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How to create a basic Bluetooth® Low Energy peripheral in 10 min : Click & Go

Workshop Team



SW prerequisites

- STM32CubeWBA MCU package (v1.1.0 or up)
- IDE: STM32CubeIDE (v1.13.1 or Up)
- A serial terminal (e.g. TeraTerm)
- **ST BLE ToolBox Smartphone application**

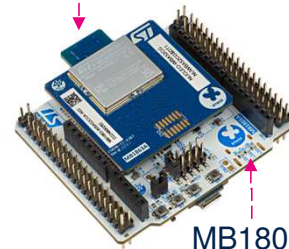
HW prerequisites

- USB A to Micro-B Cable

Prerequisites Refresh



MB1863



MB1801



ST BLE Toolbox

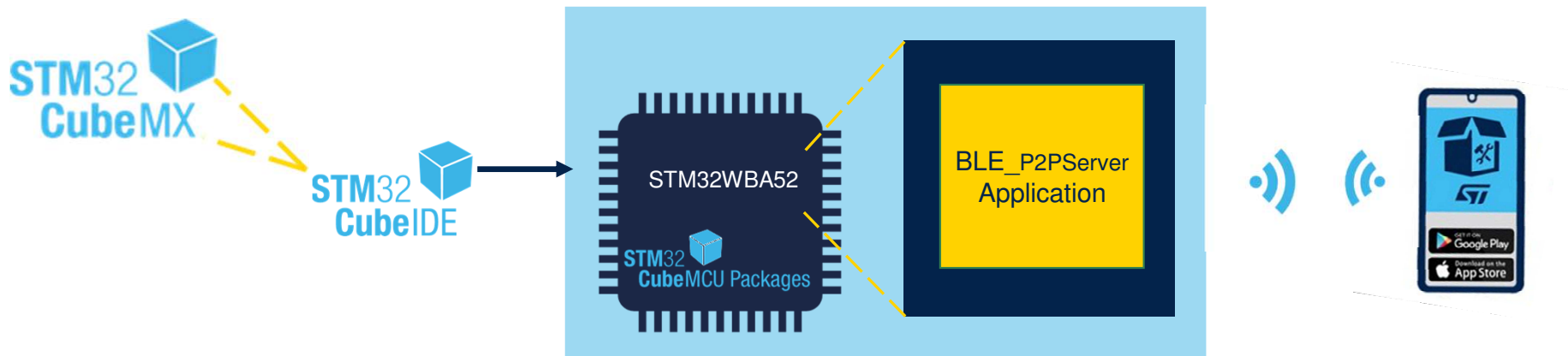


Basic Peripheral in 10mn : Click & Go :



Purpose

- As a first exercise, Let's start from an existing project example **BLE_P2PServer**
- Purpose of this session is to **modify this code example to customize advertising data (Local name)**.



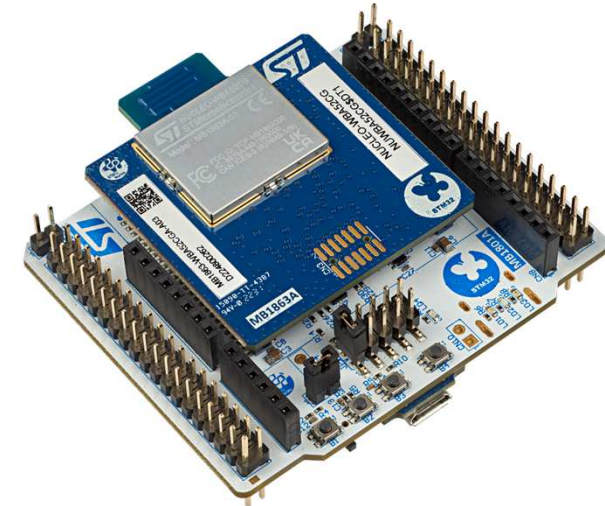
BLE_P2PServer

- In the second part of the Hands on we will generate associated code, flash and test over Nucleo-WBA5x board



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

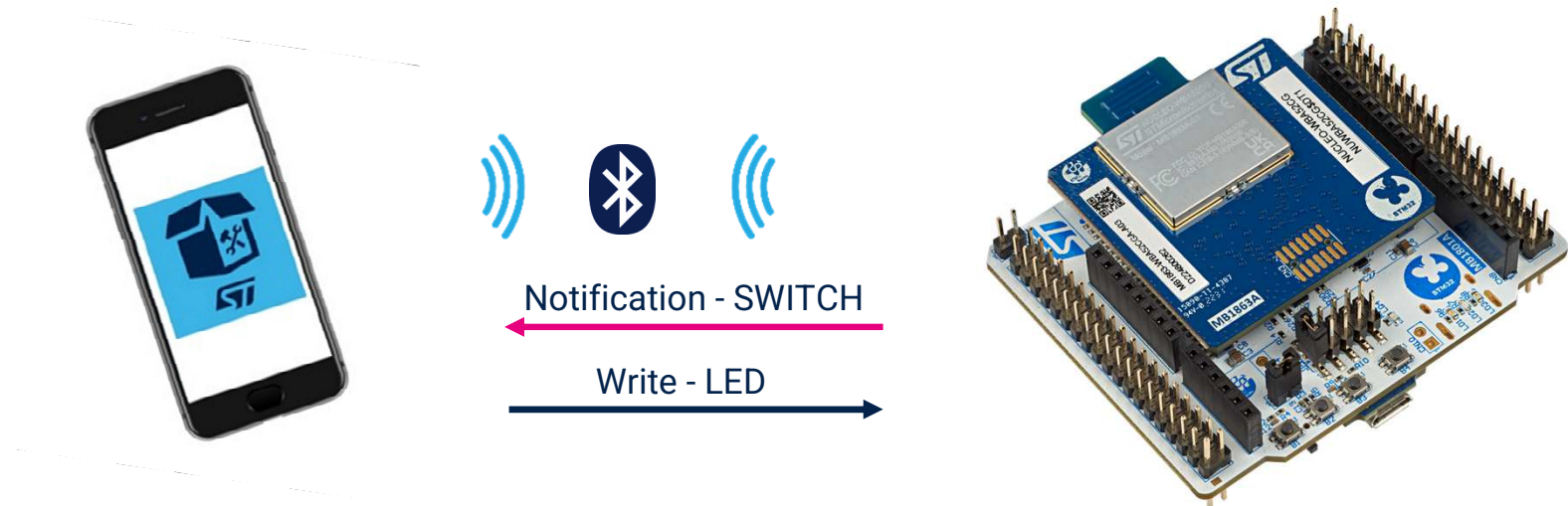
GATT Server

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

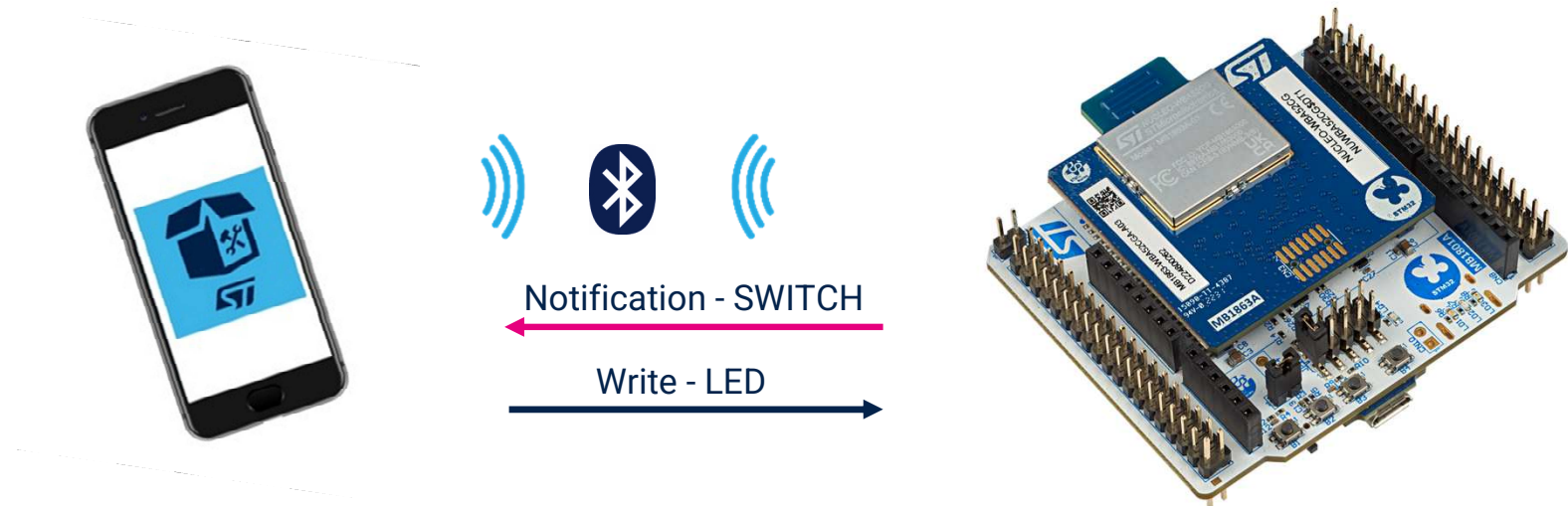
GATT Server

GAP peripheral



What is a P2P Server?

We will be able to control LED from Mobile and to get notification of LED status from Nucleo-WBA52



ST BLE Toolbox



GATT Client

GAP central

GATT Server

GAP peripheral





STM32
CubeIDE

STM32
CubeMX

STM32CubeMX capabilities

STM32CubeMX 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_WBA52)

3

Chipset level

require to configure your HW (PCB) & your application





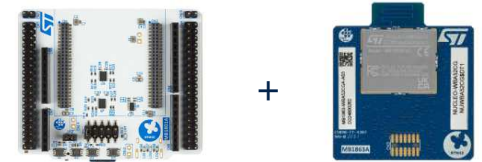
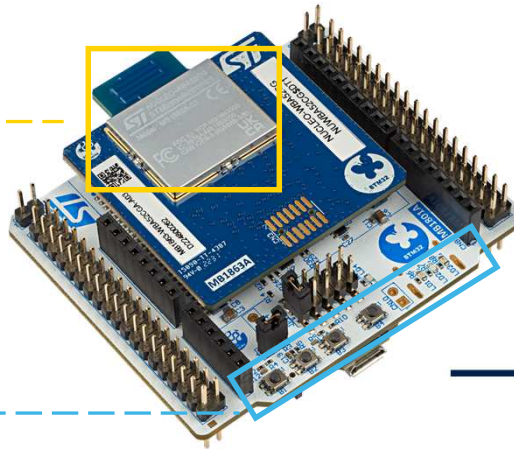
Connect the NUCLEO-WBA52CG to the PC

STM32WBA52CG

3 user LEDs
3 user buttons

STLINK-V3MODS

- Programming
- Debugging
- VCOM



START STM32CubeIDE

Open BLE_P2PServer example

workspace_1.13.1 - STM32CubeIDE

File Edit Source Refactor Navigate Search Project Run Window Help Hello Sebastien

New Alt+Shift+N > Makefile Project with Existing Code
Open File... C/C++ Project
Open Projects from File System... STM32 Project
Recent Files STM32 Project from an Existing STM32CubeMX
STM32 CMake Project
Project...

Close Editor Ctrl+W
Close All Editors Ctrl+Shift+W
Save Ctrl+S
Save As...
Save All Ctrl+Shift+S
Revert
Move...
Rename... F2
Refresh F5
Convert Line Delimiters To >
Print... Ctrl+P
Import...
Export...
Properties Alt+Enter
Switch Workspace >
Restart
Exit

Source Folder
Folder
Source File
Header File
File from Template
Class
Other...

Target Selection
Select STM32 target or STM32Cube example

MCU/MPU Selector Board Selector Example Selector Cross Selector

Example Filters
Name BLE_p2pServer
Key
Vendor
Board
Name
Type
MCU / MPU

STM32WBA
BLE_p2pServer V1.1.0
Required Software Package STM32Cube_FW_WBA_V1.1.0 (size: 161.0 MB) ✓
Vendor STMicroelectronics
Supported Toolchain/IDE EWARM, MDK-ARM, STM32CubeIDE
Board NUCLEO-WBA52CG
Mounted device STM32WBA52CGU6 UFQFPN 48 7x7x0.55 mm

BLE_p2pServer NUCLEO-WBA52CG

Examples List: 11 items

Name	Board	Package type	Configurable	STM32CubeIDE...	SW Package In...
BLE_p2pServer	NUCLEO-WBA52CG	Nucleo-64	✓	1.12.0	✓
BLE_p2pServer	P-NUCLEO-WB55	Nucleo-64	✓	1.12.0	✓
BLE_p2pServer	P-NUCLEO-WB55	Nucleo-64	✓	NA	✓
BLE_p2pServer	STM32WB55MM-DK	Discovery Kit	✓	1.12.0	✓
BLE_p2pServer	NUCLEO-WBA52CG	Nucleo-64	✓	1.13.0	✓
BLE_p2pServer	P-NUCLEO-WB55	Nucleo-64	✓	NA	✓
BLE_p2pServer	P-NUCLEO-WB55	Nucleo-64	✓	NA	✓
BLE_p2pServer	NUCLEO-WBA52CG	Nucleo-64	✓	1.13.0	✓
BLE_p2pServer	NUCLEO-WB15CC	Nucleo-64	✓	NA	✓
BLE_p2pServer	P-NUCLEO-WB55	Nucleo-64	✓	NA	✓
BLE_p2pServer	NUCLEO-WBA52CG	Nucleo-64	✓	1.13.0	✓

MCU/MPU Selector Board Selector Example Selector

Example Filters
Name BLE_p2pServer

of capable

Next > Back Finish Cancel



STM32CubeIDE – Nucleo Docs&Resources

Examples List: 13 items

Export

	Name	Board	Board Type	STM32CubeMX Compatib...	STM32CubeMX Version	SW Package Installed
☆	BLE_p2pServer	NUCLEO-WB15CC	Nucleo-64	✓	6.8.0	📄
☆	BLE_p2pServer	P-NUCLEO-WB55-NUCLEO	Nucleo-64	✓	6.8.0	📄
☆	BLE_p2pServer	P-NUCLEO-WB55-USBDONGLE	Nucleo-64	✗	NA	📄
☆	BLE_p2pServer	STM32WB5MM-DK	Discovery Kit	✓	6.8.0	📄
☆	BLE_p2pServer	NUCLEO-WBA52CG	Nucleo-64	✓	6.9.0	✓
☆	BLE_p2pServer_Ext	NUCLEO-WB15CC	Nucleo-64	✗	NA	📄
☆	BLE_p2pServer_Ext	P-NUCLEO-WB55-NUCLEO	Nucleo-64	✗	NA	📄
☆	BLE_p2pServer_Ext	NUCLEO-WBA52CG	Nucleo-64	✓	6.9.0	✓
☆	BLE_p2pServer_Ext	NUCLEO-WB15CC	Nucleo-64	✗	NA	📄

Features

Large Picture

Docs & Resources

Datasheet

Buy

Start Project

STM32WBA Series



NUCLEO-WBA52CG is a Bluetooth® Low Energy wireless and ultra-low-power board embedding a powerful and ultra-low-power radio compliant with the Bluetooth® Low Energy SIG specification v5.3.

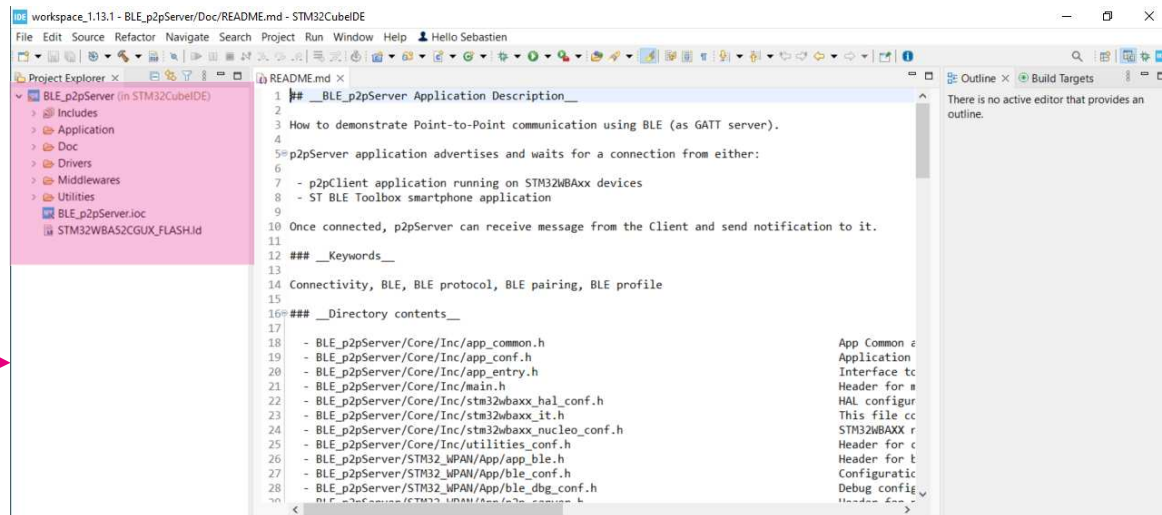
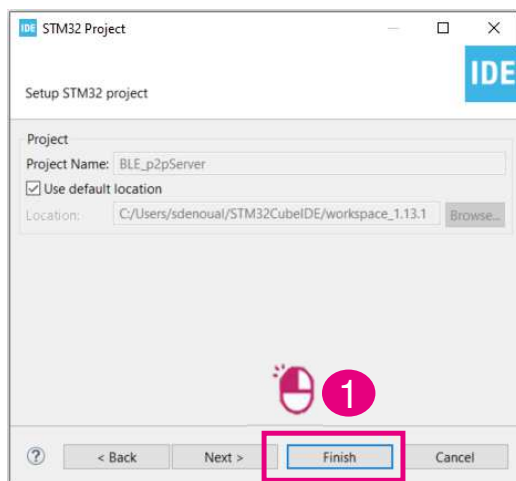
The ARDUINO® Uno V3 connectivity support and the ST morpho headers allow the easy expansion of the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.

Features

! by Clicking on the Board type we can access all the Doc & Resources related to the Nucleo-WBA52 and more in general to the STM32 product family

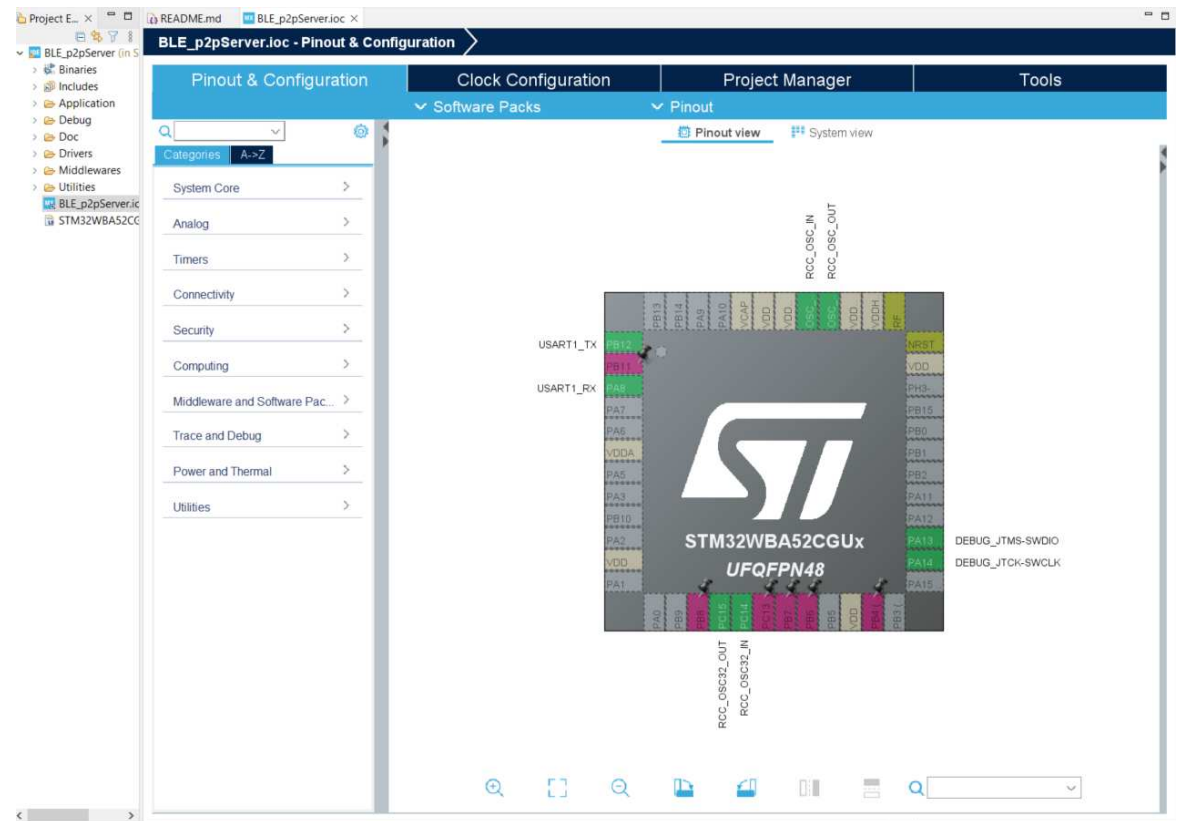
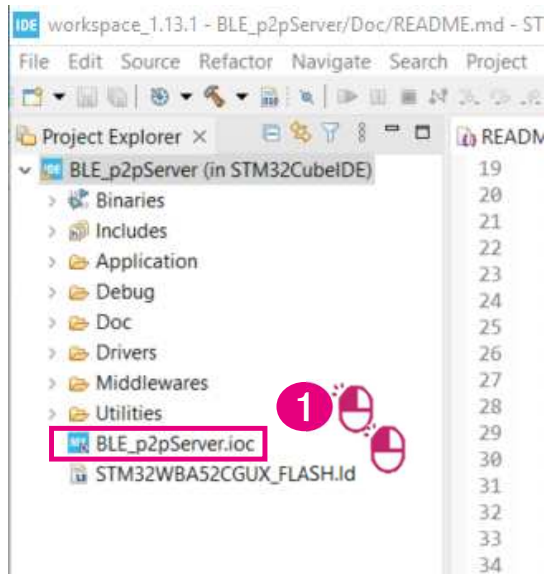
START STM32CubeIDE

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





Customize Local Name

BLE_p2pServer.ioc - 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

14



Customize Device Name

BLE_p2pServer.ioc - 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 | Advertising

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

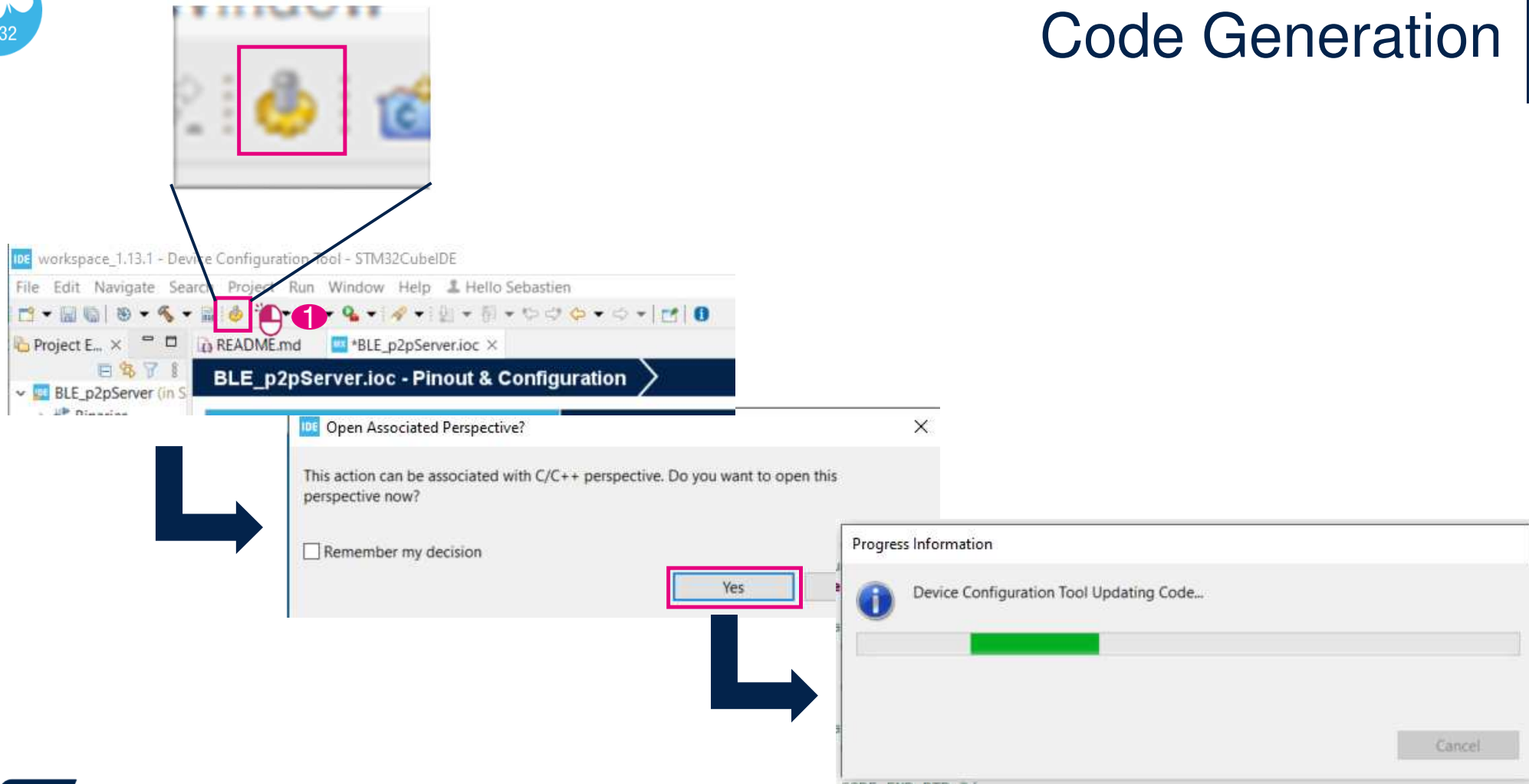
CFG_TX_POWER	-0.3 dBm (0x19)
CFG_BD_ADDRESS	0x0008E12A1234
Address Type	Public address(0)
PAIRING_PARAMETERS	ON
CFG_BONDING_MODE	Bonding mode(0x01)
CFG_FIXED_PIN	111111
CFG_USED_FIXED_PIN	Use a fixed pin (0x00)
CFG_ENCRYPTION_KEY_SIZE_MAX	16
CFG_ENCRYPTION_KEY_SIZE_MIN	8
CFG_IO_CAPABILITY	Display Yes 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)



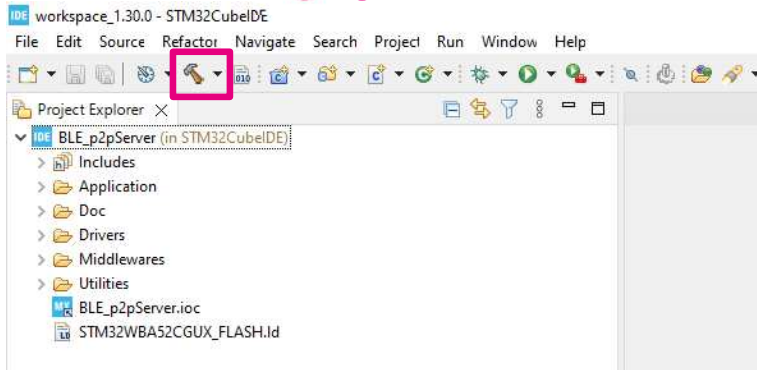
Code Generation





Build and flash modified project

1 Build



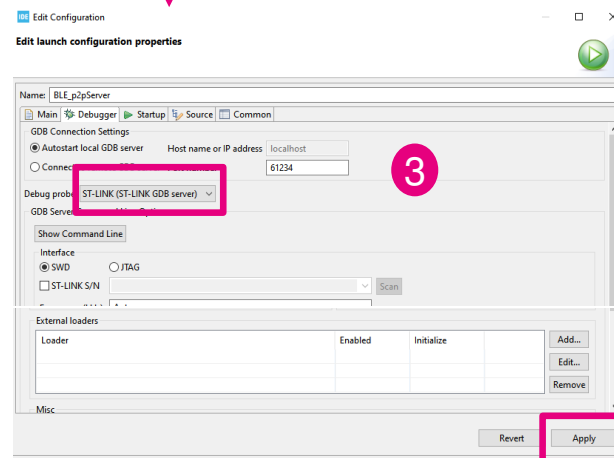
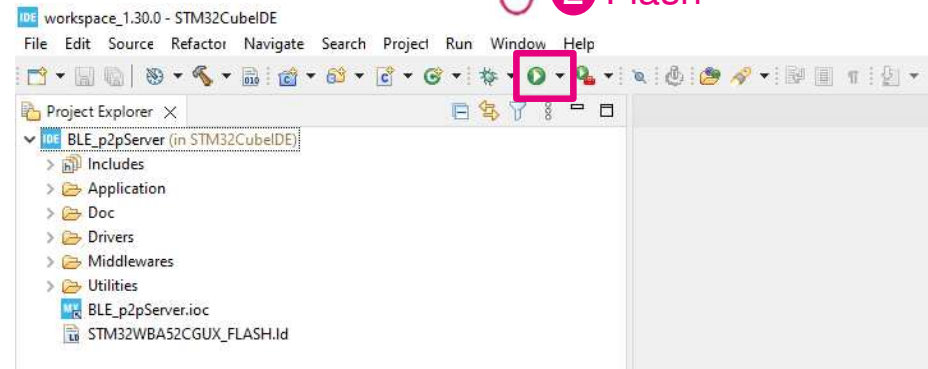
```
CDT Build Console [BLE_p2pServer]
200400 1372 56920 258692 3f284 BLE_p2pServer.elf
arm-none-eabi-objcopy -O binary BLE_p2pServer.elf "BLE_p2pServer.bin"
Finished building: default.size.stdout

Finished building: BLE_p2pServer.bin
Finished building: BLE_p2pServer.list

17:16:14 Build Finished. 0 errors, 0 warnings. (took 30s.161ms)
```

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 STM32WBA52 project running!



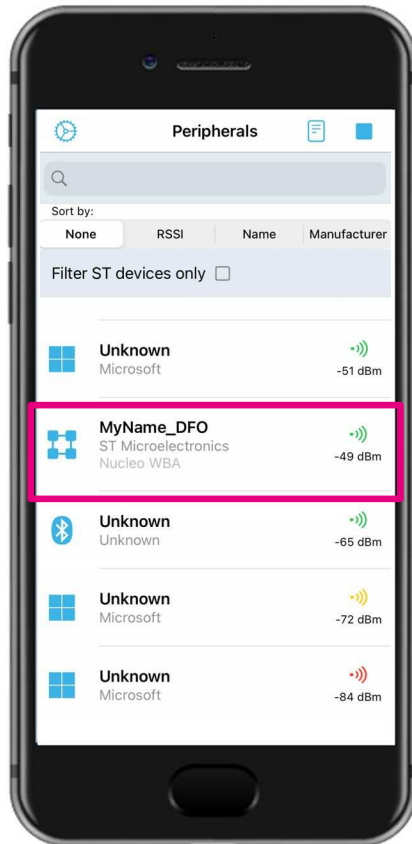
ST BLE Toolbox





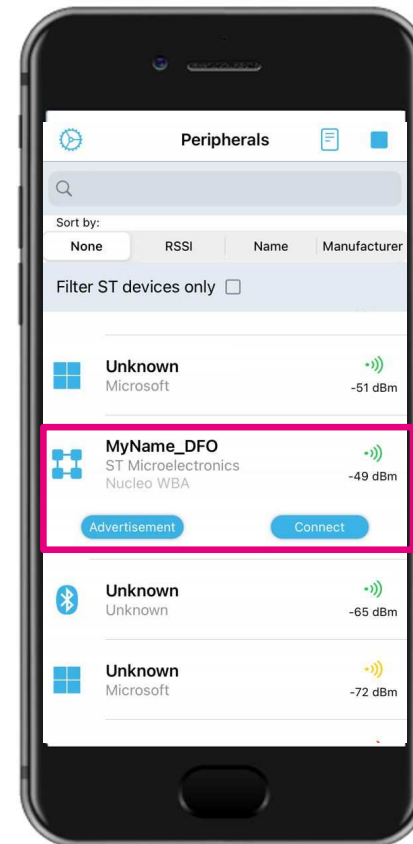
STBLE Toolbox

1



click on device

2



click on connect



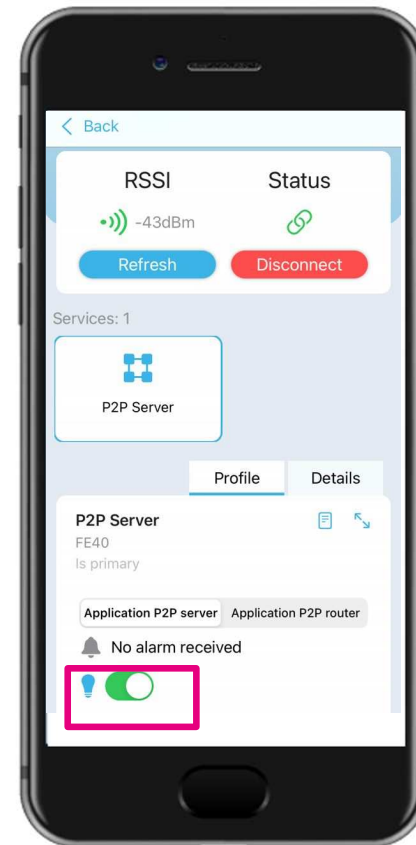
STBLE Toolbox

3

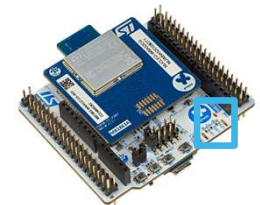


access to profile

4



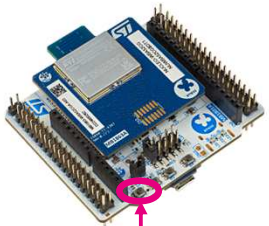
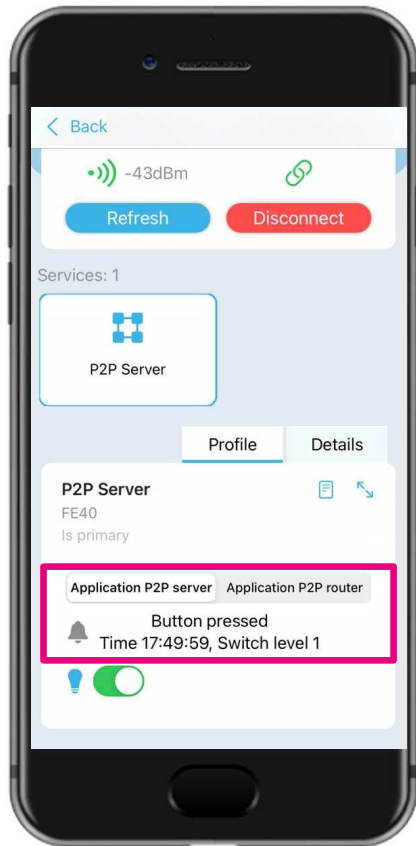
control LED status on Nucleo





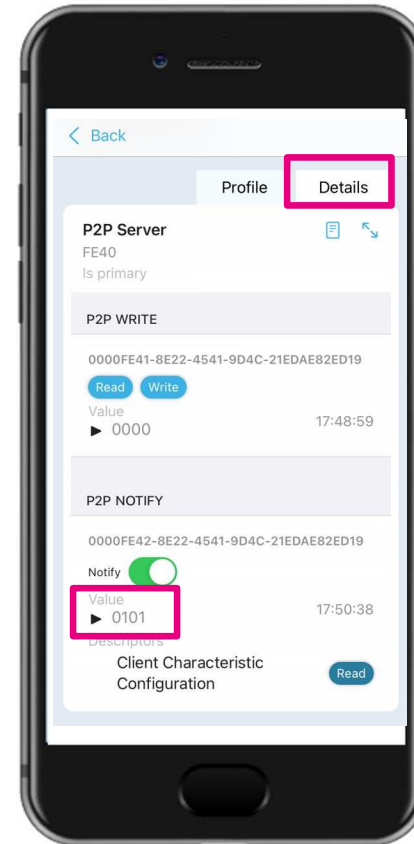
STBLE Toolbox

5

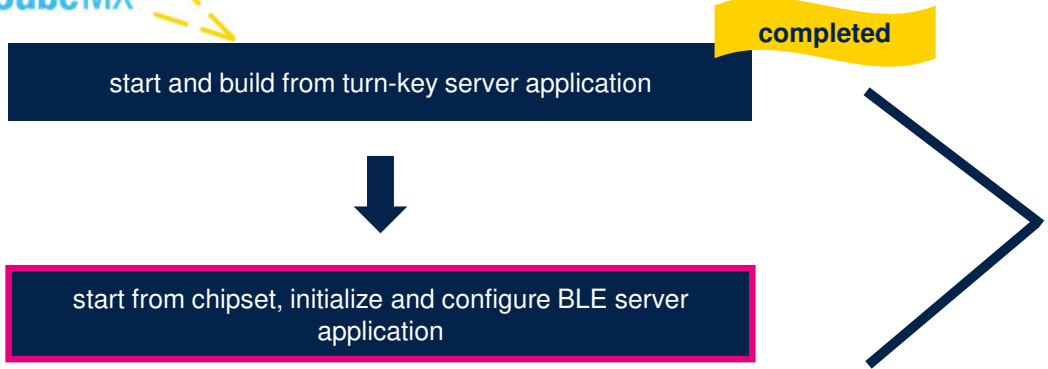


push button 1 and
notify device

6



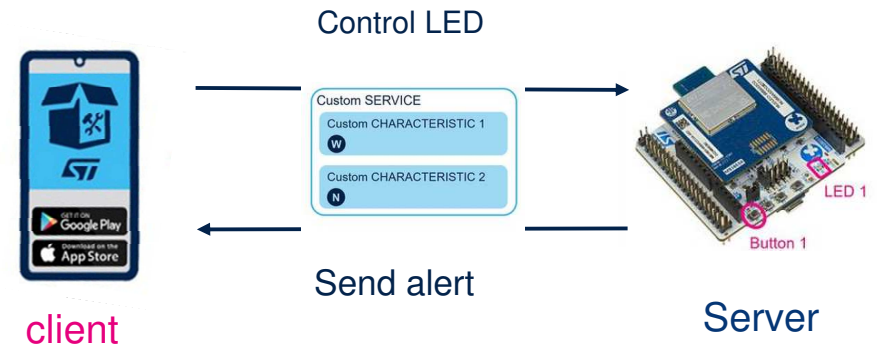
click on details to see
bytes sent/received



- #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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