Application Note：
User Guide For Telink BLE Mesh Emulator tool

AN-BLE-15050400-E5

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Brief：

This document is the user guide for Telink BLE Mesh Emulator tool.

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Revision History

Version	Major Changes	Date	Author
1.0	Initial release	2015/5	J.H.P., Cynthia
1.1.0	Added UI control, updated tool interface figures	2015/7	M.S.S., Cynthia
1.2.0	Added “Schedule” function on Mesh UI window, updated tool interface figures	2015/9	S.Q.F., Cynthia
1.3.0	Updated schedule function; Updated pre-defined commands and added light node serial number column in GUI interface;	2015/10	S.Q.F., Cynthia
1.4.0	Added scene mode; Update pre-defined commands on the main interface; Added scene event for alarm clock function.	2015/12	Z.J.Y., Cynthia

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1 Brief Introduction

This document presents the instruction for using Telink BLE Mesh Emulator tool and applies to all engineers who want to develop Bluetooth Low Energy (BLE) Mesh (such as BLE mesh light) applications. The Telink BLE Mesh Emulator tool allows the developer to connect to BLE mesh nodes using a Telink developed master dongle and emulates some of the control that can be performed on a mobile phone, such as setting security information, performing group assignment, and controlling and polling node status.

2 Emulator Tool GUI

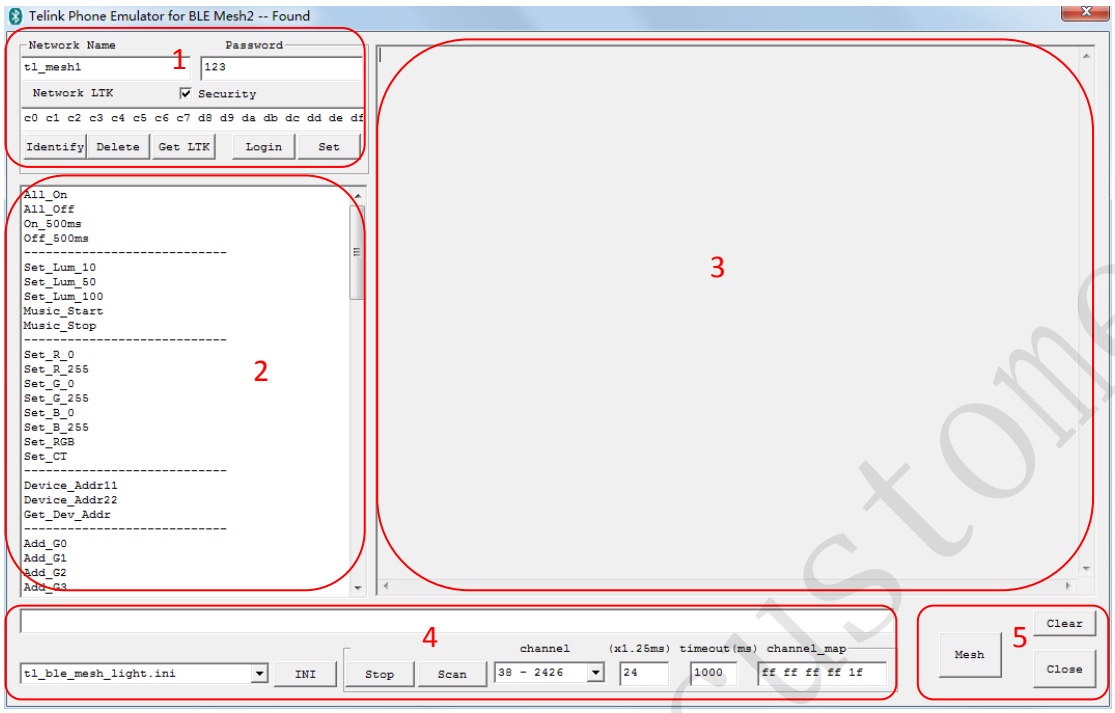


Figure 1 Tool GUI

The Emulator tool GUI is shown in Figure 1, with several main components included. The first section “1” show the security information related to the mesh network, including information such as network name, password for accessing the network, and the network long term key. A number of control buttons are also included to allow operations related to these security fields.

The second section “2” includes a series of pre-defined control commands that can be used to control connected mesh nodes. For example, commands for group assignment, commands for adjusting RGB, commands for turning nodes on/off, and commands for querying current node status.

The third section “3” is a log window, it shows in real time the related log information for the mesh network or the connected mesh nodes, for example, details in commands transmitted over the air, failure/successful status of commands.

The fourth section “4” also contains a read-only text box for showing the details of the pre-defined commands, text box showing general physical layer information such as the channel used and the connection interval settings. There are also a number of buttons to allow scan, connect and disconnect to a mesh node. All the pre-defined commands are configurable in a text configuration file “tlk_ble_lights.ini” and can be opened and edited by clicking “INI” button.

The fifth section “5” contains a “Mesh” button to open user control interface, a “Clear” button to clear the log window, and a “Close” button to close the tool interface.

The detailed usage of the GUI is described in a step-by-step example in Section 3.

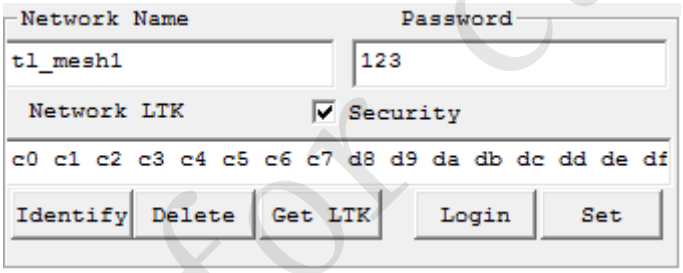


Figure 2 Security information field

Within the first section (security information field), button “Identify” is used to find a mesh node that is in factory default state and has not been added to any mesh network;

Button “Delete” is used to delete a mesh node from the current mesh network and restore it to factory default state;

Button “Get LTK” reads the LTK information from a mesh node.

Button “Login” is used to confirm the network name and password information with a mesh node and establishes a security association before the Emulator tool can change any of the these values on the mesh node;

Button “Set” is used to set new values for network name, password, or network LTK on a logined mesh node.

3 Step-by-step user guide

3.1 Initial state

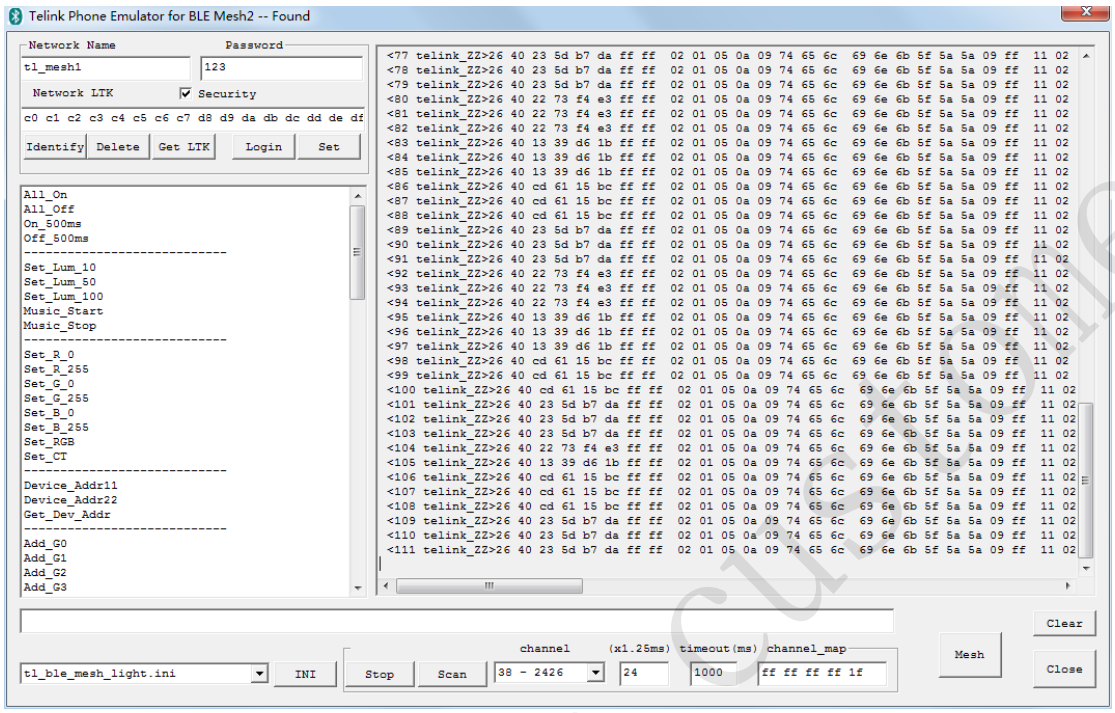


Figure 3 Initial state

In Figure 3, the initial state of the Telink BLE Mesh Emulator tool is shown. Since the Emulator tool is not connected to any mesh nodes at this moment yet, it only scans all the advertising channels for available mesh nodes nearby. As can be seen in the rolling log, the light module (dongle emulator) is just programmed with the light_security.bin and is advertising its availability with the default mesh network name “telink_mesh1”.

3.2 Establish connection

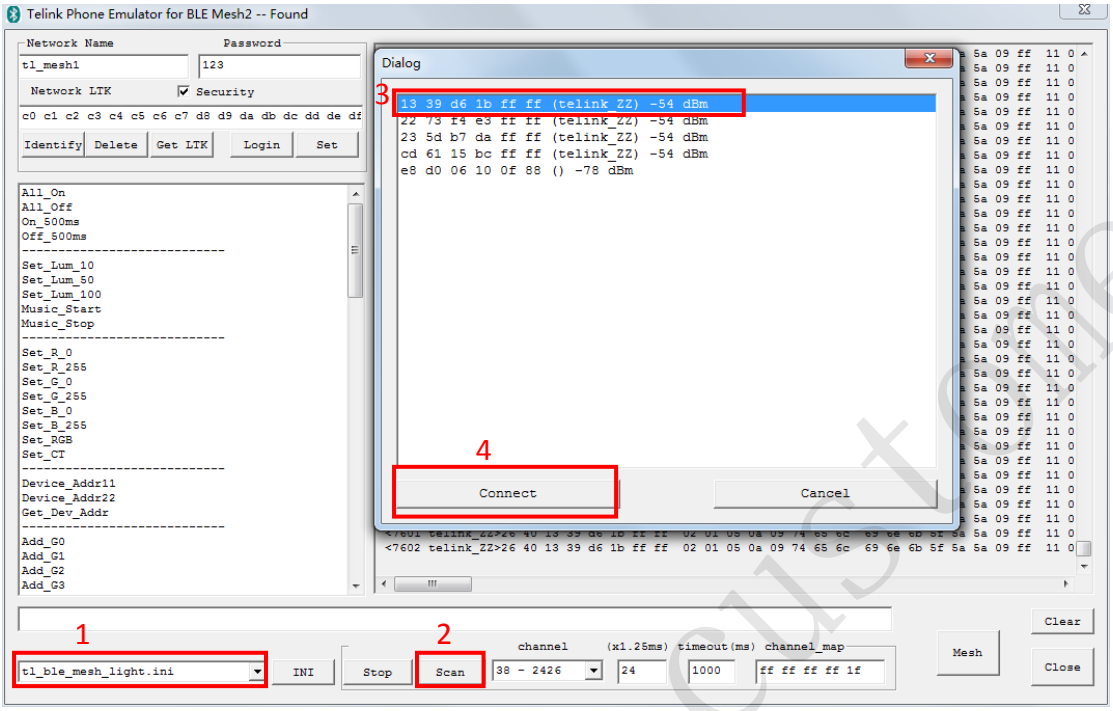


Figure 4 Connect to the selected mesh node

Select “tl_ble_mesh_light.ini” via the drop-down menu at the lower left corner of the interface, as shown in mark 1 of Figure 4.

To connect to the mesh node, click on the “**Scan**” button (as shown in mark 2 of Figure 4). The Emulator tool will provide the list of nodes available for connecting to, as shown in mark 3 of Figure 4. Click the “**Connect**” button (as shown in mark 4 of Figure 4) to connect to the selected node.

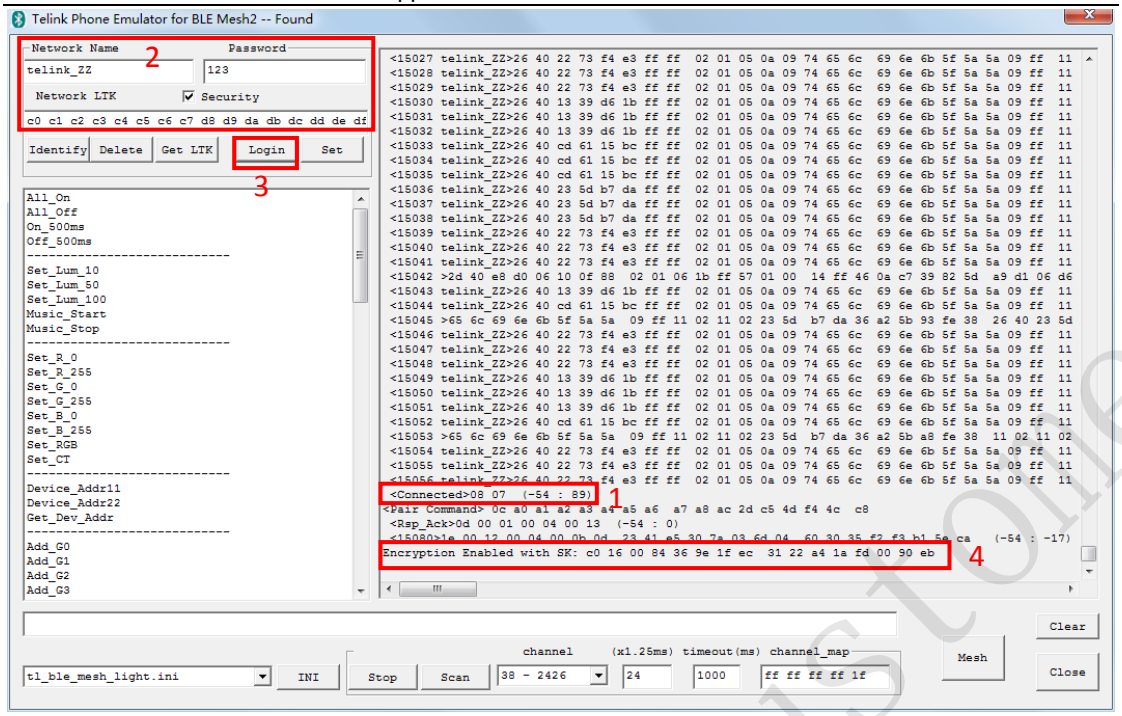


Figure 5 Confirm the connected state and enable control

If the connection is established correctly, the log window will show confirm the connected state as shown in mark 1 of Figure 5. In addition, the network name text box (as shown in mark 2 of Figure 5) also shows the connected node's network name. Then click the "Login" button (as shown in mark 3 of Figure 5) to enable the GUI to control connected node(s), and the log window will show indication information as shown in mark 4 of Figure 5.

*Note: Once the selected node is connected, all nodes with the same network name and password will be connected automatically.

3.3 Pre-defined control commands

3.3.1 Mesh node control over established connection

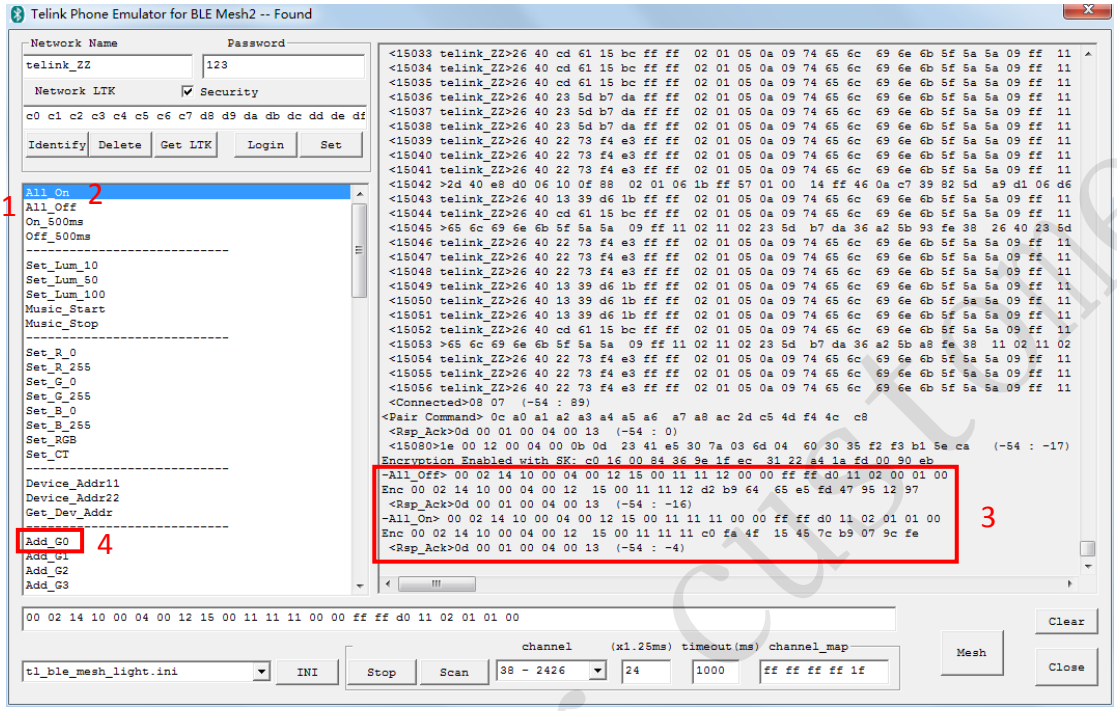


Figure 6 Mesh Node control (on/off)

The user can use the included commands to test the connection. For example, double clicking “All_off” (as shown in mark 1 of Figure 6) will turn the connected node(s) off, double clicking “All_on” (as shown in mark 2 of Figure 6) will turn the node(s) back on again. The actual over the air commands corresponding to the control command “All_off”/”All_on” are also displayed in the log window (as shown in mark 3 of Figure 6). Both plaintext version of the commands and the encrypted commands (marked as “Enc”) are shown for easy debugging.

3.3.2 Group assignment and group control

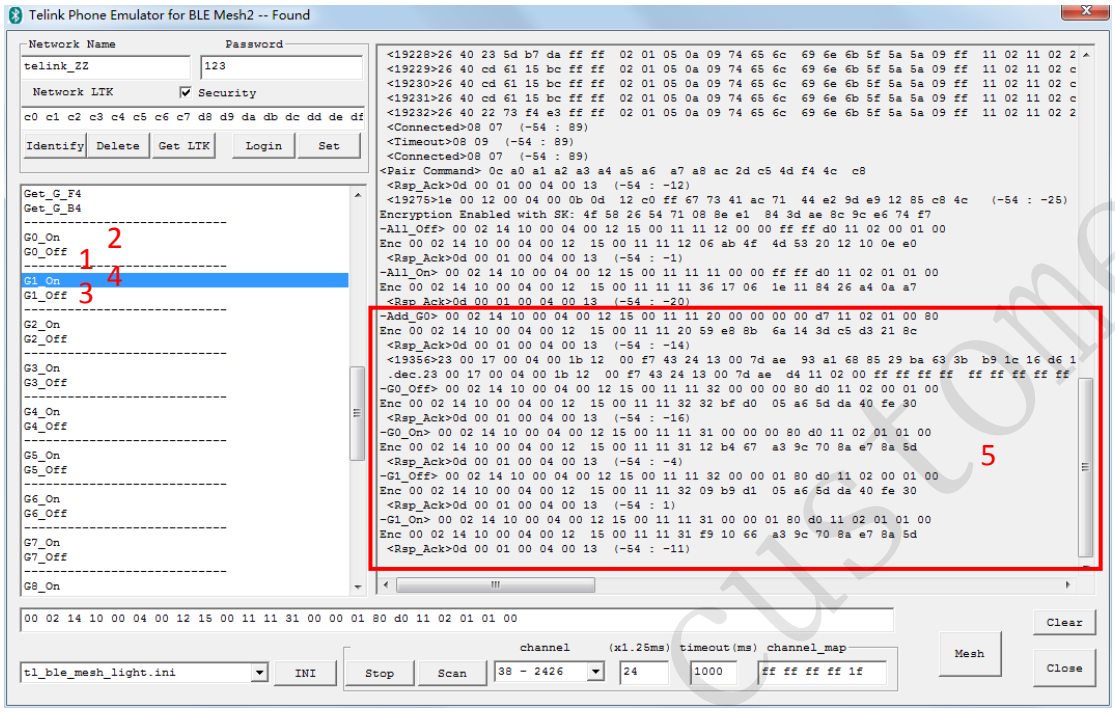


Figure 7 Assign group and control node

The user can assign the light node to different groups using pre-defined commands. For example, double clicking “Add_G0” (as shown in mark 4 of Figure 6) will assign the node which is connected via the “Scan”→“Connect” button to group 0. Then double clicking “G0_Off” (as shown in mark 1 of Figure 7) / “G0_On” (as shown in mark 2 of Figure 7) can turn the node off and on; while double clicking “G1_Off” (as shown in mark 3 of Figure 7) / “G1_On” (as shown in mark 4 of Figure 7) has no effect on the node assigned to group 0. The corresponding log information is shown in mark 5 of Figure 7.

*Note: One node can be assigned to several groups.

Double clicking “Del_G0” will delete the node from group 0.

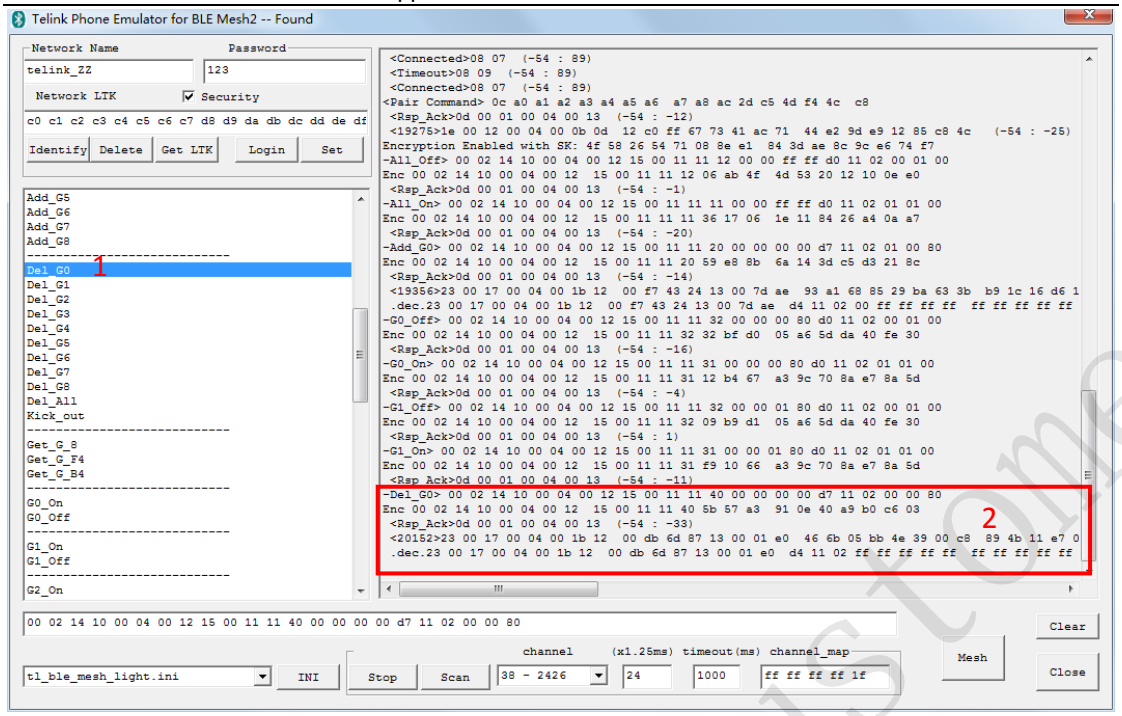


Figure 8 Delete node from group0

3.4 User interface (UI) control

Click the “Mesh” button at the lower right corner to open the user control interface. The UI emulates some main functions that can be performed on a Mobile App, such as group assignment, on/off control, group status and on/off/online status check.

First click the “Online Status” button (as shown in mark 1 of Figure 9), the device list will be available on the left of the window.

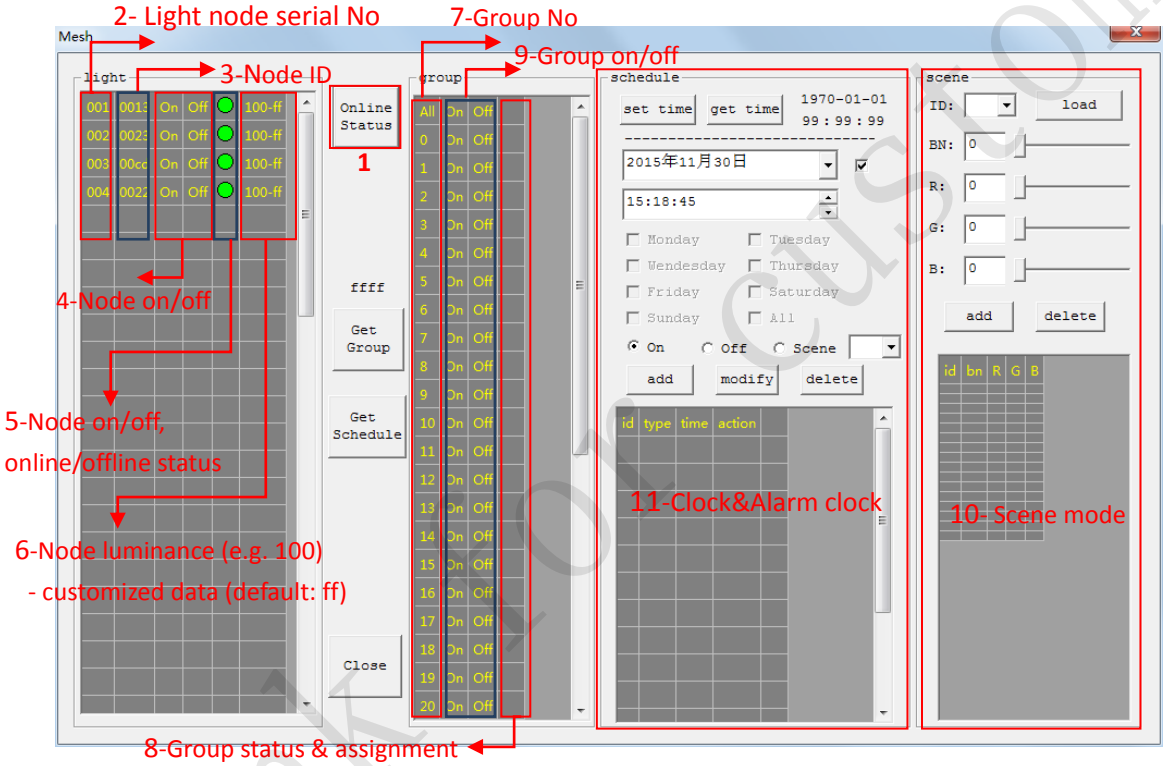


Figure 9 UI control 1

3.4.1 Single node control and status check

Single light node can be turned on/off by clicking corresponding “On”/“Off” button (as shown in mark 4 of Figure 9) next to the node ID (as shown in mark 3 of Figure 9).

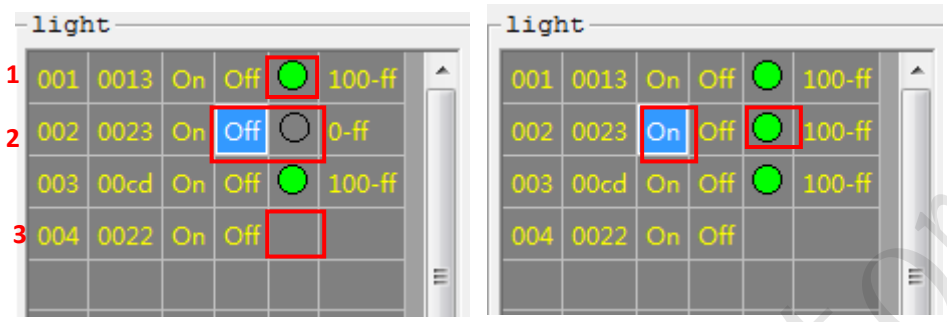


Figure 10 Node off/on control and status check

The node on/off and online/offline status can be checked by the indication as shown in mark 5 of Figure 9. The “Green” color icon  (as shown in mark 1 of Figure 10) indicates the node is turned on, the icon  (as shown in mark 2 of Figure 10) indicates the node is turned off, and the icon  (as shown in mark 3 of Figure 10) indicates the node is offline (powered off), in which case, the node will not respond to control command.

3.4.2 Group control

By double clicking corresponding node “Serial No.” (as shown in mark 2 of Figure 9), the group assignment information for the light node can be checked in the vertical bar as shown in mark 8 of Figure 9.

Left/Right clicking the button in the vertical bar as shown in mark 8 of Figure 9 will assign the node to/ delete the node from corresponding group, respectively.

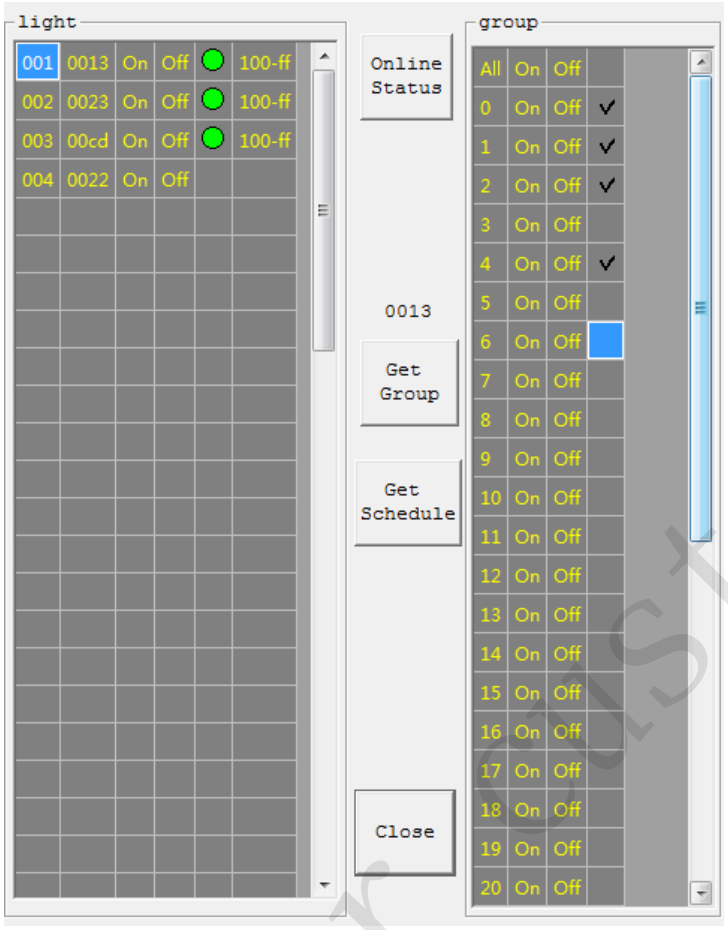


Figure 11 Add node 001 to group 0, 1, 2, 4

Clicking the “On”/“Off” button (as shown in mark 9 of Figure 9) next to “All” or “Group No.” (as shown in mark 7 of Figure 9) will turn on/off all nodes within the network or all nodes assigned to the group, respectively.

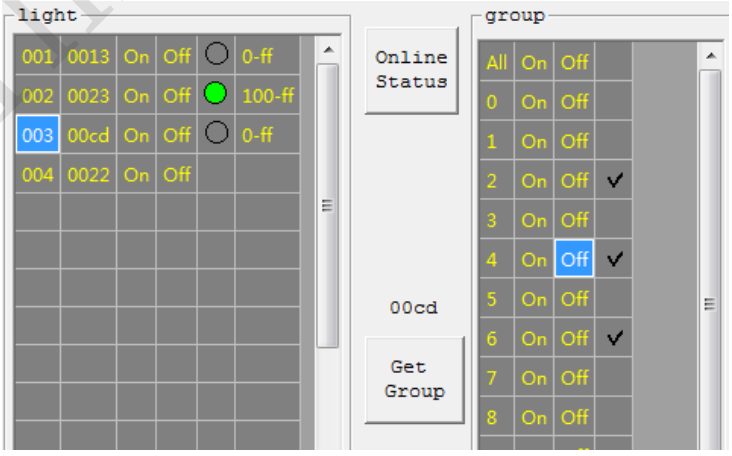


Figure 12 Turn off light nodes of group 4 (including node 001 and 003)

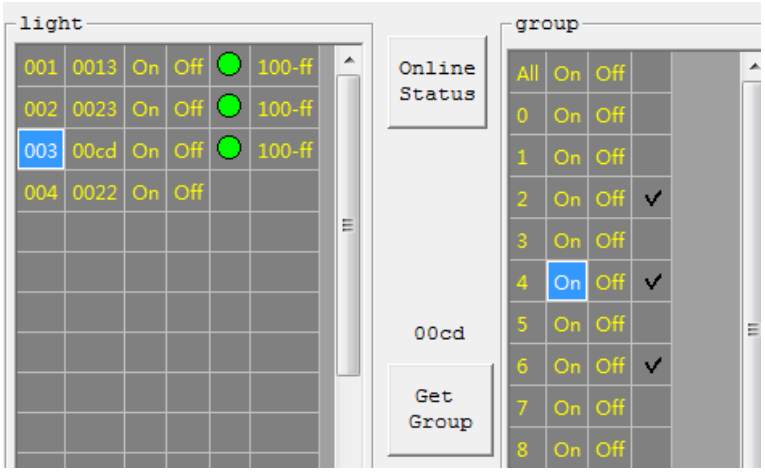


Figure 13 Turn on light nodes of group 4

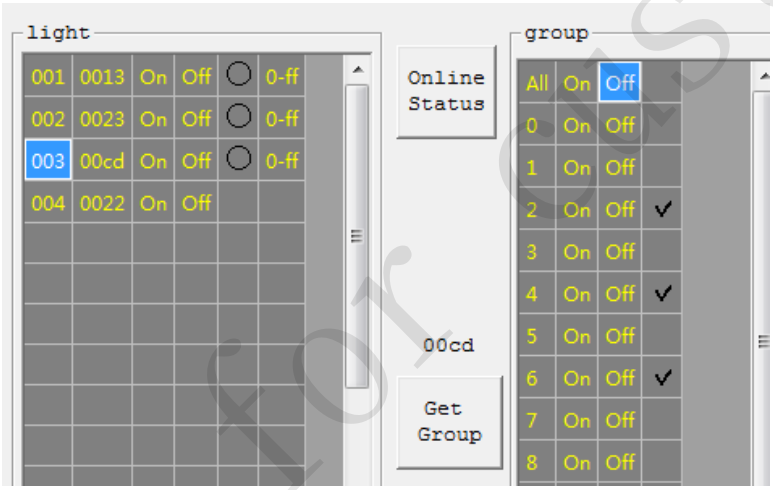


Figure 14 Turn off all light nodes within the network

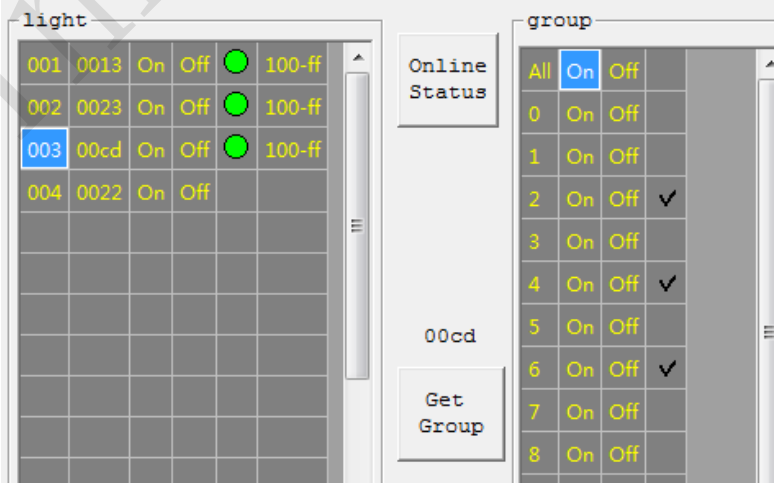


Figure 15 Turn on all light nodes within the network

3.4.3 Node luminance indication

The node luminance level (adjustable from 0% to 100% of maximal level) can also be checked by the indication as shown in mark 6 of Figure 9.

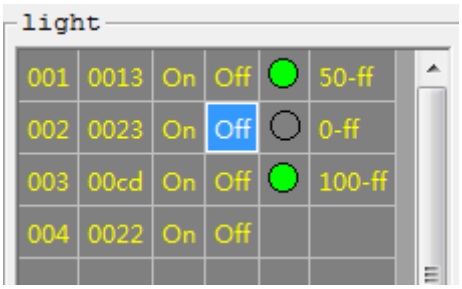


Figure 16 Node luminance check

As shown in Figure 16, the luminance of light node 001, 002, 003 are 50%, 0%, 100% of the maximal level, respectively.

3.4.4 Scene mode

Up to 16 scene modes with configurable brightness and RGB values can be added for each light node within the mesh network.

First click the “Online Status” button.

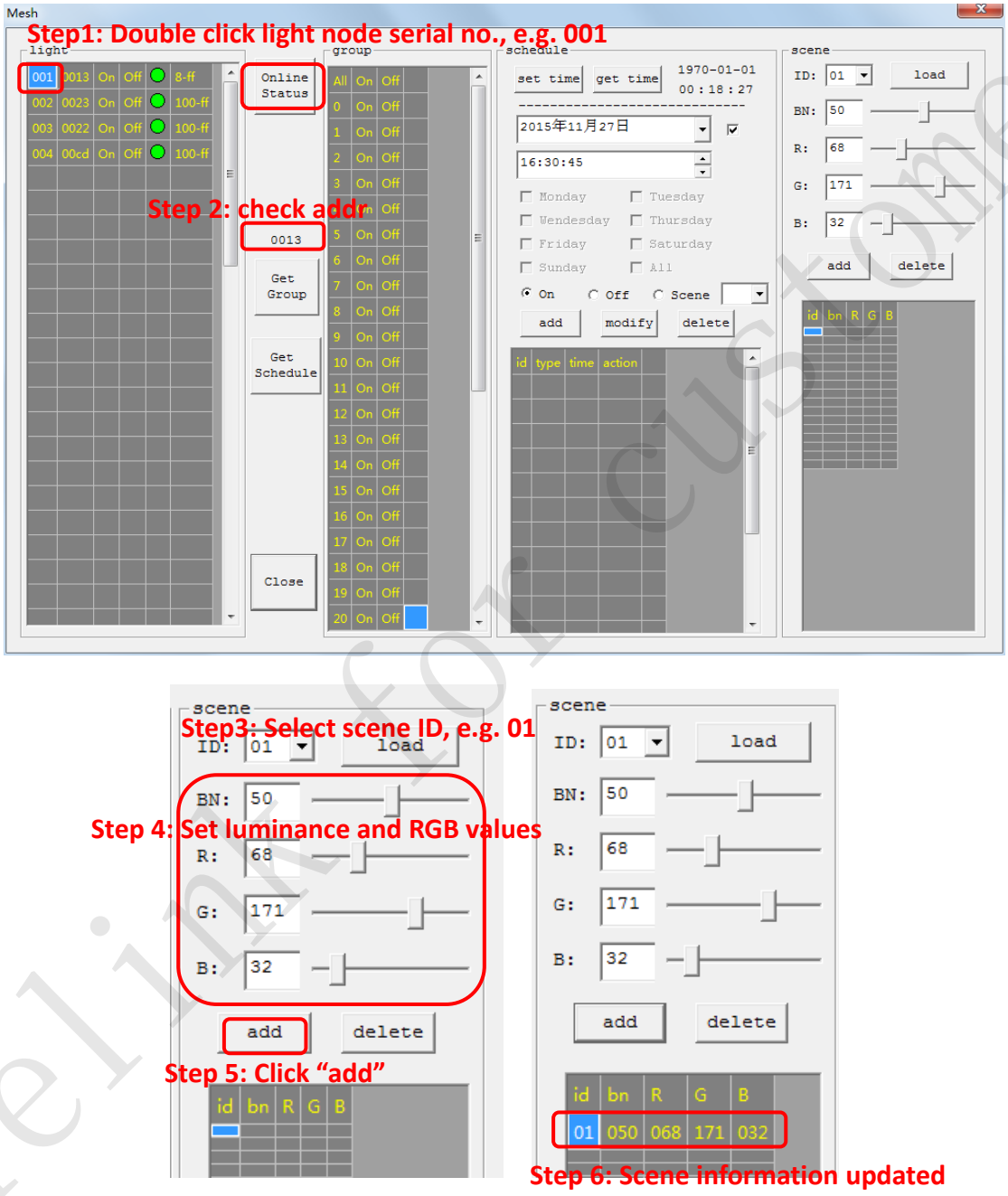


Figure 17 Add scene mode 01 for Light node 001 (device ID: 0013)

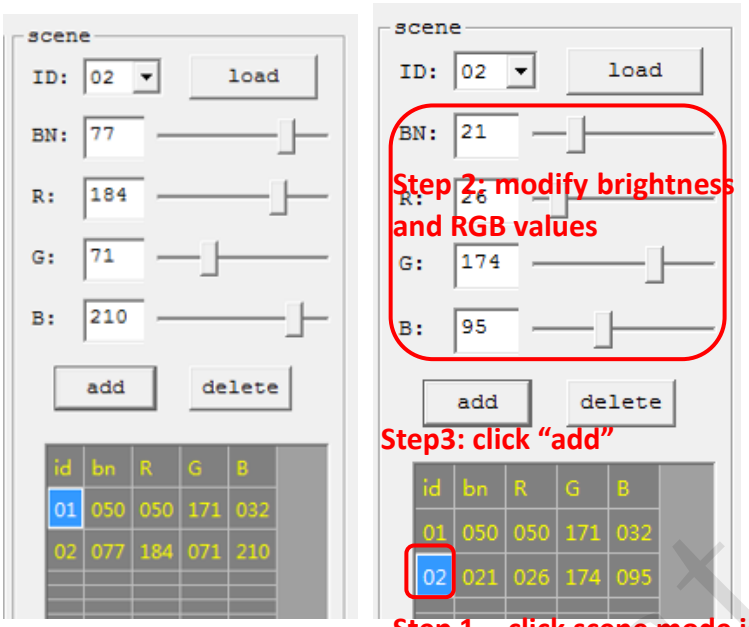


Figure 18 Modify scene mode 02

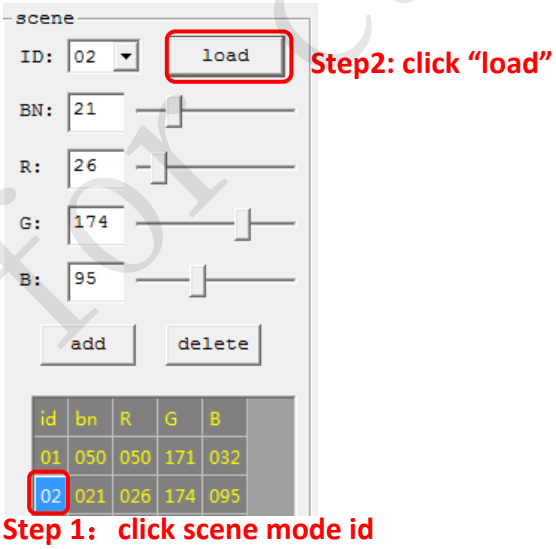


Figure 19 Load scene mode 02

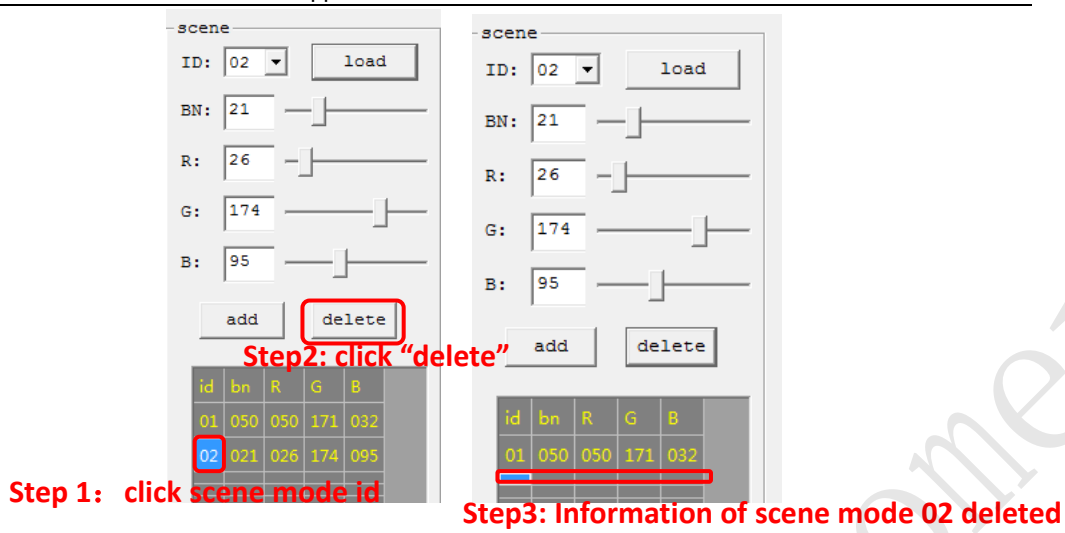


Figure 20 Delete scene mode 02

Please refer to **Section 6.10** in the document "***AN_BLE-2015060300_Telink BLE Mesh Development Kit And SDK Manual***" for details about the Schedule function.

3.4.5 Schedule function

The Schedule function including "**Clock**" and "**Alarm clock**" is supported for all light modules within the network.

The time of each light node will be reset to "January 1st, 1970" after restart. User can synchronize its time to system time via the "set time" button, and manually obtain its time via the "get time" button.

Via setting day-type or week-type "Alarm clock", one light node can be turned off/turned on or switch to certain scene mode automatically after the timing duration expires. User can obtain and set alarm clock information via the UI interface.

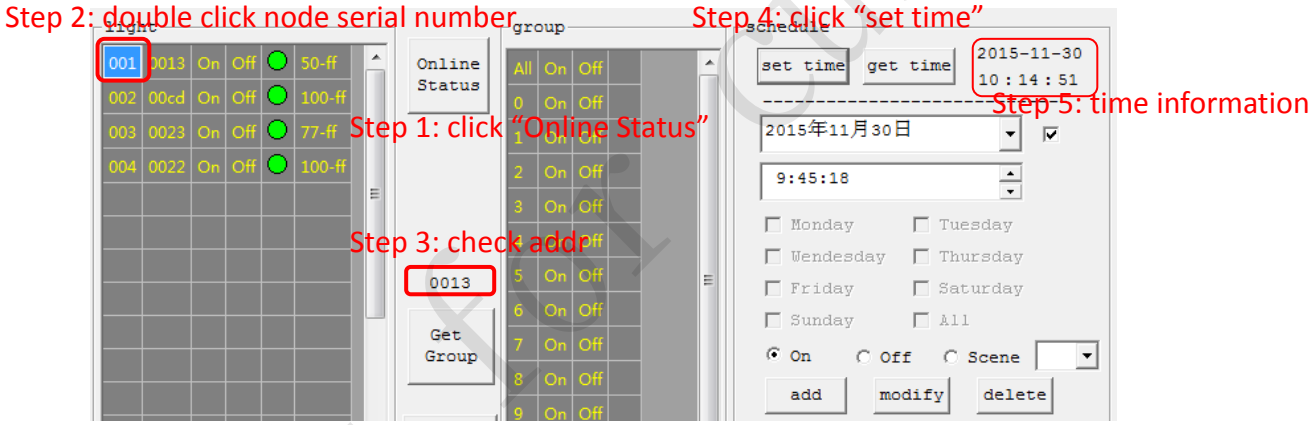


Figure 21 Synchronize nodes' time to system time

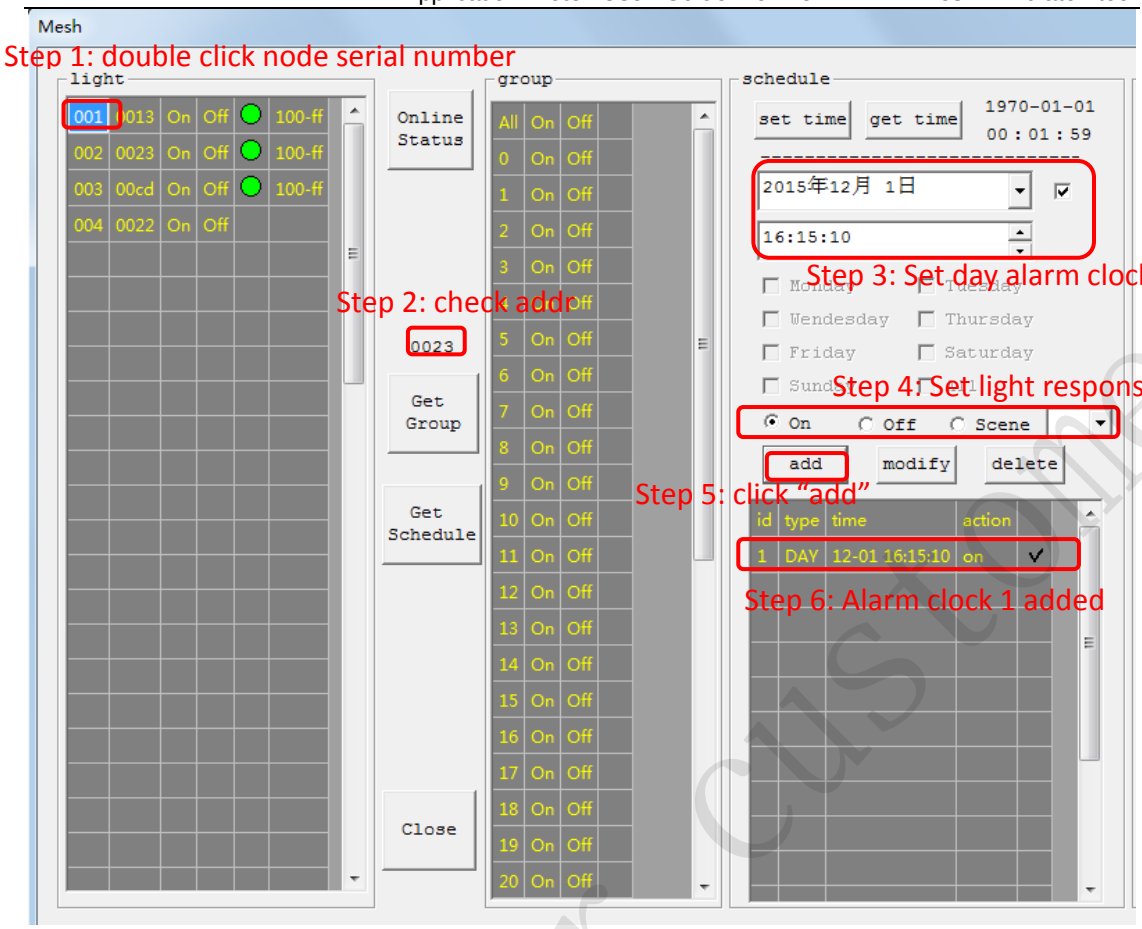


Figure 22 Add "DAY alarm clock"

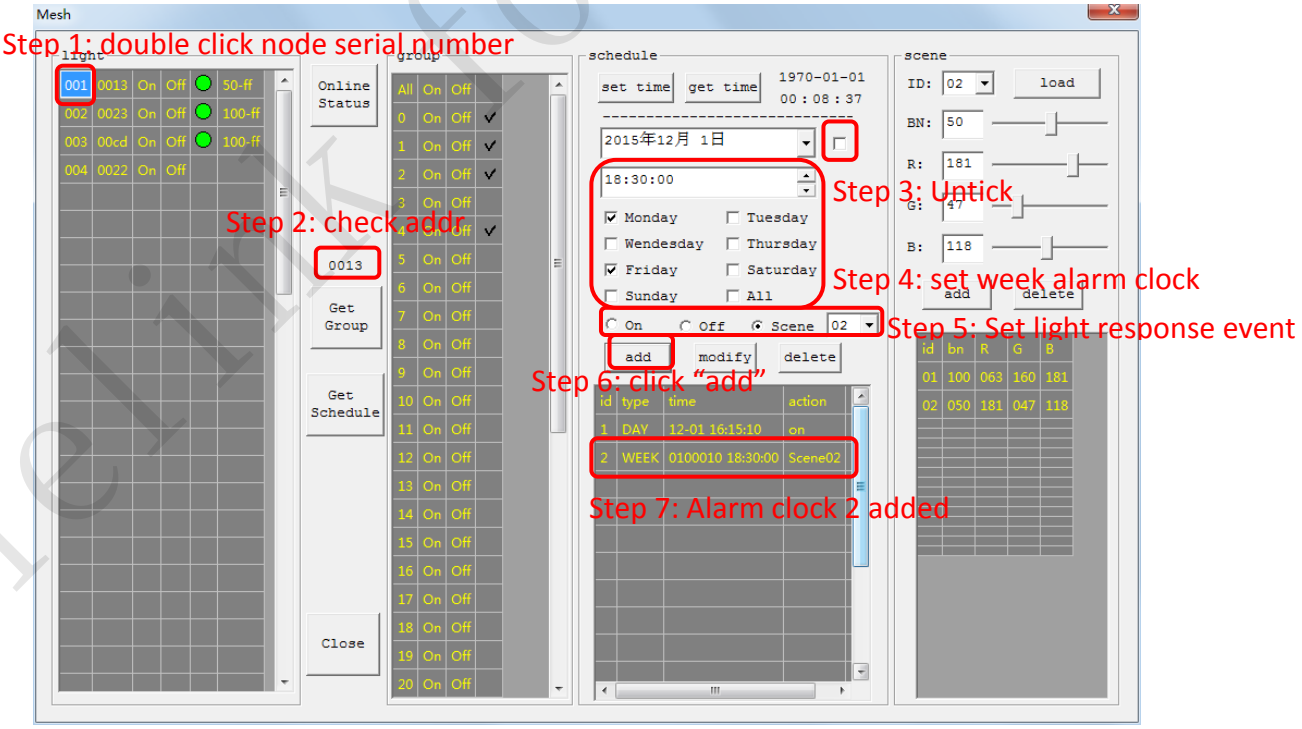
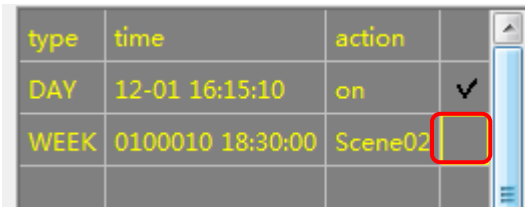
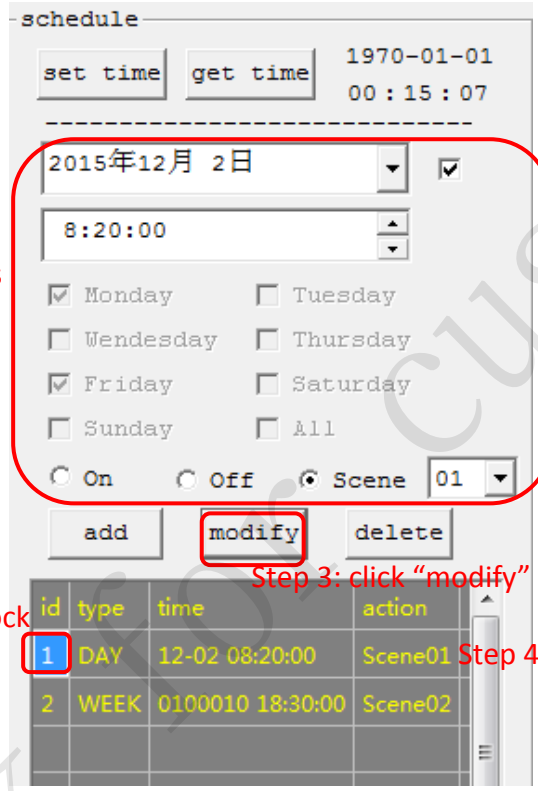


Figure 23 Add "WEEK alarm clock"



Left/Right click to turn on/off alarm clock:
√ indicates on;
blank indicates off.

Figure 24 Turn off alarm clock 2



Step 2: Modify parameters

Step 3: click "modify"

Step 1: click alarm clock id number

Step 4: alarm clock 1 updated

Figure 25 Modify alarm clock 1

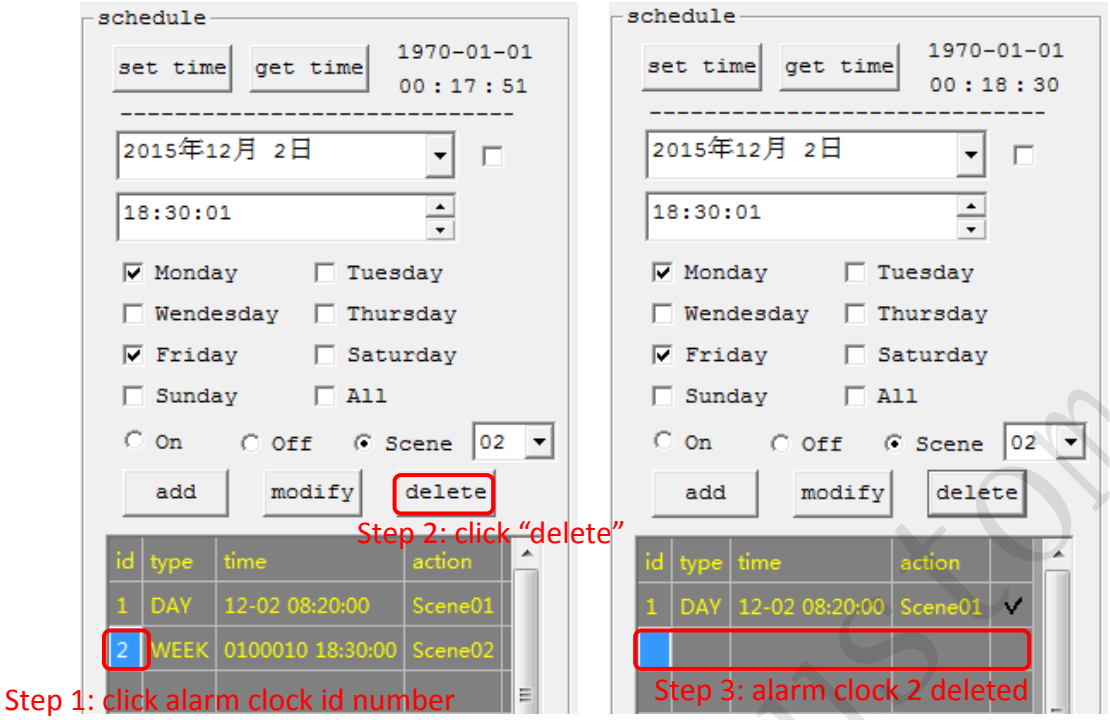


Figure 26 Delete alarm clock 2

Please refer to **Section 6.11** in the document "***AN_BLE-2015060300_Telink BLE Mesh Development Kit And SDK Manual***" for details about the Schedule function.

3.5 Change network configuration information

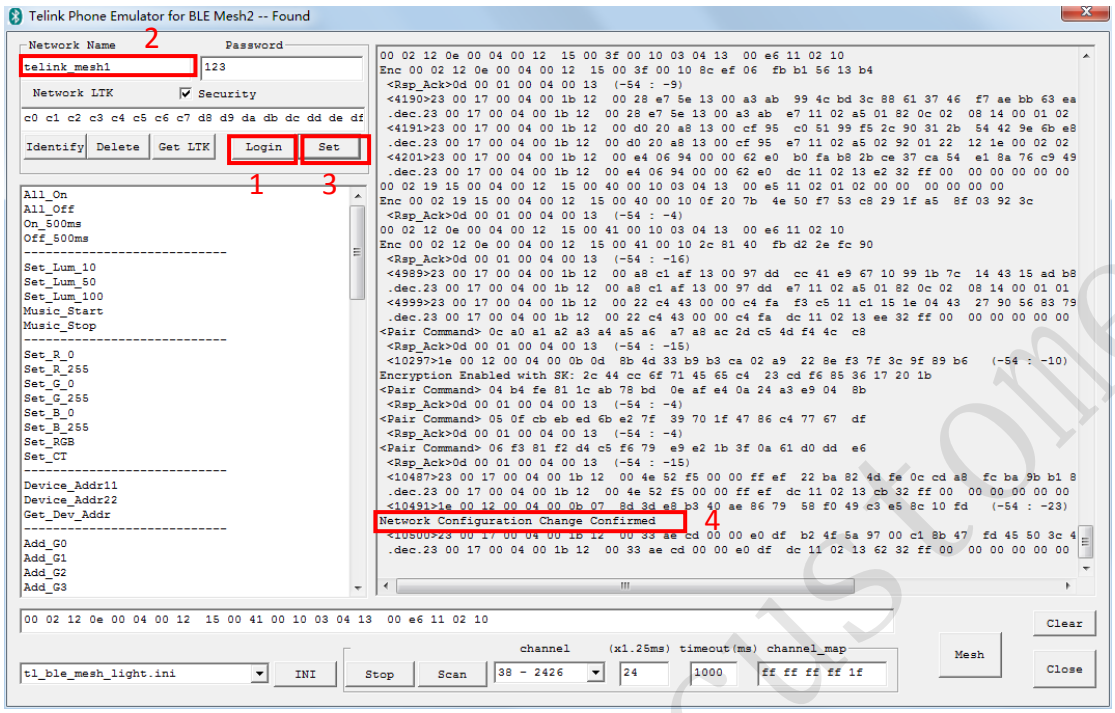


Figure 27 Change network configuration

The user can also change the network name, password, and long term key information through the Emulator tool. As shown in Figure 27, the user first needs to click "**Login**" (shown as mark 1) button with current network name and password information before changes can be made. If the user wants to change the network name from "telink_ZZ" to "telink_mesh1", simply enter the new value in the corresponding text box (as shown in mark 2 of Figure 27) and click "**Set**" button (as shown in mark 3 of Figure 27). As shown in mark 4 of the log window, the network configuration change is confirmed.

3.6 Terminate and reestablish connection

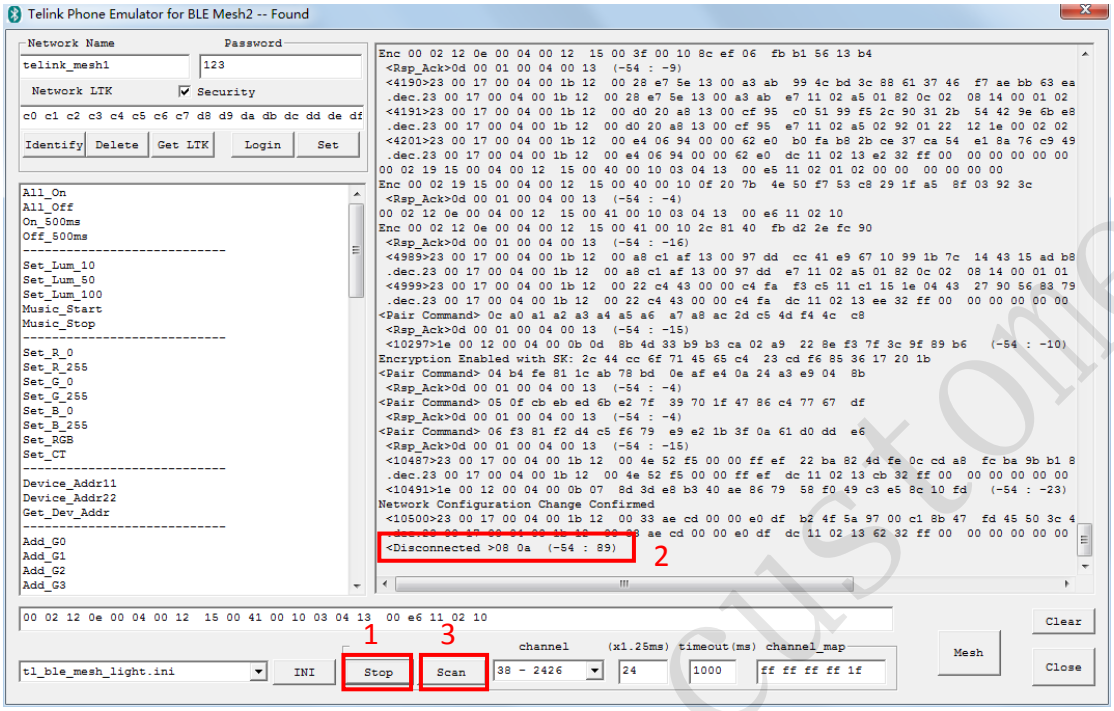


Figure 28 Terminate and reestablish connection

At any time, the connection to the light node can be terminated by clicking "**Stop**" button (as shown in mark 1 of Figure 28). As shown in mark 2 of Figure 28, the connection is marked as disconnected. To reconnect to the same node or to connect to a different node, simply click "**Scan**" button (as shown in mark 3 of Figure 28) again and follow the instructions as described in **Section 3.2**.