USER MANUAL

EME800A-US, EME800A-EU

ALERTWERKS AW3000

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BLACK BOX®

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

AlertWerks™ AW3000 (AW3000) is an all-in-one-box LoRaWAN® solution for wireless IoT applications. More than a gateway that is uploading your important data to any cloud service, it is a central unit providing full control with just a web interface.

AlertWerks is open platform, allowing you to use any LoRaWAN 1.0.x sensor. It has a simple connection (join) procedure to get LoRaWAN data from your sensor flowing into the system. It offers rich features to set up virtual sensors, actions, and notifications. Multiple dashboards can be set up and used.

LoRaWAN works on sub 1GHz frequencies using multiple modern technologies to transmit data wirelessly on a kilometer scale. It offers end-to-end encryption and security, so no one can see your data or steal your sensor.

AW3000 is a Linux device with a HDMI Output and USB Ports. It can connect to a touch monitor to visualize data directly from the unit. There is no command line editing or Linux knowledge necessary, since AW3000 boots directly into a graphical user interface.

AW3000 gives you highly customizable dashboards that can include a variety of options including world maps and floor plans. Interactivity and drill down functionality is possible.

All data is stored in an SQL database. Your IT department will love AW3000.

1.1.1 PRODUCT IMAGES

TABLE 1-1. GENERAL SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Dimensions (H X W X D)	1.3" x 2.4" x 3.9" (32 x 62 x 99 mm)
Weight	6.3 oz. (180g)
Rating	IP20, 14 to 131°F (-10 to +55°C)
Power	Micro USB (20W) or PoE 802.3at
Connectors	(1) HDMI, (4) USB, (1) Audio Out, (1) RJ-45, (1) Antenna
CPU/RAM	Quad 1, 4GHz ARM Cortex A53, 1GB RAM
OS	Linux 5.10.60-v7+
GNU/MIT Software	MariaDB, PHP, Apache, SNMPD 5.7.3, gcc, Semtech libloragw
Browser	Firefox V90+

1.1.2 OVERVIEW

AW3000 mainly is a small computer running Linux. You can connect it to a monitor, keyboard, and mouse.

The side panel contains connectors for Micro USB, HDMI, and Audio Out. The HDMI Interface is intended to connect DVI (with Adapter) or HDMI monitors. The screen resolution is adaptable, and it is compatible with touch monitors.

NOTES:

- **AW3000 does not work with DisplayPort™ monitors.**
- **For best results, do not connect a 4:3 monitor or a monitor with resolution below 1280x720 pixels. A HDMI Monitor with Audio capability is recommended.**

The antenna connector and the SD Card with software prepared and installed are located on the side of the device with LEDs.

NOTE: Never use AW3000 without the Antenna, and never unplug the SD Card while the unit is powered on.

On the opposite side is the PoE-enabled RJ-45 Network port and four USB Ports. You can use the USB Ports for keyboard and mouse, or you can connect to a Touch Monitor.

Unit power is either done by PoE (802.3at) or Micro-USB. The unit's power demand in full working mode is up to 20W, so it requires an appropriately powered power supply.

NOTES:

- **You can check the LEDs to determine if the unit has enough power. If they are just glimmering, the power supply being used is insufficient for the unit's power needs. Furthermore, the display will indicate "Low Voltage" when insufficient voltage and/or amps are supplied to the unit.**
- **AW3000 is intended to be used indoors only. It is rated IP20, so it not waterproof and must be used in a dry location. It does not have a fan, but it dissipates heat from the Semtech SX1308 chip to the chassis.**

WHAT'S INCLUDED

- (1) Wireless AW3000
- (1) Antenna
- (2) Mounting Plates
- (4) Screws

CHAPTER 2: INSTALLATION

NOTE: Carefully consider device placement, since it needs to be able to receive and transmit wireless information. For example, locating the device inside of a steel cabinet would interfere with the wireless signal, so placing an antenna on top of the cabinet would be necessary in that case.

2.1 INSTALLATION PROCEDURE

To install the AW3000:

1. Connect a HDMI or DVI (with Adapter) monitor to the unit's HDMI output.
2. Power on your monitor.
3. Connect a keyboard and mouse or a touch monitor to the unit's USB port(s).
4. Connect a sub 1GHz 50 Ohm Antenna to the unit.
5. Power up the unit by inserting your RJ-45 cable coming from a PoE PSE device (PoE Switch or PoE Injector following 802.3at) or by inserting the Micro USB cable coming from a power supply with at least 5V, 3A.

NOTE: A Black Box video and Linux startup messages will be displayed during the boot process. After loading the unit's graphical interface, the unit will start a web browser and display the AW3000's start screen.

FIGURE 2-1: START SCREEN

AW3000 can be used with WiFi 802.11 b/g/n/ac at 2, 4, or 5 GHz, RJ-45 connectivity, or without Internet or network connectivity.

2.1.1 SETTING UP CONNECTIVITY

To set up connectivity:

1. Close the browser window and move the mouse to the upper portion of the screen. This displays the hidden menu bar on the start screen.

2. Right-click on the networking symbol on the top right corner of the screen.

   NOTE: There are two symbols displayed in this area. The one to the left of the clock is for configuring audio output. The one to the left of the audio is for networking.

FIGURE 2-2: SCREENSHOT SHOWING NETWORKING SYMBOL

3. On the displayed menu, left-click on the **Wireless & Wired Network Settings** option.

FIGURE 2-3: SCREENSHOT SHOWING WIRELESS & WIRED NETWORK SETTINGS

4. A window appears, where you may change from Interface to SSID. When selecting SSID, all WiFi networks found are displayed. When selecting the interface ,you can change the IP settings of either eth0 (RJ-45) or Wlan0 (WiFi). Automatically configure empty options is DHCP.

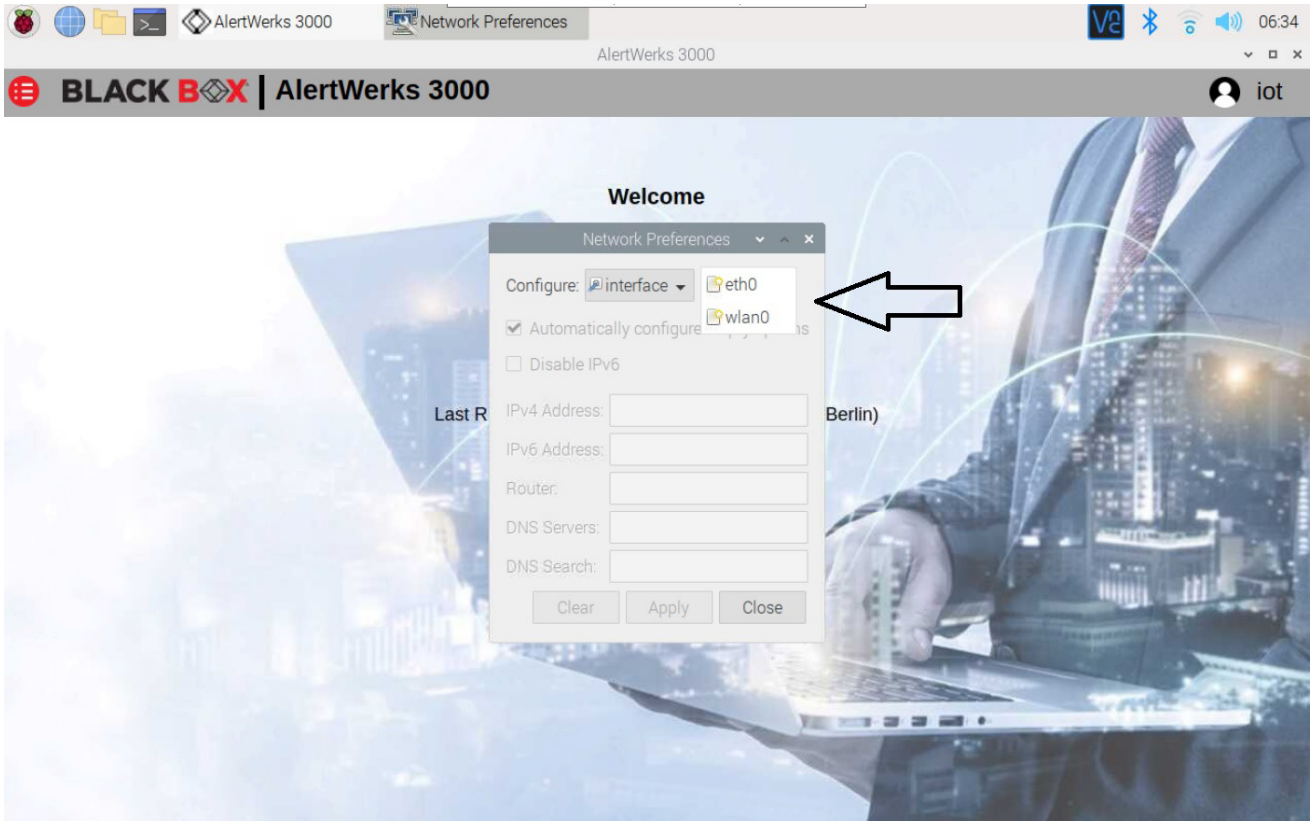

FIGURE 2-4: SCREENSHOT SHOWING CONFIGURATION OPTIONS

5. After you make your selection and enter required information, try to use the Web Interface from any network device. If you selected **DHCP** and need to know the IP which was assigned, hover your mouse over the network symbol in the menu bar.

The unit checks for internet connectivity, which can be monitored either in **Logs** or in **Settings**. If it has internet connectivity, the unit automatically adjusts the clock.

After AW3000 has network connectivity, you may connect to it from your PC using your browser and the IP Address, which can be found through step 5.

NOTE: Many WiFi networks do not allow a connection to another device in the same WiFi network. This is often called "Privacy seperator" or "Client Isolation." In these cases you will not be a able to connect to AW3000.

EXAMPLE:

You have one WiFI Access Point with that feature enabled, and you connect both AW3000 and your computer or laptop to it. The workaround to this problem is to connect either or by RJ-45 or to disable that **Client Isolation** feature on your WiFi Access Point.

Next, connect your LoRaWAN® sensor.

NOTE: Verify that your sensor is intended for your region. For example, if the sensor is for US900, it will not work with AW3000 in EU868 mode.

Depending on your sensor, it may need to be powered on. In many cases, you need to plug in the battery. Review your sensor's manual for Appkey instructions, which are necessary for connecting the sensor. Many sensor vendors print a list of keys and EUI on the sensor or its box.

To start the data flow into AW3000:

1. Power on the sensor, per the sensor manual's instructions.
2. Check the box and the sensor for the Appkey. This is a 32-character-long security key.
3. At AW3000's Web interface from the top left menu, select **Neighborhood**. You should now see that sensor.

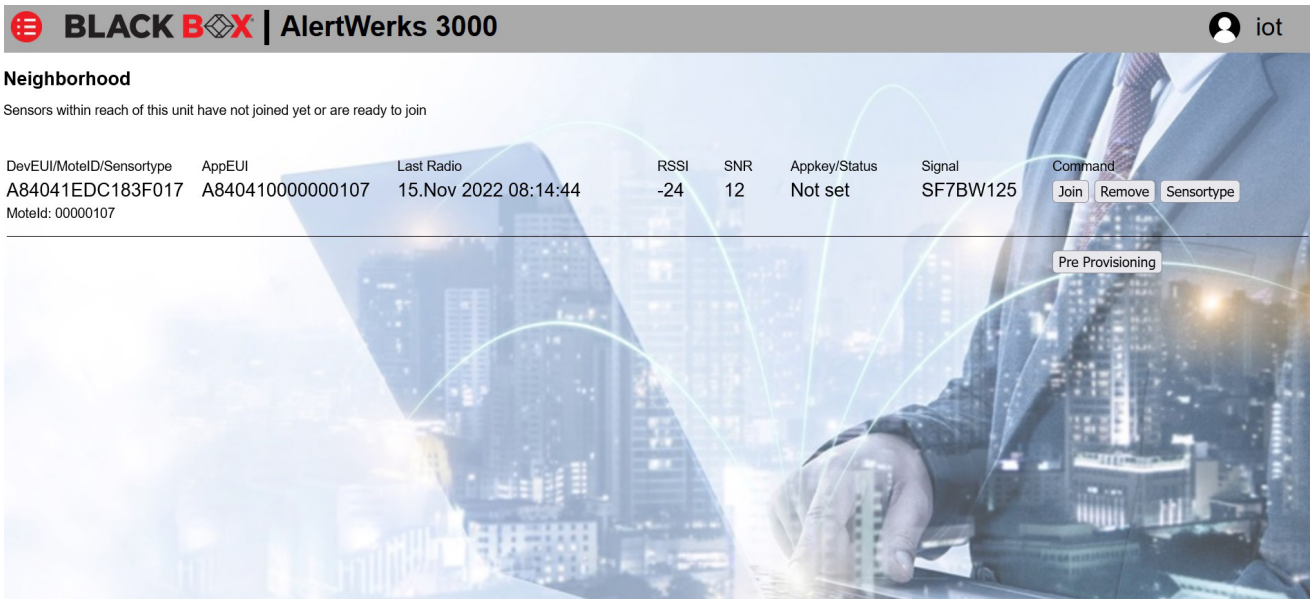

FIGURE 2-5: NEIGHBORHOOD SCREEN

2.1.2 TROUBLESHOOTING SENSORS NOT APPEARING IN NEIGHBORHOOD.

To troubleshoot sensors not appearing in Neighborhood:

1. Black Box is defining a list of tested and certified sensors. Check with your Black Box representative if your sensor is in that list.
2. Check the frequency setting. For the sensor it should be printed on the box or the sensor. The AW3000's frequency setting is viewable from the **Settings** menu, but not changeable.

   NOTE: The frequency setting must match your region. You should never try to use frequency settings not intended for your region. This may apply to you if you purchased the unit in one country while using it in another country. If you need to change AW3000's frequency setting, contact Black Box tech support. There is an unlock code that allows changing it.

LoRaWAN® sensors that are not yet connected send out a "Hello" message which we refer to as a "Join Request." LoRaWAN sensors that are otherwise already connected, which we refer to as joined, do not send out that Join Request. This may apply to you if you are using a sensor that you or someone else previously used elsewhere. In this circumstance, your sensor may need resetting. For some sensor vendors this is not possible. Other vendors may include a button that needs to be pressed for a specified amount of time or a DIP switch for this purpose. Follow the instructions in your sensor's manual to avoid damaging the sensor. If your sensor is on the list of tested and certified sensors, you may also contact Black Box tech support for assistance.

After you can view the sensor:

1. On the neighborhood page, click on **join**.
2. In the pop-up window, enter the Appkey, and select the vendor and part number for your sensor.
3. Click on **Join Sensor** in the bottom right of the pop-up window that appears after selecting the sensor's vendor and model from the drop-down list box.

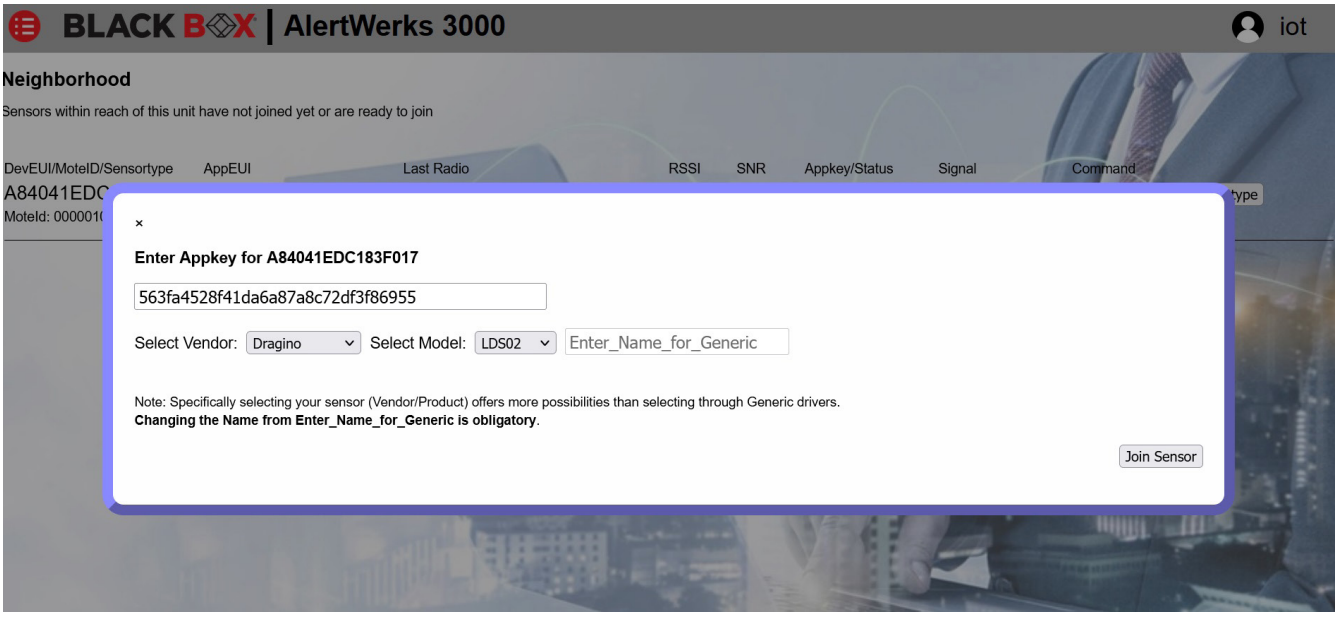

FIGURE 2-6: APPKEY ENTRY SCREEN

In the list of sensors on the neighborhood page, it now shows **Set/Wait** instead of **Not Set**. It may take a few seconds or even a few minutes until that changes from **Set** to **Joining**.

NOTE: If the message doesn't change to "Joining," select "Logs" from the left upper menu and check messages. If there is an entry "No valid Appkey/None given," verify that you typed the Appkey correctly and repeat the above steps. Once the sensor is transmitting values, the display will show "Joined."

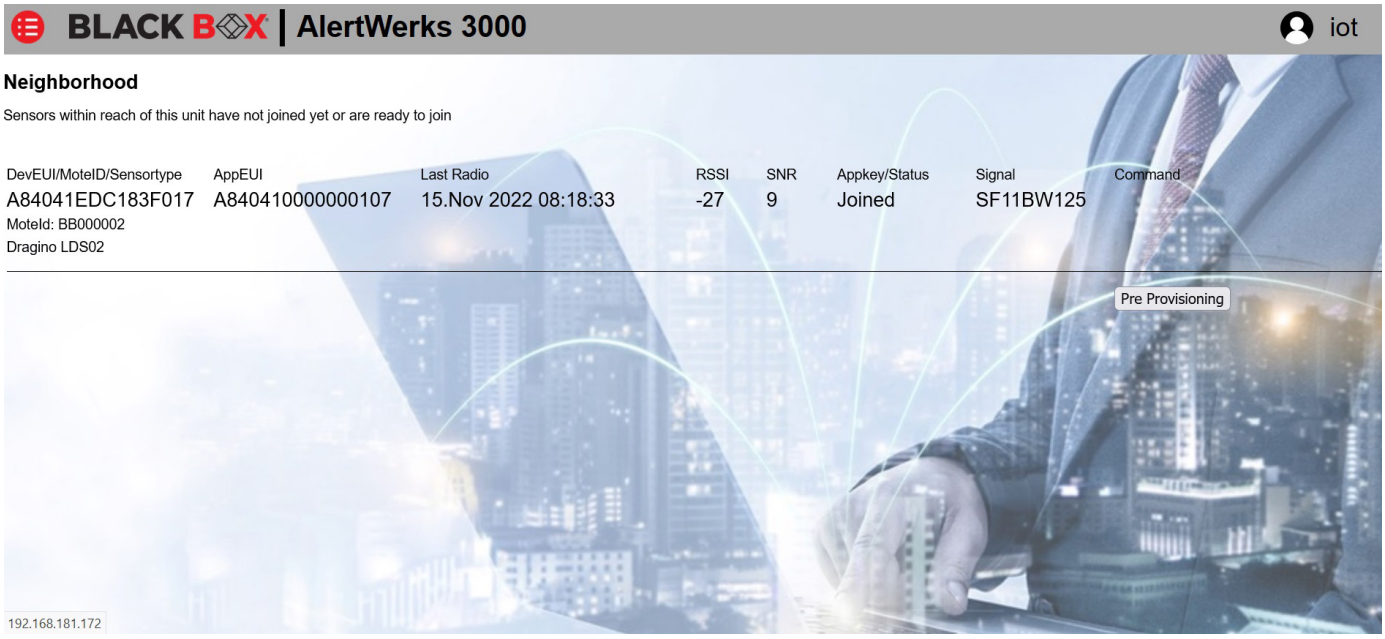

FIGURE 2-7: SENSOR STATUS SCREEN

After the display changes to **Joined**:

1. From the top left menu, select **Sensors**.

For physical sensors, entries will appear automatically.

NOTE: Most LoRaWAN® sensors carry more than one value which are referred to as datapoints. For example, a temperature and humidity sensor with a good battery will display three datapoints. While the type is provided by the sensor's vendor and entered during the join process, you may change the name by clicking on "edit." The "Settings" section of this manual provides more information about this process.

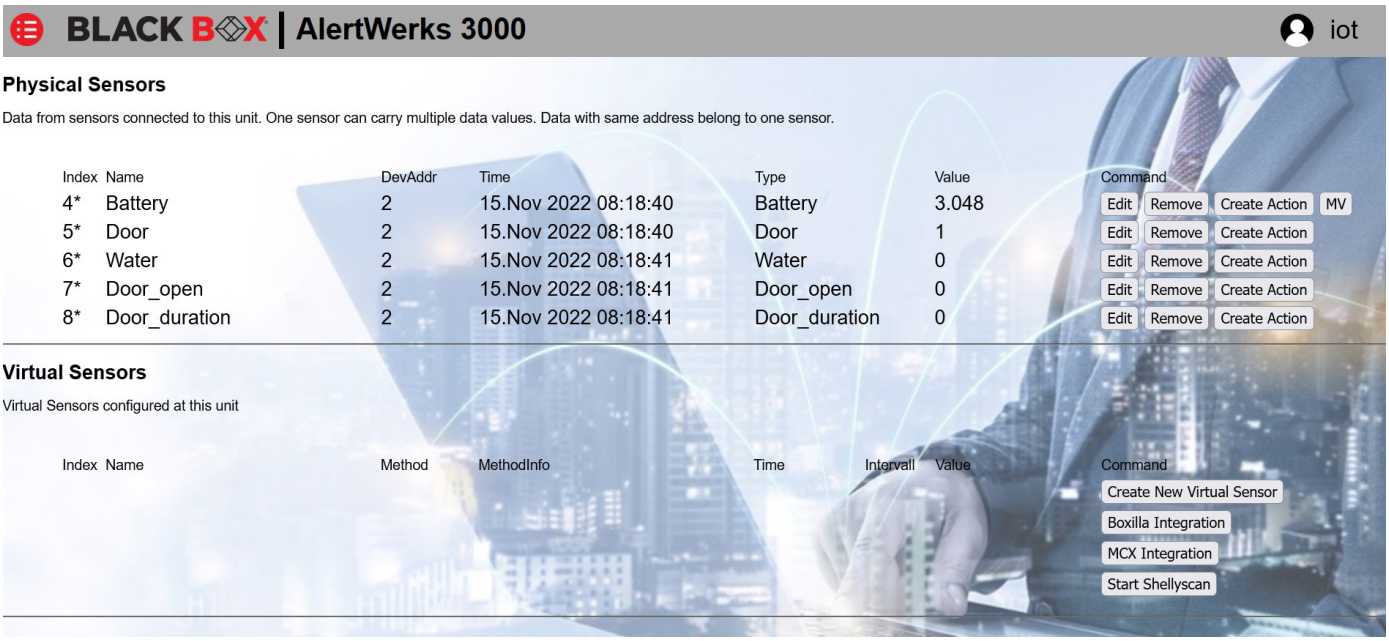

FIGURE 2-8: SENSOR SCREEN

While this page provides current data, historical data is accumulated as the sensor transmits data.

2.1.3 DASHBOARD CREATION

To create a dashboard:

1. From top left menu, select **Dashboard**.

   NOTE: If the unit is new and dashboards have not yet been created, an empty screen except for commands to execute in the top right corner of the screen appears.

1. Select **Add a dashboard**.
2. In the pop-up window, select a name for the dashboard.
3. To get started, select **4 x 3 = 12 Dashboxes** for Size, and do not select **Auto Populate**.
4. Click on **create** to create your first dashboard.

2.1.4 ADDING ITEMS TO THE DASHBOARD

To add items to the dashboard:

1. Select **Add a dashbox**.
2. Select the data point that you want to view.

   NOTE: These data points were previously created by the Join process.

3. Click **Create**. The Dashbox is created with default values.

FIGURE 2-9: DASHBOARD CREATED WITH DEFAULT VALUES

You can now create more dashboxes for other datapoints. To instructional purposes, we will use simple and single values from one datapoint, although other options are available.

You can customize your dashbox, including changing the position and size of the dashbox or the time scale of the content. The dashboard can be operated with Drag and Drop. Dashbox settings available by right-clicking on the Dashbox.

2.1.5 CHANGING THE DASHBOX

To change the Dashbox:

1. Right-click on the dashbox that you want to change.
2. When a window appears which allows you to change the type of dashbox, change the time scale and change the coloring, if desired.
3. Use the **More options** option to change the dashbox's size and position or to remove it.

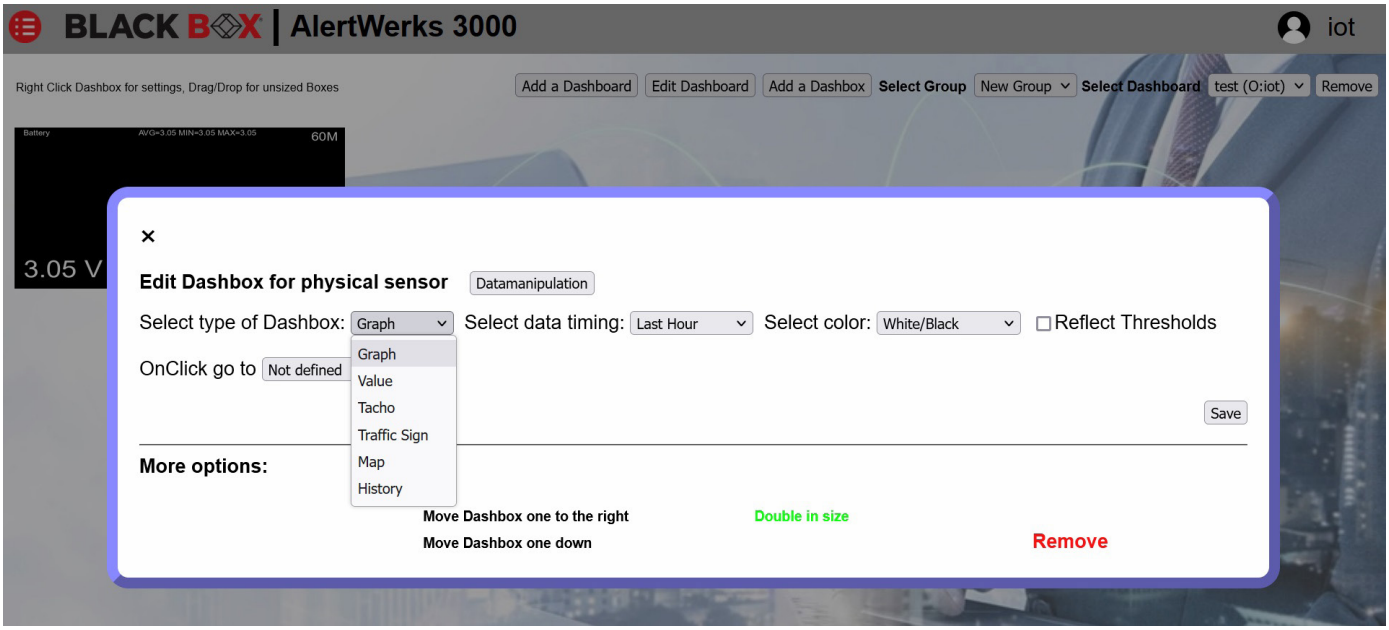

FIGURE 2-10: DASHBOX EDITING SCREEN

NOTE: One standard dashboard can carry up to 12 Dashboxes. While a dashbox's position can be changed by Drag and Drop, resizing is only possible in the dashbox's settings menu.

Apart from Dashboards with a maximum of 12 Dashboxes, you can also change to 8x6=48, 12x9=108, or 16x9=144 Dashboxes by clicking on **Edit Dashboard**. Alternatively, these options can be selected while creating the Dashboard. Changing the size afterward may cause the number of dashboxes and their positioning on the dashboard to change.

See **Tips and Tricks** for more information about dashbox types.

2.1.6 TRAINING EXERCISE

Experiment with your sensors to see how they work with AW3000. Since LoRaWAN® has a substantial reach, you could test them meters and kilometers away from AW3000. You could test how air quality sensor values change when they are positioned at various distances from someone who smokes. You could also place a temperature sensor in a refrigerator to see how the values change.

NOTE: Some sensors have a predefined interval for sending data, such as every 20 minutes. For sensors with a changeable setting, there is a "Set Timing" command on the Neighborhood page.

CHAPTER 3: DEFINITION OF PHYSICAL SENSORS, VIRTUAL SENSORS, AND ACTIONS

3.1 DIFFERENCE BETWEEN PHYSICAL AND VIRTUAL SENSORS

In chapter 2 we worked with a physical sensor, which is a sensor that you can touch. There are also virtual sensors that you can use by configuring them. Virtual sensors can receive data from IP and IT devices. Virtual Sensors can combine data or do mathematics with data.

EXAMPLE 1:

Let us assume that you have an UPS. If your UPS is a managed one, it runs SNMP. You can retrieve data from your UPS, such as the remaining battery capacity, through SNMP.

EXAMPLE 2:

Let us assume that you have an older IoT or Environmental Monitoring unit, for example AlertWerks™ Wired (EME10x, EME16x). You can move in data from older systems to AW3000 through SNMP.

EXAMPLE 3:

Let us assume that you have an important network server that you want to control and monitor. You can do that using a virtual sensor through PING.

EXAMPLE 4:

Let us assume that you have issues with your internet connectivity. You can monitor LATENCY using a virtual sensor.

EXAMPLE 5:

Let us assume that you want to visualize the difference between indoor and outdoor temperature. Having two physical sensors (one indoor, one outdoor) you can use a virtual sensor to do the math and display that value in a dashbox.

EXAMPLE 6:

Let us assume that you want to visualize two datapoint values in a dashbox. You can do this by using a virtual sensor with COMBINE method.

That means virtual sensor functionality is very versatile and opens many possibilities. Virtual sensors can be configured having the basement of any Method (SNMPGET/LATENCY/PING etc) or any physical sensor. At the end a virtual sensor is just another datapoint that can be used just like the other datapoints.

For any datapoint, actions can be set up. Actions are done by AW3000 automatically when something happens. That can be any datapoint getting below, beyond, or exactly at a certain level. Actions can also be set up based on time. Therefore, AW3000 is also a time switch.

Actions can be as simple as playing a sound, sending an email, changing the color of a dashbox, or changing the sensor's time interval. You can also issue SNMPSET commands which allow you to toggle or power off or on any IP-based PDU at any location.

Actions follow the multilayer principle. You can configure multiple actions, and these actions can interact with each other.

DETAILED EXAMPLE 1:

Let us assume that you have a UPS with SNMP. Let us also assume that you have a physical LoRaWAN® sensor measuring incoming power from your energy provider. As long as primary power is up, battery capacity is not significant. An interval for the SNMPGET virtual sensor of 30 or more minutes is sufficient. But as soon as primary power goes down, you want a different interval of just a few seconds. Perhaps you also want AW3000 to send an SNMPSET command to your server to shut down. Perhaps you also want to play an alarm sound. Perhaps you want the corresponding dashbox at that time to have a red background color. You create actions for these things. With another action defined when power is available again, you can set the interval to 30 minutes again and have the white background for your dashbox again.

CHAPTER 3: DEFINITION OF PHYSICAL SENSORS, VIRTUAL SENSORS, AND ACTIONS

DETAILED EXAMPLE 2:

GDPR-compliant air quality and people count sensors are placed at the entrance of a meeting room. The sensor reports when one person enters and when one person exits the room. A virtual sensor can be used with AW3000 data to report the number of people in the room. An overnight action can be used to reset the counter to zero. With another action, you can start ventilation in the room if the air quality or person count in the room exceeds the set parameters. With another action you can enable a traffic light showing red so that people know to not enter that room. With Black Box conference and meeting room solutions, you may also move the next meeting to another room by SNMPSET.

NOTE: For the Black Box air quality and people count sensor (SKU: EM-P), everything is prepared and the datapoint only shows the number of people in that room.

4.1 CREATING VIRTUAL SENSORS

4.1.1 PROCEDURE TO CREATE VIRTUAL SENSOR

To create a virtual sensor:

1. Go to **Webpage Sensors** from the top left menu.
2. Click on **Create New Virtual sensor**, which is the last entry at the left edge on that page.

   NOTE: If you can't see that entry and there is a message about a "BeenLate" factor, see 11.1.9, which discusses the "BeenLate" factor.
3. On the pop-up window, select the method used. Explanations of methods appear later in this manual. To get started, select **PING,** and then click on **Next step**.
4. The content of the window changes, and AW3000 needs to know the interval in seconds and the IP Address or the DNS Name to ping. To explain the process, we will enter **127.0.0.1** for the IP Address, thereby pinging the unit itself.
5. Change the interval to **5 seconds**.
6. Click on **Create**.

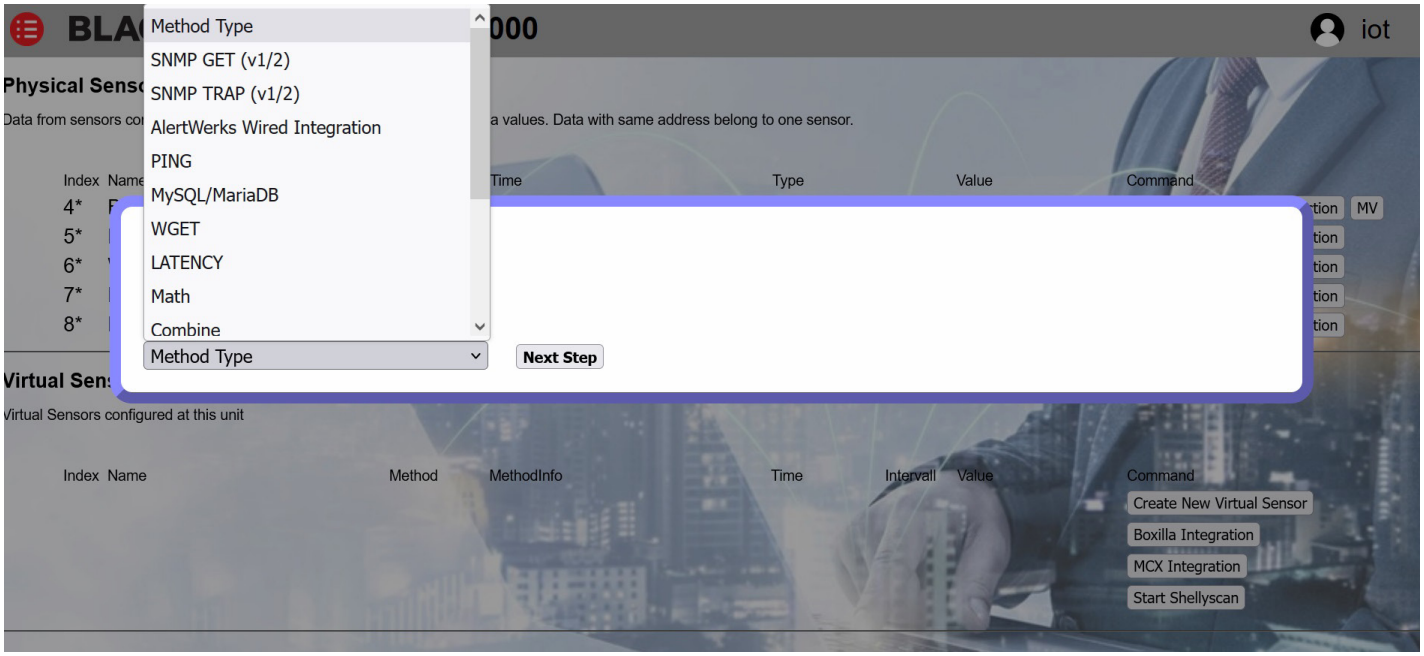

FIGURE 4-1: SELECTING METHOD TYPE

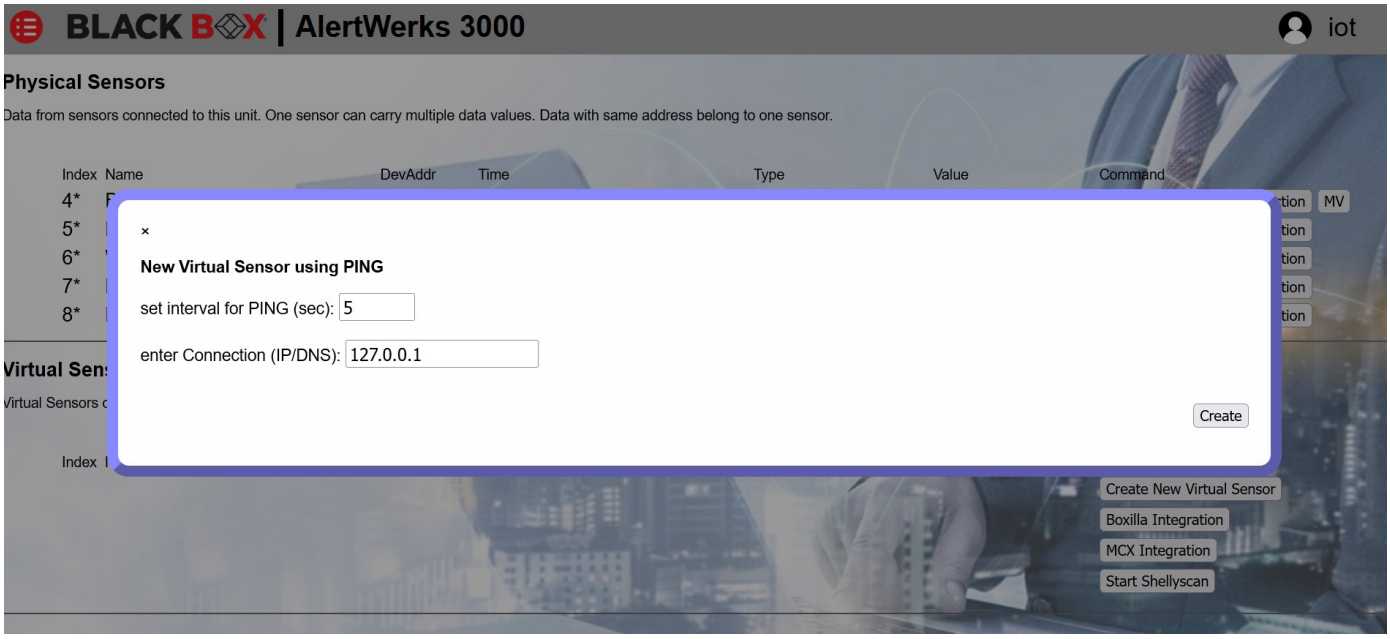

FIGURE 4-2: SETTING INTERVAL AND CONNECTION

An entry for virtual sensors was added to the list, which previously only had physical sensors on it.

To add a sensor name:

1. Click on **Edit** in the line of the new virtual sensor at the right edge.
2. When a new window appears, you can enter a name and a unit. For **Ping**, **Unit** does not make sense, so leave that field empty. For the name, enter **Ping myself**.
3. (optional) If you want to avoid recording historical data, then enable that option.
4. Click on **Save**.

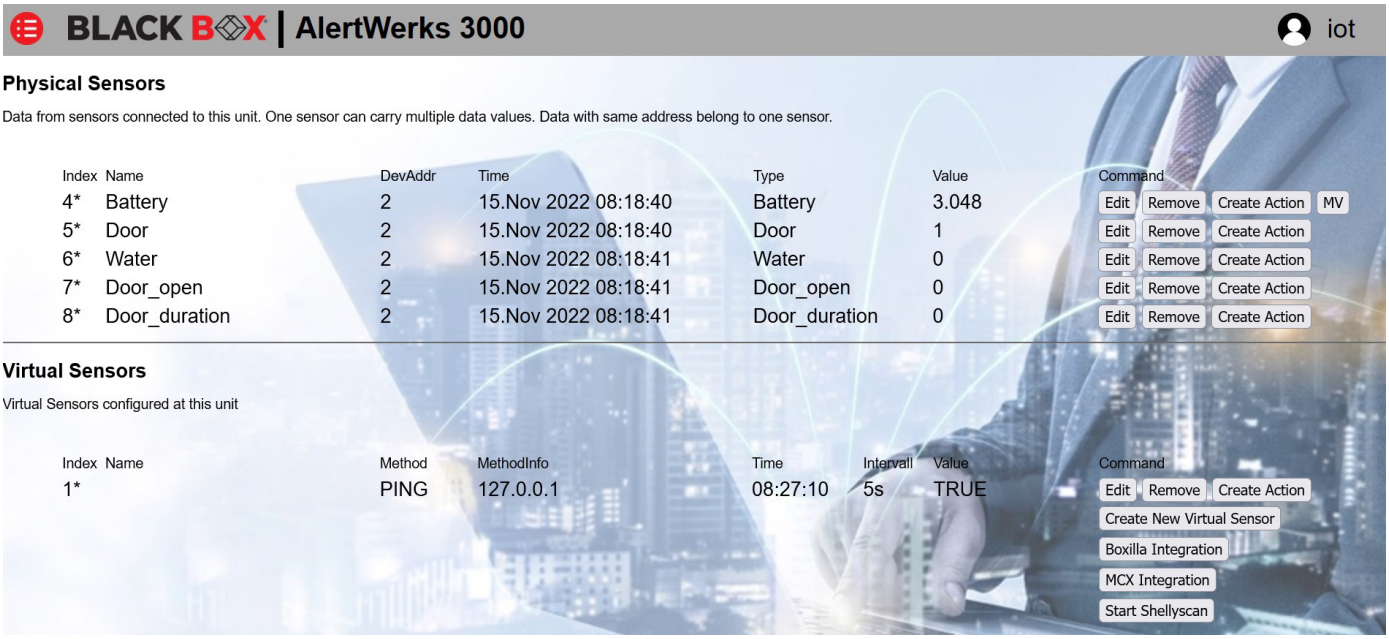

FIGURE 4-3: SENSOR SCREEN WITH ADDED VIRTUAL SENSOR INFORMATION

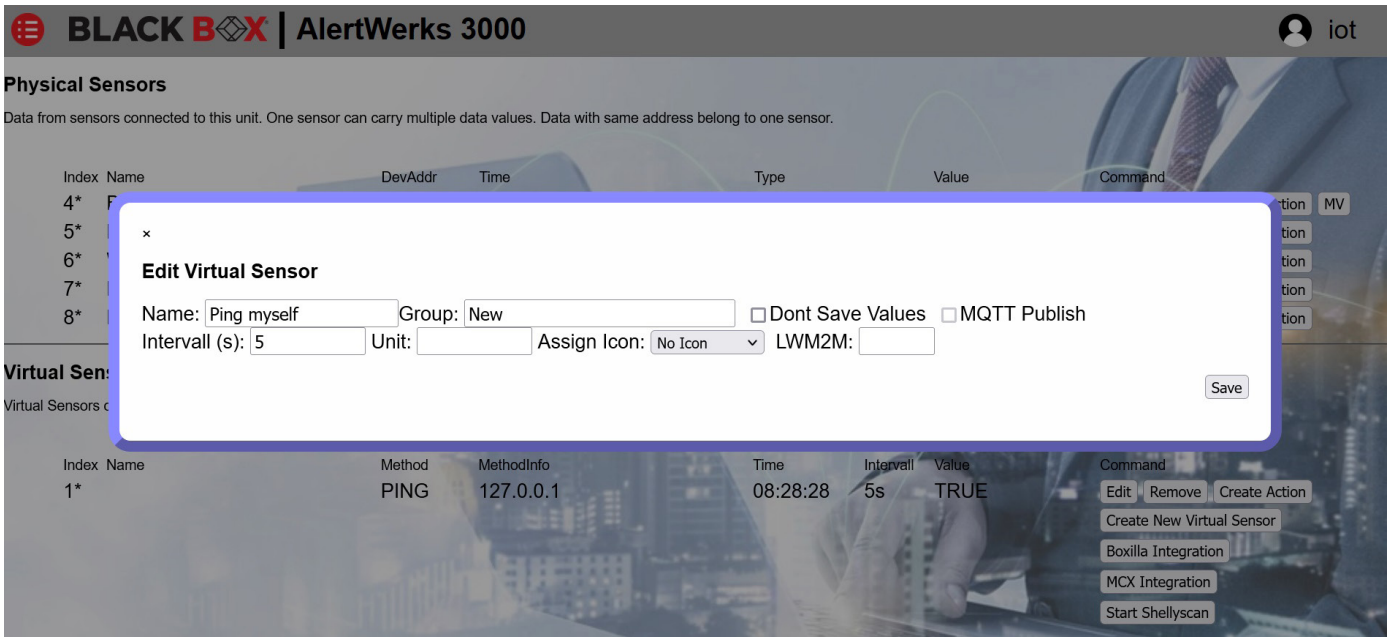

FIGURE 4-4: EDIT VIRTUAL SENSOR SCREEN

CHAPTER 4: CREATING A VIRTUAL SENSOR

You can use this virtual sensor for a dashbox.

Next steps:

1. From top left menu, select **dashboard**.
2. Click on **Add a Dashbox**.
3. From the list of datapoints, select **Ping myself**.
4. Click on **create**.
5. Since AW3000 shows that value as a graph by default, and this is not the best option for our example, right-click on that newly created Dashbox and change **Select Type of Dashbox** to **Traffic Sign**.

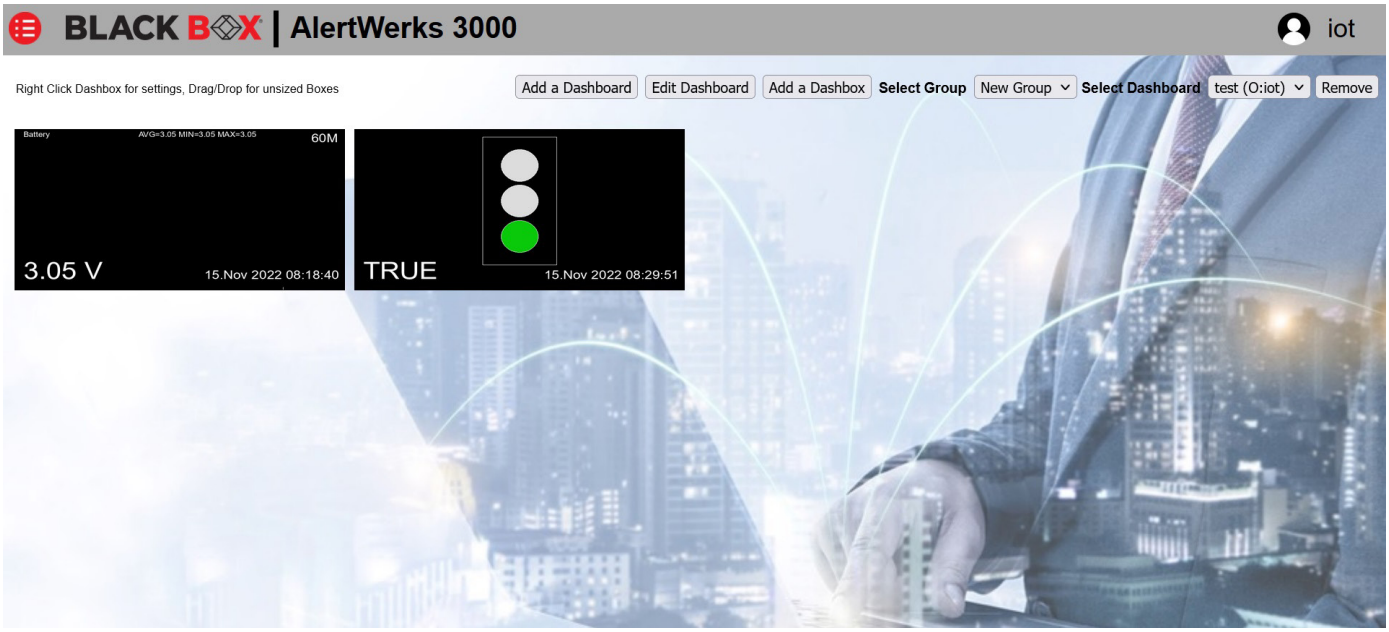

FIGURE 4-5: SCREEN WITH TRAFFIC SIGN DASHBOX TYPE

Since AW3000 is a Linux device, and since Linux has its own local interface, this virtual sensor will never be false. To learn how AW3000 works, you can practice with other methods.

TABLE 4-1. EXPLANATION OF METHODS

METHOD	EXPLANATION
PING	Get information about availability of IP devices.
LATENCY	Get information about availability of IP devices plus their network latency.
SNMPGET	Get information from IP devices. You need to know certain parameters such as OID, Community, and IP address. This manual can't explain SNMP completely. Black Box offers training and videos about this topic.
SNMPTRAP	Traps are sent from IP devices to AW3000. In these Traps information pieces and values are normally included.
SQL/Maria	Get information from other databases. You need to know certain parameters and enter a valid SQL Command. This manual can't explain SQL completely. Black Box offers training and videos about this topic. For testing purposes, you may use AW3000's database with these settings: IP: **127.0.0.1** User: **iot** PW: **iot** Database: **LoRa** Command: **Select count(*) from sensors**
WGET	This will provide you with the amount of physical sensors seen or joined. Get information from webpages. You need to know the address and limiters. The value retrieved is what is between the limiters. If the string between the limiters includes a comma (**,**) then it is for a floating point calculation converted to a dot (**.**). The webpage that you use for WGET method should be a maximum of 1 Megabyte.
MATH	Do some arithmetic and mathematics with values. You can select 1-2 sensors, or 1 sensor and 1 fixed value, or 2 fixed values. With the values you can perform: **+** Mathematical addition **-** Mathematical subtraction (resulting in negative value if second value is larger) ***** Mathematical Multiplication **/** Mathematical Division (resulting in 0 when second value is 0) **Absdiff** Difference between the two values (always positive) **Average** Average of both values **Min** The lowest of both values **Max** The highest of both values
MULTIMATH	With this virtual sensor method, you can perform even more math, but you need certain knowledge. For MULTIMATH you can enter a formula with brackets. The formula is processed by the SQL process. So any formula that is possible with a SELECT statement is also possible here. Values of sensors are represented by P or V for physical or virtual sensors followed by the sensor's index number. Example: 2*(p1+p2+v5) Watch the log for errors if you do not get a valid result after setting it up.

TABLE 4-1. EXPLANATION OF METHODS (CONTINUED)

METHOD	EXPLANATION
COMBINE	Combine two sensors into one. Graphs will then show both. If it is a GPS tracking sensor you can use COMBINE to get latitude and longitude to one datapoint and use the Dashbox Type Maps. This is just an automated link to Google Maps.
PHPSCRIPT	You can define a PHP script that deals with any of your data points. Whatever PHP can do, you can do it here. The values of physical and virtual sensors can be accessed by two arrays provided to the PHP Script. $v[x] and $p[x] where x is the index number of that datapoint. You just echo out the result of your script. **Note. It is highly recommended to use numbers at this point.**
CONTAINER	This virtual sensor can be used like a variable in programming. Through actions to be defined for any virtual or physical sensor, you can amend the container's content. Occupancy Sensors benefit from this unique feature. Occupancy Sensors deliver 0 for no one there and 1 for someone there. That change can be tracked by actions and a container Variable counted up.

CHAPTER 5: CREATING AN ACTION

5.1 CREATING ACTIONS

Creating an action is about automation. Let AW3000 do the job for you.

Example using a temperature sensor:

1. Follow steps in Chapter 2 to have a physical sensor with at least one temperature data point.
2. Go to **Sensors** from the top left menu.
3. For the datapoint from your physical sensor, click on **Create Action** on that line at the right edge..
4. When a new window appears, you have multiple options:
   a. You can enter an Operator (bigger **>**, smaller **<**, or equal **=**) .
   b. You can enter a value (the current value is filled in).
   c. You can enter for how many seconds the situation is persistent.
   d. You can select the **Action Type**.
   e. You can set from which hour to which hour this action is active.
   f. You can set the rearming period, which means that once the action was active, it is not active for that amount of seconds.

   Assuming that your physical temperature sensor is indoors, enter **10** as a value, select smaller (**<**), and select **5s** for timing. Then select action type **play alarm**. Click on **Save**. (For Delta Up/Down see below.)

5. Move your sensor into your refrigerator.

In a few seconds or minutes, the alarm will start. Alarm sounds exit AW3000 either by analogue audio or by HDMI. If you can't hear the alarm, check your settings accordingly (see Chapter 2).

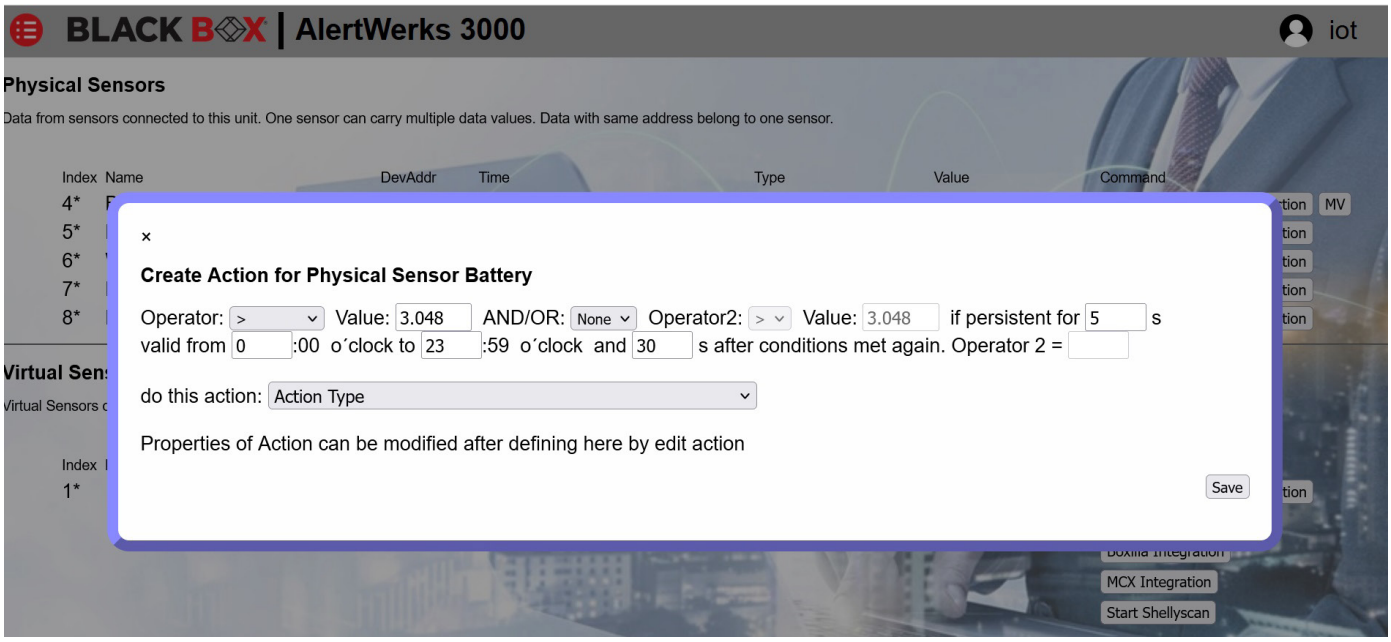

FIGURE 5-1: CREATE ACTION SCREEN

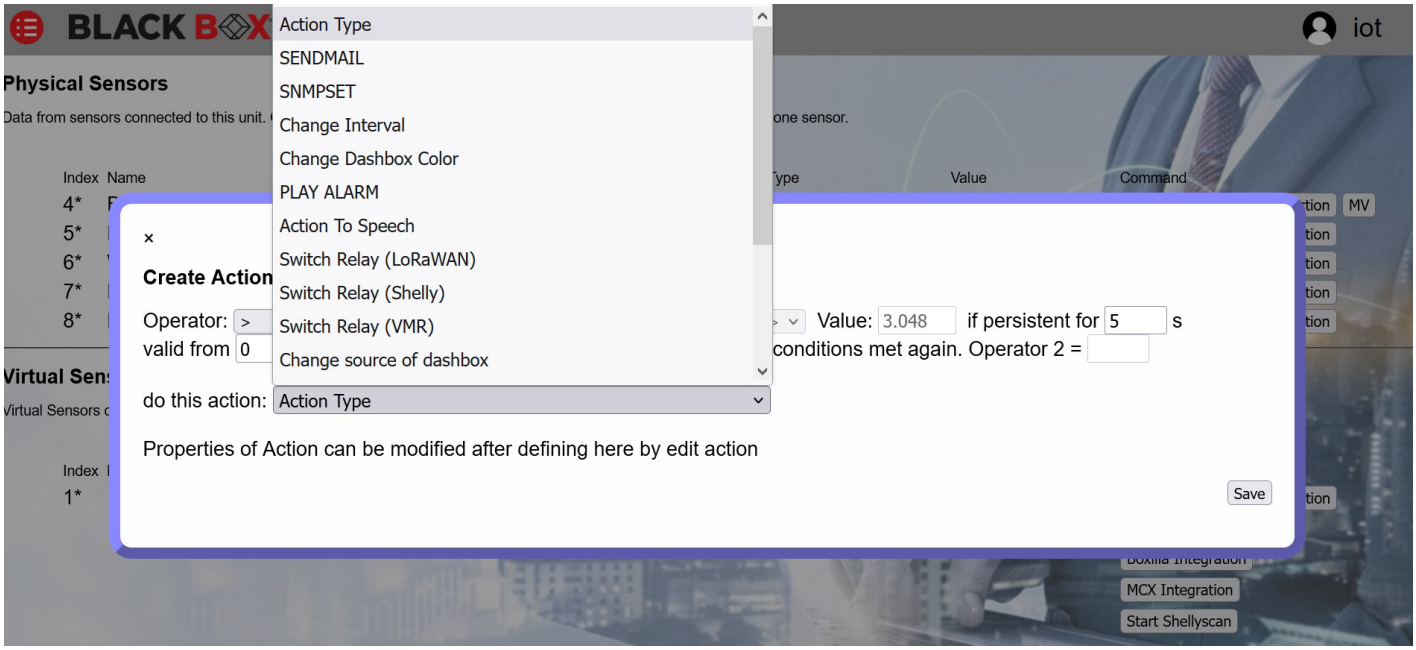

FIGURE 5-2: PLAY ALARM SELECTION

CHAPTER 5: CREATING AN ACTION

TABLE 5-1. EXPLANATION OF ACTION TYPES

ACTION TYPE	EXPLANATION
SENDMAIL	Send an email. Check SMTP settings on menu settings to be able to send mails. You have the option of sending emails only once per alarm, and there is an option to have AW3000 send out an extra Email once the alarm condition ends. For the message itself, you can use variables as follows: %1% Time %2% Value %3% Unit %4% Lastvalue (only works if storing values is not disabled) Example email message: "The temperature changed at %1% from %4% %3% to %2% %3%." You can also define that an image from an URL is downloaded and sent as an attachment. This is useful with IP Cameras and motion or door contact sensors. **Note: You need an IP Camera having a snapshot capability in this example.**
SNMPSET	Send an SNMPSET Command. You need to know certain values just like for the SNMPGET Method for virtual sensors.
SNMPTRAP	Send out a SNMP TRAP.
Change Interval	Change the interval of another sensor. **NOTES:** • **Have another action to revert interval changes.** • **This makes manual edits for intervals obsolete.**
Change Color	Change the color setting of corresponding dashboxes. **NOTES:** • **Have another action to revert color changes.** • **This makes manual edits for color changes obsolete.**
Play Alarm	Play an alarm sound. To change the alarm sound, see Chapter 11:Tips and Tricks.
Switch Relay (LoRaWAN)	Apart from wireless physical sensors for LoRaWAN®, there are also actuators available. Using this action type, you can switch to ON/OFF or you can just toggle it.
Switch Relay (Shelly)	AW3000 is prepared with these type of home automation wireless LAN devices. This action allows you to switch these. There is a video on how to use and set these Shelly devices up with AW3000.
Change source of dashbox	Every dashbox is sourced from either a virtual or a physical sensor. With this action method, you can change that.
Change current viewer of dashboard to specific dashboard	Using this action method, a specific user, when logged in, is forced to view a specific dashboard.
Container Arithmetic	Using this action will amend the content of a Container (virtual sensor type) according to your configuration (Set/Add/Substract).

CHAPTER 5: CREATING AN ACTION

Once you configure an action, it is displayed on the **Sensors** menu sensors right below the corresponding datapoint. That line has a blue background which changes to red as the configured timescale is reached.

Apart from >, <, or =, there are many more possibilities. First, you can define two values and combine these with AND or OR. Using the previous example, you could indicate if temperature <10 and if temperature >0., then this action is active between 0 and 10 degrees. Alternatively you could indicate if temperature is <10 or >20, then this action is active if temperature is below 10 or above 20 degrees. Remember that AW3000 allows combinations that do not make sense, such as if temperature is <10 and >10. This action will never be active.

Delta Up and Delta Down are useful functions. Delta is shown in the web interface with the greek symbol accordingly. This allows you to set actions active if values change up or down with a certain range, such as if temperature is delta down 0.1 and <10. This action will be active if the value is below 10 degrees and still decreasing. These functions are useful for occupancy or people-count sensors.

NOTE: Delta Up and Down only works if storing values is not disabled.

CHAPTER 6: SETTINGS AND LOGS

6.1 SETTINGS

Once you click on **Settings**, you can make changes to several settings.

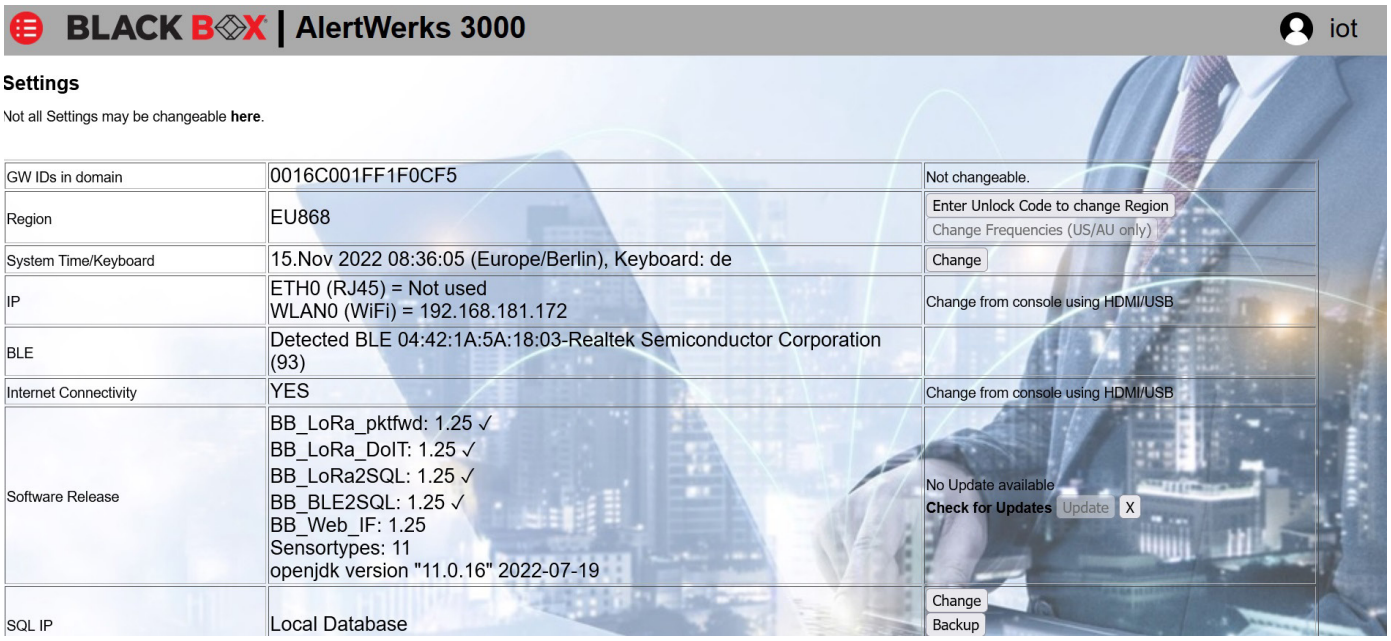

FIGURE 6-1: SETTINGS SCREEN

6.1.1 GATEWAY ID

Within the LoRaWAN® logic most devices that collect values from sensors are gateways because they just upload your valued data to any cloud platform. While AW3000 is different since it does the JOIN Procedure and provides actions and visualization, the Semtech chip used (SX1308) is still intended for gateway usage. The ID assigned is the prebuilt ID (EUI64) of the Semtech Chip, and it cannot be changed. If you are running a redundant AW3000 domain (see Chapter 11: Tips and Tricks), a gateway ID list may appear here.

6.1.2 REGIONAL SETTING

Per regulations in most regions, users shall not have the ability to amend regional settings for radio devices. Per standard Black Box processes and procedures, you received your AW3000 for the region that you ordered it from. The chip used inside can handle more than just your region. If you purchase your AW3000 in one region and need to use it in a different region, contact Black Box tech support. Once legal requirements are satisfied, a Black Box team member can provide an unlock code, which enables you to change the regional setting in that hour.

NOTE: You will need to provide the Black Box support team with your Gateway ID (see above) and the current hour in your timezone. For example, if you call at 1:50pm and you get your unlock code at 1:55pm it will be valid for another 5 minutes.

For specific regions (America (North and South American countries), Australia, and Japan) an additional frequency option is available, since these regions have a much larger frequency spectrum allowed for LoRaWAN. With that setting you can select the frequency band on which you want to operate. The default is Band 1.

NOTES:

- **Some of the open source LoRaWAN cloud platforms use Band 2.**
- **You need to select the band before joining sensors. If you joined sensors in Band 1 and change to Band 2, you will no longer receive their transmissions. AW3000 will attempt to move them to the new frequency band, but the change will not be effective immediately.**

6.1.3 DATE AND TIME SETTING

Since AW3000 receives NTP broadcasts and does active NTP requests, changing the date and time setting is not needed when your AW3000 is connected to an active network or the internet. (See Chapter 11: Tips and Tricks for more information.)

Network connecivity and IP address information is also displayed here. Use the HDMI/USB console to amend settings, if required.

The software provided with AW3000 has four main programs, and the release version is displayed accordingly. You can update the software online through our Update Servers, since binary files are not provided for upgrading purposes. If desired, you can initiate the update process to enable temporary Internet access for your AW3000. The update process uses TCP ports 21 and 3627.

AW3000 uses an SQL database. By default, the local database on the unit itself is used. You can use the Change, Backup, and Restore commands.

Change amends the system to use a different database, such as a database in your IT department. Backup is a backup method where you simply get a whole SQLDUMP. That may also be useable for swapping the database from local to a different location.

6.1.4 SMTP FOR SENDING OUT EMAILS

You can enter IP or DNS, Port, User, and Password of your encrypted and secured SMTP connection. Unauthorized plain SMTP on port 25 is not supported.

6.1.5 AGING VALUES

For aging values for the log and the historical sensor values, the aging is entered in minutes. One day has 1440 minutes.

There are system-wide options. These options are configureable:

6.1.6 AUTOMATIC REJOIN PROCESS

Due to LoRaWAN® standards, every new join request of a physical sensor needs to lead to a new Device Address. Since AW3000 stores historical values following that DeviceAddress, a new datapoint may occur after a new join request/process.

Some sensors are chargeable, and they often reset during the charging process. This causes them to be considered a new sensor with a new join request. The same applies to sensors that need battery swapping, or solar-powered sensors without enough recent sunshine for charging. Some sensors also reset due to a firmware bug.

Enabling the automatic rejoin process option bends LoRaWAN specifications. While some LoRaWAN protocol versions know a rejoin process, version 1.0.3, which is being used here, does not. In this case, a previously known sensor just gets in place with the old DeviceAddress it had previously.

6.1.7 SAVE LOG ENTRIES ERROR ONLY

Since, by default, every successful virtual sensor request is recorded in the logs, enabling this option provides information that could be useful for later device troubleshooting.

6.1.8 DO SQL OPTIMIZE TABLE AT MIDNIGHT

SQL Optimize for a SQL Database is similar to hard drive defregmentation for a computer. Enabling that option will generate an according SQL Command to Optimize all tables at midnight.

6.1.9 SENSOR GROUPING

This option is also disabled by default. Having many sensors, either virtual or physical, will cause a long Webpage Sensor's list. Therefore, for every sensor, a Groupname can be defined. For physical sensors, by default, the groupname is vendor and model. For virtual sensors, by default, the groupname is **New**.

To edit a Groupname, click on **Edit** for a physical or virtual sensor. Enabling the option for sensor grouping will then change the display on the webpage sensors and cause sensors to be sorted according to the group name.

The sorting happens according to a main group and a sub group. This is derived from that single group name.

EXAMPLE:

For a groupname called "Saxony Anhalt," the main group is "Saxony," and the sub group is "Anhalt." The view in webpage sensors with grouping enabled is also very intuitive, since it is presented like folders on your computer's hard drive. A small bomb that appears for a main or sub group indicates that actions are defined in this group. This makes it easier for you to keep an overview.

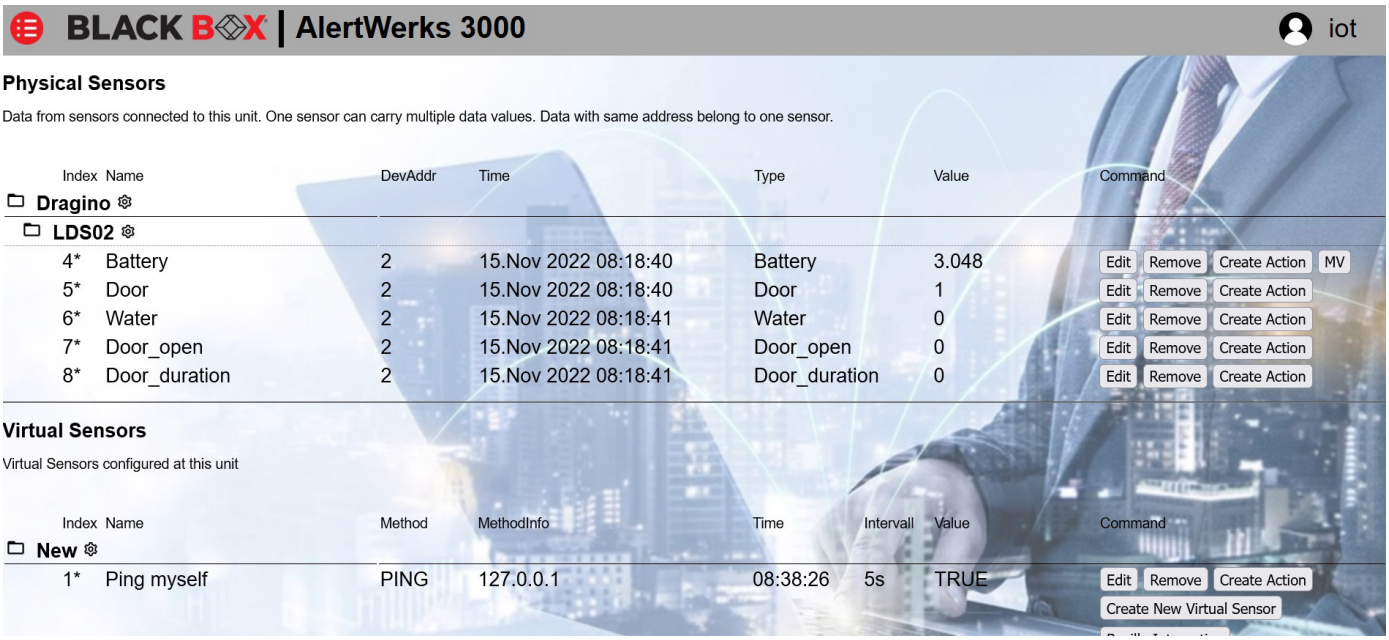

FIGURE 6-2: SENSOR PAGE WITH SENSOR GROUPING

6.1.10 ALLOW SWITCHING OF RELAYS IN DASHBOARDS

There are relays available being either physical or virtual sensors. Mainly these are any On/Off actuators. Examples include an AC power outlet sensor and actuator, or Shelly WiFi devices.

If your sensor is a relay, it is known to AW3000 automatically. These typically contain values of either ON or OFF. You may place these sensors as a dashbox of type value to one of your dashboards.

With this global setting, you enable to allow switching these relays on these dashboards with dashboxes of type value for these relays. The default setting is disabled.

6.1.11 ALLOW SNMPSET TO RELAYS DISABLED

These relays (see "Allow switching of relays in Dashboards") can also be triggered by SNMPSET commands to AW3000 if this global option is enabled. Default is disabled.

6.1.12 SENSOR TYPES UPDATE

With the update procedure for AW3000, new available payload decoders and MAC command options are downloaded and installed. This option is enabled by default. If you disable it, the payload decoders and MAC command options are not changed within the update process.

This is important if you changed payload decoders or wrote your own ones.

6.1.13 SENSORS TO ERROR IF LASTRADIO>1H

Any physical LoRaWAN® Sensor that no longer transmits values is set to ERROR for all values of this sensor. This global option is disabled by default. Having this option enabled allows you to set an action if value is “ERROR” to notify you when a physical LoRaWAN sensors stops working.

6.1.14 NO CFG-PAGES BACKGROUND IMAGE

If you do not like the background image on the configuration pages, select this option.

CHAPTER 7: USER MANAGEMENT

7.1 SETTINGS

Once you power up AW3000 for the first time you are logged in as a default user.

The default user is **iot** with the password **iot**.

Once you click on **User Management** from top left menu, you have the ability to change that setting. Every user has a database-wide, 16-bit field of access rights. One of the bits defines a user as the default user.

The default user is always logged in and is never automatically logged out unless you manually log the user out. On all web screens you see the current logged in user in the middle of the top banner. Clicking on that name leads you to logging out.

Even if you defined a default user (with all or restricted access rights) you can log that user out and log in as another user with extended access rights.

For security reasons, AW3000 never stores any cookies on your computer. For every connection, a file is stored on AW3000. You can find that file in /tmp and it´s name is "U-xyz," where xyz is the IP Adress of the logged in user in hexadecimal format.

Also, for security reasons, every connection and login data is valid for one hour using that IP Address and that browser. This enables you to bypass any Client methods of keeping the connection alive, and no one can retrieve login data from computers logging in. Furthermore, stored passwords on the client may help while logging in, but no automated process will take place.

With access rights, you can define which functionality is allowed for that user. **Can access settings**, **can access logs**, **can access user management**, and **can amend sensor settings** enables the corresponding access. With **can see all dashboards** right enabled, that user can see all defined dashboards. With that access right disabled, that user can only see the user-defined dashboards.

As the administrator, you can set up any user and define dashboards and dashboxes. If you bundle that feature with **can amend dashboards**, you have a defined and unchangeable view for that user.

Users with the Datamanipulation option selected get an option when amending a dashbox.

Datamanipulation means that the system analyzes historical data and provides the option to remove values from historical data either being twice or four times higher or lower than the average. Since some sensors, especially virtual sensors using WGET method, sometimes produce useless values, this is a nice way to clean up data.

CAUTION: Be careful when enabling Datamanipulation, since data can only be restored through a database backup restore if something is removed by mistake.

If you locked yourself out or forgot your password, use the CLI/Bash of HDMI/USB Output of your AW3000. To do this create a file in /tmp with name **resetme** while AW3000 is running.

The file content is not important, since the file creation causes the user credential database to be reset to factory default and AW3000 to restart.

CAUTION: For those that use a centralized database using SQL, this method will erase the credentials on the centralized database.

CHAPTER 8: OBTAINING A WORLD MAP OF INSTALL SITES

8.1 HOW TO OBTAIN A WORLD MAP OF YOUR INSTALLATION SITES

Now that you have your IoT network in place using AW3000, you may want to extend the system. See Chapter 11: Tips and Tricks to learn how to use a common database for multiple AW3000 units.

You may want to consider activating grouping of your sensors. See Chapter 6: Settings and Logs for instructions on enabling sensor grouping. This provides a much better overview once you have multiple sites and multiple sensors.

In this chapter, we will cover how to get a world map of your installation sites. Having multiple units and sensor grouping enabled is essential at this point.

To obtain a map of your installation sites, AW3000 needs to know where your installation sites are located. This works through Latitude and Longitude GPS Coordinates. The easiest way to obtain these values is by using a GPS Tracker Sensor for every site. This GPS Tracker Sensor needs to be member of that group that represents your site. Alternatively, you can enter GPS Coordinates for a group on the sensors page manually.

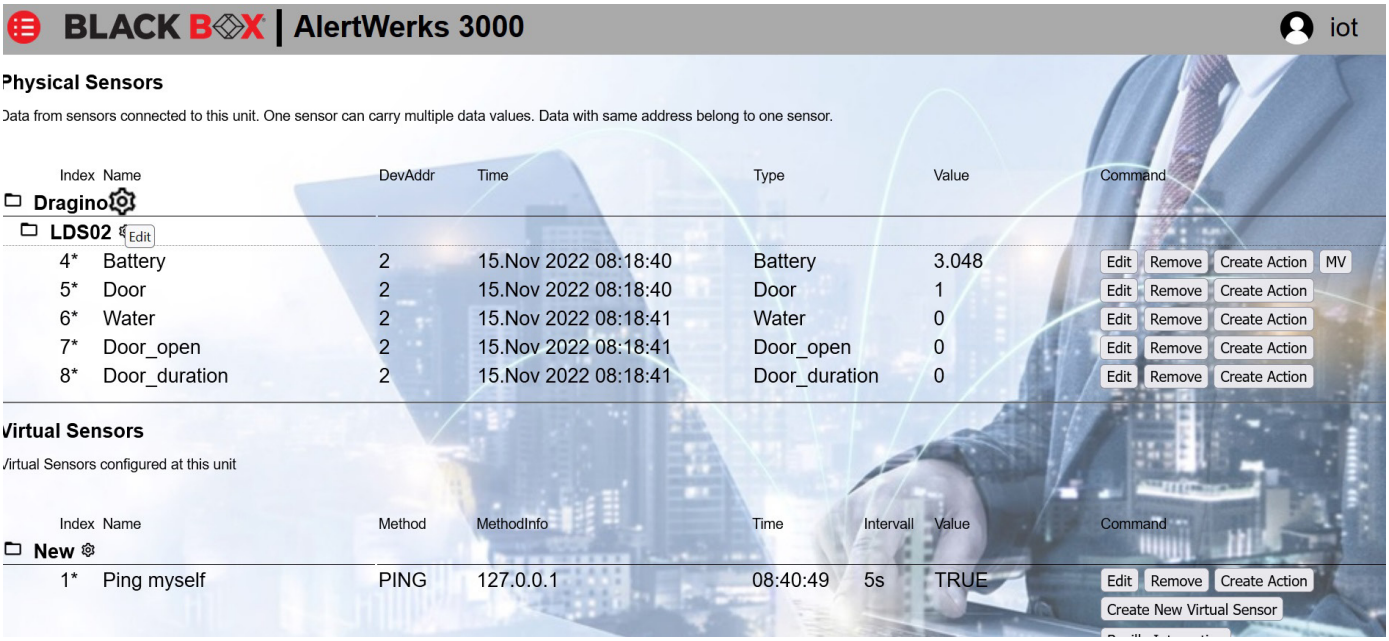

FIGURE 8-1: SENSORS PAGE

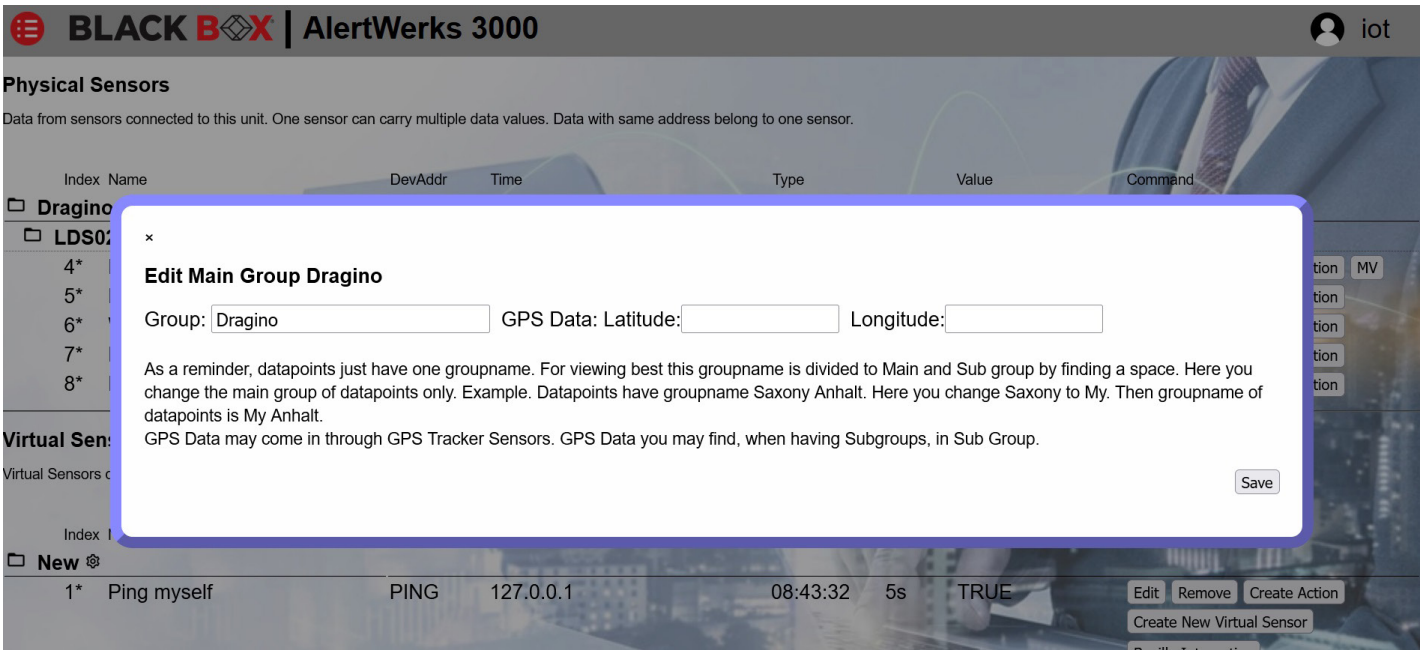

FIGURE 8-2: EDIT SCREEN

Moving datapoints from one group into another works by using **Edit** to change the Group Name for that datapoint. The main group and the sub group, separated by a space, make the group name. Do not use any special characters in these fields.

EXAMPLE:

If the sensor group group name is "Dragino LDS02," then the main group is "Dragino," and the subgroup is "LDS02." When you click on **Edit** for that main or sub group, the edit feature renames the corresponding field.

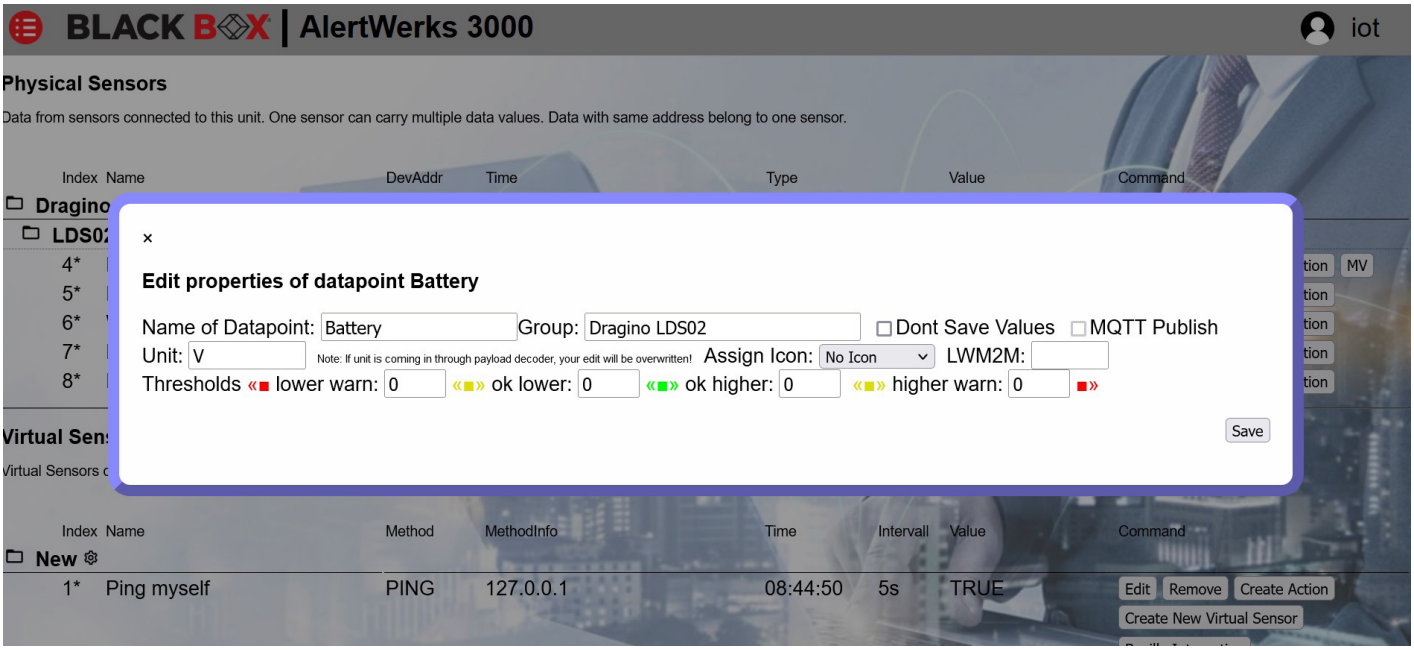

FIGURE 8-3: CHANGING A GROUP NAME

After you have your groups set up and sorted according to your preference with GPS coordinates, change to dashboard and select **Add a dashboard**. Enter **EARTH** for the name, and attach it to group **EARTH**.

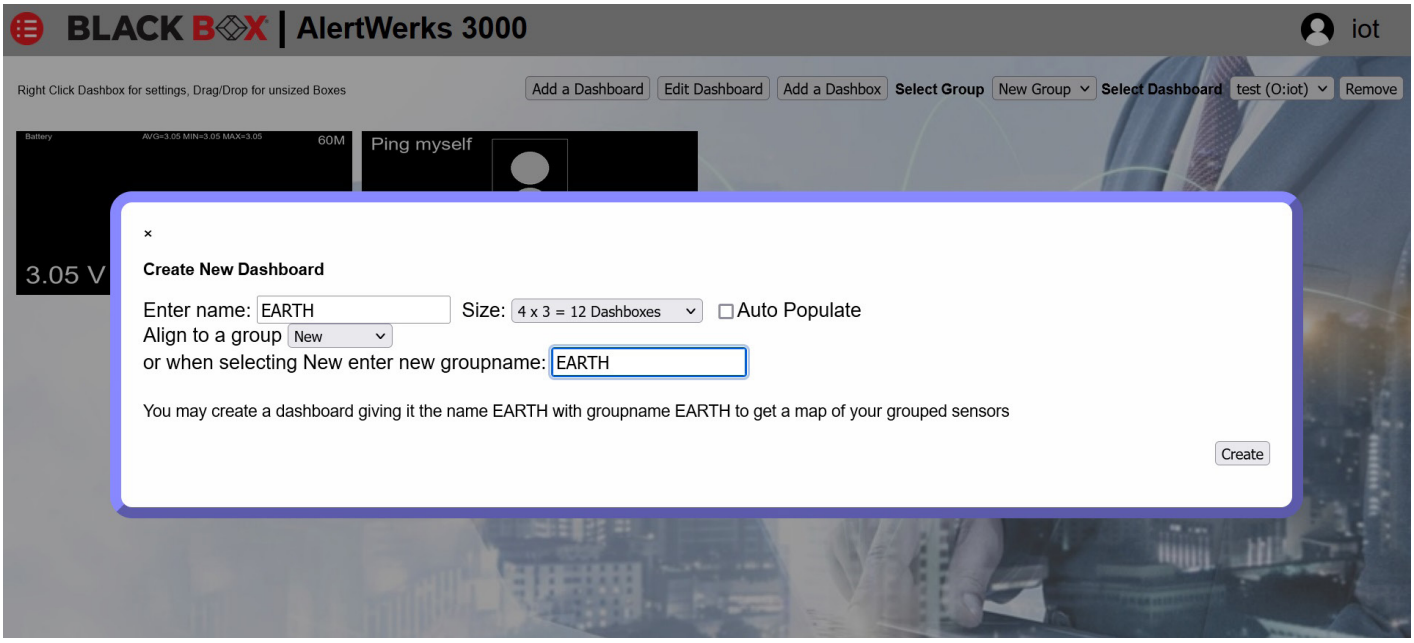

FIGURE 8-4: ENTERING A NEW GROUP NAME

CHAPTER 9: CUSTOMIZING DASHBOARDS AND DASHBOXES WITH IMAGES

You should now see a screen similar to this:

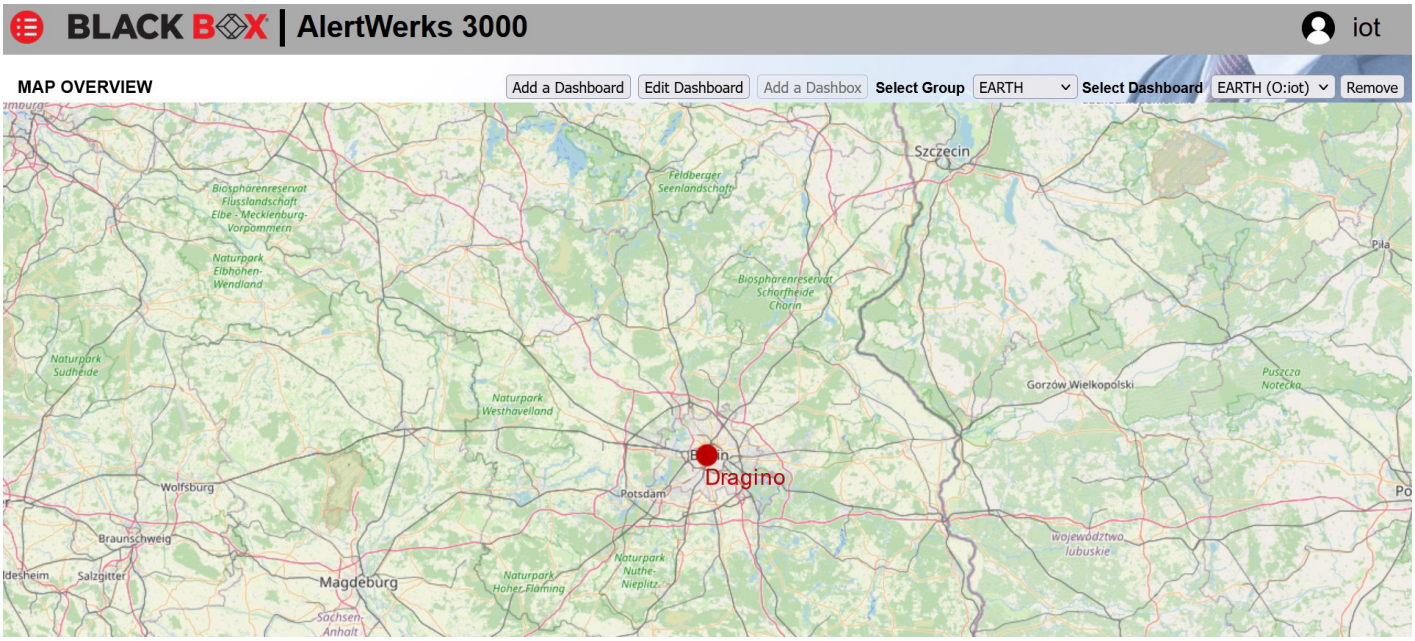

FIGURE 8-5: SAMPLE MAP SCREEN

The MAP is centered for your site and zoomed acordingly. For these sites you can now define Jump Points. A jump point indicates which dashboard should be presented once that site is clicked. Therefore, this is a drill-down functionality.

If you left-click on that site, a hint about how to define the jump point appears. Right-click on it. On the next window, define the dashboard to call.

The position on the map in terms of the color represents the state of all sensors in that group. That is either green, yellow or red. For this setting, sensor threshholds are essential.

CHAPTER 9: CUSTOMIZING DASHBOARDS AND DASHBOXES WITH IMAGES

9.1 CHOOSING IMAGES FOR DASHBOARDS AND DASHBOXES

Apart from having a world map for your installation sites, having floorplans and application drawings with jump points are possible. See Chapter 8 for the definition of Jump points.

In **Settings**, you are able to upload 2D and 3D images. These can be used as background images for any dashboard. You can also place this on a dashboard as dashbox type image.

9.1.1 CREATING DASHBOARD IMAGES

To create a dashboard type image:

1. Switch to **Settings** from the top left main menu.
2. Upload a file.

   NOTE: The maximum file size is 1 MB for 2D and 10MB for 3D. Zip files for 3D.
3. Switch to Dashboard and call a Dashboard (or define one) with space left.
4. Add a Dashbox and select **Image** (2D, for 3D use 3D).
5. Right-click on that empty Dashbox and select the image you uploaded.
6. Resize and center the image, if desired, depending upon the image's resolution.
7. Define a transparent background for your image, if desired.
8. Right-click on that dashbox and click on **Click here** after the text **To place objects**....

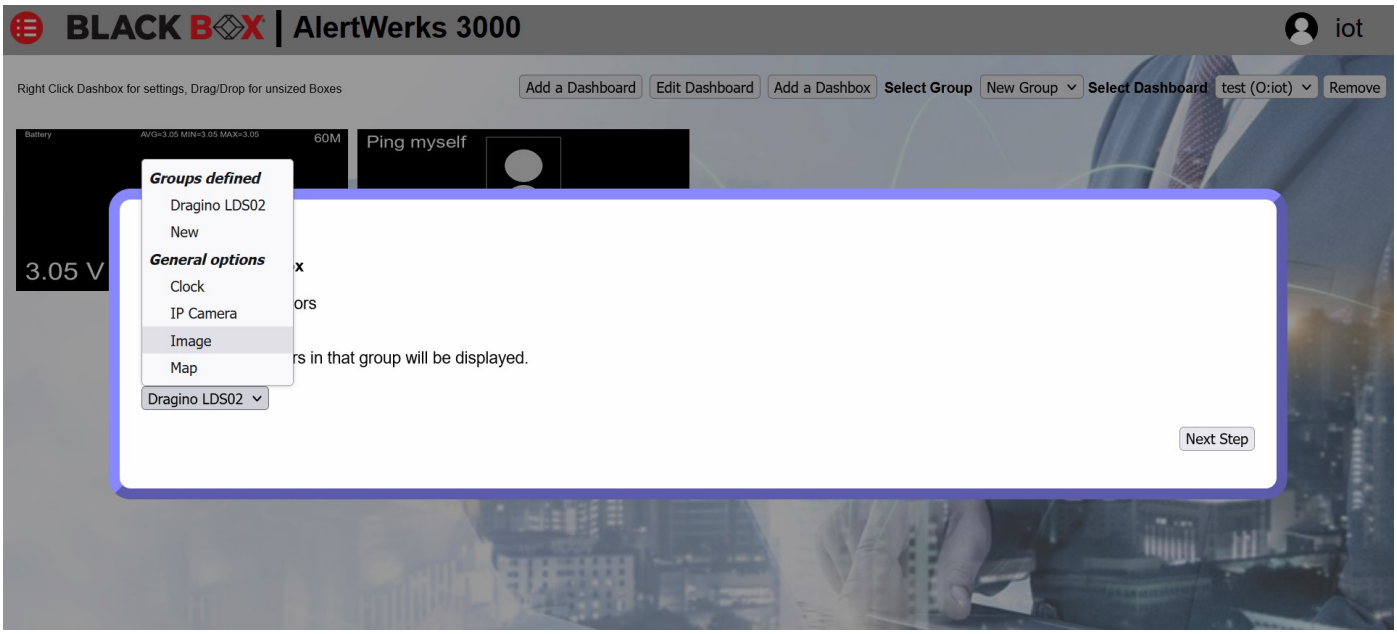

FIGURE 9-1: IMAGE OPTION

CHAPTER 9: CUSTOMIZING DASHBOARDS AND DASHBOXES WITH IMAGES

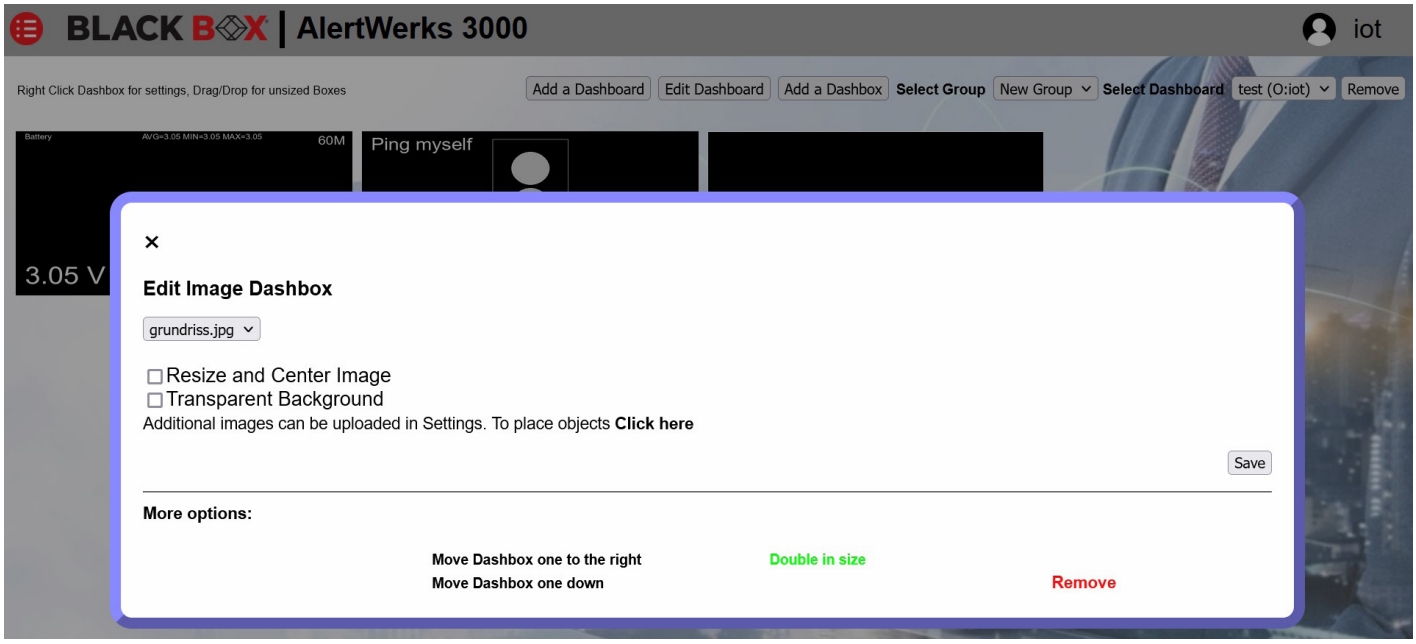

FIGURE 9-2: EDITING AN IMAGE

In a new browser window the FileDesigner is started.

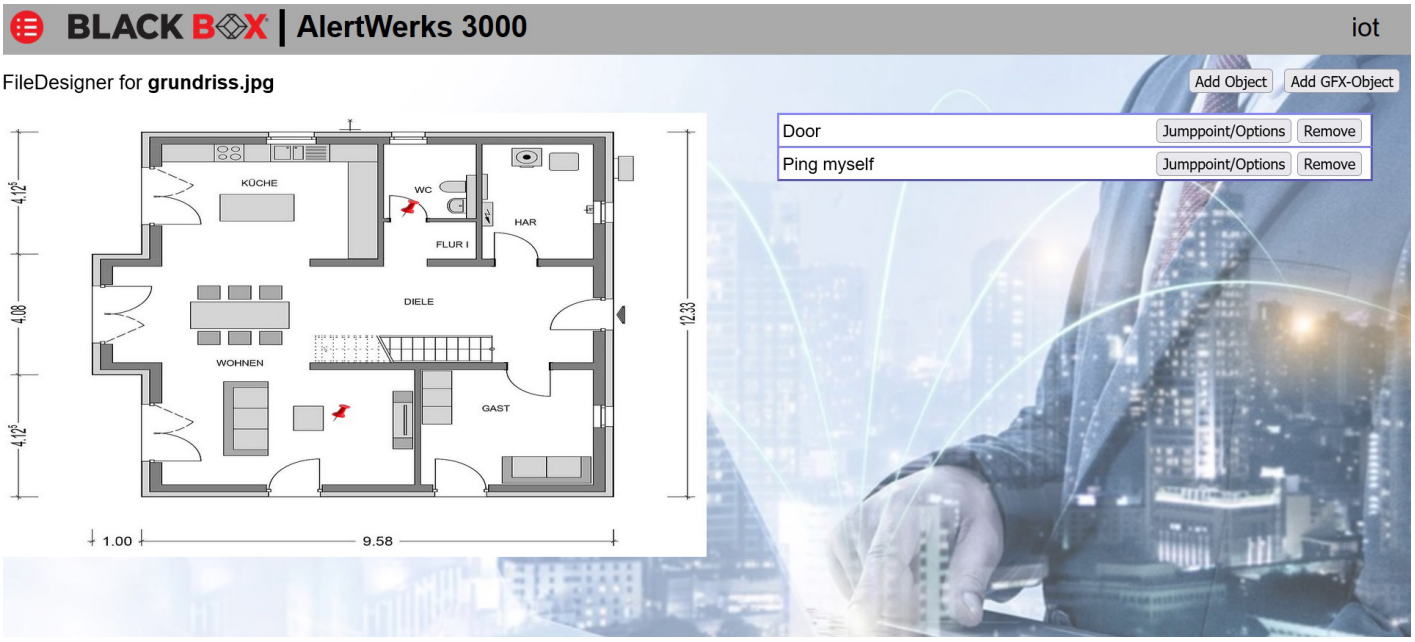

FIGURE 9-3: FILE DESIGNER SCREEN

CHAPTER 9: CUSTOMIZING DASHBOARDS AND DASHBOXES WITH IMAGES

In the given screenshot example, two objects are already defined.

To create your design:

1. Click on **Add Object** in the top right.
2. Select a group or a single sensor from a group. The new object appears in the image on the center.

   NOTE: If you can't view the object, hover over the entry top right, and the object is then highlighted.
3. Move the object to the desired location.
4. Select **Jumppoint/Options** for that new object from the right pane.

   NOTE: for 3D also use Cursor Up/Down while moving to change the height. A standard PC mouse is 2D capable.

You can define which Dashboard is called when the object on the image is clicked. There are also options for opacity and **Pop up** or **Stay up**. You can decide these options for each object individually.

CHAPTER 10: COMBINING ALERTWERKS WIRED AND ALERTWERKS AW3000

10.1 CHOOSING IMAGES FOR DASHBOARDS AND DASHBOXES

In many projects both platforms will be combined, since a wired IoT System delivers continuous sensor data, especially when using with legacy protocols, such as ModBus or dry contacts, AlertWerks™ wired has some advantages over a wireless system.

Both platforms can communicate with each other using the SNMP protocol and other means. To prevent two systems in parallel from needing administration, AlertWerks Integration is possible.

10.1.1 ALIGNING WIRED AND WIRELESS ALERTWERKS SYSTEMS

To align the systems:

1. Set up AW3000 according to Chaper 2 of this manual.
2. Set up AlertWerks Wired according to the manual.
3. Connect your physical wired sensor to any port of AlertWerks wired and remember the number.
4. Configure thresholds and the name of that new wired sensor on Web I/F of AlertWerks Wired.
5. Create a virtual sensor in AW3000 using AlertWerks Wired integration.
6. Configure just the IP adress of AlertWerks Wired and the port number of the sensor.

Values, Thresholds, and Names are now retrieved and steadily aligned.

If you want to integrate AW3000 into AlertWerks wired, you also need to use virtual sensors.

Use the OID 1.3.6.1.4.1.6878.x.y1.y2.3 with multiplier 0.001. While x, y1 and y2 are:

X	1=Physical Sensor, 2=Virtual Sensor
Y1	MSB of Index Number
Y2	LSB of Index Number

EXAMPLE 1:

For Physical Sensor 33 use: 1.3.6.1.4.1.6878.1.0.33.3

EXAMPLE 2:

For Virtual Sensor 256 use: 1.3.6.1.4.1.6878.2.1.0.3

Using the second method, values are only imported to AlertWerks Wired.

CHAPTER 11: TIPS AND TRICKS

11.1 TIPS AND TRICKS

11.1.1 COMBINING ALERTWERKS WIRED AND WIRELESS

The old series of IoT and environmental products has existed for more than 10 years. Both series allow the use of virtual sensors. Using these and SNMP is the way to combine both platforms. However, AlertWerks™ Wired initially only knew integer values. So the old AlertWerks Wired (ServSensor) did not have 13.8 degrees celsius, just 13 or 14 degrees celsius. That is why the old series just delivers integer values by SNMPGET. The updated series AlertWerks Wired Plus therefore multiplies the value. When getting the values in you need to divide them again by the corresponding factor.

The SNMP Tree of AW3000 for combining both series provides all values either as string (for example „13.8“) or as multiplied (by 1000) value for the Wired series. Enter multiplying factor **0.001** for your virtual sensor in AlertWerks Wired accordingly.

The SNMP Tree for AW3000 is very simple. The OID .1.3.6.1.4.1.6878.x.y1.y2.z where x is either 1 for physical sensors or 2 for virtual sensors, y1 and y2 is MSB and LSB of the index number of the sensor and z is either 1 for the string representation of the value, 2 for the name of the sensor, and 3 for the multiplied integer value of the sensor.

Unless you need special information pieces from AlertWerks Wired, the method of using the integration (see Chapter 10) is recommended.

11.1.2 ACCESSING THE DATABASE

AW3000 is an open platform, so you can access the database directly. The database being used is MariaDB. We set up an account just for reading values from the database.

Credentials are **iot** as a username and **iot** as the password

Port used is the standard port **3306.**

This account does not have access rights for all tables and does not have the right to change tables or values. If you want to use data for other systems and platforms, however, this may be, apart from using SNMP, the easiest and fastest way to accomplish this task.

11.1.3 ACCESSING LINUX

The top menu while using HDMI/USB of the unit enables you to access the bash. Since Black Box tech support does not provide assistance with Linux, we recommend that only experienced Linux professionals use this feature.

An IT professional may use the bash for security purposes. Since no firewall is configured, you should not place AW3000 as-is in any DMZ.

11.1.4 CHANGING THE ALARM SOUND

The Settings page allows you to upload audio files in WAV or MP3 format. The standard alarm sound alarm.wav is not removable, but your uploaded audio files can then be selected when amending the action defined.

11.1.5 UNTESTED AND UNCERTIFIED LORAWAN SENSORS

While joining a sensor you need to provide the vendor and part number. For every one of these a payload decoder is configured. If you want to use any sensor not listed and if doing an update of the unit did not help, then you may want to configure your own payload decoder.

You need to have know how to do this in PHP programing and you need to have certain knowledge about your sensor. If that is the case, visit http://<youripofalertwerksiotweb>/sensortypes.php.

If you do not know how to do that, Black Box can offer a paid and managed service, since Black Box technical support will not support problems caused by improper programming.

11.1.6 SD CARD CAUTION

CAUTION: Do not plug the sd card into a Windows(C) PC. Doing so will corrupt the image, and you will need to order a new prepared SD Card from your Black Box representative.

11.1.7 CHANGING THE DATABASE TO MY OWN DATABASE OR HOW TO DO REDUNDANCY AND LORAWAN WIDE AREA NETWORKS

The settings menu allows you to change the database in its location. That allows you to use a database on your servers. It also allows you to build up a large LoRaWAN® AW3000 infrastructure with redundancy.

For transfering the database the first time, you need to use an user account of your database with CREATE TABLE and DROP TABLE access rights. The database needs to be named **LoRa** and be created in advance. After first creation, user rights without CREATE TABLE and DROP TABLE are acceptable, but they are needed for the AW3000 Restore functionality.

If you configure other AW3000 units with the same SQL database, all units work with the same information. You may have noticed small asterisk after the index numbers on the **Sensors** page. As long as you are only running one AW3000 unit, that asterisk appears for every physical and virtual sensor. This does not occur when you are running multiple AW3000 units with one common database.

The asterisk shows if the current unit you are viewing the webinterface from owns that physical or virtual sensor. Ownership can, may, and will change with more AW3000 units.

For a virtual sensor, that unit has ownership of the sensor where it was configured. If that unit could not keep the intervals (because it is offline or too busy) another AW3000 unit may take ownership.

For a physical sensor that unit has ownership where it was best received. If it is later better received by another AW3000 unit, ownership may change.

All actions being setup are executed by the AW3000 unit having sensor ownership. That way the system balances itself and does the redundancy work for you.

An appropriate network needs to be available to connect all units to your central database. You need to set up virtual sensors in a way that all AW3000 units can execute them.

By checking the **Settings** page, you have an overview for your AW3000 domain. All IDs are listed and when they last time did something.

NOTES:

- **The port is fixed to 3306, and the database name needs to be LoRa. This part is not changeable.**
- **If you need to revert to defaults, remove the file /home/pi/sql.conf, and reboot AW3000 to return to SQL connection information defaults.**

TABLE 11-1. TYPES OF DASHBOXES WHEN SELECTING A DATAPOINT

TYPE	DESCRIPTION
Graph	This gives you a graph. You can also define the time scope.
Tacho	This gives you a tacho. If you configured Thresholds, these are accordingly used. Without thresholds the tacho uses min/max value of the time scope defined.
Traffic Sign	This gives you a traffic sign. It is either red, yellow, or green. This dashbox needs thresholds to be set.
Value	This dashbox displays the current value. The system allows the option of having the background color change on values if thresholds are defined.
Map	This dashbox shows a map. The value needed is COMBINED GPS Coordinates. This means you need to first create a virtual sensor to do COMBINE with latitude and longitude of a GPS Tracker sensor.

TABLE 11-2. GENERAL DASHBOXES

TYPE	DESCRIPTION
Clock	This dashbox shows either a digital or analog clock.
Overview	This dashbox is only available with sensor grouping enabled. (See Settings.) A list with values of all sensors in a certain group appears.
Image	This dashbox shows an image (See chapter 9).
3D	This dashbox shows an 3D image and allows you to move it.
Camera	This dashbox shows pictures from IP Cameras.
Map	This dashbox shows a map just like the dashboard feature **EARTH**, but as one dashbox. This feature needs Sensor Grouping enabled and Group names to be defined in the dashbox's settings.

11.1.8 4G/LTE CONNECTIVITY

AW3000 is prepared to accept 4G/LTE USB sticks. Make 3372 from Huawei is compatible. This allows you to connect AW3000 units to the internet by plugging in the 4G USB stick and entering the PIN for the new upcoming interface. From the **Settings** menu, you can then use the Dynamic DNS functionality to obtain units. If you are using the redundancy feature mentioned earlier with 4G, consider latencies and other network issues.

SMS sending or actions with outgoing voice calls is not allowed when using 4G/LTE USB sticks.

11.1.9 AMOUNT OF SENSORS, DATAPOINTS, AND ACTIONS OR THE BEENLATE FACTOR

The amount of sensors, datapoints, and actions is not limited by nature of programming, since you define the limit. If you configure virtual sensors with their lowest intervals, AW3000 will eventually no longer allow new creation of virtual sensors. In the background the "BeenLate" factor is calculated which gives the unit an impression if all jobs are done on time. If that is not the case, the "BeenLate" factor rises.

The unit considers timing and will not allow all events happen at the same time. Below is a small table of what is possible:

Intervals below 1 minute:	maximum physical/virtual sensors and actions: 10
Intervals 1-10 minutes:	maximum physical/virtual sensors and actions: 25+
Intervals 10-30 minutes:	maximum physical/virtual sensors and actions: 50+
Intervals 30+ minutes:	maximum physical/virtual sensors and actions: 100+

We can only provide approximate values here because latency and Time-on-Air differs from physical to physical sensor and from virtual to virtual sensor.

NOTE: Not every IP device answers an SNMP get instantly.

CHAPTER 11: TIPS AND TRICKS

NOTE: The previous information needs to be read like approximately 25 physical and virtual sensors counted together plus the actions. For example, 5 actions, 5 physical sensors, and 15 virtual sensors. Using your own database or a centralized redundant database for many units changes these calculations dramatically depending on the power of your database server.

11.1.10 DATA STORAGE

The size of the provided SD card is 64GB. Since aging is, by default, one month, historical data and logs with entries older than 30 days are purged. You may change that value in the top left menu **Settings**. You may decide to store certain values and not to store other values by clicking on the **Edit** option for virtual sensors or datapoints.

11.1.11 IP CAMERA LIVE FEEDS

A Dashbox can be of Type **IP Camera** for live feeding pictures onto the dashboard and into that Dashbox. Since this feature needs web browser capabilities, not all URLs from your IP camera may work. However, many cameras have an URL that provides an image as a snapshot. Since Dashboxes are actualized every second this may work for you as well.

Dashboxes with IP Camera Live Feeds can never be interactive. See below.

11.1.12 CLOCK DASHBOX

A Dashbox can be of Type **Clock**. You can visualize the clock as an analog or digital clock. For the digital clock, it can use either EU 24 hour format or US 12 hour AM/PM format. You can also define an offset to visualize time in other time zones.

Dashboxes with Clocks can never be interactive. See below.

11.1.13 HISTORICAL DATA AND ASSIGNMENT TO DEVICE ADDRESSES

In the LoRaWAN® universe physical sensors being joined are identified by a network-wide, unique Device Address. That is a 32-bit field where the upper bits are for defining the network. If AW3000 tells you it is Device Address 32, the hexadecimal equivalent with network identifier would be “BB000020.”

NOTE: Since Device Addresses need to be unique, a physical sensor gets a new Device Address after every new join process. Historical data, however, is assigned to Device Addresses.

As a result, you may encounter this situation: You join a sensor which gets Device Address (leaving out the network identifier part) of 32. You collect historial data for one week. Then someone, by chance, hits the reset button of that sensor, and a new join process happens. Since the Appkey never changes for a physical LoRaWAN sensor unless you change it, you have new datapoints for Device Address 33 not ,connected to the historial data of Device Address 32.

For that case, there is that button **MV** in the sensors page. That allows you to assign the historical data behind that datapoint to another Device Address.

Since there are many variations of LoRaWAN sensors, this is the best solution in this circumstance. Also consider that some sensors do not remember having joined a network when unplugging the battery.

The alternative is to enable **Automatic Rejoin** in **Settings**. (See “Settings” in this manual.)

11.1.14 MISSING REMOVE BUTTON

Once you joined a sensor, you can’t remove it. If you remove datapoints for this sensor and if that sensor is still active, with next data transmission the removed datapoints return. Removing a datapoint mainly deletes historical data.

If a sensor is joined, but is no longer transmitting for more than one hour, the **Remove Button** is shown again. By removing that sensor, all information about the join process and established encryption keys is lost. Removing the sensor, however, does not automatically remove the datapoints.

11.1.15 UNLOCK CODE

The unlock code is provided to you by a Black Box tech support team member. The Black Box tech support team member needs to know the EUI64 ID of your unit. You can view that on the start screen or in settings.

The unlock code is just for one purpose: to change the frequency setting. The unlock code is only valid for one hour and will only be issued when Black Box's technical support determines that it is necessary.

11.1.16 INTERACTIVE DASHBOARDS

You may encounter situations where you want to have interactive dashboards. There is the method of force view of a specific dashboard, and there is the method of changing a dashbox in a dashboard. Interactivity may involve clicking on one.

NOTE: We recommend creating a user that does not have the ability to amend dashboards and dashboxes.

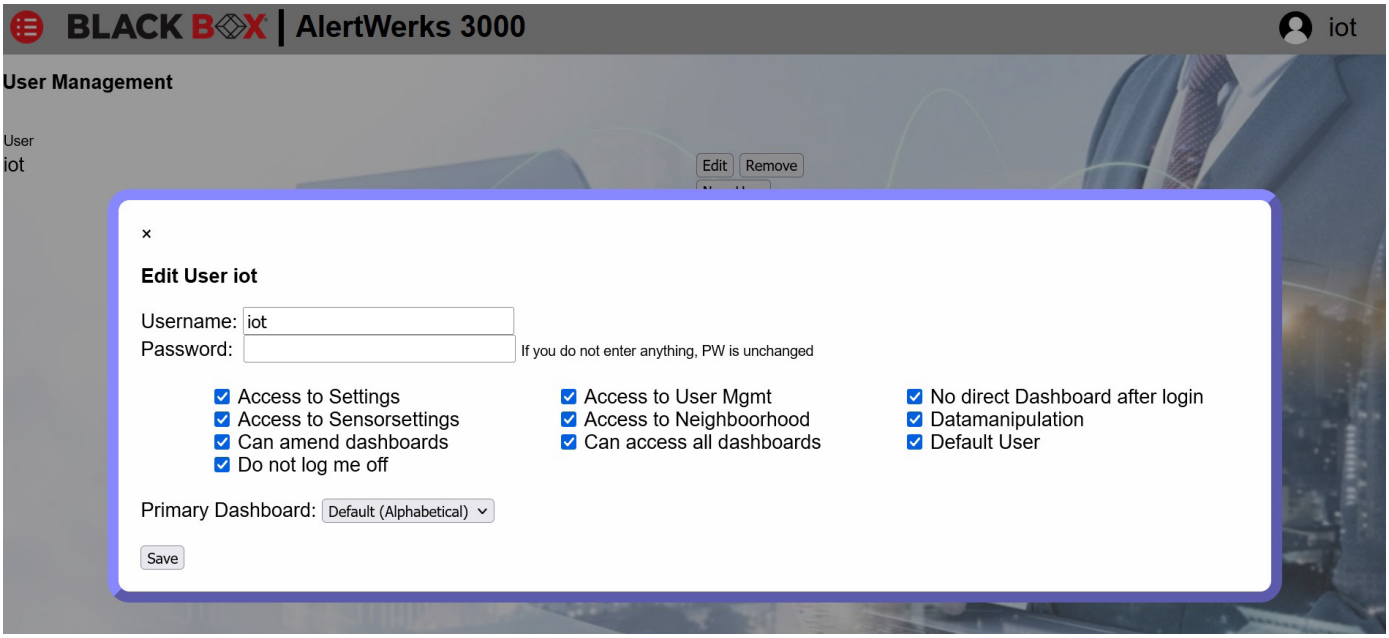

FIGURE 11-1: USER ACCESS, INCLUDING SETTING TO AMEND DASHBOARDS

On this screen, only the option for the user to be able to access all dashboards is relevant.

Continue with a user logged in that can amend dashboards.

For every dashbox you can set up a jump point. If you click on one dashbox you can define elements including type and timing for that dashbox. There is also a field **OnClick go to**.

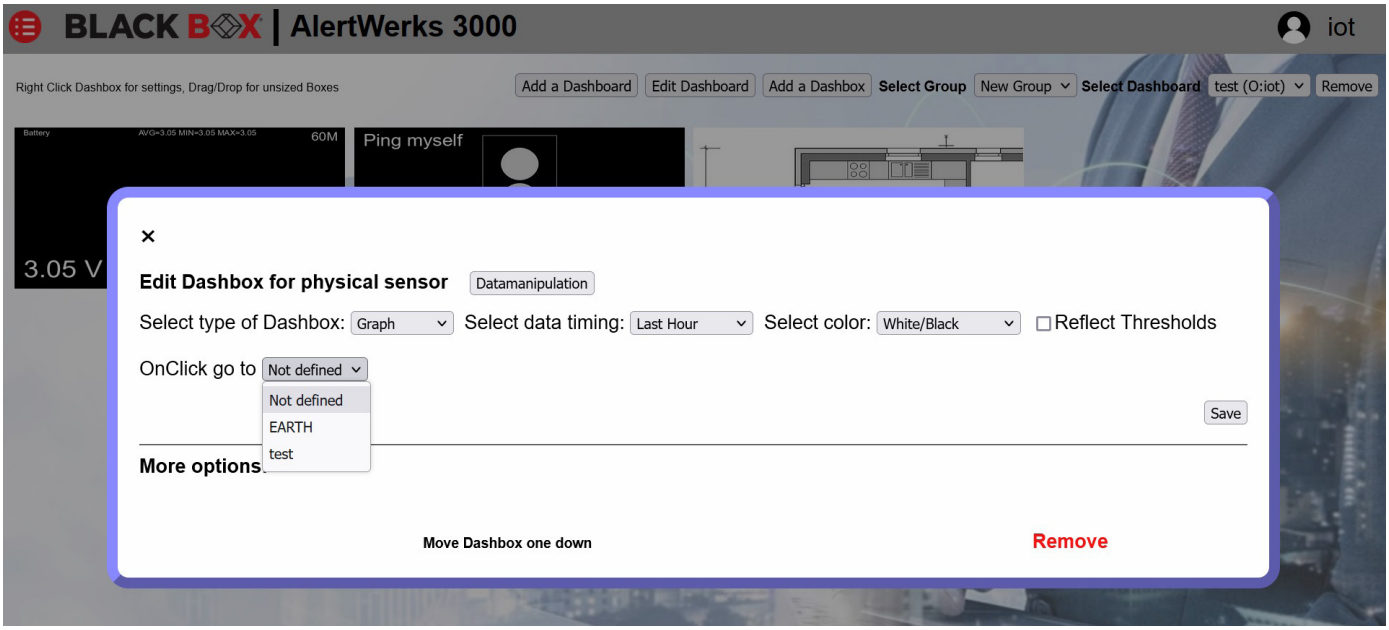

FIGURE 11-2: SCREEN WITH ON CLICK GO TO SETTING

This field lets you specify which dashboard is called up when that dashbox is clicked by someone without privileges to amend dashboards.

NOTE: if that specific user does not have the chance to access all dashboards and if you define a jump point of a dashboard that he is not owner of, his default dashboard is displayed

11.1.17 SHELLY DEVICES

For Home Automation there are Shelly devices available. These are devices connecting to WiFi/Wireless LAN. There are various types of Shelly devices available. The best fit for the IoT example is the Shelly RGBW Bulb. This is a E27 form factor Multicolor LED Lamp.

Being new, these start a new WLAN Network. Once you connect with your PC to this, you can configure the Shelly Device with its Default IP: 192.168.33.1.

Once you configured it to be in your normal WiFi/WLAN with connectivity to AW3000, you are able to integrate these, control them, and use them for actions.

The best and ideal use case here is using the Shelly RGBW Bulb for signaling of error conditions. On the **Sensors** page of AW3000, you start the Shellyscan which scans your network (Class C only supported) for new Shelly devices.

Once these are detected, you may use for any sensor an action to switch Shelly Relays upon values being beyond or below certain values. For the Bulb you can enter the RGBW value.

11.1.18 LARGER DEPLOYMENTS

This manual is intended as an introduction to AW3000 and LoRaWAN® technology. It is one of the uniquenesses of AW3000 that users can work step-by-step and grow with the solution.

For larger deployments, pre-provisioning can be utilized through that icon on the **Neighborhood** page. You will need a file with AppEUI, DevEUI, Appkey, and a name for the sensors. The sensors you select should be available as Generic in AW3000.

After clicking the **Pre Provisioning** icon, you can copy and paste text into the field shown with AppEUI, DevEUI, Appkey, and name seperated by a semicolon. Using the CSV Export function within Excel will provide you with the necessary file.

These sensors will be configured for AW3000 (or the AW3000 domain) accordingly. Once they are visible to AW3000, they will be joined automatically. The matching sensortype and Payload Decoder is derived and selected from the DevEUI. For those not being able to select a proper payload decoder, the **Neighborhood** Webpage will show the option of **Sensortype**. Here you can then select a specific sensor type manually.

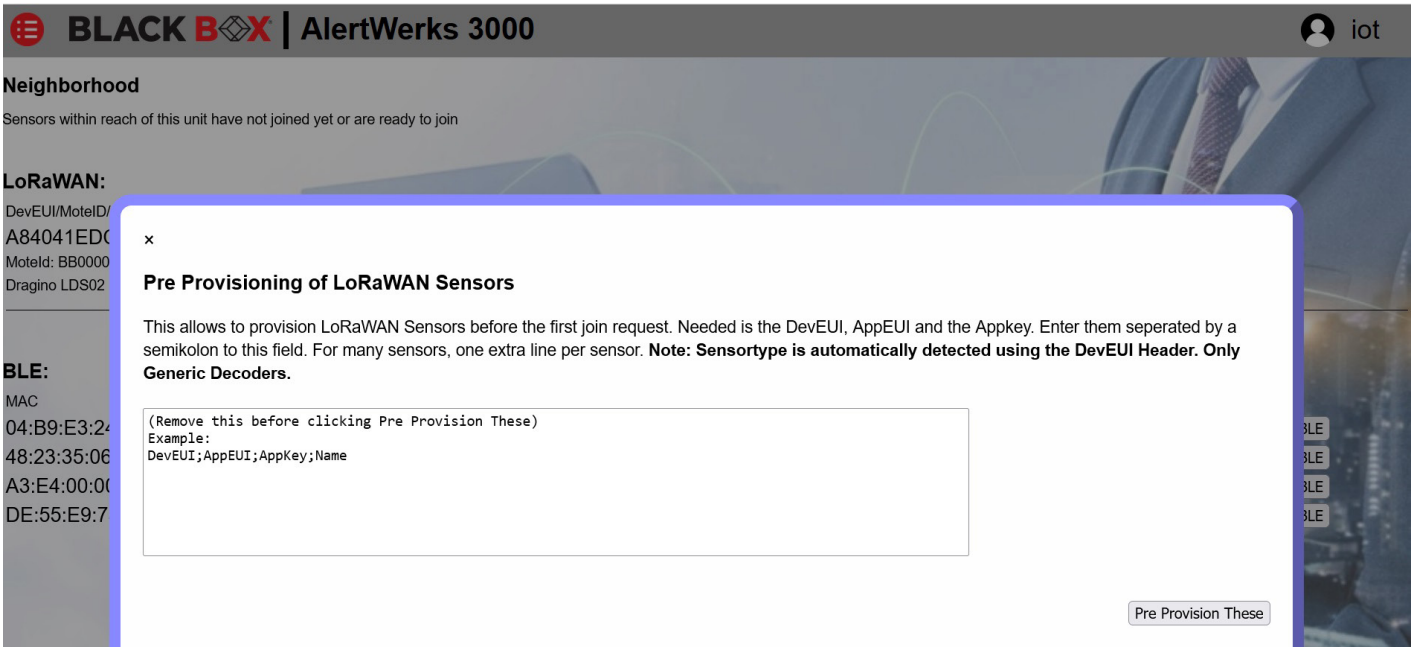

FIGURE 11-3: PRE PROVISIONING SCREEN

This method is then even supported by the **Auto Population** functionality for creation of dashboards.

11.1.19 INCORRECT DATA AND TIME

AW3000 does not have a real time clock. This means once you power AW3000 Off, time does not change. If you then repower AW3000, date and time continues at the point where it was powered off. AW3000 is configured to get date/time from your network or via the internet.

This means that this will only happen to you if (a) you powered AW3000 off for some days and (b) it does not have network connectivity with an NTP broadcast server or any internet connectivity.

In this case, you need to set date and time manually or connect it temporarily to the internet. To set the date and time, use the **Settings** menu and change the values accordingly. Alternatively, you can use also a Linux CLI window and execute:

Sudo Date –s „day month year hour:minute:second“

EXAMPLE:

If you wanted to change the date and time to 12:30 on April 18, 2022, enter

Sudo Date –s „18 APR 2022 12:30:00“

11.1.20 DASHBOX MAPS

You should feed the DashBox MAPS with a virtual sensor doing “COMBINE” since the dashbox needs latitude and longitude to display a valid GPS location.

NOTE: Only the viewer of the webpage needs access to the internet; the unit itself does not.

Since AW3000 is just displaying Maps from a popular search engine, the click to change settings works different for that dashbox. You need to click on the black border of the dashbox for changes.

Inside that dashbox you can scroll around and zoom in and out. The refresh rate of MAPS dashboxes is 10 seconds. Therefore, after a few seconds, you get the picture you had initially.

11.1.21 SENSOR VALUE THRESHOLDS

There is the option to set Thresholds for sensor values. If you click on the sensors page on edit for one of the sensors/ datapoints, you see the option of entering “lower warn,” “higher warn,” “ok lower,” and “ok higher.”

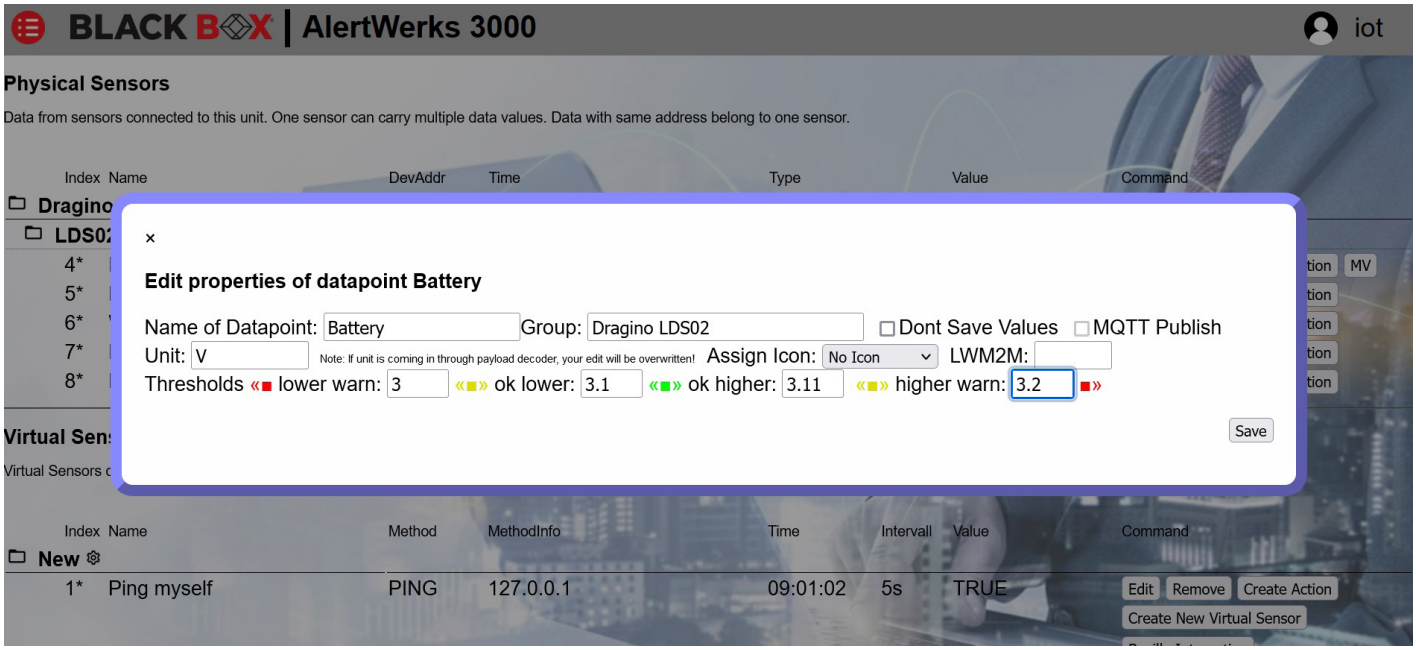

FIGURE 11-4: DATA POINT EDIT SCREEN

This option only appears for physical and virtual sensors that can receive numerical values. Setting these thresholds does not affect actions and notifications.

The only purpose of this setting is for dashboxes TACHO, TRAFFIC SIGN, maps and images with objects. While a TRAFFIC SIGN-type dashbox can’t interprete the values being green, yellow, or red for numeric values unless these thresholds are set, the meaning for TACHO is different.

If you set the values, the TACHO starts from the lowest possible value, either being from the historical values or from that setting. An example is a temperature sensor’s data point. You set the threshold lower warn to 10, but the lowest value measured was 5. Then the TACHO starts at 5. If the lowest value was 12 with threshold lower warn being 10, the TACHO starts at 10. The same principle applies to the other values.

If you do not set these thresholds, the TACHO starts with lowest and highest values from the historical database.

You can define a background color for every dashbox on any dashboard. Alternatively, you can define **Reflect Thresholds**. Then the background color of that dashbox changes from red to yellow and to green, accordingly.

NOTES

NOTES

APPENDIX A: REGULATORY INFORMATION

A.1 FCC STATEMENT

This equipment has been tested and found to comply with the regulations for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this Quick Installation Guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case, the user will be required to correct the interference at his/her own expense.

A.2 CE STATEMENT

This is a Class B product in a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

A.3 ROHS

This product is RoHS compliant.

APPENDIX A: REGULATORY INFORMATION

A.4 NOM STATEMENT

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
    A: El cable de poder o el contacto ha sido dañado; u
    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
    C: El aparato ha sido expuesto a la lluvia; o
    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    E: El aparato ha sido tirado o su cubierta ha sido dañada.

APPENDIX B: DISCLAIMER/TRADEMARKS

B.1 DISCLAIMER

Black Box Corporation shall not be liable for damages of any kind, including, but not limited to, punitive, consequential or cost of cover damages, resulting from any errors in the product information or specifications set forth in this document and Black Box Corporation may revise this document at any time without notice.

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