



USER MANUAL

— Smarteh BLE Mesh Provisioning
Tool 1.0.13

Version 1



Written by SMARTEH d.o.o.
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User manual

Document Version: 1
July 29, 2026



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Smarteh BLE Mesh Provisioning Tool 1.0.13

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1 ABOUT THIS DOCUMENT

This document describes in detail how to setup, use and navigate through Smarteh BLE Mesh Provisioning Tool 1.0.13.

1.1 Who should read this document

This document is the main source of information for users of **Smarteh BLE Mesh Provisioning Tool 1.0.13**.

You should read this document if you are new to Smarteh BLE Mesh Provisioning Tool 1.0.13.

For more information call +386 (0)5 388 44 00 or send an e-mail to support@smarteh.si.

1.2 Content of document

This document consists of the following chapters:

- **Chapter 1, “About this Document”:** Provides an introduction to the purpose and usage of this document.
- **Chapter 2, “Terminology”:** Throughout this manual, various phrases and technical terms are used. This chapter gives a detailed description of them.
- **Chapter 3, “Description of Smarteh BLE Mesh Provisioning Tool 1.0.13”:** Offers insight into the usage of the Smarteh BLE Mesh Provisioning Tool 1.0.13, providing basic knowledge for new users along with examples.
- **Chapter 4, “General BLE and Bluetooth Mesh Description”:** Contains fundamental information about BLE and Bluetooth Mesh standards and their applications.
- **Chapter 5, “Installation”:** Covers essential information about the installation procedure for the Smarteh BLE Mesh Provisioning Tool 1.0.13.
- **Chapter 6, “Standard Procedures for Using This Application”:** Offers a quick presentation of the standard procedures for application use, outlining the typical workflow of application usage.
- **Chapter 7, “Smarteh BLE Mesh Provisioning Tool 1.0.13 Tutorial”:** Presents the software screens, content, and a basic tutorial on how to use the application correctly. This chapter also includes descriptions of each function on a page and introduces the local database of the application. Completion of this chapter should enable users to utilize most of the application functions.
- **Chapter 8, “Smarteh BLE Devices”:** Lists all of Smarteh BLE devices and their P/N numbers for referencing or orders.
- **Appendix A, “Compatibility”:** Informs you about the system requirements for the application.





- **Appendix B, “Error Reporting”:** Provides guidance on what to do if an error is encountered and invites users to share ideas or suggestions for future improvements to the application.
- **Appendix C, “Changes”:** Lists all the changes that were added to newer versions of the Smarteh BLE Mesh Provisioning Tool 1.0.13 Tutorial.



2 TERMINOLOGY

2.1 Bluetooth Low Energy (BLE) and Bluetooth Mesh terminology

Mesh Network

A network topology where devices communicate with one another to create a reliable and scalable system, enabling devices to forward messages within the network.

Provisioning

The process of adding a new device to a mesh network by assigning it a unique unicast address and network keys, ensuring secure communication with other devices.

Mesh Proxy

A device that allows non-mesh devices to interact with a mesh network by forwarding messages between the mesh network and other devices that do not support mesh functionality.

Unicast Address

A unique identifier assigned to each device in the network, ensuring that messages are sent to a specific device rather than broadcasted to all devices.

Group Address

An address that represents a group of devices within the mesh network. Messages sent to a group address are received by all devices in that group.

Network Key

A shared key used by all devices in the mesh network to secure communication. It is essential for ensuring the confidentiality and integrity of data in the network.

Application Key

A key used for securing application-specific communication within the mesh network. Each device in the network can have one or more application keys assigned to it.

Composition Data

Data that describes the features, models, and capabilities of a device in the mesh network. This information is used to inform other devices in the network about the device's capabilities.

Subscription Address

A group address to which devices can subscribe in order to receive specific messages. This allows devices to act as receivers for broadcasted data within the mesh.

Friendship

A feature in BLE Mesh where one device stores data on behalf of a





low-power device, allowing the low-power device to conserve energy by sleeping and receiving messages later.

Provisioned Device

A device that has been successfully added to the mesh network and has received its unique address, keys, and other configuration settings.

Provisioning Tool

The tool used to configure and provision devices into a mesh network, including device setup, network key management, and application key assignment.

Provisioning Success

A status indicating that a device has been successfully added to the network, with its keys and settings properly configured.

Device Binding

The process of associating a device with an application key, publication address, or subscription address to enable specific communication within the mesh network.

Publication Address

An address used by devices to broadcast information to other devices in the network. It is typically a group address that all devices in the group can receive.

Opcode

A specific operation code used to define actions or commands within the mesh network, allowing devices to execute predefined functions.

Key Index

A reference number used to distinguish different keys used in the mesh network. It helps to identify the specific key used for security purposes during communication.

Security Credentials

A set of keys and authentication mechanisms used to secure communication between devices in the mesh network.

Key Refresh

A process of changing the network or application key periodically to enhance security by preventing unauthorized access to the mesh network.

Message Retransmit

A mechanism in the mesh network to retransmit messages to ensure reliability and prevent data loss, typically associated with network transmit settings like retransmit count.



2.2 Smarteh BLE Mesh Provisioning Tool 1.0.13 terminology

Provisioning Tool

The software or interface used to provision BLE devices into a mesh network by assigning unique addresses, network keys, and application keys.

Log Console

The section of the UI that displays log messages, alerts, and events triggered by user actions or system events during device provisioning and configuration.

Clear Logs Button

A button in the Log Console section that allows the user to clear all existing log messages for a fresh session.

Firestore Connection Address

The URL or address used to connect to a Firestore Realtime Database for importing or exporting mesh network and device data.

Import Networks

The functionality that allows users to import existing network configurations from a .csv file or Firestore Realtime Database into the tool.

Export Networks

The functionality that enables users to export the current network configuration to a .csv file or Firestore Realtime Database for backup or sharing purposes.

Scan Button

A button in the UI that starts the process of scanning for nearby BLE devices or Mesh Proxy devices, making them available for provisioning or connection.

Stop Scan Button

A button that stops the scanning process for nearby BLE devices or Mesh Proxy devices.

Provision Button

A button that appears when a device is found and is ready to be provisioned. It initiates the provisioning procedure for the selected device.

Network Key Dropdown

A UI element where the user selects the desired network key when provisioning or configuring a device, ensuring secure communication within the network.

Unicast Address Input

A field where the user inputs a unique unicast address for a device during the provisioning process, ensuring each device has a distinct address within the network.





Device Tile

A UI representation of a device that displays essential information like device name, address, status, and buttons for configuration or deletion.

Configure Button

A button on the device tile that navigates the user to the device's configuration screen, allowing advanced settings or actions to be performed on the device.

Delete Button

A button on the device tile that allows the user to delete a provisioned device from the network, prompting a confirmation dialog before proceeding.

Add New Group Button

A button that enables the user to create a new group of devices, allowing easier management and control of multiple devices within a mesh network.

Delete All Groups Button

A button in the UI that allows the user to delete all groups of devices from the mesh network, with a confirmation dialog before proceeding.

Device Configuration Button

A button used to access the device configuration settings, enabling the user to modify parameters and settings for a specific provisioned device.

Set Settings Button

A button that saves changes made to device or group configurations, applying the new settings to the network.

Import Devices Locally Button

A button that allows users to import BLE device configurations from a local .csv file into the tool.

Export Devices Locally Button

A button that allows users to export BLE device configurations from the current session to a local .csv file.

Network Key Dropdown Field

A field in the UI where the user selects the network key for a group or device, ensuring correct network-level security during provisioning and communication.

Custom Data Command Field

A field where users can enter specific operational data or opcodes for sending custom commands to BLE devices, allowing advanced communication within the network.

Device Information Display

A section in the UI where information such as the device's name,





status, and key bindings is displayed, allowing the user to view or modify device settings.

Disconnect Button

A button in the UI used to disconnect from a currently active device or Mesh Proxy, ensuring the user can switch devices or end the current session.

Import Devices from Firebase Button

A button that allows the user to connect to a Firebase Realtime Database and import existing BLE device configurations from the cloud.



3 DESCRIPTION OF SMARTEH BLE MESH PROVISIONING TOOL 1.0.13

3.1 About Smarteh BLE Mesh Provisioning Tool 1.0.13

The Smarteh BLE Mesh Provisioning Tool 1.0.13 is primarily designed for provisioning Smarteh BLE devices and sensors into Bluetooth Mesh networks. Additionally, the tool is used for managing the networks and customizing their settings.

This tool provides the freedom to create your own Bluetooth Mesh networks by generating their network keys, enabling the provisioning of scanned Smarteh BLE devices or sensors into them. With a simple and user-friendly interface, it caters to both normal day-to-day users and advanced users.

The device where this application operates must support the Bluetooth 5.0 protocol and be equipped with a Bluetooth module/card (commonly found in laptops) or a Bluetooth adapter/dongle (for personal computers). The software has been tested on both laptops and personal computers. The tool can function as a standalone portable Windows application or be installed and used like any other Windows-based application.

Example: After successfully setting up several Smarteh BLE devices or sensors in your building, you can seamlessly integrate them into a Bluetooth Mesh network using the Smarteh BLE Mesh Provisioning Tool 1.0.13. This tool allows you to add these devices to their designated networks and, additionally, provides control over their behavior and communication within the network, all through a single user-friendly interface.

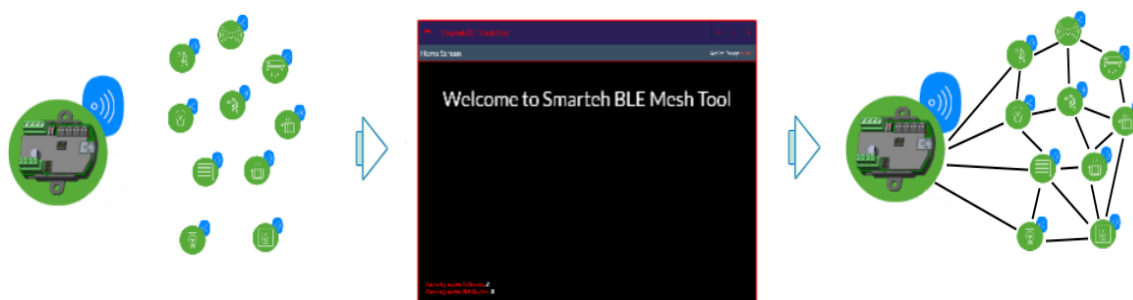


Figure 1: General overview of tool usability:

The user interface of the tool encompasses various functions. You can edit or delete already created networks, scan for unprovisioned Smarteh BLE devices, provision the found devices, configure settings for already provisioned Smarteh BLE devices,



or delete devices. The tool also supports importing or exporting network and BLE device files, scanning for active Mesh Proxy devices, and configuring them, among many other features.

Additionally, the setup offers portability. For instance, if you wish to use Bluetooth Mesh networks and BLE devices created on one PC, you can export them to .json or .csv files or utilize your favorite cloud-based database. Then, you can easily import these files on another PC or share them with others.

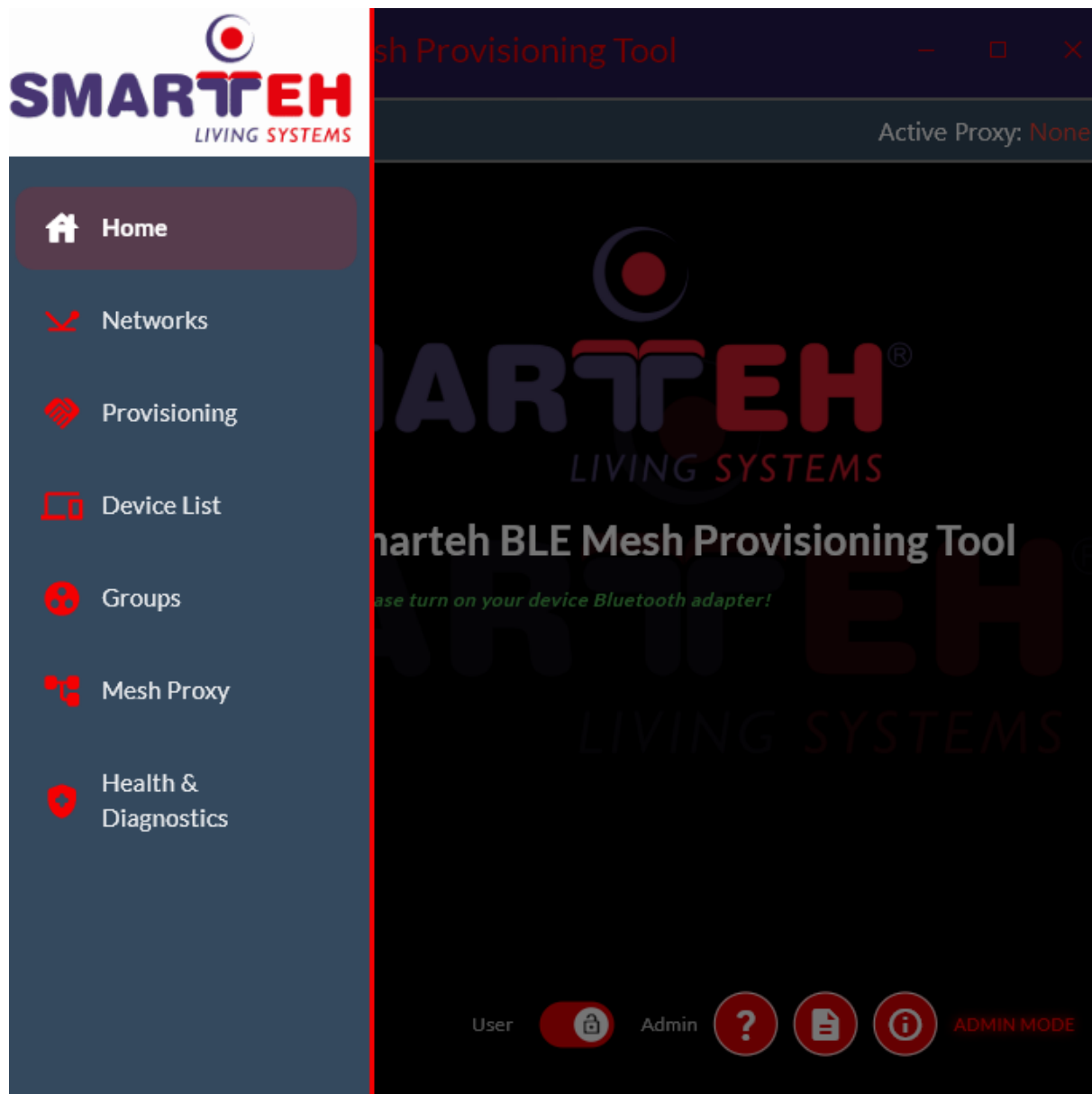


Figure 2: Simple graphical user interface





The user interface of the tool is easy to maneuver and offers quick and understandable actions. It provides feedback information to the user when needed and is divided into 5 main screens and 6 different secondary screens, offering advanced actions that will be covered in the next chapter. The interface also includes more advanced settings, such as manually creating a network or a BLE device .json or .csv file, importing existing networks or devices from a local file or cloud-based database, and configuring Bluetooth Mesh and BLE device parameters.

Furthermore, the application uses a persistent local database for the current user session, ensuring that the data (Networks, BLE Devices) are stored locally and automatically loaded into the tool whenever it is started.

An important note is that if the application window is totally responsive. When the main window becomes small enough, the entire surface of the window becomes scrollable in some screens with more elements. Moreover, if the application window area is large enough to accommodate all components, only some of them become scrollable, as described in upcoming sections, such as the Log Console.



4 GENERAL BLE AND BLUETOOTH MESH DESCRIPTION

Bluetooth Low Energy, or BLE, devices initiate their operations in an unprovisioned mode, indicating that they are not part of any network. In this mode, devices broadcast an advertisement message. Our PC serves as a provisioner device, utilizing the Smarteh BLE Mesh Provisioning Tool 1.0.13 to scan for these advertisement messages. Subsequently, appropriate messages are sent to provision the unprovisioned node into a pre-established network.

Within a Bluetooth Mesh network, three types of devices exist. Plugged-in devices, typically relay nodes (LBT-1.DO1, LBT-1.DO4, LBT-1.DO5, LBT-1.DI1, LBT-1.DD1, LBT-1.IR1), can relay messages to other BLE devices within the same network or group. The other two types include Low Power devices (LBT-1.B01, LBT-1.B02, LBT-1.BA1), which do not relay messages, and Mesh Proxy devices, acting as proxies for transmitting messages to other receiving devices. A Mesh Proxy device belonging to the correct network must be present to facilitate message transmission using the Mesh protocol.

Once devices are part of a network or group, they automatically exchange messages based on their configured Publication and Subscription addresses. Each device can be associated with one or more application keys, specifying the group of devices to which it belongs. For example, a device may have a network key named "First Floor" and a further specified application key "Kitchen," instructing it to operate and communicate exclusively within the set of devices in the kitchen on the first floor. When a device has an application key bound to its vendor model, users can send vendor-specific messages to it via the Mesh Proxy device. These vendor-specific message types vary from device to device.

To remove a device from the active network, it must be unprovisioned, returning it to its original state.

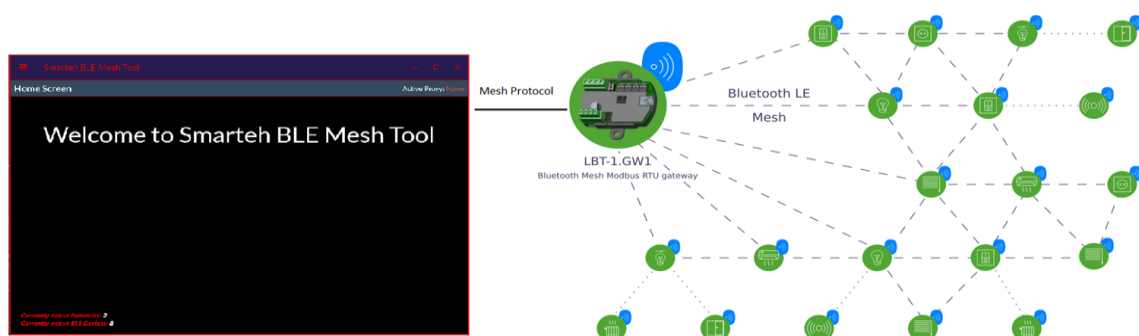


Figure 3: Typical Bluetooth Mesh use case





5 INSTALLATION

5.1 Prerequisites

The Smarteh BLE Mesh Provisioning Tool 1.0.13 currently supports devices running the Windows operating system exclusively. For personal computers lacking built-in Bluetooth modules/cards, we highly recommend utilizing a high-quality USB Bluetooth 5.0 dongle that supports the Bluetooth Low Energy protocol (GAP profile). We suggest considering the Sandberg USB Bluetooth 5.0 Dongle, equipped with the Realtek RTL8761b chipset, and using the appropriate driver. This dongle demonstrated excellent performance during the development and testing phases of the tool.

5.2 Smarteh BLE Mesh Provisioning Tool 1.0.13 installation

The installation of the Smarteh BLE Mesh Provisioning Tool 1.0.13 is a straightforward process. Just follow the instructions provided below.

5.2.1 Smarteh BLE Mesh Provisioning Tool 1.0.13 installation as a portable application

If you want to use the Smarteh BLE Mesh Provisioning Tool 1.0.13 as a portable application, you can simply copy the setup folder (containing SmartehBleMeshTool.exe) to the desired PC or laptop. No special folder or path for the setup is required; you can just launch the SmartehBleMeshTool.exe, and you are good to go. Double-click the executable (SmartehBleMeshTool.exe) and follow the instructions seen on the next page:

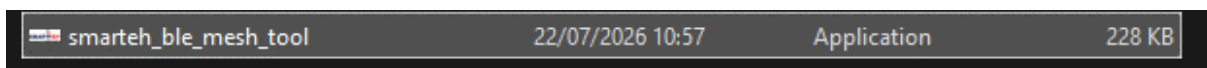


Figure 4: Run the Smarteh BLE Mesh Provisioning Tool as a Portable Application



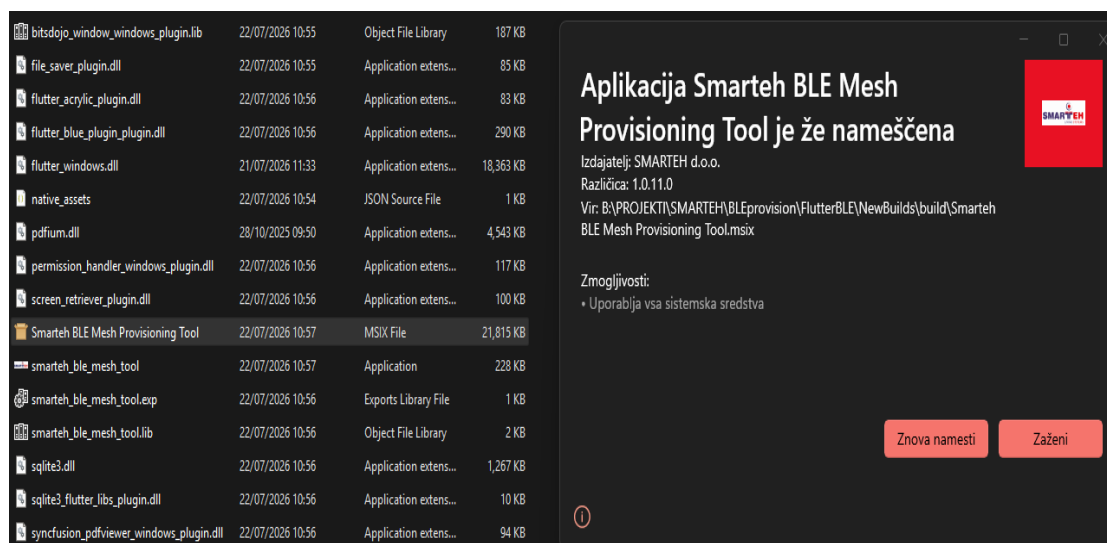


Figure 5: Install the Smarteh BLE Mesh Provisioning Tool as a Standalone Application



6 STANDARD PROCEDURES FOR USING THIS APPLICATION

When using this tool, the standard procedure is already displayed on the Introduction page, which was described in section 5.1.

Firstly, the user should navigate to Networks Screen and create a new Network with desired Network Name and Location Name, furthermore the user needs to generate the Network Key and all the Application Keys.

Secondly, the user needs to head to the Provisioning Screen and start a scan for Devices that are provisionable. After an appropriate device is found, the user can provision it with appropriate data. When the device is successfully provisioned, the user must also have a Mesh Proxy device (**LMP-1.BT1.GW**) Gateway device present and provisioned into the same network to be able to communicate to devices in the Network using the Mesh Proxy protocol.

Thirdly, the user needs to head to the Mesh Proxy Screen, scan for Mesh Proxy devices and later connect to an appropriate device which was discovered. When the connection is successful and the device credentials were verified, the user can head to Device Screen.

In the Device Screen the user can see all the devices which were provisioned into all the Networks and from there the user can enter the Device Configuration Screen for each of the devices.

All further and advanced actions are described on each of the pages describing the appropriate Screen.



7 SMARTEH BLE MESH PROVISIONING TOOL 1.0.13 TUTORIAL

7.1 Basic graphical user interface elements

7.1.1 Bottom Status Message

The Bottom Status Messages are shown in the figure above, it is usually displayed to inform a user of a successful or an unsuccessful action when he is navigating the application.

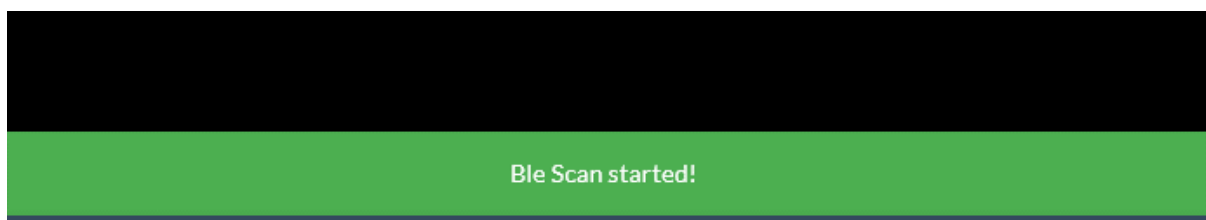


Figure 6: Bottom status message

7.1.2 Bluetooth connectivity status

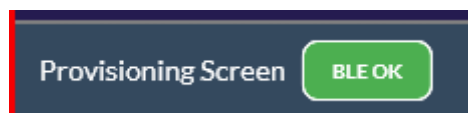


Figure 7: Bluetooth connectivity status banner

Each screen that uses Bluetooth Low Energy connectivity has a small banner indicating the status of the BLE connection capabilities.

7.1.3 Alert Dialog

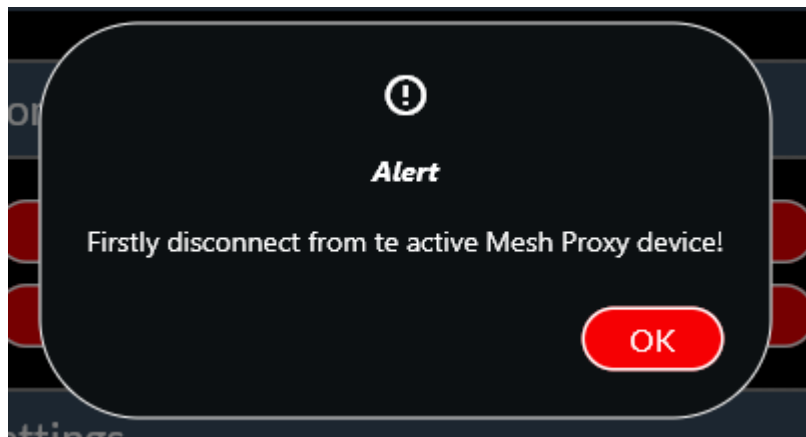


Figure 8: Alert dialog

The Alert Dialog is shown when a user commits an action that is not allowed or interferes with another command. The user is always kindly alerted to roll back the action or to perform another action to correct the previous one.

7.1.4 Input Field Error Message

If the user inputs an incorrect input in the input field or the user leaves a crucial input empty before performing an action, an error message is displayed under the appropriate input field.



Figure 9: Input field errors



7.1.5 Application Drawer

Application Drawer is a navigation menu which can be opened by pressing the three vertical lines icon which is located on each of the main screens left upper corner.

From the Application Drawer we can access all the screens in this application, therefore navigating the application.



Figure 10: App Drawer icon and App Drawer

7.1.6 Log Console

Log console can be found on bottom of each of the screens that host some procedure to communicate with Mesh Proxy service or Provisioning service. In the Log Console meaningful information and messages regarding the procedures are displayed. In the top right of the console the number of log lines is displayed and on top of the label a button can be found with which the user can clear the log console at the start of the new procedure.



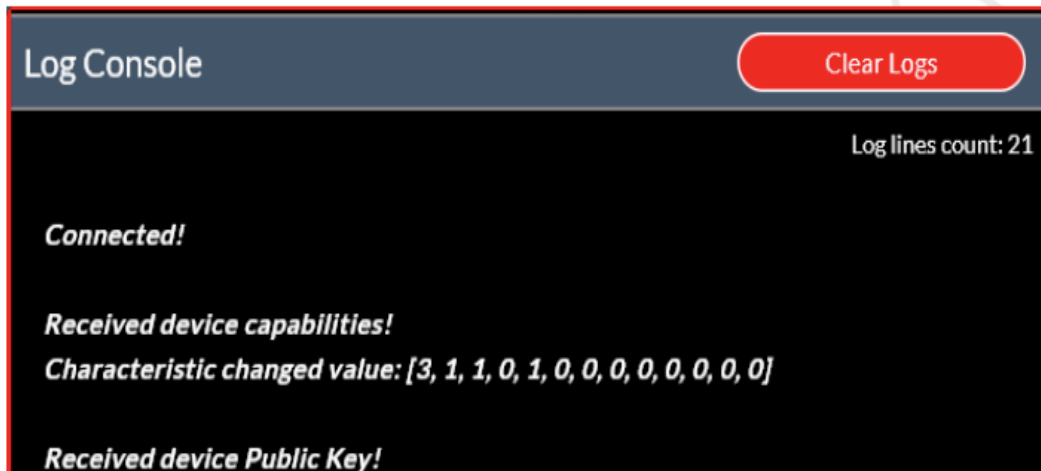


Figure 11: Log Console

7.2 The Introduction Screens

The Introduction screens provide a quick tour of the application and its usage to the user. Each screen explains a usability component offered by the application, guiding the user through the most common workflow for provisioning BLE devices into Mesh Networks and configuring them. It is highly recommended that new users go through these screens to gain basic knowledge about using this application, facilitating their subsequent interaction with the tool.



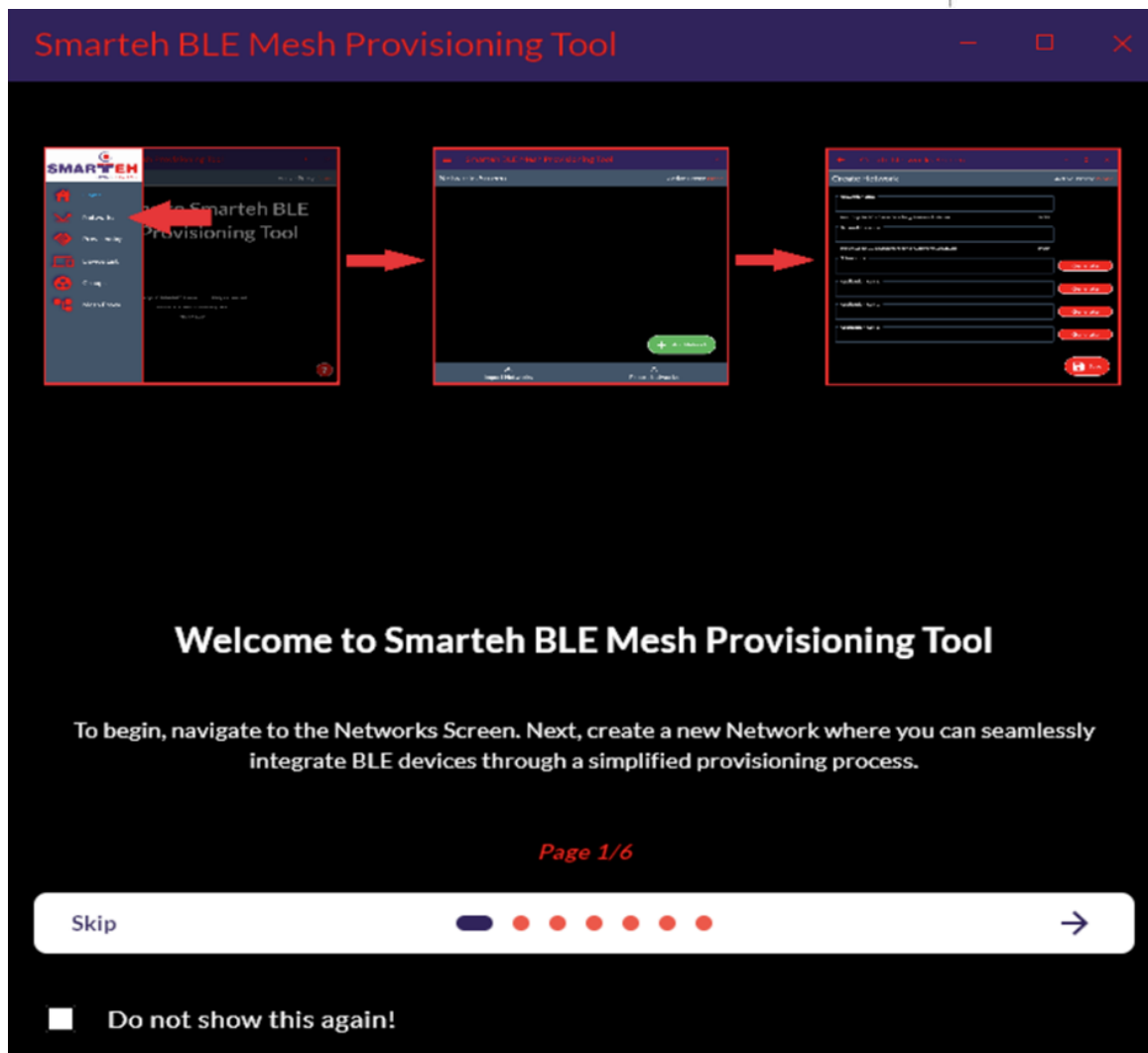


Figure 12: Introduction screen

The Introduction screens consist of:

- Six pages, navigable using the bottom dots or the right arrow button.
- An option to skip the Introduction screens is available.
- A checkbox for permanently hiding the Introduction screen.

7.3 The Home Screen

The Home Screen is the initial interface of this application, serving as the central hub. This screen displays the current Proxy device in the upper right corner, a feature shared by all other screens. Additionally, it provides information about the current number of active BLE devices, Mesh Networks stored and the number of active



Groups of devices in the ongoing application session. There are also some basic information about the software itself in the middle of the Home screen.

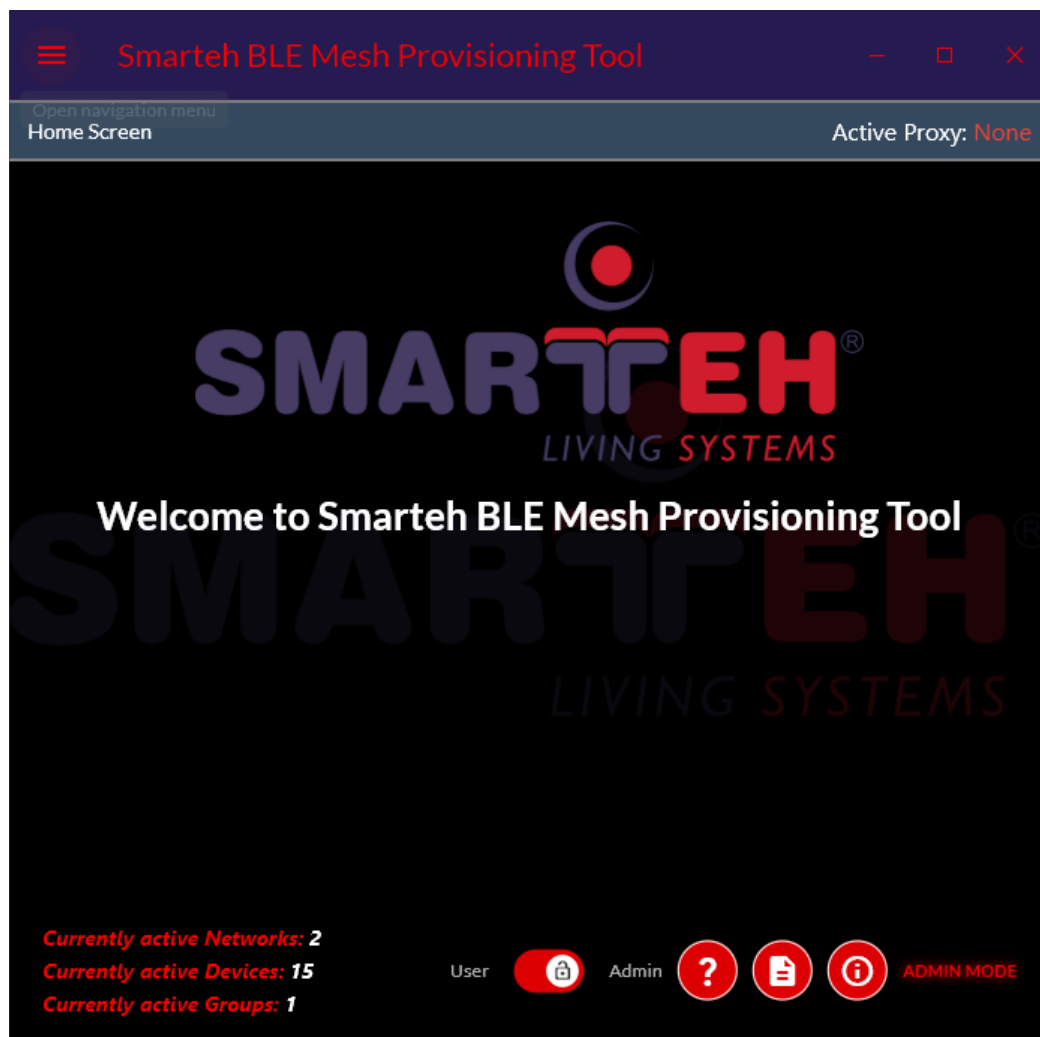


Figure 13: Welcome screen

From this screen, we can navigate further through the application by using the application drawer accessible through the handle in the upper-left corner. In the bottom right of the screen is a question mark button with which we can access this user manual

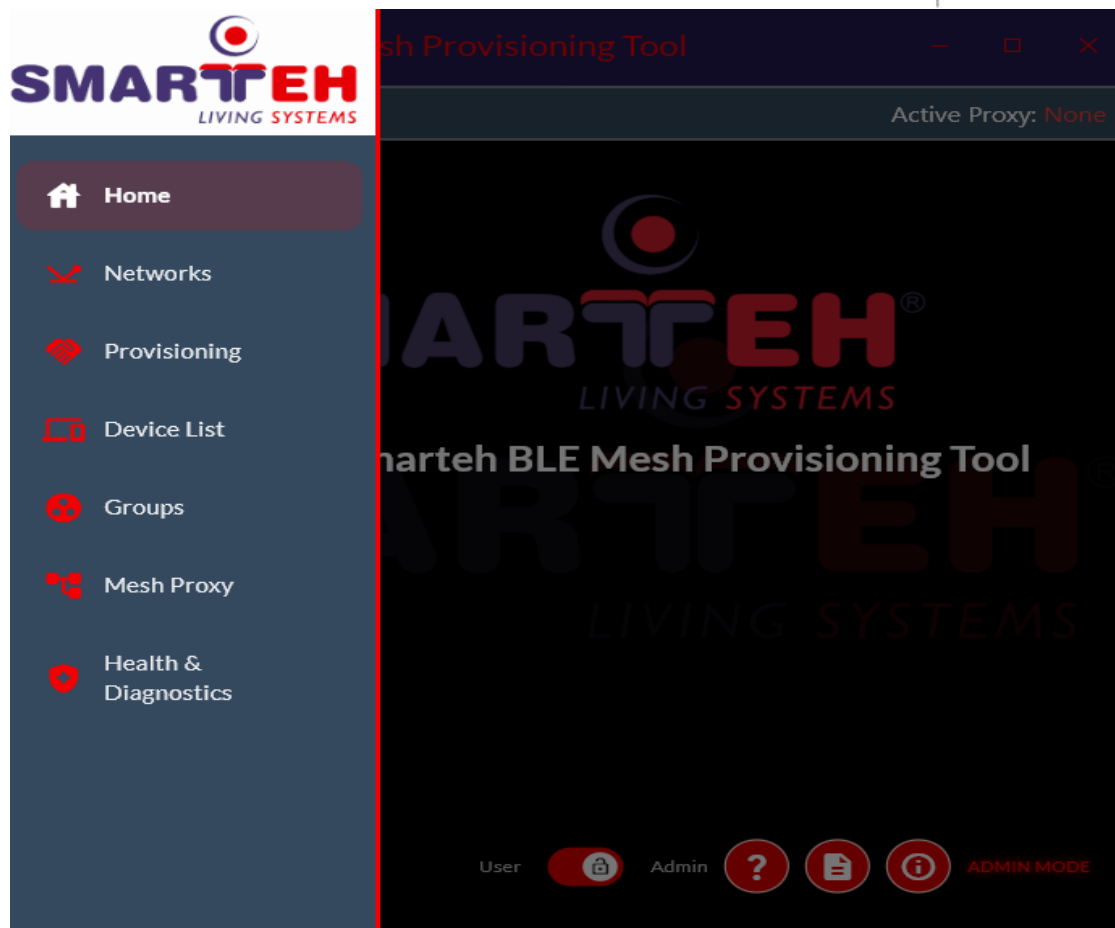


Figure 14: App drawer

From the App Drawer we can access all the screens in this application, therefore navigating through the application.



7.4 The Networks Screen

The Networks Screen is utilized to present all the created Mesh Networks in the active session in a list, serving as the central hub for Network management in this application. The user can proceed to add a new network from this screen or delete all existing networks, with both actions accessible through the floating buttons in the bottom right corner. Additionally, the user can configure each of the Mesh Networks individually and also delete each of the networks individually. At the bottom of the screen, one can access the pages to import or export networks to the active application session through the buttons on the bottom navigation bar.

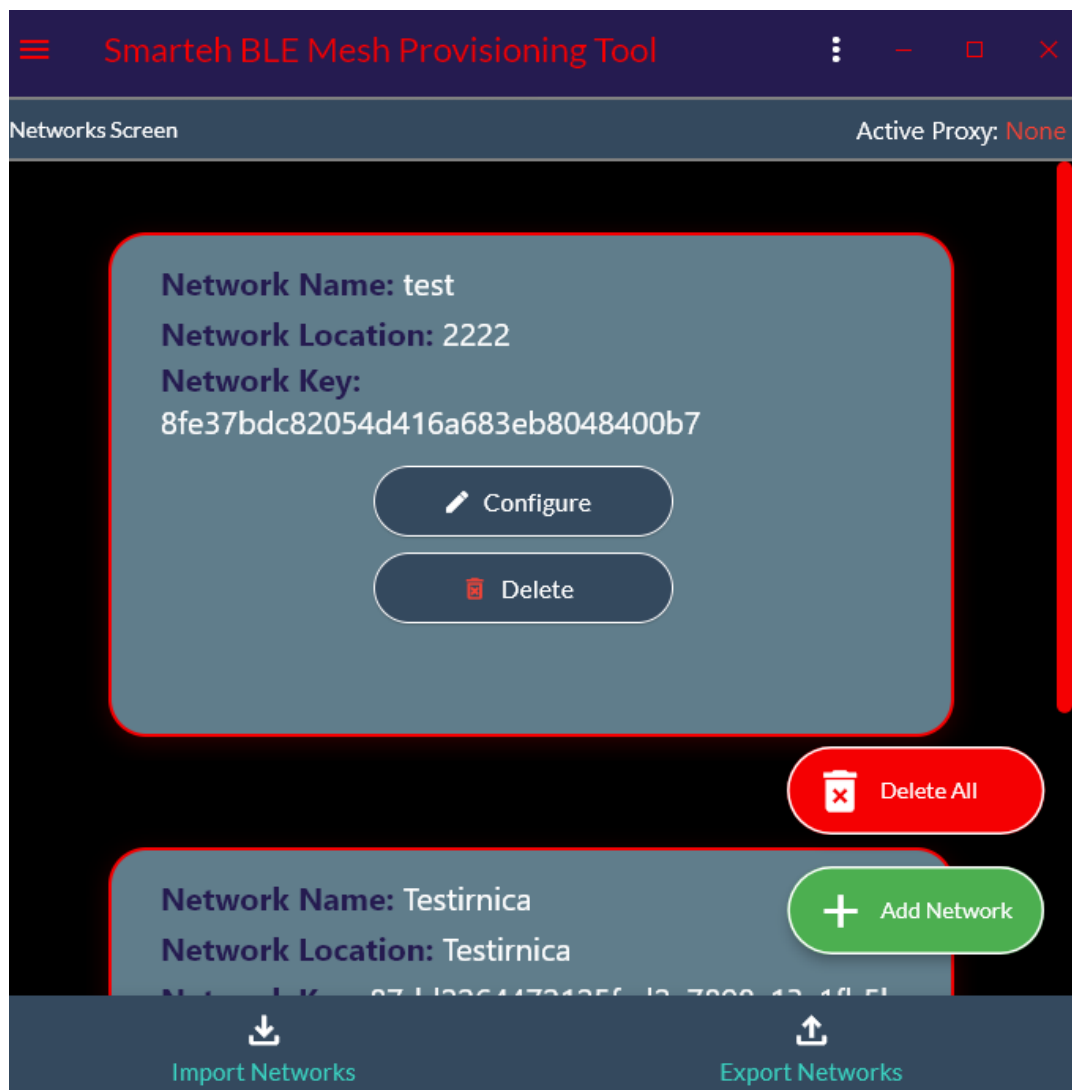


Figure 15: Networks screen

When the user wants to add a new network, they are directed to the Create Networks screen. Furthermore, when the user wants to configure the existing network, they are directed to the Edit Networks screen.



If the user decides to delete all networks, a warning pop-up is displayed, prompting the user to confirm their desired action. Each of the network items has its Network Name, Location, and Key listed on its tile, with the Configure and Delete buttons as described before.

7.5 The Create Networks Screen

The Create Networks screen is straightforward. Firstly, the user needs to input a desired Network name and Network location. Secondly, the user needs to generate the Network Key and all of the Application Keys. After that, the user can save the newly created Network. Furthermore, if the user leaves the screen without saving, they are also presented with a warning pop-up that prompts the user to confirm their desired action.

← Create Networks Screen

Create Network Active Proxy: None

Network Name:

Input up to 30 characters long Network Name 0/30

Network Location:

Input up to 30 characters long Network Location 0/30

Network Key:

Application Key 1:

Application Key 2:

Application Key 3:

Generate

Save

Figure 16: Create Networks Screen



7.6 The Edit Networks Screen

The Edit Networks Screen functions similarly to the Create Networks Screen. The user can modify the selected network's name, location, and all of the keys for existing networks. Furthermore, if the user wants to modify the Network key or any other Application key, they are presented with a warning pop-up if any of those keys are already bound to some active device or if any of the active devices are already tied to this Network key.

Figure 17: Edit Networks Screen

7.7 The Import Networks Screen

The Import Networks Screen is used to import existing networks from a .csv file or a Firebase Realtime Database. When a user creates networks on one device, they can then store them to a .csv file through the Export Networks Screen or store them in their Firebase Realtime Database.



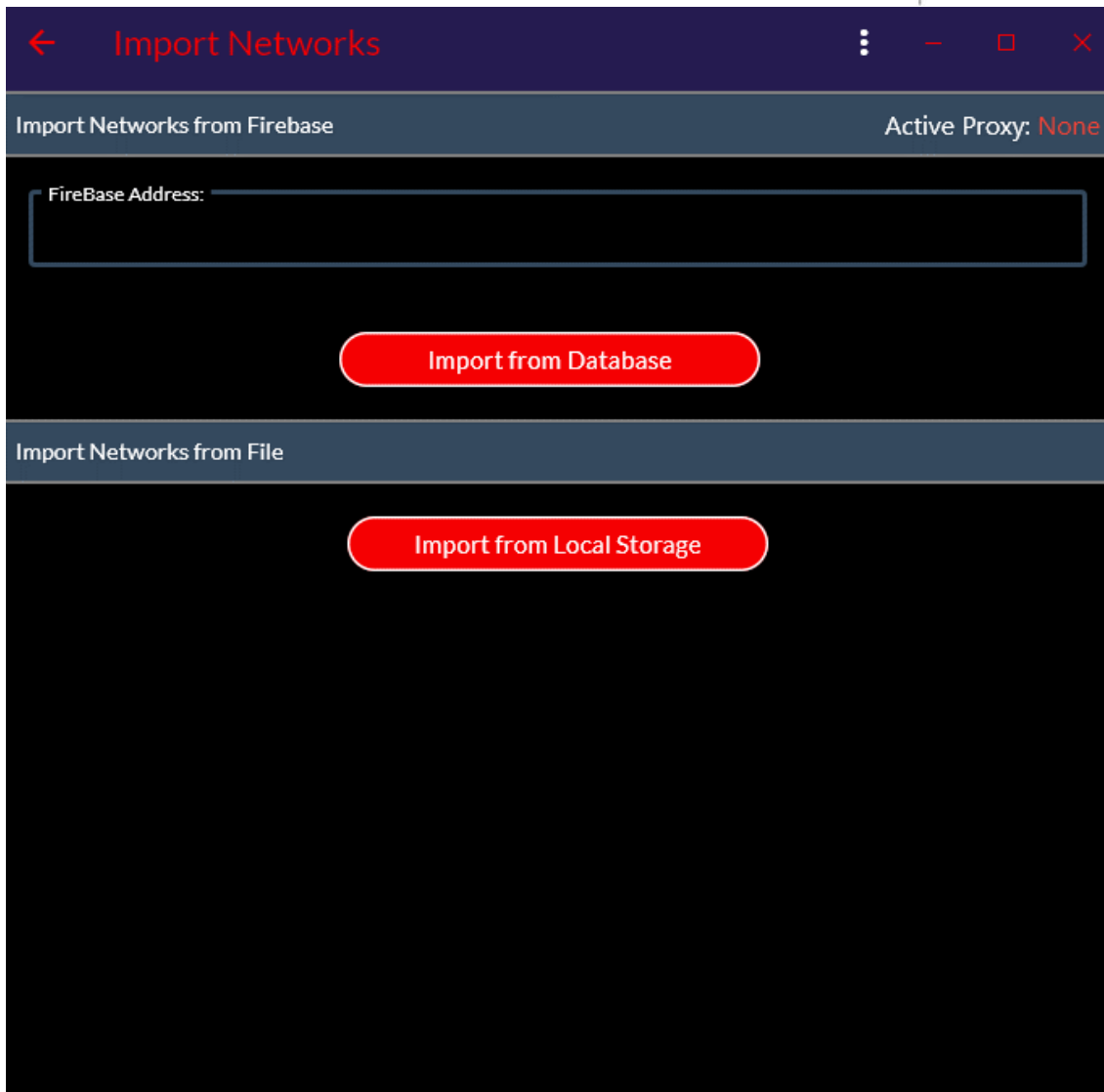


Figure 18: Import Networks Screen

When the user wants to import network files from their Firebase Realtime Database, they must paste the Firebase connection address into the "Firebase Address:" input field. After that, they need to press the "Connect to Database" button to establish a connection to the database. Finally, by pressing the "Import from Database" button, they can ensure that the network files are imported into the active application session.

When the user wants to import networks from a local .csv file, they can do so by pressing the "Import Networks Locally" button and later selecting the correct file from a pop-up file explorer window.

7.8 The Export Networks Screen

The Export Networks Screen is the exact opposite of the Import Networks one. Here, a user can export existing networks from the current application session to a local .csv file or a Firebase Realtime Database. When a user creates networks during their





active session, they can later store them to a .csv file or store them in their Firebase Realtime Database through this screen.

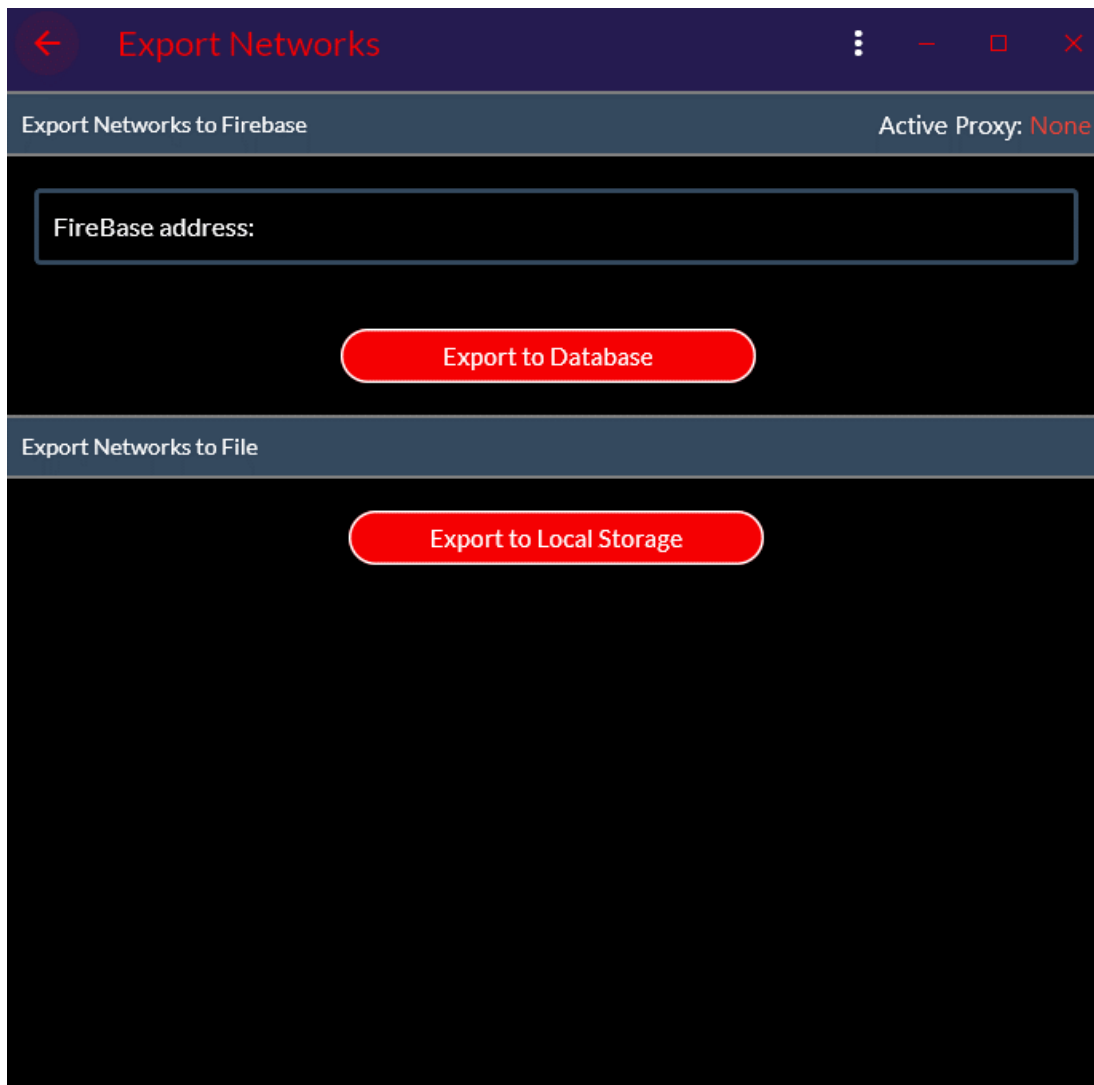


Figure 19: Export Networks Screen

When the user wants to export created networks to their Firebase Realtime Database, they must paste the Firebase connection address into the "Firebase Address:" input field. After that, they need to press the "Connect to Database" button to establish a connection to the database. Later, by pressing the "Export to Database" button, they can ensure that the network files are exported to their Firebase Realtime Database.

When the user wants to export the networks to a local .csv file, they can do so by pressing the "Export Networks Locally" button and later selecting the desired save location and save file name from a pop-up file explorer window.



7.9 The Provisioning Screen

The Provisioning Screen is where a user can provision new devices into previously created or existing Mesh Networks. In the top center of the screen, the user can filter the scanned devices by type. The types of devices consist of unprovisionable - indicating the device is already provisioned or cannot be provisioned, provisionable - denoting that the device is ready to be provisioned, or All Devices, which includes both of the previously mentioned types.

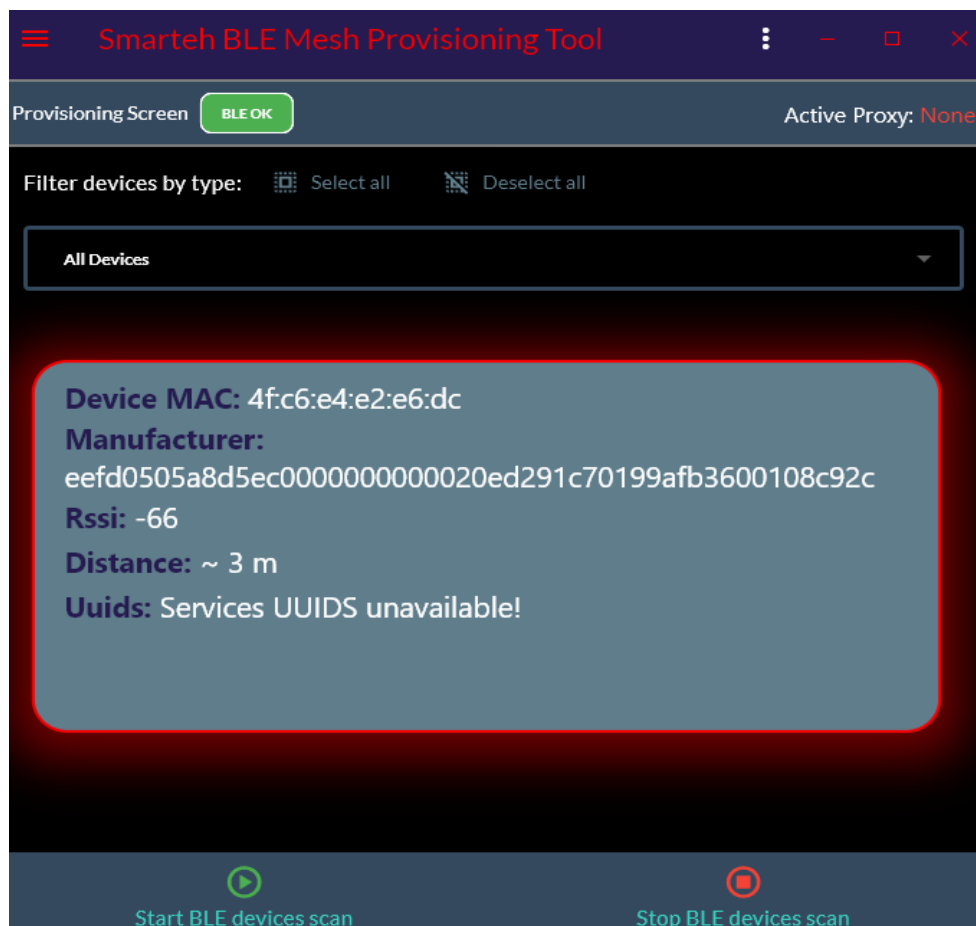


Figure 20: Provisioning Screen



In the bottom navigation bar, the user can either start or stop the scan for nearby BLE devices. Each of the scanned device items is presented with the Mac Address, Manufacturer data (if available), RSSI, approximate distance to the device calculated by the RSSI value, and the UUIDs that the device possesses.

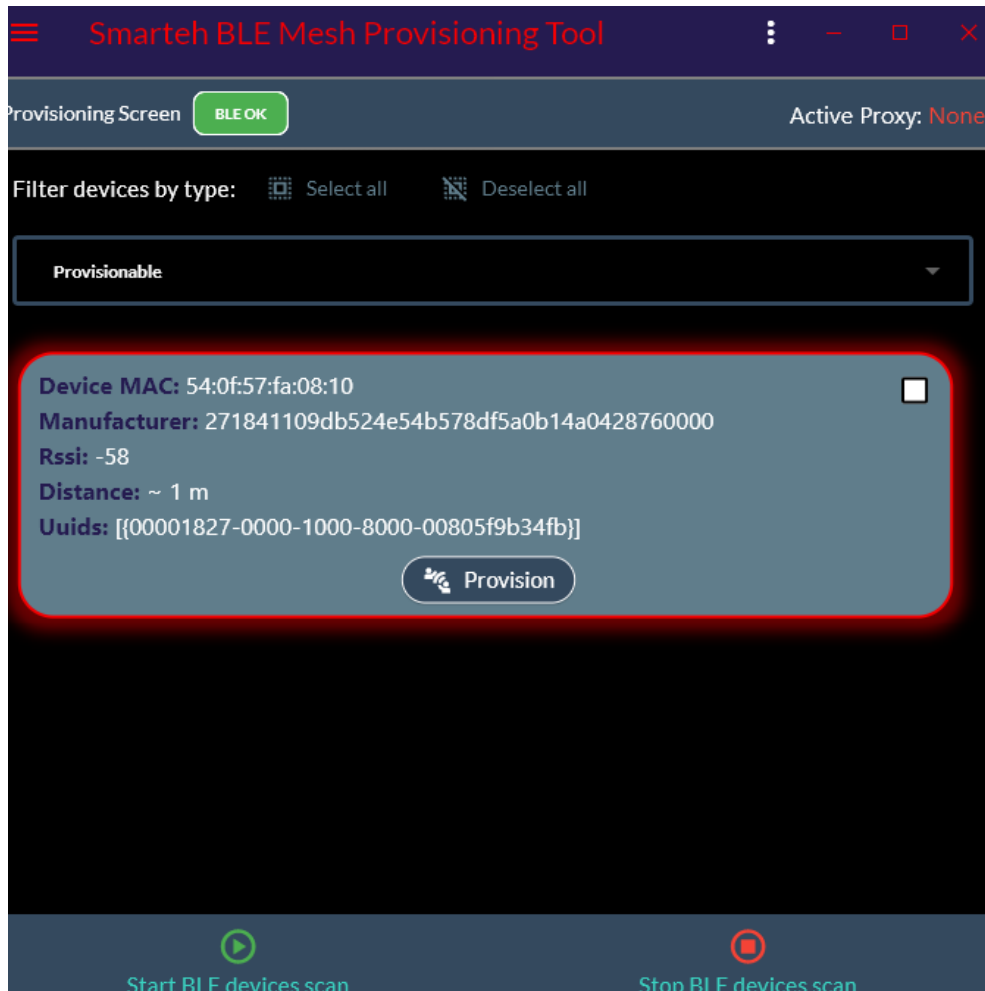


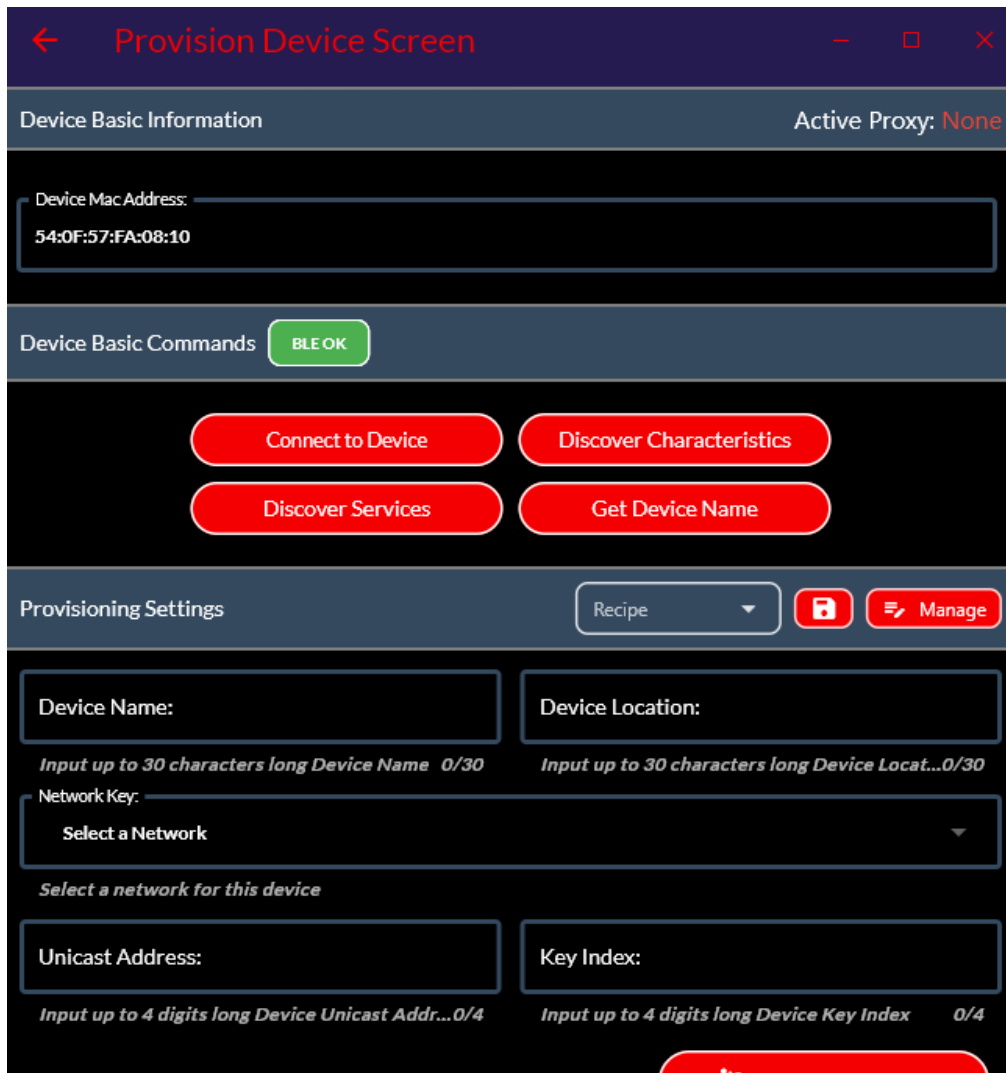
Figure 21: Provisioning screen showing provisionable device

When a new provisionable device is found, a "Provision" button appears on its tile. Clicking this button navigates the user to the Provision Device Screen, where they can provision the selected device into the desired network with the desired configuration. User can also provision more device concurrently with the help of the checkbox in right top of each device card and also with the help of select all deselect all buttons.



7.10 The Provisioning Device Screen

The Provision Device Screen is where a user can connect/disconnect to the device with the appropriate radio button, provision a device into an existing Mesh Network, or retrieve information from the device, such as Device Name, Characteristics of the device, and Services of the Device.



Provision Device Screen

Device Basic Information Active Proxy: None

Device Mac Address: 54:0F:57:FA:08:10

Device Basic Commands BLE OK

Connect to Device Discover Characteristics

Discover Services Get Device Name

Provisioning Settings Recipe Manage

Device Name: Input up to 30 characters long Device Name 0/30

Device Location: Input up to 30 characters long Device Locat...0/30

Network Key: Select a Network

Select a network for this device

Unicast Address: Input up to 4 digits long Device Unicast Addr...0/4

Key Index: Input up to 4 digits long Device Key Index 0/4

Figure 22: Provision Device Screen

All the logs of the actions and alerts are displayed in the Log Console at the bottom of the screen. Logs can also be copied to the clipboard with copy button.

If the user just wants to get some information from the device, they must firstly connect to the device and then perform one of the actions from the Device Basic Commands section. The user can either Discover device Services, Discover Device Characteristics, or just get the Device Name. The Device Name command helps in identifying the models of the devices nearby. If the user wants to leave the screen



after getting some basic information, they must firstly disconnect from the device; otherwise, a warning pop-up is displayed to inform the user of this.

The user can also save recipes for easier future provisioning. Selected device location, network key and key index can be saved into a recipe that can then be reused in later provisioning scenarios.

If the user wants to provision the device into a network, they must input the desired Device Name, Device Location, select the desired Network from the Network Key dropdown field, and then input the desired Unicast Address in decimal numbers. Additionally, the user needs to input the Key Index, which is preferably set to 0. If the Unicast Address is already taken in the desired network, the user is alerted and must change that setting. The user must then press the "Provision Device" button. All of the input fields and the "Provision Device" button are located in the Provisioning Settings section.

After the provisioning procedure is started, all of the events of the provisioning and logs are presented in the Log Console. When the "Provision Success" message is displayed, the user must wait a few moments so the tool disconnects from the device and saves the acquired settings to the local database. If the provisioning is not successful, the user should wait a few moments and repeat the procedure, preferably with the same parameters.

Provisioning procedure auto retries three times in case of a lost connection or an error, user can also retry the procedure.

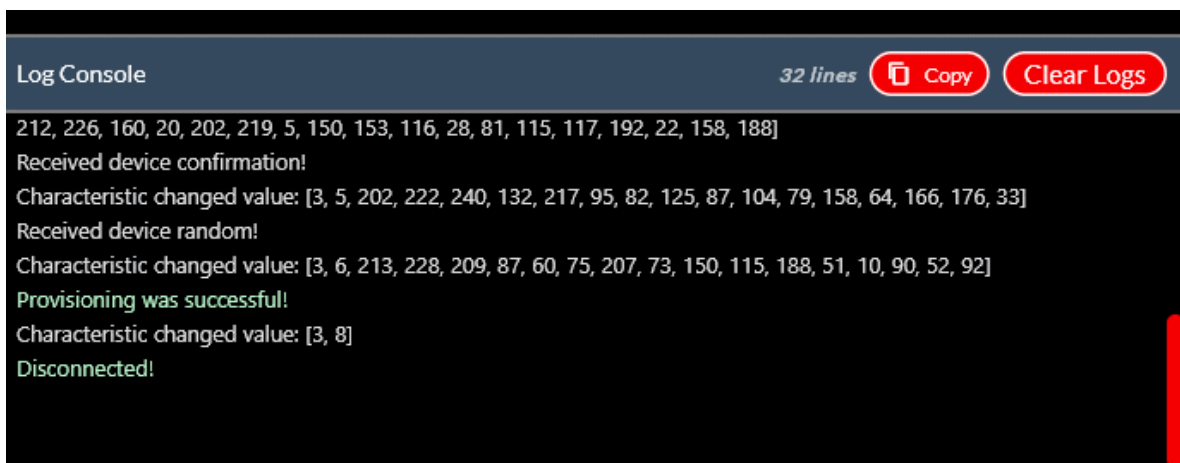


Figure 23: Log Console

The Log Console also has the "Clear Logs" button in the top right corner to clear the current log messages. Underneath, the log lines count is displayed, which helps the user better understand how far they are into the provisioning procedure or how many messages they have received or sent to the device.



An important thing to notice is that when the user is connected to an active Proxy device, they must firstly disconnect from it, as seen in the figure below, and then initiate the Provision Device procedure. If the user fails to disconnect from the active Proxy before, a warning pop-up is displayed reminding them to do so.

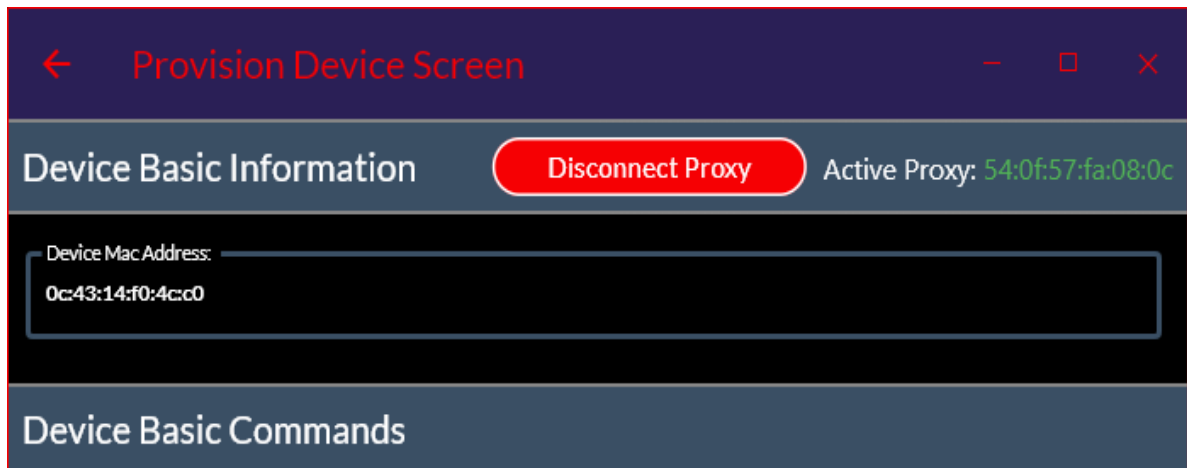


Figure 24: Disconnect Proxy option

After the user completes all desired actions, they can return to the Provisioning Screen with the arrow button in the top left corner of the screen.

7.11 The Mesh Proxy Screen

The Mesh Proxy Screen is used to connect to an available Mesh Proxy device. The only Smarteh device that has the Proxy Service available out of the box is the LMP-1.BT1.GW or the Gateway device. Others can be manually set to expose the Proxy Service to users, but we advise users not to do so if they are unaware of the operational mode of Mesh Proxy devices. A Mesh Proxy device is always needed to configure other BLE devices in the same network. The user firstly needs to have an active connection to the Mesh Proxy device to be able to later modify other BLE devices from the same network.



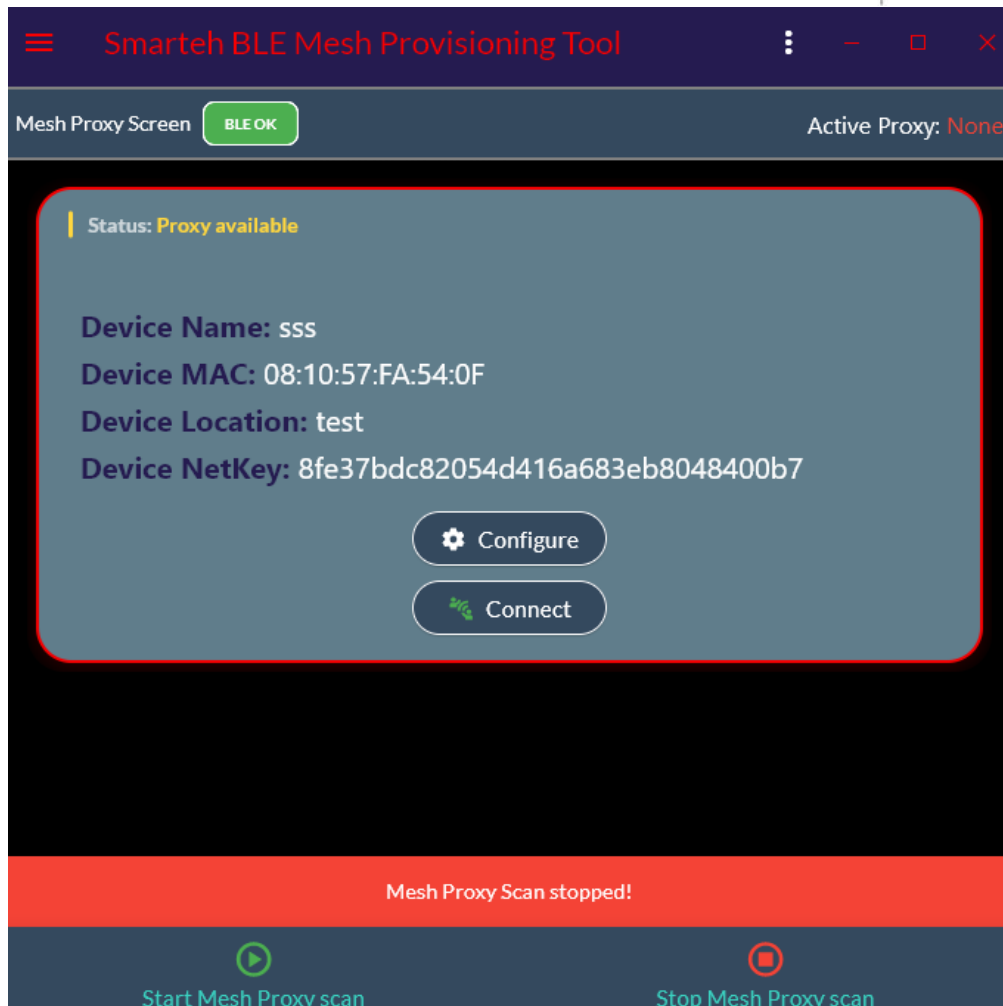


Figure 25: Mesh Proxy Screen

The user must firstly start a Mesh Proxy device scan with the button in the bottom navigation bar, where they can also stop the scan afterward with the appropriate button. When a nearby Mesh Proxy device is found, its tile is created. The first item on the tile is the status message that tells the user if it has a Proxy functionality and if not if it has an Application key bound or not. The tile also consists of Device Name, Device Mac address, Device Location, and the Device Network key.

Furthermore, two buttons are displayed below: the Configure button, which takes you to the Mesh Configuration Screen, and the Connect/Disconnect radio button, which lets you connect or disconnect from the Mesh Proxy device.

Afterward, the user can directly connect to the Mesh Proxy device by pressing the "Connect" button. Subsequently, the current Active Proxy device is displayed in the top right corner of the user interface, a feature common to all screens.



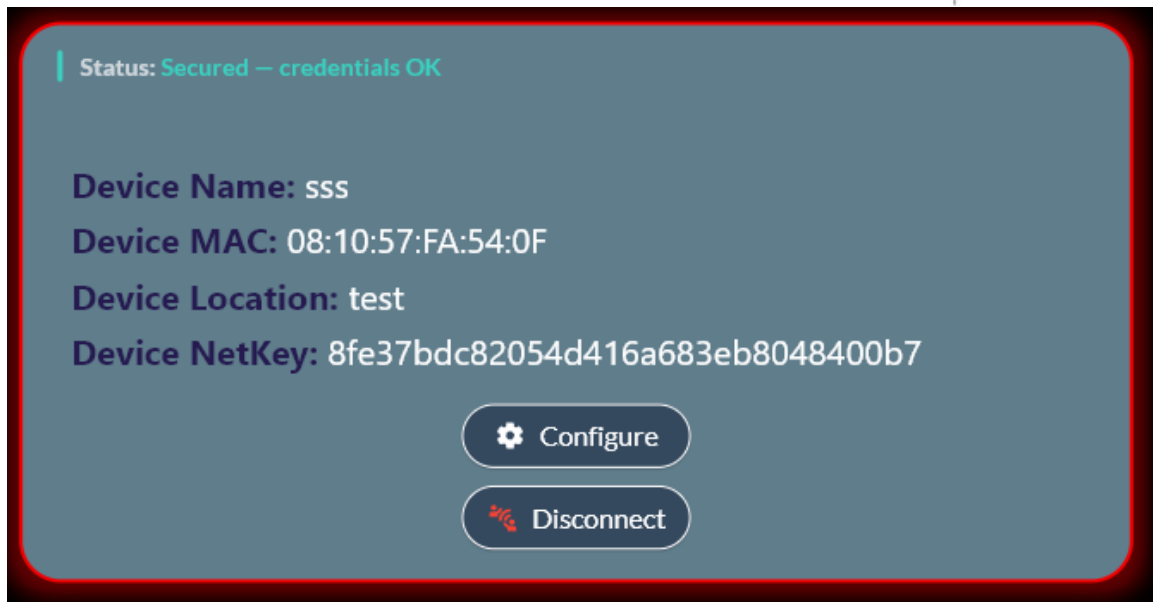


Figure 26: Successful connection to Mesh Proxy device

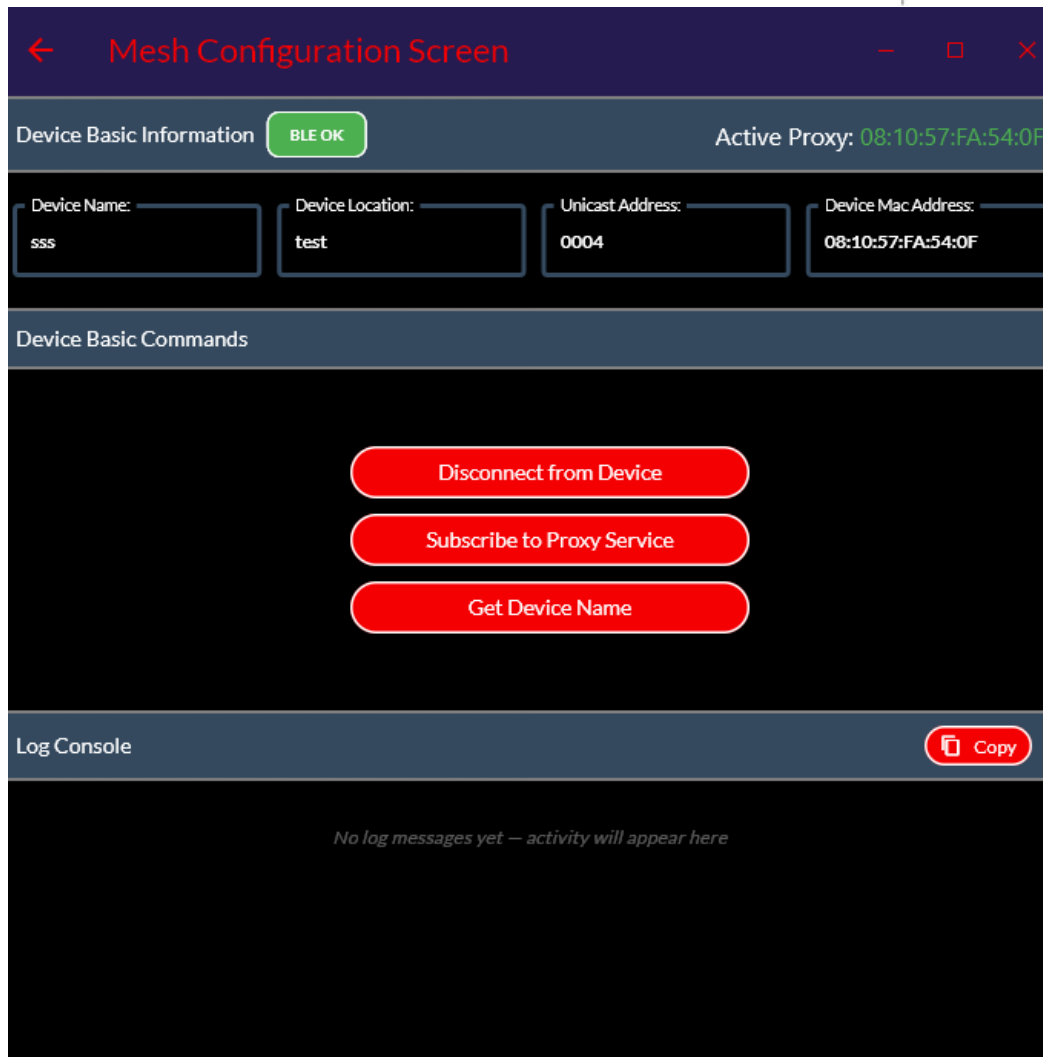
After the user successfully connects to the Mesh Proxy device, the Status field on the tile changes. If the established connection to the device is secured and the appropriate credentials are correct, then the status is the same as displayed in the figure above. However, if the credentials are not right, the status displays the “Device is not Secured” message, and the Mesh Proxy device will not be able to communicate with the other nodes in the Mesh Network.

If the user wants to further configure or interact with the Mesh Proxy device, they can press the “Configure” button on the appropriate device tile, which then takes them to the Mesh Configuration Screen.

7.12 The Mesh Configuration Screen

The Mesh Configuration Screen is intended for more advanced users. Here, a user can see basic information about the selected Mesh Proxy Device, connect to the device, subscribe to the device's Proxy Service, or just get the Device Name.





The screenshot shows a web application window titled "Mesh Configuration Screen". At the top, there is a back arrow and window control buttons. Below the title bar, the "Device Basic Information" section is highlighted in a dark blue header. To the right of this header is a green button labeled "BLE OK" and the text "Active Proxy: 08:10:57:FA:54:0F". Below this, there are four input fields: "Device Name:" with the value "sss", "Device Location:" with the value "test", "Unicast Address:" with the value "0004", and "Device Mac Address:" with the value "08:10:57:FA:54:0F". Below these fields is another dark blue header for "Device Basic Commands". Under this header, there are three red buttons with white text: "Disconnect from Device", "Subscribe to Proxy Service", and "Get Device Name". At the bottom, there is a "Log Console" section with a dark blue header and a red "Copy" button. The main area of the log console is black and contains the text "No log messages yet — activity will appear here".

Figure 27: Mesh Configuration Screen

The selected device information is displayed in the Device Basic Information section. Below is the Device Basic Commands section where the user can Connect to Device, Subscribe to Proxy Service manually, or just acquire the Device Name.

All the actions are logged below in the Log Console section. If the user connects to the Mesh Proxy device from this screen, they must also disconnect from it before leaving the screen after finishing all the desired actions. If the user fails to disconnect from the Mesh Proxy device, a warning pop-up is displayed prompting them to do so.

7.13 The Device List Screen

The Device List screen is where all the provisioned BLE devices are displayed. They are grouped into their corresponding network. In the top center of the screen, we



can filter the devices by network. We can filter by each of the available networks or just show All devices from All networks together.

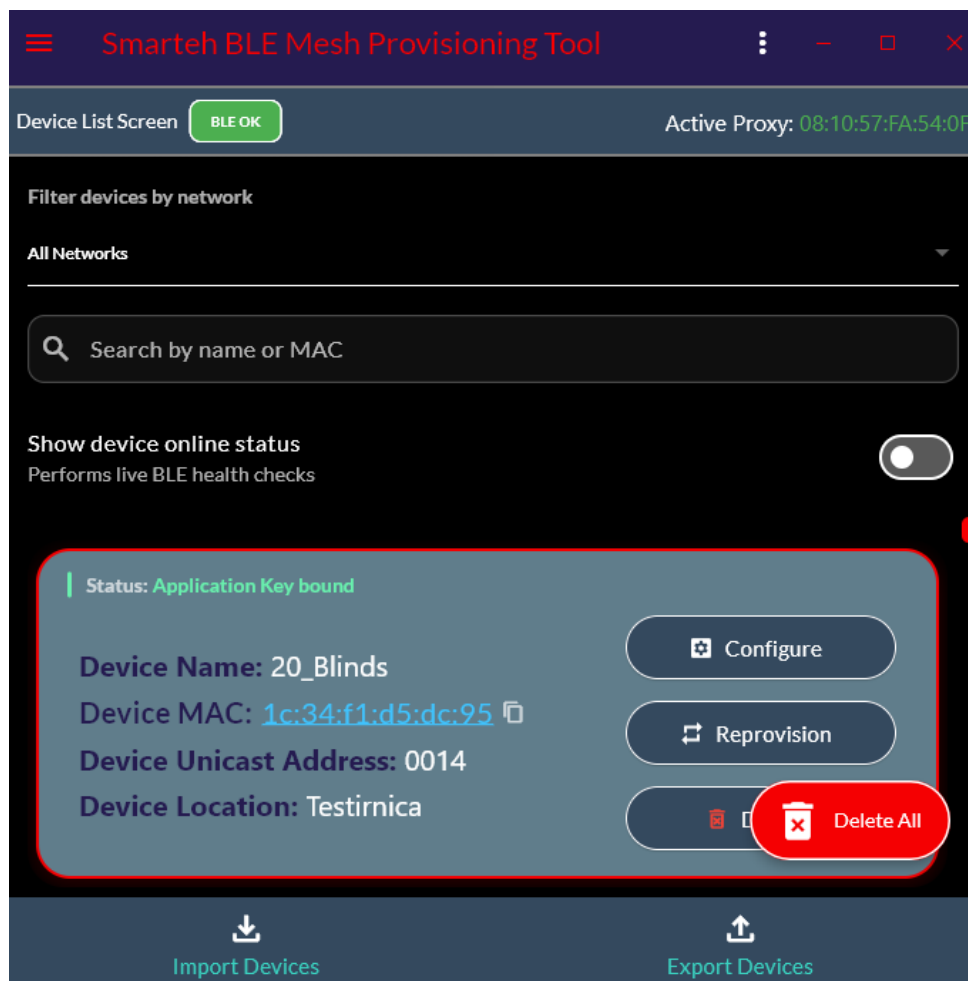


Figure 28: Device List Screen

Each of the BLE devices has its own tile, which consists of a Status message that tells the user the current state of the device. Furthermore, it has the Device Name, Device Mac address, Device Unicast Address and Device Location displayed below. On the right of the tile are three buttons that can be used to configure the device, which leads to the Device Configuration screen, reprovision device with same data or delete it. A warning pop-up is displayed when the user wants to delete the device, alerting him of his action, which he must confirm.

In the bottom right corner, there is also a floating button that lets the user delete all the devices. Here the warning pop up is also displayed which alerts the user of his action which he must confirm.

In the bottom navigation bar, the buttons that lead to the Import Devices or Export Devices screen are also present.



The user can filter devices by network at the top of the screen and also can search for the specific device by name or its MAC address. Under these search field is also a toggle button that forces Bluetooth health checks for all the sensor if enabled.

7.14 The Device Configuration Screen

The Device Configuration Screen is used to set the provisioned device settings, modify its information, or further set up the device.

Device Configuration Screen

Device Basic Information

Reconnect Proxy
Disconnect Proxy
Active Proxy: 08:10:57:FA:54:0F

Device Name: 20_Blinds
Device Location: Testirnica
Unicast Address: 0020
Set Settings

Input up to... 9/30 Input up to... 10/30 Input up to... 4/4

Device Current Configuration Show Configuration

Device Basic Commands BLE OK

Get AppKey Status Unprovision Device
Get Publication Status Set Proxy Active
Get Subscribe Status Set Friend Active

Log Console Debug Copy

No log messages yet — activity will appear here

Figure 29: Device Configuration Screen

The first section on this screen is the Device Basic Information section, where the user can see the device information and even change it by inputting it into the input fields and then pressing the Set Settings button.





Under the first section is the Device current configuration section where we can see the current configuration of the device.

Device Current Configuration		▲ Hide Configuration
MAC Address:	1c:34:f1:d5:dc:95	
Device Name:	20_Blinds	
Device Location:	Testirnica	
Unicast Address:	0014	
Network Key:	87dd2264472125fcd2a7898c13c1fb5b	
Device Key:	93b25681938fa74fdcf9b7f180a6f926	
Key Index:	0000	
Is Proxy:	No	
Is Friend:	No	
Is Relay:	Yes	
NID:	27	
Encryption Key:	9259f259a45ecf740768a133c3a0fa2f	
Privacy Key:	a869c4f7fd168e9f0e83ec9294d9dab1	
Sequence Number:	000000	

Figure 30: Device current configuration section expanded

Below is the Device Basic Commands section. It consists of multiple buttons: Get App Key Status gets the application keys status of the device. The Get Publication Status button gets the status of the Publication addresses bound to the device. The Get Subscribe Status gets the status of the Subscription addresses bound to the device. The Get Composition Data function gets all the composition data of the device. The Provision Device button command unprovisions the device, but only if the application key is already bound to the device.

The Set Proxy Active/Not Active command is a radio button that enables or disables the Proxy Service of the device. The Set Friend Active/Not Active command is a radio button. The button enables the friend feature of the device If the device supports it. The Network Transmit button is also a radio button. When set to 3 it sets the Network Retransmit to 3 packets, and its opposite sets the Network Retransmit to 1 packet (the default is 3).



Device Bind Commands

Bind Application Key

Currently binded AppKey: 1

Unbind Application Key

Publication Address:

Enter up to 4 hex characters (C0xx for Groups)

Bind Publication Address

Subscription Address:

Enter up to 4 hex characters (C0xx for Groups)

Bind Subscription Address

Publication Virtual Address:

Input a 32 character long hexadecimal address 0/32

Bind Publication Virtual Address

Subscription Virtual Address:

Input a 32 character long hexadecimal address 0/32

Bind Subscription Virtual Address

Send Custom Data

Operation Code:

Input up to 10 digits lo... 0/10

Data:

Input up to 10 digits lo... 0/10

Send Data

Log Console

Debug

Copy

No log messages yet — activity will appear here

Figure 31: Device Bind Commands and Send Custom Data section

In the Device Bind Commands section, we can then bind the appropriate Application Key to the device. The application Key is in the drop-down field, which consists of all three of the Application Keys of the Network that the device is bound to.

Below, the user can also bind the Publication address to the device. If the user enters the address in the format “c0xx” the address is the group address. Also, the user can enter a decimal address to a Unicast address of the device in decimal value.

Below, the user can also bind the Subscription address in decimal form, because the Subscription address is always a group address, so the “c0” header is added automatically.

Below are also the commands for binding the Publication Virtual and Subscription Virtual addresses, which are meant for more advanced users.





Below, users can then communicate with all the Smarteh BLE-capable devices through the Opcodes provided in the appendix for the Opcode commands below. The Custom Data commands work only if the device has an Application Key bound to it.

All of the alerts and logs are displayed in the Log Console section below.

If the users were connected to a Mesh Proxy device during the active session, they could reconnect to it again or disconnect from it and then reconnect to it directly with the use of the buttons in the top right corner, which become visible If a user was connected to a known Mesh Proxy during the latest active session.

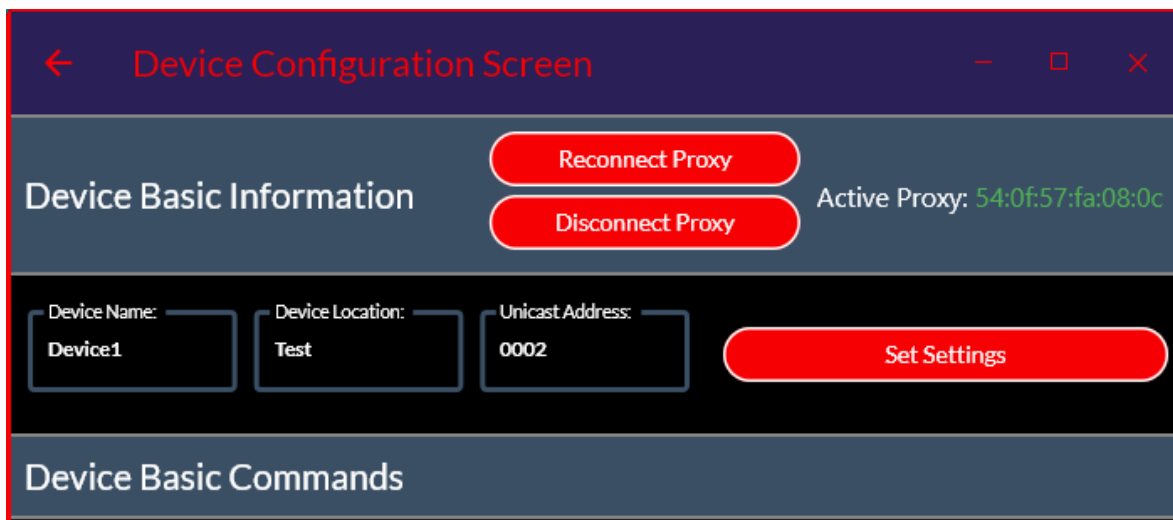


Figure 32: Device Configuration Screen top status bar with active Proxy buttons

7.15 The Import Devices Screen

The Import Devices Screen is used to import existing BLE Devices from a .csv file or a Firebase real-time database. When a user provisions Devices on one computer, he can then store them to a .csv file using the Export Devices Screen or store them in their Firebase real-time database.



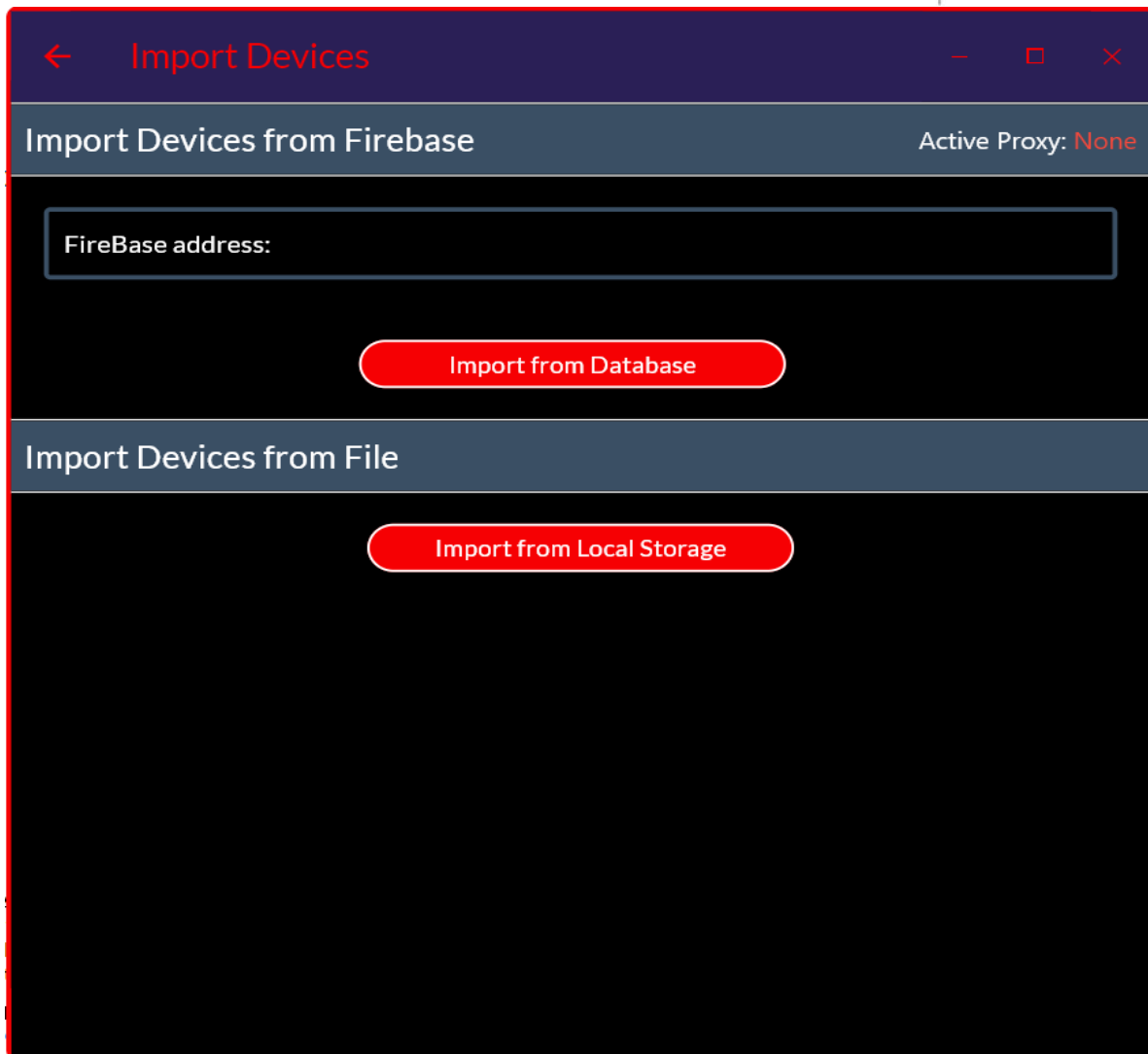


Figure 33: Import Devices Screen

When the user wants to import BLE Devices file from his Firebase real-time database, he must paste the Firebase connection address to the “Firebase Address:” input field and then firstly press the Connect to Database button to establish a connection to the database and then later by pressing the Import from Database button, ensure that the BLE Device files are imported to the active application session.

When the user wants to import the BLE Devices from a local .csv file, he can do so by pressing the Import Devices Locally button and later selecting the correct file from a pop-up file explorer window.



7.16 The Export Devices Screen

The Export Devices Screen is an exact opposite to the Import Devices one. Here, and user can export existing BLE Devices from the current application session to a local .csv file or a Firebase real-time database. When a user provisions Devices during their active session, he can later store them to a .csv file or store them in their Firebase real-time database using this screen.

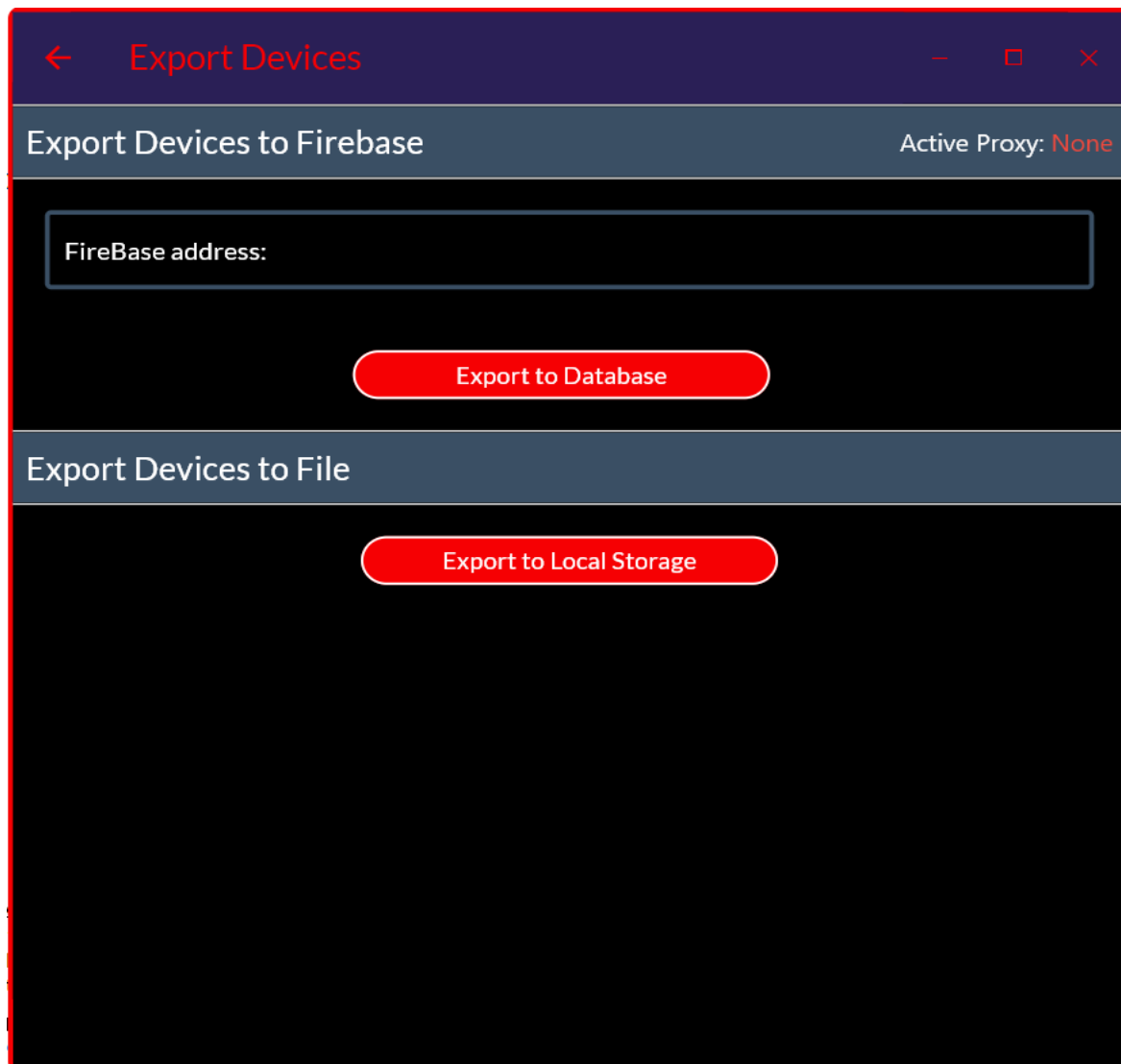


Figure 34: Export Devices Screen

When the user wants to export BLE Devices to his Firebase real-time database, he must paste the Firebase connection address to the “Firebase Address:” input field and then firstly press the Connect to Database button to establish a connection to the database and then later by pressing the Export to Database button, ensure that the BLE Devices are exported to their Firebase real-time database.



When the user wants to import the BLE Devices from a local .csv file, he can do so by pressing the Import Devices Locally button and later selecting the correct file from a pop-up file explorer window.

When the user wants to export the BLE Devices to a local .csv file, he can do so by pressing the Devices Networks Locally button and later selecting the desired save location and save file name from a pop-up file explorer window.

7.17 The Groups Screen

The Groups Screen is where all the groups of BLE devices are displayed. Each tile on the screen represents an individual group of devices, where Group Name, Group Location and Group Unicast Address are displayed. Each tile also has a button to configure the group elements or to delete the group element completely.

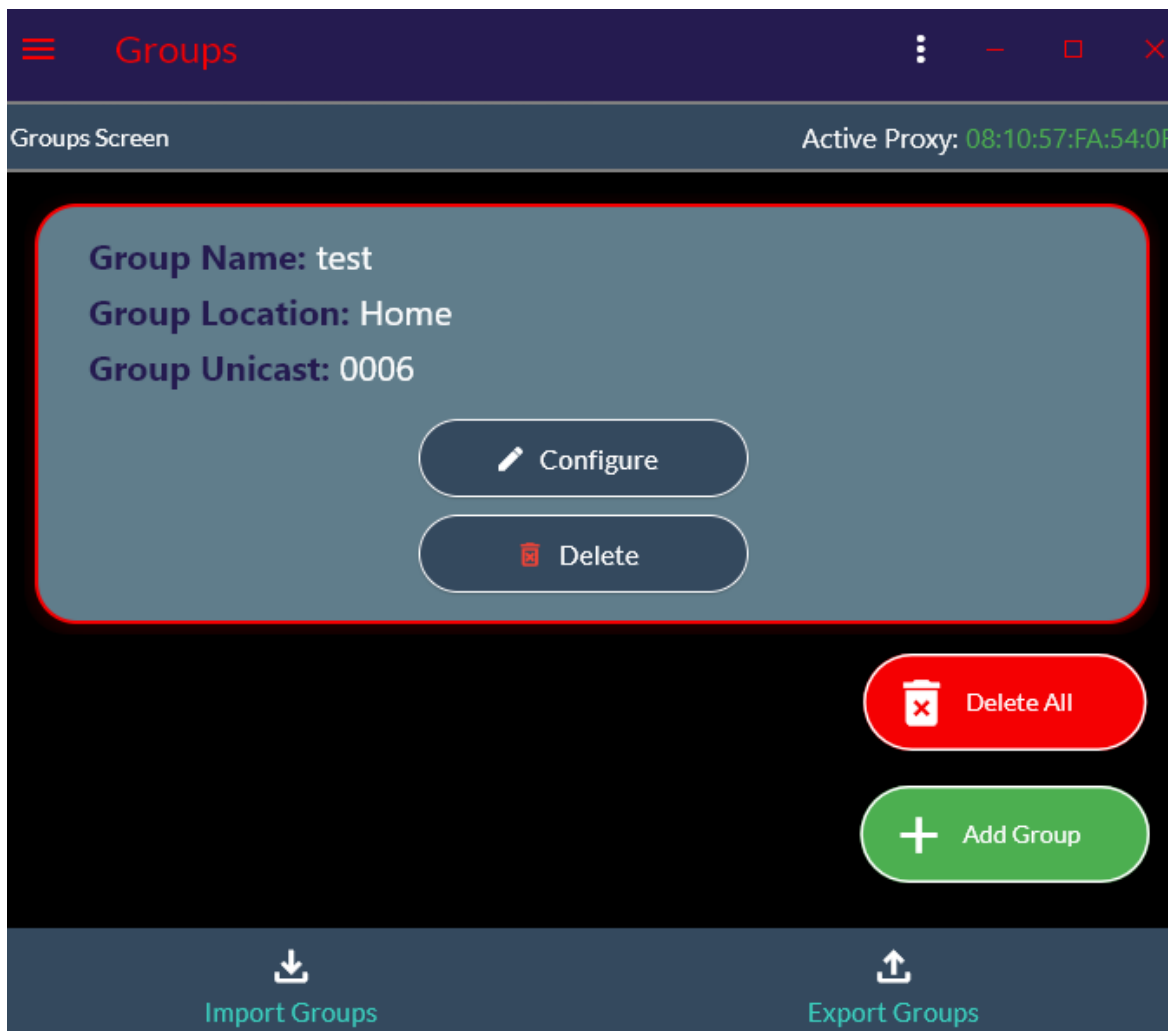


Figure 35: Groups Screen

On the bottom right of the screen there are also buttons for deleting all groups together and also a button for adding a new group.



7.18 The Create Groups Screen

The Create Groups Screen is where we can create a new group of devices that share the same group address. The screen has input fields for Group Name, Group Location and Group Unicast Address.

← Create Groups Screen

Create Group Active Proxy: None

Group Name:

Input up to 30 characters long Group Name 0/30

Group Location:

Input up to 30 characters long Group Location 0/30

Group Unicast Address:

c0 added by default

Input up to 4 digits long Group Unicast Address 0/4

Save

Figure 35: Create Groups Screen

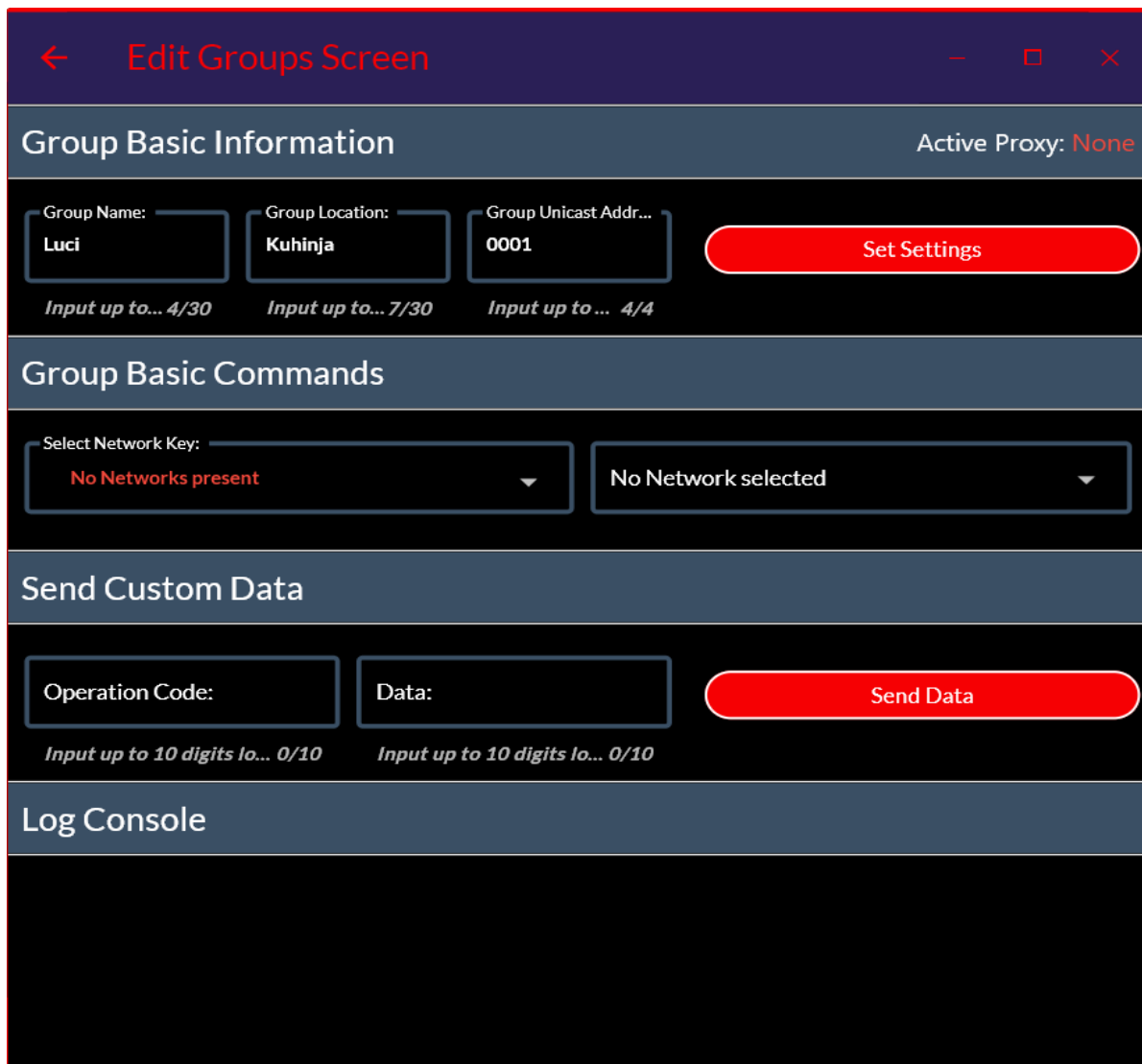
On the bottom right there is the button to Save the created group.

7.19 The Edit Groups Screen

The Edit Groups Screen is where we can update elements of an existing group of devices that share the same group address. On the top of the screen lies the Group Basic Information part which has input fields for Group Name, Group Location and Group Unicast Address. The settings for Group Basic Information can be saved by clicking the right-side button Set Settings. Under it sits the Group Basic Commands



part, where the user can select the network key of the group and then also the application key of the group, so the tool knows exactly how to address each of the groups when sending commands. Under it sits the Send Custom Data part, where the user can send Smarteh specified Operation Codes and their corresponding data. The user can then send the data with Send Data button on the right side.



Edit Groups Screen

Active Proxy: **None**

Group Basic Information

Group Name: Input up to... 4/30

Group Location: Input up to... 7/30

Group Unicast Addr... Input up to ... 4/4

Set Settings

Group Basic Commands

Select Network Key: No Networks present

No Network selected

Send Custom Data

Operation Code: Input up to 10 digits lo... 0/10

Data: Input up to 10 digits lo... 0/10

Send Data

Log Console

Figure 36: Edit Groups Screen

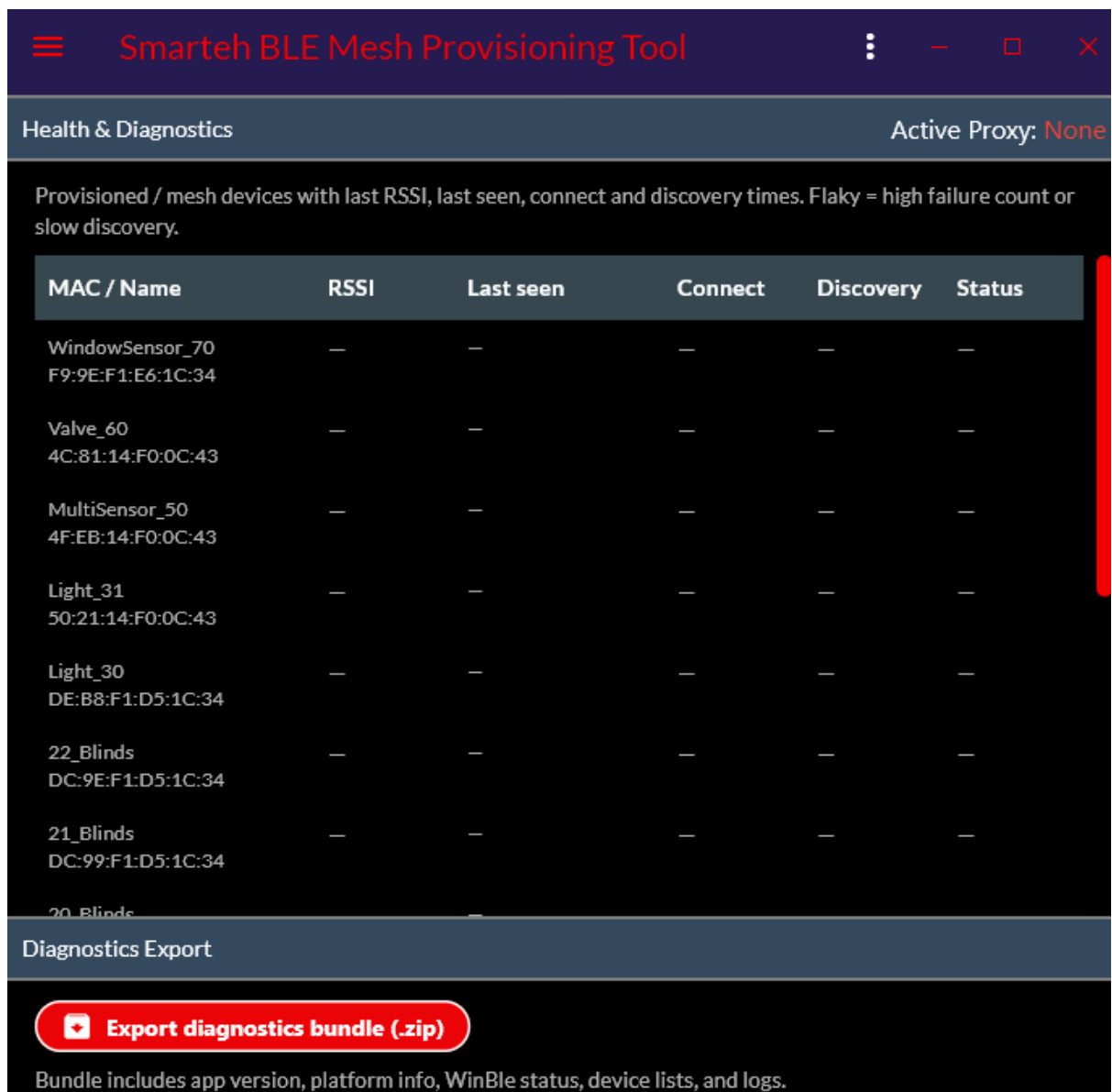
On the bottom of the screen there is also a Log Console where useful information regarding the communication with the group are displayed.





7.20 Health and Diagnostics Screen

On the Health and Diagnostics screen users can find about their currently connected devices connection health. They can inspect RSSI to the devices, when they were last seen and if they are connected or discovered and what is their status. They can also export diagnostics bundle to a .zip file.



The screenshot shows the 'Health & Diagnostics' screen of the Smarteh BLE Mesh Provisioning Tool. The title bar is dark blue with the tool's name and standard window controls. Below the title bar, the screen is divided into two main sections. The top section, 'Health & Diagnostics', has a dark background and displays a table of provisioned mesh devices. Above the table, a note explains that the table shows last RSSI, last seen, connect and discovery times, and that 'Flaky' indicates a high failure count or slow discovery. The table has six columns: MAC / Name, RSSI, Last seen, Connect, Discovery, and Status. The bottom section, 'Diagnostics Export', has a dark background and features a red button with a download icon and the text 'Export diagnostics bundle (.zip)'. Below the button, a note states that the bundle includes app version, platform info, WinBle status, device lists, and logs.

MAC / Name	RSSI	Last seen	Connect	Discovery	Status
WindowSensor_70 F9:9E:F1:E6:1C:34	—	—	—	—	—
Valve_60 4C:81:14:F0:0C:43	—	—	—	—	—
MultiSensor_50 4F:EB:14:F0:0C:43	—	—	—	—	—
Light_31 50:21:14:F0:0C:43	—	—	—	—	—
Light_30 DE:B8:F1:D5:1C:34	—	—	—	—	—
22_Blinds DC:9E:F1:D5:1C:34	—	—	—	—	—
21_Blinds DC:99:F1:D5:1C:34	—	—	—	—	—
20_Blinds	—	—	—	—	—

Export diagnostics bundle (.zip)

Bundle includes app version, platform info, WinBle status, device lists, and logs.

Figure 36: Health and Diagnostics Screen



8 SMARTTEH BLE DEVICES

For ordering Smarteh BLE devices compatible with Bluetooth Mesh standard, following Part Numbers should be used:

Product	Model	Bluetooth Mesh Role	Part Number
Bluetooth Mesh Modbus RTU Gateway	LBT-1.GW1	Proxy, Friend Node	245GW121001001
Bluetooth Mesh Relay Output Module	LBT-1.DO1	Relay, Friend Node	245DO121001001
Bluetooth Mesh Triac Output Module	LBT-1.DO4	Relay, Friend Node	245DO421001001
Bluetooth Mesh Triac Output Module	LBT-1.DO5	Relay, Friend Node	245DO521001001
Bluetooth Mesh Window/Door Sensor	LBT-1.B01	Low Power Node	245B0121001001
Bluetooth Mesh Multisensor	LBT-1.B02	Low Power Node	245B0221001001
Bluetooth Mesh Thermostatic Radiator and Floor-Heating Valve Actuator	LBT-1.BA1	Low Power Node	245BA121001001
Bluetooth Mesh Digital Input Module	LBT-1.DO1	Relay, Friend Node	245D0121001001
Bluetooth Mesh Light Dimmer Module	LBT-1.DD1	Relay, Friend Node	245DD121001001
Bluetooth Mesh IR Module	LBT-1.IR1	Relay, Friend Node	245IR125001001





APPENDIX A - COMPATIBILITY

SmarteH BLE Mesh Provisioning Tool 1.0.13 has the following hardware and system requirements:

Operating System: Windows 10/Windows 11

Bluetooth: Built-in Bluetooth Adapter or a Windows compatible Bluetooth Dongle (Realtek RTL8761b chipset, etc.)

If you run the program as an executable, it should be run with Administrator privileges because of the access to the Bluetooth driver.





Appendix B – Error Reporting

For all the error reporting, please send an email with as much information about the error and possibly with screenshots to *support@smarteh.si*.



Appendix C – License

END-USER LICENSE AGREEMENT FOR SOFTWARE PRODUCT:

Smarteh BLE Mesh Provisioning Tool

<http://www.Smarteh.si/>

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Ljubljana, January 2025



APPENDIX D - CHANGES

The following table describes all the changes to the document.

<i>Date</i>	<i>V.</i>	<i>Description</i>
24.02.2024	1	The basic version, issued as Smarteh BLE Mesh Provisioning Tool - User Manual.
29.07.2026	2	Extended User Manual with new pages and functions described.

