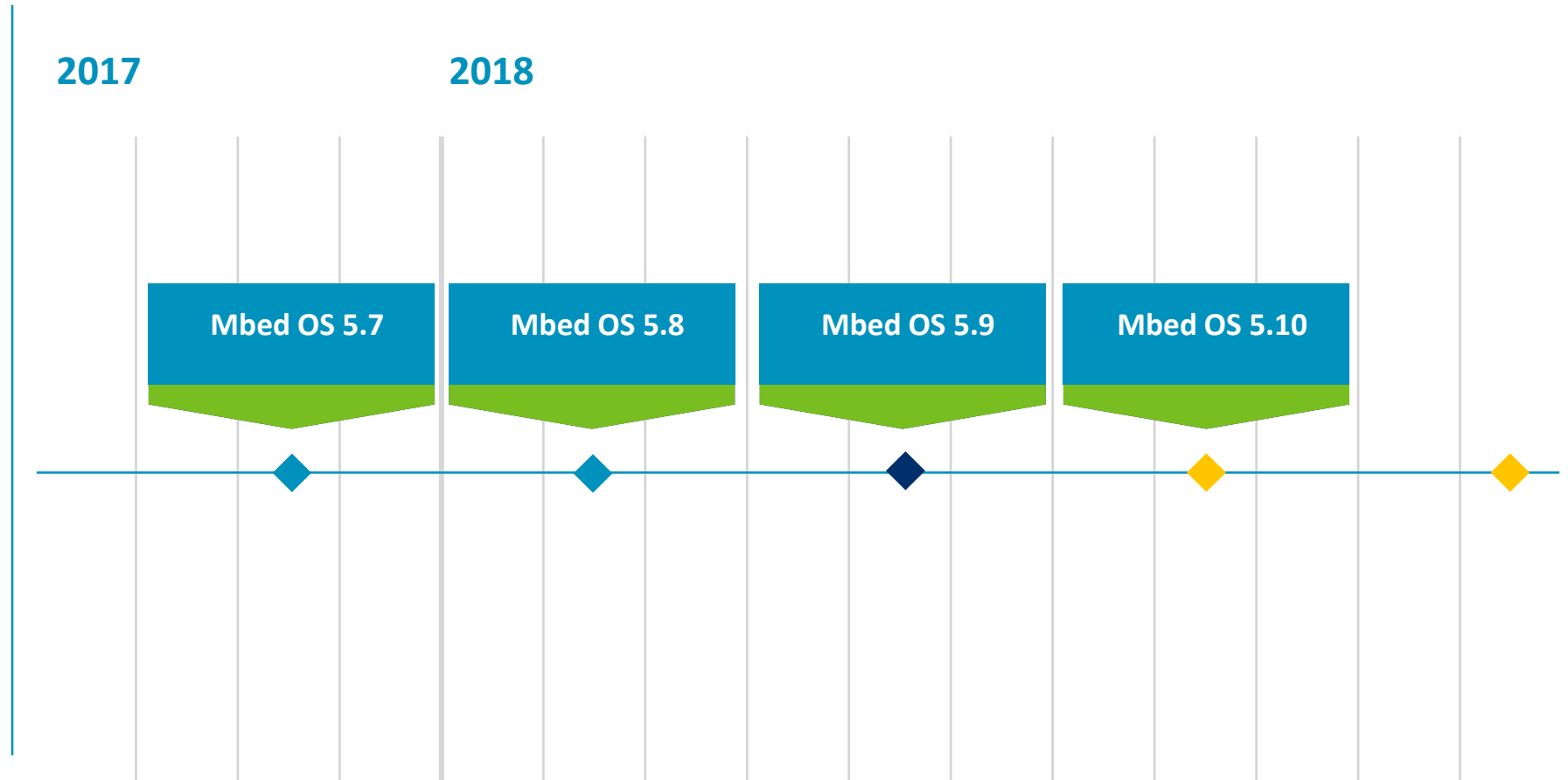
A regular release train for effectively supporting developers and partners

## Feature Releases

- Bringing new and enhanced features **every 3 months**

## Patch Releases

- Adding new partner target support and delivering bug fixes **every 2 weeks**



# Mbed OS 5.7

## Headline features

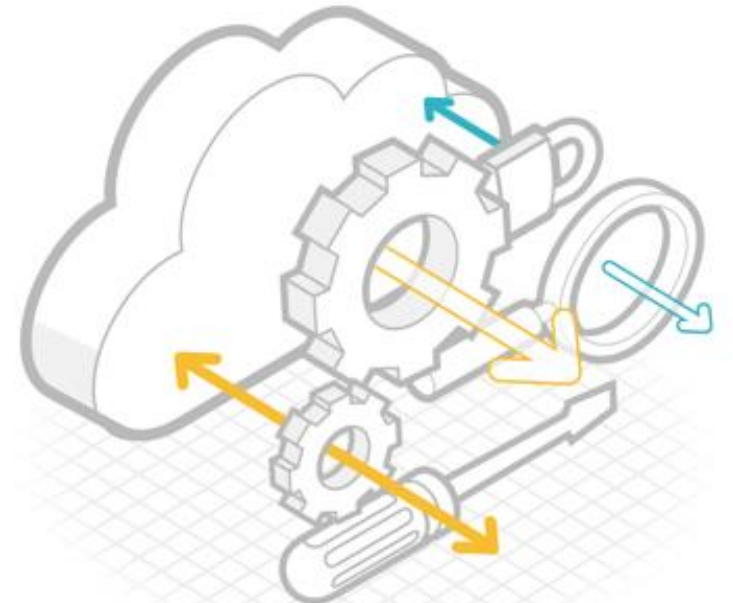
### LittleFS



### Mesh networking stack



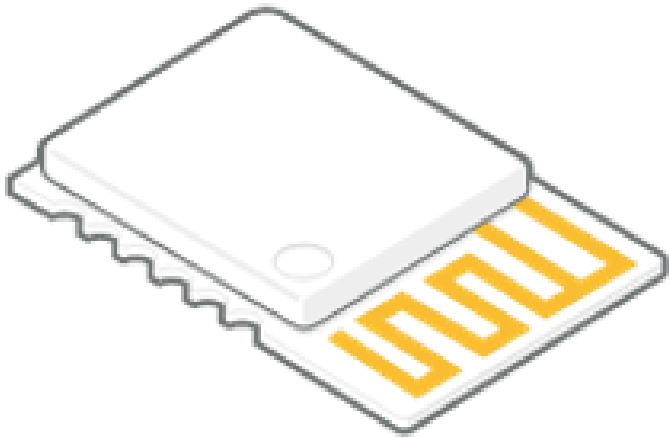
### Cortex-A support



# Mbed OS 5.8

## Headline features

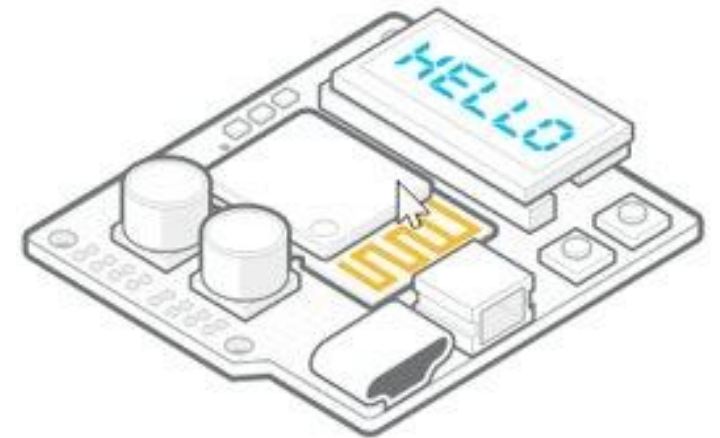
### Mbed Enabled modules



### NB-IoT and CAT-M1



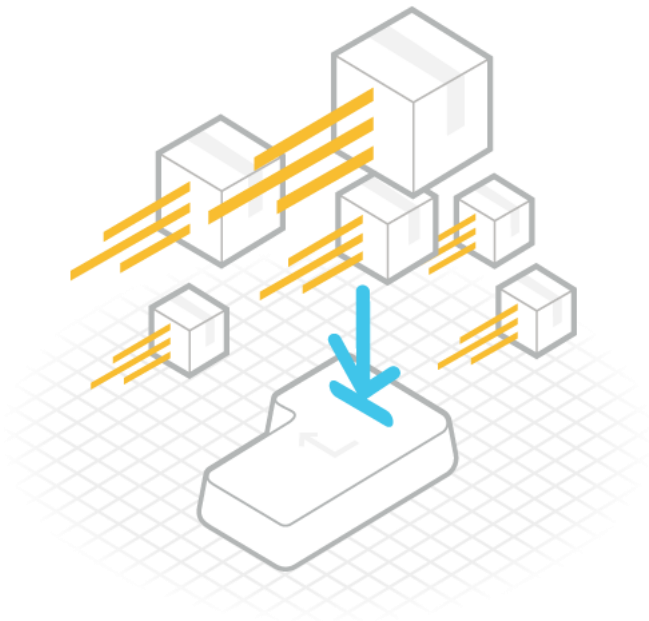
### Debug features



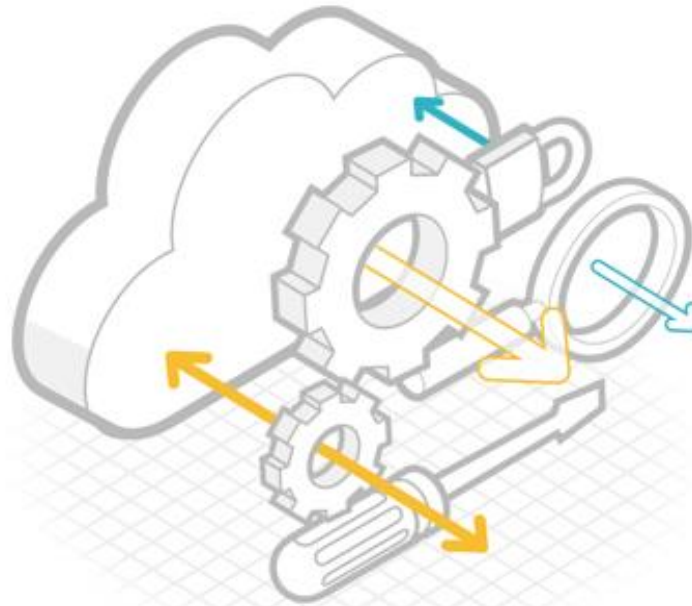
# Mbed OS 5.9

## Headline features

### Device statistics



### Updates to HAL



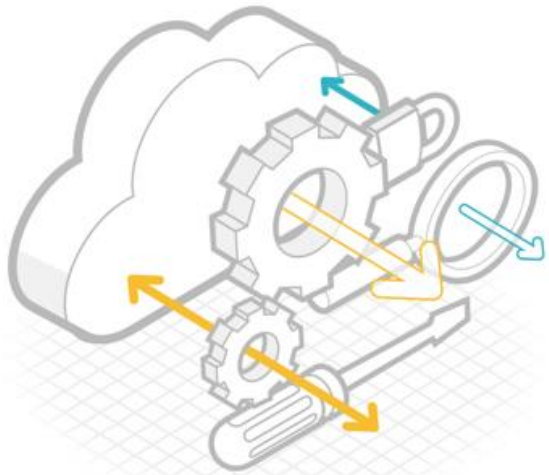
### Ethernet MAC API



# Mbed OS 5.10

## Headline features

### ARMv8-M



### NFC



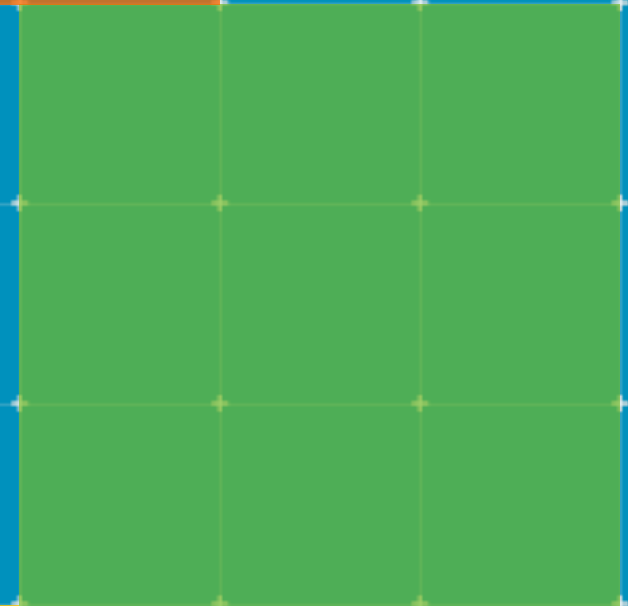
### Arm Mbed Cordio BLE stack



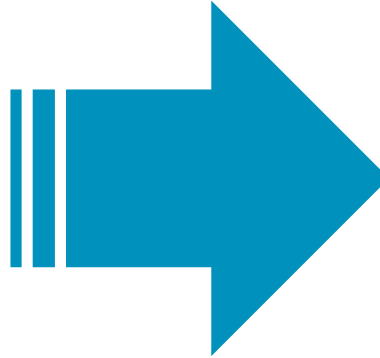


# Progress

## Quality and maturity



# Continuous integration



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# Tests

## Mbed OS 5.6

~500 functional tests

System tests

## Mbed OS 5.10

~1150 functional tests

System tests

Host unit tests

Fast model

More than 100,000 tests cases run per day

Farm of over 800 devices

~40,000 hours of testing for Mbed OS 5.10 release

# Documentation

## Changes during the past year

Added 51 new API references

Architecture background on 7 networking technologies

Extended porting guide

Improvements after UX user study:

- Quadrupled success rate in finding information
- Halved the time to find information
- Reduced the number of clicks by 30%
- Raised positive feedback on our documentation from 48% to 82%

## Plans for the future

Adding tutorials requested by the community, including end-to-end tutorials that cover the Arm ecosystem

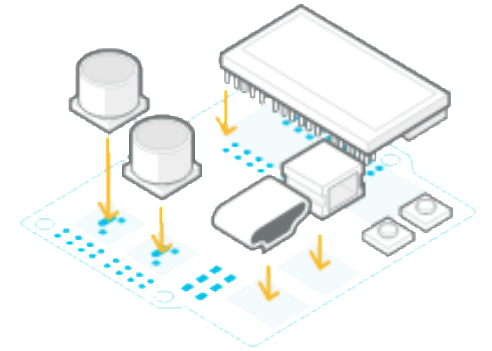
Improve porting content

Updating and standardizing our examples, including our quick start guide

Continued improvements across the content

# Hardware abstraction layer specifications

Improvements

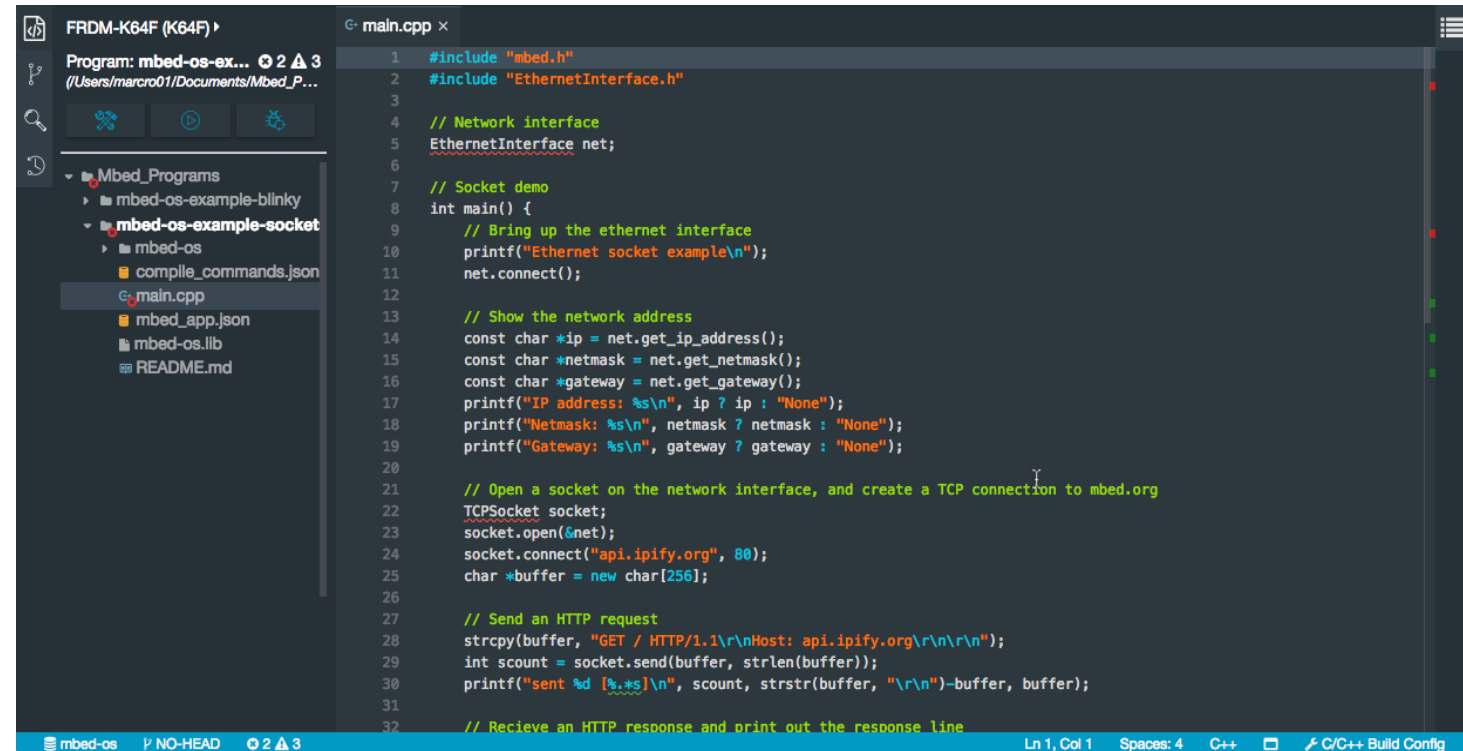




# Mbed Studio

A desktop IDE designed for Mbed OS, suitable for professionals and hobbyists alike.

- ✓ Arm Compiler 6
- ✓ Import Mbed programs from os.mbed.com and GitHub
- ✓ C/C++ code completion and inspection
- ✓ Mbed library management
- ✓ Build, run and debug connected platforms
- ✓ Support for Windows, Linux and Mac OS
- ✓ Updated online IDE based on the same framework



The screenshot displays the Mbed Studio IDE. On the left, a project tree shows the structure of a project named 'mbed-os-ex...'. The tree includes folders for 'Mbed\_Programs', 'mbed-os-example-blinky', and 'mbed-os-example-socket'. The 'mbed-os-example-socket' folder is expanded, showing files like 'compile\_commands.json', 'main.cpp', 'mbed\_app.json', 'mbed-os.lib', and 'README.md'. The main editor window displays the 'main.cpp' file, which contains C++ code for a network interface and a socket demo. The code includes headers for 'mbed.h' and 'EthernetInterface.h', and implements a 'main' function that sets up a network interface, connects to a socket, and sends an HTTP request to 'api.ipify.org'. The status bar at the bottom indicates the current file is 'main.cpp', the compiler is 'Arm Compiler 6', and the target is 'FRDM-K64F (K64F)'.

```
1 #include "mbed.h"
2 #include "EthernetInterface.h"
3
4 // Network interface
5 EthernetInterface net;
6
7 // Socket demo
8 int main() {
9     // Bring up the ethernet interface
10    printf("Ethernet socket example\n");
11    net.connect();
12
13    // Show the network address
14    const char *ip = net.get_ip_address();
15    const char *netmask = net.get_netmask();
16    const char *gateway = net.get_gateway();
17    printf("IP address: %s\n", ip ? ip : "None");
18    printf("Netmask: %s\n", netmask ? netmask : "None");
19    printf("Gateway: %s\n", gateway ? gateway : "None");
20
21    // Open a socket on the network interface, and create a TCP connection to mbed.org
22    TCPSocket socket;
23    socket.open(&net);
24    socket.connect("api.ipify.org", 80);
25    char *buffer = new char[256];
26
27    // Send an HTTP request
28    strcpy(buffer, "GET / HTTP/1.1\r\nHost: api.ipify.org\r\n\r\n");
29    int scount = socket.send(buffer, strlen(buffer));
30    printf("sent %d [%s]\n", scount, strstr(buffer, "\r\n")-buffer, buffer);
31
32    // Recieve an HTTP response and print out the response line
```



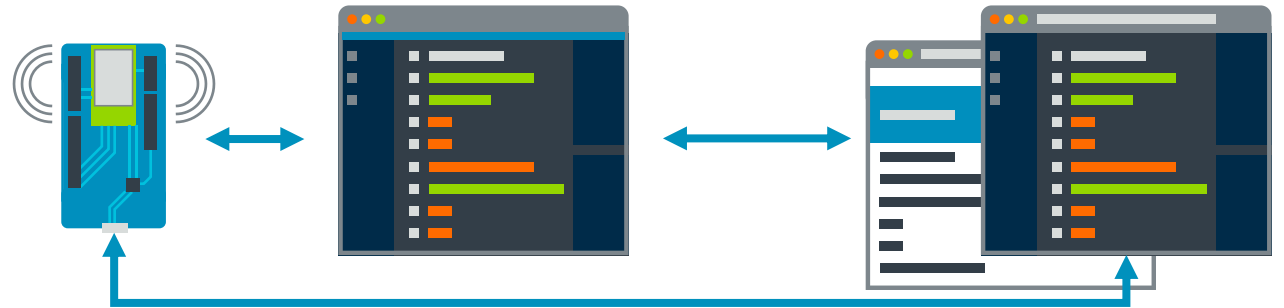
# User Experience

5 minute quick start guide

Improvements to end-to-end workflow:

Mbed CLI extended to support:

- Bootloader
- Pelion integration



Offline and Online IDE integration with Pelion

A decorative graphic consisting of three colored rectangles on a blue grid background. An orange rectangle is at the top right, a green rectangle is in the middle right, and a yellow rectangle is at the bottom left.

# Where are we heading?

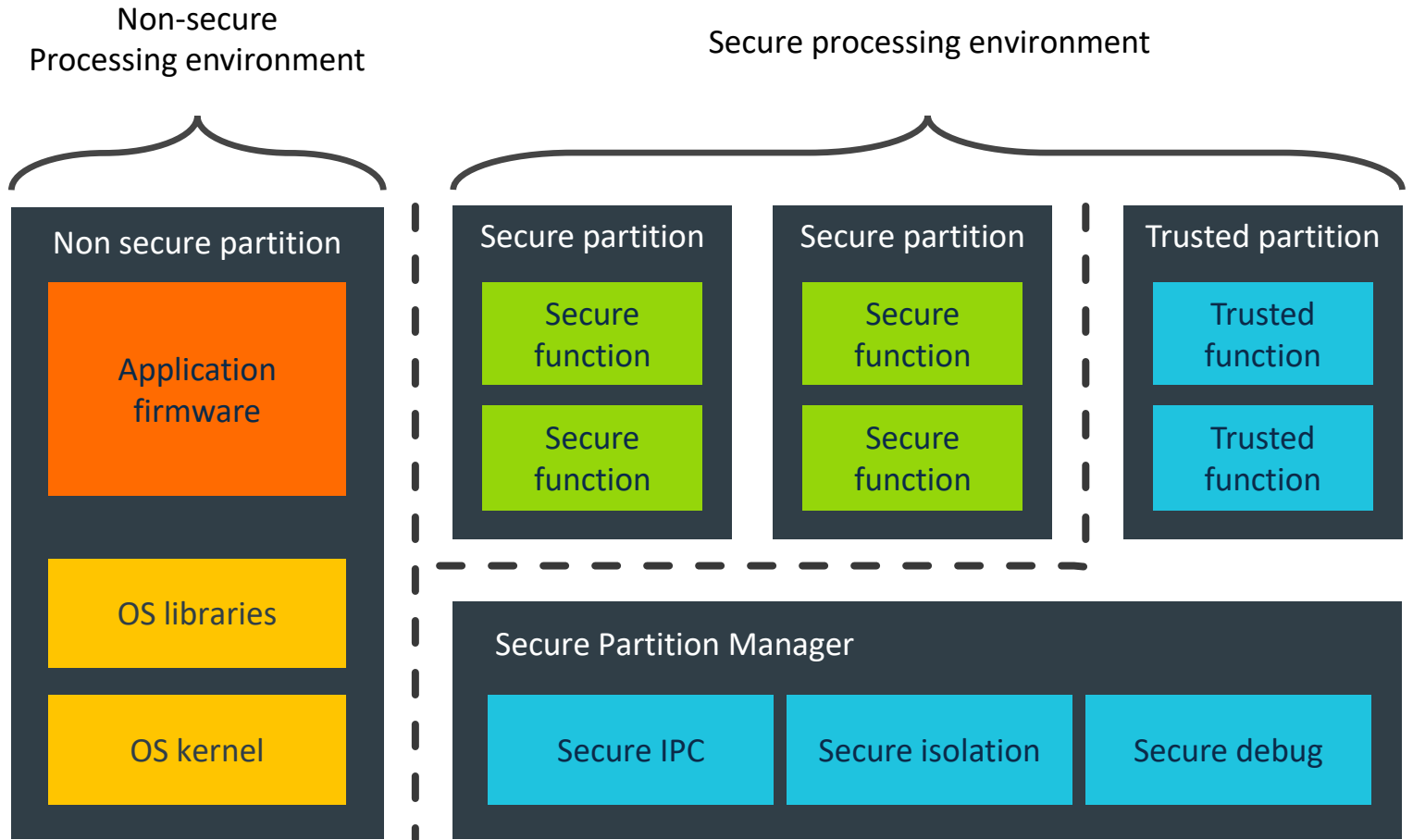
# Platform Security Architecture

## Features

- Crypto APIs
- Secure storage
- Attestation

## Secure Partition Management

- Single-V7M + Secure Element
- Dual-core V7M
- V8M



# Bluetooth Low Energy 5 and Mesh

## BLE 5 Mbed APIs

- Improved speed – x 2 times faster
- Improved range – 4 x further
- Extended advertising – 8 x broader

## Introduction of Mbed OS Mesh APIs

- Provide BLE Mesh APIs for developers
- Give partners preview of upcoming open source Mesh implementation



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# Thank You!

