

mbedって？

NXPセミコンダクターズジャパン

2015年04月16日



目次

- ❖ mbedとは？
- ❖ ハードウェア と ソフトウェア
- ❖ さらに (情報の活用)
- ❖ まとめ

mbedとは？

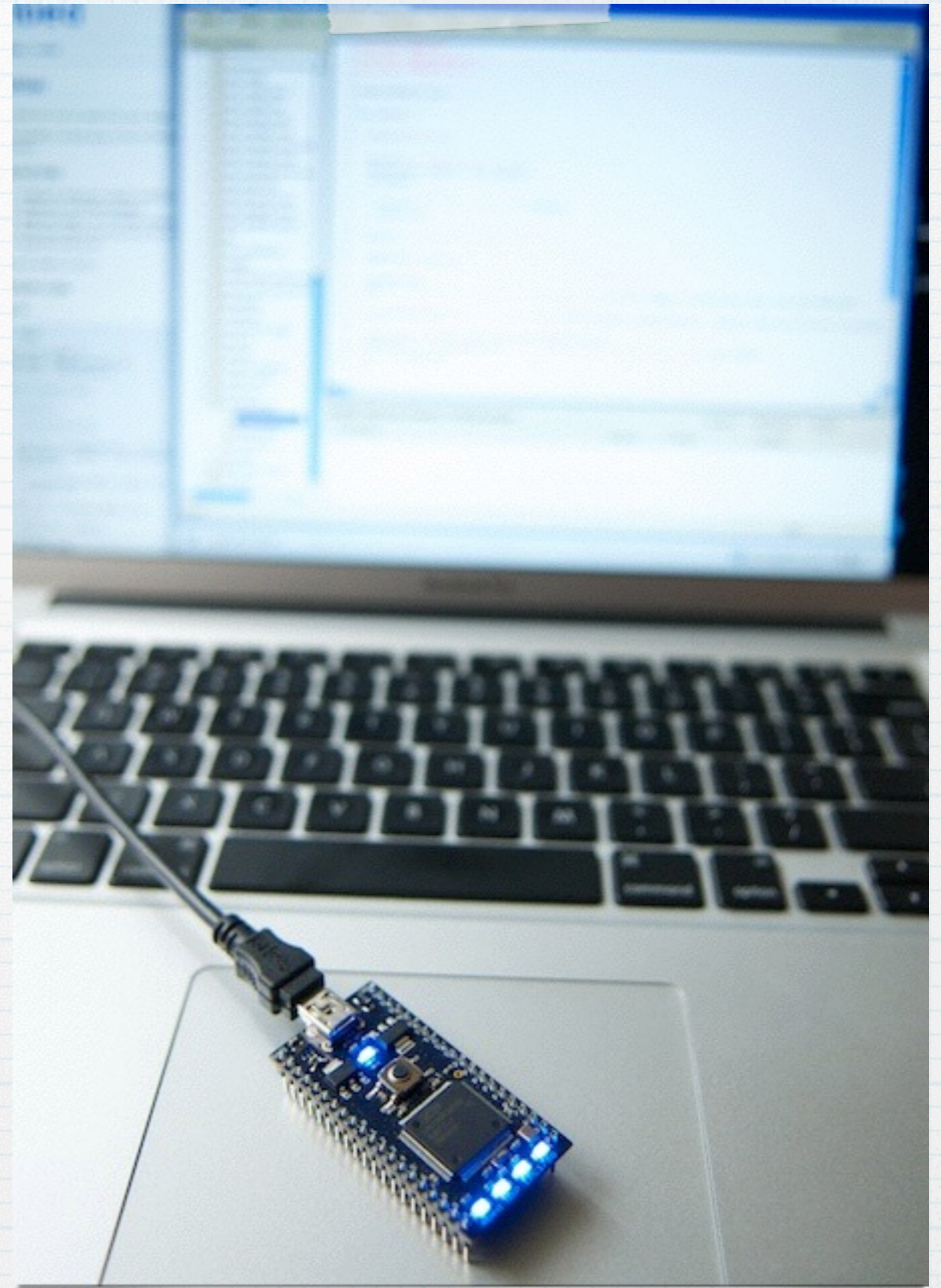
mbedとは

開発プラットフォーム

開発環境構築の手間を省略

組み込み開発の煩雑さを
省いて問題解決に集中
できます

チップ依存部分を抽象化



mbedとは

- ❖ 未経験者でも簡単に「組み込み」を
- ❖ 経験者には、より高度な問題解決のツールとして
- ❖ 教育向けのツールとして

簡単スタート

オフライン・ツール
も使えます



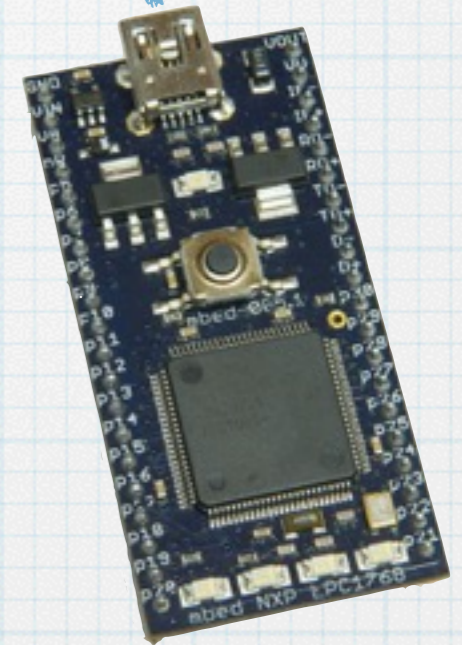
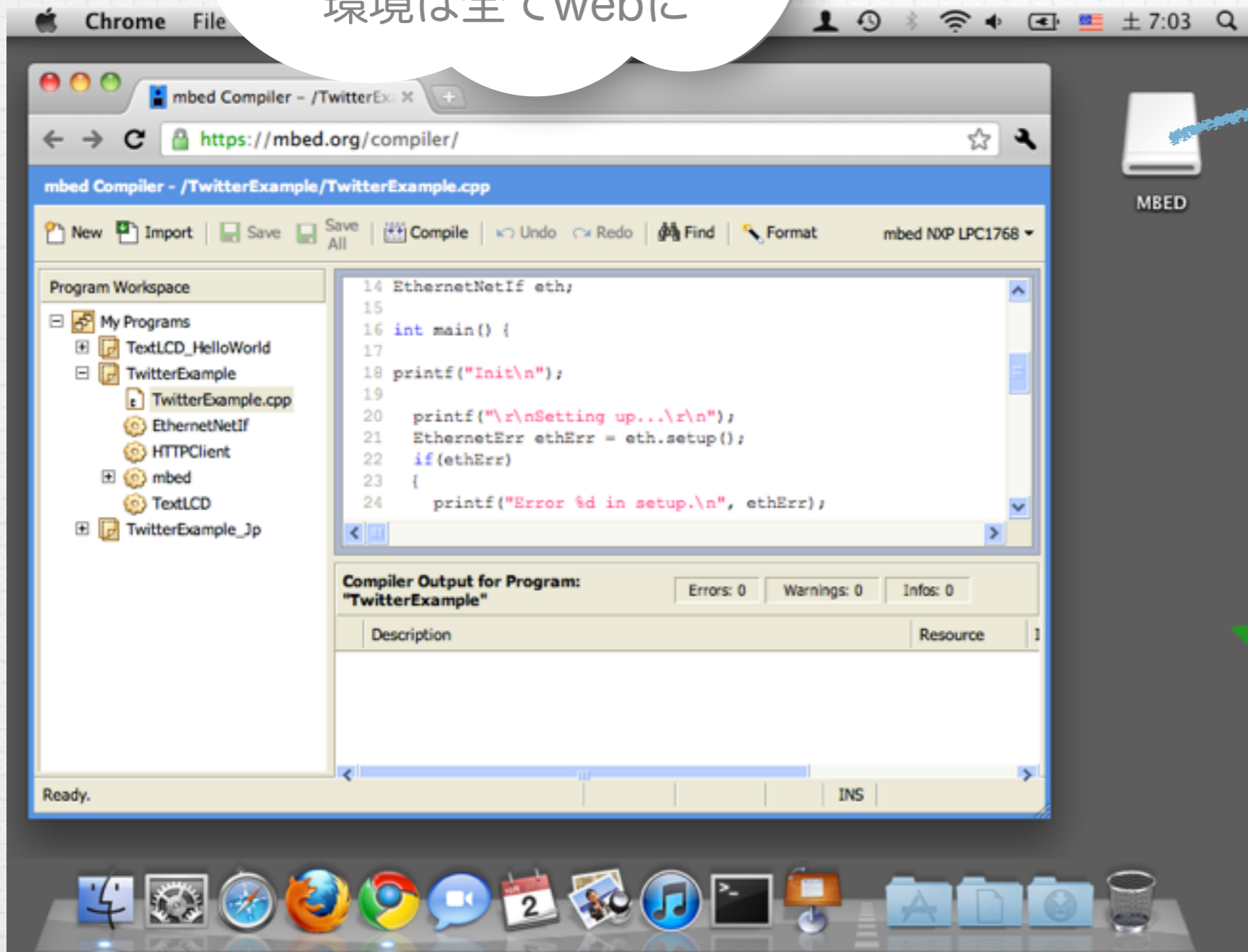
インストール不要のソフトウェア

環境は全てwebに



書き込みツール不要

Flashメモリへの
書き込みは「コピー」で



基板上的設定なし

スイッチやジャンパピンが
無い

手軽

❖ ツールもコードもすべて
Webに

- ▶ ネットに繋がった環境さえあれば作業できる

❖ 直感的なSDK-API

- ▶ 分かりやすいAPIとサンプルコード

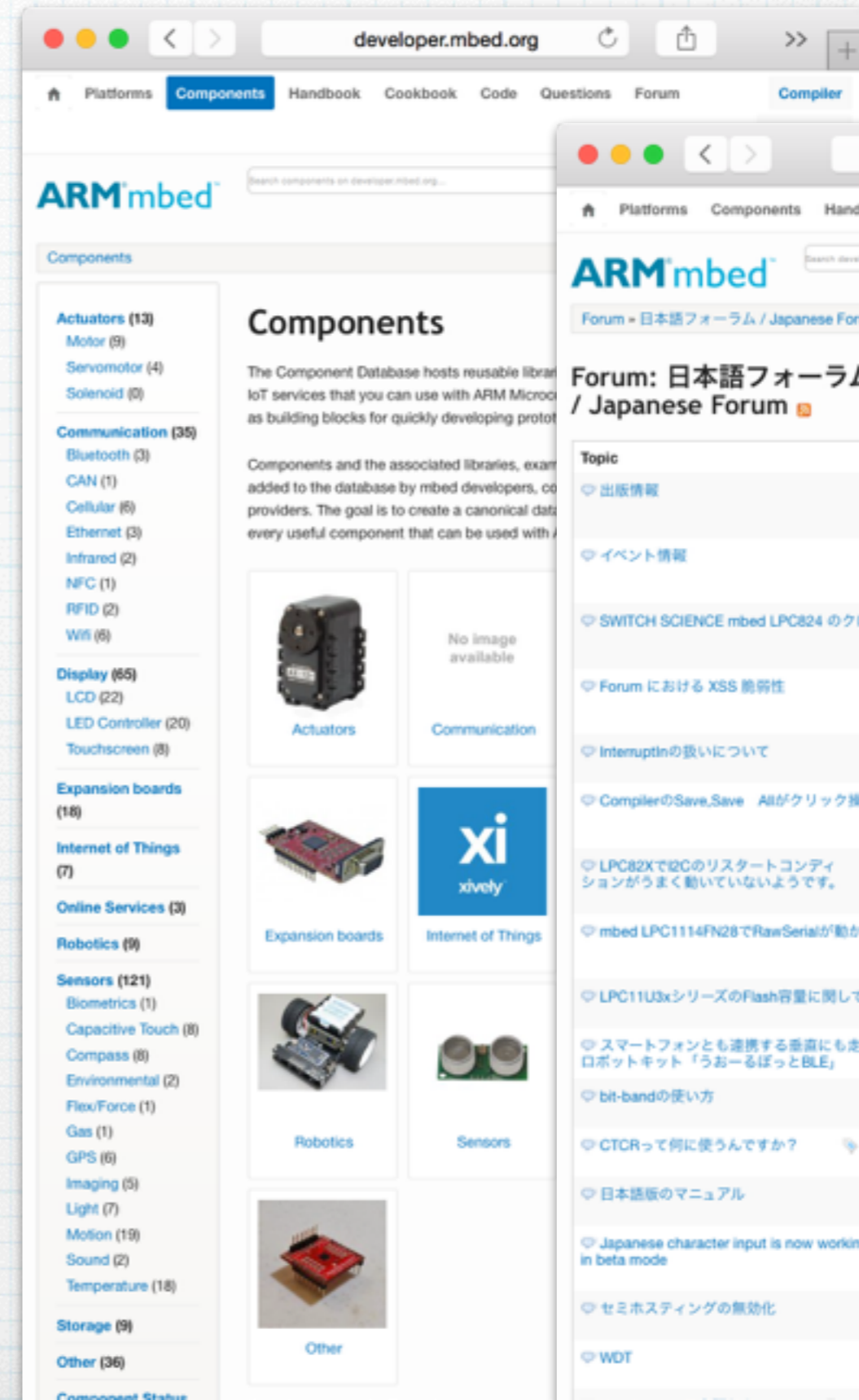
レジスタレベルを抽象化
高機能ライブラリ群



```
1 #include "mbed.h"
2
3 DigitalOut myled(LED1);
4
5 int main() {
6     while(1) {
7         myled = 1;
8         wait(0.2);
9         myled = 0;
10        wait(0.2);
11    }
12 }
13
```

豊富な情報

- ❖ 豊富なライブラリ群
- ❖ 各ライブラリにサンプルコードがある
- ❖ Webサイト上のフォーラムで問題を共有, 議論, 解決
- ❖ 日本語フォーラムも!



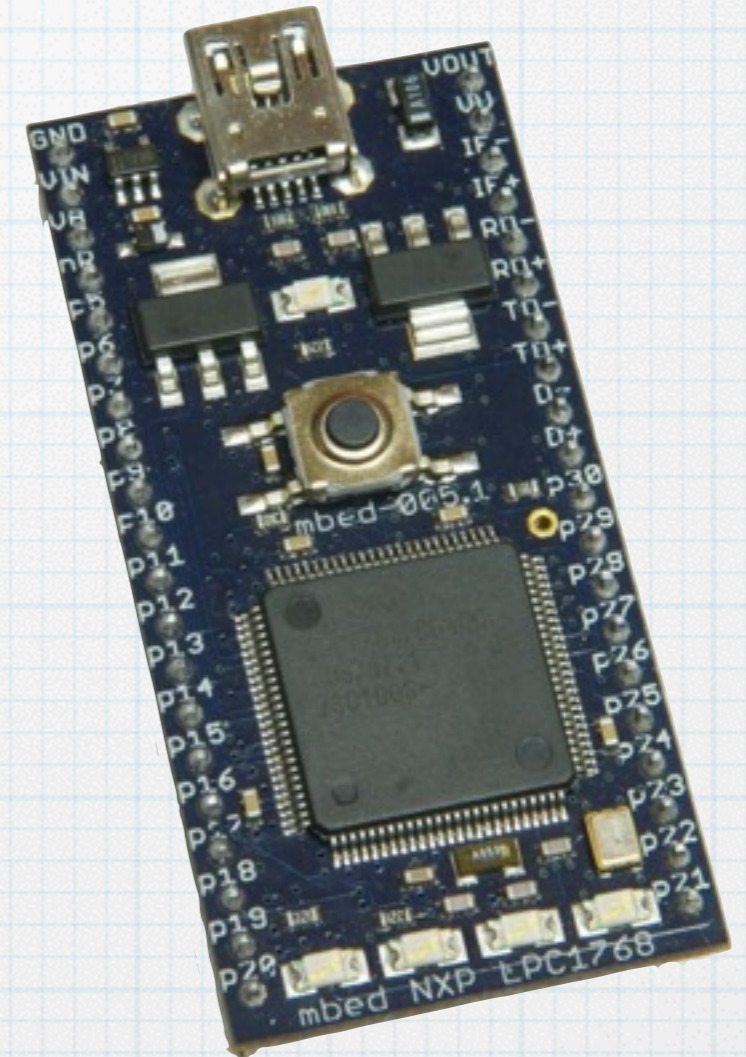
ハードウェアと ソフトウェア

mbed.org

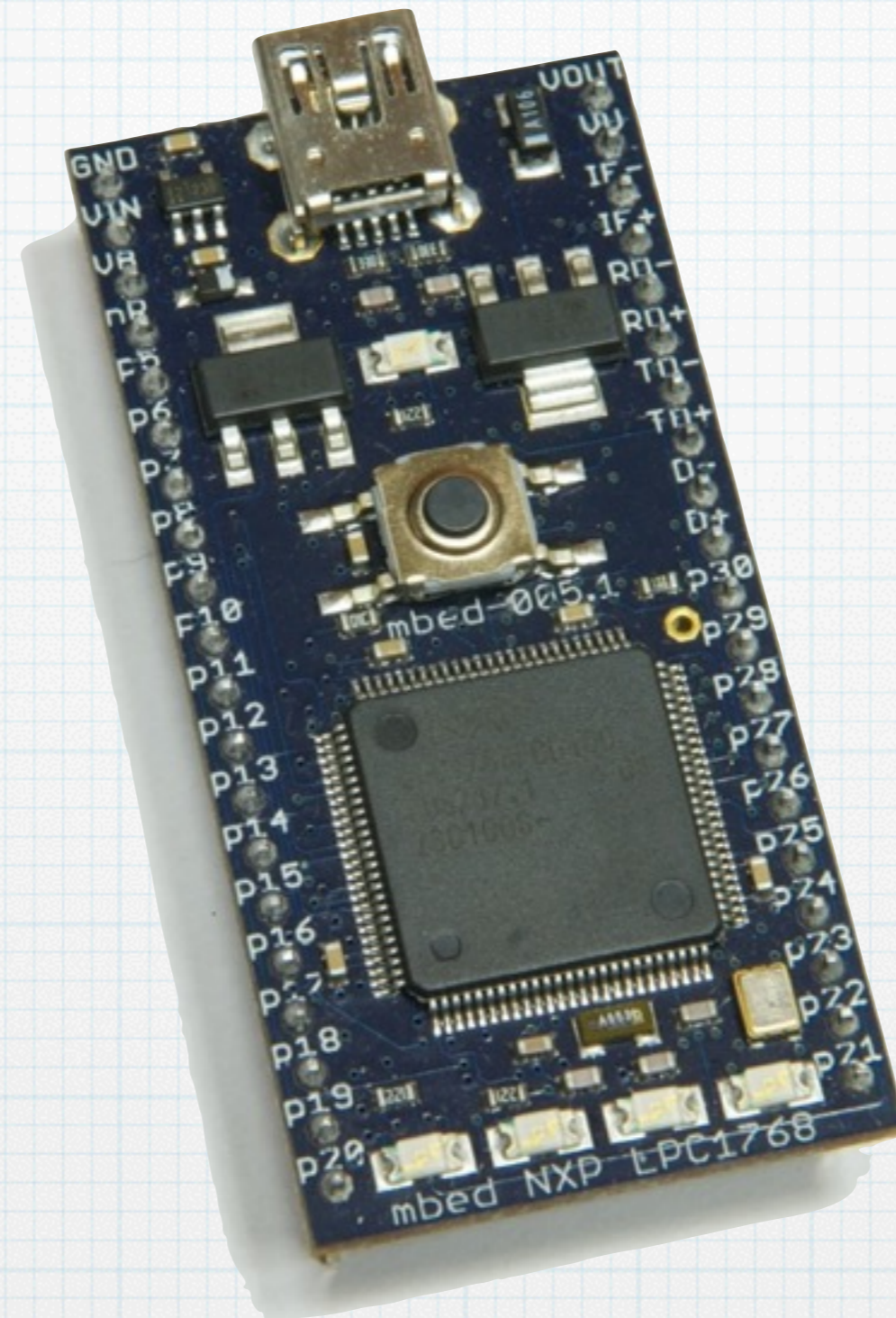
The image shows a composite of two screenshots. The top-left screenshot is the mbed.org homepage, featuring a navigation bar with 'Blog', 'Forum', 'Handbook', and 'Cookbook' links. The main content area includes an 'Introduction' section with links to 'About the Cookbook', 'Wiki Syntax', and 'Sandbox', and a 'Components and Libraries' section listing various modules like 'Networking Stack Releases', 'HTTP Client', 'HTTP Server', 'NTP Client', 'MySQL Client', 'Ethernet', 'Twitter', and 'Pachube'. The bottom-right screenshot is the mbed Compiler IDE interface, titled 'mbed Compiler - /__test/main.cpp'. It displays a code editor with the following C++ code:

```
1 #include "mbed.h"
2
3 DigitalOut myled(LED1);
4
5 int main() {
6     while(1) {
7         myled = 1;
8         wait(0.2);
9         myled = 0;
10        wait(0.2);
11    }
12 }
13
```

The IDE also shows a 'Program Workspace' tree on the left with a folder structure: 'My Programs' containing '.__test' which includes 'main.cpp', 'mbed', and several '_training_lpcpresso_baset' and 'blinker' sub-folders.



ハードウェア



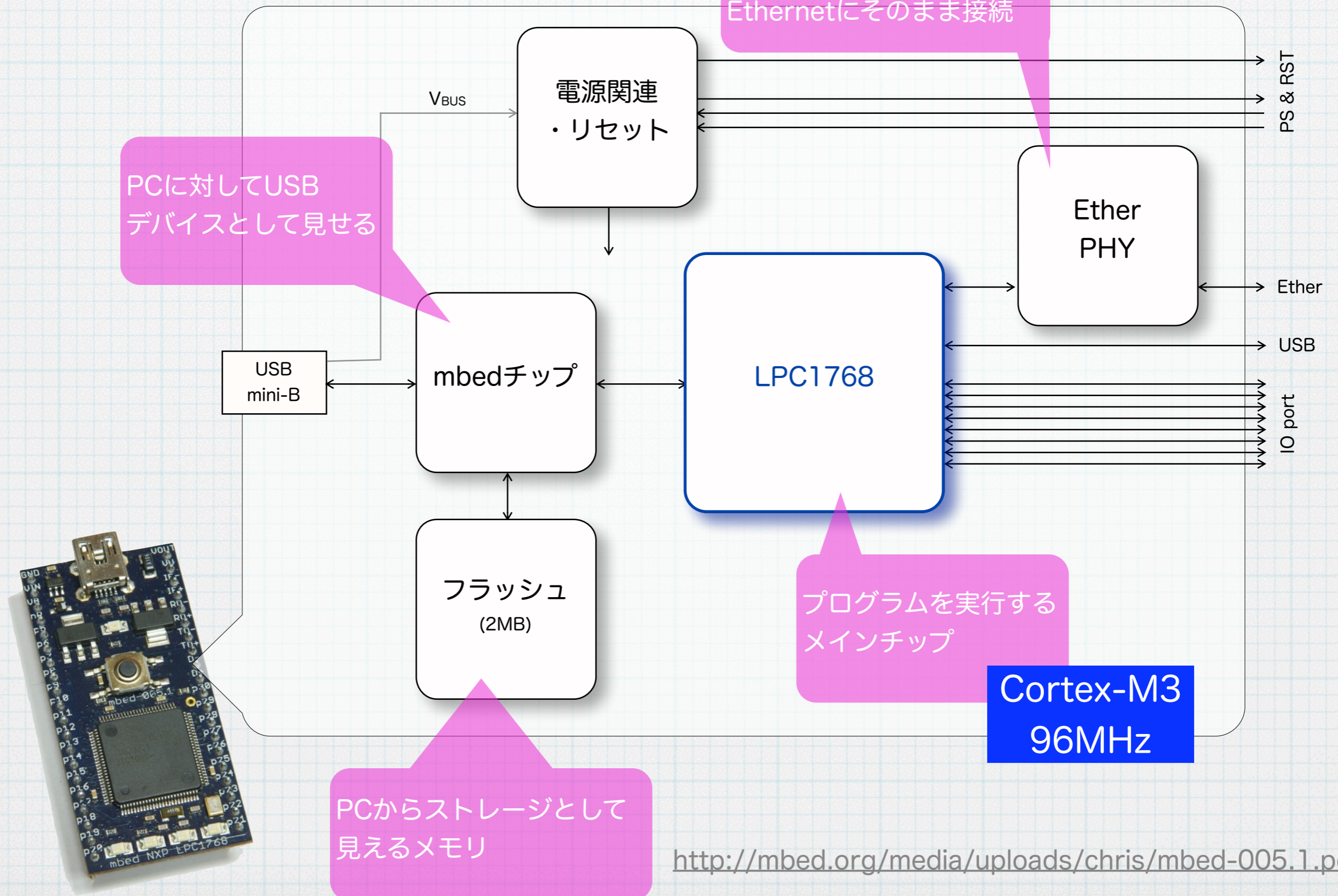
青mbed: mbed LPC1768

- ❖ 現在, 非常に多くのプラットフォームがサポートされています
- ❖ 今回のワークショップではこの中で最初に販売が開始された最もポピュラーな「青mbed: mbed LPC1768」を使います

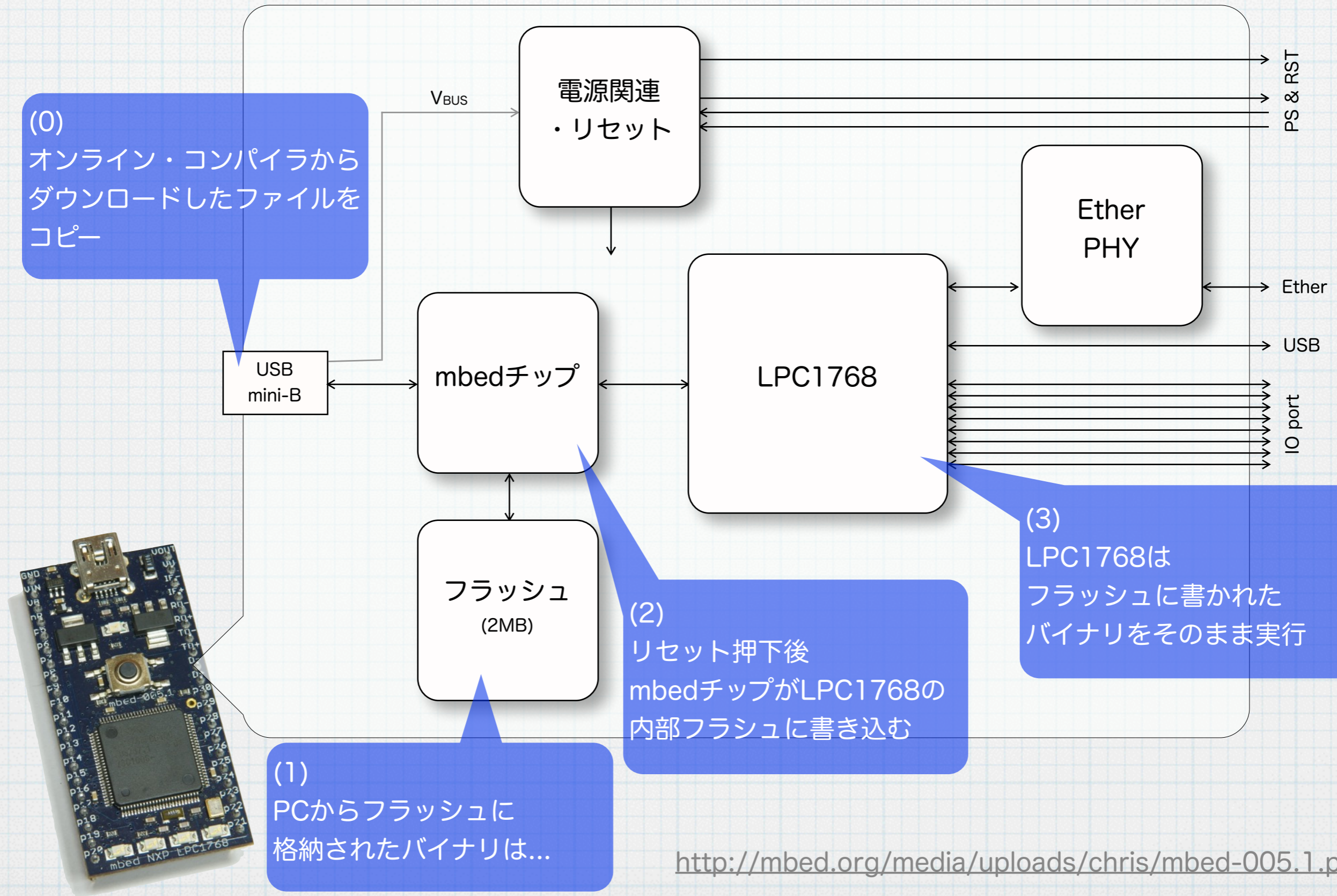
<http://developer.mbed.org/platforms/>

The screenshot shows the ARM mbed website's 'Platforms' page. The main content is a grid of 40 development boards, each with a small image and a list of specifications. The first board in the top-left corner is the 'mbed LPC1768', which is highlighted by a grey arrow pointing from the text '青mbed: mbed LPC1768' on the left. The specifications for this board are: Cortex-M3, 96MHz; 512KB Flash, 32KB RAM. The sidebar on the right contains filter options for Interface (CMSIS-DAP), Connectivity (Bluetooth Smart, CAN, Cellular, Ethernet, USB Device, USB Host, Wi-Fi), Platform vendor (CG Publishing Co., Ltd., Embedded Artists, Freescale Semiconductor, JKSoft, NGX Technologies, NXP Semiconductors, Nordic Semiconductor ASA, Outrageous Circuits, ReBearLab, Renesas, STMicroelectronics, SeedStudio, Silicon Labs, Solder Splash Labs, Switch Science Inc., YS-Design, u-blox AG), Target vendor (Freescale Semiconductor, NXP Semiconductors, Nordic Semiconductor ASA, Renesas, STMicroelectronics, Silicon Labs), and Form Factor (Arduino Compatible, Breadboardable).

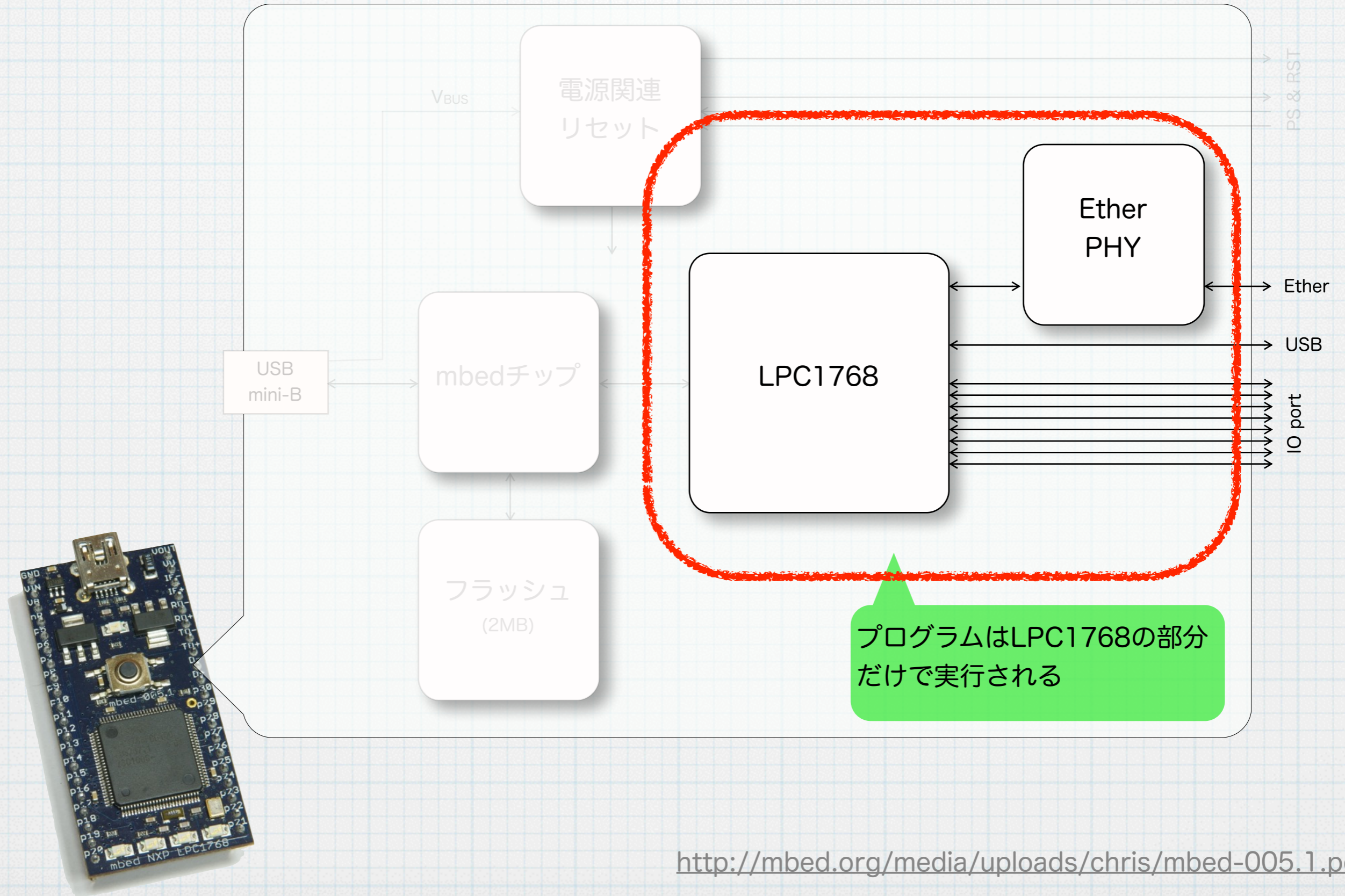
ハードウェア



ハードウェア

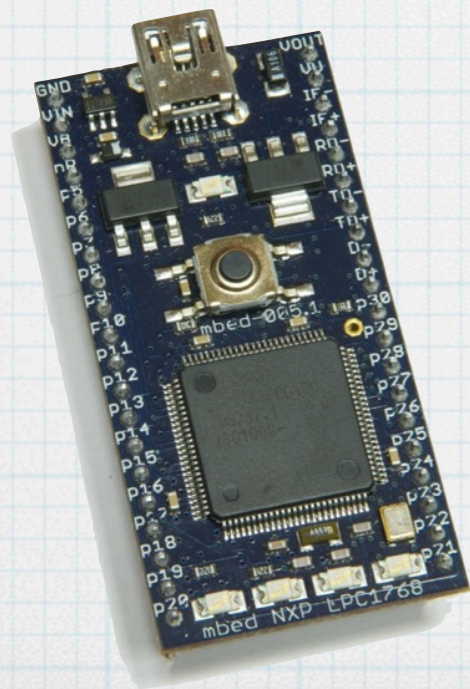


ハードウェア



mbedで作ったコードは
他のハードでもうごくの？

うごきます！

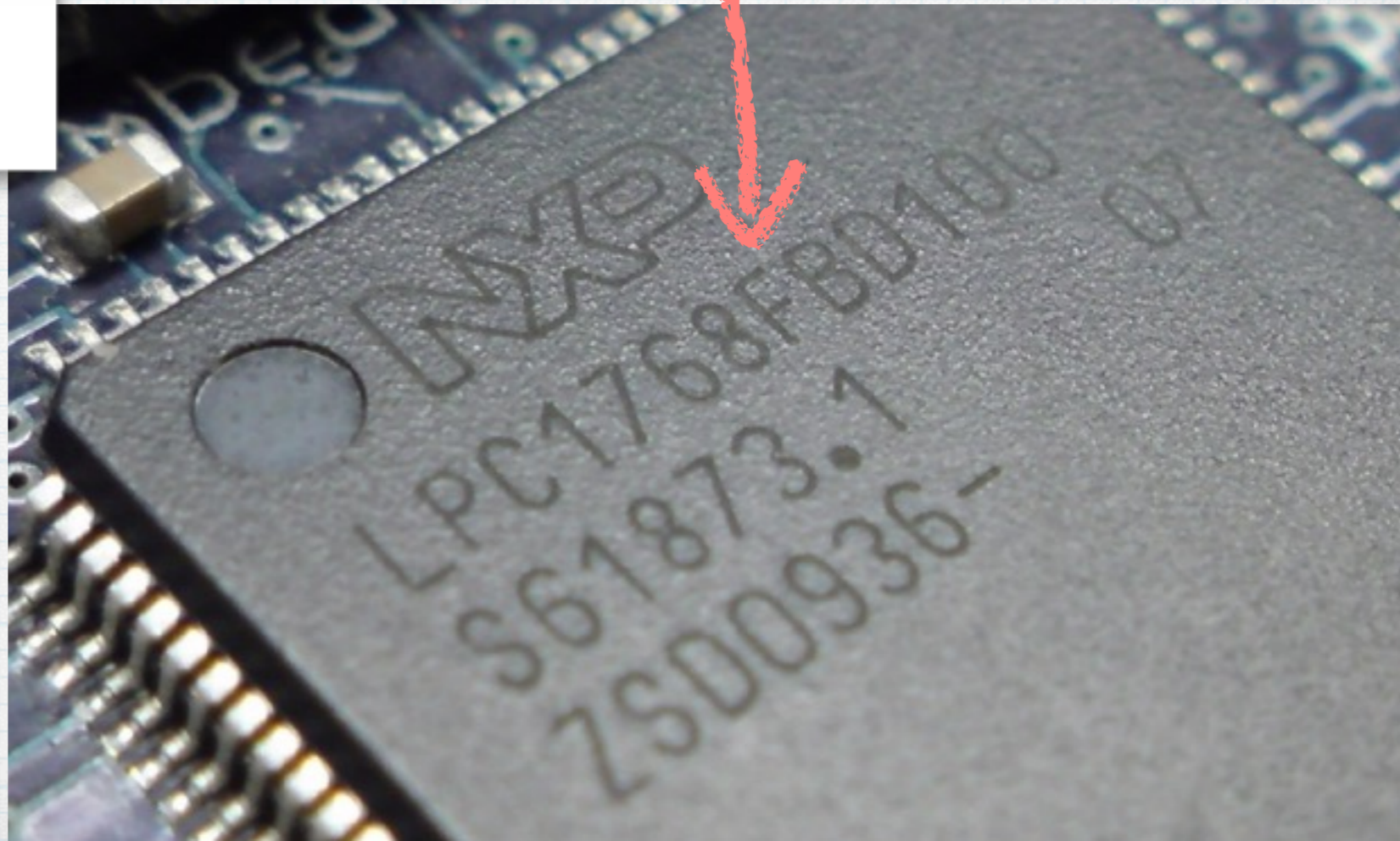


ハードウェア

HelloWorld_LPC1768.bin

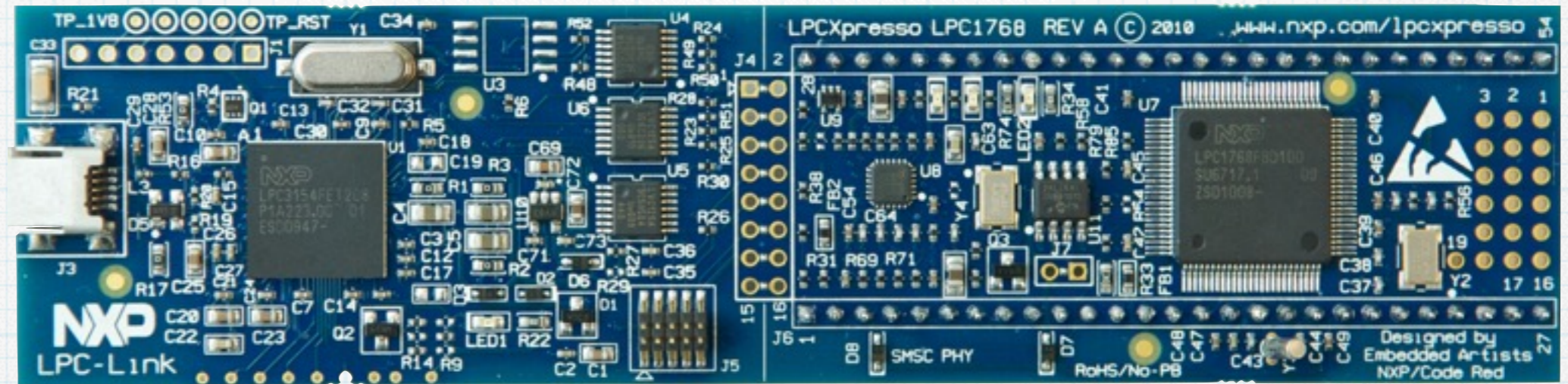
フラッシュに書き込む

mbedコンパイラで作成した
実行ファイルは
単体のLPC1768で
そのまま動きます



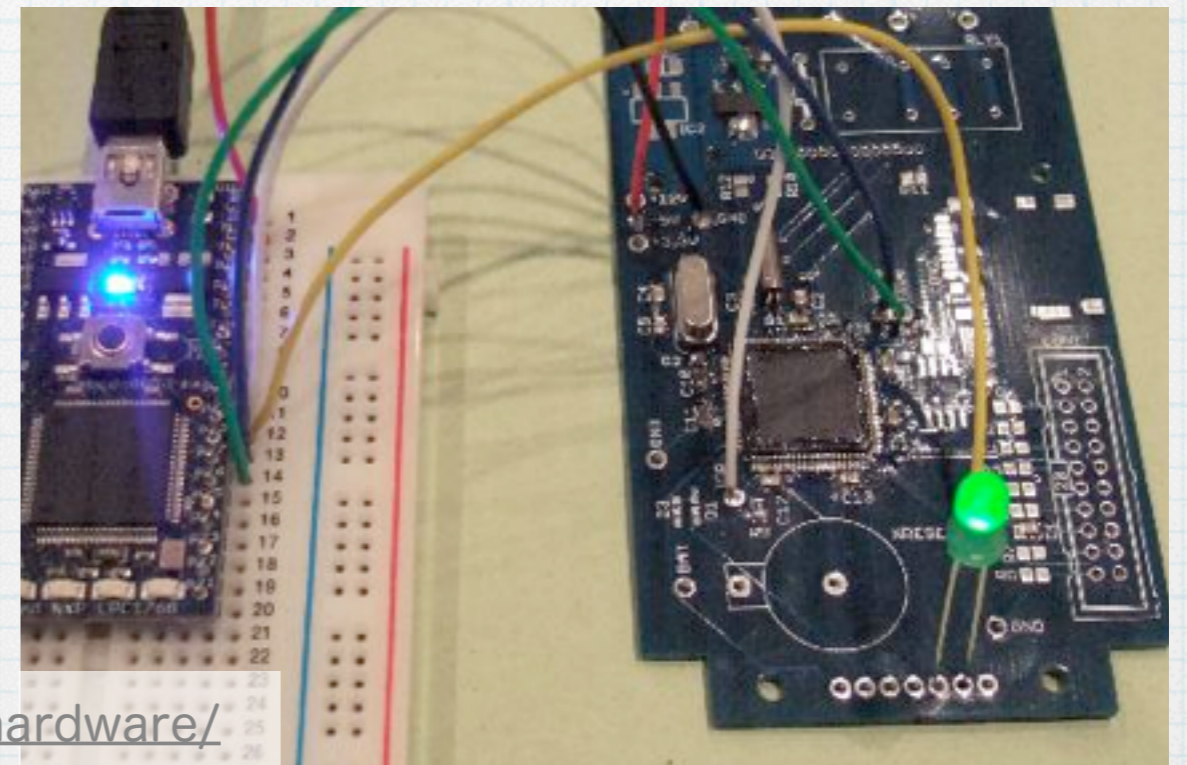
ハードウェア

たとえば...



LPCXpresso LPC1768 / 1769

<http://mbed.org/users/nxpfan/notebook/mbed-led-blink-code-on-lpcxpresso-lpc1768/#japanese>



mbed teamのクリスさんの例...

<http://mbed.org/users/chris/notebook/prototype-to-hardware/>

ハードウェア

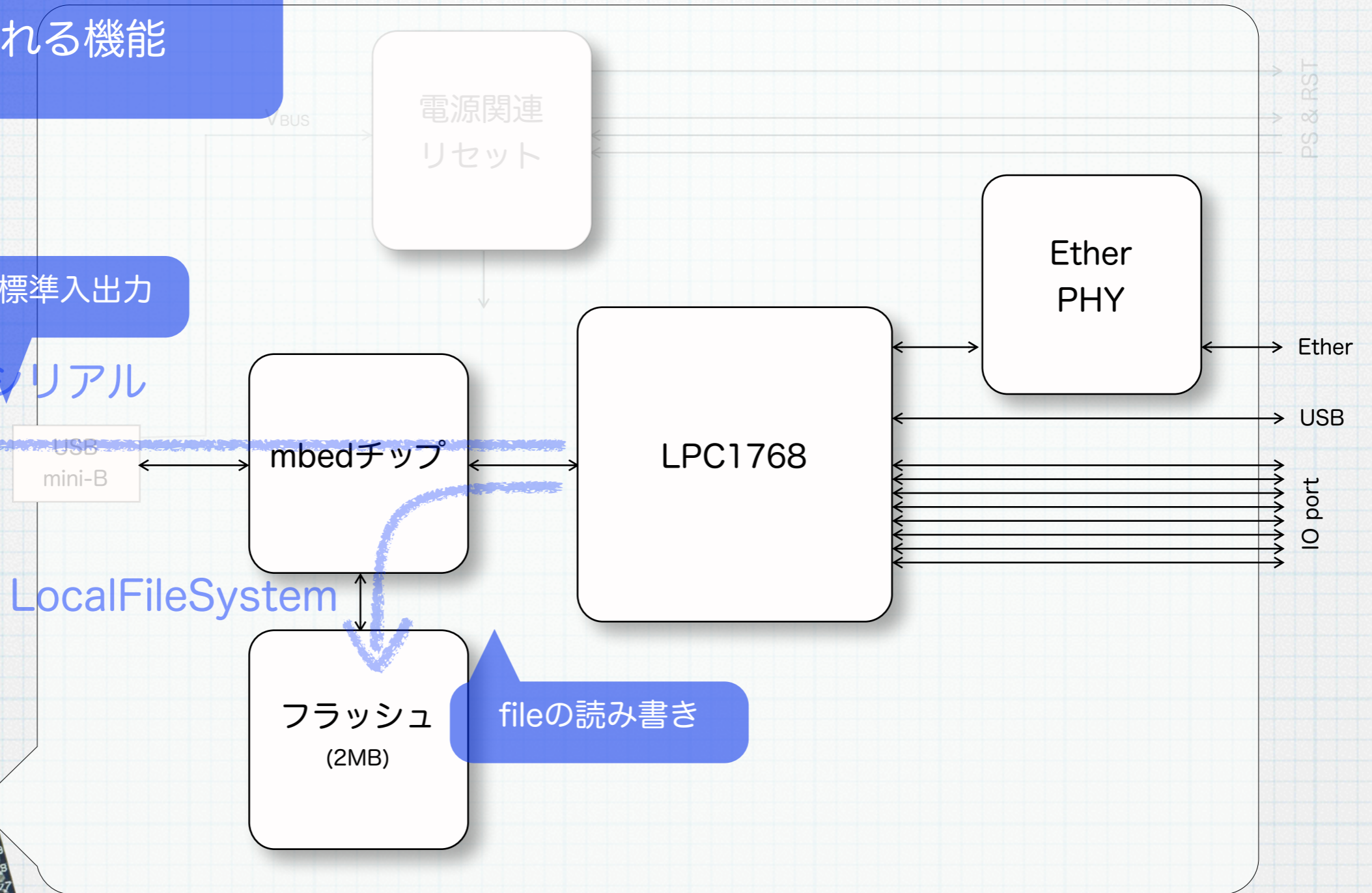
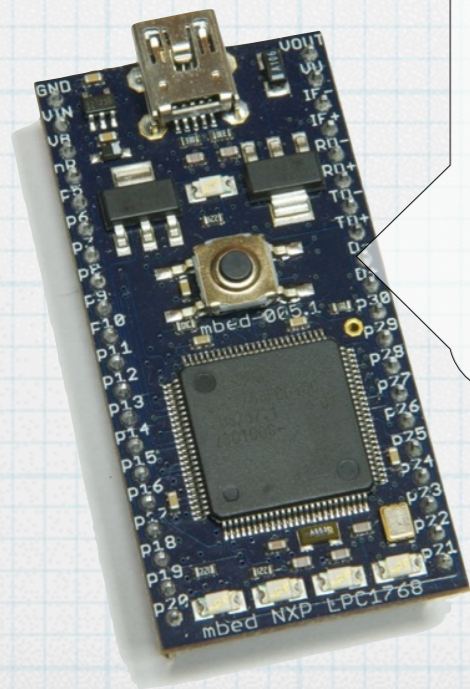
mbedチップを利用して
実現される機能

printf/scanf等の標準入出力

USBシリアル

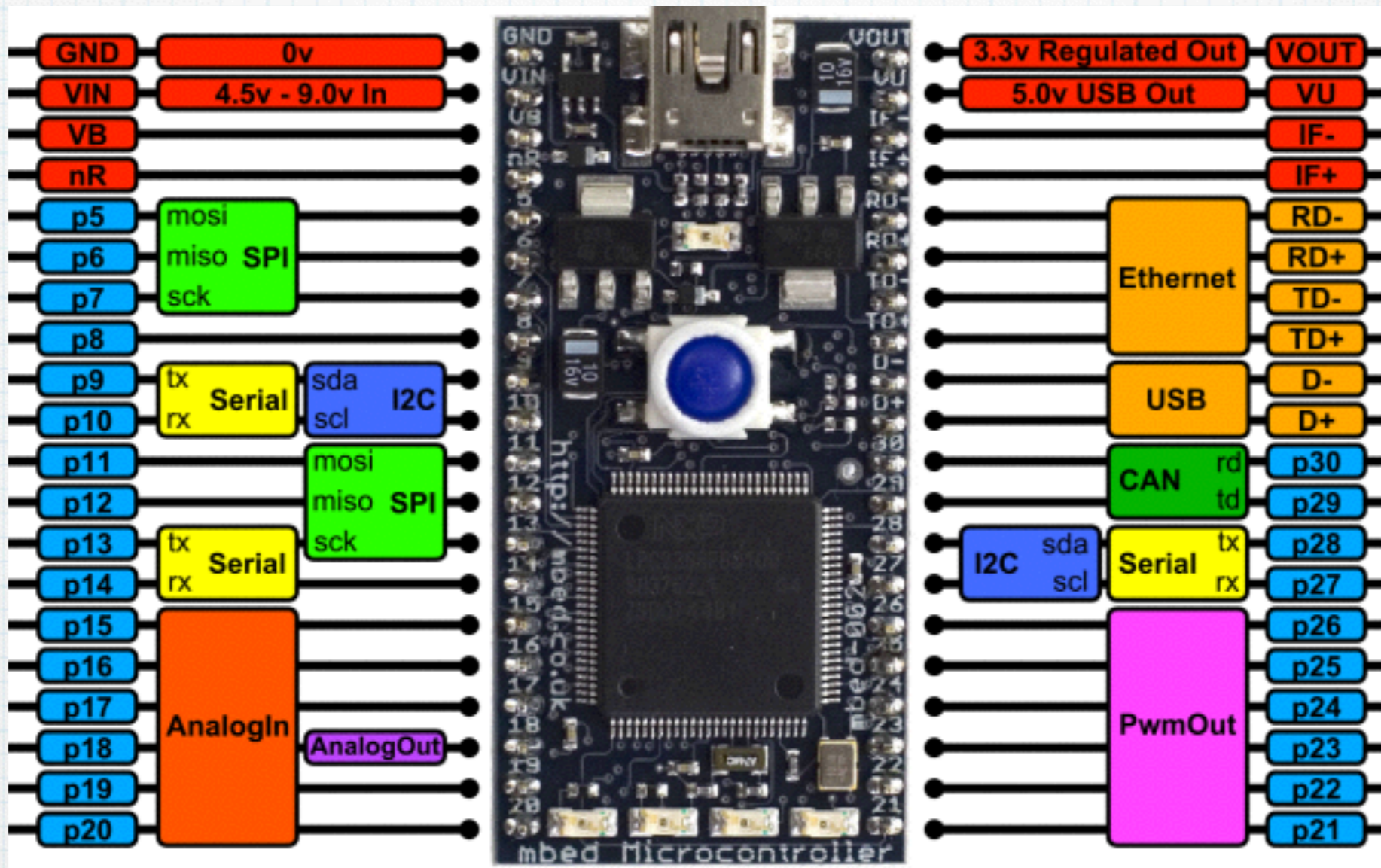
LocalFileSystem

fileの読み書き



ハードウェア

mbedのピン配置(リファレンスカード)

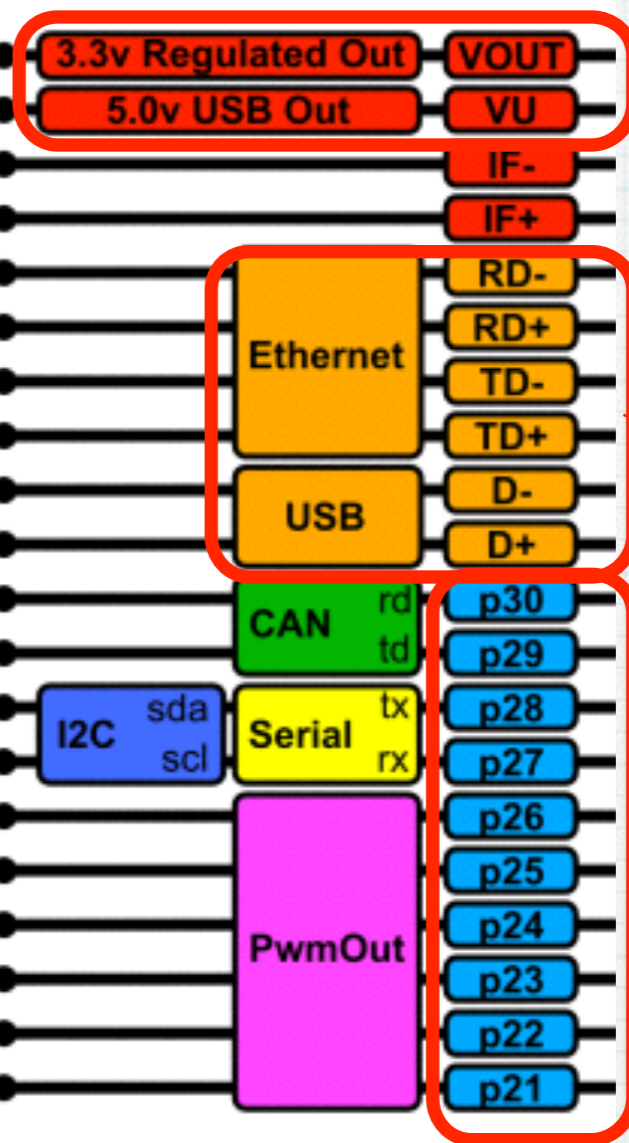
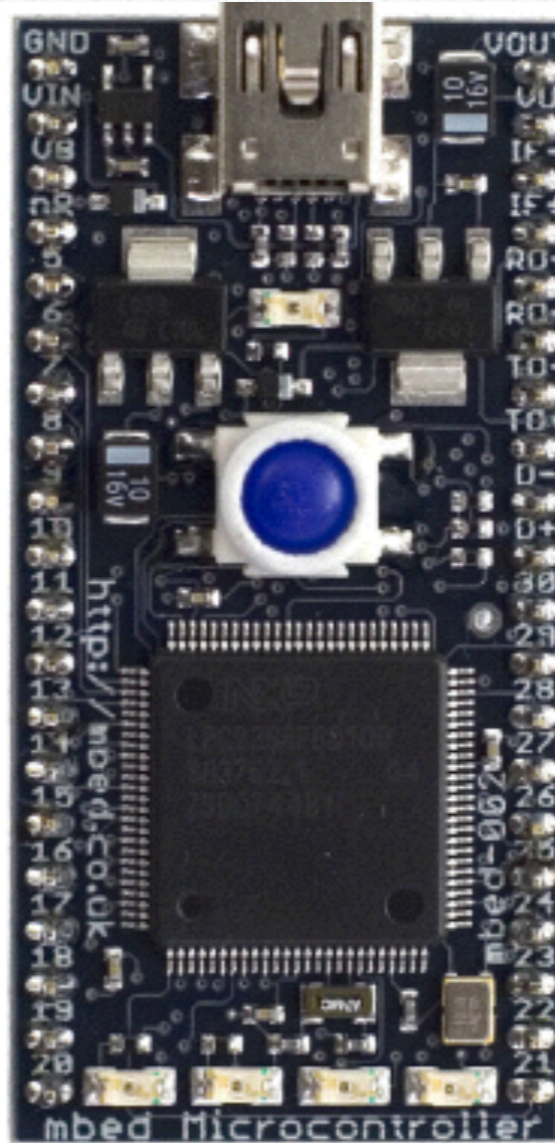
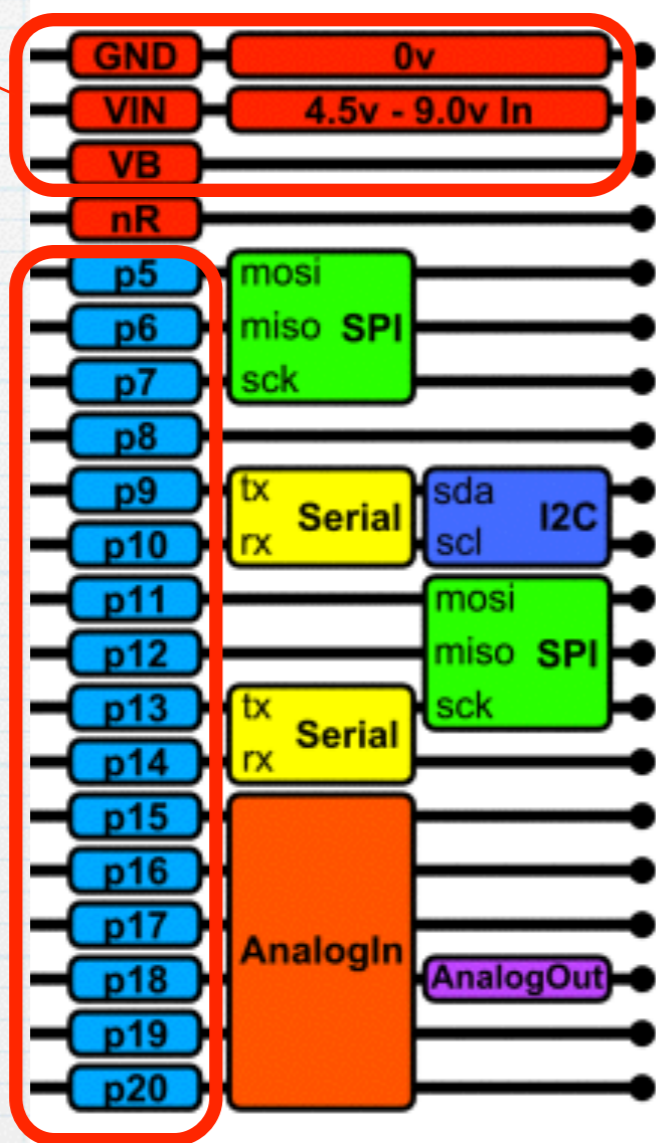


この図は、mbedと同梱のカードやwebサイト <http://mbed.org/nxp/lpc1768/quick-reference/> にあります。

ハードウェア

mbedのピン配置(リファレンスカード)

電源ピン



電源出力ピン

専用IOピン

汎用デジタルIOピン

内側に書かれてある機能と切替できます

ハードウェア

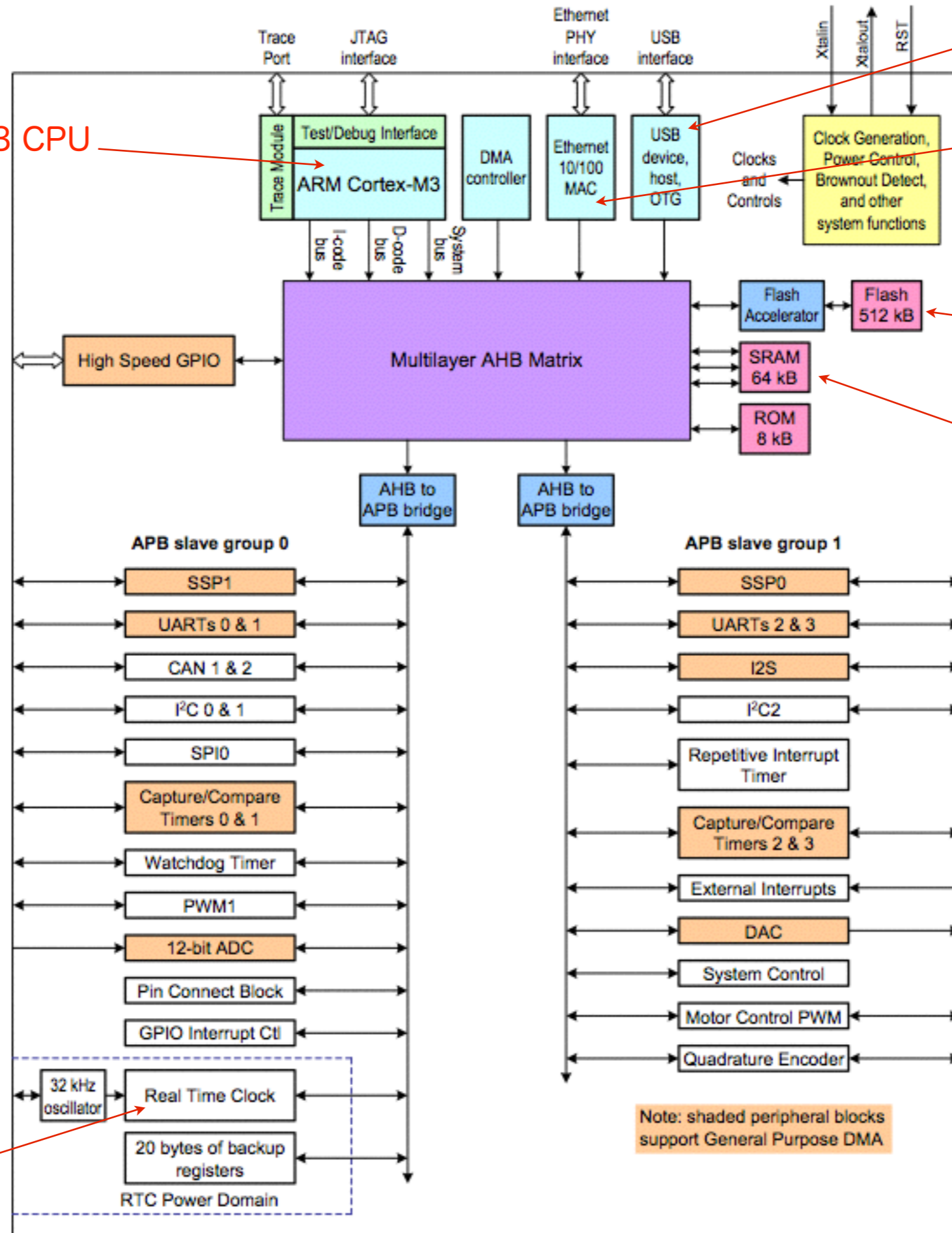
mbedのピン配置(リファレンスカード)



ペリフェラル・チップへの給電に

- ❖ VOUTはmbed上のレギュレータを介した3.3Vの電源
- ❖ VUはUSBコネクタから給電している際の5V出力
- ❖ デジタルIOピンは「5Vトレラント入力」

ARM Cortex-M3 CPU
Clock = 96MHz



USBホスト/デバイス(OTG)

イーサネットMAC

フラッシュメモリ:
512KB

SRAM : 64KB

RTC

LPC1768ブロック図

❖ mbedのオリジナル・プラットフォーム：最初の2つの青と黄のmbed以外は， mbed-HDKと呼ばれる公開仕様に則って作られています

❖ HDK仕様のmbedには「ローカルストレージ」と呼ばれるフラッシュ・メモリがありません

❖ HDKでは， D&D書き込みの際， ターゲットチップのフラッシュメモリへの書き込みがそのまま実行されます

<http://developer.mbed.org/handbook/mbed-HDK>

The screenshot shows the ARM mbed developer website. The top navigation bar includes 'Platforms', 'Components', 'Handbook', 'Cookbook', 'Code', 'Questions', and 'For'. The main heading is 'ARM mbed' with a search bar. Below it, the page title is 'Handbook » mbed HDK'. The main content area is titled 'mbed HDK' and contains several paragraphs of text. A sidebar on the right has a 'Table of Contents' with links to '1. Microcontroller systems', '2. CMSIS-DAP', '3. Benefits', and '4. Source'. A callout box titled 'Creating your own mbed-enabled platforms' contains text about creating a custom platform. Below this is a section titled 'Microcontroller Sub-systems' with a list of components and a diagram of an evaluation board. The diagram shows an 'Evaluation Board' with a 'Reset' button, 'USB' port, and 'Target Power' input. It features an 'Onboard interface' connected to a 'Target MCU' via 'SWD' and 'UART' lines. The 'Target MCU' is surrounded by several 'peripheral' blocks. Below the diagram is a section titled 'CMSIS-DAP interface' with text describing the interface and its benefits.

developer.mbed.org

Platforms Components **Handbook** Cookbook Code Questions For

ARM mbed™ Search mbed.org...

Handbook » mbed HDK

mbed HDK

The mbed Hardware Development Kit (HDK) provides full microcontroller sub-system design files and firmware for building development boards and custom products that benefit from the native support of the mbed SDK and free mbed Online Compiler and mbed Developer Platform.

The mbed HDK specifies all support components and circuits including the CMSIS-DAP Interface design that provides simple USB drag-n-drop programming and CMSIS-DAP debug interface for the target microcontroller.

Development boards that are already based on the mbed HDK are the quickest way to get started with the mbed platform. We manufacture official mbed Microcontroller modules that are specifically optimised for flexible rapid prototyping, and are available from distributors worldwide. Our partners are now also creating new hardware such as ultra low-cost ARM evaluation boards in the popular Arduino form-factor.

Creating your own mbed-enabled platforms

Are you a hardware company that would like to create an mbed-enabled platform of your own that is supported within the platforms database and tools? If so, then please email us at support@mbed.org and we can help you with your questions you through the process.

Microcontroller Sub-systems

Each of the subsystems designs include

- Hardware design schematics (Eagle format)
- Interface binary for the CMSIS-DAP interface

An example of how a microcontroller sub-system might be used to build an evaluation board.

The diagram illustrates an evaluation board. On the left, there is a 'Reset' button, a 'USB' port, and 'Target Power' input. These are connected to an 'Onboard interface' block. The 'Onboard interface' is connected to a 'Target MCU' block via 'SWD' and 'UART' lines. The 'Target MCU' is surrounded by several 'peripheral' blocks, which are also connected to the 'Onboard interface'.

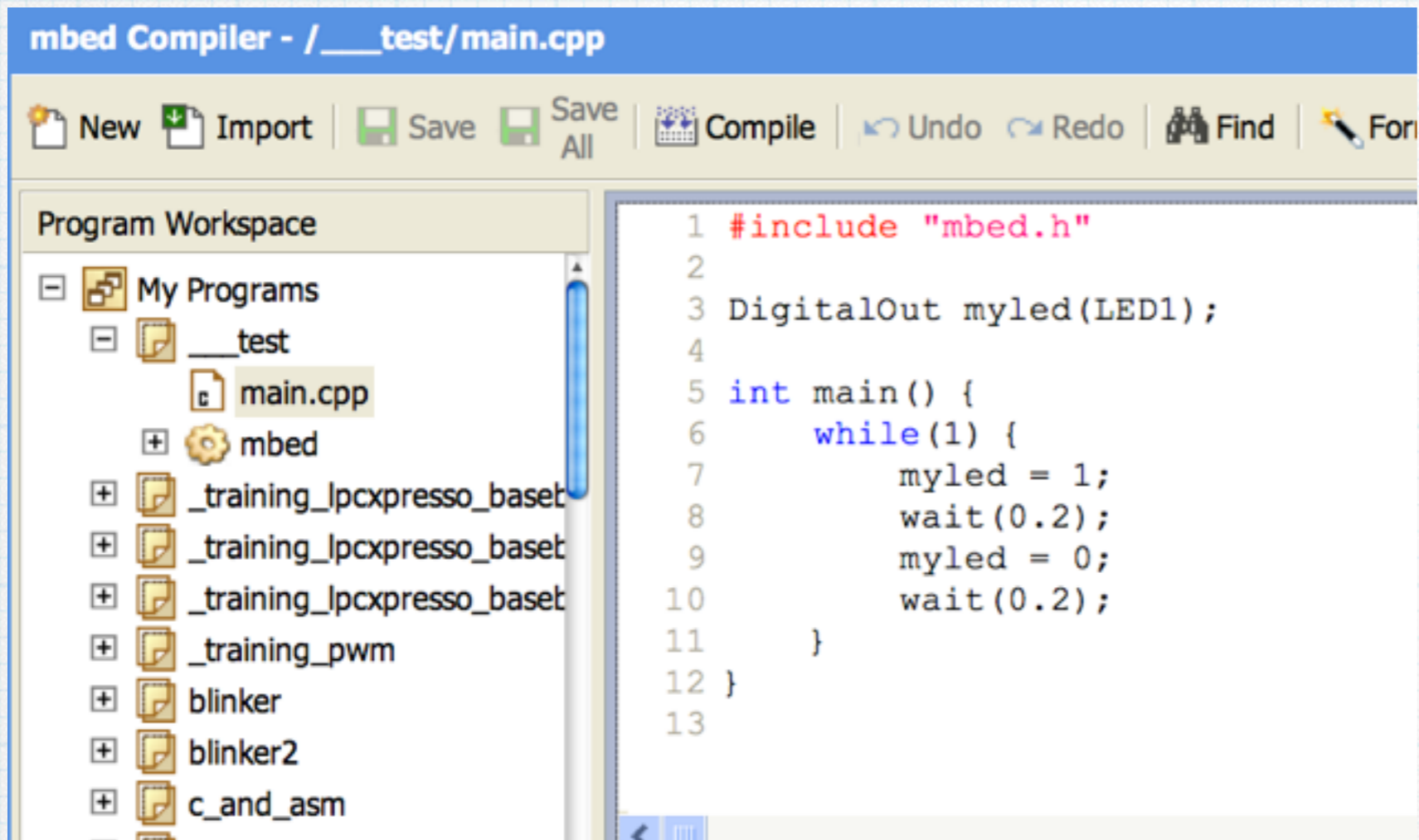
CMSIS-DAP interface

The CMSIS-DAP Interface is a microcontroller based single chip solution that provides, Drag and Drop programming, CMSIS-DAP debugger and USB serial interface to a range of Cortex-M based microcontrollers.

The small footprint, low number of passive components and rich feature set provide a low cost, low overhead solution that can be integrated on a PCB.

The firmware required to turn the low cost microcontroller into a powerful programming, debug and communication interface with the HDK and can be used freely, including for use in commercial products.

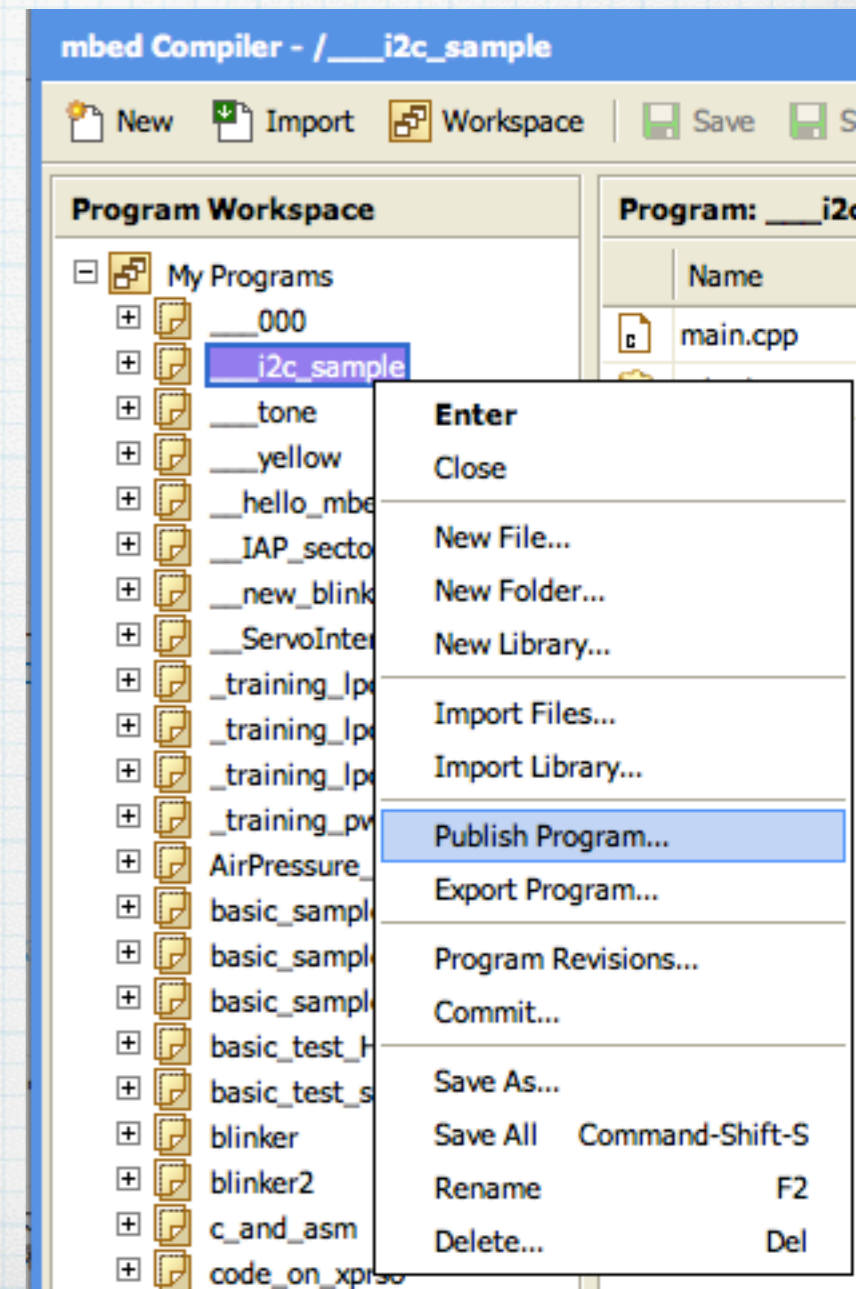
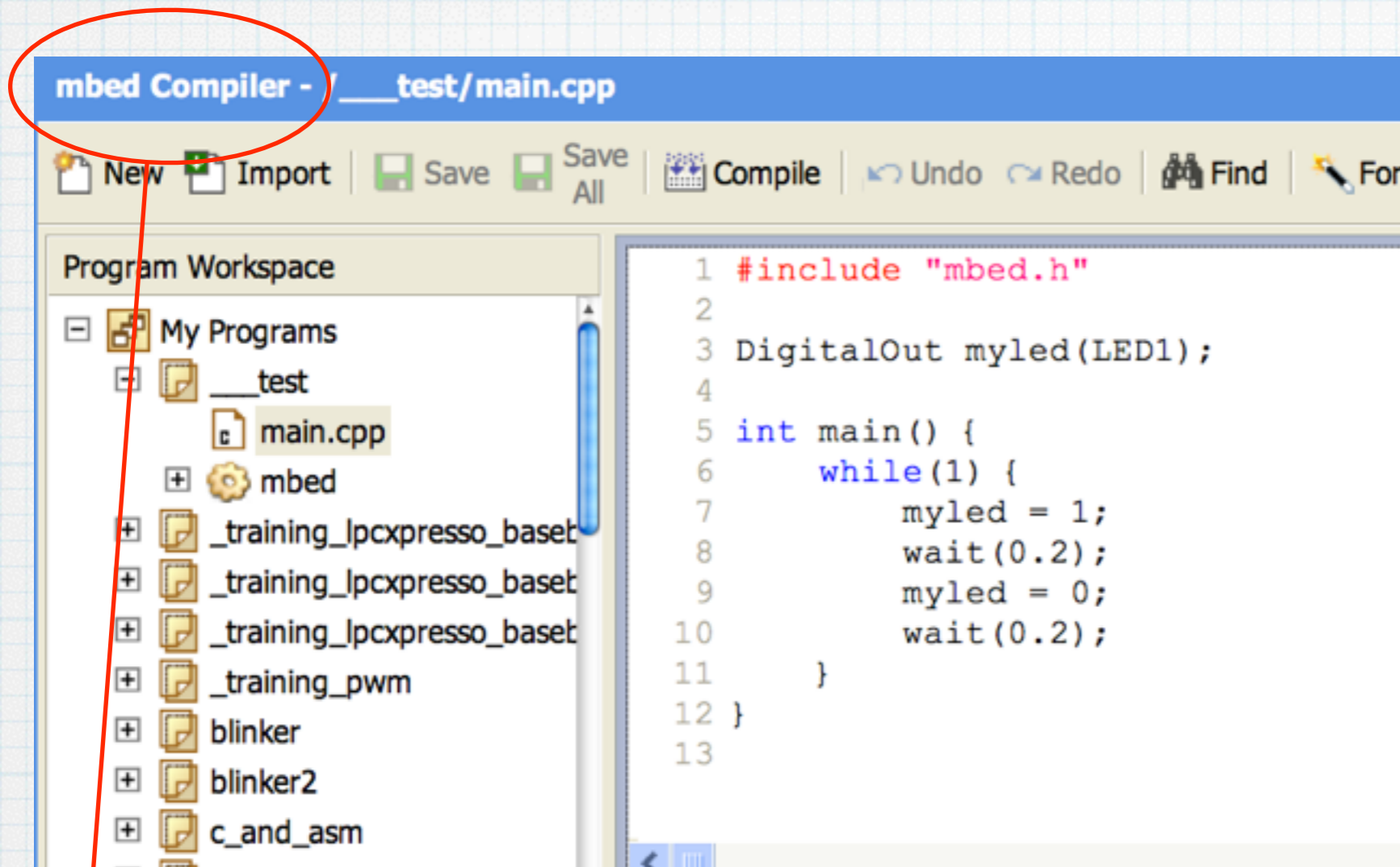
ソフトウェア



The screenshot shows the mbed Compiler IDE interface. The title bar reads "mbed Compiler - /__test/main.cpp". The menu bar includes "New", "Import", "Save", "Save All", "Compile", "Undo", "Redo", "Find", and "For". The "Program Workspace" on the left lists "My Programs" with sub-items: "__test" (containing "main.cpp" and "mbed"), and several "_training_lpcpresso_baset" and "_training_pwm" folders, along with "blinker", "blinker2", and "c_and_asm". The main editor displays the following C++ code:

```
1 #include "mbed.h"
2
3 DigitalOut myled(LED1);
4
5 int main() {
6     while(1) {
7         myled = 1;
8         wait(0.2);
9         myled = 0;
10        wait(0.2);
11    }
12 }
13
```


ソフトウェア



❖ オンライン・コンパイラ

- ▶ Webにブラウザ上で提供されるIDE
- ▶ Webブラウズ環境があればどこでも開発できる
- ▶ コンパイルした実行コードをダウンロードして使う
- ▶ **RealView4を搭載(RVDS4.1)**
- ▶ ライブラリのアップデートなどもすべてweb上で
- ▶ 自分のコードを公開，共有できる

ソフトウェア

mbed

Beta test the new mbed.org

Blog | Forum | Handbook | Cookbook | Code |

Users » okano » Published programs » ___i2c_sample

___i2c_sample

Import this program Edit Delete

Published moments ago, by Tedd OKANO No tags

いいね!

Summary Code & API History

Summary of ___i2c_sample

Embed: `<<program /users/okano/programs/___i2c_` (wiki syntax)

Description

I2C transfer sample

This item is unlisted.

As the owner of the item, only you will see it listed on mbed.org and others will not be able to access it if they do not know the URL.

How to get this program

Import this program

Open this program in the mbed Compiler, where you can edit it and compile it for your hardware.

Download as .zip

Download this program as .zip file.

Code

main.cpp [code]

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mbed, the fastest way to prototype with ARM based microcontrollers.

Compiler - /___i2c_sample

new Import Workspace Save S

Program Workspace

My Programs

___000

___i2c_sample

___tone

___yellow

___hello_mbe

___IAP_secto

___new_blink

___ServoInter

___training_lpe

___training_lpe

___training_lpe

___training_lpe

___training_lpe

AirPressure_

basic_sampl

basic_sampl

basic_sampl

basic_test_H

basic_test_s

blinker

blinker2

c_and_asm

code_on_xpr

Program: ___i2c

Name

main.cpp

Enter

Close

New File...

New Folder...

New Library...

Import Files...

Import Library...

Publish Program...

Export Program...

Program Revisions...

Commit...

Save As...

Save All Command-Shift-S

Rename F2

Delete... Del

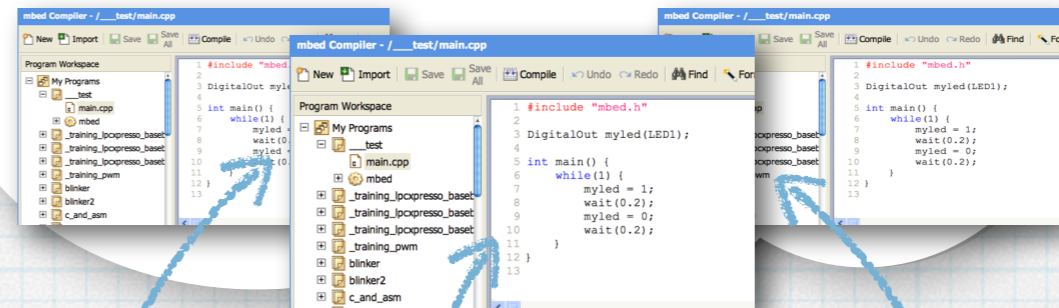
自分のコードを公開，共有できる

ソフトウェア

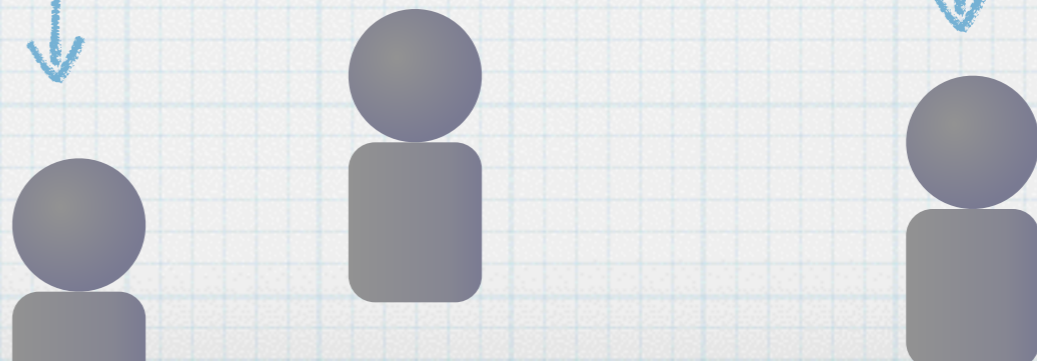
オンライン・コンパイラ

- ▶ セットアップ(インストール/アップデート)の必要なし
- ▶ どこでも同じ環境が使える
- ▶ 全てのユーザが同じ環境を使う→同じ結果が得られる

オンライン・コンパイラ



どこからでも同じ環境が使える

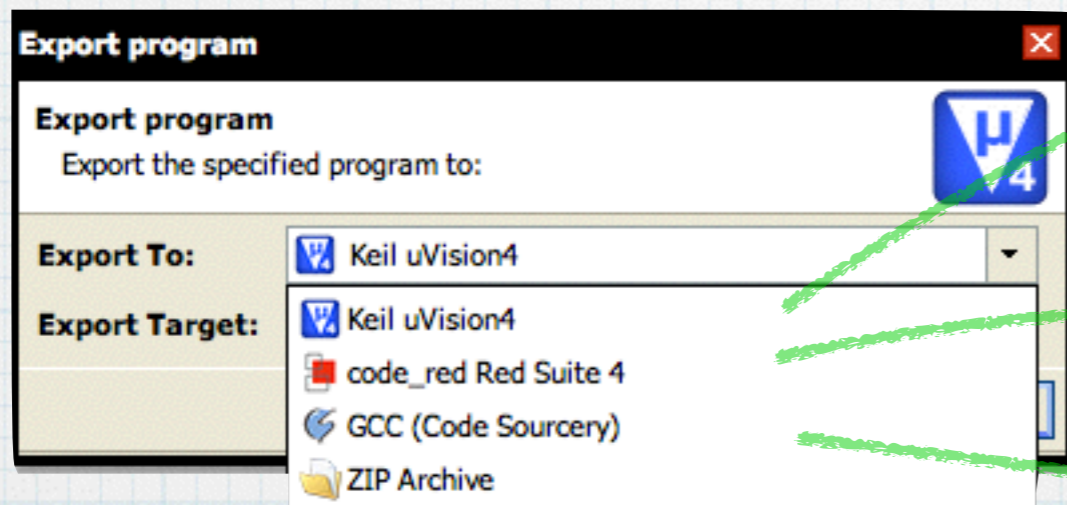


ソフトウェア

オフライン・コンパイラ

- ▶ **Export**すれば**オフライン・ツール**でもビルドできます

CMSIS-DAPを使った
デバッグサポートも！



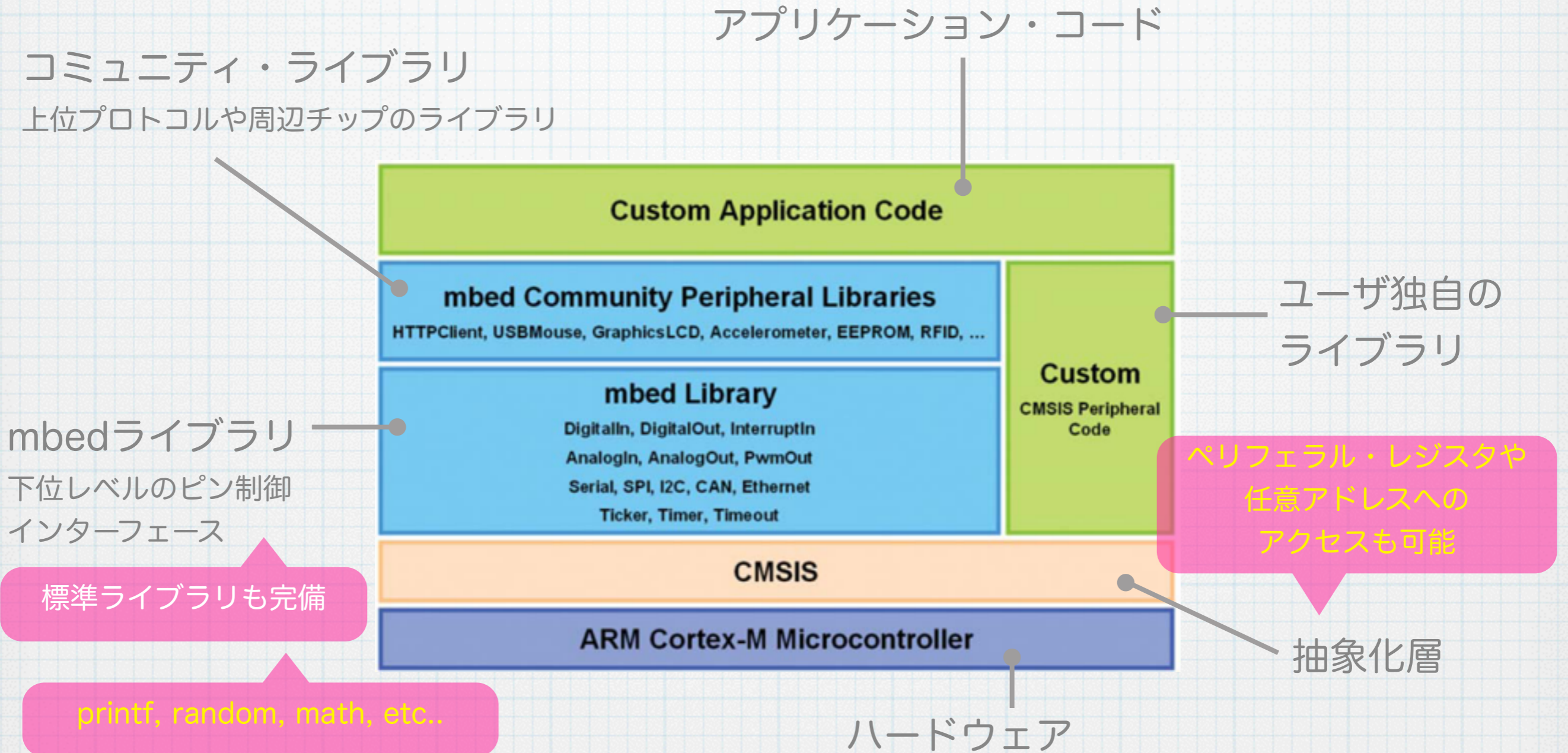
ソフトウェア

```
mbd Compiler - /__test/main.cpp
New Import Save Save All Compile Undo Redo Find For
Program Workspace
My Programs
  __test
    main.cpp
    mbed
  _training_lpcpresso_baset
  _training_lpcpresso_baset
  _training_lpcpresso_baset
  _training_pwm
  blinker
  blinker2
  c_and_asm
1 #include "mbed.h"
2
3 DigitalOut myled(LED1);
4
5 int main() {
6     while(1) {
7         myled = 1;
8         wait(0.2);
9         myled = 0;
10        wait(0.2);
11    }
12 }
13
```

充実したライブラリ

- ▶ C++のクラスとして実装されたインターフェース
- ▶ 高度に抽象化
- ▶ 分かりやすいAPI定義
- ▶ さらに...
ユーザ・コミュニティで提供された各種高レベル・ライブラリ

ソフトウェア ライブラリ



ソフトウェア

コードのインポート：
サンプルコードを
試してみるのもかんたん！

The screenshot shows the mbed.org website interface. At the top, there are navigation links for Handbook, Cookbook, Code, Questions, and Forum. The main header includes the mbed logo, a search bar, and user information for 'okano'. Below the header, the breadcrumb trail reads 'Users » npx_ip » Code » __collab_test'. The repository name 'NXP / __collab_test' is prominently displayed. A blue button labeled 'Import this program' is circled in red. Below it, there is an 'Embed' field with a code snippet: '<<program /users/npx_ip/code/__/collab_test'.

The 'Import Program' dialog box is shown. It contains the following fields and options:

- Source URL:** `http://mbed.org/users/npx_ip/code/__/collab_test/`
- Import As:** Program Library
- Import Name:** `__collab_test`

The 'Import' button at the bottom is circled in red. A red arrow points from this button towards the mbed Compiler window.

The mbed Compiler interface is shown. The 'Program Workspace' on the left displays a tree view with 'My Programs' containing the imported project '.__collab_test', which includes 'main.cpp' and 'mbed'. The right panel shows the details for 'Program: __collab_test' with a table of files:

Name	Size	Type
main.cpp	0.2 kB	Source File
mbed		Precompiled

ソフトウェア

mbed Compiler - /PCU9669_pca9629

New Import Save Save All Compile Commit Revisions Format mbed NXP LPC1768 Guide

Program Workspace

- My Programs
 - 5_motors_by_PCA9554
 - __TextLCD_HelloWorld
 - __collab_test
 - main.cpp
 - mbed
 - __new_blinker
 - __training_lpcpresso_baseb
 - c_and_asm
 - DKM_TextLCD_LM35
 - DKM_TextLCD_LM35_2
 - FFT
 - Filesystem_SD
 - GPIO_clocking
 - hello_world
 - I2C_FmPlus_Hello
 - i2c_sample
 - IAP_11U24_test
 - IAP_internal_flash_write
 - LED_Cube444_mbeduino-ver
 - LED_Cube444_mbeduino_de
 - MARMEX_OB_oled__HelloW
 - mini_board_PCU9663_functi
 - mini_board_PCU9669_16sla
 - mini_board_PCU9669_demo
 - mini_board_PCU9669_PCA9
 - mini_board_PCU9669_WinI2
 - NXP_PCA9626_demo
 - NXP_PCA9629
 - NXP_PCF2127A
 - NXP_PCF85063
 - PCA9532_PCA9552
 - PCA9629
 - PCA9629_demo
 - PCA9629_Hello
 - PCA9629_16-16-2_mbeduino

Revision History

Revisions of "PCU9669_pca9629"

Commit Discard Changes Compare Switch Revert Merge

Graph	Revision	When	Who	Comment
	25+	now		Working set (uncommitted changes)...
	25	21 Dec 2011	okano	default tip for PCA9655 comparison
	24	20 Dec 2011	okano	for comparison with PCA9665
	23	02 Dec 2011	okano	default *** SLAVE DEVICE\ S REGISTER POLLING
	22	02 Dec 2011	okano	default buffer pointer increment test
	21	02 Dec 2011	okano	bus error test
	20	02 Dec 2011	okano	transfer length test for publish
	19	01 Dec 2011	okano	transfer length test
	18	01 Dec 2011	okano	small modification to test personal question
	17	30 Nov 2011	okano	for demo (beta)
	16	30 Nov 2011	okano	BYTECOUNT demo implemented
	15	30 Nov 2011	okano	status monitoring by auto-polling
	14	30 Nov 2011	okano	error monitoring for each transactions
	13	30 Nov 2011	okano	error handling added, just showing list of channels
	12	30 Nov 2011	okano	compile switch for waveform monitoring for logic
	11	30 Nov 2011	okano	
	10	30 Nov 2011	okano	
	9	29 Nov 2011	okano	
	8	29 Nov 2011	okano	
	7	28 Nov 2011	okano	
	6	28 Nov 2011	okano	comment corrected

Revision 25+ (uncommitted)

Comment	Working Set
When	now
Date	now
Files changed	3
Lines changed	9

Revision log

All Changes

- main.cpp
- mbed.bld
- mbed.lib

No longer related to [okano/code/PCU9669_pca9629/](#) Incoming: n/a Outgoing: n/a

Update Update From... Publish Changes

リビジョン管理機能も

ソフトウェア

mbed

Blog | Forum | Questions | Handbook | Cookbook | Code | M

Logged in as

Users » okano » Code » __collab_test2



Tedd OKANO / [__collab_test2](#)

Import this program

Follow

Last commit 11 7月 2012 , 72 views

Description: modified project by other user

[Home](#) [History](#) [Graph](#) [API Documentation](#) [Wiki](#) [Admin](#)

Revision graph

12:2795d0cb19c5	mbed lib updated : rev40	default tip	11 7月 2012 , by Tedd OKANO
11:743c0c03cb76	just pulled from mr.ytsuboi and add this line and publishing again		09 6月 2012 , by Tedd OKANO
10:dfd571493c66	change wait from 1.0 to 0.5		09 6月 2012 , by Yoshihiro TSUBOI
9:dd2089ab7029	test 9		09 6月 2012 , by Tedd OKANO
8:3c9ab61912f1	ct 05		09 6月 2012 , by InetfaceProducts NXP
7:2ff2752fe534	test 3		09 6月 2012 , by Tedd OKANO
6:e7484c826f75	test 3		09 6月 2012 , by Tedd OKANO
5:2ccbf6d5d336	test 2		09 6月 2012 , by Tedd OKANO
4:0e5ac8240bb0	test 1		09 6月 2012 , by Tedd OKANO
3:5d42ca9632ba	ct 01		09 6月 2012 , by Tedd OKANO
2:08342de867c7	ct 00		09 6月 2012 , by Tedd OKANO
1:90119b064e7a	ct 0		09 6月 2012 , by Tedd OKANO
0:0e25a3e84b78	test project for collab		09 6月 2012 , by InetfaceProducts NXP

コラボレーション機能も

Format

mbed NXP LPC1768 | Guide

Revision 25+ (uncommitted)

Comment	Working Set
When	now
Date	now
Files changed	3
Lines changed	9

Revision log

All Changes

main.cpp	
mbed.bld	
mbed.lib	

PCA9629

PCA9629_demo

PCA9629_Hello

No longer related to [okano/code/PCU9669_pca9629/](#)

Incoming: n/a

Outgoing: n/a

Update Update From... Publish Changes

さらに...


mbed.orgサイトを使って

コミュニティの活用

The screenshot shows the mbed.org website interface. The top navigation bar includes links for Blog, Forum, Handbook, Cookbook, and Notebooks. The main content area displays a 'Welcome to mbed!' message and a user's notebook page titled 'タッチパネル付きカラー液晶' (Color LCD with Touch Panel). The notebook page includes a pin function table for the LPC1768 microcontroller and a photograph of the hardware setup.

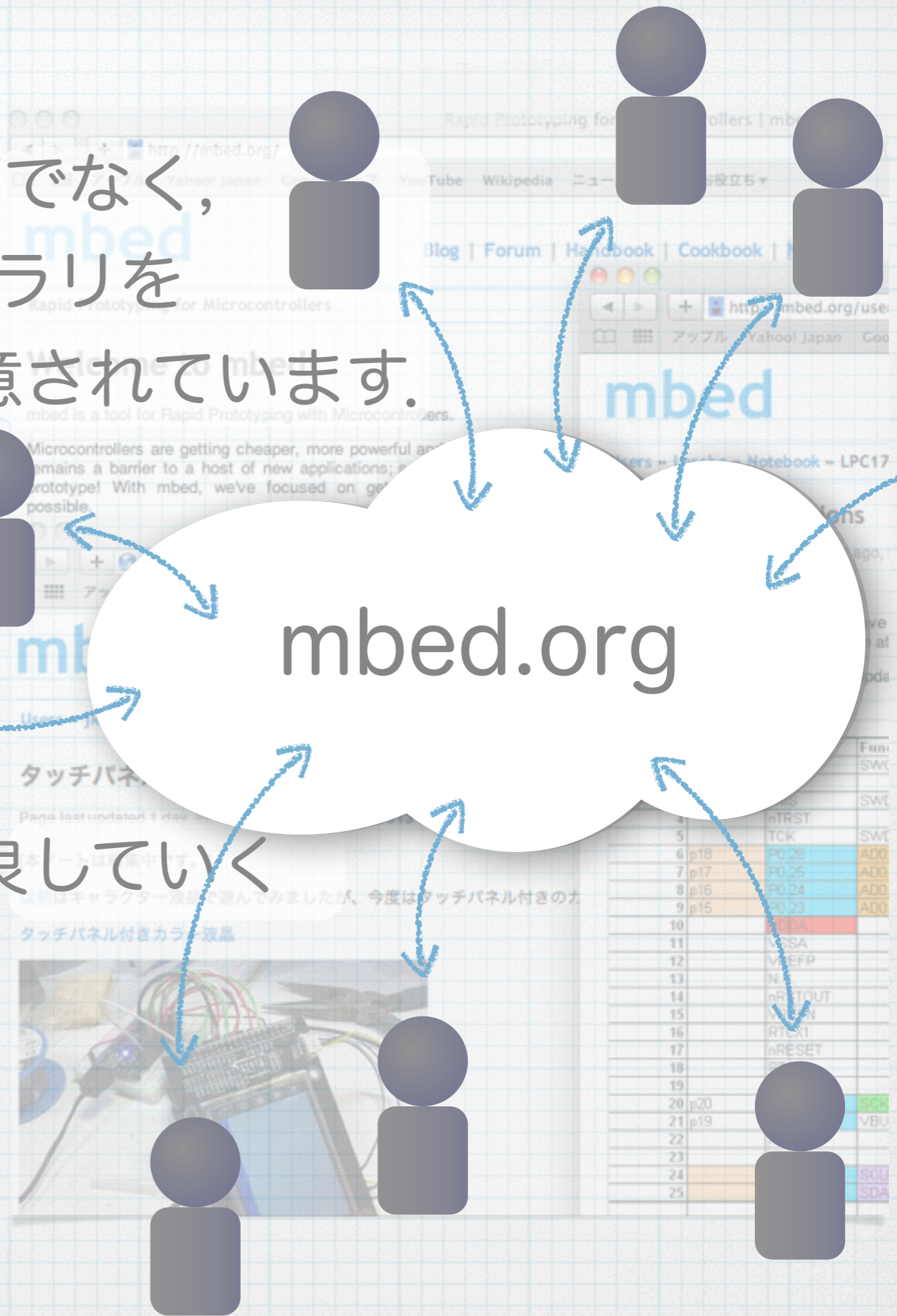
LPC1768 Pin functions

Pin	mbed Pin	Func 1	Func 2
1		TDO	SWDIO
2		TDI	
3		TMS	SWCLK
4		nTRST	
5		TCK	SWDIO
6	p18	P0_26	AD0
7	p17	P0_25	AD0
8	p16	P0_24	AD0
9	p15	P0_23	AD0
10		VDDA	
11		VSSA	
12		VREFP	
13		N.C.	
14		nRSTOUT	
15		VREFN	
16		RTCX1	
17		nRESET	
18		RTCX2	
19		VBAT	
20	p20	P1_31	SC1
21	p19	P1_30	VBU
22		XTAL1	
23		XTAL2	
24		P0_28	SC1
25		P0_27	SDA



mbed.orgにはコンパイラだけでなく、
フォーラムやサンプル/ライブラリを
公開して共有する仕組みが用意されています。

自分の作ったコードを公開し、
みんなの意見を求め、より改良していく
ことも簡単にできます



mbed.orgサイトは
日本語にも対応。

言語や情報のレベルに関係なく、
共有が歓迎されています。

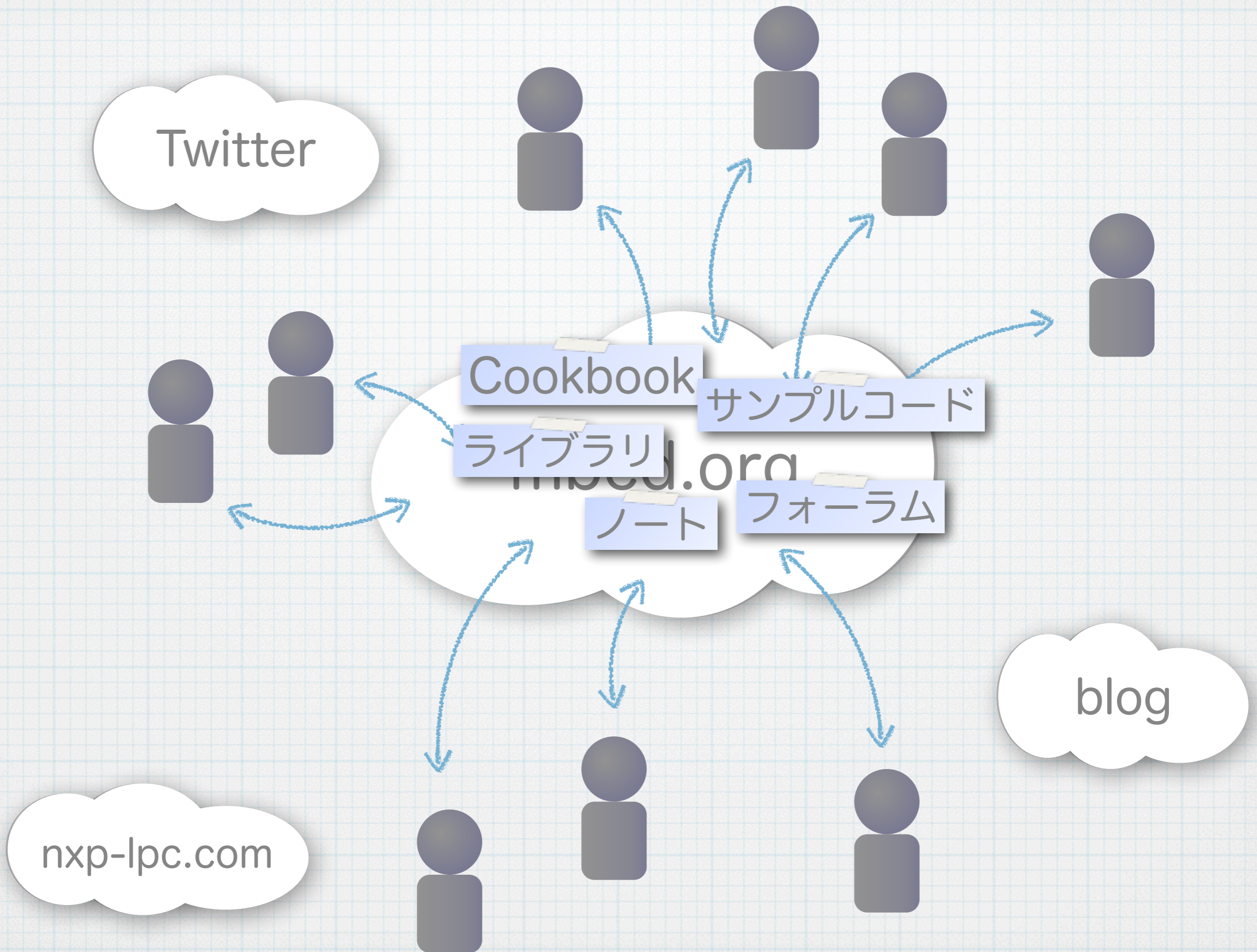
フォーラムではC言語の
初心者に対する親切な回答も。
mbedだけでなく関連技術を学ぶ
良い場が提供されています。

The image shows a screenshot of the mbed.org website. The main page displays a welcome message and a user's notebook page titled "タッチパネル付きカラー液晶" (Touch panel color LCD). The notebook page includes a table of pin functions for the LPC1768 microcontroller. A blue circle highlights the notebook title in the breadcrumb navigation.

Pin Function Table:

Pin	mbed Pin	Func 1	Func 2
1		TD0	SW0
2		TDI	
3		TMS	SW1
4		nTRST	
5		TCK	SW2
6	p18	PO_26	AD0
7	p17	PO_25	AD0
8	p16	PO_24	AD0
9	p15	PO_23	AD0
10		VDDA	
11		VSSA	
12		VREFP	
13		N.C.	
14		nRSTOUT	
15		VREFN	
16		RTCX1	
17		nRESET	
18		RTCX2	
19		VBAT	
20	p20	P1_31	SC0
21	p19	P1_30	VBU
22		XTAL1	
23		XTAL2	
24		PO_28	SC1
25		PO_27	SDA

The photograph shows a microcontroller board with a color LCD screen. The board is connected to various wires, and a USB cable is plugged into it. The LCD screen displays some text, and the board is surrounded by other components like a breadboard and a power supply.



Twitter

Cookbook

サンプルコード

ライブラリ

imbed.org

ノート

フォーラム

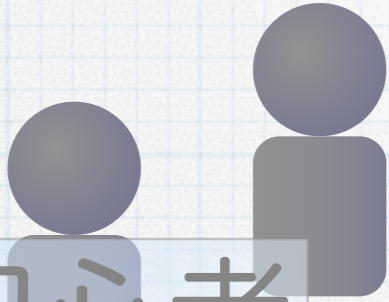
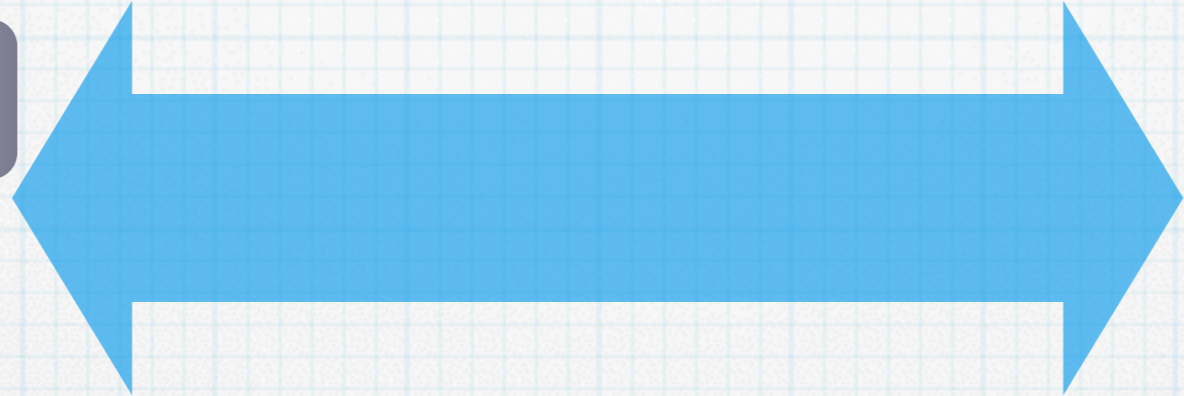
blog

nxp-lpc.com

まとめ

初心者

現場のプロ



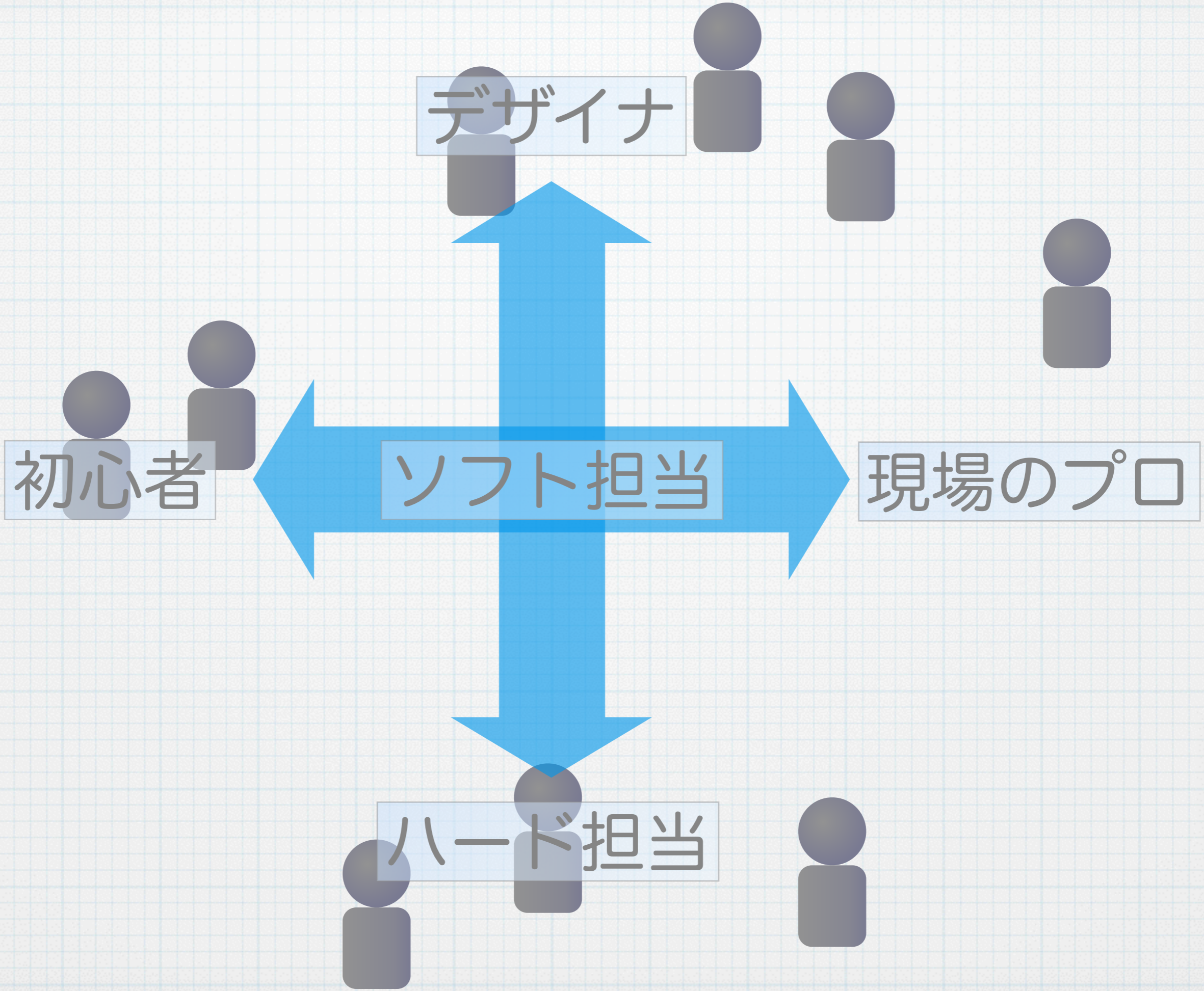
初心者

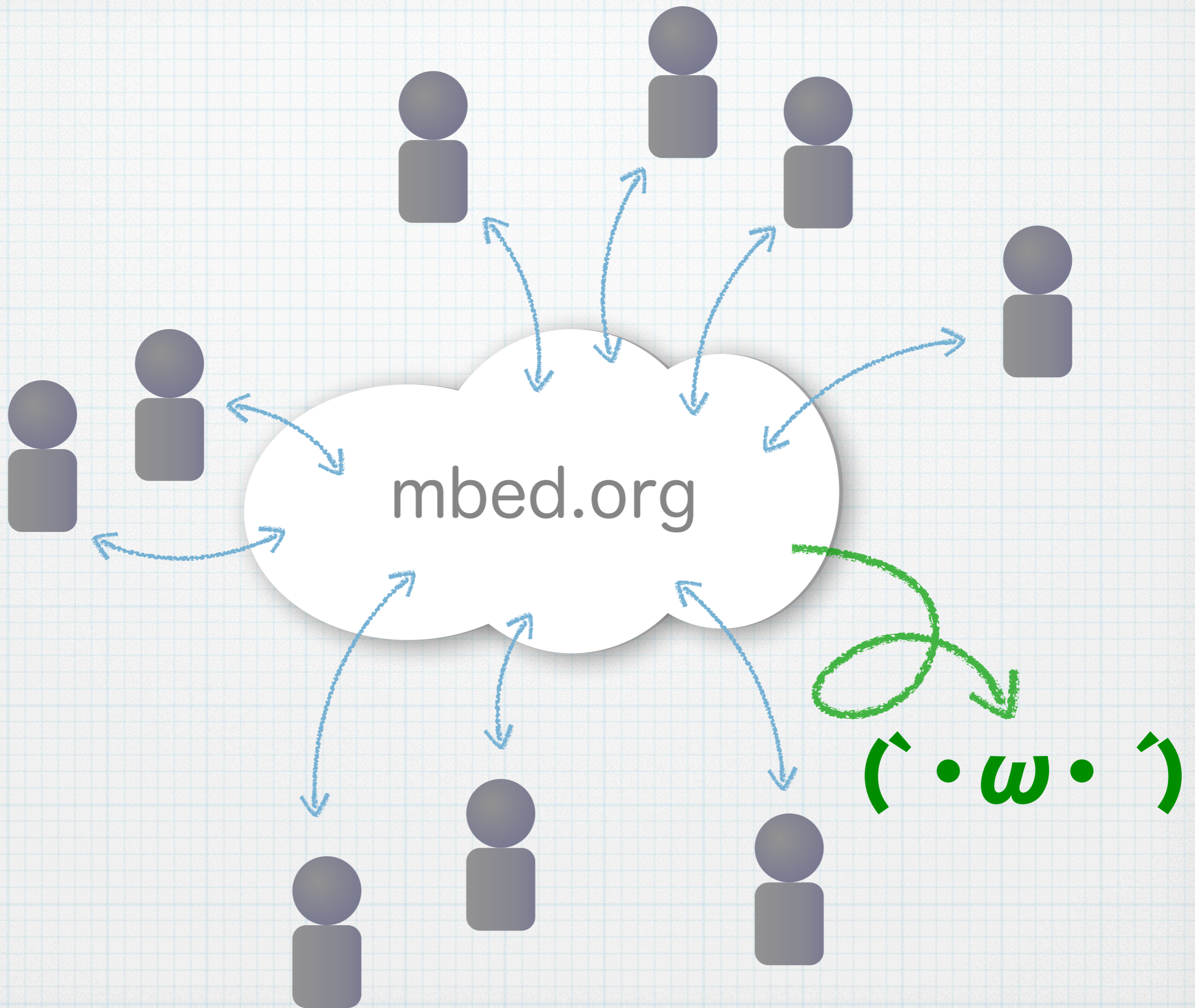
ソフト担当

現場のプロ

デザイナー

ハード担当





まとめ

❖ mbedは...

▶ 幅広いユーザーに

- 初心者, 初めてマイコンを学ぶ人から組込開発の現場まで
- ソフト担当, ハード担当, デザイナー, あらゆる人に

▶ 情報の共有で

- コミュニティの力を借りて, 自分の問題に集中
- スピードをさらに加速
- 「試作 - フィードバック - 改良」の繰り返しでより良いゴールへ

▶ スピード開発

- 機能するものをいち早く作る. 成功への近道

まとめ

❖ 今後の可能性

- ▶ ユーザ層の拡大でさらに大きなコミュニティに
 - より多くのライブラリの供給
 - より多くの人をサポートが得られる環境に
 - ソフトだけでなく、ハード開発もさらに活発に
- ▶ mbed.orgの機能拡充
 - コンパイラのバージョンアップ、webサイトの機能追加改善が常に行われている

さらに

- ❖ NXPはチップや開発ツールを通してコミュニティをサポートしていきます

web : **www.nxp-lpc.com**

 : **[@nxpfan](https://twitter.com/nxpfan)**

 : **www.facebook.com/nxpfan**