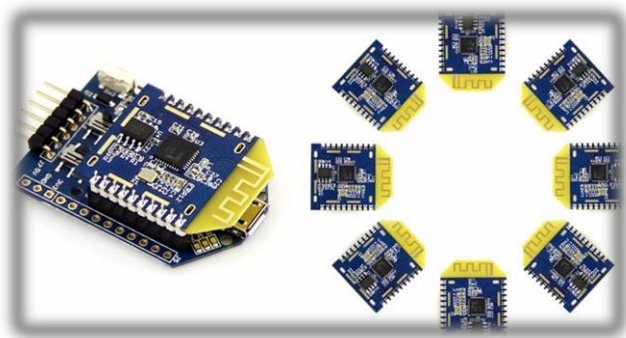




MeshBee® Open Source ZigBee RF Module User's Manual



©2014 Seeed Technology Inc.
www.seeedstudio.com

Doc Version	Date	Author	Remark
<i>v0.1</i>	<i>2014/04/28</i>		<i>Created</i>
<i>v0.2</i>	<i>2014/6/17</i>	<i>Oliver wang</i>	<i>Add some AT commands</i> <i>Add some api descriptions</i>
<i>v0.3</i>	<i>2016/1/22</i>	<i>Jack</i>	<i>Updated the API frame structure, updated the AT command index, added IO index.</i>

Table of Contents

USER'S MANUAL.....	1
OVERVIEW.....	4
<i>About this document</i>	<i>4</i>
<i>Introduction.....</i>	<i>4</i>
<i>Acronyms and Abbreviations</i>	<i>5</i>
1. KEY FEATURES.....	6
1.1 <i>Physical features:.....</i>	<i>6</i>
1.2 <i>Operation features:.....</i>	<i>6</i>
2. PIN DEFINITION.....	7
2.1 <i>Pin assignment.....</i>	<i>8</i>
3. OPERATION MODE.....	9
3.1 <i>AT MODE.....</i>	<i>9</i>
3.2 <i>API MODE.....</i>	<i>10</i>
3.3 <i>MCU MODE.....</i>	<i>10</i>
3.4 <i>DATA MODE</i>	<i>11</i>
4. ATCOMMANDS	12
4.1 <i>Node information commands</i>	<i>12</i>
4.2 <i>Data transmit commands</i>	<i>13</i>
4.3 <i>Network formation commands.....</i>	<i>14</i>
4.4 <i>OTA commands</i>	<i>16</i>
4.5 <i>Sleep commands.....</i>	<i>18</i>
4.6 <i>State commands</i>	<i>18</i>
5. API FRAME	19
5.1 <i>Structure of API Frame.....</i>	<i>19</i>
6. AUPS FUNCTION LIST	25
6.1 <i>Set run-time parameters.....</i>	<i>25</i>
6.2 <i>Send RF data.....</i>	<i>25</i>
6.3 <i>Receive RF data.....</i>	<i>26</i>
6.4 <i>Suli API.....</i>	<i>27</i>
6.5 <i>RPC function</i>	<i>34</i>
6.6 <i>Tools function.....</i>	<i>35</i>
APPENDIX A: ATCOMMAND INDEX AND API FRAME STRUCTURE	36
APPENDIX B: IOINDEX.....	38

Overview

About this document

This manual gives a single point of reference for information relating to the MeshBee. Including:

- Chapt1: Key features;
- Chapt2: Pin definition;
- Chapt3: Operation mode;
- Chapt4: AT commands;
- Chapt5: API frames;
- Chapt6: Functions that AUPS can call

Information shown in this document is all based on the firmware v1.0.4. The manual should be used as a reference resource throughout MeshBee application development. It does not provide in-depth introduction of the MeshBee programming. Please refer to the MeshBee CookBook(*MB_2014_D02*) for further references on the firmware architecture and programming issue.

Introduction

MeshBee[®] is a 2.4 GHz wireless zigbee RF module together with high level open source software driven by community. It uses microchip JN516x from NXP that enables several different standards-based zigbee mesh networking. User can easily and cost-effectively integrate ZigBee functionality into target project. Our factory firmware supports latest fully **Zigbee Pro** stack.

MeshBee[®] is the best choice to make your connected thing.

Acronyms and Abbreviations

AUPS: Arduino-ful user programming space

SPM: Stream processing machine

CMI: Communication interface

ADS: Airport data server

UDS: Uart data server

HAL: Hardware abstract layer

SULI: Seeed Unified Library Interface

API: Application programming interface

MCU: Microcontroller

JenOS: Jennic operating system

RPC: Remote procedure call

1. Key Features

1.1 Physical features:

- 1) *Range: Indoor/Urban: up to 30m;
Outdoor line-of-sight: up to 100m;*
- 2) *Receiver Sensitivity: -95dBm;*
- 3) *Working Frequency: unlicensed
2.4GHz band;*
- 4) *Data Transmission Rate: 4800, 9600,
19200, 38400, 57600, 115200 (bps);*
- 5) *Programmable 32-bit RISC CPU:
32M clock, 256KB Flash, 32KB RAM,
4KB EEPROM;*
- 6) *Socket compatible with the Xbee, so
you can plug it into any Xbee socket
as a quick replacement*

1.2 Operation features:

- 1) *Easy-to-Use Serial Interface and rich
extendable ports;*
- 2) *Communication type: Point to Point,
Star Network , Mesh Network;*
- 3) *Support for OTA(upgrade firmware
over the air);*
- 4) *Easy-to-Use AT Command: Setup
ZigBee network, set Serial Baud Rate,
etc;*
- 5) *API configuration and control mode;*
- 6) *Arduino-ful user programming
space;*
- 7) *Supports for RPC;*
- 8) *Open source hardware and firmware.*



2. Pin definition

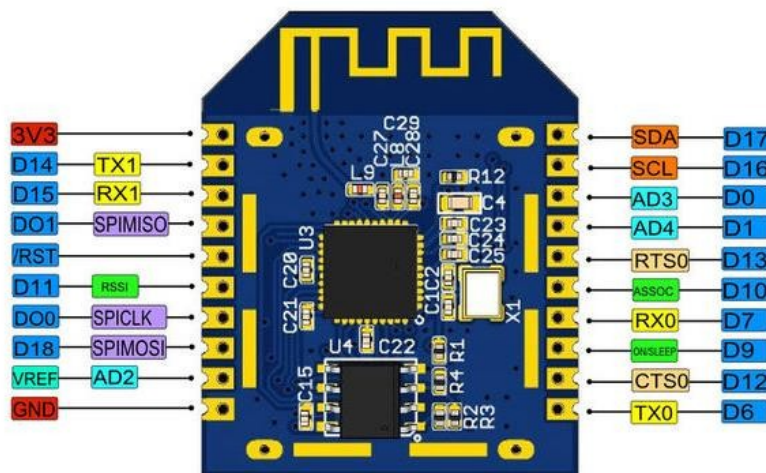


Figure 2.1: Pin definition of MeshBee



Note: please refer to datasheet of JN516x for more information about each pin.

2.1 Pin assignment

Pin No	Name	Direction	Description
1	3V3	—	Power supply
2	D14/TX1	Output	Digital IO14 or UART1 TX
3	D15/RX1	Input	Digital IO15 or UART1 RX
4	DO1/SPIMISO	Both	Digital Output 1 or SPI Master In Slave Out Input
5	RST	—	Reset pin
6	D11/PWM1	Both	Digital IO11 (default usage: RSSI Indicator) or PWM1 Output
7	DO0/SPICLK	Output	Digital Output 0 or SPI Master Clock Output
8	D18/ SPIMOSI	Both	Digital IO 18 or SPI Master Out Slave In Output
9	Vref/ ADC2	Input	Analogue peripheral reference voltage; ADC input 2
10	GND	—	GND
11	D6/TX0	Both	UART0 TX or Digital IO6
12	D12/CTS0	Both	Digital IO12 or UART0 clear to send input
13	D9	Both	Digital IO 9 (default usage: Mesh Bee ON/Sleep Indicator)
14	D7/RX0	Both	UART0 RX or Digital IO 7
15	D10	Both	Digital IO 10 (default usage: Network Association Indicator)
16	RTS0	Both	Digital IO 13 or UART0 request to send output
17	D1/SPISSEL2/ADC4	Both	Digital IO 1; SPI Master Select Output 2; ADC input 4
18	D0/SPISSEL1/ADC3	Both	Digital IO 0; SPI Master Select Output 1; ADC input 3
19	D16/SCL	Both	Digital IO 16 or I2C clock
20	D17/SDA	Both	Digital IO 17 or I2C data

3. Operation Mode

MeshBee has four different types of mode: AT, API, DATA, MCU, illustrated in figure below:

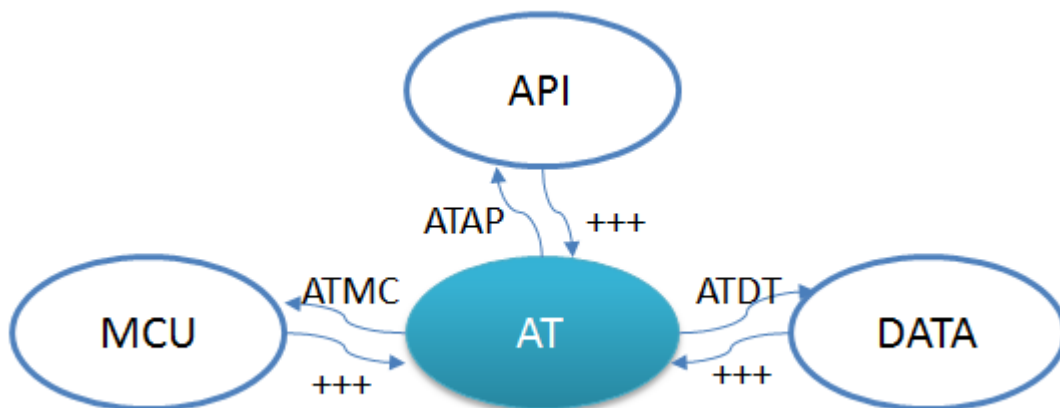


Figure 3.1: No matter which mode MeshBee works in, input “+++” can come back to AT command mode.

3.1 AT mode

Mesh Bee communicates with outside through UART1 including data and command communicating. The default setting of UART1 is: *115200 baud rate, data bits 8, parity none, stop bit 1*. “+++<CR>” can put Mesh Bee into AT mode. The mode switch is illustrated in figure 3.1.

AT command can be classified into two types: register R/W AT and action AT.

The pattern of AT command is “ATXX[DDDD]<CR>” in which XX stands for the register/action name and DDDD stands for the written value of a register. All letters’ case is ignored.

Register R/W AT can operate a virtual register of Mesh Bee. Absence of DDDD means reading the register value out and meanwhile ATXXDDDD means setting the register value to DDDD.

Action AT can trigger a specific action. The execution of command may be immediate or time-consuming.

Syntax for sending AT commands:

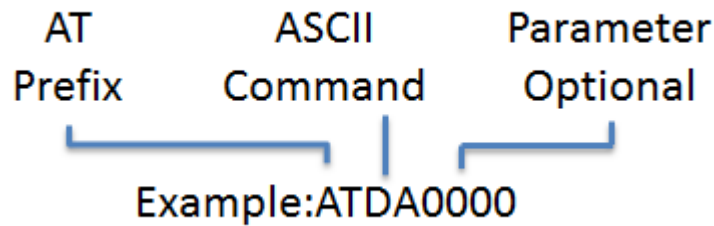


Figure 3.2: syntax for AT commands

3.2 API Mode

API is simply a set of standard interfaces created to allow other MCU to interact with MeshBee. For our purposes, API supports local operation and remote operation. For example, a host application can send an “ATIO” frame to Coordinator A, A will set its GPIO when it receives this frame. The most important thing to note is that APIs are specifically engineered to enable MeshBee to talk efficiently to other MCU. The target of API-mode is to transmit highly structured data quickly and reliably.

3.3 MCU Mode

In order to simplify the development of application for user, we create an Arduino-ful user programming space(AUPS).

In AT mode, using “ATMC” to enter MCU mode, then the `arduino_loop` will be executed periodically.

Write your own code in “[ups_arduino_sketch.c](#)”.

Example :

```
IO_T led_io;  
int16 state = HAL_PIN_HIGH;  
void arduino_setup(void)  
{  
    setLoopIntervalMs(1000);           //set loop period
```

```
suli_pin_init(&led_io, 9);           //init led
suli_pin_dir(&led_io, HAL_PIN_OUTPUT);
}

void arduino_loop(void)
{
    suli_pin_write(&led_io, state);    //set led
    if(state == HAL_PIN_HIGH)
        state = HAL_PIN_LOW;
    else
        state = HAL_PIN_HIGH;
}
```



Note: In MCU mode, Uart1 is under the control of the AUPS, user should not send API frame to MeshBee.

3.4 Data Mode

When operating in Data mode, the modules act as a serial line. All UART data received through the UART1 is transmitted to a specified remote device.

To use a transparent connection, take the following steps:

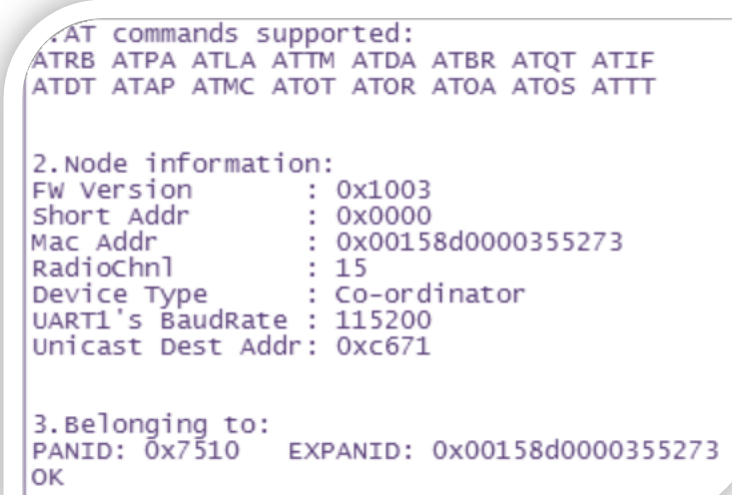
- 1) Set unicast address: *ATDAxxxx*
- 2) Enter Data Mode: *ATDT*

4. AT commands

4.1 Node information commands

ATIF

- 1) Action AT, immediate execution, for any zigbee role.
- 2) Get node InFormation
- 3) ATIF command will print information of node including: supported AT commands, node's firmware version, node's zigbee short address, node's MAC address, node's radio channel, node's zigbee role, etc.
- 4) Example:



```
.AT commands supported:
ATRB ATPA ATLA ATTM ATDA ATBR ATQT ATIF
ATDT ATAP ATMC ATOT ATOR ATOA ATOS ATTT

2.Node information:
Fw Version      : 0x1003
Short Addr      : 0x0000
Mac Addr        : 0x00158d0000355273
RadioChnl       : 15
Device Type     : Co-ordinator
UART1's BaudRate : 115200
Unicast Dest Addr: 0xc671

3.Belonging to:
PANID: 0x7510   EXPANID: 0x00158d0000355273
OK
```

Figure 3.3: ATIF screen shot

ATLA

- 1) Action AT, time-consuming execution, for any zigbee role
- 2) List All nodes within the network

- 3) ATLA will broadcast a topology query packet into the whole network. The node that's still alive may response to that. The querying node will print responding nodes' short address, MAC address, Link-Quality-Indication (LQI), etc. LQI is a positive integer, the bigger LQI the better link quality.



Figure 3.4: ATLA screen shot

ATQT

- 1) Action AT, immediate execution, for any zigbee role
- 2) Get on-chip temperature.

4.2 Data transmit commands

ATTM

- 1) Register R/W AT, for any zigbee role
- 2) Bits:1, decimal, max:1, default:0
- 3) Set node's TX Mode
- 4) 0 - broadcast, 1- unicast (need setting destination address by ATDA command first).

ATDA

- 1) Register RW AT, for any zigbee role
- 2) Bits:4, hex, max: ffff, default:0000
- 3) Set node's unicast destination address
- 4) This address will also be used as the OTA target address, means that this destination address will be used for ATOT and ATOS command. It has a pattern of HHHH that is 4 bits of HEX number ignoring case.
- 5) Example: ATDA14ad<CR>

ATBR

- 1) Register R/W AT, for any zigbee role
- 2) Bits:1, decimal, max:5, default:5
- 3) Set UART1's Baud Rate
- 4) 0- 4800, 1-9600, 2-19200, 3-38400, 4-57600, 5-115200.
- 5) Example: ATBR5<CR>

4.3 Network formation commands

ATPA

- 1) Register RW AT, for any zigbee role but with different effect.
- 2) Bits:1, decimal, max:1, default:0
- 3) Set node's Power up Action
- 4) The node's default power-up behavior is restoring the last network state before power down. But when setting PA register to 1 and then reboot, the node will not restore the last network. In this case, coordinator node will re-create a network and router/End device will re-scan the network. The PA register will be cleared to 0 after reboot.

ATRS

- 1) Action AT, time-consuming execution, for router/End device
- 2) Re-Scan network
- 3) The scanning process will take a while and you can use ATLN command to monitor the scan result. If node finds nothing after a long time scanning, retry ATRS command or reset Mesh Bee. The node will automatically join the first found network when AJ register has a value of 1.

ATLN

- 1) Action AT, immediate execution, for router/End device
- 2) List Network scanned
- 3) The index value will be used by ATJN command.

ATJN

- 1) Register R/W AT, for router/End device
- 2) Bits:1, decimal, max:8, default:0
- 3) Join a Network with specific index
- 4) ATJN command is also an action trigger command. The node will join the network specified by the index of ATLN output. ATJN will return error when the node's already in that network.

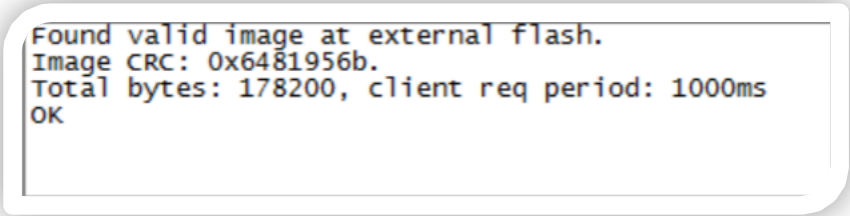
ATAJ

- 1) Register RW AT, for router/End device
- 2) Bits:1, decimal, max:1, default:1
- 3) Whether Auto Join network scanned
- 4) If AJ register has a value of 1, the node will automatically join the first network scanned after ATRS command or power up with PA register equals to 1.

4.4 OTA commands

ATOT

- 1) Action AT, immediate execution, for coordinator
- 2) OTA Trigger
- 3) Non-coordinator nodes can upgrade firmware over-the-air. This is called OTA. ATOT command will trigger the OTA upgrade download of a destination node. OTA architecture consists of OTA server and client. Coordinator will be the server side and router/End device is the client side. To OTA a client node, you should firstly enter the AT mode on server side and set the unicast destination address (DA register) to the short address of the client node, and then execute the ATOT command. And now trace serial port (usually UART0) will print some information about OTA process if trace is enabled. After downloading all image blocks which are saved in the external Flash, the client node will trigger the upgrade process automatically. The process is: mark the internal firmware invalid, then reboot, and then the bootloader will copy the new image from the external Flash into the internal Flash, and then run the new firmware.



```
Found valid image at external flash.  
Image CRC: 0x6481956b.  
Total bytes: 178200, client req period: 1000ms  
OK
```

Figure 3.5: ATOT screen shot

ATOR

- 1) Register RW AT, for coordinator
- 2) Bits:5, decimal, max:60000, default:1000
- 3) OTA block request Rate
- 4) Set the interval of two image block requests. The value's unite is milliseconds. The smaller, the faster.

ATOA

- 1) Action AT, immediate execution, for coordinator
- 2) OTA Abort
- 3) Abort the OTA downloading process of a specific node specified by the DA register.
- 4) Example:

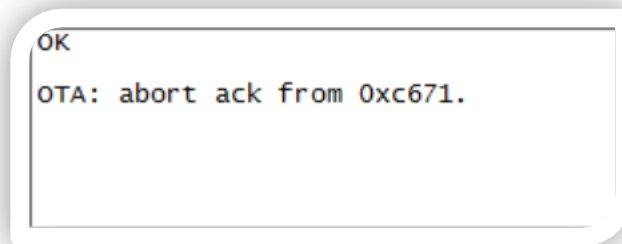


Figure 3.6: ATOA screen shot

ATOS

- 1) Action AT, time-consuming execution, for coordinator
- 2) Query OTA Status
- 3) Query the status of the OTA downloading process of a specific node specified by the DA register.

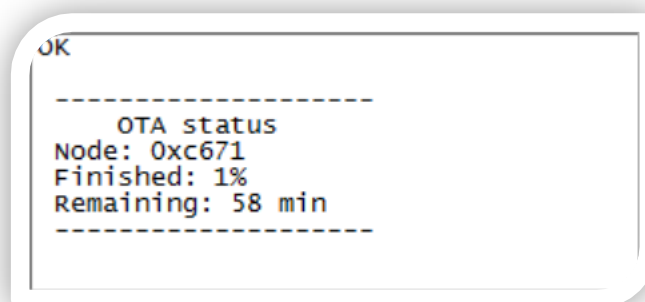


Figure 3.7: ATOS screen shot

4.5 Sleep commands

ATSM

- 1) Register RW AT, for end device
- 2) Bits:1, decimal, max:5, default:0
- 3) 0: disable sleep mode, 1/2/3: not defined, 4: cyclic sleep, 5:cyclic sleep with pio wake
- 4) Set sleep mode of end device

ATSP

- 1) Register RW AT, for end device
- 2) Bits:4, decimal, max:9999, default: 0
- 3) Sleep period
- 4) Set an end device's sleep period

ATST

- 1) Register RW AT, for end device
- 2) Bits:4, decimal, max:9999, default: 0
- 3) wait time before sleep
- 4) Set an end device's wait time before sleep

4.6 State commands

ATMF

- 1) Register RW AT, for all of the nodes

- 2) Bits:4, decimal, max:3000, default: 0
- 3) Delay period between each Arduino_Loop
- 4) Set the delay period between each Arduino_Loop

ATMC

- 1) Action AT
- 2) Enter MCU mode

ATDT

- 1) Action AT
- 2) Enter DATA mode

ATAP

- 1) Action AT
- 2) Enter API mode

5. API frame

5.1 Structure of API Frame

Every transfer of information requires a protocol. We defined the API frame like this(structure was defined in firmware_at_api.h):

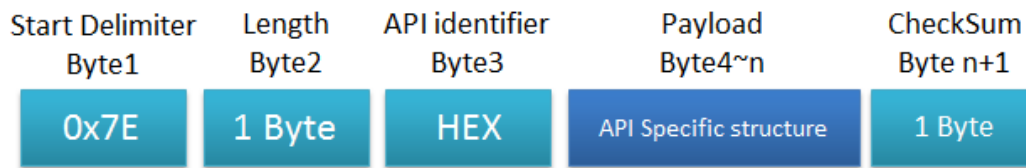


Figure 5.1: API Frame structure

Start Delimiter: Fixed to 0x7e.

Length: The length of payload section.

API Identifier: The ID of API frame type, see 5.1.1 for detail.

Payload: see 5.1.1 for detail.

CheckSum: The summary of all bytes in payload section.

5.1.1 API Specific Structures

API_LOCAL_AT_REQ

API identifier value: 0x08

These packet types are useful only if the host wants to send commands to its local MeshBee. You don't need to specify the unicast address.

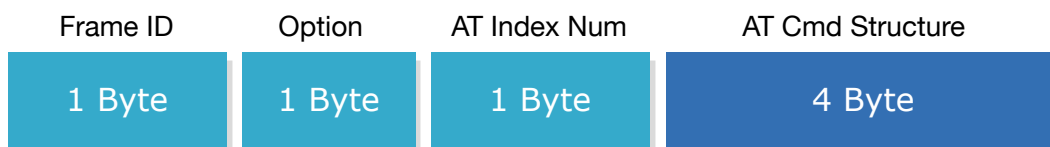


Figure 5.2: local AT request

Frame ID: To Identify the UART data frame for the host to correlate with a subsequent ACK (acknowledgement).

Option:

Bit0: ACK Mode, 0 with ACK; 1 without ACK. Please don't set this to 1 if you're executing a read command.

AT Index Num: Index of the AT commands, see appendix A for detail.

AT Cmd Structure: The structure for this AT command, see appendix A for detail.

API_LOCAL_AT_RESP

API identifier value: 0x88

AUPS Function list

The API type “local AT response” is an ACK frame which is returned to the host from MeshBee after handling a local AT request frame. To set a register, these frame types indicate whether the request execution is successful or not. To read a register, it contains the value of the register you query.

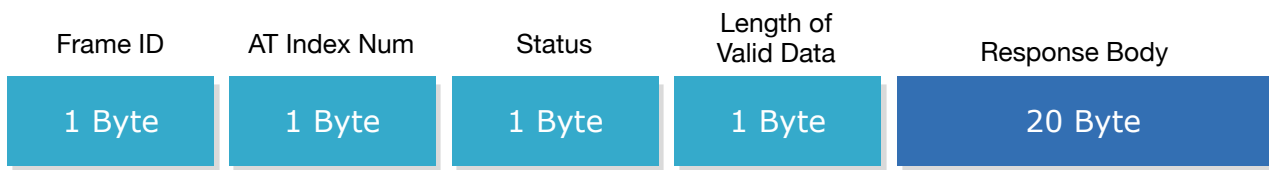


Figure 5.3: local AT response

Frame ID: Corresponding frame ID which is set when the `API_LOCAL_AT_REQ` request is constructed.

AT index Num: Index of the AT commands, see appendix A for detail.

Status: Command execution status, 0x0: OK, 0x1: ERR, 0x2: INVALID_CMD, 0x3: INVALID_PARAM.

Length of Valid Data: The length of valid data in response body.

Response Body: See appendix A for detail.

`API_REMOTE_AT_REQ`

API identifier value: 0x17

These types allows for module parameter registers on a remote device to be queried or set, or perform an action (example: reboot) on a remote device.

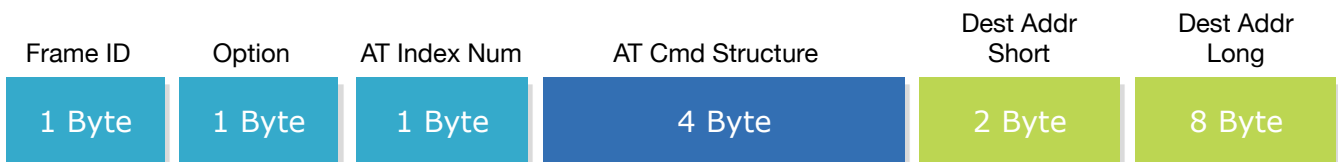


Figure 5.4: remote AT request

Frame ID: To Identifies the UART data frame for the host to correlate with a subsequent ACK (acknowledgement).

Option:

Bit0: ACK Mode, 0 with ACK; 1 without ACK.

Bit1: Cast Mode, 0 unicast; 1 broadcast.

AT index Num: Index of the AT commands, see appendix A for detail.

AT Cmd Structure: The structure for this AT cmd, see appendix A for detail.

Dest Addr Short: Set to the 16- bit network address of the remote, if this address is set to 0xfffe, the long address(MAC) will be used.

Dest Addr Long: Set to the 64- bit network address of the remote (MAC address).

API_REMOTE_AT_RESP

API identifier value: 0x97

The API type “remote AT response” is an ACK frame which is returned to the host from the remote node after handling a remote AT request frame.

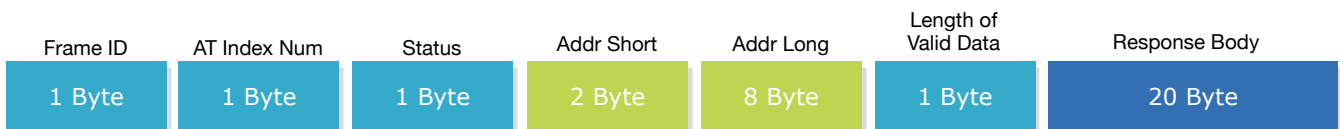


Figure 5.5: remote AT response

Frame ID: Corresponding frame ID which is set when the API_REMOTE_AT_REQ request is constructed.

AT Index Num: Index of the AT commands.

Status: Command execution status, 0x0: OK, 0x1: ERR, 0x2: INVALID_CMD, 0x3: INVALID_PARAM.

Addr Short: The 16- bit network address of the remote.

Addr Long: The 64- bit network address of the remote (MAC address).

Length of Valid Data: The length of valid data in response body.

Response Body: See appendix A for detail.

API_DATA_PACKET

API identifier value: 0x02

The API type “data packet” is a user defined data frame. This request message will send a block of data to the remote node. This request will not be responded except that the remote sends another data packet as a response.

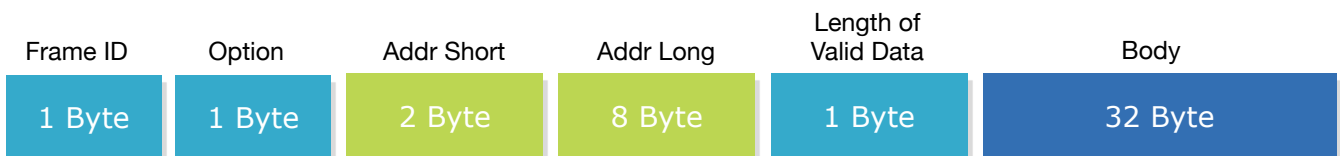


Figure 5.6: data packet request

Frame ID: To Identify the data frame subsequence at the remote side.

Option:

AUPS Function list

Bit0: Reserved.

Bit1: Cast Mode, 0 unicast; 1 broadcast.

Addr Short: For the packet to send, this is the 16-bit network address of the remote, if this address is set to 0xffff, the long address(MAC) will be used. For the packet received, this is the 16-bit network address of the data sender.

Addr Long: For the packet to send, this is the 64-bit network address of the remote (MAC address), this address can be filled with zero if short address is specified. For the packet received, this is the 64-bit MAC address of the data sender.

Length of Valid Data: The length of valid data in data body.

Body: The data which will be transmitted to the remote node.

API_TOPO_REQ

API identifier value: 0xfb

This API type allows module to query the network's topology, it will cause the module broadcasting a ping to the whole network, and all the nodes which listens to this network will respond a API_TOPO_RESP frame.

Required Cmd

0x01

Figure 5.7: Structure of network Topo Require

Required Cmd: Fixed to 0x01.

API_TOPO_RESP

API identifier value: 0x6b

In response to an "API_TOPO_REQ" message, the module will send a response message.

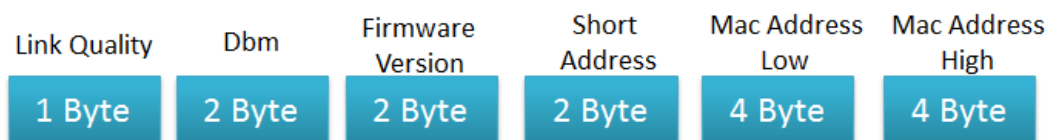


Figure 5.8: Structure of network topology response

Link Quality: Indicate link quality of node, it's a positive integer, the bigger the better link quality, it will be 305 when signal intensity is 0dbm.

Dbm: Signal intensity, $dbm = (lqi - 305)/3$.

Firmware Version: Firmware Version.

Short Address: source address of this response.

Mac Address Low: MAC address of the node, low 32bit.

Mac Address High: MAC address of the node, high 32bit.

6. AUPS Function list

This chapter contains the information of functions that AUPS can call.

6.1 Set run-time parameters

setNodeState

void setNodeState(uint32 state);

Description:

This function can be used to set the working state of MeshBee.

Parameter:

state : working state

E_MODE_AT

E_MODE_API

E_MODE_DATA

E_MODE_MCU

Return:

None

6.2 Send RF data

bSendToAirPort

bool API bSendToAirPort(uint16 txMode, uint16 unicastDest, uint8 *buf, int len);

Description:

This function can be used to send RF packets.

Parameter:

txMode: mode of transmit UNICAST or BROADCAST

unicastDest: short address of unicast

buf: the pointer of data

len: length of the data

Return:

OK
ERR

API_bSendToMacDev

bool API_bSendToMacDev(uint64 unicastMacAddr, uint8 srcEpId, uint8 dstEpId, char *buf, int len);

Description:

This function can be used to send RF packets .

Parameter:

unicastMacAddr: dest mac address
srcEpId: source end point
dstEpId: dest end point
buf: the pointer of data
len: length of the data

Return:

OK
ERR

6.3 Receive RF data

aupsAirPortReadable

PUBLIC uint32 aupsAirPortReadable(void);

Description:

This function returns the available bytes in AUPS's airport ringbuffer.

Parameter:

none

Return:

the number of available bytes

aupsAirPortRead

PUBLIC uint8 aupsAirPortRead(void *dst, int len);

Description:

This function reads len bytes of data to dst from AUPS's airportringbuffer.

Parameter:

dst: pointer to the destination Address

len: data len

Return:

real number of bytes you read

6.4 Suli API

suli_pin_init

void suli_pin_init(IO_T *pio, PIN_T pin);

Description:

This function can be used to initialize a digital IO of MeshBee.

Parameter:

pio: pointer of the IO_T entity

pin: pin No

D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14,
D15, D16, D17, D18, D19, D20, DO0, DO1.

Return:

none

suli_pin_dir

void suli_pin_dir(IO_T *pio, DIR_T dir);

Description:

This function can be used to set direction of digital IO.

Parameter:

pio: pointer of the IO_T entity

dir: direction

HAL_PIN_INPUT

HAL_PIN_OUTPUT

Return:

none

suli_pin_write

void suli_pin_write(IO_T *pio, int16 state);

Description:

This function can be used to write a digital IO.

Parameter:

pio: pointer of the IO_T entity

state: state of IO

HAL_PIN_LOW

HAL_PIN_HIGH

Return:

none

suli_pin_read

int16 suli_pin_read(IO_T *pio);

Description:

This function can be used to read a digital IO.

Parameter:

pio: pointer of the IO_T entity

Return:

state: state of IO

HAL_PIN_LOW

HAL_PIN_HIGH

suli_analog_init

void suli_analog_init(ANALOG_T * aio, PIN_T pin);

Description:

This function can be used to initialize an analog pin.

Parameter:

aio: pointer of the ANALOG_T entity

pin: pin No macro

A1 : ADC1

A2 : ADC2

A3 : ADC3

A4 : ADC4

TEMP: On-chip temperature ADC

VOL : On-chip voltage ADC

Return:

none

suli_analog_read

int16 suli_analog_read(ANALOG_T*aio);

Description:

This function can be used to read the ADC value.

Parameter:

aio: pointer of the ANALOG_T entity

Return:

ADC value

suli_i2c_init

void suli_i2c_init(void * i2c_device);

Description:

This function can be used to initialize I2C of MeshBee (D16, D17).

Parameter:

i2c_device: any dummy value

Return:

none

suli_i2c_write

uint8 suli_i2c_write(void * i2c_device, uint8 dev_addr, uint8 *data, uint8 len);

Description:

This function can be used to write a buff to I2C.

Parameter:

i2c_device: any dummy value

dev_addr: device address

data: data array

len: length of the data

Return:

The number of bytes already been written

suli_i2c_read

uint8 suli_i2c_read(void *i2c_device, uint8 dev_addr, uint8 *buff, uint8 len);

Description:

This function can be used to read a buff from I2C.

Parameter:

i2c_device: any dummy value

dev_addr: device address

data: pointer of data array

len: length of the data

Return:

The number of bytes already been read

suli_uart_init

void suli_uart_init(void * uart_device, int16 uart_num, uint32 baud);

Description:

This function can be only used to initialize uart1 of MeshBee. Because uart0 is under the control of the system.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

baud: baud rate

4800

9600

19200

38400

57600

115200

Return:

none

suli_uart_send

void suli_uart_send(void *uart_device, int16 uart_num, uint8 *data, uint16 len);

Description:

This function can be only used to send data through uart1.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

data: pointer of the data array

len: length of the data

Return:

none

suli_uart_send_byte

void suli_uart_send_byte(void *uart_device, int16 uart_num, uint8 data);

Description:

This function can be only used to send one byte through uart1.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

data: data byte

Return:

none

suli_uart_write_float

void suli_uart_write_float(void *uart_device, int16 uart_num, float data, uint8 prec);

Description:

This function can be only used to send float data through uart1.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

data: float data

Return:

none

suli_uart_write_int

void suli_uart_write_int(void *uart_device, int16 uart_num, int32 num);

Description:

This function can be only used to send int data through uart1.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

num: int value

Return:

none

suli_uart_printf

void suli_uart_printf(void *uart_device, int16 uart_num, const char *fmt, ...);

Description:

This function can be only used to send formatted string to uart1.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

fmt: format of string

Return:

none

suli_uart_read_byte

uint8 suli_uart_read_byte(void * uart_device, int16 uart_num);

Description:

This function can be only used to read a byte from uart1.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

Return:

Returned byte

suli_uart_readable

uint16 suli_uart_readable(void * uart_device, int16 uart_num);

Description:

This function can be only used to judge if uart1 is readable.

Parameter:

uart_device: any dummy value

uart_num: any dummy value

Return:

The number of bytes which can be read

6.5 RPC function

RPC_vCaller

PUBLIC void RPC_vCaller(uint64 mac, char* cmd);

Description:

User can use this function to make an Rpc call.

Parameter:

mac: mac address of the server node

cmd: rpc command string

Return:

none

6.6 Tools function

random

PUBLIC uint16 random();

Description:

This function is used to generate a 16bits random number.

Parameter:

none

Return:

random number

Appendix A: AT Command Index and API Frame Structure

Version v1004

Command	Index	Description	Request Frame(4 Byte)	Response Frame(20 Byte)
ATRB	0x30	Reboot the node	Byte[3:0]: 0x00	None
ATPA	0x32	Power up action	Byte0: 0 – read the register 1 – write the register Byte[2:1]: uint16, register value Byte3: 0x00	Byte[1:0]: uint16, register value
ATAJ	0x34	Auto join network	Byte0: 0 – read the register 1 – write the register Byte[2:1]: uint16, register value Byte3: 0x00	Byte[1:0]: uint16, register value
ATRS	0x36	Re-Scan network	Byte[3:0]: 0x00	Byte[1:0]: uint16, 0 – Re-scan succeed 1 - Re-scan failed
ATLN	0x38	List scanned network, only for Router and End Device	Byte[3:0]: 0x00	Multiple response frame may be returned, each has a structure like this: Byte0: uint8, index of this response Byte1: Uint8, radio channel Byte2: Uint8, permitted to join Byte[6:3]: Uint32, PAN ID low 32bit Byte[10:7]: Uint32, PAN ID high 32bit
ATJN	0x40	Join specified network	Byte0: 0 – read the register 1 – write the register Byte[2:1]: uint16, register value, the network index Byte3: 0x00	String, error message The result of joining can be obtained from the status byte.
ATRJ	0x41	Rejoin the last network	Byte[3:0]: 0x00	Byte[1:0]: uint16, 0 – Re-join succeed 1 - Re-join failed
ATTM	0x44	Transmit mode	Byte0: 0 – read the register 1 – write the register	Byte[1:0]: uint16, register value

			Byte[2:1]: uint16, register value, tx mode Byte3: 0x00	
ATDA	0x46	Unicast address	Byte0: 0 – read the register 1 – write the register Byte[2:1]: uint16, register value, unicast dest address Byte3: 0x00	Byte[1:0]: uint16, register value
ATBR	0x48	Set baud rate for UART1	Byte0: 0 – read the register 1 – write the register Byte[2:1]: uint16, register value, baud rate index Byte3: 0x00	Byte[1:0]: uint16, register value
ATQT	0x50	Query on-chip temperature	Byte[3:0]: 0x00	Byte[1:0]: int16, temperature, Celsius degree
ATIF	0x54	Query node information	Byte[3:0]: 0x00	Byte0: Uint8, node role, 0 – COO 1- ROU 2- END Byte1: Uint8, Radio channel Byte[3:2]: Uint16, firmware version Byte[5:4]: Uint16, short address Byte[7:6]: Uint16, pan id belonging Byte[11:8]: Uint32, MAC low 32bit Byte[15:12]: Uint32, MAC high 32bit
ATIO	0x70	Read/write IO	Byte0: Uint8, read/write flag 0-write 1-read Byte1: Uint8, pin number, see appendix B Byte2: Uint8, the state of this IO to be written Byte3: 0x00	Byte0: Uint8, read/write flag as same as the one in request Byte1: Uint8, pin number as same as the on in request Byte2: Uint8, the state of this IO currently
ATAD	0x72	Sample the ADC	Byte0: Uint8, ADC source index, see appendix B Byte[3:1]: 0x00	Byte0: Uint8, ADC source index as same as the one in request Byte[2:1]: Uint16, ADC sample value

Appendix B: IO Index

Digital IO Index

IO Name	Index
D0	0x00
D1	0x01
D2	0x02
D3	0x03
D4	0x04
D5	0x05
D6	0x06
D7	0x07
D8	0x08
D9	0x09
D10	0x0a
D11	0x0b
D12	0x0c
D13	0x0d
D14	0x0e
D15	0x0f
D16	0x10
D17	0x11
D18	0x12
D19	0x13
D20	0x14
DO0	0x21
DO1	0x22

ADC Source Index

ADC Source	Index
A3	0x00
A4	0x01
A2	0x32
A1	0x33
TEMP	0x34

S T U

Copyright (c) 2014 Seeed Technology Inc.

F5, Bldg 8, Shiling Industrial Park,
Xinwei, #32 Tongsha Road,
Xili Town, Nanshan Dist.
Shenzhen 518055 China

+86 755 33552591

www.seeedstudio.com