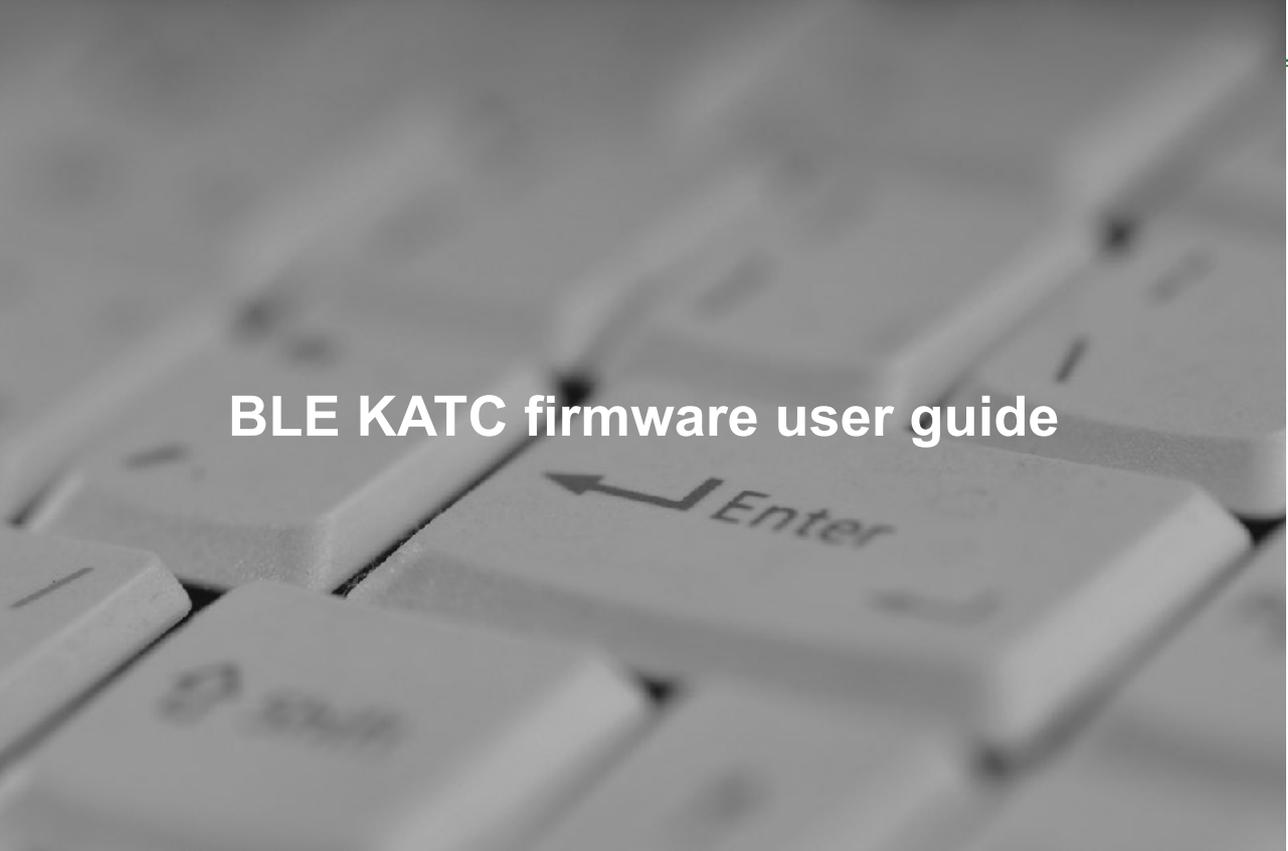


K-Solution Consulting Company Ltd.

A grayscale close-up photograph of a computer keyboard, focusing on the 'Enter' key. The text 'BLE KATC firmware user guide' is overlaid in white on the image.

BLE KATC firmware user guide

version 0.9 (firmware version 1.0)

Introduction

BLE (Bluetooth Low Energy) is a one of the major medias for IoT (Internet-of-Things) implementation. Devices with BLE feature can be easily connected to smart phone, tablet or PC. As BLE consume very low power, it is very suitable for portable or mobile device. In order to help customers to embed BLE feature, K-solution Consulting Co. Ltd (K-Solution) provides a comprehensive solution to customers.

AT-Command Central firmware (KATC) is a new firmware by K-Solution, which extends BLE connection not just between smartphone and device, but also device-to-device connection. KATC acts as Central mode and able to connect to maximum 8 peripherals KATP firmware modules. With KATC and KATP firmware, a comprehensive network can be established without the need of smartphone.

Feature

- Pre-programmed with GWBMD0x BLE module
- AT-command mode (AT-CMD MODE) for configuration
- BLE Central mode
- Connect up to 8 GWBMD0x with KATP firmware
- Auto sleep mode after 3 minutes without connection for power saving
- UART speed up to 115200bps
- Flow control support

Basic structure

The following diagram describes how module with KAT works

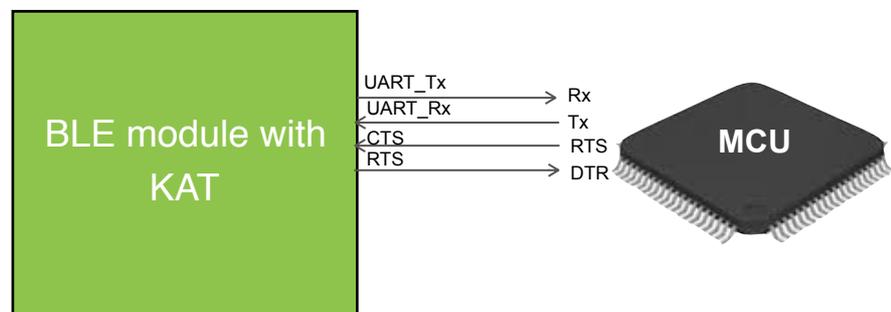


diagram 1: Basic module connection

Pin description

- UART_TX

UART port data transmission pin. Should connect to MCU's UART Rx pin. Data received from BLE will be sent to this pin under TRANSPARENT MODE.

- UART_RX

UART port data receive pin. Connect to MCU's UART Tx pin. Any data sent to this pin will automatically sent to BLE side under TRANSPARENT MODE.

- CTS, RTS

UART flow control pins. Flow control is suggested for higher serial data speed for ensuring the data to be sent/received accurately

- Pin mapping

KATC is developed base on Nordic nRF51822, the table below indicates pins on nRF51822 corresponding to KAT firmware:

Nordic nRF51822 pin	KAT corresponding pin	Direction
P0.06	BLE_Connect	Output, current sink
P0.13	RTS	Output
P0.14	CTS	Input
P0.15	UART_RX	Input
P0.16	UART_TX	Output

Table 2: pin mapping

Setup the connection

KATC will automatically scan and connect to any appropriate KATP(s) available. The establishment of connection depends on the name configured on KATC and KATP(s) as the following steps:

KATC

1. Using AT+NAME command to set to the name of the connection, for example, ABC.
2. Using AT+RESET to reset the KATC module
3. The name of KATC must be NAME=0, i.e. ABC0

KATP(s)

1. Using AT+NAME command to set the name of the connection, the name must be same as the name set in KATC appended with a digit (0-7), for example, ABC0, ABC1,... ABC7
2. Then using AT+RESET command to reset the KATP module(s)

KATC module will then search any module named with same name and a digit, 0 to 7, appended, and will automatically connect them once found.

The setting of Bluetooth name, and other AT-commands, for KATP is described in “BLE peripheral AT-CMD firmware user guide”

Once the connection is established, data can be transferred between module with KATC firmware and module(s) with KATP firmware. The following is an example.

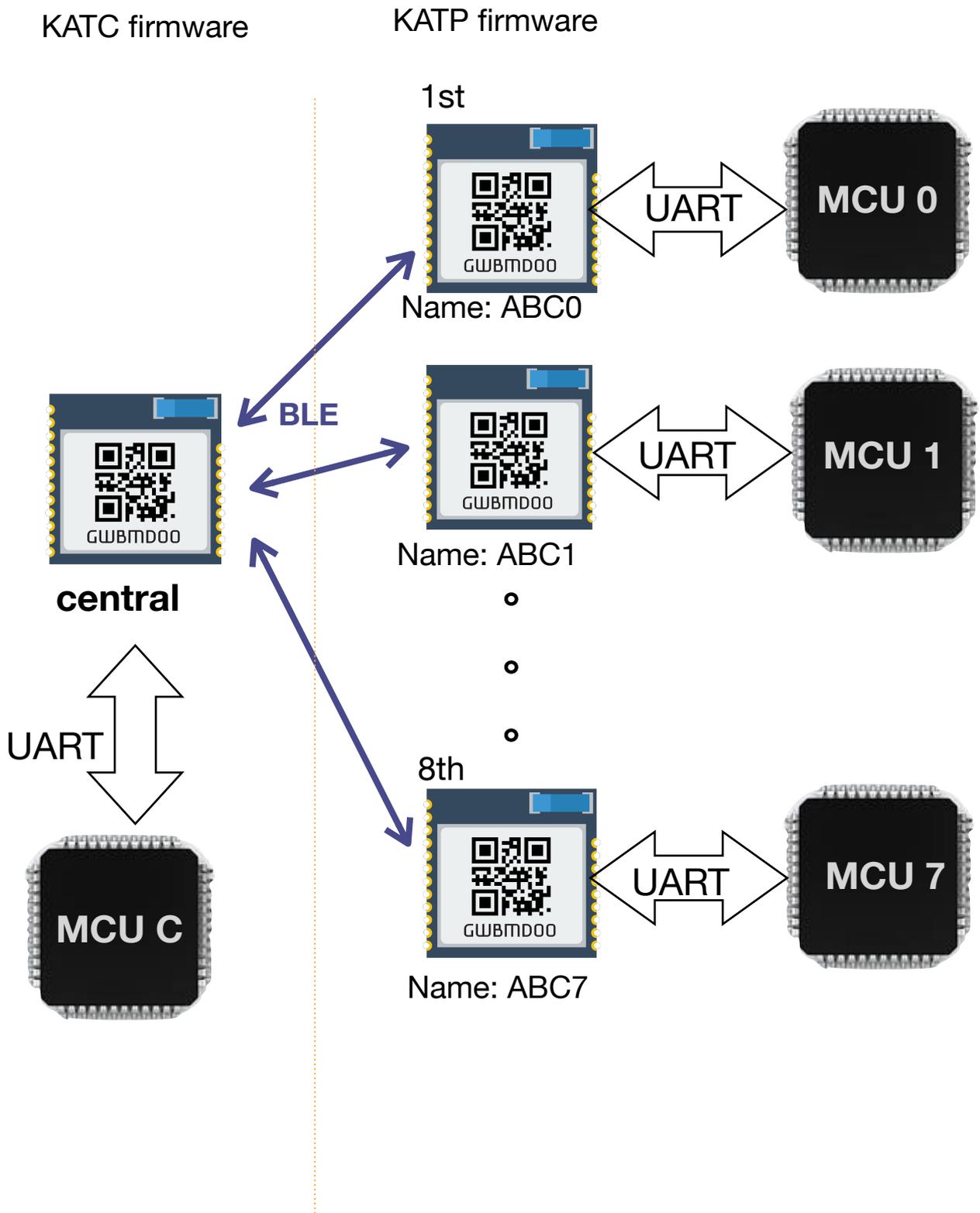
Module with KATP firmware sending data to module with KATC (Peripheral to Central)

Assuming the KATP module is in tunnelling mode

MCU connected with Peripheral module 0 sent “abcde” through its UART port, data will then appears on KATC module’s UART port as “[0]abcde”, where [0] indicates the source of this data.

In the case of sending data from Central to Peripheral, assuming KATC module needs to send data to KATP module 5, then MCU connected to KATC’s module need to [5]ABCDE, then KATC module will delivery “ABCDE’ to KATP module 5.

The connection between KATC and KATP(s) is illustrated as following:



Data transfer

When data is sent from KATC's UART port to a specific KATP module, the destination ID (with blanket) must be added in advance of the data.

[ID]DATA, where ID is 0 to 7

For example, data "2468" needed to be sent to KATP #5, then the data to KATC's UART port must be [5]2468. KATC will then remove [5] and send "2468" to KATP #5.

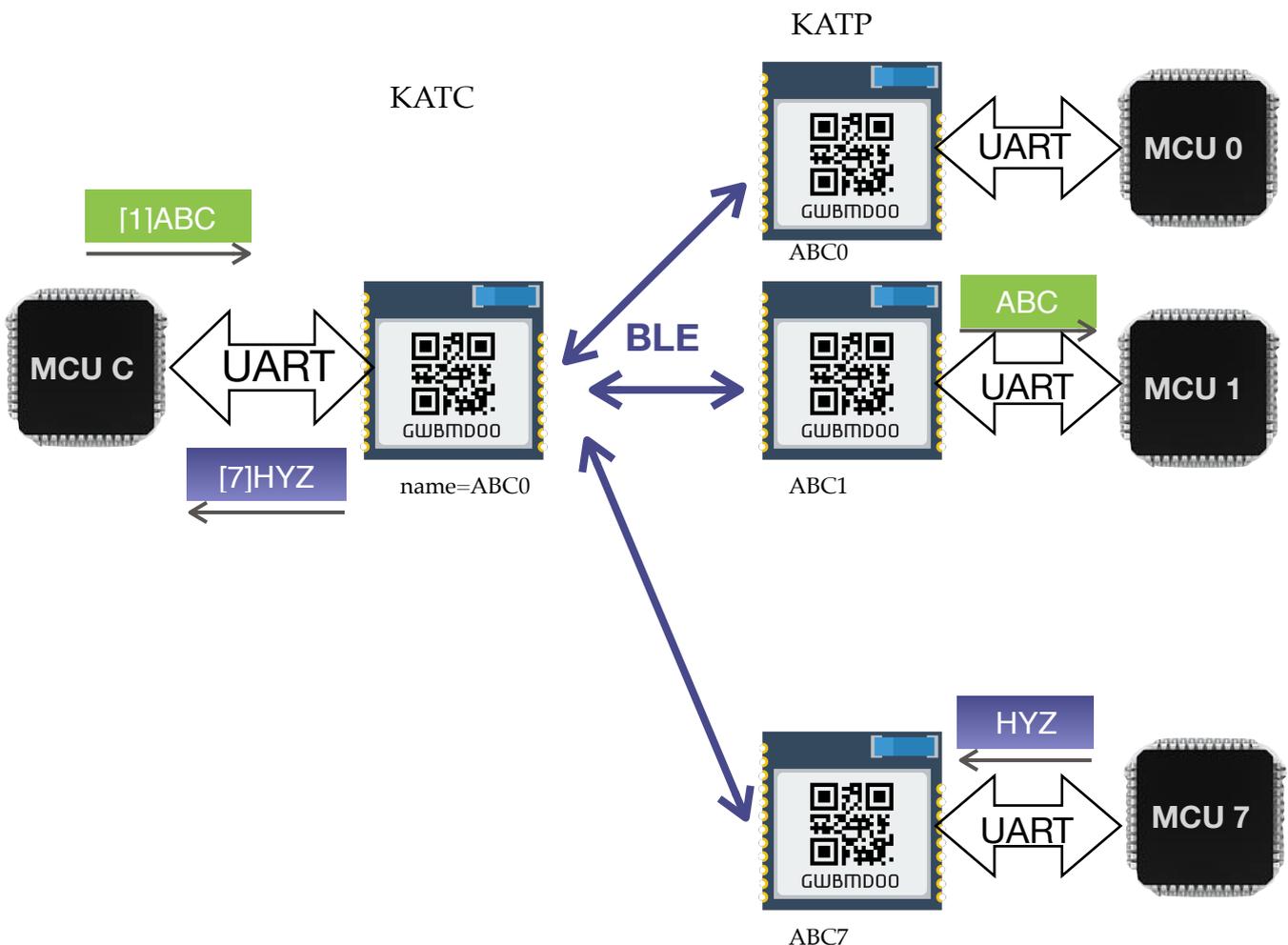
When data received from any KATP module, KATC will then add the KATP ID in front of the data, so that the MCU connected to KATC module is able to aware who is the sender.

The data format appear on the UART will be as following:

[ID]DATA, where ID is 0 to 7

For example, data "1357" is sent by KATP module #6, then the data appear on KATC's UART port will be as [6]1357.

The data transaction is illustrated as following:



Syntax:

AT+HELP↵

example

```
AT+HELP
CMD LIST
AT+ID?/=
AT+HELP
AT+RESET
AT+DEFAULT
AT+SLEEP
AT+NAME?/=
AT+TXP?/= (-40, -30, -20, -16, -12, -8, -4, 0, or 4 dBm)
AT+SPEED?/=
AT+CTRL?/=
OK
```

RESET

This command will reset the module, it is needed for making new value effective

Syntax:

AT+RESET↵

DEFAULT

~~It recovers all the setting to default configuration, including:~~

```
BAUD: 9600
Flow control disable
Name: KSOL
Tx Power: 0 dBm
AT+SLEEP
```

Syntax:

AT+DEFAULT↵

BLE related command:

NAME

Enquire and set the name for connections

Syntax:

```
AT+NAME=?↵          enquire current name
AT+NAME=new-name↵   set a new name
```

example

```
AT+NAME?
```

NAME=KSOLDEMO // show current name
OK

AT+NAME=DEMO2
NAME SET=DEMO2 // a new name set
OK

TXP

Enquire and change RF TX power

Syntax:

AT+TXP?↵ enquiry current Tx Power
AT+TXP=new-power↵ set new Tx Power
new-power must:
-40 (dBm), -30, -20, -16, -12, -8, -4, 0 or 4. any
other value will return ERR

example:

AT+TXP?
TXP=0 //current TX power is 0dBm

AT+TXP=4
TXP SET=4 //set the Tx power to 4dBm
OK

UART related command:

SPEED

Enquiry and set the UART speed

Syntax:

AT+SPEED?↵ enquiry current UART speed
AT+SPEED=new-speed↵ set a new UART speed
new-speed must be 2400, 4800, 9600, 14400,
19200, 28800, 38400, 57600, 115200

example:

AT+SPEED?
SPEED=115200bps //current BAUD is 115200

```
AT+SPEED=9600
SPEED SET=9600 //new BAUD is 9600
OK
```

CTRL

Enquire and set UART flow control(RTS/CTS). It is suggested to be enable when the BAUD is over 9600, however, it also depends on the data package length, therefore, customer need to determine to enable this feature depends on their own situation.

Syntax:

```
AT+CTRL=?↵ enquiry the current flow control status
AT+CTRL=1(or 0)↵ enable or disable flow control
```

example:

```
AT+CTRL?
CTRL=DISABLED //No flow control in current setting
```

```
AT+CTRL=1
CTRL SET=ENABLED //Enable flow control
OK
```

```
AT+CTRL=0
CTRL SET=DISABLED //Disable flow control
OK
```

Module pin assignment (with KATC)



Gigawit GWBMD00 BLE module

Operation example

Below are some examples for establishing connections and transferring data between KATC and KATP.

Establishing connection:

1. Power up Central and peripheral (Use MYUART as the example of the target name)
2. At Peripheral 0 to 7: use AT-command to change the peripheral name as following:
3. KATP module 0
 - AT+NAME=MYUART0
 - AT+RESET
4. KATP module 1
 - AT+NAME=MYUART1
 - AT+RESET
5. KATP module 2
 - AT+NAME=MYUART2
 - AT+RESET
6. KATP module 3
 - AT+NAME=MYUART3
 - AT+RESET
7. KATP module 4
 - AT+NAME=MYUART4
 - AT+RESET
8. KATP module 5
 - AT+NAME=MYUART5
 - AT+RESET
9. KATP module 6
 - AT+NAME=MYUART6
 - AT+RESET
10. KATP module 7
 - AT+NAME=MYUART7
 - AT+RESET
11. At Central: use command to change the target peripheral name:
 - AT+NAME=MYUART0
 - AT+RESET
12. When a KATP module is connection, IDX0...7 will display on the UART indicating connection establishment

Note

KATC is not a standalone product, but pre-programmed in GWBMD00 BLE module, and no HEX code or source code will be provided.

Customisation of KATC is possible, NRE may required.

Disclaimer and copyright

K-Solution is doing the best to provide a reliable and stable firmware to customer. Hence K-Solution will update the firmware irregularly for performance and feature improvement without any prior notice.

K-Solution deliveries the firmware as it is. Customer need to test and verify the feature and performance of the firmware. K-Solution will take no obligation, direct or indirect, on any loss, damage for using this firmware.

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Revision: