# GL-Zigbee SDK User Guide

| Version | Changed Item | Author | Date |
| --- | --- | --- | --- |
| 1.0.0 | First version | Feng.He | 2020.06.16 |
| 2.1.0 | Change code architecture、Change API & add zdo API | Feng.He | 2020.11.25 |

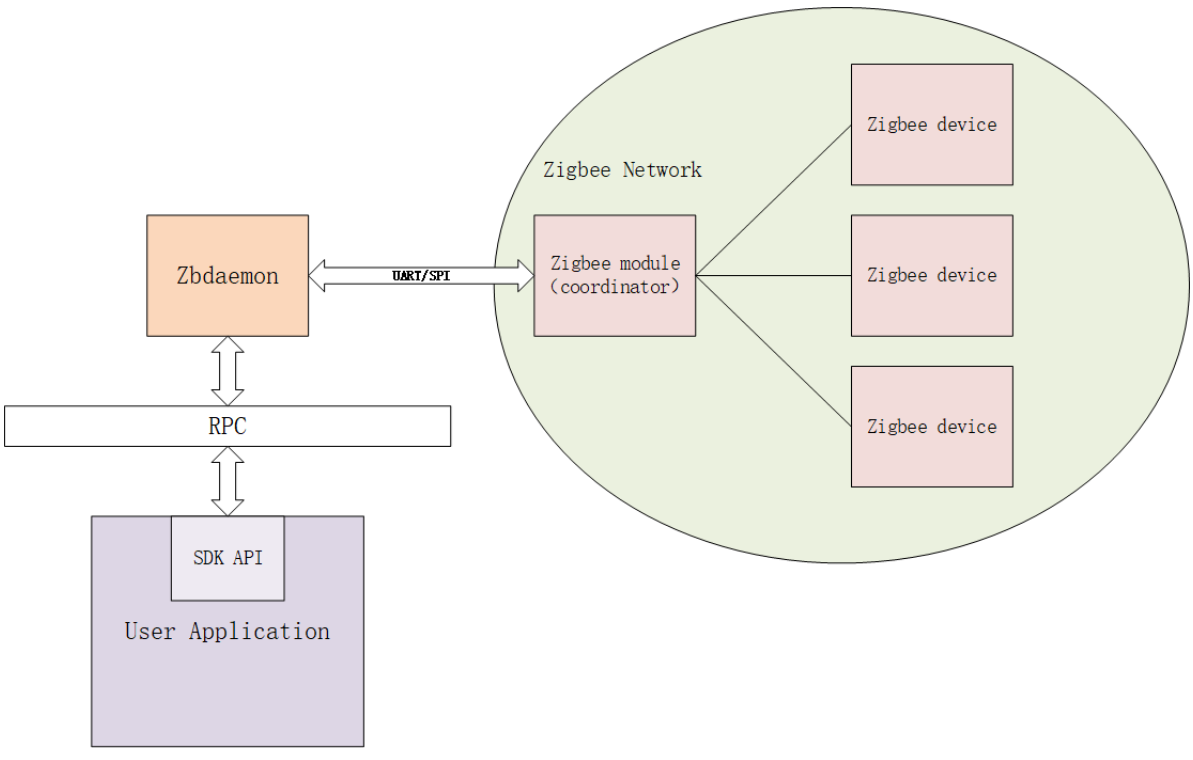
# 1. Description

## 1.1 What's GL-Zigbee SDK

GL-Zigbee SDK is developed and provided by GL-iNet Technology as a part of the zigbee solution. The SDK encapsulates the communication between the gateway and the zigbee module, allowing third-party developers to focus on the business layer rather than the communication layer.

There are two parts of GL-Zigbee SDK, zbdaemon and gl-zb-api. Zbdaemon is used to communicate with modules and process zigbee protocol stack. Gl-zb-api encapsulates the communication between the user application and the zbdaemon. To maintain the stability of zbdaemon, we separated it from the user project. So developers only need to call the APIs, no need to maintain zbdaemon.

The overall structure is as follows:



## 1.2 How to test easily

Zbtool is a cmd line tool for debug gl-zigbee module which bases on gl-zb-api. You can use it for quick controning and managing zigbee network and devices.

```
$ opkg update
$ opkg install gl-zbtool_2.1.0_ipq806x.ipk
```

For information on how to use zbtool, users can refer to the “Zbtool User Guide”.

## 1.3 Download

```
$ git clone https://github.com/gl-inet/gl-zigbee-sdk.git
```

## 1.4 Directory structure of gl-zigbee_sdk

```
|-- Makefile
|
|-- LICENSE
|
|-- VERSION_FILE
|
|-- README
|
|-- doc                                 # document
|   |-- Zbtool User Guide
|   |-- GL-Zigbee SDK User Guide
|
|-- files
|   |-- gl-zbtool.init                  # configuration file
|
|-- src
    |   |-- components
    |   |   |-- dev_mgr
    |       |-- log
    |       |-- thread
    |
    |-- daemon                          # zb daemon
    |   |-- daemon
    |   |-- zbdriver
    |       |--silabs                   # silabs SDK
    |
    |-- include                         # header file
    |
    |-- lib                             # zb api lib
    |   |-- libglzbapi.h
    |   |-- libglzbapi.c
    |
    |-- project                         # user application file
    |   |-- demo.c                      # demo file
    |
    |-- tool
    |   |-- cli.c                       # debug tool - zbtool
    |
    |-- Makefile
```

# 2. API References

## 2.1 glzb_init()

```
GL_RET glzb_init(void);
```

**Summary:** Initialize the zigbee.

**Parameters:** Void

**Return Values:** Check return code

**Note**: This API is used with glzb_free().

## 2.2 glzb_free()

```
GL_RET glzb_free(void);
```

**Summary:** End of the program and release the resource.

**Parameters:** Void

**Return Values:** Check return code

**Note**: This API is used with glzb_init().

## 2.3 glzb_get_sdk_ver()

```
GL_RET glzb_get_sdk_ver(char* version);
```

**Summary:** End of the program and release the resource.

**Parameters:** Pointer to string for version

**Return Values:** Check return code

## 2.4 glzb_subscribe()

```
GL_RET glzb_subscribe(void);
```

**Summary:** Enable callback functions(see in gl_zb_register_cb()), subscribe module message.

**Parameters:** Void

**Return Values:** Check return code

**Note**: This API is used with glzb_unsubscribe().

## 2.5 glzb_unsubscribe()

```
GL_RET glzb_unsubscribe(void);
```

**Summary:** Disable callback functions(see in gl_zb_register_cb()), unsubscribe module message.

**Parameters:** Void

**Return Values:** Check return code

**Note**: This API is used with glzb_subscribe().

## 2.6 glzb_register_cb()

```
GL_RET glzb_register_cb(glzb_cbs_s *cb);
```

**Summary:** Register user callback functions

**Parameters:** glzb_cbs_s *cb

```
typedef struct {
    int (*z3_zcl_report_cb)(glzb_zcl_repo_s* zcl_p);
    int (*z3_zdo_report_cb)(glzb_zdo_repo_s* zdo_p);
    int (*z3_dev_manage_cb)(glzb_desc_s *dev);
} glzb_cbs_s;
```

**Return Values:** Check return code

### 2.6.1 int (*z3_zcl_report_cb)(glzb_zcl_repo_s* zcl_p)

**Summary:** Receive zcl message reports from the module. User can get report message and use it in this callback. This callback will be called when module receive a zcl data(report or response).

**Parameters:** glzb_zcl_repo_s* zcl_p

```
typedef struct {
    uint16_t short_id;
    uint16_t profile_id;
    uint16_t cluster_id;
    uint8_t src_endpoint;
    uint8_t dst_endpoint;
    uint8_t cmd_type;
    uint8_t cmd_id;
    uint16_t msg_length;
    uint8_t *message;
} glzb_zcl_repo_s
```

| parameter | description |
| --- | --- |
| short_id | Short ID of report deivce |
| profile_id | Profile ID of this message |
| cluster_id | Cluster ID of this message |
| src_endpoint | Source endpoint of this message |
| dst_endpoint | Destination endpoint of this message |
| cmd_type | 0: global zcl cmd; 1: specific zcl cmd |
| cmd_id | ZCl command ID of this message |
| msg_length | The length of data |
| message | Data |

**Return Values:** Define by user.

### 2.6.2 int (*z3_zdo_report_cb)(glzb_zdo_repo_s* zdo_p)

**Summary:** Receive zdo message reports from the module. User can get report message and use it in this callback. This callback will be called when module receive a zdo data(report or response).

**Parameters:** glzb_zdo_repo_s* zdo_p

```
typedef struct {
    uint16_t short_id;
    uint16_t profile_id;
    uint16_t cluster_id;
    uint16_t msg_length;
    uint8_t *message;
} glzb_zdo_repo_s;
```

| parameter | description |
| --- | --- |
| short_id | Short ID of report deivce |
| profile_id | Profile ID of this message |
| cluster_id | Cluster ID of this message |
| msg_length | The length of data |
| message | Data |

**Return Values:** Define by user.

### 2.6.3 int (*z3_dev_manage_cb)(glzb_desc_s *dev)

**Summary:** Receive zigbee device message reports from the module. User can get report message and use it in this callback. This callback will be called when a zigbee device join, rejoin or left the network.

**Parameters:** glzb_desc_s *dev

```
typedef struct {
    char eui64[DEVICE_MAC_LEN+1];
    uint16_t short_id;
    uint16_t parent_node_id;
    glzb_dev_update status;
    glzb_Join_decision decision;
} glzb_desc_s;
```

| parameter | description |
| --- | --- |
| eui64 | Eui64 of new device |
| short _id | Short ID of new device |
| parent_node_id | Short ID of the parent of new device |
| status | Status of the Update Device message |
| decision | The decision made by the Trust Center when a node attempts to join. |

**Return Values:** Define by user.

## 2.7 glzb_get_module_msg()

```
GL_RET glzb_get_module_msg(glzb_module_ver_s* status);
```

**Summary:** Get module software information.

**Parameters:** glzb_module_ver_s* status

```
typedef struct {
    char mac[DEVICE_MAC_LEN+1];
    uint16_t build;
    uint8_t major;
    uint8_t minor;
    uint8_t patch;
    uint8_t special;
    uint8_t type;
} glzb_module_ver_s;
```

**Return Values:** Check return code

## 2.8 glzb_get_nwk_status()

```
GL_RET glzb_get_nwk_status(glzb_nwk_status_para_s* status);
```

**Summary:** Get current network status.

**Parameters:** glzb_nwk_status_para_s* status

```
typedef struct {
    glzb_nwk_status_e nwk_status;
    glzb_node_type_e node_type;
    char extended_pan_id[EXPENDED_PAN_ID_LEN+1];
    uint16_t pan_id;
    uint8_t radio_tx_power;
    uint8_t radio_channel;
    glzb_join_method_e join_method;
    uint16_t nwk_manager_id;
    uint8_t nwk_update_id;
} glzb_nwk_status_para_s;
```

| parameter | description |
| --- | --- |
| nwk_status | State of device |
| node_type | Type of device in current network |
| extended_pan_id | Extended pan ID of current network |
| pan_id | Pan ID of current network |
| radio_tx_power | Radio TX power |
| radio_channel | Radio channel |
| join_method | The type of method used for joining. |
| nwk_manager_id | The ID of the network manager in the current network. |
| nwk_update_id | The value of the ZigBee nwkUpdateId known by the stack. |

**Return Values:** Check return code

## 2.9 glzb_create_nwk()

```
GL_RET glzb_create_nwk(uint16_t pan_id, uint8_t channel, uint8_t tx_power);
```

**Summary:** Create a new zigbee network(as coordinator).

**Parameters:**

| parameter | description |
| --- | --- |
| pan_id | Pan ID of network |
| channel | Channel of network |
| tx_power | Radio TX power(dbm) |

The tx power can be set to 0-255, but the actual tx power is limited by the chip, so setting the tx power beyond the upper limit will not take effect.

**Return Values:** Check return code

## 2.10 glzb_leave_nwk()

```
GL_RET glzb_leave_nwk(void);
```

**Summary:** leave the network.

**Parameters:** Void

**Return Values:** Check return code

## 2.11 glzb_allow_dev_join()

```
GL_RET glzb_allow_dev_join(int limit_time);
```

**Summary:** open the network, allow new device join in.

**Parameters:**

| parameter | description |
| --- | --- |
| limit_time | The time of open network(0-255)(s) |

**Return Values:** Check return code

## 2.12 glzb_delete_dev()

```
GL_RET glzb_delete_dev(char* mac, uint16_t short_id);
```

**Summary:** Remove device from zigbee network.

**Parameters:**

| parameter | description |
| --- | --- |
| mac | Eui64 of target device |
| short_id | Short ID of target device |

**Return Values:** Check return code

## 2.13 glzb_get_dev_tab()

```
GL_RET glzb_get_dev_tab(glzb_dev_table_s *table);
```

**Summary:** Get current child/neighbor device table. A child device is usually a zigbee-end_device or zigbee-sleepy_end_device mounted on the current device. A neighbor device is usually a zigbee-router_device.

**Note**: if an end-device mounted on other router, it will not show in child table.

**Parameters:** glzb_dev_table_s *table

```
typedef struct glzb_child_tab_node{
    char eui64[DEVICE_MAC_LEN+1];
    glzb_node_type_e type;
    uint16_t short_id;
    uint8_t phy;
    uint8_t power;
    uint8_t timeout;
    struct glzb_child_tab_node* next;
} glzb_child_tab_s;

typedef struct glzb_neighbor_tab_node{
    uint16_t short_id;
```

```
    uint8_t average_lqi;
    uint8_t in_cost;
    uint8_t out_cost;
    uint8_t age;
    char eui64[DEVICE_MAC_LEN+1];
    struct glzb_neighbor_tab_node* next;
} glzb_neighbor_tab_s;

typedef struct {
    int child_num;
    glzb_child_tab_s *child_table_header;
    int neighbor_num;
    glzb_neighbor_tab_s *neighbor_table_header;
} glzb_dev_table_s;
```

**Return Values:** Check return code

## 2.14 glzb_send_zcl_cmd()

```
GL_RET glzb_send_zcl_cmd(glzb_aps_s *frame);
```

**Summary:** Create and send a zcl command.

**Parameters:** glzb_aps_s *frame

```
typedef struct {
    char mac[DEVICE_MAC_LEN+1];
    uint16_t short_id;
    uint16_t profile_id;
    uint16_t cluster_id;
    uint16_t group_id;
    uint8_t src_endpoint;
    uint8_t dst_endpoint;
    uint8_t cmd_type;           //0: global zcl cmd; 1: specific zcl cmd
    uint8_t cmd_id;
    uint8_t frame_type;         //0: unicast; 1: multicast; 2: broadcast
    uint16_t msg_length;
    uint8_t *message;
} glzb_aps_s;
```

| parameter | description |
| --- | --- |
| mac | Eui64 of target device |
| short_id | Short ID of target device |
| profile_id | Profile ID of this message |
| cluster_id | Cluster ID of this message |
| src_endpoint | Source endpoint of this message |
| dst_endpoint | Destination endpoint of this message |
| cmd_type | 0: global zcl cmd; 1: specific zcl cmd |
| cmd_id | ZCl command ID of this message |
| frame_type | 0: unicast; 1: multicast; 2: broadcast |
| msg_length | The length of data |
| message | Data |

**Return Values:** Check return code

## 2.15 glzb_send_node_desc_req()

```
GL_RET glzb_send_node_desc_req(uint16_t target);
```

**Summary:** Send node descriptor request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |

**Return Values:** Check return code

## 2.16 glzb_send_power_desc_req()

```
GL_RET glzb_send_power_desc_req(uint16_t target);
```

**Summary:** Send power descriptor request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |

**Return Values:** Check return code

## 2.17 glzb_send_active_eps_req()

```
GL_RET glzb_send_active_eps_req(uint16_t target);
```

**Summary:** Send active endpoint request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |

**Return Values:** Check return code

## 2.18 glzb_send_simple_desc_req()

```
GL_RET glzb_send_simple_desc_req(uint16_t target, uint8_t targetEndpoint);
```

**Summary:** Send simple descriptor request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |
| targetEndpoint | endpoint on the target device where the simple descriptor request will be sent |

**Return Values:** Check return code

## 2.19 glzb_send_lqi_tab_req()

```
GL_RET glzb_send_lqi_tab_req(uint16_t target, uint8_t startIndex);
```

**Summary:** Send lqi table request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |
| startIndex | starting index into table query |

**Return Values:** Check return code

## 2.20 glzb_send_routing_tab_req()

```
GL_RET glzb_send_routing_tab_req(uint16_t target, uint8_t startIndex);
```

**Summary:** Send routing table request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |
| startIndex | starting index into table query |

**Return Values:** Check return code

## 2.21 glzb_send_binding_tab_req()

```
GL_RET glzb_send_binding_tab_req(uint16_t target, uint8_t startIndex);
```

**Summary:** Send binding table request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |
| startIndex | starting index into table query |

**Return Values:** Check return code

## 2.22 glzb_send_dev_bind_req()

```
GL_RET glzb_send_dev_bind_req(glzb_bind_req_para_s* bind_para);
```

**Summary:** Sendzigbee device bind request to target device.

**Parameters:** glzb_bind_req_para_s* bind_para

```
typedef struct {
    uint16_t target;
    uint16_t bind_cluster_id;
    uint8_t source[8];
    uint8_t sourceEndpoint;
    uint16_t clusterId;
    uint8_t type;
    uint8_t destination[8];
    uint16_t groupAddress;
    uint8_t destinationEndpoint;
} glzb_bind_req_para_s;
```

| parameter | description |
| --- | --- |
| target | Short ID of target device |
| bind_cluster_id | Bind cluster ID |
| source | The source EUI64 of the binding |
| sourceEndpoint | The source endpoint of the binding |
| clusterId | The cluster ID to bind |
| type | The type of bind request |
| destination | The destination EUI64 of the binding |
| groupAddress | The group address in the binding if use group bind |
| destinationEndpoint | The destination endpoint of the binding |

```
Bind cluster ID:
- #define BIND_REQUEST                       0x0021
- #define UNBIND_REQUEST                     0x0022

Type of bind request:
- #define UNICAST_BINDING                      0x03
- #define UNICAST_MANY_TO_ONE_BINDING          0x83
- #define MULTICAST_BINDING                    0x01
```

**Return Values:** Check return code

## 2.23 glzb_send_match_desc_req()

```
GL_RET glzb_send_match_desc_req(uint16_t target, uint16_t profile, uint8_t
inCount,uint8_t outCount, uint16_t *inClusters, uint16_t *outClusters);
```

**Summary:** Send match descriptors request to target device.

**Parameters:**

| parameter | description |
| --- | --- |
| target | Short ID of target device |
| profile | Profile id for the match descriptor request |
| inCount | Num of in clusters |
| outCount | Num of out clusters |
| inClusters | Array of in clusters |
| outClusters | Array of out clusters |

**Return Values:** Check return code

# 3. Return Code

```
typedef uint16_t GL_RET;
```

0x0000 - 0x00FF  Error code defined by GL-iNet

0x0100 - 0xFFFF  Error code defined by zigbee module manufacturer

| Description | Error code defined by GL-iNet |
| --- | --- |
| GL_SUCCESS | 0x0000 |
| GL_UNKNOW_ERR | 0x0001 |
| GL_PARAM_ERR | 0x0002 |
| GL_UBUS_CONNECT_ERR | 0x0011 |
| GL_UBUS_LOOKUP_ERR | 0x0012 |
| GL_UBUS_SUBSCRIBE_ERR | 0x0013 |
| GL_UBUS_INVOKE_ERR | 0x0014 |
| GL_UBUS_REGISTER_ERR | 0x0015 |
| GL_UBUS_CALL_STR_ERR | 0x0016 |
| GL_UBUS_JSON_PARSE_ERR | 0x0017 |