



life.augmented

# **#3 How to create a basic Bluetooth® Low Energy peripheral in 10 min**

**Click & Go**



# Prerequisites Refresh

## SW prerequisites

- STM32CubeWBA MCU package (v1.2.0 as basis + optional patch)
- IDE: STM32CubeIDE (1.14.0)
- A serial terminal (e.g. TeraTerm)
- **ST BLE ToolBox Smartphone application**

NUCLEO STM32WBA55



ST BLE Toolbox

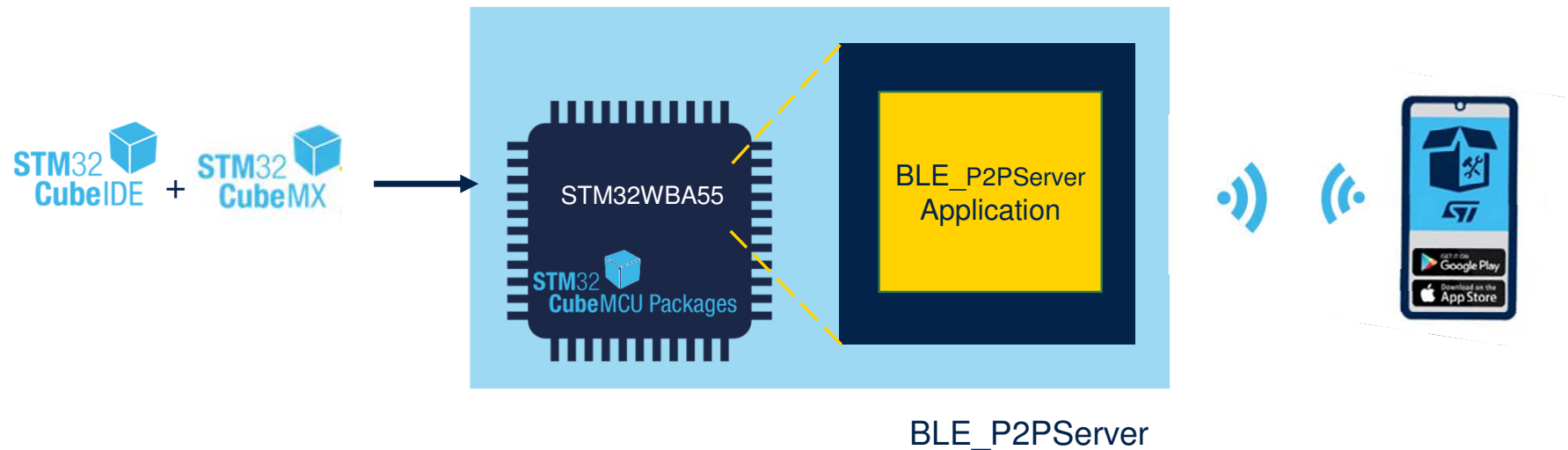


## HW prerequisites

- USB C cable



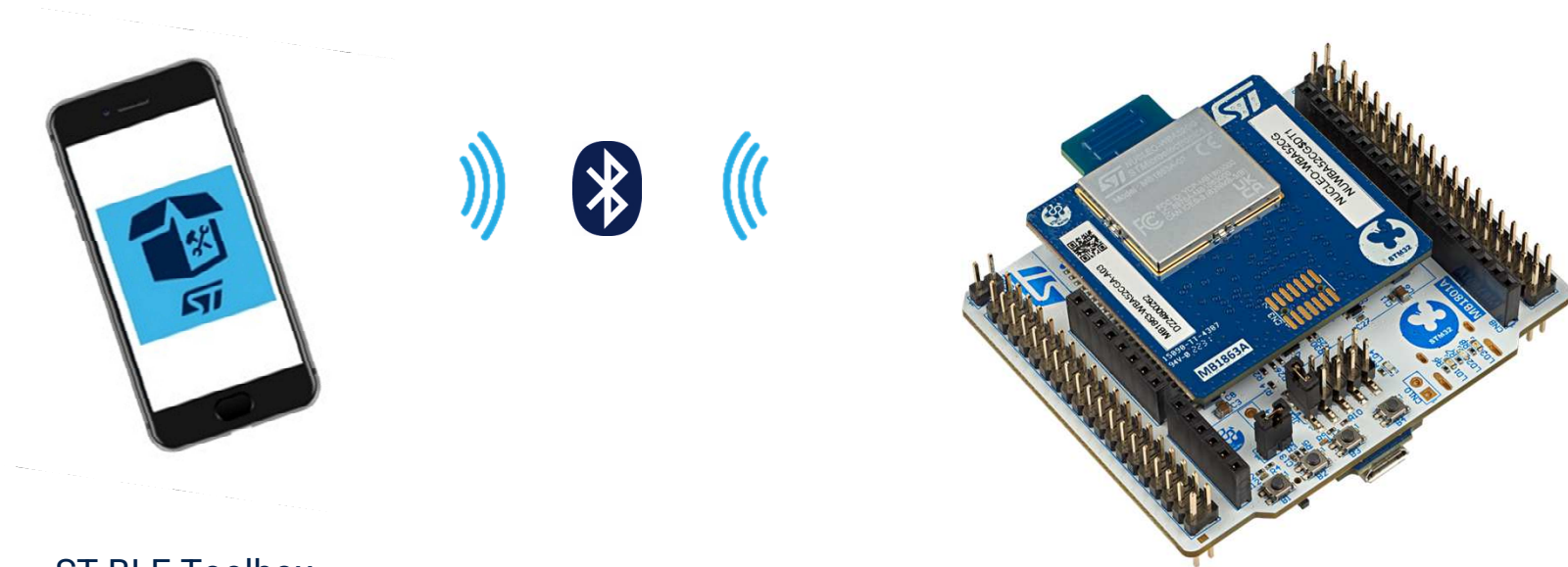
# **Basic Peripheral in 10mn : Click & Go :**





# What is a P2P Server?

P2P is a Generic Attribute Profile (GATT) based on Bluetooth® Low Energy defined by STM with proprietary UUIDs 128bit



ST BLE Toolbox



**GATT Client**

**GAP central**

**GATT Server**

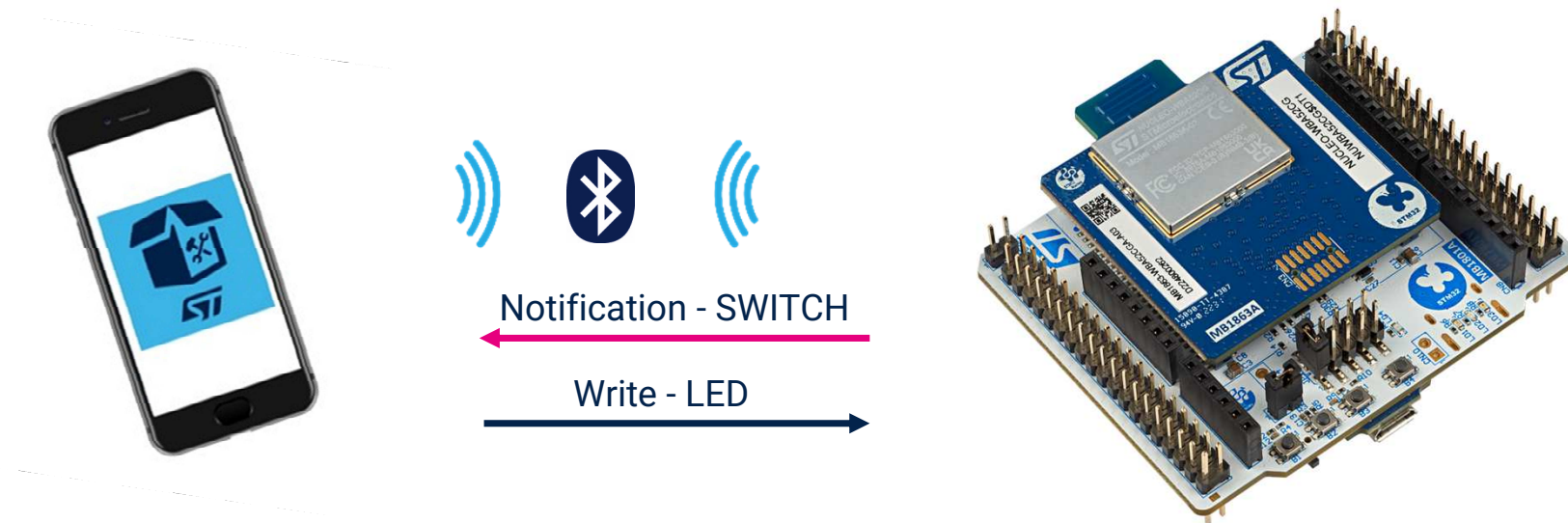
**GAP peripheral**





# What is a P2P Server?

P2P is widely used for direct connection and defined connection between GATT Server and GATT Client



ST BLE Toolbox



**GATT Client**

**GAP central**

**GATT Server**

**GAP peripheral**





# STM32Cube capabilities



STM32Cube allow to start design within 3 options

1

## Example application

complete application running over NUCLEO

2

## Board level

all the hardware is already configured (NUCLEO\_WBA55)

3

## Chipset level

require to configure your HW (PCB) & your application





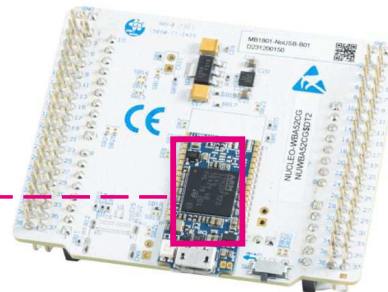
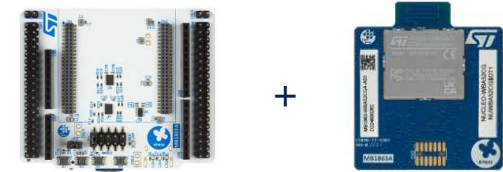
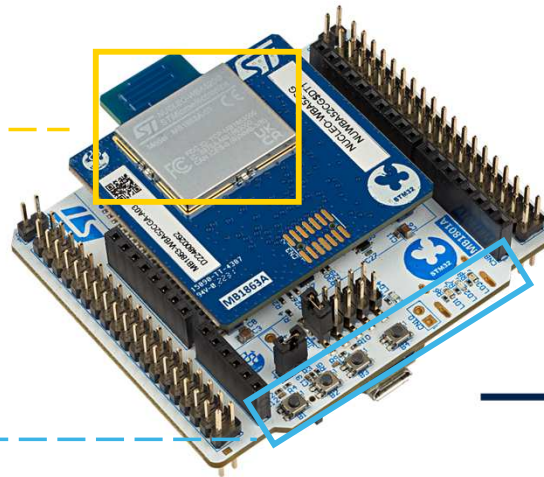
# Connect the NUCLEO-WBA55CG to the PC

STM32WBA55CG

3 user LEDs  
3 user buttons

STLINK-V3MODS

- Programming
- Debugging
- VCOM





# START STM32CubeIDE

## Open BLE\_P2PServer example

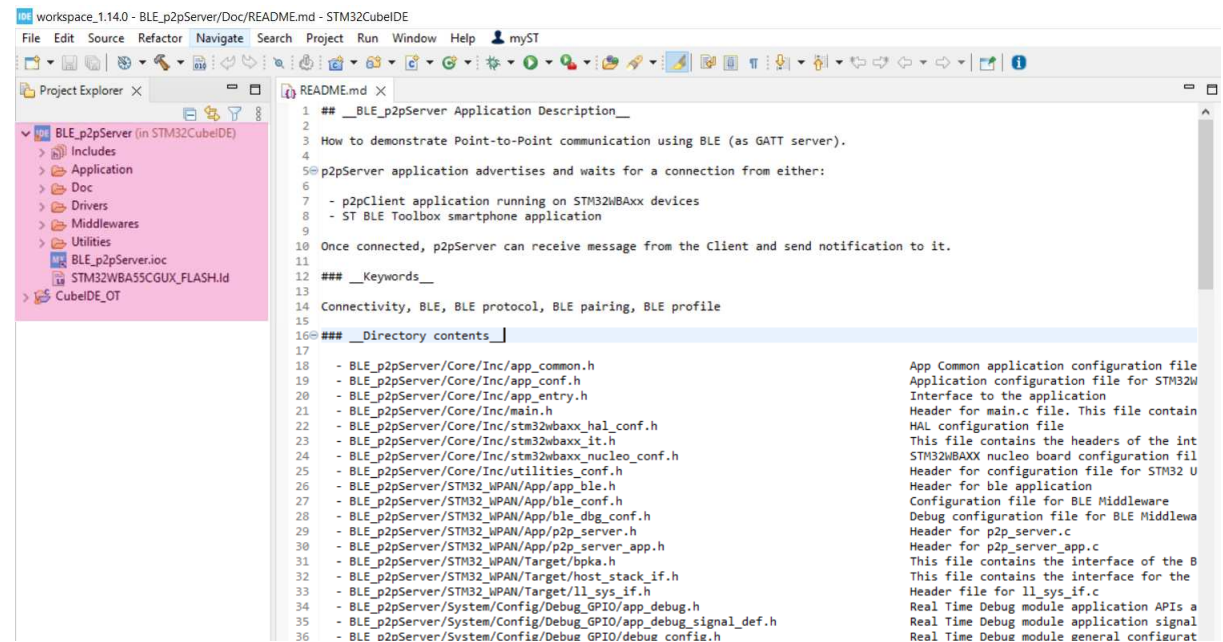
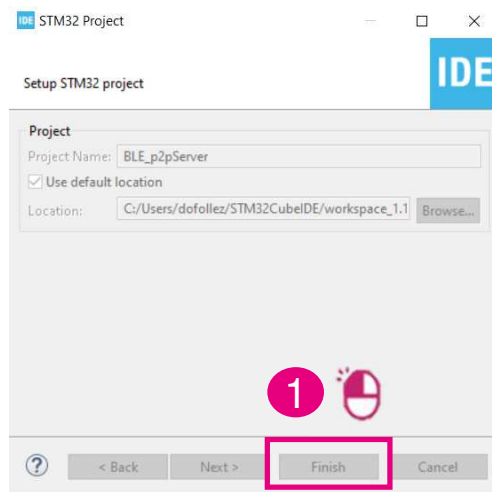
The screenshot shows the STM32CubeIDE interface with the following components:

- File Menu:** Located at the top left, showing options like New, Open File..., Open Projects from File System..., Recent Files, Close Editor, Close All Editors, Save, Save As..., Save All, Revert, Move..., Rename..., Refresh, Convert Line Delimiters To, Print..., Import..., Export..., Properties, Switch Workspace, Restart, and Exit.
- Target Selection Dialog:** A dialog box titled "Target Selection" with the subtitle "Select STM32 target or STM32Cube example". It has tabs for "MCU/MPU Selector", "Board Selector", "Example Selector", and "Cross Selector". The "Example Selector" tab is active, showing a list of examples. A red circle with the number 1 is next to the "File" menu, and a red circle with the number 2 is next to the "Example Selector" tab.
- Example Selector:** A section with "Example Filters" and a search bar. The search bar contains the text "BLE\_p2pServer". A red circle with the number 3 is next to the "Next" button at the bottom right.
- Examples List:** A table listing 13 items. The first item, "BLE\_p2pServer", is highlighted with a red box. The table has columns for Name, Board, Board Type, Configurable, SW Package Installed, and STM32CubeIDE Version.
- Project Details:** A section titled "STM32WBA" showing details for the "BLE\_p2pServer" project, including the required software package, supported toolchain, and board information.

Name	Board	Board Type	Configurable	SW Package Installed	STM32CubeIDE Version
BLE_p2pServer	NUCLEO-WB15CC	Nucleo-64	Yes	Yes	1.12.0
BLE_p2pServer	P.NUCLEO-WB55-NUCLEO	Nucleo-64	Yes	Yes	1.12.0
BLE_p2pServer	P.NUCLEO-WB55-USBONGLE	Nucleo-64	Yes	Yes	NA
BLE_p2pServer	Discovery Kit	Discovery Kit	Yes	Yes	1.12.0
BLE_p2pServer	NUCLEO-WB15CC	Nucleo-64	Yes	Yes	1.14.0
BLE_p2pServer_Ext	P.NUCLEO-WB55-NUCLEO	Nucleo-64	Yes	Yes	NA
BLE_p2pServer_ota	NUCLEO-WB15CC	Nucleo-64	Yes	Yes	1.14.0
BLE_p2pServer_ota	P.NUCLEO-WB55-NUCLEO	Nucleo-64	Yes	Yes	NA
BLE_p2pServer_ota	NUCLEO-WB15CC	Nucleo-64	Yes	Yes	1.14.0
BLE_p2pServer_TZ	NUCLEO-WB15CC	Nucleo-64	Yes	Yes	1.14.0
BLE_p2pServerThreadX	NUCLEO-WB15CC	Nucleo-64	Yes	Yes	1.14.0

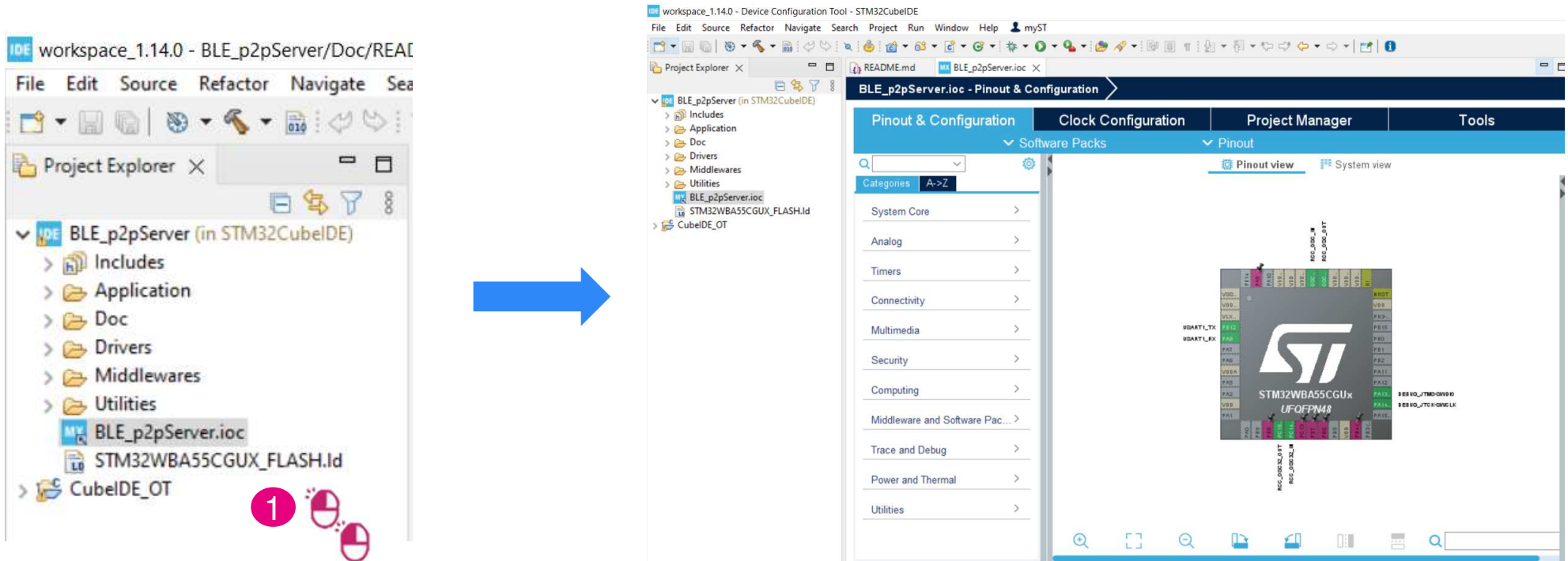
# START STM32CubeIDE

## Open BLE\_P2PServer example



At this stage, Default BLE\_P2PServer project source code is ready to be modified, built and flash using STM32CubeIDE

# Let's customize this BLE\_p2pServer



Double click on .ioc file to Open CubeMx graphical interface



# Customize Local Name

BLE\_p2pServer.loc - Pinout & Configuration

Pinout & Configuration | Clock Configuration | Project Manager

Software Packs | Pinout

STM32\_WPAN Mode and Configuration

Mode

BLE Select and configure your Server application

Configuration

Reset Configuration

SERVICE1 | User Constants | Platform Settings

BLE Applications and Services | Configuration | BLE Advertising

Configure the below parameters:

Search (Ctrl+F)

ADV\_INTERVAL\_MIN 80  
ADV\_INTERVAL\_MAX 100

Advertising elements

ad\_data[] length 27  
Include AD\_TYPE\_TX\_POWER\_LEVEL element No  
Include AD\_TYPE\_COMPLETE\_LOCAL\_NAME... Yes  
AD\_TYPE\_COMPLETE\_LOCAL\_NAME\_L 10  
AD\_TYPE\_COMPLETE\_LOCAL\_NAME MyName\_01  
Include AD\_TYPE\_SHORTENED\_LOCAL\_NAME... No  
Include AD\_TYPE\_APPEARANCE element No  
Include AD\_TYPE\_ADVERTISING\_INTERVAL... No  
Include AD\_TYPE\_LE\_ROLE element No  
Include AD\_TYPE\_16\_BIT\_SERV\_UUID\_CMPL No  
Include AD\_TYPE\_128\_BIT\_SERV\_UUID\_CMP No  
Include AD\_TYPE\_SLAVE\_CONN\_INTERVAL... No  
Include AD\_TYPE\_URI element No  
Include AD\_TYPE\_MANUFACTURER\_SPECIFIC Yes

Local Name must be < 11 CubeMx constraints

Advertising elements

ad\_data[] length 27  
Include AD\_TYPE\_TX\_POWER\_LEVEL element No  
Include AD\_TYPE\_COMPLETE\_LOCAL\_NAME... Yes  
AD\_TYPE\_COMPLETE\_LOCAL\_NAME\_L 10  
AD\_TYPE\_COMPLETE\_LOCAL\_NAME MyName\_01

12



# Customize Device Name

BLE\_p2pServer.loc - Pinout & Configuration

Pinout & Configuration | Clock Configuration | Project Manager

Software Packs | Pinout

STM32\_WPAN Mode and Configuration

Mode

BLE Select and configure your Server application

Configuration

Reset Configuration

SERVICE1 | User Constants | Platform Settings | Advertising

Configuration

Configure the below parameters :

Search (Ctrl+F)

CFG_TX_POWER	-0.3 dBm (0x19)
CFG_BD_ADDRESS	0x0008E12A1234
Address Type	Public address(0)
PAIRING_PARAMETERS	ON
CFG_BONDING_MODE	Bonding mode(0x01)
CFG_FIXED_PIN	111111
CFG_USED_FIXED_PIN	Use a fixed pin (0x00)
CFG_ENCRYPTION_KEY_SIZE_MAX	16
CFG_ENCRYPTION_KEY_SIZE_MIN	8
CFG_IO_CAPABILITY	Display Yes No (0x01)
CFG_MITM_PROTECTION	MITM protection required (0x01)
CFG_SC_SUPPORT	Secure Connections Pairing supported but optional (0x01)
CFG_KEYPRESS_NOTIFICATION_SUPPORT	Keypress notification not supported (0x00)
CFG_BLE_IRK	12, 34, 56, 78, 9A, BC, DE, F0, 12, 34, 56, 78, 9A, BC, D...
CFG_BLE_ERK	FE, DC, BA, 09, 87, 65, 43, 21, FE, DC, BA, 09, 87, 65, ...
CFG_GAP_DEVICE_NAME	MyName_01
CFG_GAP_DEVICE_NAME_LENGTH	9

Application configuration - Application parameters

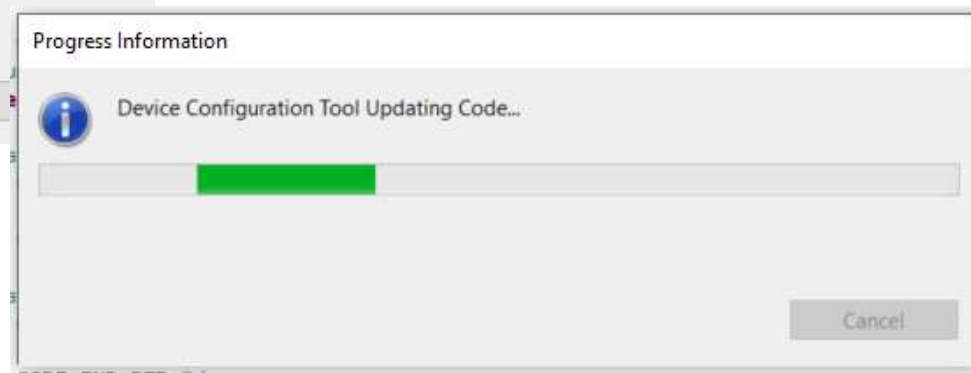
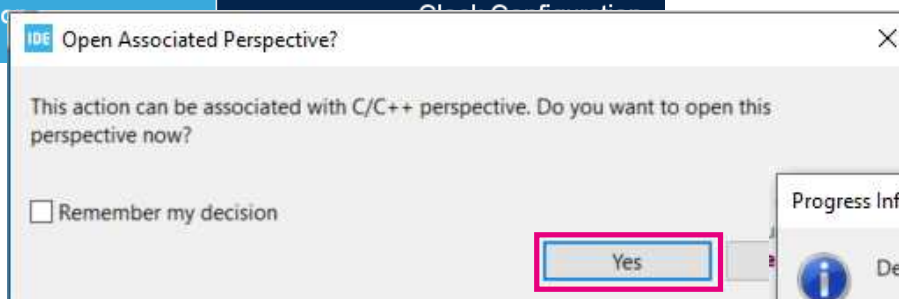
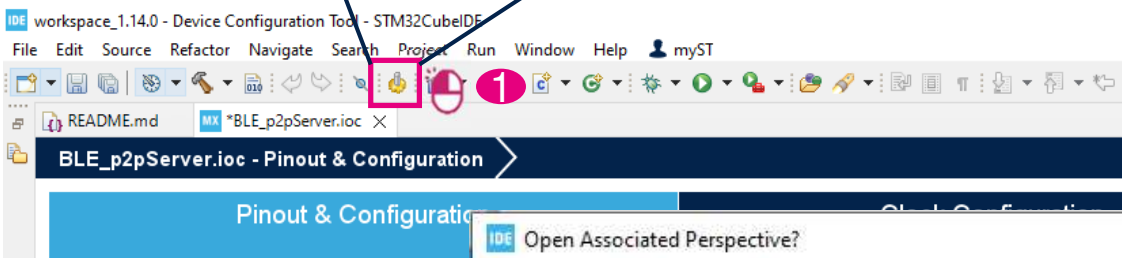
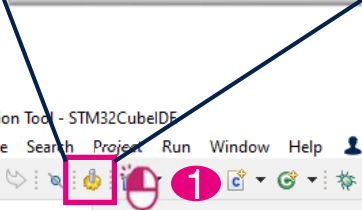
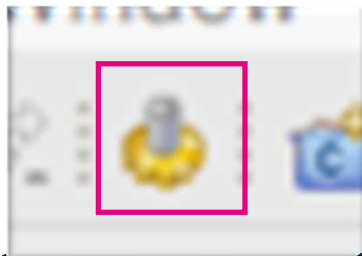
CFG_TX_POWER	-0.3 dBm (0x19)
CFG_BD_ADDRESS	0x0008E12A1234
Address Type	Public address(0)
PAIRING_PARAMETERS	ON
CFG_BONDING_MODE	Bonding mode(0x01)
CFG_FIXED_PIN	111111
CFG_USED_FIXED_PIN	Use a fixed pin (0x00)
CFG_ENCRYPTION_KEY_SIZE_MAX	16
CFG_ENCRYPTION_KEY_SIZE_MIN	8
CFG_IO_CAPABILITY	Display Yes No (0x01)
CFG_MITM_PROTECTION	MITM protection required (0x01)
CFG_SC_SUPPORT	Secure Connections Pairing supported but optional (0x01)
CFG_KEYPRESS_NOTIFICATION_SUPPORT	Keypress notification not supported (0x00)
CFG_BLE_IRK	12, 34, 56, 78, 9A, BC, DE, F0, 12, 34, 56, 78, 9A, BC, D...
CFG_BLE_ERK	FE, DC, BA, 09, 87, 65, 43, 21, FE, DC, BA, 09, 87, 65, ...
CFG_GAP_DEVICE_NAME	MyName_01

set same Device name  
=  
Local Name

iOS displays Local Name (advertising data) prior to a 1st connexion.  
After a 1st connexion iOS displays Device name (thanks to look up table :  
associates BLE MAC @ & Device Name)



# Code Generation



## Slide 14

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**MM0**

Put a small comment also on the first two tabs

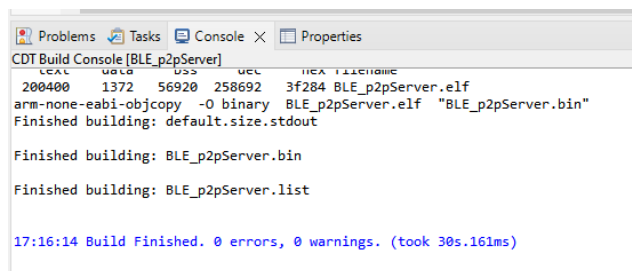
Manuel MARCIAS; 2023-08-03T11:59:22.255





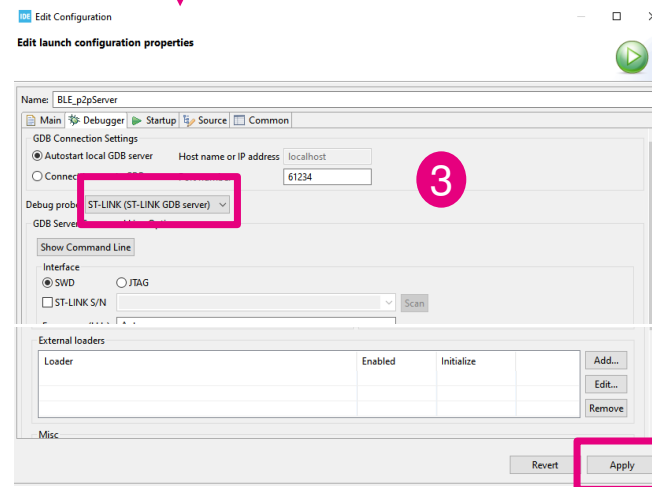
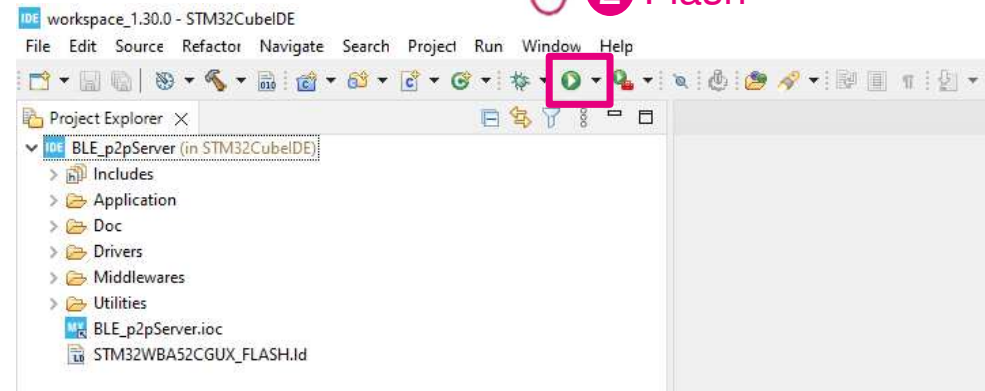
# Build and flash modified project

## 1 Build



## Plug the board

## 2 Flash



Erasing memory corresponding to segment 0:  
Erasing internal memory sectors [0 24]  
Download in Progress:  
File download complete  
Time elapsed during download operation: 00:00:01.738





# Enjoy your first STM32WBA55 project running!



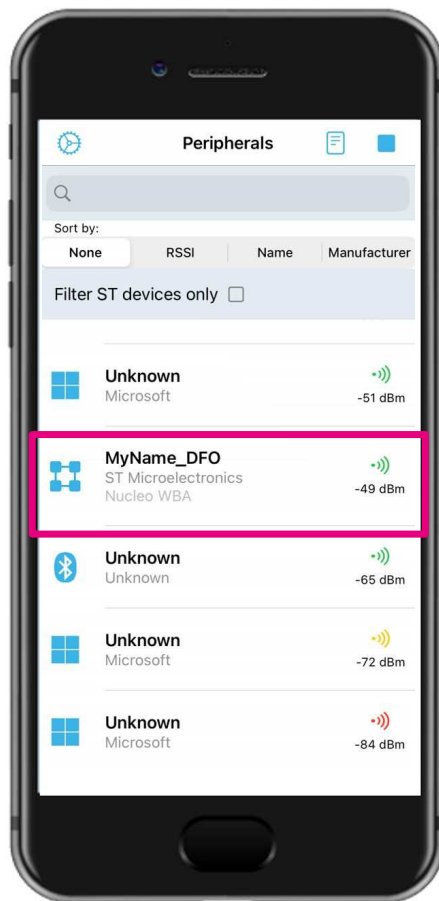
ST BLE Toolbox





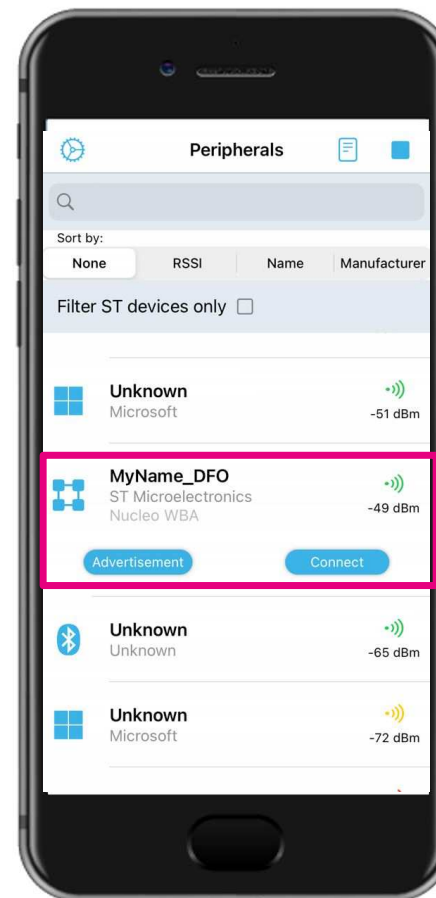
# STBLE Toolbox

1



click on device

2



click on connect



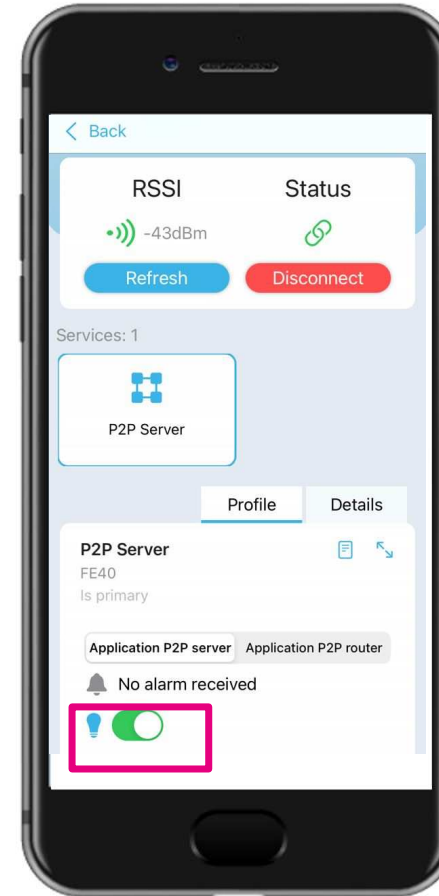
# STBLE Toolbox

3

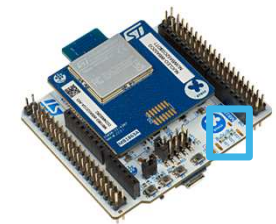


access to profile

4



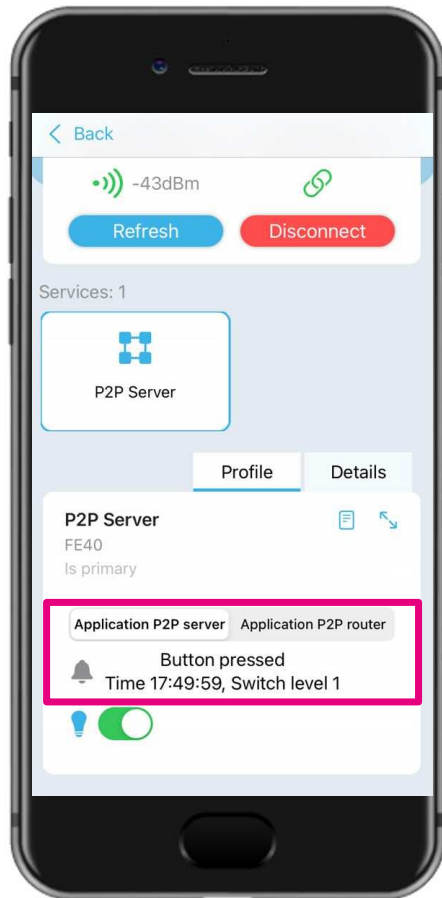
control LED status on Nucleo





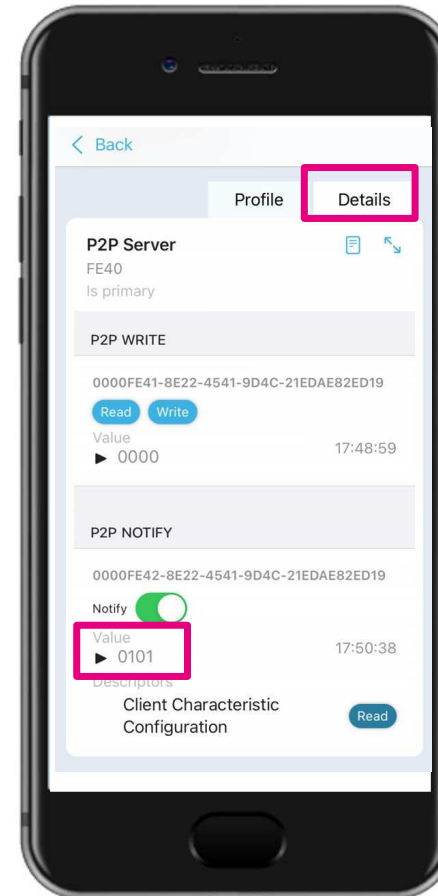
# STBLE Toolbox

5

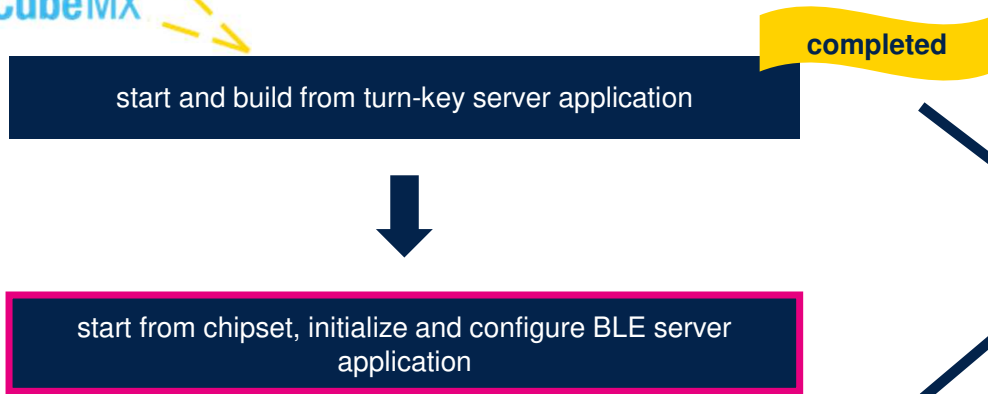


push button 1 and  
notify device

6



click on details to see  
bytes sent/received

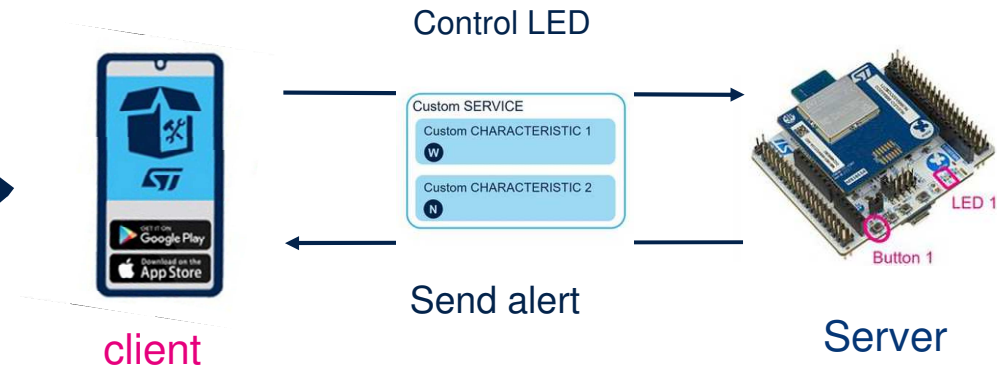


#1 initialize your HW 🛠️

#2 configure & understand BLE settings (Adv, service, characteristic) 🧠 🛠️

#2 modify application code & build 🛠️

# What's next ?



# Our technology starts with You



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