



# arm

# Workshop

4. Connecting your platform to Pelion

Document Location : <http://bitly.kr/Yv9v>

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1. Arm IoT Ecosystem
2. Setup develop environment
3. Peripheral IPs control practice
4. Connecting your platform to Pelion
5. Remote FW update of your device

# #4 Connecting your platform to Pelion

Not include 'Pelion <-> Web app', will do with Daliworks

-  [Dashboard](#)
-  [Metrics, usage](#)
-  [Usage dashboard](#) 
-  [Custom dashboard](#) 
-  [Device directory](#)  
List, filter, events
-  [Device identity](#)  
Security, certificates
-  [Firmware update](#)  
Upload, configure, deploy
-  [Tenants](#)  
Customer management
-  [Access management](#)  
Access, authentication
-  [Help](#)
-  [Language](#)

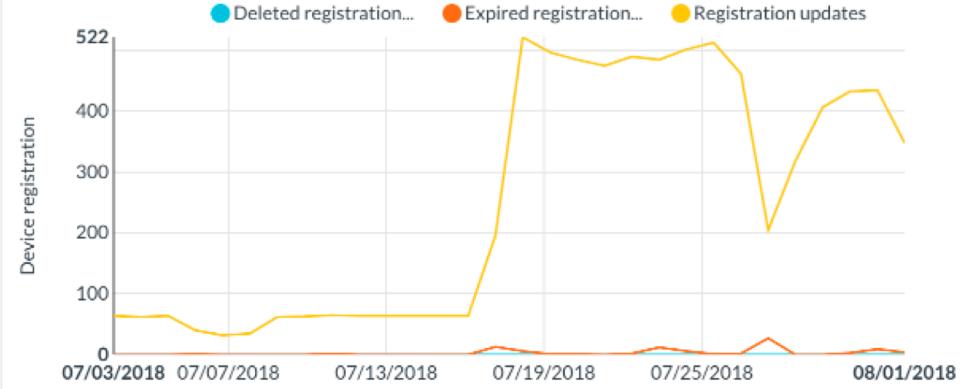
## Usage dashboard

 SET AS DEFAULT

View: [1 month](#) | [1 week](#) | [12 hours](#)

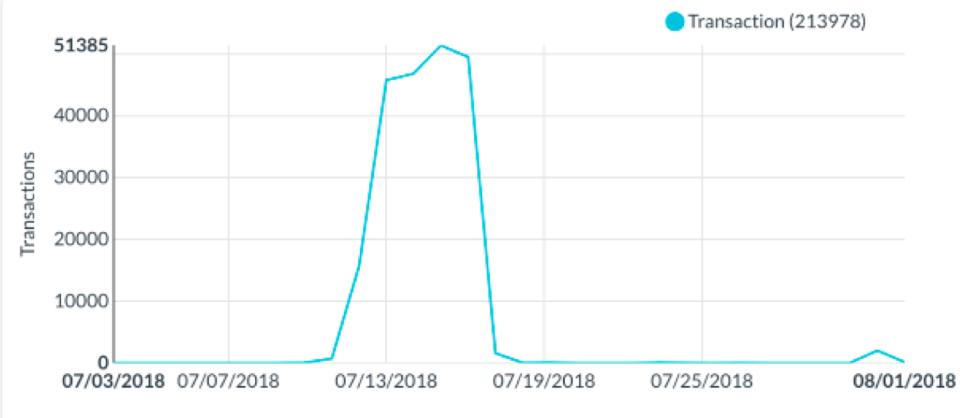
### Usage summary

Devices: **101,320** / unlimited  
Transactions: **213,978** / unlimited(1 month)  
Images: **94** / 1,000  
Manifests: **909** / unlimited  
Certificates: **20** / 20  
API keys: **18** / 25  
Groups: **7** / 10  
Users: **38** / 100  
Billing quota: **0** / 100,000

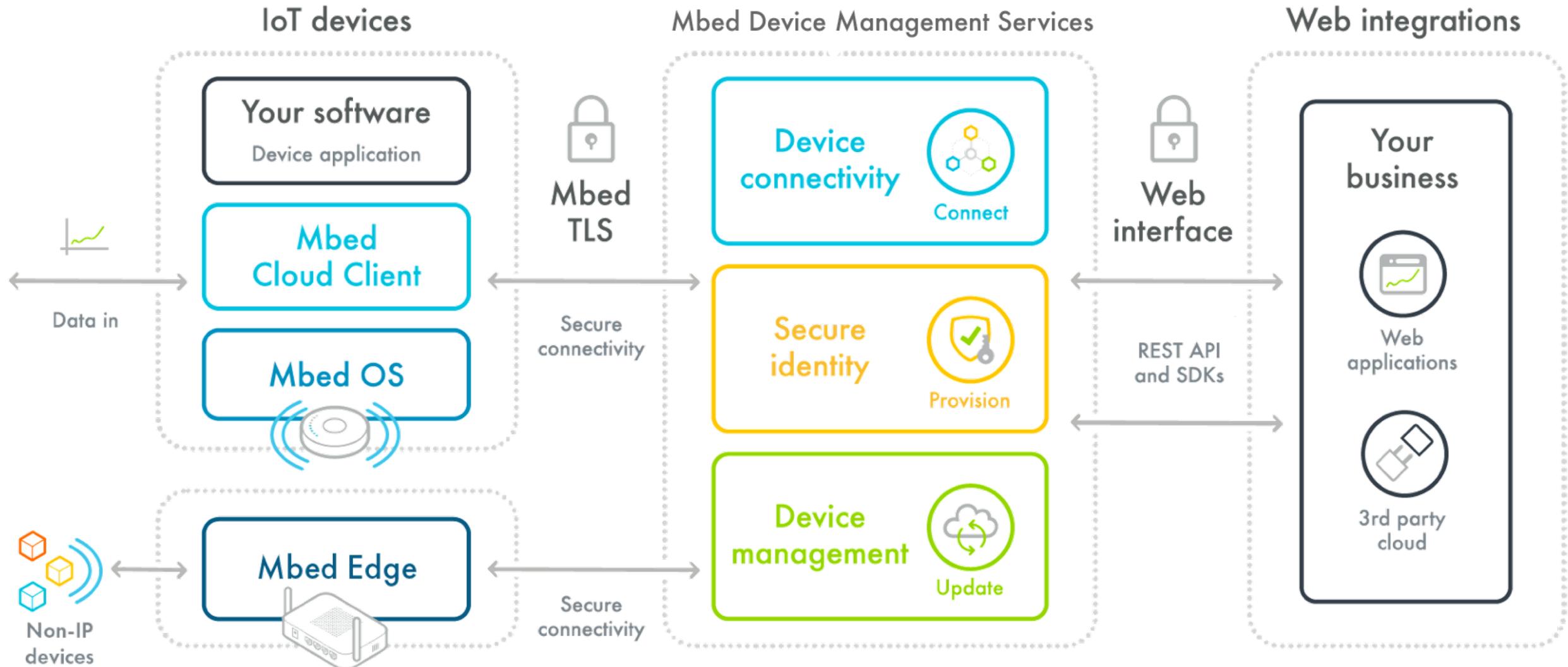


### Transactions

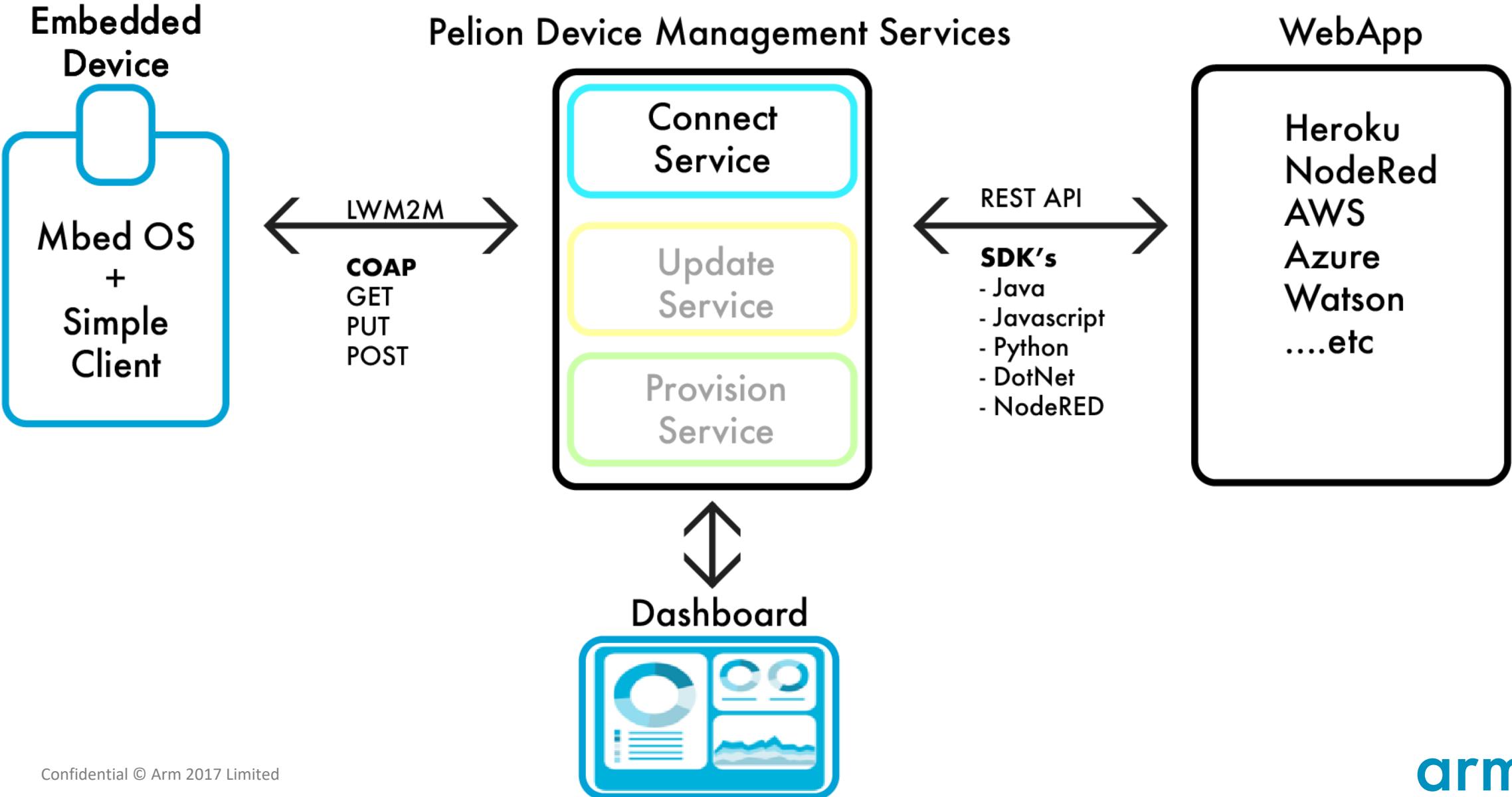
Used: **213,978**



# The Pelion Device Management Service offering



# Today – the Connect service

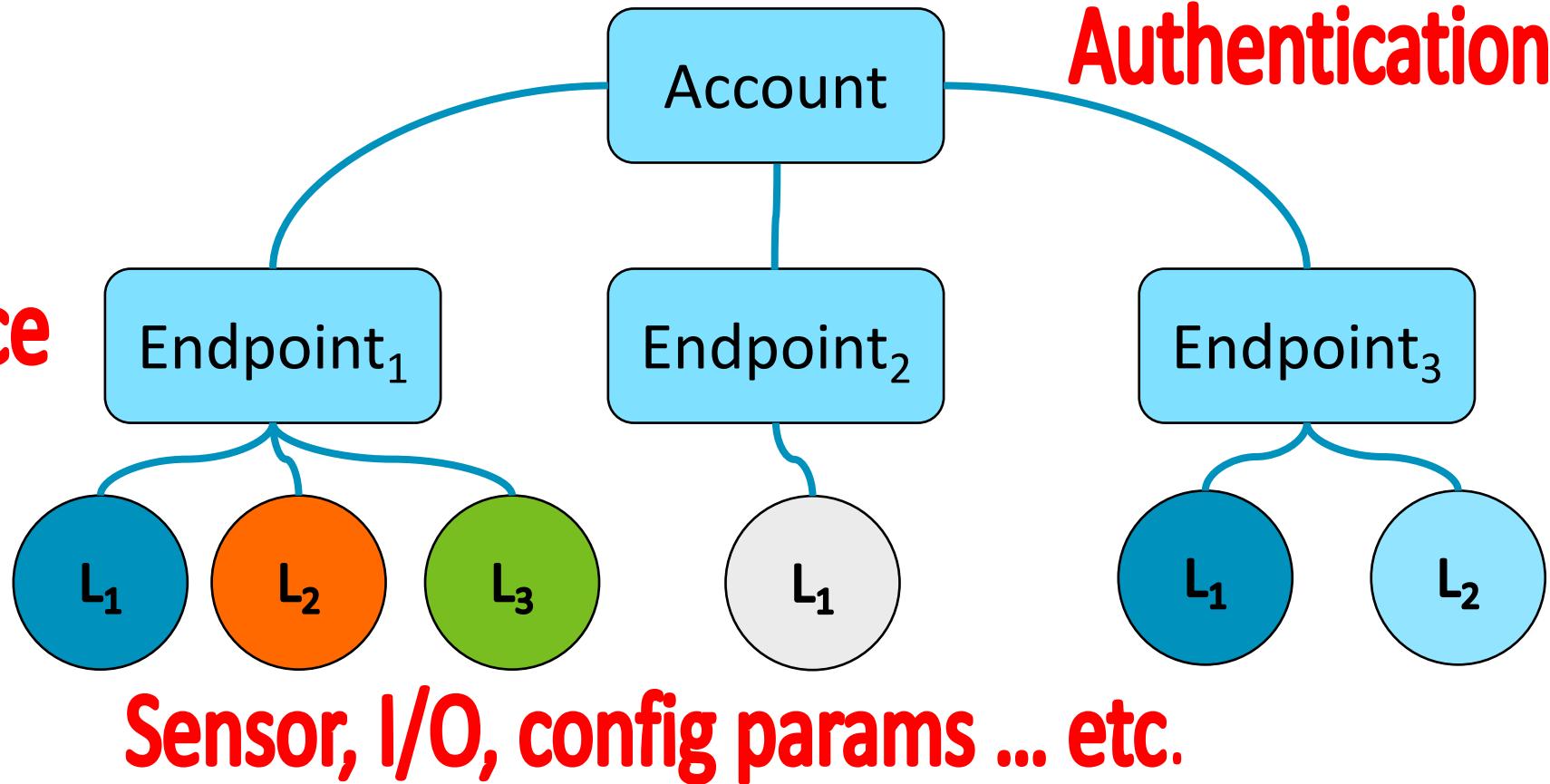


# Data Model – 3 levels

Account

- Endpoint
  - LWM2M thing

**Physical Device**



# LWM2M Data Model

## Hierarchy

{ObjectID}/(ObjectInstance)/{ResourceID}

ex) temp sensor object

/temp/0/maxValue /3303/0/5602

/temp/0/minValue /3303/0/5601

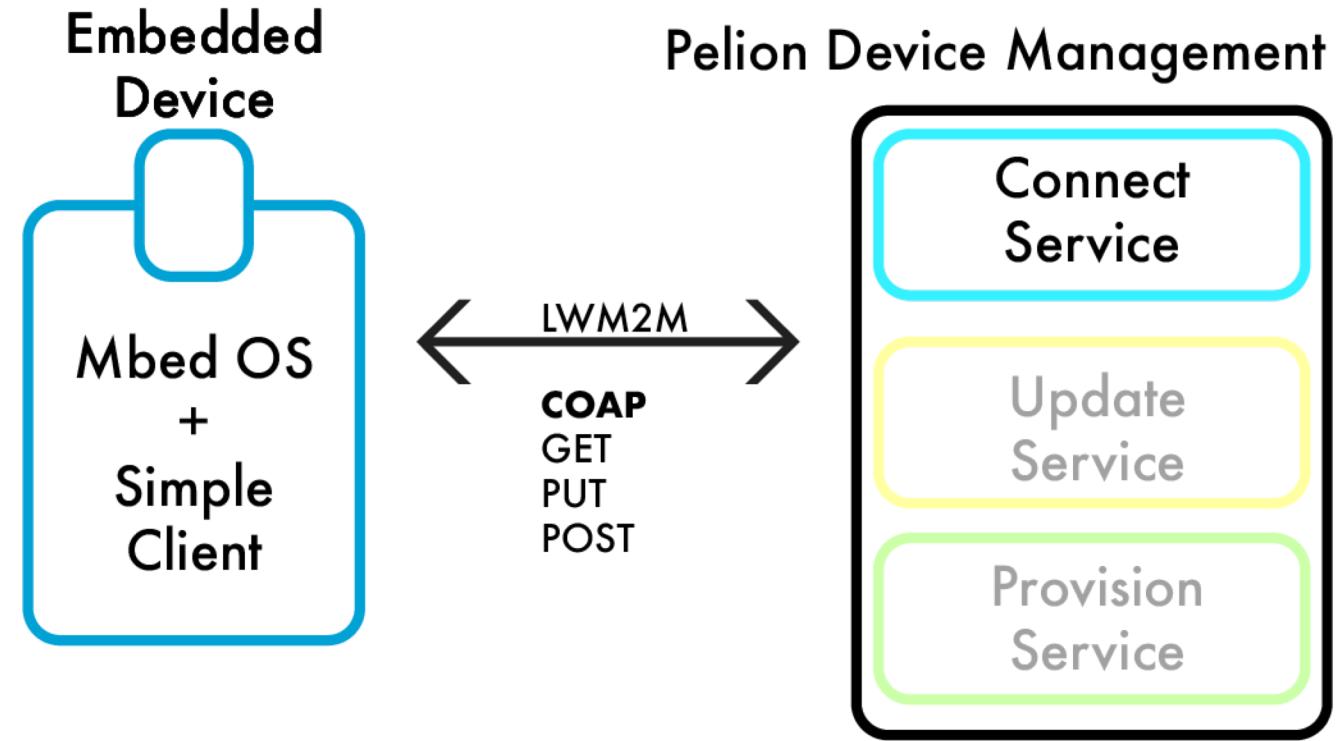
/temp/0/sensorValue /3303/0/5700

# Full Database

- Full Database
  - <http://www.openmobilealliance.org/wp/OMNA/LwM2M/LwM2MRegistry.html>
- [KOR] ‘LwM2M(Lightweight M2M) 기술  
[file:///Users/danlee02/Downloads/LwM2M\(Lightweight%20M2M\)%20%C2%B1%C3%A2%C2%BC%C3%BA\\_1%20\(6\).pdf](file:///Users/danlee02/Downloads/LwM2M(Lightweight%20M2M)%20%C2%B1%C3%A2%C2%BC%C3%BA_1%20(6).pdf)
- Lightweight M2M (LWM2M)
  - Homepage : <https://www.omaspecworks.org/what-is-oma-specworks/iot/lightweight-m2m-lwm2m/>
  - Spec : [http://www.openmobilealliance.org/release/LightweightM2M/V1\\_0-20170208-A/OMA-TS-LightweightM2M-V1\\_0-20170208-A.pdf](http://www.openmobilealliance.org/release/LightweightM2M/V1_0-20170208-A/OMA-TS-LightweightM2M-V1_0-20170208-A.pdf)
- IPSO Objects
  - <https://github.com/IPSO-Alliance/pub/tree/master/reg>

# COAP Options

- GET
  - Read value from device
  - Must be marked as 'observable'
- PUT
  - Set value on device
- POST
  - Send data buffer to device
  - Trigger callback function on device
- DELETE
  - Not currently in use



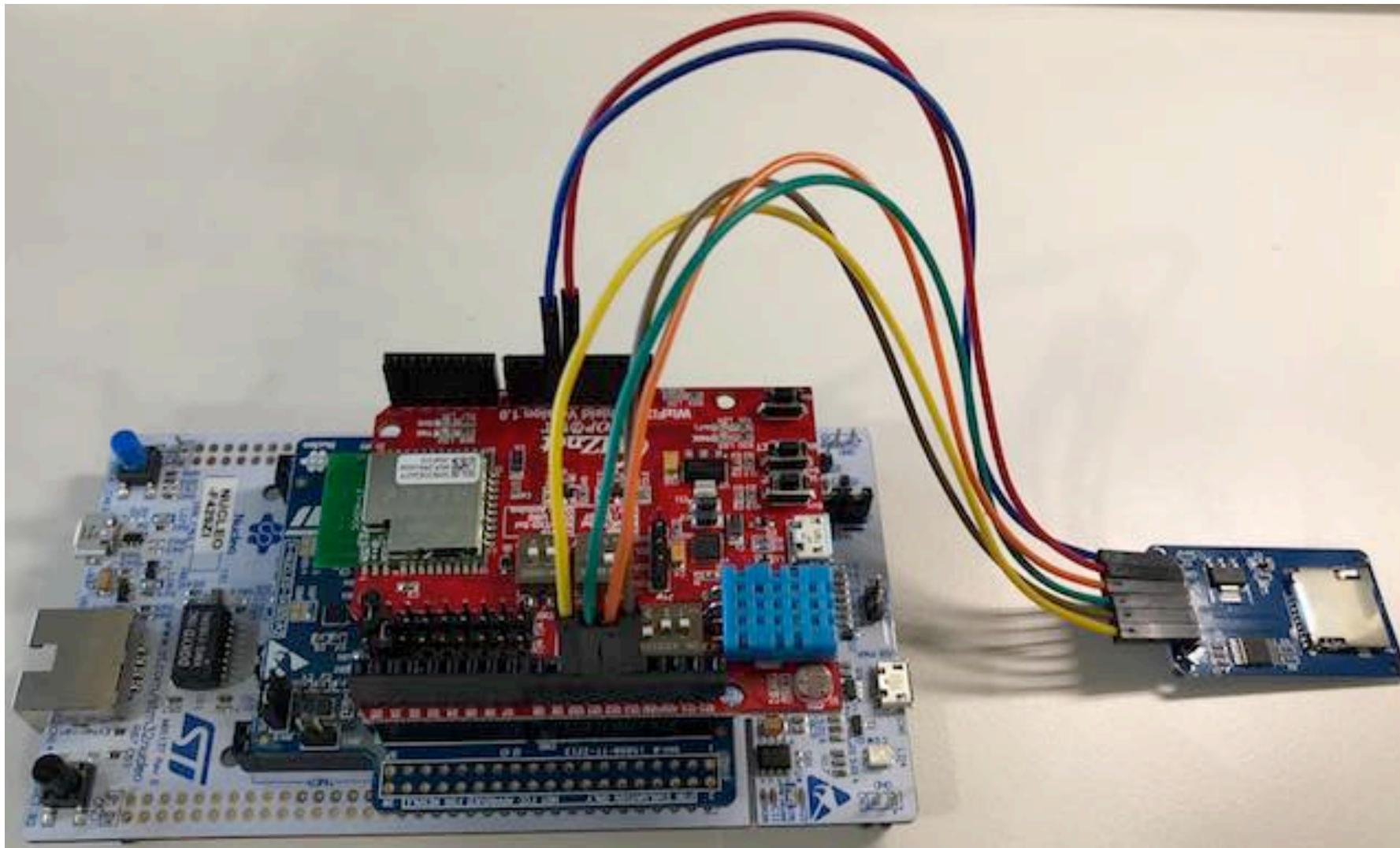
# Embedded Code Example : GET Resource

```
// Declaring pointers for access to Client resources
MbedCloudClientResource *button_res;

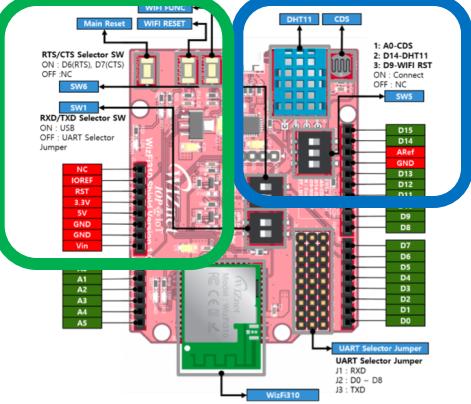
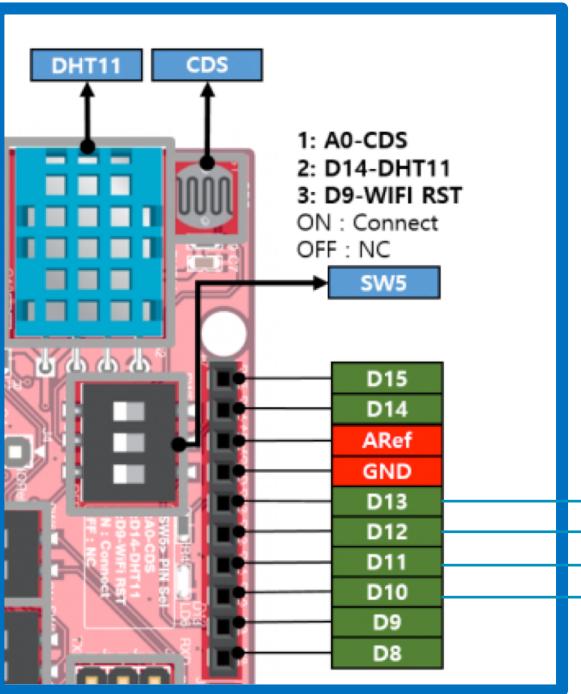
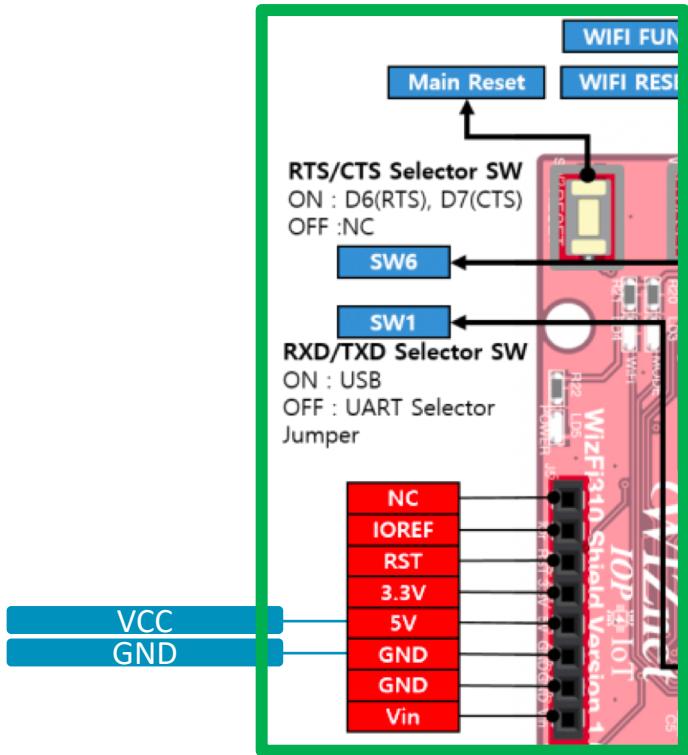
// Creating resources, which can be written or read from the cloud
button_res = client.create_resource("3200/0/5501","button_count");
button_res->set_value(0);
button_res->methods(M2MMethod::GET);
button_res->observable(true);
button_res->attach_notification_callback(button_callback);
```

# Practice #1

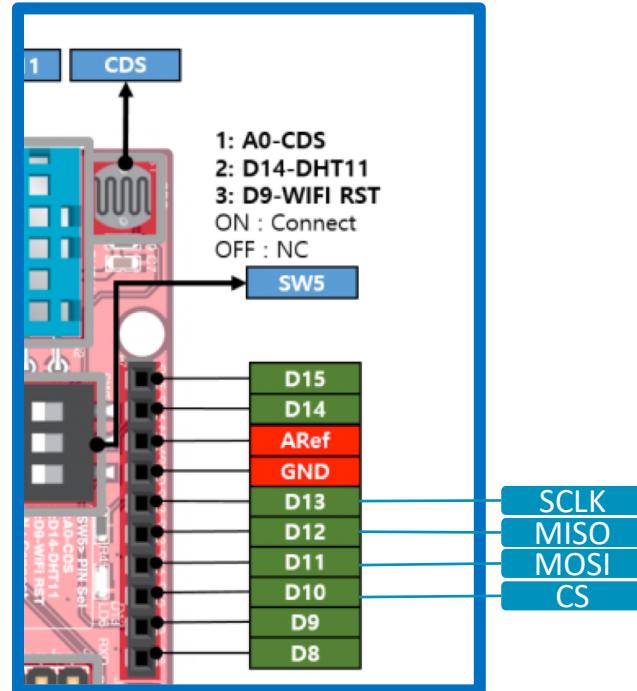
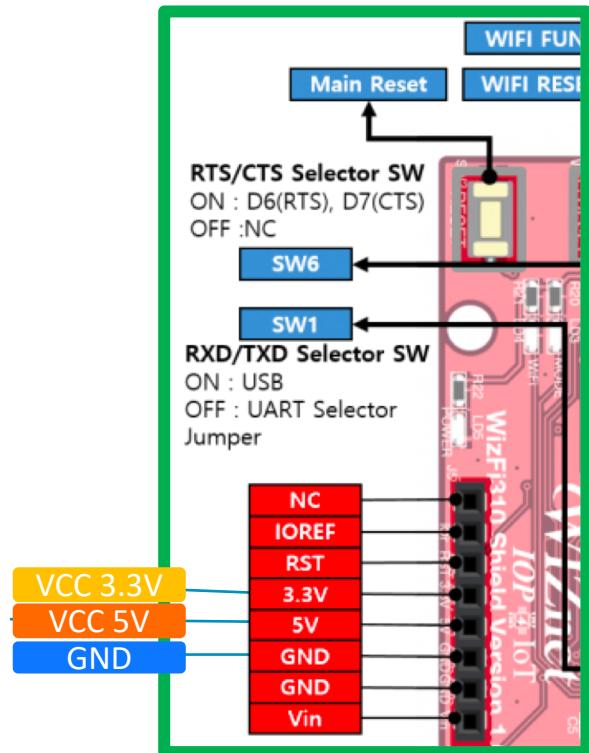
# Prepare H/W



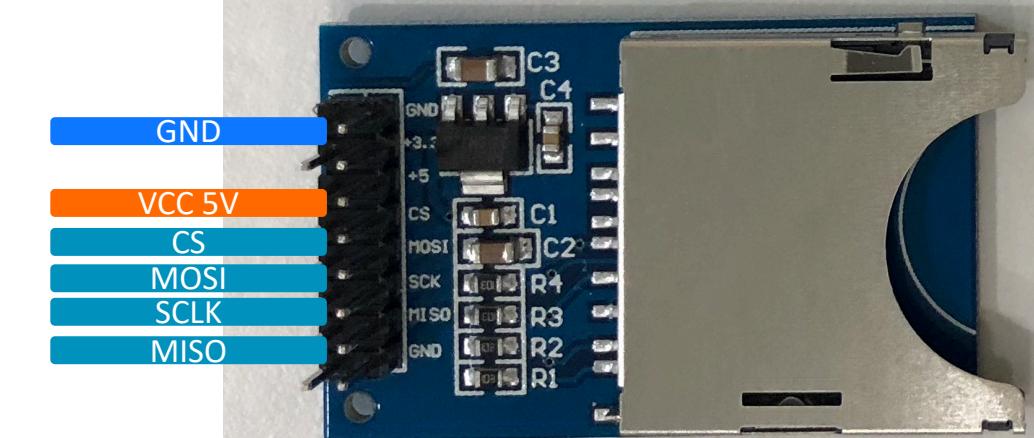
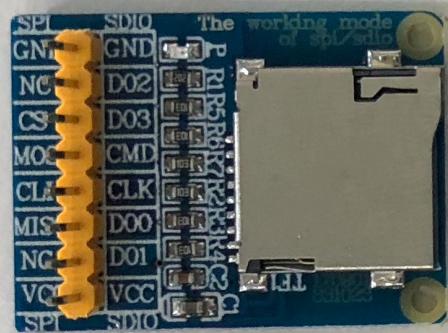
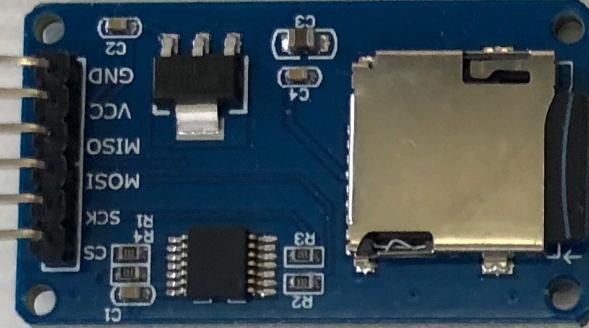
# Prepare - SDCARD CONNECT



# Prepare - SDCARD CONNECT



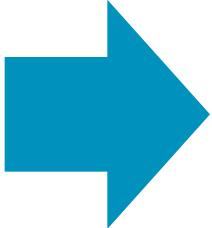
GND
VCC 5V
MISO
MOSI
SCLK
CS



# Let's start – CLI Env.

## 1. SD configure change

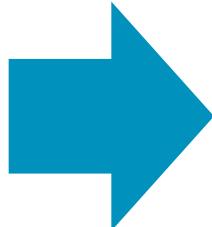
- mbed-cloud-client-example]\$ vi storage-selector/sd-driver/config/mbed\_lib.json
- "NUCLEO\_F429ZI": {
  - "SPI\_MOSI": "PC\_12",
  - "SPI\_MISO": "PC\_11",
  - "SPI\_CLK": "PC\_10",
  - "SPI\_CS": "PA\_15"}



```
92 },
93 "NUCLEO_F429ZI": {
94     "SPI_MOSI": "PA_7",
95     "SPI_MISO": "PA_6",
96     "SPI_CLK": "PA_5",
97     "SPI_CS": "PD_14"
98 },
99 "DISCO_F429ZI": {
```

## 2. Modify 'mbed\_app.json'

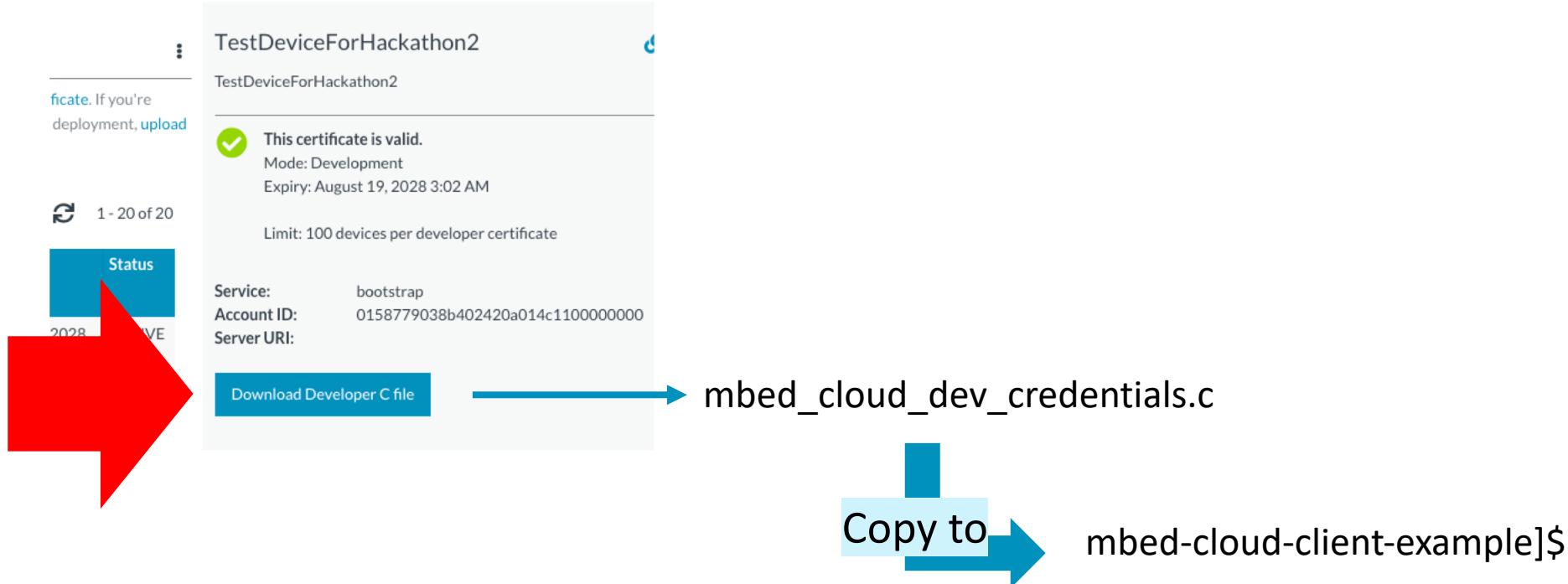
- mbed-cloud-client-example]\$ cp configs/wifi\_esp8266\_v4.json mbed\_app.json
- mbed-cloud-client-example]\$ vi mbed\_app.json



```
"config": {
    "network-interface": {
        "value": "WIFI_WIZFI310"
    },
    "wifi-ssid": {
        "help": "WiFi SSID",
        "value": "\"Seoul_IOT_3(2.4G)\""
    },
    "wifi-password": {
        "help": "WiFi Password",
        "value": "\"12345678\""
    },
},
```

# Let's start – CLI Env.

3. Download 'mbed\_cloud\_dev\_credentials.c' from Pelion, Copy to 'mbed-cloud-client-example' folder



## 4. Compile

- mbed-cloud-client-example]\$ mbed compile -t GCC\_ARM -m NUCLEO\_F429ZI

# Let's start – CLI Env.

## 5. Binary combine & Download binary to device

- mbed-cloud-client-example]\$ python tools/combine\_bootloader\_with\_app.py -m NUCLEO\_F429ZI -a BUILD/NUCLEO\_F429ZI/GCC\_ARM/mbed-cloud-client-example.bin -o combined.bin

```
| Subtotals | 387461 | 3760 | 45132 |
+-----+-----+-----+
Total Static RAM memory (data + bss): 48892 bytes
Total Flash memory (text + data): 391221 bytes

Image: ./BUILD/NUCLEO_F429ZI/GCC_ARM/mbed-cloud-client-example.bin
[daniel@ mbed-cloud-client-example]$ python tools/combine_bootloader_with_app.py -m NUCLEO_F429ZI -a
BUILD/NUCLEO_F429ZI/GCC_ARM/mbed-cloud-client-example.bin -o combined.bin
imageSize: 391900
imageHash: 507c43fb6154b5e19a89781ec6f51a6e7df6fc893bbdf49836018272adc7596
imageversion: 1535355145
Writing bootloader to address 0x08000000-0x08007dd7.
Writing header to address 0x08010000-0x0801006f.
Writing application to address 0x08010400-0x0806fedb.
Combined binary:/Users/danlee02/work/workshop/mbed-cloud-client-example/combined.bin
[daniel@ mbed-cloud-client-example]$
```

- mbed-cloud-client-example]\$ (for Mac ) cp combined.bin /Volumes/NODE\_F429ZI  
(for Windows ) copy combined.bin F:/  
(for Linux) cp combined.bin /Media/mbed/NODE\_F429ZI/

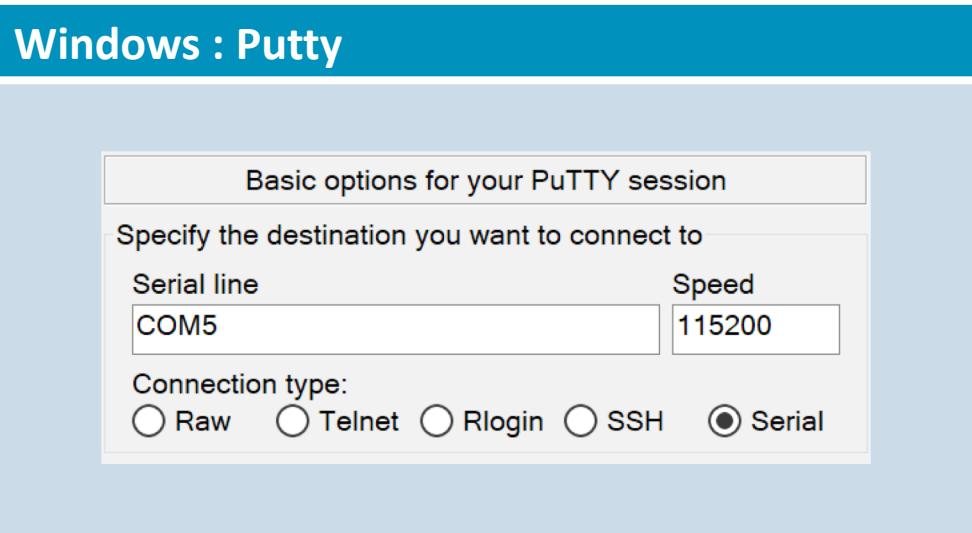
# Let's start – CLI Env.

## 5. Binary combine

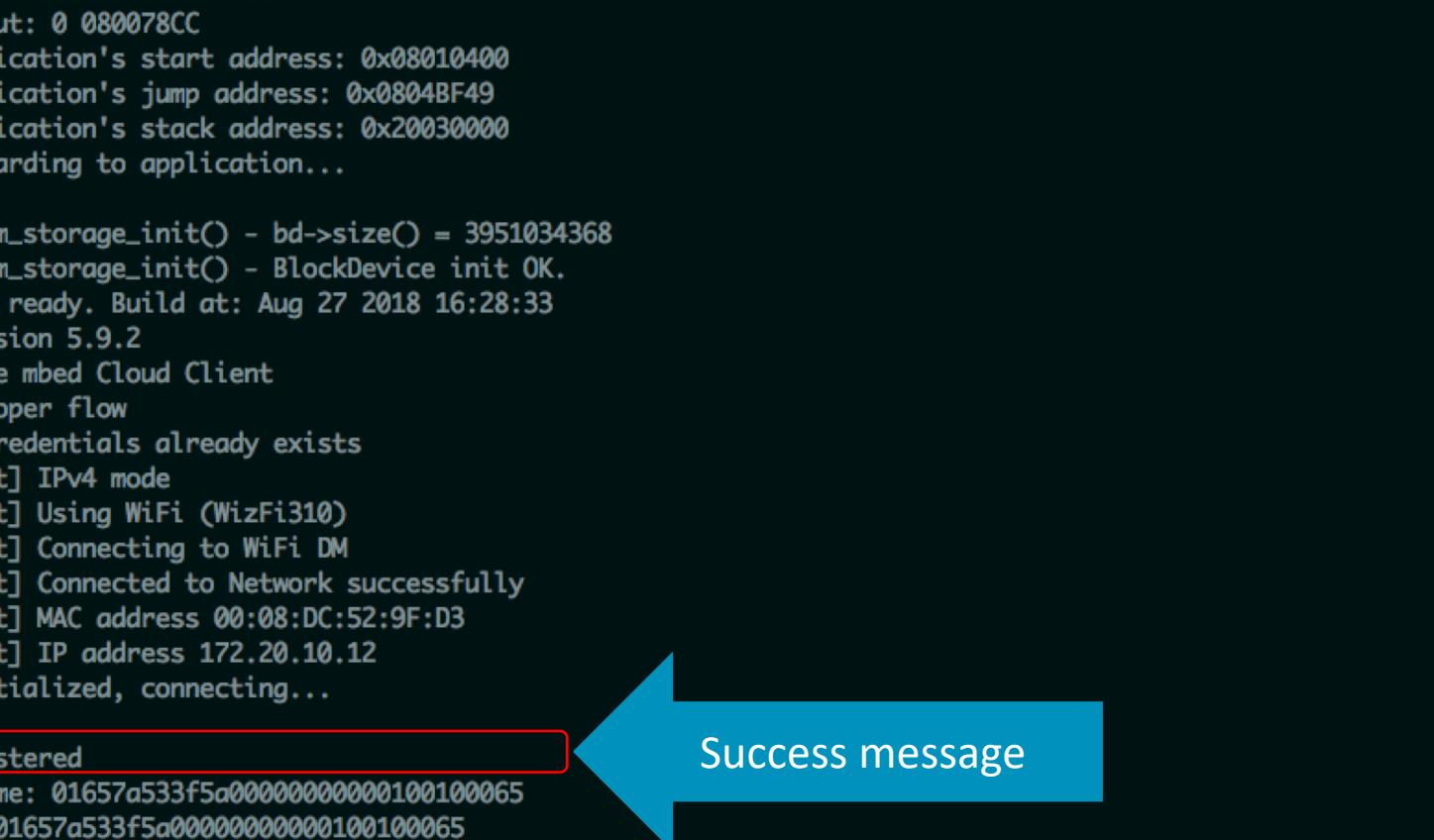
- mbed-cloud-client-example]\$ python tools/combine\_bootloader\_with\_app.py -m NUCLEO\_F429ZI -a BUILD/NUCLEO\_F429ZI/GCC\_ARM/mbed-cloud-client-example.bin -o combined.bin
- mbed-cloud-client-example]\$ (for Mac )cp combined.bin /Volumes/NODE\_F429ZI  
(for Windows )copy combined.bin F:/  
(for Linux) cp combined.bin /Media/mbed/NODE\_F429ZI/

## 6. Board rate 9600 → 115200

putty or minicom Board rate change.

Windows : Putty	Linux or Mac : Minicom – s
 <p>Basic options for your PuTTY session</p> <p>Specify the destination you want to connect to</p> <p>Serial line: COM5      Speed: 115200</p> <p>Connection type: <input type="radio"/> Raw   <input type="radio"/> Telnet   <input type="radio"/> Rlogin   <input type="radio"/> SSH   <input checked="" type="radio"/> Serial</p>	 <p>A - Serial Device : /dev/tty.usbmodem14333 B - Lockfile Location : /usr/local/Cellar/minicom/2.7.1/var C - Callin Program : D - Callout Program : E - Bps/Par/Bits : 115200 8N1 F - Hardware Flow Control : Yes G - Software Flow Control : No</p> <p>Change which setting? [ ]</p> <p>Screen and keyboard Save setup as dfl Save setup as... Exit Exit from Minicom</p>

# Let's start – CLI Env.



The screenshot shows a terminal window titled "Serial I/F terminal" with the identifier "1. minicom". The window contains the following text:

```
[BOOT] mbed Bootloader
[BOOT] ARM: 74CE36607E38CD63ECDD72CE2F1262D58BF55448
[BOOT] OEM: 000000000000000000000000000000000000000000000000000000000000000
[BOOT] Layout: 0 080078CC
[BOOT] Application's start address: 0x08010400
[BOOT] Application's jump address: 0x0804BF49
[BOOT] Application's stack address: 0x20030000
[BOOT] Forwarding to application...

mcc_platform_storage_init() - bd->size() = 3951034368
mcc_platform_storage_init() - BlockDevice init OK.
Application ready. Build at: Aug 27 2018 16:28:33
Mbed OS version 5.9.2
Start simple mbed Cloud Client
Start developer flow
Developer credentials already exists
[EasyConnect] IPv4 mode
[EasyConnect] Using WiFi (WizFi310)
[EasyConnect] Connecting to WiFi DM
[EasyConnect] Connected to Network successfully
[EasyConnect] MAC address 00:08:DC:52:9F:D3
[EasyConnect] IP address 172.20.10.12
Network initialized, connecting...
Client registered
Endpoint Name: 01657a533f5a000000000000100100065
Device Id: 01657a533f5a000000000000100100065
```

A red box highlights the line "Client registered". A large blue arrow points from the right towards this line, labeled "Success message".

# Let's start – Operation check at the Pelion

The image displays a series of screenshots illustrating the operation check process at the Pelion platform, connected by red arrows.

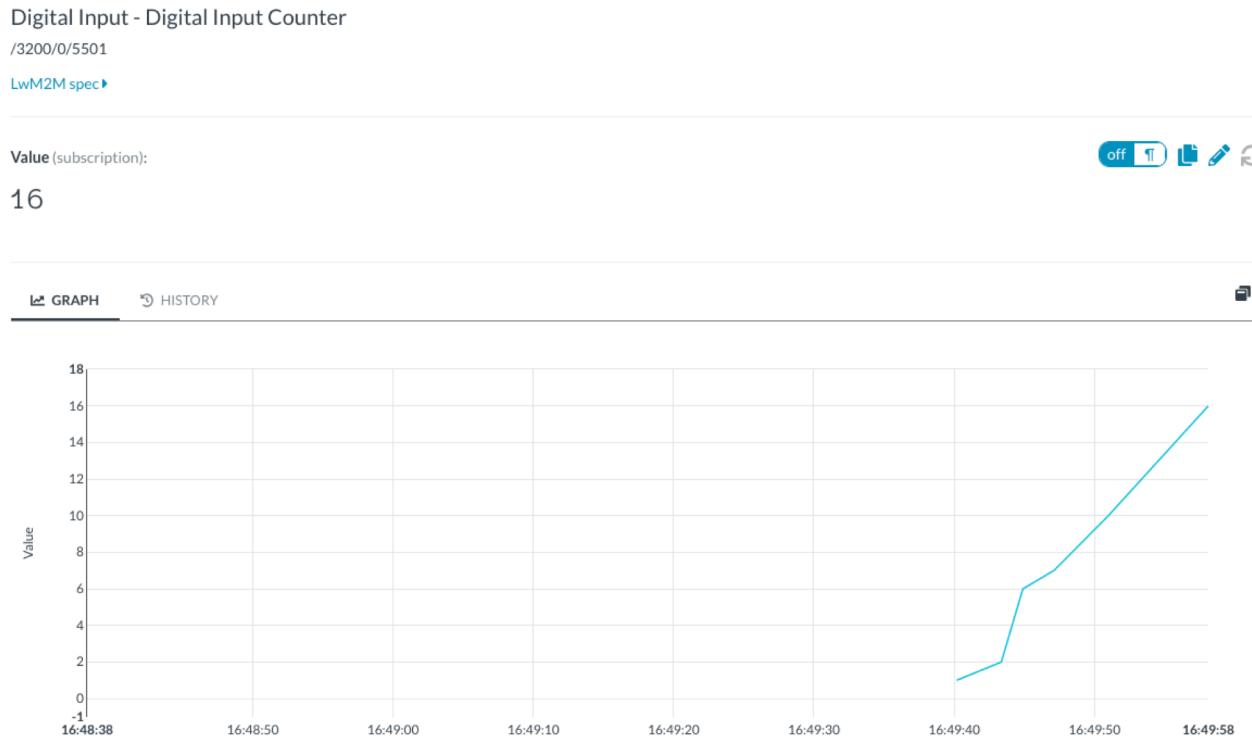
- Top Left:** A screenshot of the [Arm Mbed Cloud Product Overview](https://cloud.mbed.com/product-overview) page. A red arrow points from the "Portal" button in the top navigation bar to the [arm PELION](https://portal.mbedcloud.com/dashboard/usage) dashboard.
- Middle Left:** A screenshot of the [arm PELION](https://portal.mbedcloud.com/dashboard/usage) Usage dashboard. A red box highlights the "Device directory" section in the sidebar. Another red arrow points from the "Device directory" link in the sidebar to the "Devices" section of the main dashboard.
- Middle Center:** A screenshot of the [Devices](https://portal.mbedcloud.com/devices) page. A red arrow points from the "Devices" link in the sidebar to the table listing devices. The table shows columns for Device ID, Endpoint name, Name, State, Execution mode, and Date created. One row is selected, showing details for Device ID 01657a533f5a000000000000100100065.
- Right Side:** A detailed view of the selected device. A red box highlights the "RESOURCES" tab. The table shows:

DETAILS	ATTRIBUTES	EVENTS
Manufacturer / vendor	6465765f6d61e756661637475726572	
Model number / Device class	6465765f6d6f64656c5f6e756d626572	
Serial number	0	
Execution mode	Development (1)	
Date bootstrapped	August 27, 2018 4:40 PM	
Date created	August 27, 2018 4:40 PM	
Date modified	August 27, 2018 4:41 PM	
Certificate	TestDeviceForHackathon2 Type: developer/bootstrap Expires: August 19, 2028 3:02 AM	
- Bottom Left:** A screenshot of a Serial I/F terminal window titled "Serial I/F terminal". It shows the output of the EasyConnect library connecting to the network. A red oval highlights the "Client registered" message, and another red oval highlights the "Device Id: 01657a533f5a000000000000100100065" line.
- Bottom Center:** A screenshot of the "Digital Input - Digital Input Counter" interface. A red arrow points from the "button\_resource" entry in the table below to the "Value (GET)" input field in the interface.
- Bottom Right:** A screenshot of a table showing digital input resources. The table has two rows:

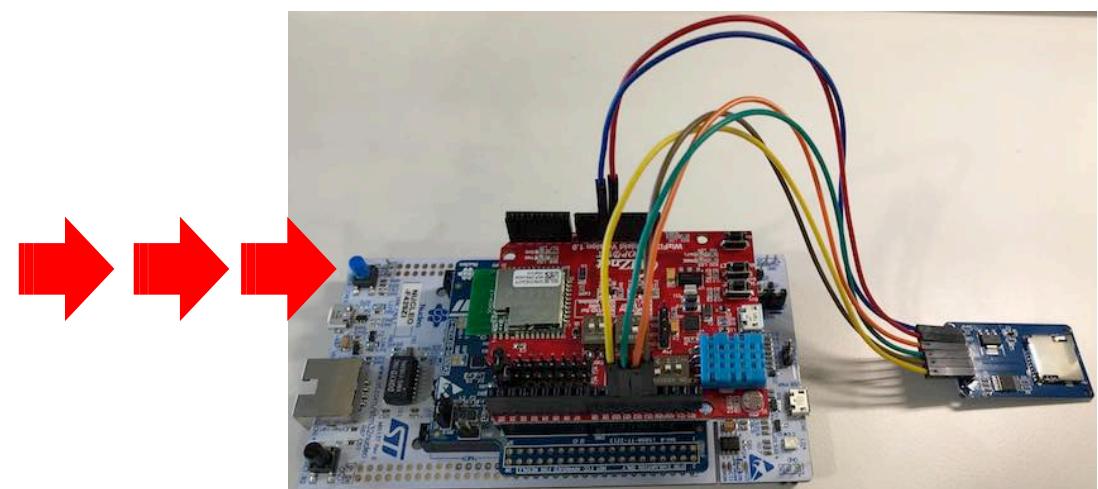
DigitalInput - 0	/3200/0
button_resource	/3201

arm

# Let's start – Operation check at the Pelion



## Serial I/F terminal



# Let's start – Help document and video

## 1. Quick start guide

\* <https://cloud.mbed.com/quick-start> - for online compiler

## 2. Video Clip

- a. [Kor] [https://www.youtube.com/watch?v=xovd\\_KG-44Q&t=1s](https://www.youtube.com/watch?v=xovd_KG-44Q&t=1s)
- b. [Eng] <https://youtu.be/HUJcAscT5-s>
- c. [Office Hours] <https://www.youtube.com/playlist?list=PLiVCejcvpsesfJNRfBHjzpM1AJXbCoqmx>

# Practice #2

# Prepare - Configure for connect Thing+

## 1. ENDPOINT Change to “thingplus”

1. mbed-cloud-client-example]\$ vi mbed\_cloud\_client\_user\_config.h

Before	After
<pre>20 #ifndef MBED_CLOUD_CLIENT_USER_CONFIG_H 21 #define MBED_CLOUD_CLIENT_USER_CONFIG_H 22 23 #define MBED_CLOUD_CLIENT_ENDPOINT_TYPE "default" 24 #define MBED_CLOUD_CLIENT_TRANSPORT_MODE_TCP 25 #define MBED_CLOUD_CLIENT_LIFETIME 3600</pre>	<pre>0 #ifndef MBED_CLOUD_CLIENT_USER_CONFIG_H 1 #define MBED_CLOUD_CLIENT_USER_CONFIG_H 2 3 #define MBED_CLOUD_CLIENT_ENDPOINT_TYPE "thingplus" 4 #define MBED_CLOUD_CLIENT_TRANSPORT_MODE_TCP 5 #define MBED_CLOUD_CLIENT_LIFETIME 3600</pre>

# Prepare - LWM2M Resource ID

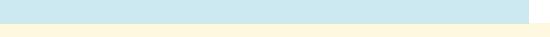
참가자 요구센서	Object name	ObjectID	ResourceId	thing+ sensorType		Conductivity	3327	5700	conductivity
초음파센서	Distance	3330	5700	distance	전류	Current	3317	5700	current
온도센서	Temperature Sensor	3303	5700	temperature	전력량	Energy	3331	5805	electricEnergy
습도센서	Humidity Sensor	3304	5700	humidity	전력	Power	3328	5700	eletricPower
감압센서	Pressure	3323	5700	pressure	주파수	Frequency	3318	5700	frequency
부저	Buzzer	3338	5850	buzzer		Acidity	3326	5700	ph
LED	Light Control	3311	5850	led		Voltage	3316	5700	voltage
미세먼지	Concentration	3325	5700	dust		Load	3322	5700	weight
가스감지센서	Presence sensor	3302	5500	presence		TPNumber	20001	5997	number
농도측정센서	Percentage	3320	5700	percent		TPString	20002	5998	string
조도센서	Illuminance Sensor	3301	5700	light	GPS	TPLocation	20003	5999	location
소리감지센서	Loudness	3324	5700	noise	Accelerometer	TPAccelerometer	20004	5999	Accelerometer
냄새감지센서	Presence sensor	3302	5500	presence	StringActuator	TPStringActuator	20005	6000	stringActuator
VOC 센서	TPNumber	20001	5997	number					
심박계센서	TPNumber	20001	5997	number					
가스센서	TPNumber	20001	5997	number					
O	Direction	3332	5705	direction					
O	On/Off Switch	3342	5500	onoff					
파워스위치	Power Control	3312	5850	powerSwitch					

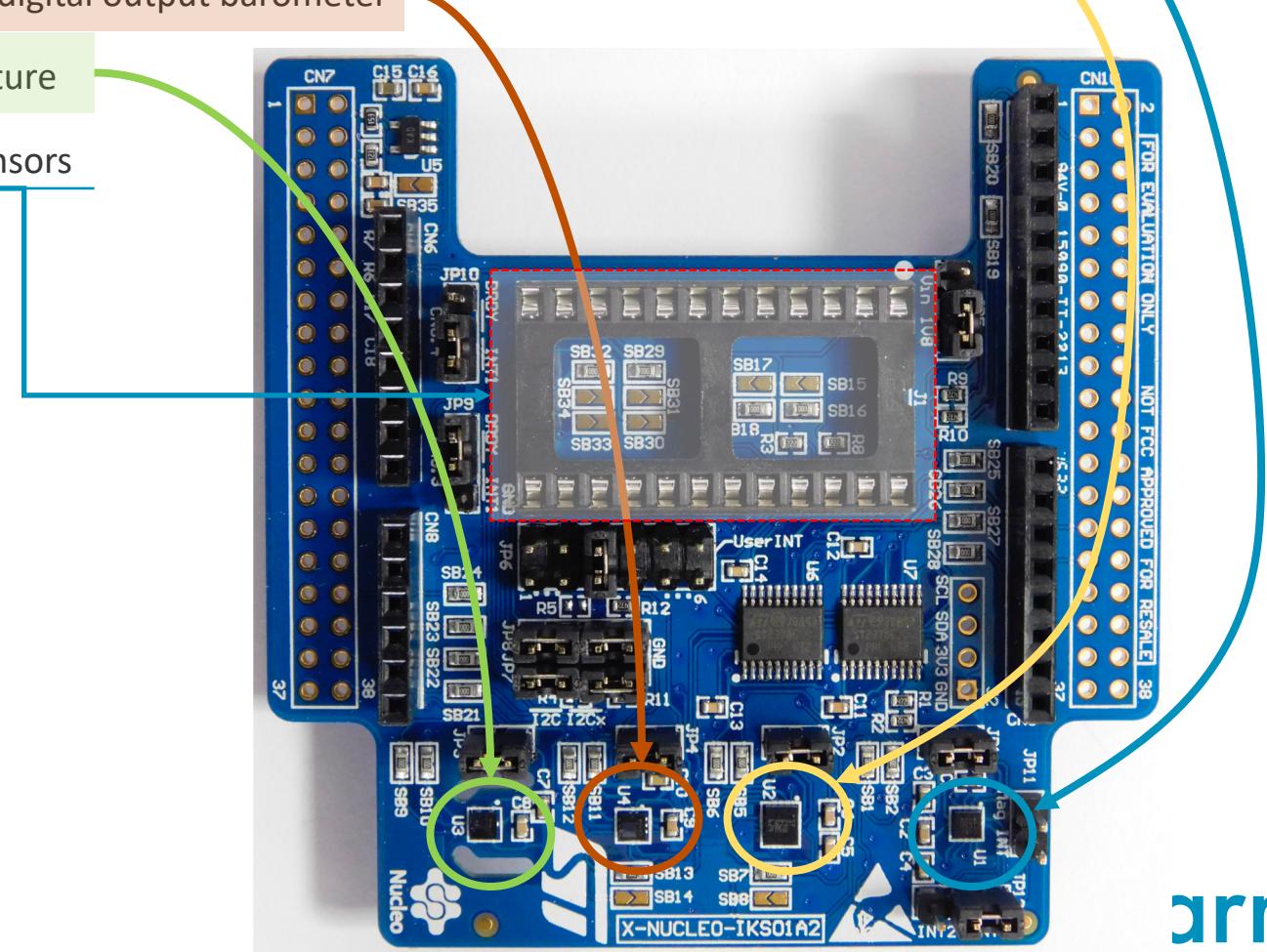
- <http://www.seoulhackathon.org/270>

## Example1 (1/5) – Read[Get] temperature value

- LSM303AGR MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g) and MEMS3D magnetometer ( $\pm 50$  gauss) \*
  - LSM6DSL MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g) and 3D gyroscope ( $\pm 125/\pm 245/\pm 500/\pm 1000/\pm 2000$  dps)
  - LPS22HB MEMS pressure sensor, 260-1260 hPa absolute digital output barometer

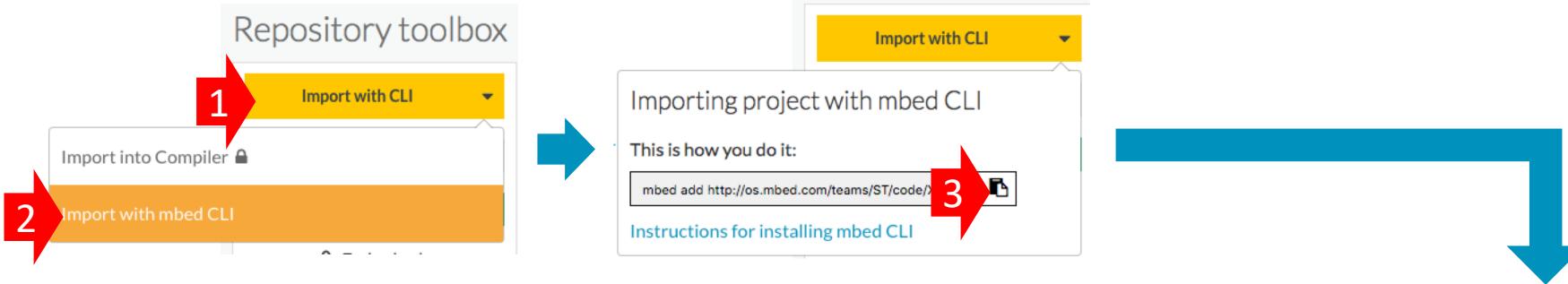
HTS221: capacitive digital relative humidity and temperature

  - DIL24 socket for additional MEMS adapters and other sensors



# Example1 (2/5) – Read[Get] temperature value

- Download resource of X\_NUCLEO\_IKS01A2 to ‘mbed-os-cloud-client-example’
- [https://os.mbed.com/teams/ST/code/X\\_NUCLEO\\_IKS01A2/](https://os.mbed.com/teams/ST/code/X_NUCLEO_IKS01A2/)



```
[Daniel@ mbed-cloud-client-example: ~]$ mbed add http://os.mbed.com/teams/ST/code/X_NUCLEO_IKS01A2/
[mbed] Adding library "X_NUCLEO_IKS01A2" from "https://os.mbed.com/teams/ST/code/X_NUCLEO_IKS01A2" at latest revision in the current branch
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/HTS221" from "https://developer.mbed.org/teams/ST/code/HTS221" at rev #c4391f20553e
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/HTS221/X_NUCLEO_COMMON" from "https://developer.mbed.org/teams/ST/code/X_NUCLEO_COMMON" at rev #21096473f63e
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/HTS221/ST_INTERFACES" from "https://developer.mbed.org/teams/ST/code/ST_INTERFACES" at rev #d3c9b33b992c
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LSM303AGR" from "https://developer.mbed.org/teams/ST/code/LSM303AGR" at rev #86d530a7f949
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LSM303AGR/X_NUCLEO_COMMON" from "https://developer.mbed.org/teams/ST/code/X_NUCLEO_COMMON" at rev #21096473f63e
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LSM303AGR/ST_INTERFACES" from "https://developer.mbed.org/teams/ST/code/ST_INTERFACES" at rev #d3c9b33b992c
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LPS22HB" from "https://developer.mbed.org/teams/ST/code/LPS22HB" at rev #33ddb62b31fd
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LPS22HB/X_NUCLEO_COMMON" from "https://developer.mbed.org/teams/ST/code/X_NUCLEO_COMMON" at rev #21096473f63e
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LPS22HB/ST_INTERFACES" from "https://developer.mbed.org/teams/ST/code/ST_INTERFACES" at rev #d3c9b33b992c
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LSM6DSL" from "https://developer.mbed.org/teams/ST/code/LSM6DSL" at rev #c583f32fe272
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LSM6DSL/X_NUCLEO_COMMON" from "https://developer.mbed.org/teams/ST/code/X_NUCLEO_COMMON" at rev #21096473f63e
[mbed] Adding library "X_NUCLEO_IKS01A2/Components/LSM6DSL/ST_INTERFACES" from "https://developer.mbed.org/teams/ST/code/ST_INTERFACES" at rev #d3c9b33b992c
[mbed] Updating reference "X_NUCLEO_IKS01A2" -> "https://os.mbed.com/teams/ST/code/X_NUCLEO_IKS01A2/#138a7a28bd21"
```

## Example Applications

- Hello World
- 6D Orientation Recognition
- Free Fall Event
- Multi Event
- Pedometer
- Single and Double Tap Events
- Tilt Event
- Wake Up Event

# Example1 (3/5) – Read[Get] temperature value

- Reference code
  - [https://os.mbed.com/teams/ST/code/HelloWorld\\_IKS01A2/file/175f561f1a71/main.cpp/](https://os.mbed.com/teams/ST/code/HelloWorld_IKS01A2/file/175f561f1a71/main.cpp/)
- Copy code from Reference code to main.cpp of ‘mbed-os-cloud-client-example’

# Example1 (4/5) – Read[Get] temperature value

```
+#include "XNucleoIKS01A2.h"  
+  
+/* Instantiate the expansion board */  
+static XNucleoIKS01A2 *mems_expansion_board = XNucleoIKS01A2::instance(D14, D15, D4, D5);  
  
// event based LED blinker, controlled via pattern_resource  
static Blinky blinky;  
+static HTS221Sensor *hum_temp = mems_expansion_board->ht_sensor; 1  
  
static void main_application(void);  
  
@@ -37,6 +43,7 @@ int main(void)  
// Pointers to the resources that will be created in main_application().  
static M2MResource* button_res;  
static M2MResource* pattern_res;  
+static M2MResource* temp_res; 2 3  
  
// Pointer to mbedClient, used for calling close function.  
static SimpleM2MClient *client;  
@@ -60,6 +67,46 @@ void blink_callback(void *)  
}  
  
+  
+/* Helper function for printing floats & doubles */  
+static char *print_double(char* str, double v, int decimalDigits=2) 4
```

```
switch(status) {  
@@ -114,6 +161,9 @@ void main_application(void)  
// https://github.com/ARMmbed/sd-driver/issues/93 (IOTM0RF-2327)  
// SD-driver initialization can fails with bd->init() -5005. This wait will  
// allow the board more time to initialize.  
+ float value1=0, old_val1=25;  
+ char buffer1[32]; 5  
+  
#ifdef TARGET_LIKE_MBED  
    wait(2);  
#endif  
@@ -135,6 +185,8 @@ void main_application(void)  
    return;  
}  
  
+ hum_temp->enable(); 6  
+  
// Print platform information  
mcc_platform_sw_build_info();  
  
@@ -173,6 +225,10 @@ void main_application(void)  
button_res = mbedClient.add_cloud_resource(3200, 0, 5501, "button_resource", M2MResourceInstance::INTEGER,  
                                         M2MBase::GET_ALLOWED, 0, true, NULL, (void*)button_notification_status_callback); 7  
  
+ // Create resource for Hum & Temp.  
+ temp_res = mbedClient.add_cloud_resource(3303, 0, 5700, "temp_resource", M2MResourceInstance::FLOAT,  
                                         M2MBase::GET_ALLOWED, 0, true, NULL, (void*)button_notification_status_callback);  
+  
// Create resource for led blinking pattern. Path of this resource will be: 3201/0/5853.  
pattern_res = mbedClient.add_cloud_resource(3201, 0, 5853, "pattern_resource", M2MResourceInstance::STRING,  
                                         M2MBase::GET_PUT_ALLOWED, "500:500:500:500", false, (void*)pattern_updated, NULL);  
@@ -198,6 +254,14 @@ void main_application(void)  
if (mcc_platform_button_clicked()) {  
    button_res->set_value(++button_count);  
}  
  
+ hum_temp->get_temperature(&value1); 8  
+ if(old_val1 != value1)  
{  
    old_val1=value1;  
    printf("HTS221: [temp] %7s C\r\n", print_double(buffer1, value1));  
    temp_res->set_value(value1);  
}
```

# Example1 (5/5) – Read[Get] temperature value

## Serial I/F terminal

```
[EasyConnect] IPv4 mode
[EasyConnect] Using WiFi (WizFi310)
[EasyConnect] Connecting to WiFi Guest-AccessNG
[EasyConnect] Connected to Network successfully
[EasyConnect] MAC address 00:08:DC:52:9F:D3
[EasyConnect] IP address 192.168.1.96
Network initialized, connecting...
HTS221: [temp] 30.50 C
HTS221: [temp] 30.60 C
HTS221: [temp] 30.50 C
HTS221: [temp] 30.60 C
```

Client registered

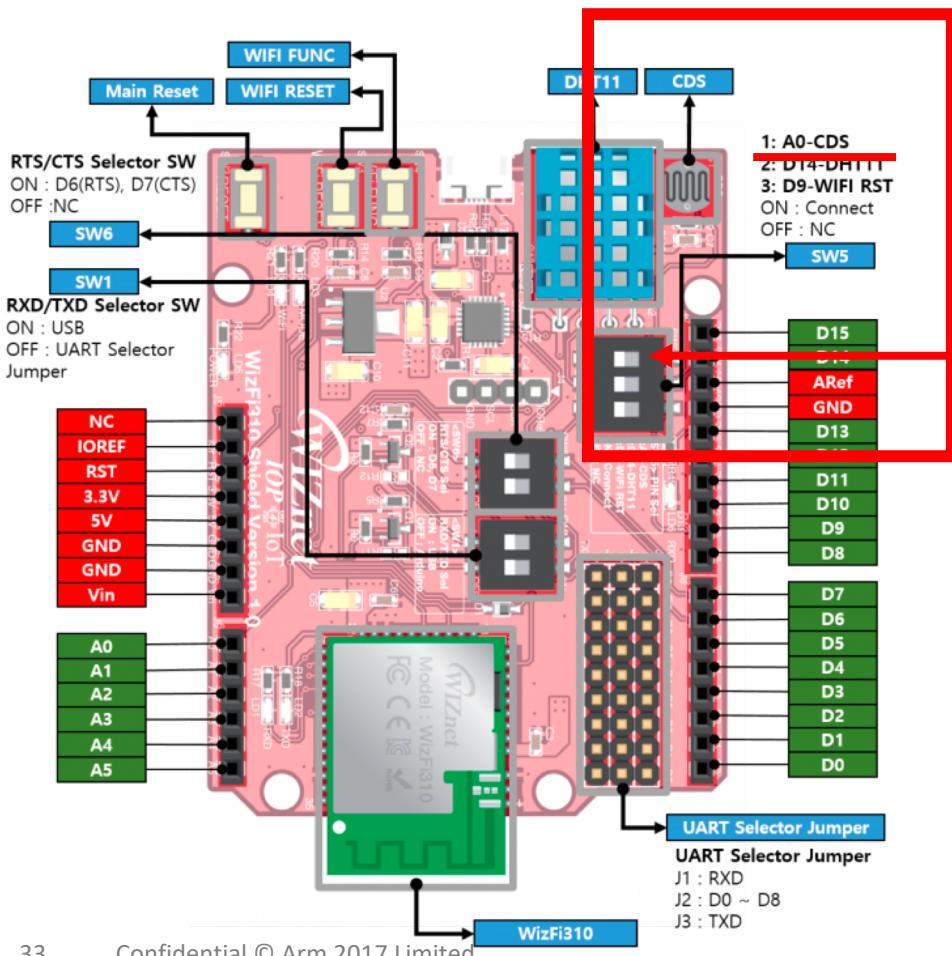
```
Endpoint Name: 01658eaf01cc0000000000001001003a4
Device Id: 01658eaf01cc0000000000001001003a4
HTS221: [temp] 30.70 C
HTS221: [temp] 30.60 C
Notification callback: (3200/0/5501) subscribed
Notification callback: (3303/0/5700) subscribed
HTS221: [temp] 30.70 C
HTS221: [temp] 30.60 C
HTS221: [temp] 30.70 C
```

The screenshot shows the Arm Pelion Device Cloud interface. On the left, a table lists three resources: 'Temperature' (path /3303), 'Temperature - 0' (path /3303/0), and 'temp\_resource' (path /3303/0/5700). A red arrow points from the 'temp\_resource' row to the main content area. The main area displays the 'temp\_resource' configuration. It shows a 'Value (GET)': 29 and a 'Value (subscription)': 31. Below this is a graph titled 'Humidity - Sensor Value' showing the value over time. The graph starts at 29, remains flat until 14:28:00, then rises to 30 by 14:29:00, drops to 29.5 at 14:29:20, rises to 31 at 14:29:40, and ends at 31.5 at 14:29:52.

# Example2

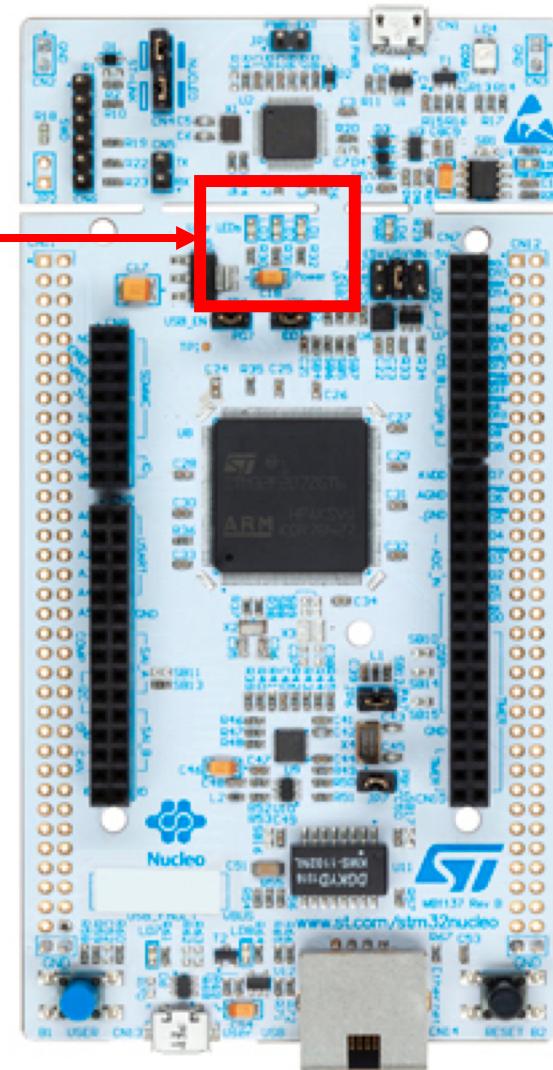
# Example 3 (1/3) – Read CDS and LED on/off

- <https://en.wikipedia.org/wiki/Photoresistor>



LED2

No.1 S/W Enable

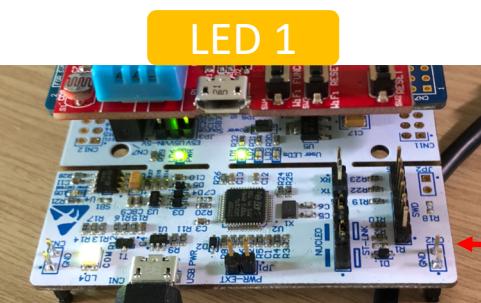
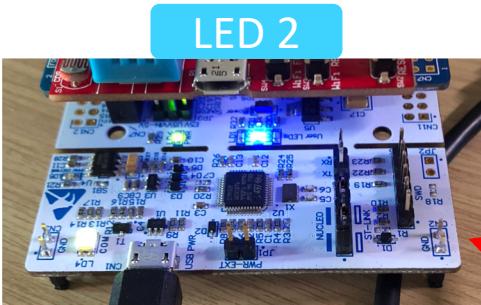
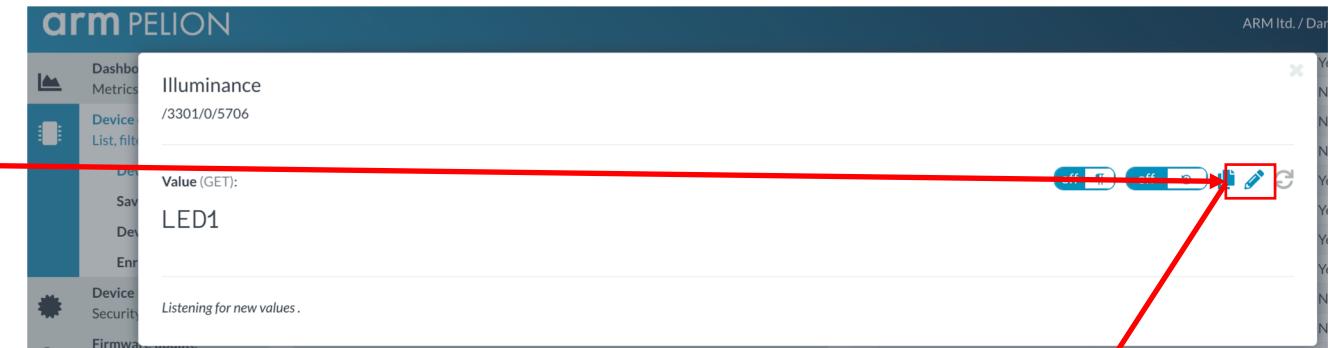


## Example 3 (2/3) – Read CDS

1. Finding reference code
  - [https://os.mbed.com/users/yu10078999/code/CDS/docs/tip/main\\_8cpp\\_source.html](https://os.mbed.com/users/yu10078999/code/CDS/docs/tip/main_8cpp_source.html)
2. Make a data structure of M2MResource for CDS
3. Check resource ID on Pelion
4. Make a data structure of M2MResource for LED on/off a structure
5. Add control conditions
6. Operation check on Pelion

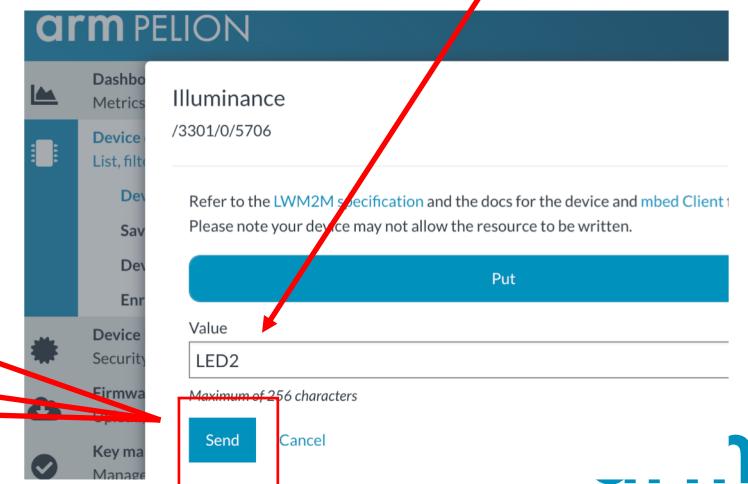
# Example 3 (3/3) – Read CDS and LED on/off

Illuminance	/3301	No
Illuminance - 0	/3301/0	No
cds_resource	/3301/0/5700	Yes
<b>cds_condition</b>	/3301/0/5706	Yes



**Serial I/F terminal**

```
Device Id: 01658ee3a2ee000000000000100100162
HTS221: [temp] 30.20 C
HTS221: [temp] 30.29 C
HTS221: [temp] 30.20 C
HTS221: [temp] 30.29 C
HTS221: [temp] 30.20 C
HTS221: [temp] 30.29 C
Notification callback: (3301/0/5700) subscribed
Notification callback: (3200/0/5501) subscribed
Notification callback: (3303/0/5700) subscribed
HTS221: [temp] 30.39 C
HTS221: [temp] 30.29 C
PUT received for CDS, LED change to LED2
HTS221: [temp] 30.39 C
HTS221: [temp] 30.29 C
```



Value change to  
'LED2'

# Last page...

- Focused on Device/Connection



Various devices

OMA LWM2M,  
CoAP/HTTP/MQTT  
TLS, DTLS

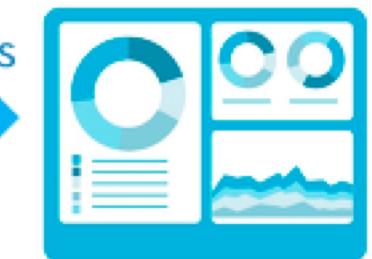
mbed  
Device Server  
Security  
Communication  
Scale

arm MBED Cloud

- Focused on Service/Data



HTTPS



IoT applications

Thing+ Platform

# FEEDBACK

<http://bitly.kr/NurQ>

- [daniel.lee2@arm.com](mailto:daniel.lee2@arm.com)
- <https://os.mbed.com/forum/ko/topic/27726/>



Thank You!

Danke!

Merci!

谢谢!

ありがとう!

Gracias!

Kiitos!

감사합니다!

arm