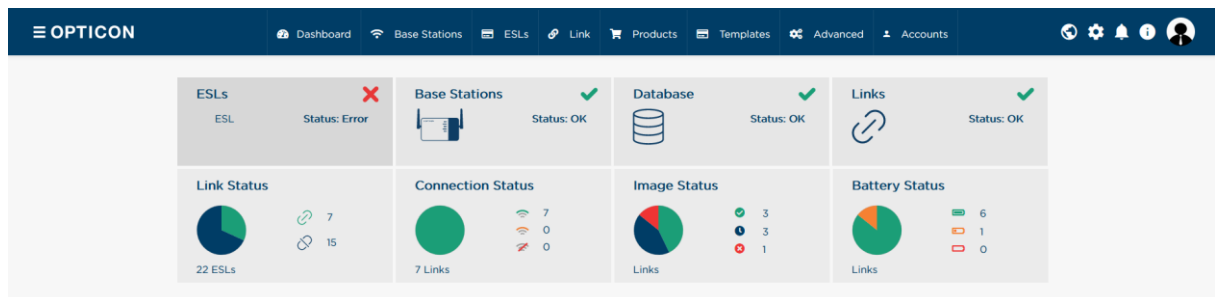


User Manual



EBS-50 Smart Base Station



ESL Web Server software

The information in this document is subject to change without notice.

Document History

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1 Features and Specifications

Abstract

This manual describes the interface and setup options for the ESL Web Server software, with additional information specific to the EBS-50, including a setup guide for new users. The EBS-50 hardware and ESL Web Server software are used in the Electronic Shelf Label (ESL) system from Opticon Sensors Europe BV.

1.1 Hardware requirements

To set up a fully working ESL solution with an EBS-50 the following hardware is required

- EBS-50 Base Station (article no. 14828)
- ESLs (see chapter [1.5 Supported ESL models](#))
- UTP cable (article no. 12607)
- 12V Power supply (article no. 14845) or LAN with Power-over-Ethernet

1.2 Specifications

1.2.1 Operation

CPU: Dual core ARM Cortex A7, Single core ARM Cortex M4
 Clock frequency: 1.2 GHz, 200 MHz

1.2.2 Memory

Storage: 64 GB eMMC
 RAM: 512 MB

1.2.3 Operating indicators

Ethernet	2x, 10/100/1000 Gigabit, port 1 supports PoE Class 3
USB host	USB-A type dongles supported
USB OTG	Micro USB
Modulation	DSSS
Band	2.4 GHz, 16 channels (2400–2495 MHz)
Transfer speed	250 Kbits/sec (>10,000 complete image updates per hour with 2" ESL)
Radio	2 (independent)
Max. load	Up to 2,500 ESLs per Base Station (with EE-20x and default ESL settings)
Range	Typical 25 m indoor; 100 m open field
Protocol	IEEE 802.15.4 based
Encryption	None (default) / 128-bit AES encryption (on request)

1.2.4 Power

Voltage requirement: Min. 9V, Max 16V
 Current consumption: 200 mA

1.2.5 Durability

Temperature in operation	0 to 70 °C / 32 to 158 °F
Temperature in storage	-20 to 70 °C / -4 to 158 °F
Humidity in operation	20 – 85% (non-condensing)
Humidity in storage	20 – 85% (non-condensing)

1.2.6 Physical

Dimensions without antennas (W x H x D):	145 x 110 x 27.1 mm / 5.71 x 4.33 x 1.07 in
Weight:	Ca. 250 g / 8.8 oz (incl. antennas)

1.2.7 Regulatory & Safety

Product compliance : FCC, RoHS, EN60950-1, IEC60950-1, EN55022, EN55024, CE, REACH

1.2.8 Serial Number

The serial number can be found on the back of the EBS-50. The EBS-50 Base Stations also have a unique MAC address which is used for both Ethernet and radio communication.

1.3 Comparison: EBS-50 / ESL Web server vs ESL Server PC Application (+ EBS40)

Feature	ESL Server PC Application	ESL Web Server software	EBS-50	Remarks *
Server / PC requirement	Windows 10	Linux / Windows 10	No *	Integrated Embedded Linux Computer
Radio communication	EBS-40 required	EBS-40 required	Integrated radio *	EBS-40s can be added to extend coverage
VPN	VPN on server/PC	VPN on server/PC	Integrated VPN support	
Platform	Windows	Windows / Linux	(Embedded) Linux	
Framework	.NET Frameworks 4.6.1	.Net 6	.Net 6	
Application type	PC (desktop) application *	ESL Web Server	ESL Web Server	PHP ESL Web interface for linking available
Browser support	(linking application only)	All *	All *	Edge/Opera/Safari/Firefox/Chrome
Software Installation	PC installer	Installers *	Pre-installed	Linux uses installation scripts
Wi-Fi support	No	No	Yes *	Dual band; by USB-dongle
Wi-Fi access point mode	-	-	Yes	
Wi-Fi client mode	-	-	Yes	
User-Access-Control	Limited	Full *		Features configurable per user/role
Power-over-Ethernet	No *	No *	Yes	PoE splitter on EBS-40 required
Upload to ESL Cloud Dashboard	No	Yes	Yes	
Software updates	Manual (by installer)	Linux: transfer update files and install scripts to host, then run scripts. Windows: Manual (by installer)	Fetch mender image from USB stick, upload mender image by UI (updates), flash device through micro-USB port (factory defaulting)	
Customizable user interface	No	Yes *	Yes *	Based on roles and user privileges
Network encryption	None *	SSL / HTTPS (application), none (EBS-40) *	SSL / HTTPS	EBS-40 is HTTP-based, web interface of EBS-40 can be turned off
ESL security	None / 128-bit AES*	None / 128-bit AES*	None / 128-bit AES*	Requires custom ESL Firmware
Notifications	No *	Yes	Yes	Alerts possible using event-handler
Dashboard overview	No	Yes	Yes	
Local SQL database	No (installer comes with optional MySQL through XAMPP)	No (Linux has optional MySQL install scripts, Windows can use	Yes (default pre-installed MySQL database)	

			MySQL through XAMPP)	
Remote SQL database support	Yes (only by VPN)	Yes (SSL or VPN)	Yes (SSL or VPN)	
Retrieve CSV file from server	No	Yes (SFTP)	Yes (SFTP)	
Upload CSV file to ESL Web Server	Yes (place in Input folder)	Yes (UI or SFTP)	Yes (UI or SFTP)	
Support SQL formats	MySQL, MS-SQL, Oracle, Postgres, DB2, Firebird	MySQL, MS-SQL, Oracle, PostgreSQL, Firebird	MySQL, MS-SQL, Oracle, PostgreSQL, Firebird	
ODBC support	Yes	Yes	Yes	
Switch/router requirement	Yes	Yes	No *	Integrated 2-port switch
REST-API	Limited *	Full	Full	No access control, limited features
Tap and Go support (NFC)	Yes	Yes	Yes	
Support ESL variants	All *	All *	All *	All Opticon ESLs
Scalable	Yes *	Yes (cloud support)	Yes (cloud support)	No Cloud Dashboard available
Template designer	Integrated in application	Stand-alone app	Stand-alone app	
Connect to Internet (upload)	No	Yes	Yes *	Uploads status information to cloud securely
Connect to Internet (remote access)	VPN required (RDP)	VPN recommended* (Browser)	VPN recommended* (Browser), Tunnelling available (service fee)	To restrict access / DDoS prevention
Software license model	Free	Trial License / Full License	Trial License / Full License	Full License can be obtained for free by registration.
Cloud Dashboard hosting	N/A	Private & Opticon	Private & Opticon	Private hosting is free Opticon cloud has service fee
Layering support (multiple products on a display)	Limited *	Yes	Yes	On ESL Server Software linking to a specific layer is not possible.
Calendar / Room signage support	No	Yes	Yes	iCalendar /.ics support

1.4 Key Features

- Integrated Linux computer (no separate PC or server required)
- ESL Web Server (works on any device with a browser)
- Easy installation, configuration and software updates
- Perfect for small retail and multi-store installations
- Upload to the cloud for remote multi-store monitoring
- Customizable dashboard (based on roles and user privileges)
- 2-port Ethernet switch (daisy chain EBS-40s for more radio coverage)
- Power-over-Ethernet (PoE) support

- Basic and advanced network settings (including VPN support)
- Dual band Wi-Fi support (by USB-dongle; configurable as Wi-Fi access point and client)
- Integration with 3rd party software possible using a secured REST-API
- Supports almost all major database formats (CSV, MySQL, MS-SQL, Oracle, PostgreSQL, FireBird)
- Supports secure (external) database connections
- Secure communication (SSL, HTTPs, VPN, AES)
- Bi-directional 802.15.4 based radio communication
- Room signage / iCalendar support
- Layering support (show multiple products on a single display)

1.5 Supported ESL models

The ESL Web Server application supports the complete range of Opticon Electronic shelf labels:

Range	Size	Models	Pixel Dimensions
EE (xx3 & xx4)	2.1"	EE-213R / EE-214R	212 × 104 / 250 × 122
	2.9"	EE-293R	296 × 128
	4.2"	EE-420R	400 × 300
	7.5"	EE-750R	640 × 384
PE (powered)	1.5"	PE-152	152 × 152
	2.9"	PE-292 / PE-293	296 × 128
SE	2.1"	SE-214R / SE-214RY	250 × 122
	2.1"	SE-214F (Freezer)	250 × 122
	2.66"	SE-266R	296 × 152
	2.9"	SE-290R / SE-290RY	296 × 128
	2.9"	SE-290A / SE-290ARY (Button)	296 × 128
	4.2"	SE-420R / SE-420RY	400 × 300
	5.83"	SE-583R / SE-583RY	648 × 480
ME	11.6"	SE-1160R	960 × 640
	1.5"HD	ME-154R / ME-154RY	200 × 200
EE (Legacy)	1.5"	EE-150R	152 × 152
	2.0"	EE-200 / EE201 / EE202 / EE202R	200 × 96
	2.9"	EE-290	296 × 128
	4.4"	EE-440	400 × 300
	7.4"	EE-740	800 × 480

For more information and specifications on the various supported ESLs, please check the leaflets on our website:

<https://opticon.com/product-category/display-solutions/electronic-shelf-labels/>

2 Solution overview

Various solutions are currently supported by the EBS-50, which are listed below and described in more detail in chapter [8 Database](#)

- CSV-file solution.** The CSV-file based solution operates by uploading a CSV-file on the EBS-50 or by having the EBS-50 automatically download a CSV-file from a SFTP-server. Logging is done in SQL database (remote or local) or in a local SQLite data file.
- SQL solution.** The SQL-based solution (MS-SQL, MySQL, Oracle, SQLite, or PostgreSQL) provides the feed to a multi-store ESL system with product updates using a central SQL database (or by using the integrated MySQL database). The logging can be done on the same SQL server, a separate SQL server (remote or local) or in a local SQLite data file.
- REST API.** The ESL Web Server has a REST API, which can be used to control the fully the EBS-50 and allow easy integration with existing systems. For more information see chapter [16 REST API commands](#).

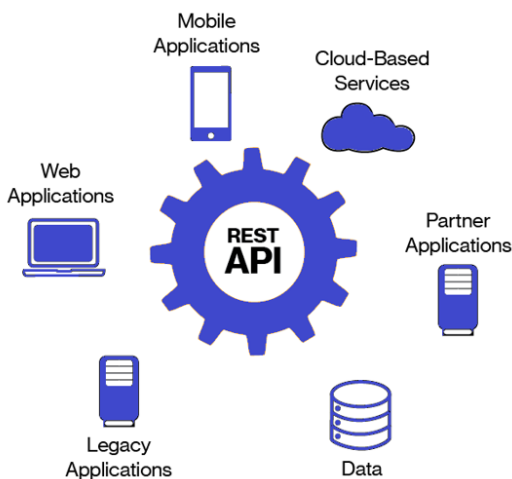


Figure 1: REST API concept image

Cloud solution. For all three solutions, cloud connectivity can be enabled to automatically upload all status information securely to the cloud. This allows easy remote monitoring of multi-store installations. See chapter [10.6 ESL Cloud Dashboard](#).

3 EBS-50: Getting started

3.1 Package Content

- EBS-50 Base Station
- Antenna (2 pieces)
- Quick Start Guide
- Safety instructions
- Lock plate

3.2 Installing and connecting to your EBS-50

1. Connect both antennas by screwing them on the connectors on the sides of the EBS-50
2. Power on your EBS-50 using a 12V power adapter ^a
3. Connect the EBS-50 to your local network using an ethernet cable
4. DHCP is enabled by default, but if no DHCP server is found the EBS-50 defaults to 169.254.19.62/24.
5. Open an Internet browser on a device that is connected to the same network and navigate to <https://ebs50.local> ^b
6. Click on advanced and proceed on the security warning ^c
7. Login with User: admin and Password: admin ^d
8. The EBS-50 can now be configured through the web browser

a: when using Power-over-Ethernet (PoE) then step 2 is not needed

b: Some browsers, like Chrome, do not properly process this local name. Use EBSFinder Tool to discover the IP address. Alternatively, connect the EBS-50 to a Windows machine with a micro-USB cable and surf to 192.168.100.5, the static RNDIS address.

c: HTTPs/SSL requires a certificate with a registered domain. Since <https://ebs50.local> is a local-domain, the EBS-50 generates a random self-signed certificate, which will result in a security warning. An official certificate can only be installed after changing the hostname to a registered domain.

d: we highly recommend changing this default as soon as possible

3.3 Content of the ESL Web Server Toolkit

Download and extract the EBS-50 Toolkit from <https://opticon.com/product/ebs-50/>

The ESL Web Server Toolkit contains:

- EBSFinder tool (to locate your EBS-50's and EBS-40's on the local network)
- Latest firmware for all ESL variants and EBS-40
- Template designer (to design and alter the templates used by your EBS-50)

3.4 Finding your EBS-50

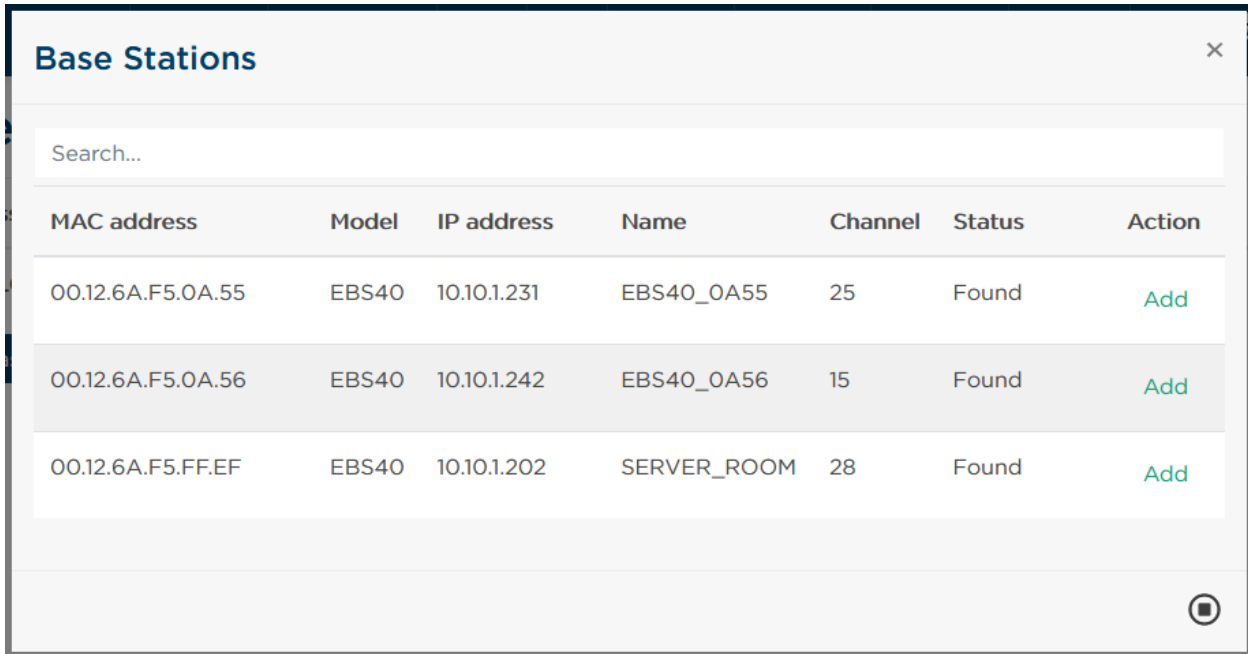
By default, the EBS-50 can be found by opening an internet browser on a device that is connected to the same network and navigate to <https://ebs50.local>

It can also be found using the included EBSFinder tool. Your Base Stations should automatically be shown after starting the tool.

Double-click on your EBS-50 (or right click and select the network address) to open a web browser and login to your EBS-50.

3.6 Connecting EBS-40s to your EBS-50 (optional)

To extend your radio coverage multiple EBS-40's can be added to your local network. Either directly; by daisy chaining it to your EBS-50 using Ethernet Port 2, or indirectly; by connecting it to the same network switch. Log-in to the ESL Web Server and go to the Base Station menu to discover and add your EBS-40s.



MAC address	Model	IP address	Name	Channel	Status	Action
00.12.6A.F5.0A.55	EBS40	10.10.1.231	EBS40_OA55	25	Found	Add
00.12.6A.F5.0A.56	EBS40	10.10.1.242	EBS40_OA56	15	Found	Add
00.12.6A.F5.FF.EF	EBS40	10.10.1.202	SERVER_ROOM	28	Found	Add

Figure 4: Base Station discovery screen

If network discovery has been disabled by your network administrator, connect the EBS-40 through the 'Manually add Base Station' menu and supplying the IP address of the EBS-40 manually. The default communications port is '1002'.

NOTE: When powering the EBS-50 through Power over Ethernet (PoE) on ethernet port 1, daisy chaining the EBS-40 on ethernet port 2 is not allowed.

3.7 Template editor

Templates are used to customize your ESL content. To alter templates on your EBS-50 you'll need to use the Template designer tool, which can be found in the ESL Web Server Toolkit.

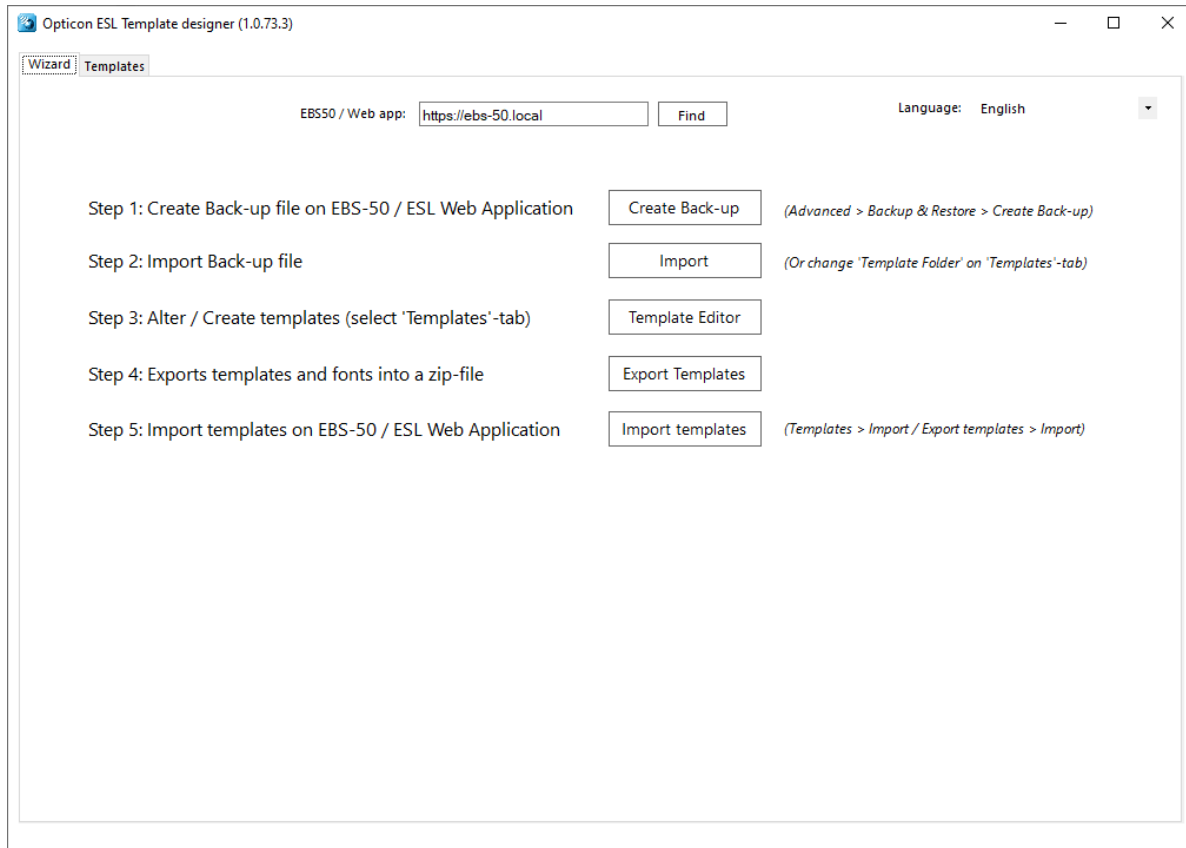


Figure 5: Template designer main screen

Follow the 5 steps of the template designer to alter/create templates and import them back on your EBS-50. The default templates of the EBS-50 can also be loaded (or restored) by importing the 'Default Templates.zip' file from the ESL Web Server Toolkit.

3.8 Local MySQL database

By default, the EBS-50 uses a local MySQL database, which can only be accessed using SSH by default. To connect to this database, use the SSH login credentials and the following MySQL login:

user / eslpassword

Example connection default when using MySQL Workbench:

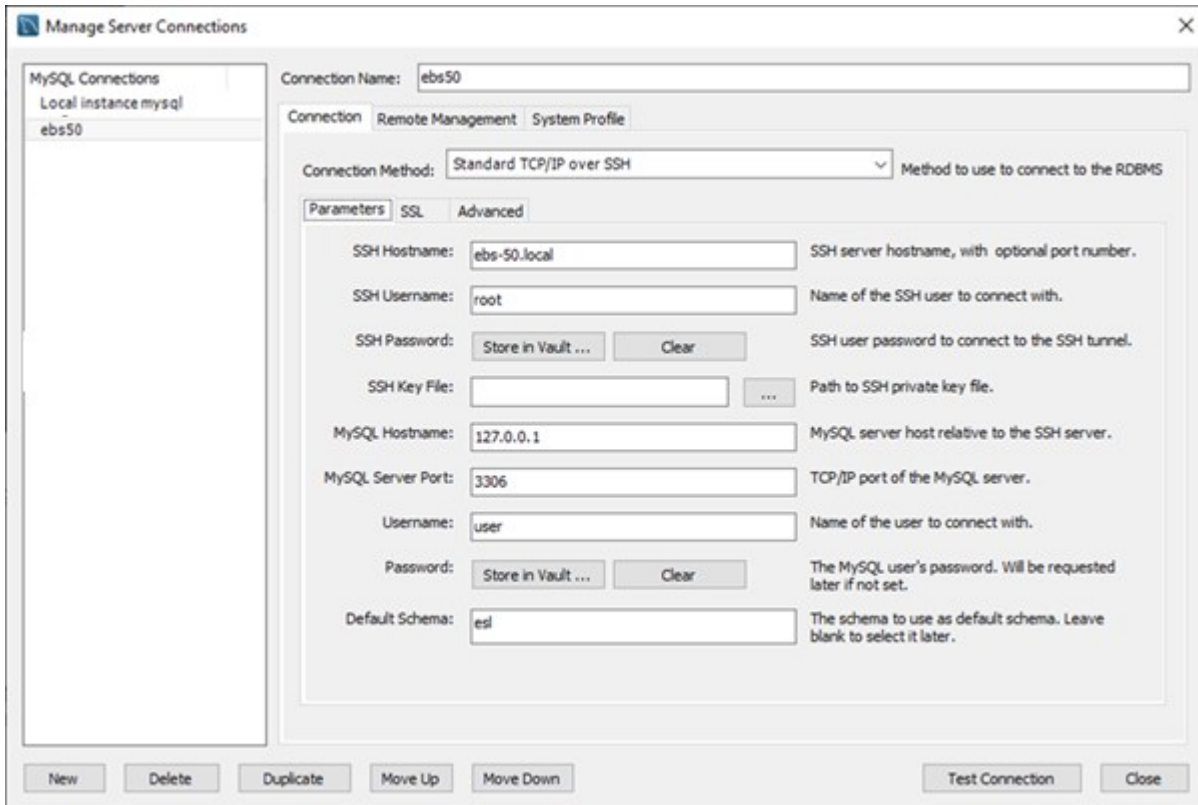


Figure 6: MySQL Workbench default credentials example

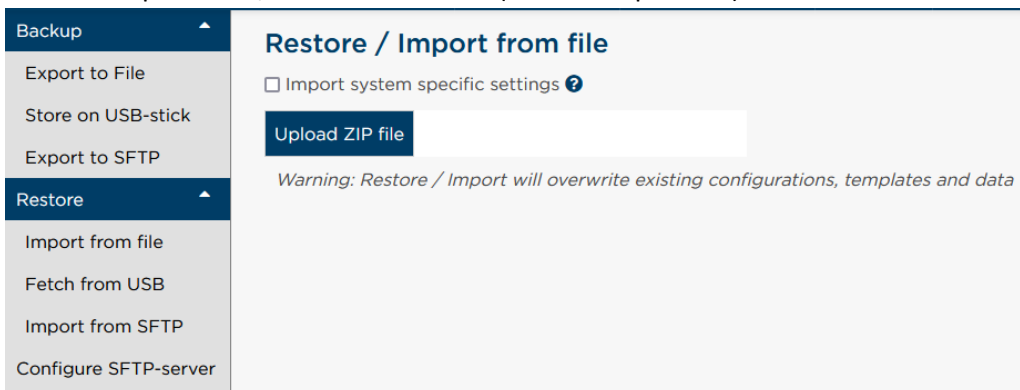
To disallow remote access to this MySQL database, use the ESL Web Server by going to **Advanced > System Settings > Networks Settings > MySQL settings** (chapter [10.3.5 SQL settings](#)).

3.9 Back-up and restore

It is possible to back-up and restore any configuration of the ESL Web Server, your templates, links, and products. Use the back-up and restore feature, which can be found under **Advanced > Backup & restore**. This makes it possible to quickly restore your EBS-50's in case a problem occurs.

The following options are available:

- Back up to file (and restore from file)
- Back up to USB / restore from USB (EBS-50 only; manual or daily)
- Back up to SFTP / restore from SFTP (manual or periodic)



NOTE: This feature will not back up the structure of the local MySQL database but will export the product table and link table as CSV-file.

3.9.1 Back-up MySQL database

Using SSH a back-up of the complete 'esl' database can be created using the following command:

```
mysqldump -u"user" -p"eslpassword" esl > esl_backup.sql
```

You can download this file from the device with a tool like WinSCP.

3.10 Firmware updates

Important: Before performing a firmware update it is recommended to create a back-up of your ESL Web Server settings and templates by using the following option in the ESL Web Server:

Advanced > Backup and restore > Create back-up

NOTE: This feature will not back up the structure of the local MySQL database, but will export the product table and link table as CSV-file

The EBS-50 has 3 methods of installing new firmware:

1. Upload a mender image in the ESL Web Server
2. Fetching a mender image from a USB-stick (must be FAT-32 formatted) and select it in the ESL Web Server
3. By using the micro-USB port and internal bootloader; flashing the device (full factory reset; wiping all personalized settings)

The first two methods install a new firmware image, but maintain the data partition, so any customizations like templates, settings, database credentials and manually changed features on the Linux operating system are unaffected.

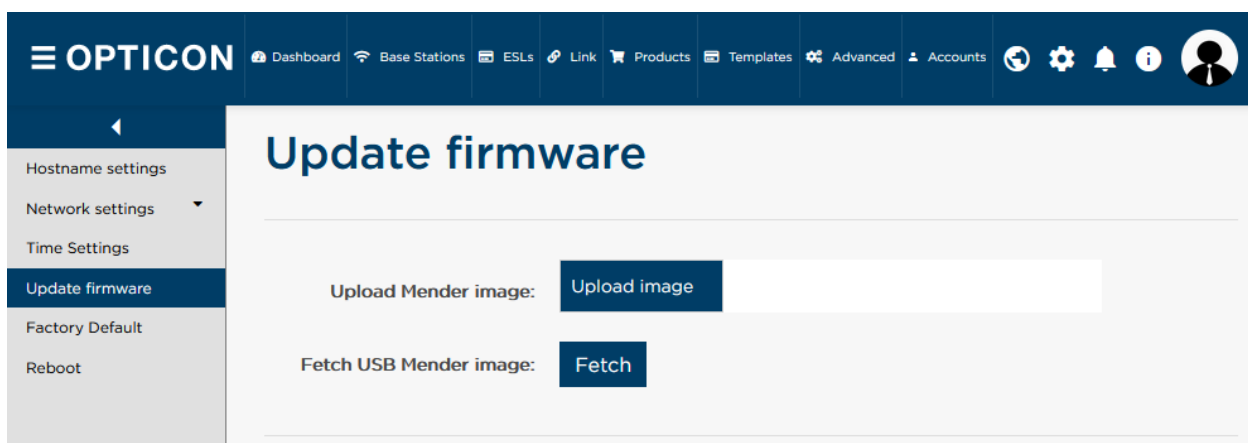


Figure 7: Update firmware screen

Go to **Advanced > System settings > Update Firmware** to update the firmware. For the full guide, refer to [10.3.7 Update firmware](#).

Option 3 is recommended if you want to fully reset everything back to the factory default and wipe all personalized settings from the EBS-50. For the full guide, refer to [10.8 Flashing the EBS-50 hardware](#).

3.11 Installing and activating the ESLs

On arrival the ESLs already have their batteries inserted. However, to allow safe transport by airplane, it is likely that the ESLs will show a ‘DEACTIVATED’ message in their left top corner. This means the ESLs do not emit any radio signals and won’t be searching for Base Stations at this point.



Figure 8: Deactivated EE213R

To reactivate these ESLs place them nearby the connected Base Station and go to ESLs > Reactivate ESLs (default <https://ebs50.local/esl/reactivate>)

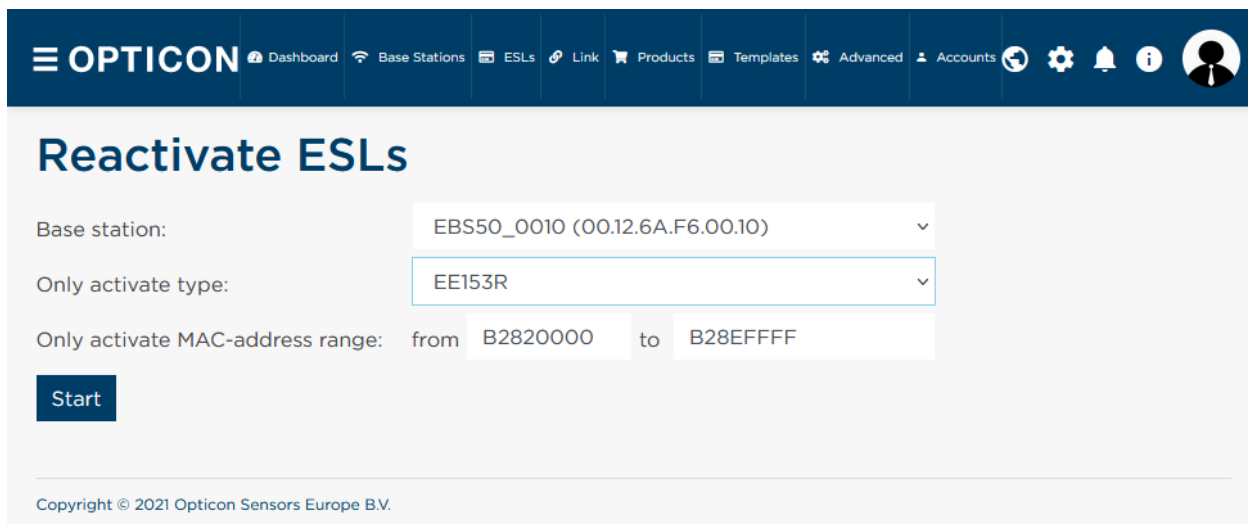


Figure 9: Reactivation screen

Select the Base Station and variant, supply the address range and press ‘Start.’ After pressing this button, the number of ESLs that have been reactivated so far will be shown.

Since the ESLs will only wake up for a split second every few minutes, it can take more than 15 minutes before all ESLs have been successfully reactivated. You can verify this by checking whether the ‘DEACTIVATED’ message has disappeared from the screen.

Active ESLs will be periodically search for a Base Station, so as soon as a Base Station is within range, they will associate with it and start sending data requests and status information to it. When a Base Station is turned off or an ESL is moved out of range, an ESL will time out after a couple of minutes and starts seeking for another Base Station in range. See chapter [6.1.3 Action dropdown](#) for more information about configuring ESLs.

It might be possible that even though the ESLs are working properly, they still don’t connect to the Base Station. This might be caused by strong interference on the default RF-channel of the Base Station. To resolve this problem, see chapter [5.4 Energy scan](#).

3.12 Mounting ESLs

Since there are many types of mounting clips to mount shelf labels to shelves, the ESLs of the demo kit are supplied without mounting clips. Please contact Opticon for more information on the mounting possibilities of our ESLs to your shelves. For simple demonstration purposes with small amounts of labels one might also consider using double sided foam tape as a temporary solution.

3.13 Using Wi-Fi by USB-dongle

The EBS-50 can be equipped with a Dual band USB Wi-Fi dongle. Whether your dongle can work depends on the type of network chip on the dongle and the firmware version of your EBS-50 as support for new chips can be added with future releases. Contact support@opticon.com for the latest information.

The following models have been tested:

- TP-Link Archer T2U | AC600
- TP-Link Archer T2U Nano
- TP-Link Archer T3U

4 Dashboard

The dashboard is the main page of the ESL Web Server, which gives you a quick impression on the status of the ESL system. If everything is fine, the tile is **green**. If there is a warning the tile turns **orange**. If there's an error, the tile turns **red**.

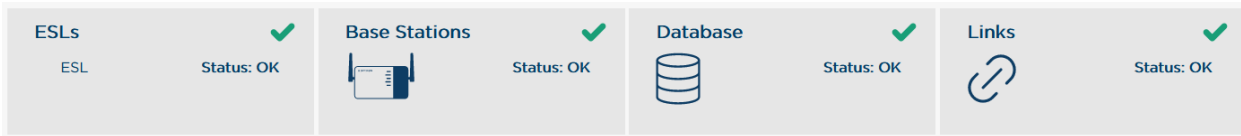


Figure 10: Dashboard overview tiles

In total there are 4 groups that can change status: ESLs, Base Stations, Database and Links.

4.1 ESLs

When pressing on the ESL tile, the dashboard will expand by showing 4 pie charts with different status information about ESLs.

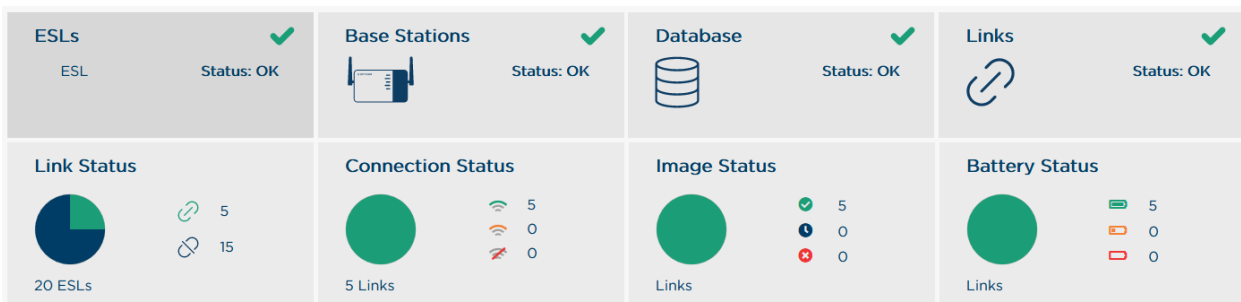


Figure 11: ESL Dashboard tile opened

“Link status” shows how many ESLs have been linked and how many active ESLs are not linked.

“Connection status” shows the connection status of all ESLs that have been linked, which can be good, poor and disconnected.

“Image status” shows how many ESLs are showing the latest image, how many are still busy updating the image and how many failed to update (i.e. due to being disconnected or due to a hardware failure).

“Battery status” shows the battery status of the linked ESLs, which can be OK, low, or empty/disconnected.

4.2 Base stations

The Base Station tile shows whether all Base Stations are connected. When pressing on the Base Station tile it shows the amount of connected Base Stations, which can then be viewed by clicking on it.

4.3 Database

The database tile shows whether your database is currently connected, how many products are present in the product table and when the next synchronization will take place. If the option for staging and triggers is enabled, the tile will show a warning if (part of) these are missing (see chapter [8.5.1 Staging and Trigger status](#) for more information).

4.4 Link

The link tile shows how many links are present in the link table, which can be viewed by clicking on it. It also offers a shortcut to the Quick Link tool (see chapter [7.2 Quick Link](#) for more information).

4.5 Dashboard settings

Dashboard settings can be found under ‘Advanced > Dashboard settings’ (default <https://ebs50.local/advanced/dashboardsettings>).

When there is an issue with your ESLs, these are grouped into errors and warnings. Examples of errors are: linked ESLs that are not online anymore, or ESLs that failed to update their image. Examples of warnings are ESLs that have a bad wireless connection, or ESLs that are low on batteries.

If you have 100 ESLs, you may want to be warned immediately if even a single ESL is showing an error. If you have 1500 ESLs, you may be okay with a dozen ESLs giving an issue before spending the time on maintenance.

The ESL status sensitivity screen allows you to set a percentage of ESLs reporting an error and ESLs reporting a warning that you find acceptable.

Dashboard settings

Threshold of warning status ? %

Threshold of error status ? %

Apply

Figure 12: Dashboard settings

5 Base Stations

Base Stations are the link between the ESL Web Server software and the Electronic Shelf Labels, relaying commands and information between the two. ESL Web Server issues commands to a label over the wired network to the correct Base Station, which sends the command on over a wireless low-power protocol. In other words, the Base Station is a wireless access point. It has several innovative features that allow it to communicate with hundreds of labels simultaneously.

5.1 Difference between the EBS-50 and the EBS-40

The introduction says that Base Stations are the link between the ESL Web Server software and the labels, which might sound confusing when looking at the EBS-50. This device is both a Base Station and an embedded computer running the ESL Web Server. You can consider the ESL Web Server software the brains of the operation and the Base Station as the one relaying the commands.

An EBS-40 does not contain an embedded computer, it only has the hardware to perform Base Station related tasks, including relaying commands from the ESL Web Server.

In a small setup, you will need only the EBS-50. However, if the number of labels or the size of the store necessitates more Base Stations, the EBS-40 is added for the extra range and bandwidth.

5.2 Installing the EBS-50

See chapter [3.2 Installing and connecting to your EBS-50](#) for more information on how to install and connect to your EBS-50.

To set up a wireless connection, you will need to connect through the ethernet interface and use the ESL Web Server's interface to set up the connection. See chapter [10.3.2 Network settings](#) for more information.

The EBS-50 has two ethernet ports and can be used to daisy chain other devices when powered by an adapter. When powered with PoE, the other ethernet port cannot be used for daisy chaining.

5.3 Finding and adding Base Stations

The EBS-50 is an unremovable Base Station that is permanently added to your ESL Web Server setup hosted on the device. You will not need to take any further steps.

The EBS-40 can most easily be found through the discovery function. Browse to the ESL Web Server. Choose "Base Stations" from the menu bar at the top (default: <https://ebs50.local/ebs>) and press the button "Search Base Stations". A window will appear that will start to list all the Base Stations discovered on the network. Click on the button "Add" to add a Base Station to your list.

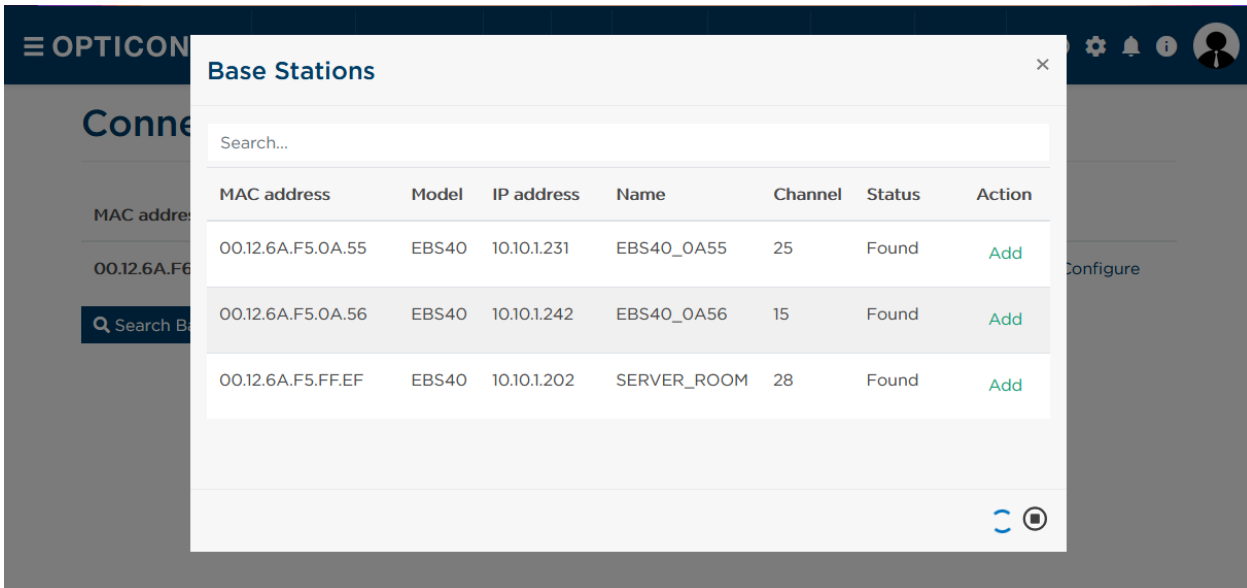


Figure 13: Base Station discovery screen

If the Base Station cannot be discovered (usually if the Base Station is not on the same subnet) you can add the Base Station manually. Click on the button “Manually add Base Station”. In the new window you can supply the IP address of the Base Station you want to add, its communication port (by default 1002 for the EBS-40) and the type of Base Station. Press “Add” to add this manually added Base Station to the list. If the credentials are correct, your Base Station should soon switch its value in the column “Status” to “Connected”.

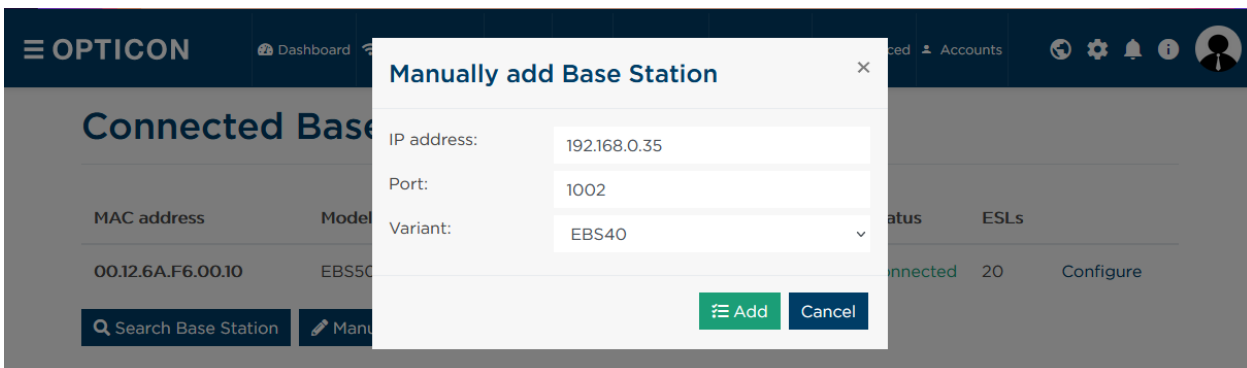


Figure 14: Manually add Base Station screen

5.4 Energy scan

Energy scanning is a tool that helps you to find out how busy the radio space is. The e-paper ESLs communicate wirelessly with the Base Station on the 2.4GHz band, which may also be used by, for instance, Wi-Fi or Bluetooth. Although these protocols will not interfere with the protocol used by our labels, their transmissions may limit the reliability of the connections of your ESLs and Base Stations.

To assess the amount of energy present in each channel, the Base Station can perform an energy scan that will show you how much energy is present *at that specific Base Station*. For best results, it is recommended that you perform energy scan at each Base Station. This way, you know which wireless channels are experiencing the least interference.

To change the channel that your Base Station uses, you can edit the settings. See chapter [5.6.1 Channel](#) for more information.

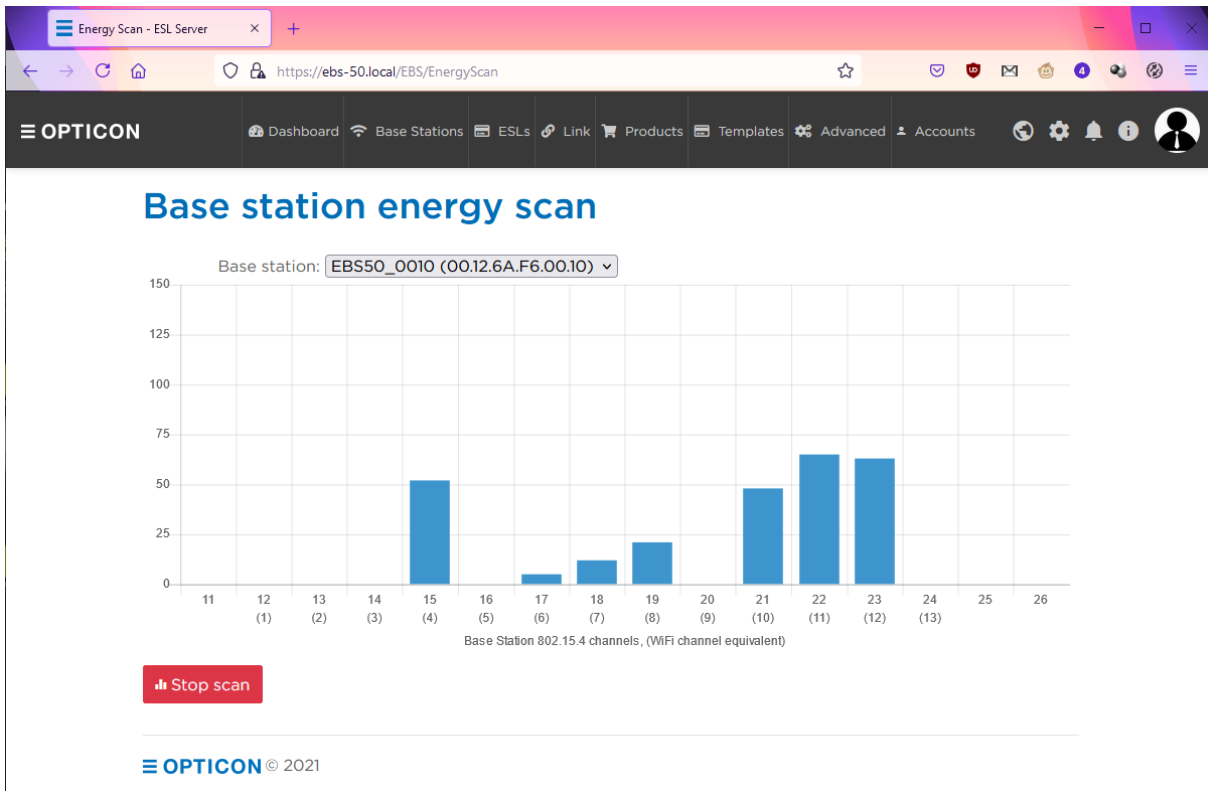


Figure 15: Result of energy scanning

5.5 Wireless channels

Within the 2.4GHz band that the EBS-40 and EBS-50 use to communicate with the ESL labels there are several channels available. As with other wireless technologies, the idea behind this is that you can have multiple devices communicating simultaneously in slightly different bands that do not interfere with each other. Our ESL labels are set by default to use channels 11, 15, 20, 25 and 26.

If you want to use more than one Base Station to enhance the reliability of your communications, choosing non-overlapping channels is paramount. This way you won't interfere with your own devices.

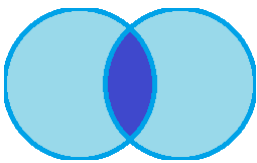


Figure 16: Overlap, two Base Stations on the same channel interfere

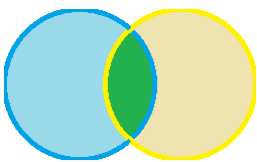


Figure 17: No overlap, different channels can operate simultaneously

5.6 Configuration

Base Stations can be configured through the ESL Web Server software. Open the ESL Web Server software, open the page Base Stations and press on the “Configure” button of the Base Station you want to update.

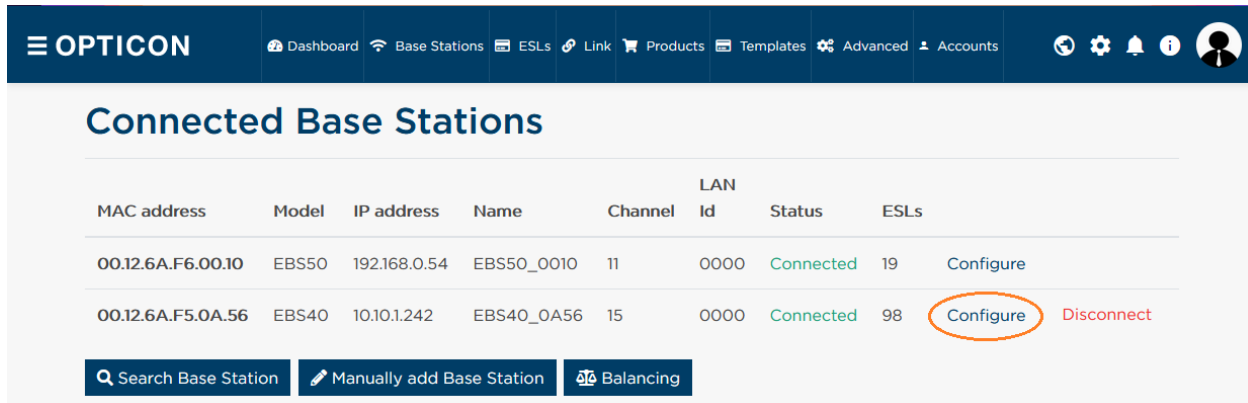


Figure 18: Press 'configure' to edit Base Station settings and update the firmware

EBS-40's can also be edited through their own web page, accessible by browsing to the IP address of the EBS-40.

5.6.1 Channel

The channel on which the Base Station communicates with ESLs. Default values that ESLs search on are 11, 15, 20, 25 and 26. Use energy scanning to find a channel with low traffic. *NOTE: Changing the channel will cause labels currently connected to this Base Station to lose their connection for roughly 400 seconds (default) as they will think this Base Station “disappeared”.*

5.6.2 Local name

The name of this Base Station is known by. By default, EBSyy_zzzz where yy is the type number and zzzz is the last four digits of the MAC address. You can rename it to locations, like “ENTRANCE” and “SERVICE_DESK”.

5.6.3 LAN-ID

By default, LAN-ID is 0000, which means any ESL can connect to it. If you change the LAN-ID, only ESLs who have the same LAN-ID set (or LAN-ID '0000') can find and connect with the Base Station. Use this setting combined with setting LAN-IDs in ESLs to assign an ESL more permanently to a (group of) Base station.

NOTE: Changing the LAN-ID will cause labels currently connected to this Base Station to lose their connection for roughly 400 seconds (default) as they will think this Base Station “disappeared”.

5.6.4 PAN-ID

By default, the PAN-ID is equal to the last four digits of the MAC address. It allows Base Stations operating on the same channel (not recommended) to be distinguished. Usually, this setting does not need to be changed.

NOTE: Changing the PAN-ID will cause labels currently connected to this Base Station to lose their connection for roughly 400 seconds (default) as they will think this Base Station “disappeared”.

5.6.5 Ethernet settings (EBS-40)

Unlike the other settings, these properties can only be set on the EBS-40's own web page. These are more advanced settings for when you have no DHCP server or if the DHCP server is not properly resolved. You can

change the default IP address, subnet mask and default gateway to manually assign the Base Station to your network.

NOTE: If you want the EBS-40 to retry resolving DHCP, apply power to the unit while pressing the reset button. Release the reset button after ten seconds. This will factory reset your EBS-40.

5.7 Firmware update (EBS-40)

When a new firmware file is released, you can update the firmware of the Base Station without losing any of your personalized settings (such as channel, system name, et cetera).

To update the firmware of a Base Station, move to the bottom of the page and click on “Browse file” to select the firmware file that you want to upload to the Base Station. Once the Base Station starts its upgrade, a progress bar will appear. Once this is completed, the Base Station will perform a software reset and the process is complete.

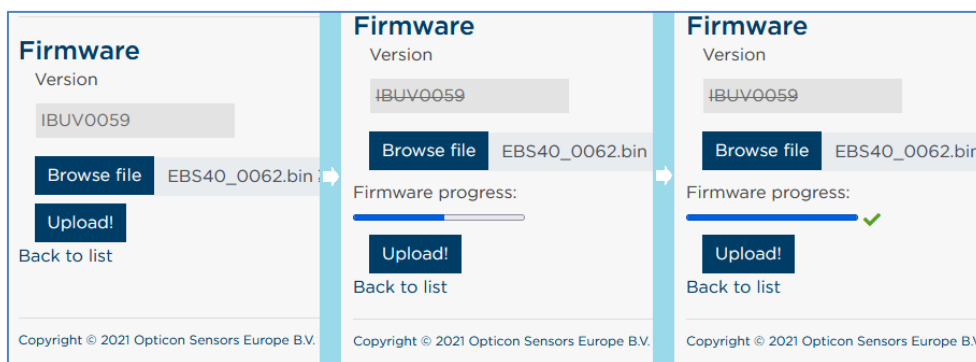


Figure 19: Choose firmware file, press upload, await update process

5.8 Resetting Base Station

The last option on the Configuration page for an individual Base Station.

When a Base Station is not working as expected or has not updated its ethernet settings properly, a software reset is often enough to fix the problem. Click on the Reset button to perform a reset of the Base Station hardware.

5.9 Balancing

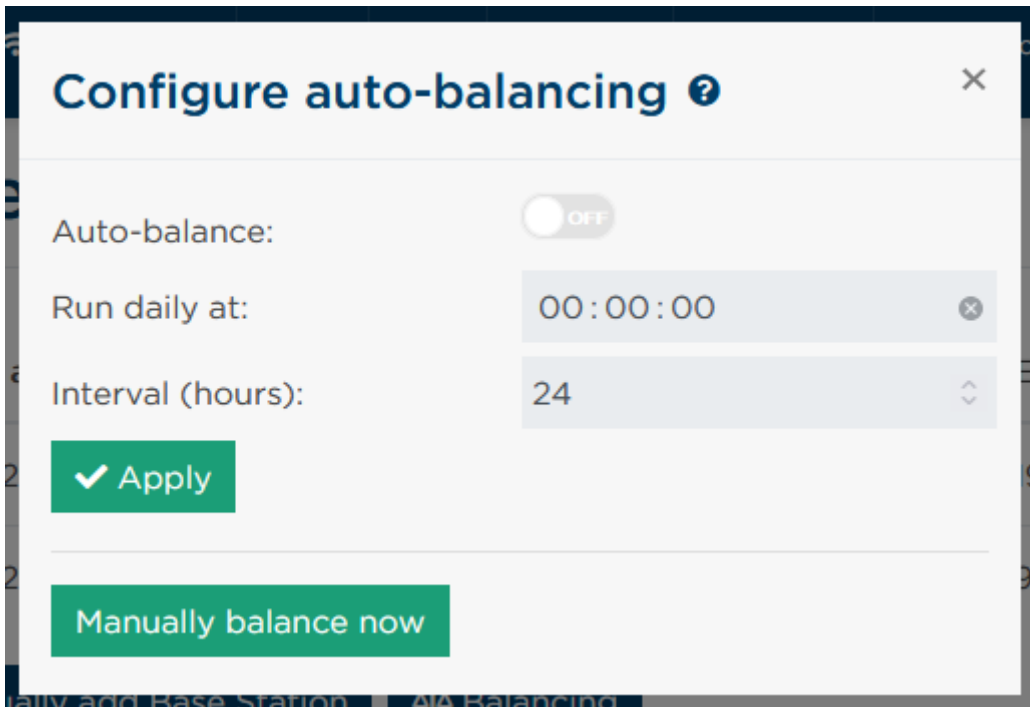


Figure 20: Balancing option window

Moving/kicking ESLs can be done manually (using the “Move from Base Station”, “Kick from Base Station” and “Find Best Base Station” actions on the ESL page), but you may want to automate this process. Auto-balancing is a function that tells all Base Stations connected to the ESL Web Server software to issue a “Find best Base Station” command to all labels with an LQI (link quality index) below 10. Do not use this function when you are actively using the ESLs, because ESLs may become unresponsive for a couple of minutes.

To perform balancing manually (allowed once per day) go to the Base Station page of the ESL Web Server and click the button labelled “Balancing”. Press “Manually balance now” to perform balancing immediately.

To perform balancing at a set time (for instance, daily at midnight) go to the Base Station page of the ESL Web Server and click the button labelled “Balancing”. Fill in the requested interval and press “Save”.

5.10 Roaming

With roaming enabled, ESLs with a poor or unreliable connection regularly look for a better Base Station to connect with. This is particularly useful when ESLs are non-stationary and move around on carts or containers.

1. To enable roaming first change the LAN-ID of all Base Stations you want to use for roaming to a non-zero value (see chapter [5.6.3 LAN-ID](#)). All Base Stations in the roaming network need to be configured to the same LAN-ID.
2. Set the LAN-IDs of all ESLs:
 - Deactivated ESLs will automatically set their LAN-ID during activation if the Base Station has a LAN-ID configured.
 - Activated ESLs that are not configured to have a LAN-ID need their LAN-ID to be set manually. Move the ESLs to any of the Base Stations with the LAN-ID if they are not connected to it yet. Select the ESLs and

perform the action “Set LAN-ID”. The ESLs will now change their LAN-ID, disassociate, and search for the best Base Station signal with that LAN-ID. This can take several minutes.

3. Make sure the ESLs have firmware version IxxxV0164 or higher installed.

If all these steps have been taken, go to the menu bar and select “Base Stations > Roaming”. Toggle the switch to enable roaming.

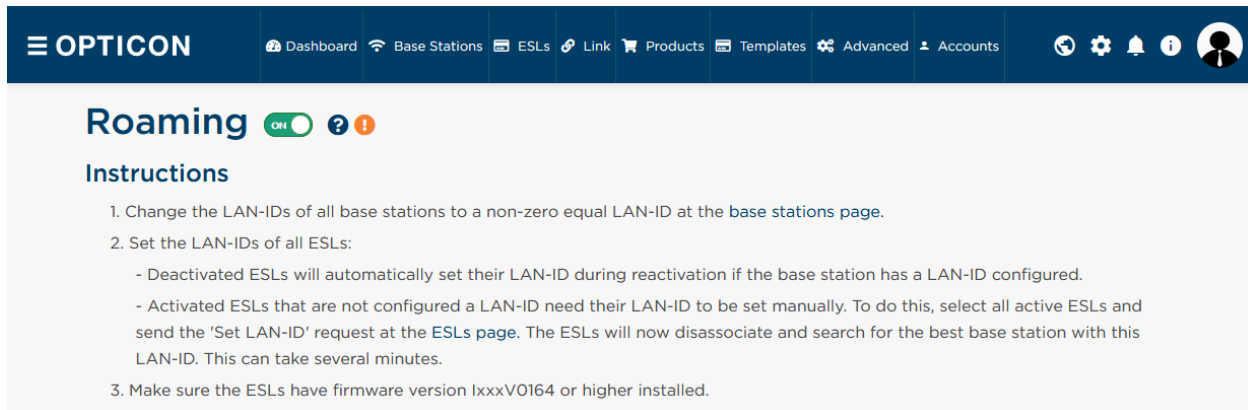


Figure 21: Roaming option enabled

5.10.1 Effect on power consumption with roaming enabled

Enabling roaming can have both a positive and negative effect on the battery life of an ESL. This depends on the following factors:

- Connection quality:
 - If an ESL is connected to an EBS with a good connection, then the effect on battery life is virtually non-existent.
 - If connection quality is poor, this has a negative effect on the battery life because more retransmissions are needed to poll for data. Since roaming generally improves the average connection quality this can have a positive effect on battery life.
- Number of polls:

If ESLs move around and/or have a poor connection, then the ESLs will look for a better connection every 10 polls (this is determined by the ‘poll timeout’-setting of the ESL).

To perform this connection lookup, ESLs use a whitelist of all available Base Stations with the same LAN-ID and send a poll to all Base Stations in this list. This is done using an interval of 60 seconds (this is determined by the ‘associate interval’-setting of the ESL) divided by the number of Base Stations with the same LAN-ID. With default settings, this means that with 3 whitelisted Base Stations the number of polls send by the ESLs is the same (60/3=20 sec interval) compared to having roaming disabled. So, battery life will not be affected negatively (or even improve due to better average connection quality).

If the number of Base Stations in the roaming pool increases, then it’s recommended to change the associate interval of the ESLs to a value equivalent to **Associate interval = <Number of Base Stations> * <poll interval (of 20 sec)>**.

This will make sure the battery life is not affected by enabling roaming. Otherwise, battery life can be reduced by ~5% for each additional Base Station.

5.10.2 Number of ESLs per Base Station

ESLs are designed to be power efficient, including in their communications. Radio communications are a large part of the power usage of ESLs. Therefore, ESLs will only turn on its radio shortly to check if there are pending assignments and to let the ESL Web Server know its health (signal strength, battery, et cetera). This short transaction is called a poll. By default, an ESL will poll once every 20 seconds; this setting is called the poll interval.

To allow as many ESLs as possible on a Base Station, the Base Station may tell ESLs to increase its poll interval for a while when the Base Station detects it is nearing its maximum number of concurrent polls.

Besides small transactions, ESLs may be required to update their image, or to update their firmware. This is a large transaction that takes a longer amount of time. The more of these large transactions you have, the faster your Base Station will be near its maximum number of concurrent polls.

A rule of thumb is that you can expect the best performance if you have about 25 ESLs polling a Base Station every second. With the default poll interval of 20 seconds, that amounts to 500 ESLs. Increase the poll interval to 60 seconds, and you can support 1500 ESLs on one Base Station. Lower the poll interval to 5 seconds, and you can support 125 ESLs.

6 ESLs

ESLs are the most important part of the entire system. Electronic Shelf Labels have an e-paper display that displays product information. When that product information changes, the ESLs automatically update to reflect that change, removing the need to physically replace labels as you would with normal paper labels.

Because they are the focal point of the ESL ecosystem, the interface that allows you to manage the ESLs is a powerful tool. The interface was designed to be user friendly, yet capable of satisfying the needs of power users as well.

6.1 ESL page interface

The ESL page can be found by clicking on “ESLs” in the menu bar or by clicking on any pie chart on the ESL tab of the Dashboard overview (doing so may also delimit the ESLs shown based on the type of pie chart, i.e., Linked ESLs or ESLs with an image error). The default path is <https://ebs50.local/esl>.

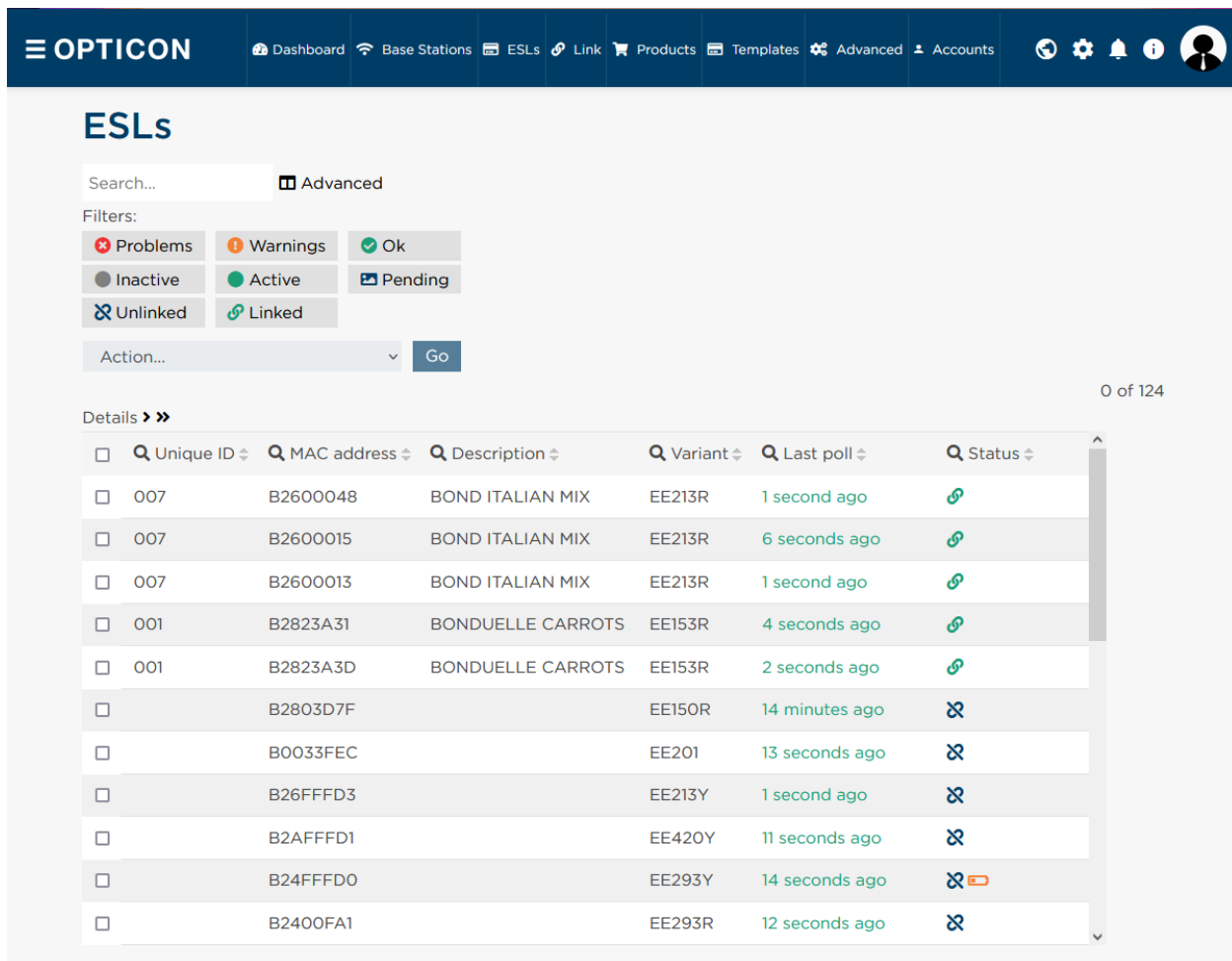


Figure 22: Interface of the ESL page

The page consists of a couple of sections, each with their own purpose. It starts with a search bar, a list of filters, a dropdown menu for actions that ESLs can perform, and the list of all ESLs that are connected to the system with their most important properties.

6.1.1 Search bar

The first section you see is the search bar. By default, typing in any word will cause all properties of the ESL (even those not visible in the simplified list view, like the “Firmware version” column) to be searched with a case-insensitive search that allows partial hits.

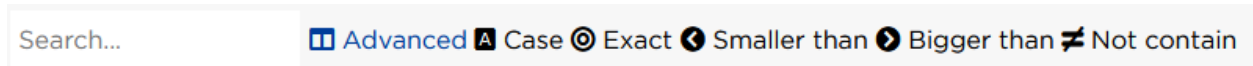


Figure 23: Fully expanded search bar

Pressing “Advanced” will give you more power over your search terms.

- “Case” allows you to force the search word to be case-sensitive.
- “Exact” allows only words that are an exact match with your search term to be returned (i.e., “for” returns product description “Shampoo for Men” but not “Tea Forest Fruit”).
- “Smaller than” allows the search word to be parsed as a number and then search all columns for a number with a smaller value (for instance with “group number” for specific product types).
- “Bigger than” allows the search word to be parsed as a number and then search all columns for a number with a higher value.
- “Not contain” is a negation search. It returns ESLs who do not contain the search term in any of their columns.

To search on a specific column, press the magnifying glass on the column header in the ESL list and the column prefix will be filled into the search bar for you.

6.1.2 Filters

Filters allow you to filter your list of ESLs based on their properties.

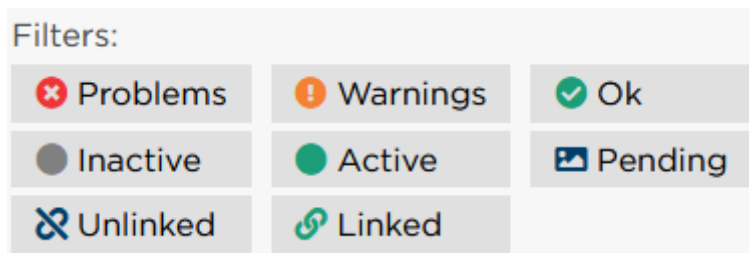


Figure 24: Filter menu

The filter menu consists of three rows, each representing different types of properties that ESLs can have. The top row are “Problems”, “Warnings” and “Ok”. Every ESL has a few properties that are determined to see what the overall health is. For instance, “Problem” could be a unit that failed to update its image but is online and polling, or a unit that hasn’t been seen for a long time, but was operating fine before disappearing. The middle row is the activity list. “Inactive” are units that were online until recently, but haven’t been seen for a while, or units that have a link (i.e., it is in use) but are not online. Whether a unit is inactive depends on how many times it was supposed to poll but failed to do so. “Active” are units that have been online recently and have not missed polls. “Pending” are units who have new images waiting for them (i.e., they have work to do) but are yet to process this new image.

The bottom row is the link status. “Unlinked” means ESLs that are not linked to a product and therefore not in use by the system. These ESLs can be seen as “available for work”. “Linked” means ESLs that are linked to a product and that should be showing an image. In other words, these ESLs are in use by the system. You can select multiple filters. Say you want to know if any of the “Linked” ESLs have a health status that would put them in the “Warning” or “Problems” category, you can get that by activating all three filters.

6.1.3 Action dropdown

When you want ESLs to perform certain actions, you first select the ESL in the ESLs list (by placing a checkmark on the row with the ESL(s) you want to edit) and then choose an action from the dropdown.

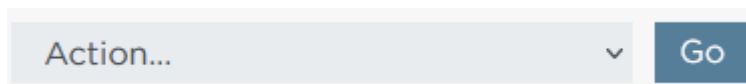


Figure 25: the Action dropdown

Each of these actions performs a specific action. What actions are available to a user depends on the rights of the user’s role (see chapter [11.6 Manage roles](#))

The following actions are available.

6.1.3.1 Link ESL

Opens the link modal for the selected ESL(s). It allows you to link directly if you know the unique ID of the product. Pressing the pencil and pad icon next to this field opens the product viewer, allowing you to search for the exact product. Clicking on the product row you want selects the unique ID and closes the product viewer, pressing “Apply” confirms the link between ESL(s) and product. See chapter [7.1 UI linking](#) for more information.

6.1.3.2 Unlink ESL

The selected ESL(s) are unlinked. This is done by removing the ESL’s MAC address from the link table. If the unit is already unlinked and not present in the link table, this action will not cause any issues; the command is simply ignored.

6.1.3.3 Refresh ESL image

Over time ESLs can start to fade their image. Besides the issue of image fading, for a longer lifespan it is recommended to regularly refresh the image of an ESL. Refreshing the image causes the ESL to redraw the image it is currently displaying.

6.1.3.4 Resend ESL image

When an ESL receives its image, it does a simple error check to see if the wireless transmission sent all the information. False positives are unfortunately still a possibility. Resending an ESL image will restart the image transmission from scratch to fix this issue.

6.1.3.5 Show default ESL image

The default ESL image consists of the MAC address of the unit in both text and barcode forms in the middle of the screen, the boot count (number of times the unit was restarted) in the top left and the current firmware version in the top right.

NOTE: if you unlink an ESL (which could happen erroneously, for instance by losing connection to the database with the link table), it will still show the last product image as its default behavior. To change this, visit the Template page and change the setting “Show default image on unlink” from off to on.

6.1.3.6 Request ESL settings

Each ESL has several settings that do not change value that often, like firmware version and battery level. It is a waste of bandwidth to report this value every time ESLs poll the Base Station. This information is by default not sent for 39 polls, and a full status report is delivered in the 40th poll (See chapter [6.1.3.16 Change ESL poll settings](#) for more information).

If you want to be sure that all information provided by ESLs is as up-to-date as possible, this option will make the ESL give a full status report.

6.1.3.7 Move ESL to best Base Station

With this option, an ESL is instructed to disconnect from its current Base Station and to search for any Base Station. The first Base Station to respond to ESL's search command (which could be the Base Station it was already connected to) will be the new Base Station that the ESL will use as its source of wireless communications.

6.1.3.8 Kick ESL from Base Station

With this option, ESLs are instructed to disconnect from its current Base Station and to search for any other Base Station. The first new Base Station to respond the ESL's search command will be the new Base Station that the ESL will use as its source of wireless communications. If no new Base Station can be found within 15 minutes, the ESL will revert to its previous Base Station.

6.1.3.9 Move ESL to another Base Station

With this option, an ESL is instructed to disconnect from its current Base Station and to connect with a Base Station of your choice. If an ESL is incapable of communicating with this specified Base Station, it will start to search for any Base Station. The first Base Station to respond to the ESL's search command (which could be any Base Station, including the Base Station it was already connected to) will be the new Base Station that the ESL will use as its source of wireless communications.

6.1.3.10 Reset ESL

This action instructs your selected ESL(s) to shut down and reboot. Once the unit turns back on, it will try to connect to the Base Station it knew. If connected to a product, it will keep showing its most recent image. Use this action when your ESL seems to act unusual. Often, a reboot is all it needs to fix any odd behavior.

6.1.3.11 Delete ESL

ESLs that have been seen in the last 15 minutes, or ESLs that are present in the link table, may no longer be physically present in the system and can be cleared. This option will remove the selected ESL(s) from the link table and label status logs, and it will not reappear on your system unless it is once again physically present and connected to a Base Station.

6.1.3.12 Set ESL to factory default

NOTE: Use with caution.

By resetting an ESL to factory default, all the customizable settings of an ESL will be cleared. These include: boot count, stored image in memory, image counter, connected Base Station, search channels, poll settings. Sometimes, the amount of customization may cause an ESL to be unable to communicate (for instance; search channels do not match any of the channels that Base Stations are active on). This option will wipe all the customization and make the ESL behave as a freshly produced unit.

6.1.3.13 Store current image on ESL

Preliminary option to preload image(s) in the ESL before displaying them. The latest image will be sent and then stored in the first memory slot of the ESL, but it won't be displayed after transmission. The image can be shown at a later moment using the 'Refresh ESL image' action. This feature can be useful to preload images and quickly change the image on multiple ESLs at once.

6.1.3.14 Set ESL LAN-ID

LAN-ID allows you to further narrow down what Base Stations an ESL can connect to. By default, the LAN-ID is set to '0000', which means an ESL can communicate with any Base Station, no matter what the LAN-ID of that Base Station is. If you want to keep an ESL assigned to a (group of) Base Station(s) with a specific LAN-ID, this option will instruct an ESL to change its LAN-ID to the LAN-ID of the Base Station.

NOTE: An ESL with its LAN-ID set can only communicate with Base Stations with the same LAN-ID, or LAN-ID '0000'. If you are missing an ESL, configure a Base Station to use channel 11 and LAN-ID '0000' to create a catch-all Base Station.

6.1.3.15 Clear ESL LAN-ID

If you have an ESL with its LAN-ID set, it will only be able to communicate to Base Stations with the same LAN-ID or with LAN-ID '0000'. Clearing the LAN-ID of the ESL will revert the ESL to use LAN-ID '0000', which allows it to communicate with any Base Station.

6.1.3.16 Change ESL poll settings

This action allows you to change poll settings for the selected ESL(s).

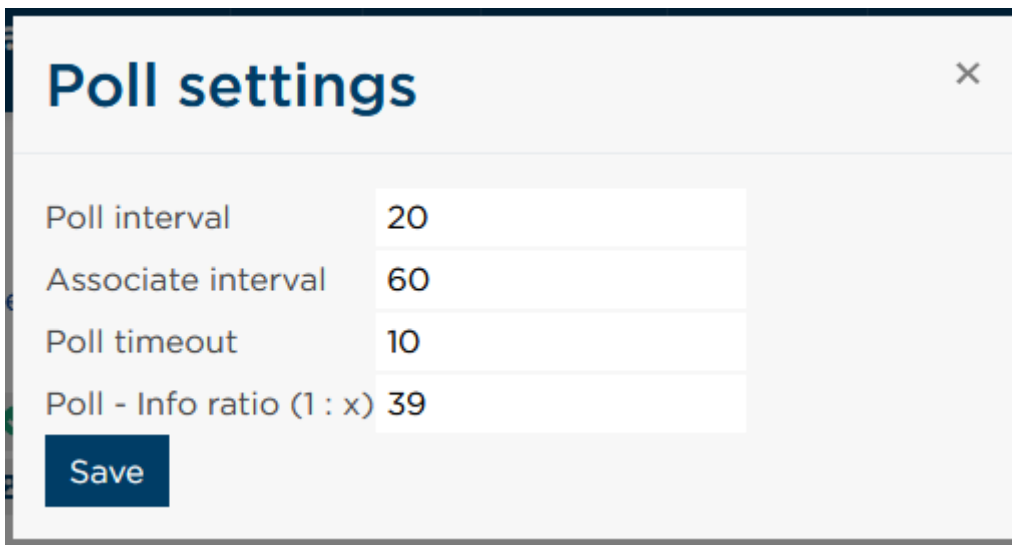


Figure 26: Poll settings screen

- Poll interval: number of seconds that an ESL waits between polls. Lowering this number will improve responsiveness, but increases power use and therefore shorten battery life (e.g.: lowering from 20 seconds to 5 seconds interval will triple power usage). Increasing the number will allow more ESLs to be served by a single Base Station.
- NOTE: If the Base Station has a lot of ESLs, it may instruct labels to poll less frequently than their poll setting. If the Base Station can handle the traffic, the ESLs poll setting will be honored.
- Associate interval: number of seconds between search operations. If an ESL is not yet or no longer connected to a Base Station, it will search on all its configured scan channels once every interval. The longer

a unit is disconnected, the less frequently the search will take place, up to a 15-minute interval. If an ESL is connected, this setting is moot.

- Poll timeout: the number of times an ESL will try to poll its known Base Station before assuming it is not present anymore (i.e. the Base Station was removed, or its channel setting changed). Once an ESL assumes a Base Station as gone, it will switch to association mode and search for a new Base Station.
- Poll to Info ratio: the number of “simple” polls an ESL performs before sending a complete health status to the Base Station. Simple polls are polls where settings that don’t often change (i.e. battery level, firmware version) are not reported. As this health status uses some processing power of the ESL and more bandwidth in the radio space, this setting is a tradeoff between up-to-date status information and available radio bandwidth for other tasks.

6.1.3.17 Change ESL display options

If you have mounted an ESL sideways, or upside down, the image that is sent to the unit may need to be flipped 180 degrees to be the right way up. This option allows you to change the display mode of your selected ESL(s) to “Normal”, “Flipped” and “No display”.

NOTE: The option “No display” will ignore hardware errors of ESLs without displays or ESLs with broken displays

6.1.3.18 Set ESL scan channels

This setting instructs ESLs on what channels they can expect to find Base Stations to be operating. If an ESL is not connected to a Base Station (anymore) it will use these set channels to send out a search request to nearby Base Stations to establish a new connection.

NOTE: By default, the scan channels are 11, 15, 20, 25 and 26. These channels have been chosen to lower the amount of unintended overlap and therefore data collisions between adjacent channels.

NOTE: Channel 11 is a fail-safe. It cannot be turned off.

6.1.3.19 Deactivate

NOTE: Use with caution

Deactivating a unit is meant for units that will travel by air, or for units that are to be stored for an extended period. Deactivated units will no longer poll, will not display product images and will not respond to requests from ESL Web Server. Reactivating a unit will therefore require a special activation mode on the Base Station. See chapter [6.2 Reactivate ESLs](#) for more information.

6.1.3.20 Firmware update

Over time, improvements to the firmware can lengthen battery life, increase reliability or add new features. This option allows you to update the selected ESL(s) in one go. For each type of ESL there is a different type of firmware, so selecting an incorrect firmware file will cause an ESL to ignore the command as the firmware file is not applicable to it.

After selecting this action and pressing “Go” you are prompted to upload the appropriate firmware file. The latest firmware for ESLs is available through the ESL Web Server Toolkit.

As updating the firmware is a process that takes both a lot of bandwidth (which means only a finite number of ESLs are capable of receiving the large file from the Base Station simultaneously) and processing time (after reception of the firmware file, the ESL needs to upgrade itself) it is recommended to update the firmware only when the ESLs are not immediately needed.

NOTE: The Base Station is configured to store only one type of firmware in memory. If you want to update several types of ESLs, you can do so sequentially.

6.1.3.21 Program MAC address

This option is for units reporting a Factory MAC address, which should only occur during production. If your ESL is reporting a factory MAC address, please contact Opticon.

6.1.3.22 Rf Test

Not applicable.

6.1.3.23 Update waveform

Not applicable.

6.2 Reactivate ESLs

On arrival the ESLs already have their batteries inserted.

However, to allow safe transport by airplane, it is likely that the ESLs will show a ‘DEACTIVATED’ message in their left top corner. This means the ESLs do not emit any radio signals and won’t be searching for Base Stations at this point.



Figure 27: Deactivated EE-213R

To reactivate these ESLs place them nearby the connected Base Station and go to ESLs > Reactivate ESLs (default: <https://ebs50.local/esl/reactivate>).

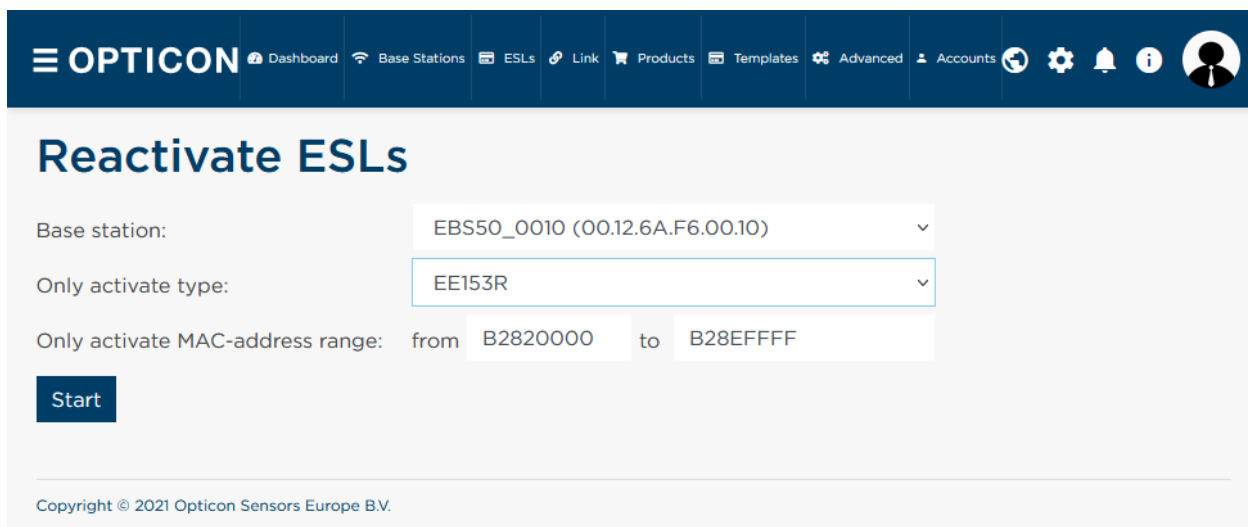


Figure 28: Reactivation page

Select the Base Station, variant and address range and press ‘Start’.

After pressing this button, the number of ESLs that have been reactivated so far will be shown. This number may be incorrect, as the activation signal may drown out the confirmation message from the ESLs. This is expected behavior and will not cause any issues for the ESLs.

Since the ESLs will only wake up for a split second every few minutes, it can take more than 15 minutes before all ESLs have been successfully reactivated. You can verify this by checking whether the ‘DEACTIVATED’ message has disappeared from the screen.

Active ESLs will be periodically search for a Base Station, so as soon as a Base Station is within range, they will associate with it and start sending data requests and status information to it. When a Base Station is turned off or an ESL is moved out of range, an ESL will time out after a couple of minutes and starts seeking for another Base Station in range. See chapter [6.1.3 Action dropdown](#) for more information about configuring ESLs.

It might be possible that even though the ESLs are working properly, they still don't connect to the Base Station. This might be caused by strong interference on the default RF-channel of the Base Station. To resolve this problem, see chapter [5.4 Energy scan](#).

7 Linking ESLs

Linking ESLs is the process of telling the system which product should be shown on which ESL. In a store environment this is usually done by scanning (or typing in) the MAC address barcode on the ESL label followed by scanning (or typing in) the unique ID of the product.

The unique ID can be anything: an EAN code, article number, location, room number, etc. If it's a unique identifier in the database, it can be linked to an ESL.

7.1 UI linking

UI linking is great for linking multiple ESLs at the same time and allows easy management of your ESLs when using a large screen device.

The ESL page of the ESL Web Server (default: <https://ebs50.local/esl>) offers the option to manually link your ESLs to products. There are two ways to open the link helper.

- Click/tap on a single ESL in the list
- Select one or more ESLs with the checkmark in the leftmost column, select the action “Link ESL” and press “Go”

Once the link helper opens, you'll see that the MAC address(es) of the ESL(s) are already filled in.

Figure 29: Link helper

In the field “Unique ID” you can supply a UID, barcode or description.

You can open a product selector by pressing the pencil and paper icon to the right of the input box.

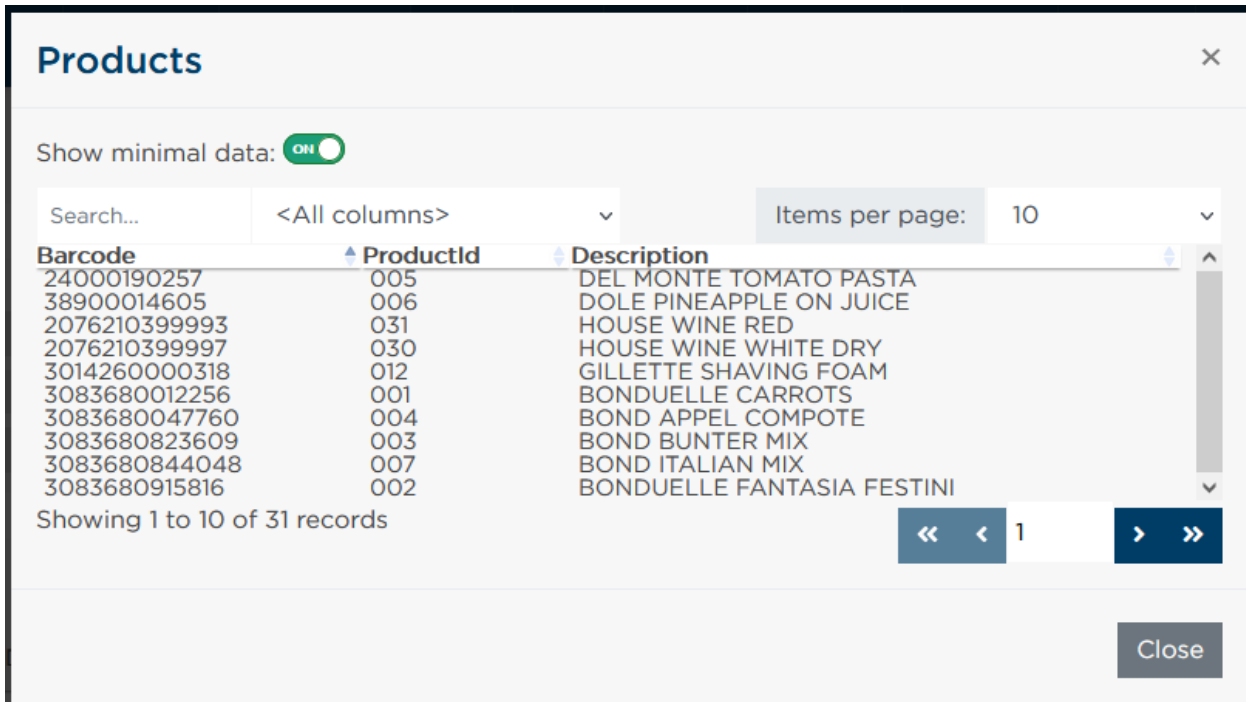


Figure 30: Product helper

In the product helper you can search for products. Click any row in this screen to select the product you want to link to.

You can also supply a search word in the “Unique ID” textbox of the link helper, which will then search on the UID, barcode and description fields of your product table. Press “Apply” to perform the linking action.

NOTE: If the value entered in the “Unique ID” textbox yields more than one result after a search on the database, you’ll be prompted to select the product you want from the list of results.

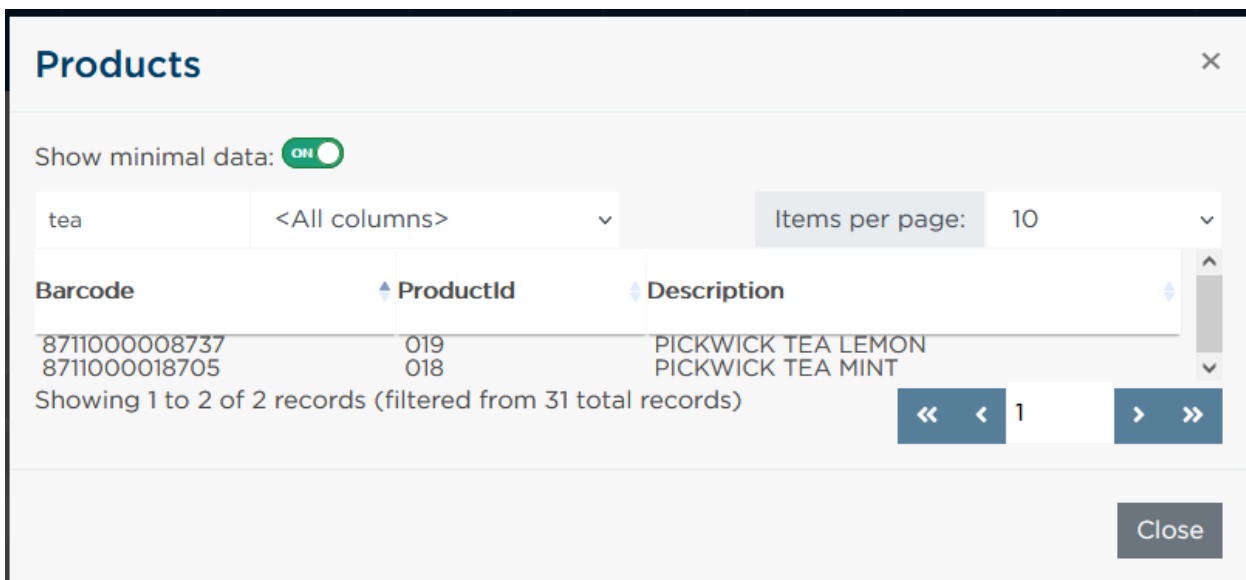


Figure 31: Ambiguous result for product "tea"

If the link is unique, then the ESL and product are linked, and you receive a prompt informing you of the successful link.

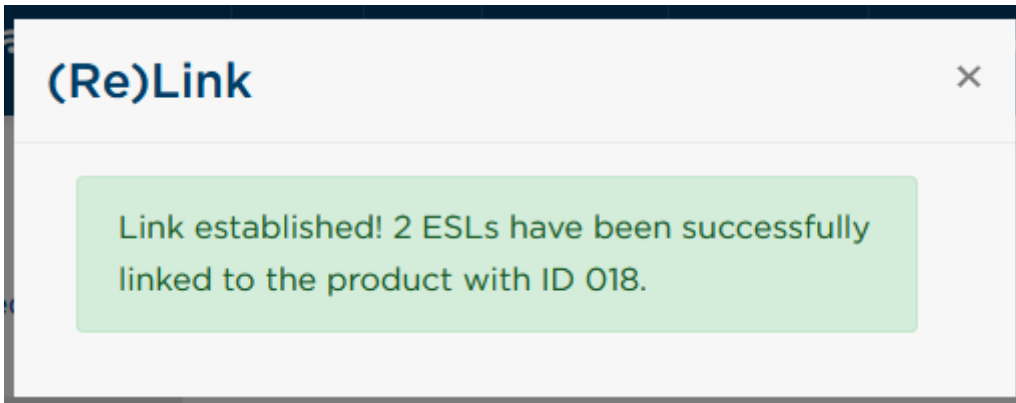


Figure 32: Link successful

If you supply a barcode or UID that does not exist in the database (yet), you can force the link. This means that, although ESL Web Server can't find the product, you can still add it to your link list. Until the product is added to the database, the ESL will display the "Product not Found" template.

Type the value in the "Unique ID" textbox and place a checkmark at "Force invalid product". Press "Apply", and the link will be added.

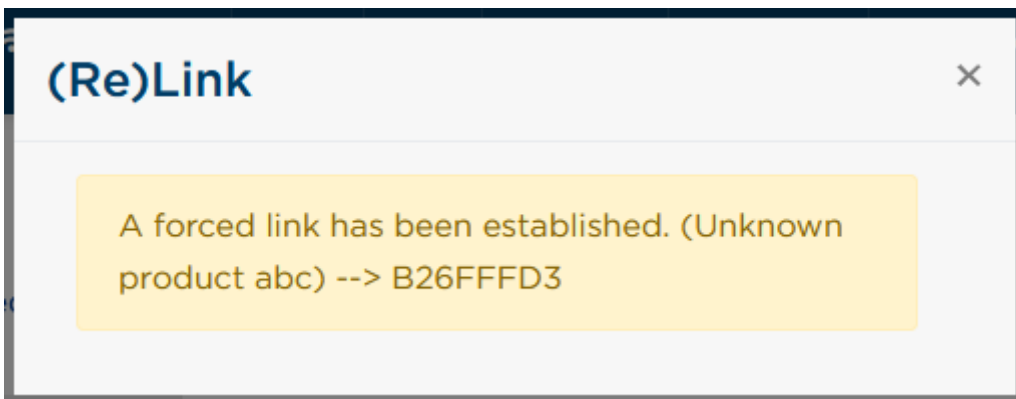


Figure 33: Forced link added

Once this missing product is added to your product table, ESLs will automatically update its image.

7.2 Quick Link

Quick linking is great when using a handheld device, especially if this device has a barcode scanner built in or attached. The Quick Link screen allows you to provide the MAC address of the ESL and the unique ID/barcode/product name to create a link. You can open the page through the menu: Link > Quick Link (default: <https://ebs50.local/link/quicklink>).

Scan (or type) the MAC address of the ESL. When using a scanner, configure it to simulate pressing the "Enter" key after performing the scan. This will switch the input to the other text box.

Scan (or type) a UID, barcode or description into the textbox and press "Enter" (again, configure your scanner to simulate pressing "Enter" after scanning).

If both boxes are filled in, the link will be applied.

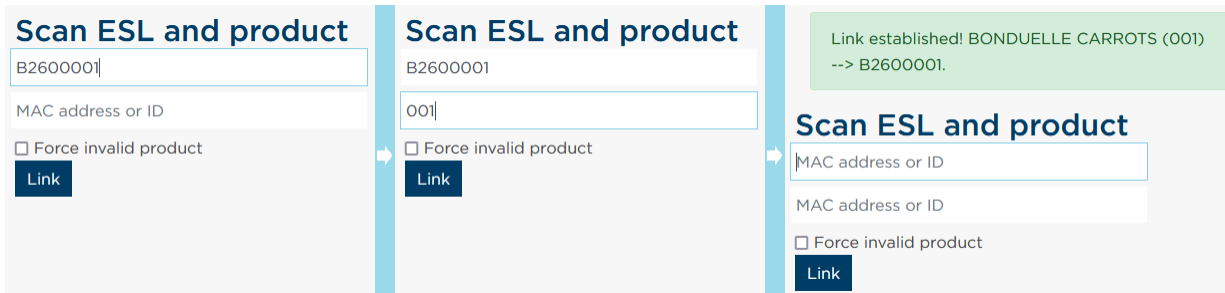


Figure 34: Quick linking step by step

You can scan the MAC address and UID/barcode/description in any order. If there is an issue with, you will receive feedback on the issue. If more than one product is found, you’re given a list of possible options to choose from.

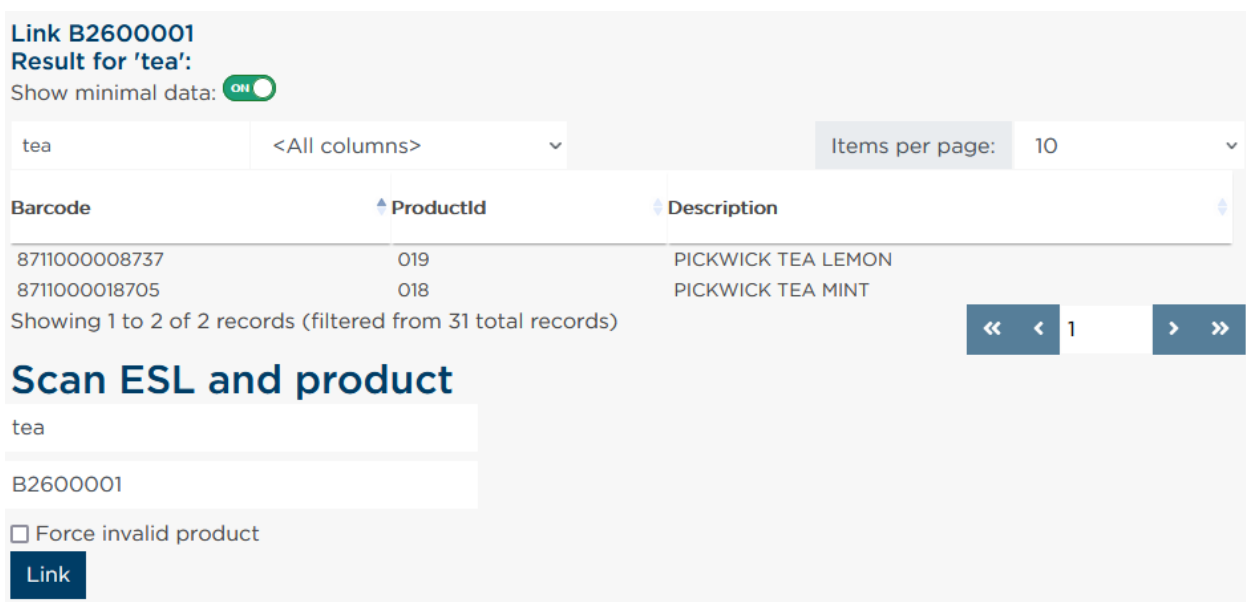


Figure 35: Quick link ambiguous result

After linking a product, you can immediately continue with the next product, offering you a steady workflow.

7.3 Quick Unlink

Quick unlinking allows you to provide the MAC address of the ESL you want to unlink. When using a device with a barcode scanner attached to or built into it, unlinking ESLs is even faster.

Go to the menu item “Link > Unlink” to open the quick unlink page (default <https://ebs50.local/link/unlink>).

Scan the MAC address, or type it in. When using a scanner, configure it to simulate pressing the “Enter” key after performing the scan. After “Enter” has been pressed, the MAC address is searched in the link tables and, if found, the entry is removed unlinking the ESL.

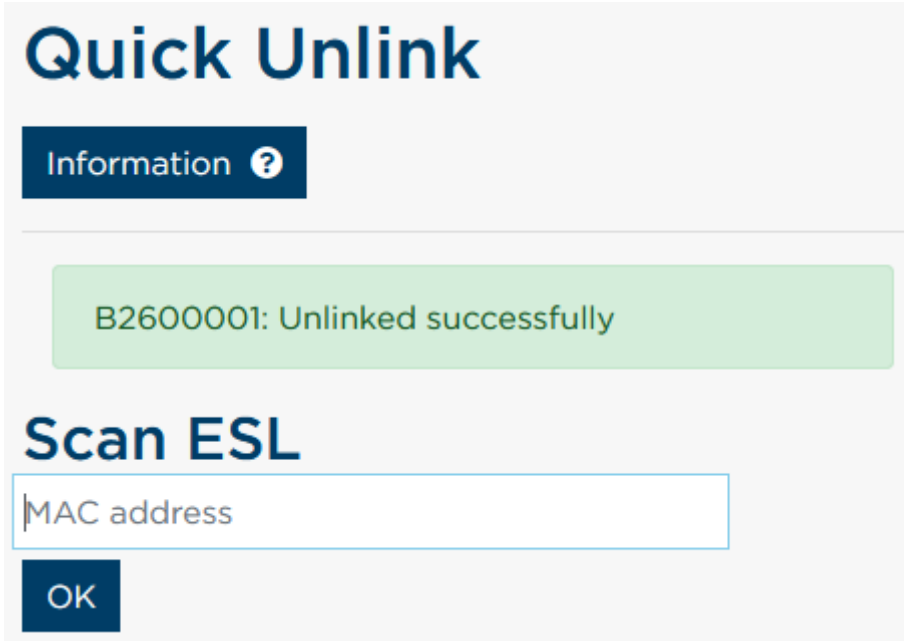


Figure 36: Quick unlinking successful

7.4 Links table

For an overview of your links, as well as some manual editing/removing of links, you can use the links table. Select the menu item “Link > Links” (default <https://ebs50.local/link>) to view the table. You can use the search bar to find links and use the column selector to focus your search on a specific column. Once you find the record you want to edit, you can click the icons in the “Action” column to change the MAC address (i.e., link the product to a new ESL), to relink the ESL (i.e., link the ESL to a new product) or remove the link altogether.

ID	Variant	MAC	Description	Action
001	EE213R	B2600001	BONDUELLE CARROTS	⌵ 🔗 ✕

Figure 37: Link table and record

7.5 Upload link CSV file

As links are stored in a links table, it is possible to express this table as a CSV file. In the ESL Web Server Toolkit, under “Examples/CSV” you can find an example of such a CSV file. The default syntax is

```
<Action>;<UID>;<Variant>;<MAC>
```

“Action” is a single letter, to specify what you want ESL Web Server to do with the rest of the line. “I” for insert (overrides existing MACs if applicable), “R” for replace (if MAC is non-existent, inserts it as a new line), D for delete (removes the link for a given MAC address if applicable).

NOTE: the Action parameter can be skipped, then each line will be treated as an insert.

“UID” is a value in the column specified as the Unique ID in your product database. This value is unique to the product you want to link the ESL to. If this value can’t be resolved to a product, the link is not added.

“Variant” is the type of ESL you are linking to, e.g. “EE213R” or “PE292”.

“MAC” is the MAC address of the ESL. There can be 8-, 11- or 16-character long hexadecimal addresses (i.e. B2600001, B000260001 and 3889DC0002600001 all refer to the same ESL).

7.6 Layering

Layering is an optional function, where you can link a single ESL to multiple products. This function allows you to create all kinds of interesting setups, for instance an ESL with an overview of an entire shelf or an ESL in between two products that show information on the products on either side. Or, when combined with a Calendar setup (see chapter [8.6 Calendar synchronization](#)), you can have room signage that shows the next two upcoming events of a calendar, or the first upcoming event of multiple calendars.

To use layering, the link table needs to be updated, and you will need to create Templates that support multiple layers. This chapter gives an overview of the new functionality in the linking and template designing UI.

7.6.1 How it works

Normally, ESLs are linked to a product in a one-on-one fashion; each ESL has a unique MAC address and can only appear in the link table once. If you link a new product to the same MAC address, the old product link is overwritten. This is the default behavior.

A linked ESL displays an image that is created by combining the Template (a blueprint for the image shown on the ESL, see chapter [9 Templates](#)) with the product information from the database. This Template, by default, is designed to display product information from a single product.

For layering to work, we will add layers to the Template. Each layer displays a single product, and the layer can be given a specific name to make linking easier. For example, if you place an ESL between two products, you may want a Template with a layer on the left side called “Left”, and a Template with a layer on the right side called “Right”.

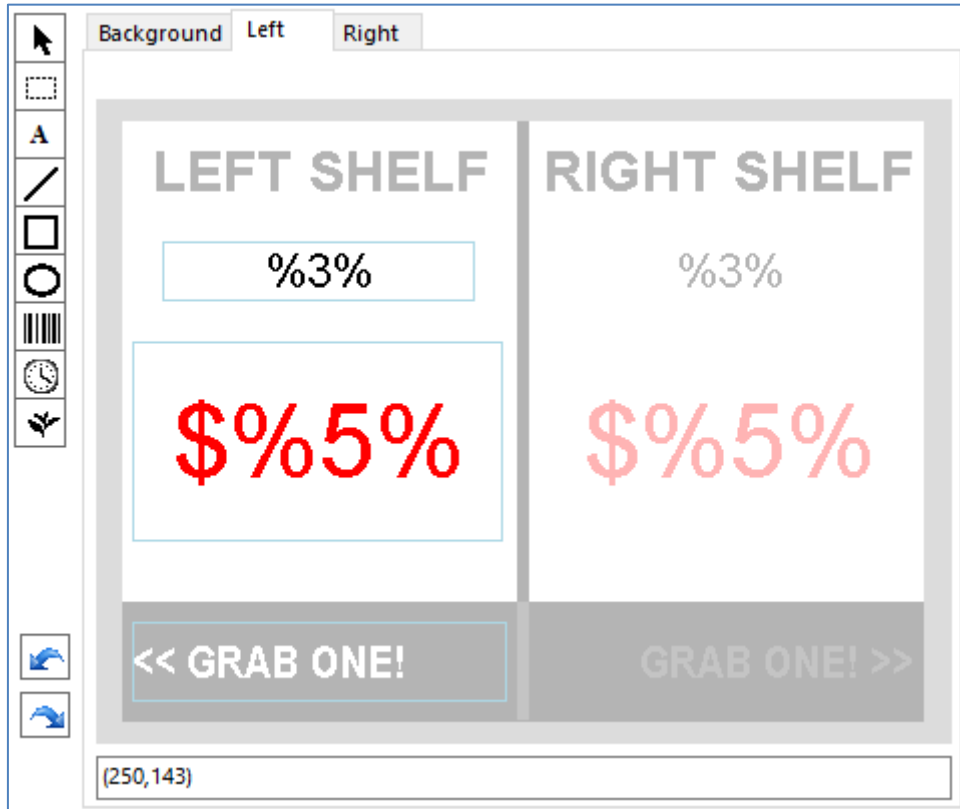


Figure 38: Template with layers

Now you need to update the link table in the database, so we can link a product to a specific ESL by MAC address and to a specific layer by layer name.

ID	Variant	MAC	Layer	Description	Action
001	EE153R	B2820001		BONDUELLE CARROTS	[Icons]
001	EE420R	B2A00001	Left	BONDUELLE CARROTS	[Icons]
002	EE420R	B2A00001	Right	BONDUELLE FANTASIA FESTINI	[Icons]

Showing 1 to 3 of 3 records

Figure 39: Link table with layering enabled

The resulting image of an ESL will now display information from two products simultaneously. If the product information of either link updates, the ESL will automatically reflect this new information.

7.6.2 Turning layering on and off

To use layering, the link table needs to be updated. Go to the Link table page (menu Links, Links table) and press on the settings wheel icon at the top to open the settings menu. Here you can toggle between layering on and off.

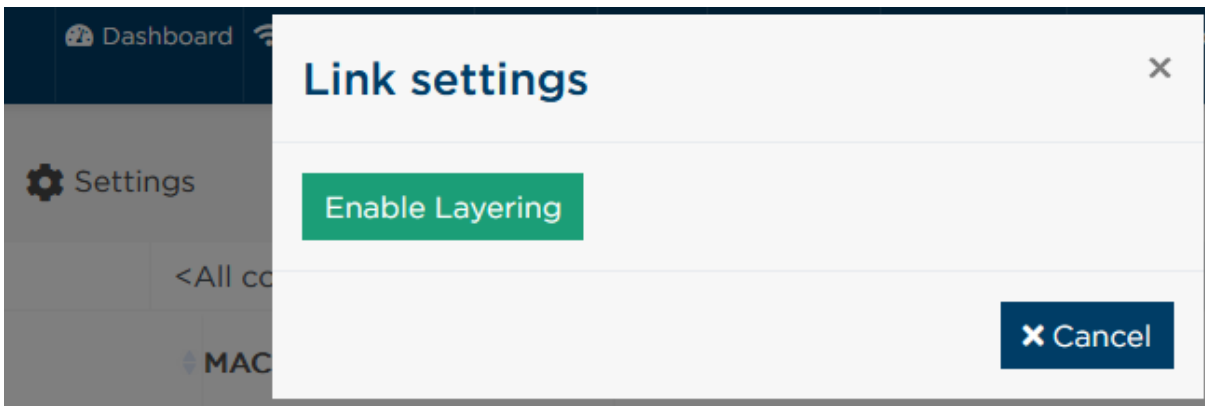


Figure 40: Pressing the settings wheel icon (left) opens the Link settings menu







Turning layering on simply adds a layer column to the link table, and all your existing links are ported to the new table with an empty value in the layer column. This means that your existing links that were not using layers, are left unchanged; they still are links that don't use layers.

Turning layering off removes the layer column from the link table, and here you may lose links (the link settings page will show a warning) because in a non-layer setup each MAC address can only appear once. If an ESL has links to multiple products and layers, all layers will be removed and only the first product will remain linked to the ESL.

ID	Variant	MAC	Layer	Description	Action
001	EE420R	B2A00001	Left	BONDUELLE CARROTS	[Icons]
002	EE420R	B2A00001	Right	BONDUELLE FANTASIA FESTINI	[Icons]
025	EE153R	B2820001		SPA & FRUIT ORANGE	[Icons]

Showing 1 to 3 of 3 records

Figure 41: Link table with layering, before layering removal

ID	Variant	MAC	Description	Action
001	EE420R	B2A00001	BONDUELLE CARROTS	  
025	EE153R	B2820001	SPA & FRUIT ORANGE	  

Showing 1 to 2 of 2 records

<< < 1 > >>

Figure 42: The same Link table without layering, after layering removal

7.6.3 Designing a Template with layering

This chapter does not cover everything about Template design, please refer to chapter [9. Templates](#) if you are unfamiliar with Templates.

For an ESL to show product information for more than one product, you will need a Template with a blueprint for more than one product. Each of these “Templates in a Template” is called a layer.

Each layer within a Template can be linked to a product. The layers can be given names, so you have more control over the exact layer a product will be linked to.

In addition, there is also the option to create a background layer. This is a layer that will always show up, even if you link only a single product to an ESL. A good use case is with an ESL showing a shelf layout; no matter how many products you want to show, the shelf always needs to be visible. The background layer is intended for this purpose.

7.6.3.1 Creating a layered Template

To create a new layered Template, open the Template Designer tool and create a new Template.


Create New Template ✕

Name:

Variant:

Portrait mode:

Calendar mode:

Nr. of products: 

Background layer:

MultiLayer_42.xml : 400 x 300

Figure 43: Creating a layered Template

Give the Template a name, choose the ESL variant you want to design for, and select how many products you want and if you want to add a background layer. You can add/remove product layers and the background layer at a later stage as well.

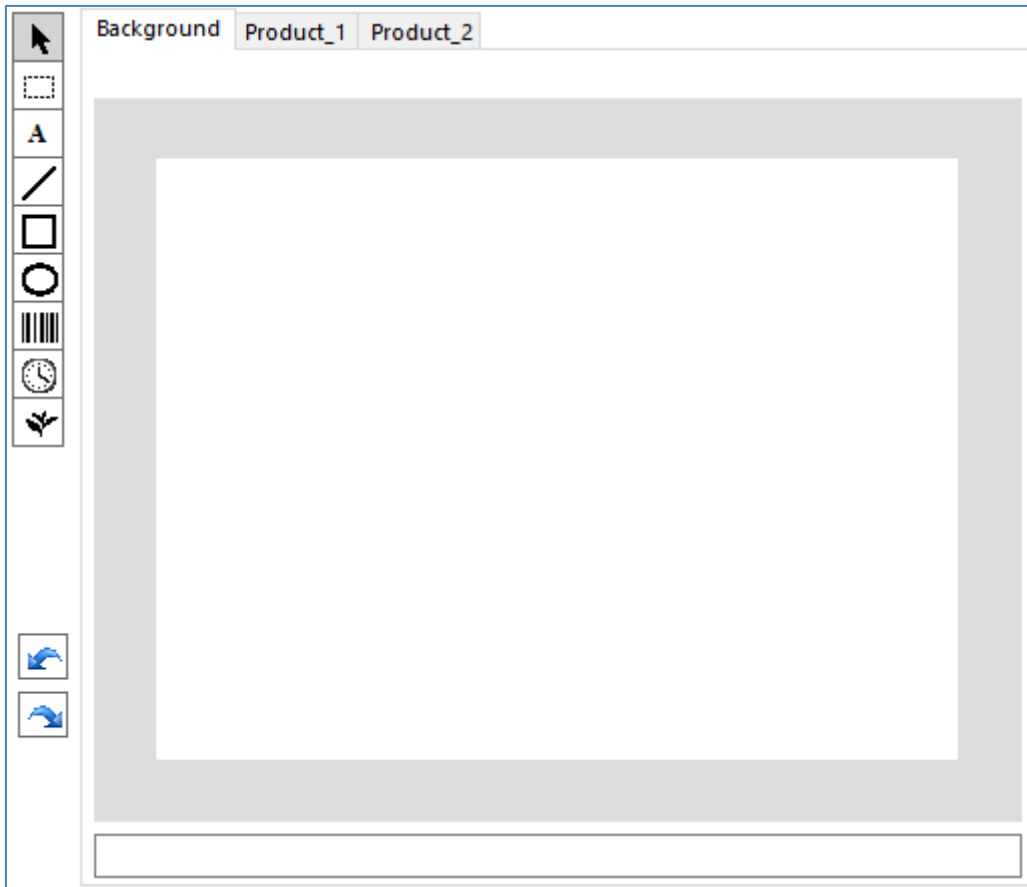


Figure 44: Blank Template created

Your Template will be automatically generated with the requested layers. The layers are named, with the product layers called "Product_1" and counting. To rename them, simply double click on the name and type in a new one. After some designing, a Template with a background layer is done!

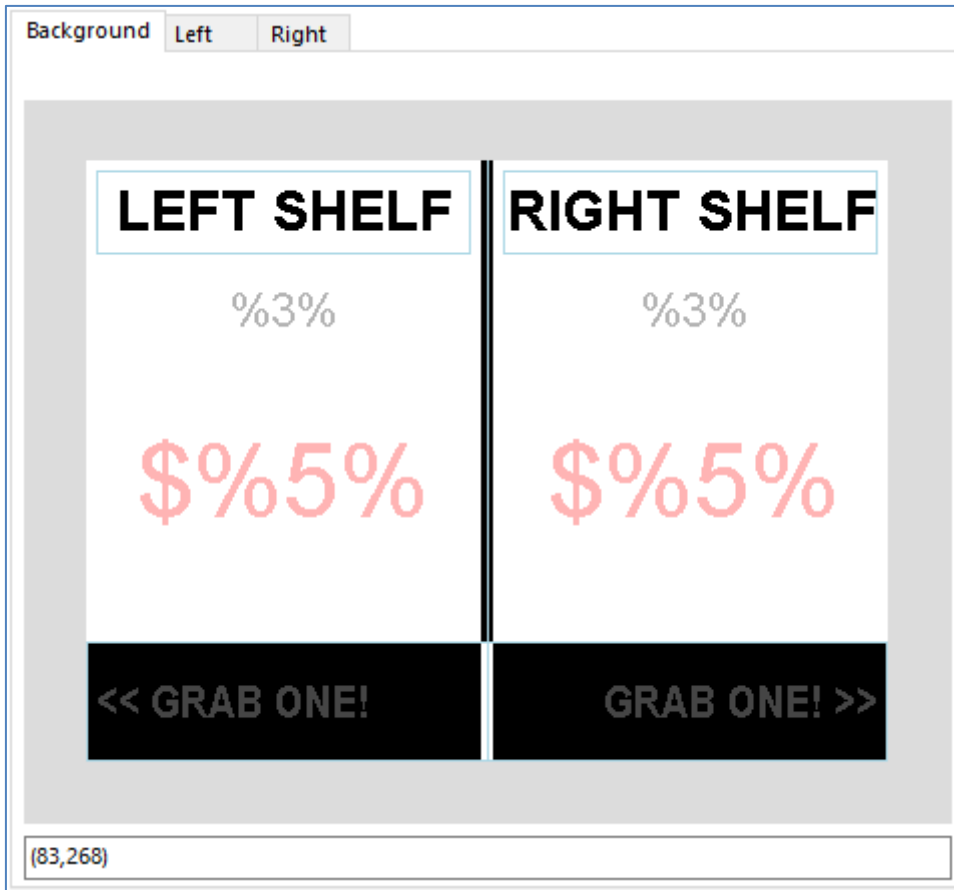


Figure 45: Example Template with two product layers and a background layer

The example in Figure 45 shows the background template selected, which consists of the words “Left shelf” and “Right shelf”, with a dividing line in the middle and a black bar at the bottom.

The designs of the layers “Left” and “Right” are seen in semi-transparent mode. They both show the product name (column 3 in the database) and the article price (column 5 in the database) with a promotional “Grab one” message beneath.

LEFT SHELF	RIGHT SHELF	LEFT SHELF	RIGHT SHELF	LEFT SHELF	RIGHT SHELF
BONDUELLE CARROTS			BONDUELLE FANTASIA FESTINI	BONDUELLE CARROTS	BONDUELLE FANTASIA FESTINI
\$0,95			\$0,99	\$0,95	\$0,99
<< GRAB ONE!			GRAB ONE! >>	<< GRAB ONE!	GRAB ONE! >>

Figure 46: Left to right; link on layer "Left", link on layer "Right", links on both layers

To reiterate, the background layer will always be shown when a link is created. This layer will show when “Left” is linked, “Right” is linked, or when both “Left” and “Right” are linked.

In the example in Figure 46 you can see this behavior in action.

7.6.3.2 Making sure the Template works on layered links only

In order to properly use a Template with layering, you will need to add a conditional to the Template (see chapter [9.2.3 Template Selection](#)) that ensures the Template is only selected for use when a link has a layer assigned to it. Simply add the condition “Use if Layer is not empty”. This conditional statement can be combined with other statements as well.

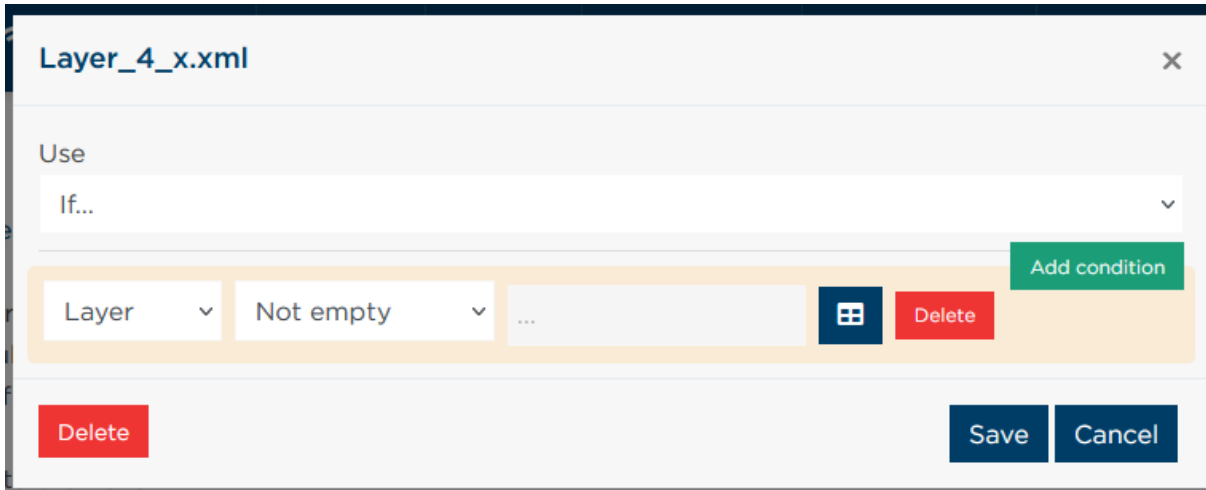


Figure 47: Layering conditional

7.6.4 Linking to a layer Template

Now that we have created a Template with layers, we will want to add links with layers. When linking is enabled on the Link table page, all three link/unlink pages will update.

These are:

- Link modal (which opens when you click on an ESL on the ESL page, or when you select the “Link ESL” action in the dropdown menu on the ESL page, or when you click on “Relink ESL” on the Link table page)
- Quick Link page
- Quick Unlink page

7.6.4.1 Link modal

The Link modal is the menu that appears when you click on an ESL in the overview list on the ESL page. This menu shows you a preview of the current image on the ESL (when linked to a product) and the information of the link (product ID, product name).

With layering enabled, a third line appears; the layer whose link you are currently editing.

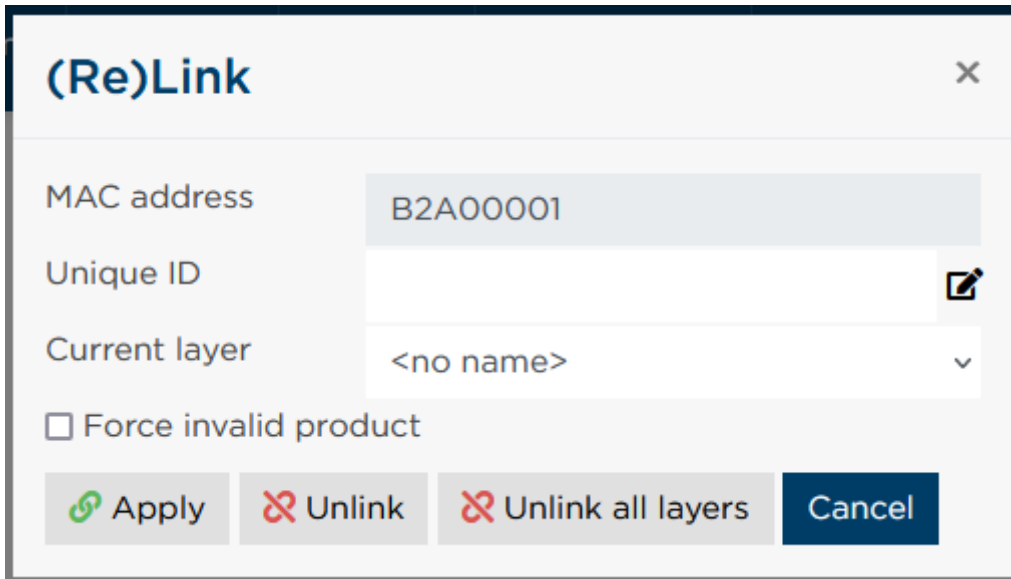


Figure 48: Non-linked ESL shows layer selector

If the ESL has no links yet, you can directly choose which layer you want to link to. The dropdown menu allows you to select the layer to link to. The layer “<no name>” means that you do not want to use a layer, but simply use a default Template that has no layers in it.

Pressing “Apply” will save the link.

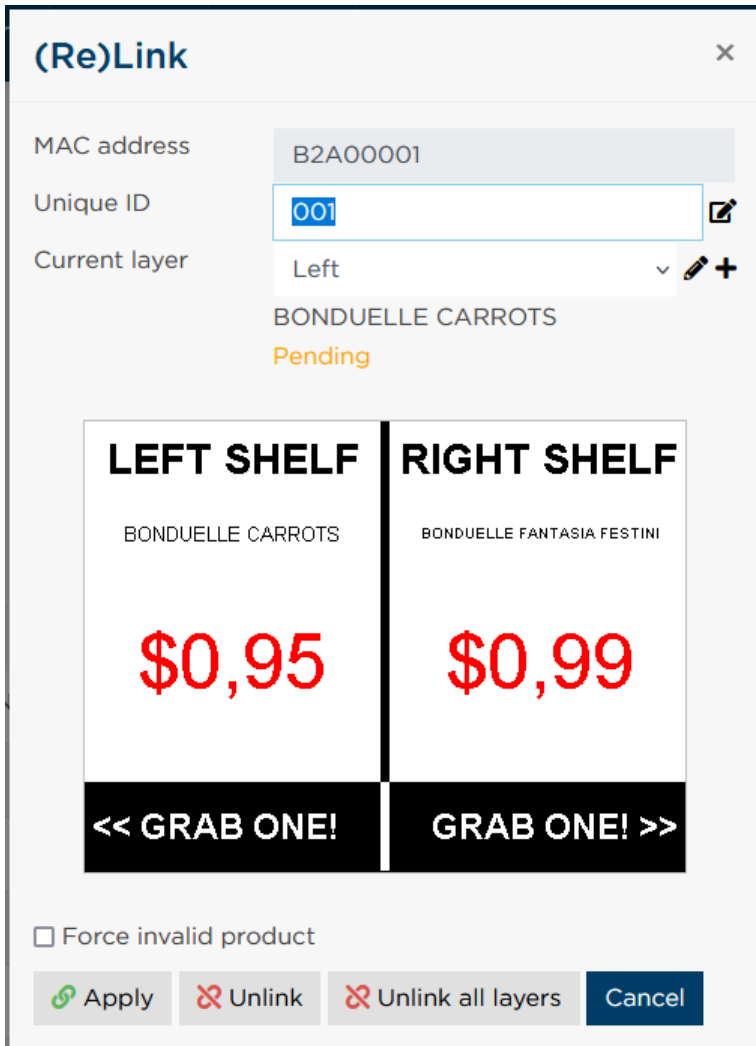



Figure 49: Link modal with linked layers

If the ESL already has one or more links, the dropdown menu is filled with the layers currently in use. Selecting a layer now will update the modal with the details of the link of that layer.

Pressing the Unlink button will unlink only the layer you are currently viewing. To unlink all the layers, press the 'Unlink all layers'-button.



Figure 50: Moving the product from the "Left" layer to "Right"

When you are working with an ESL with an active link, you can move which layer it is in by pressing the  - symbol next to the layer dropdown. In the new menu that appears you can select a layer to move the existing link to.

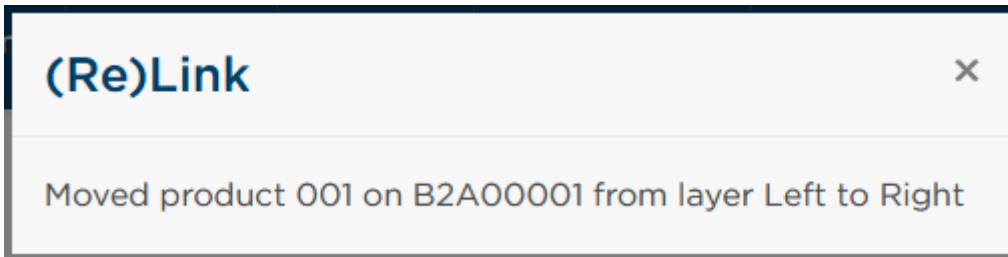


Figure 51: Layer editing success message

After pressing Apply, the link will be moved, and a success message will appear.

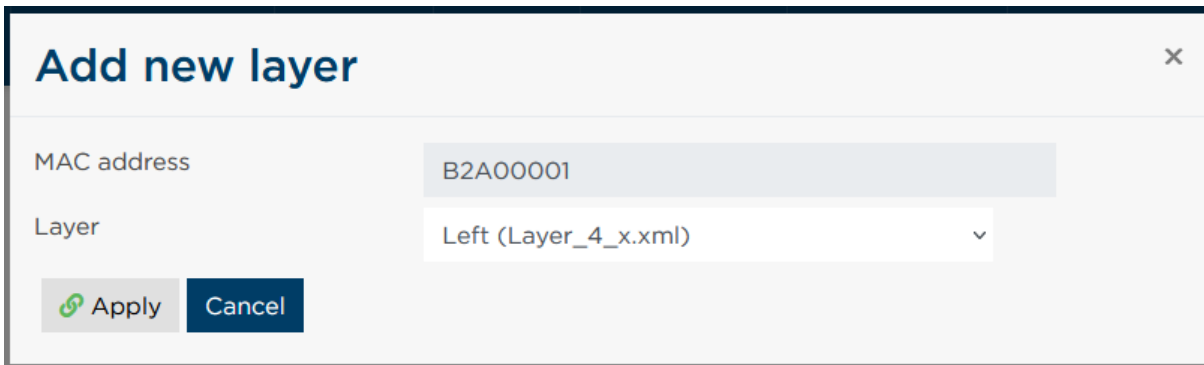

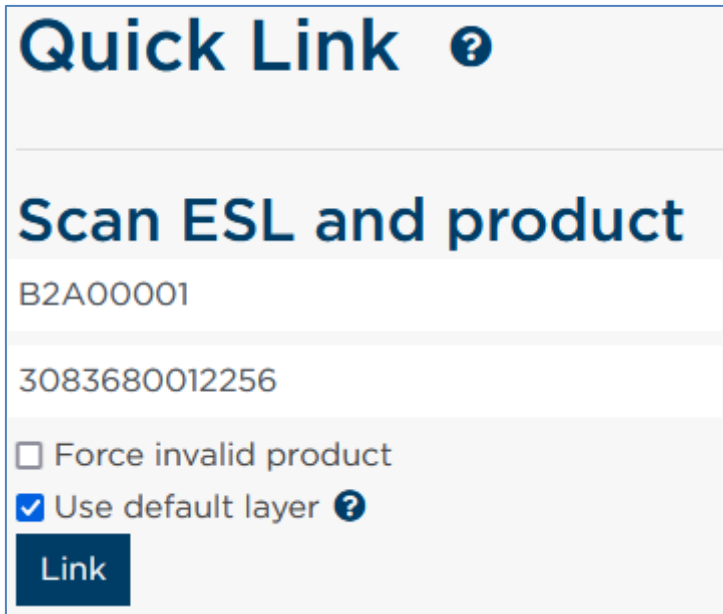


Figure 52: Adding a layer to an existing link

If you want to add a new layer to an ESL, you can press the  -symbol next to the layer dropdown. In the new menu you can select the layer you want to link a new link to.

7.6.4.2 Quick Link

When layering is enabled, the Quick Link page (menu bar Link -> Quick Link) is slightly updated. For information on the default Quick Link page, read [7.2 Quick Link](#).



Quick Link ?

Scan ESL and product

B2A00001

3083680012256

Force invalid product

Use default layer ?

Link

Figure 53: New "Use default layer" checkbox on Quick Link page

On the page a new option is added: "Use default layer". When this box is checked, any MAC + Product ID input will be processed and linked to the default (nameless) layer. The workflow here is as quick as in the original; scan an ESL, scan a product and the link is done.



Quick Link ?

Link B2A00001, Product '3083680012256'

Choose a layer to link to:

<no name> **Left** **Right**

Scan ESL and product

B2A00001

3083680012256

Force invalid product

Use default layer ?

Link

Figure 54: Layer selector when multiple layers are available

If you uncheck this box, after processing the MAC + Product ID input you will be presented with all layer names present in the Templates for the ESL variant you want to link to. If there are only default layers available, the link will automatically be applied to the default (nameless) layer. Pressing the button with the layer name you want to link will apply the link to that layer.

7.6.4.3 Quick Unlink (layers)

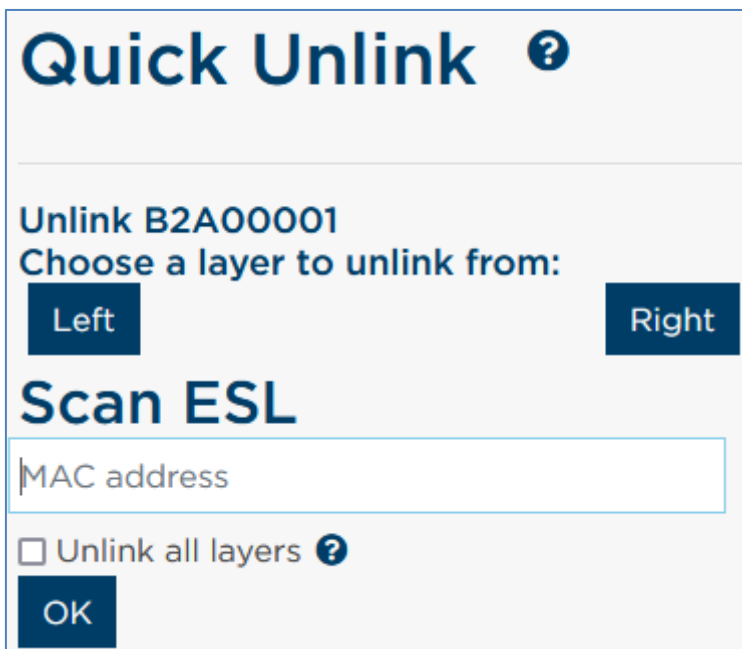
When layering is enabled, the Quick Unlink page (menu bar Link -> Quick Unlink) is slightly updated. For information on the default Quick Unlink page, read chapter [7.3 Quick Unlink](#).



The screenshot shows a dialog box titled "Quick Unlink" with a help icon. Below the title is a section "Scan ESL" containing a text input field with the value "B2A00001". Below the input field is a checked checkbox labeled "Unlink all layers" with a help icon. At the bottom left is an "OK" button.

Figure 55: 'Unlink all layers' option added

On the page, a new option is added; "Unlink all layers". When this box is checked, all links of an ESL are unlinked simultaneously.



The screenshot shows a dialog box titled "Quick Unlink" with a help icon. Below the title is a section "Unlink B2A00001" with the text "Choose a layer to unlink from:". Below this text are two buttons: "Left" and "Right". Below these buttons is a section "Scan ESL" containing a text input field with the placeholder text "MAC address". Below the input field is an unchecked checkbox labeled "Unlink all layers" with a help icon. At the bottom left is an "OK" button.

Figure 56: Unlinking from specific layer

If the box is left unchecked and more than one layer is known for this ESL, you can specify exactly which layer you wish to unlink.

When only one link is available for this ESL, this prompt is not needed, and unlinking is performed without any further input.

7.6.4.4 Upload link file

With layering enabled, the syntax for uploading CSV link files changes too. For information on the default CSV file, see chapter [7.5 Upload link CSV file](#).

The normal syntax is `<Action>;<UID>;<Variant>;<MAC>`, and layering simply adds a column “Layer” to the end of this file. A default layer can be specified by leaving the Layer column empty. A named layer can be specified by this name. There is no check on validity of the Layer name, so be careful with creating links that might fail due to missing Templates.

Example:

```
I;025;EE153R;B2820001;
```

```
I;001;EE420R;B2A00001;Left
```

```
I;002;EE420R;B2A00001;Right
```

This input creates two layered links on an EE420R (as seen in previous layering examples in this chapter) as well as a link on an EE153R on the default layer.

8 Database

8.1 Required tables

8.1.1 Products

To display the appropriate data on the ESLs, you need a table that contains the data that you want to link to ESLs. If you use ESLs in a store, this will be a table containing information about the products. If you use ESLs for room reservations, this will be a table containing information about the rooms. No matter what kind of information you want to display on the ESLs, this table is known as the “product table” for abstraction.

8.1.2 System tables

The ESL Web Server also uses other tables to keep track of everything, examples are the Links table (what ESL is connected to what ‘product’), the ESL status table (latest received information of every ESL ever connected to the system) or Event log table (logs changes to the system, or errors encountered during operation). These tables are automatically created by the ESL Web Server and are known as “system tables”.

8.2 Available set-ups

As chapter [8.1 Required tables](#) shows, there is a logical divide in the data tables that the ESL Web Server uses. The product table consists of data that you, the customer, wants to show on your ESLs. The system tables are used by your EBS-50 (or by your ESL Web Server software hosted on any other system) to store all information relevant to that specific instance.

NOTE: For more information of configuring the setups mentioned here, please read chapter [8.4 Database Wizard](#).

8.2.1 All data external

This setup can be used if you want to store all information on your existing database server. Your ESL Web Server software only needs read access on the product table, but will need write access on all the system tables (and, if the tables do not exist, write permission to create these tables on the database server).

NOTE: If you use multiple EBS-50's (or host multiple instances of ESL Web Server software) then each of these needs their own set of system tables, so be sure to create a separate table in your database for each instance (see chapter [8.4.4 System tables](#)).

8.2.2 All data internal

This setup allows you to store all information on the EBS-50 (or on whatever system you are using to host the ESL Web Server software). The EBS-50 is equipped with a locally running MySQL database, or it can store data in an SQLite data file.

You can supply the product database with information from CSV files hosted on an SFTP server (see chapter [8.4.1.1.2 Downloading CSV from SFTP server](#)), CSV files posted to the EBS-50 in the Input folder with an SFTP manager like WinSCP (see chapter [13 Log in by SSH using WinSCP/PuTTY](#)), providing product data through the REST API (see chapter [12.1 REST API](#)), or by manually adding new lines to the database through the products table (default <https://ebs50.local/products>).

8.2.3 Hybrid solution

This setup allows you to keep your product table on your existing database server and lets the EBS-50 store all its system tables in a different database. This can be the internal MySQL or SQLite database of the EBS-50, or a different database on the same external database server.

You may allow the ESL Web Server read/write access, so changes made to the products table on the ESL Web Server (through UI editing, API commands or CSV files) persist in the external product table as well.

You may disallow ESL Web Server write access, so changes made to the products table on ESL Web Server are stored in a local shadow database containing overrides to the original data. Through the database setup you can define what to do when the ESL Web Server syncs its data with the external products table. You can either remove all overrides when synchronizing, remove overrides when the external data has changed, or never remove a local override.

This hybrid setup is great for a multi-store setup when each of the stores relies on the same central database, but you want each EBS-50 to work as a local instance with all links and logs specific to the store itself.

8.3 Supported formats

The ESL Web Server supports many database formats to store its product table and system tables:

- CSV types:
 - Local CSV
 - CSV from SFTP server
 - CSV from API server
- SQL types:
 - MySQL
 - MS-SQL
 - Oracle
 - PostgreSQL
 - SQLite
 - FireBird

When working with a hybrid solution, any combination of the CSV or SQL formats is supported. For example, your data table can be in a MySQL database, while the logging tables are in an SQLite database, or you can have a CSV data table with Oracle logging tables.

In addition to the default setup of working with products and Templates, the ESL Web Server also offers:

- External Content Management System (CMS)
- Calendar syncing / room signage (can be used in addition to a product table)

8.3.1 External Content Management System (CMS)

Using an External Content Management System (CMS) means a 3rd party system will supply images and XML-files to the ESL Web Server Application by placing them into the Input-folder or uploading them to the API. For more information see 17.6 External Content Management System (CMS) configuration

8.3.2 Calendar syncing / room signage (iCalendar)

When using a setup with products and links (in other words, when not using a CMS setup) you can add calendars as an additional data source. This data source is separate from the product database and can work with any setup

you have. The latest calendar information is stored in a local SQLite database on your device, and links you make to events from the calendar are stored in the link table you already have.

The concept of linking remains the same; but where a normal link is between an ESL and a product ID referencing a product from the product table, a calendar link is between an ESL and a calendar event referencing an event from a calendar.

Please read chapter [8.6 Calendar synchronization](#) for information on setting up synchronization with a calendar.

8.4 Database Wizard

The database wizard is a step-by-step process to configure your products and system tables. As mentioned in chapter [8.2 Available](#) you can specify the location of your required tables for a flexible setup, allowing the product table to reside on one database, and system tables either on the same database or a different database. Steps 8.4.1 through 8.4.3 are related to setting up the product table, and 8.4.4 onwards on setting up the system tables.

8.4.1 Products database

The very first step of configuring your connection is by specifying the type of database that your database resides in.

For help with setting up a default product database for testing, please refer to chapter [0](#)

[Database configuration](#) examples to get your preferred database type up and running.

In the Products menu, select “Set up new connection” (default <https://ebs50.local/database/newconnectionwizard>) and select the database type to start the corresponding wizard.

8.4.1.1 CSV Database

8.4.1.1.1 Uploading CSV file

If you want to use a CSV database that you have stored in a file, the first step is started by selecting the menu option “Products” → “Set up new connection” and choosing “Configure CSV connection” (default <https://ebs50.local/database/csv>). Then upload that database file to start the wizard. Press Next and proceed to [8.4.1.1.4 Configuring the database with the supplied CSV](#).

8.4.1.1.2 Downloading CSV from SFTP server

If you want to use a CSV database that is stored on an SFTP server, the first step is started by selecting the menu option “Products” → “Set up new connection” and choosing “Configure SFTP Connection” (default <https://ebs50.local/database/sftp>). First you provide the credentials of the SFTP server, and press “Next” to establish a connection.

NOTE: The credentials can be a simple user + password, but also a user + keyfile and (optional) keyfile password.

Figure 57: SFTP connection credentials screen

Once the connection is established, you will be shown a file command window.

Configure SFTP connection

Please select the CSV file.

The screenshot shows a file selection wizard interface. At the top, it says "Please select the CSV file." Below this, there are navigation icons (home, refresh) and the current path "/home/opti/". A table lists the files and directories in the directory:

Name	Size	Changed	Rights
..		30/08/2023 16:25:50	rwxr-xr-x
.cache		30/08/2023 16:28:52	rwx-----
.local		30/08/2023 16:29:10	rwxrwxr-x
.ssh		30/08/2023 16:26:45	rwx-----
.bash_aliases	1 KB	30/08/2023 16:36:07	rw-rw-r--
.bash_history	1 KB	05/03/2024 11:30:35	rw-----
.bash_logout	1 KB	06/01/2022 17:23:33	rw-r--r--
.bashrc	4 KB	06/01/2022 17:23:33	rw-r--r--
.profile	1 KB	06/01/2022 17:23:33	rw-r--r--
.sudo_as_admin_successful	0 KB	30/08/2023 16:34:05	rw-r--r--
products.csv	2 KB	29/09/2023 09:49:21	rw-rw-r--

Figure 58: File selection wizard

Select the correct file through the file selection wizard. Once you’ve selected the file, the path to the file will be remembered for future synchronizations.

As a data-saving measure, the file will only be downloaded during reload if the timestamp of the file is different than the last synchronization. The synchronization interval is decided later on in the database wizard, and is explained in chapter [8.4.2 Reload frequency](#).

Note that you can only select a single file. If your database becomes very large, it will have an impact on the network data use and processing time required for each reload. In that case, API CSV might be interesting to consider.

Press Next and proceed to [8.4.1.1.4 Configuring the database with the supplied CSV](#).

8.4.1.1.3 API CSV connection

CSV downloaded from an API connection is like SFTP in the sense that an external server is the host to the database files, but it offers more functionality that can be optionally added.

To get started with API CSV, select the menu option “Products” → “Set up new connection” and choose “Configure CSV from API connection” (default <https://ebs50.local/database/apicsv>).

Configure CSV from API connection

Edit connection

API CSV endpoint

Request headers

<input type="text" value="x-api-key"/>	<input type="text" value="abc_secure_key"/>
----------------------------------------	---------------------------------------------

Complete reload interval

Figure 59: API-CSV connection wizard

In [Figure 59](#) you can see the configuration page. There are three components:

- API CSV endpoint
- Request headers
- Complete reload interval

The API CSV endpoint is an http or https address that can be reached by the ESL Web Server, and the endpoint should return data as text in a CSV-format.

Request headers are optional. These are key-value pairs that are added to the request, and in an HTTPS connection they are encrypted. A common use for request headers is adding an API key that ensures only trusted parties can access the data. You can even make the key function as an identifier, so that a key created for store A will only return products valid for store A.

Complete reload interval is something that sets API CSV apart from SFTP CSV. With SFTP, only a single file representing an entire database can be selected. If the database becomes large, this will make each synchronization use more network data and processing time because the entire database will be downloaded and processed. API CSV adds a date-time stamp that echoes the API server time of the last synchronization, which the API server can use to give back a CSV file containing only the changes made since that time. The server time is formatted as ISO 8601, the sortable datetime pattern, yyyy-MM-ddTHH:mm:ss. Example: 2024-02-27T21:45:50. This timestamp is added to the request headers under the key “modified since”, and as a query string that appends “&modified since=2024-02-27T21:45:50” to the endpoint URL.

To ensure that any missed changes between the ESL Web Server and the database are automatically fixed, every nth synchronization will be a request for the full database, meaning that the “modified since” parameter is not sent along. The value for “complete reload interval” decides how many partial synchronizations will take place before a full database reload is performed.

Press Next and proceed to [8.4.1.1.4 Configuring the database with the supplied CSV](#).

8.4.1.1.4 Configuring the database with the supplied CSV

No matter what the source, the supplied CSV will be parsed. The single character delimiter will be automatically determined: valid delimiters are comma (','), semicolon (';'), tab ('\t'), pipe ('|'), colon (':') and circumflex ('^'). Besides determining the delimiter, the parser will try to find a header row that contains the names for the columns. Normally, the pound symbol ('#') is used for comments, so the parser will look if there are lines with the pound symbol as its first character. If there are comment lines, each line of commentary will be parsed using the

delimiter character. If one or more lines contain as many columns as there are in your actual data lines, the last applicable row will be used to automatically fill in the column names.

Configure SFTP connection

#ACTION	+	Article No.	+	EAN/UPC	+	Description	+	Group	+	St
		001		3		BONDUELLE CARROTS		93		0,9
		002		3		BONDUELLE FANTASIA FESTINI		93		0,9
		003		3		BOND BUNTER MIX		93		1,2
		004		3		BOND APPEL COMPOTE		93		0,7
		005		24000190257		DEL MONTE TOMATO PASTA		93		1,8
		006		38900014605		DOLE PINEAPPLE ON JUICE		93		1,7
I		007		3083680844048		BOND ITALIAN MIX		93		2,1
		008		8718114412160		FRUCTIS 2 IN 1 SHAMPOO		2		3,8
		009		5410091686352		SWARZKOPF SHAMPOO PEACH		2		2,9
		010		4005808128600		NIVEA FOR MEN SPORT		2		3,9

Does everything look correct? Then click the confirm button. If the file was not read correctly, you can make changes using the Edit button.

< Previous Discard changes Save

Figure 60: Configuring CSV file

As seen in [Figure 60: Configuring CSV file](#), after uploading the products.csv example file, we see that the file is correctly parsed, and that the header row (starting with the pound symbol '#') is present.

Now we need to press the plus-sign ('+') on the columns that contain the primary key of this database, the unique ID of the product and the column containing the description of the product.

Primary key and unique ID are two separate values. In our demo product-table it is to allow duplicate ID's for products that may have multiple valid barcodes. That means that EAN/UPC is the key (completely unique per row) and Article No. is the unique ID (unique per product, not necessarily per row). Of course, you can also assign both the primary key and unique ID to the same column.

Configure SFTP connection

#ACTION	Article No.	EAN/UPC	Description	Group	Standard price	Sell price	Discot
	001	3083680012256	BONDUELLE CARROTS	93	0,95	0,89	
	002	3083680915816	BONDUELLE FANTASIA FESTINI	93	0,99	1,19	
	003	3083680823609	BOND BUNTER MIX	93	1,29	0,89	31
	004	3083680047760	BOND APPEL COMPOTE	93	0,79	0,79	
	005	24000190257	DEL MONTE TOMATO PASTA	93	1,82	1,49	18
	006	38900014605	DOLE PINEAPPLE ON JUICE	93	1,75	1,75	
I	007	3083680844048	BOND ITALIAN MIX	93	2,10	2,10	
	008	8718114412160	FRUCTIS 2 IN 1 SHAMPOO	2	3,80	3,80	
	009	5410091686352	SWARZKOPF SHAMPOO PEACH	2	2,95	2,95	
	010	4005808128600	NIVEA FOR MEN SPORT	2	3,95	2,95	25

Does everything look correct? Then click the confirm button. If the file was not read correctly, you can make changes using the Edit button.

< Previous Edit Next >

Figure 61: CSV columns assigned

Once you have assigned the columns containing the primary key, unique ID and description, press "Save". Press "Next >" if you are happy with these settings.

Please refer to paragraph [8.4.2](#) for the next configuration steps.

8.4.1.2 SQL database

If you want to use any kind of SQL database format, the first step is started by selecting the menu option “Products” → “Set up new connection” and choosing “Configure SQL connection” (default <https://ebs50.local/database/sql>) to open the SQL connection setup screen.

Fill in the credentials to your database (make sure that the database is accessible from the EBS-50, or from the system that hosts the ESL Web Server software), and press “Next >” to test the connection.

Figure 62: MySQL over IP example

NOTE: When you want to use SQLite on your local system, press the button labelled “Next” to test your setup. If the connection can be made, you’ll go to the next step in the connection wizard. See [17.6](#)

[SQLite example](#) configuration for more information on these steps. Leave “server address” empty to make ESL Web Server look for the database file named “esl.sqlite3” in your ‘Output’ folder present in your ESL Web Server’s running folder. Only the “database” parameter needs information.

NOTE: See [0](#)


[Database configuration](#) examples for information on setting up a default product database in the SQL format of your choosing.

Once your connection could be made, the tables of your database will become available in the database wizard. By default, the first table containing the word “product” (or the first table if no table containing that word can be found) will be shown. Use the dropdown menu at the top to select the correct database.

Configure SQL connection

Product table

products

NotUsed +	ProductId +	Barcode  +	Description +	Group
	001	3083680012256	BONDUELLE CARROTS	93
	002	3083680915816	BONDUELLE FANTASIA FESTINI	93
	003	3083680823609	BOND BUNTER MIX	93
	004	3083680047760	BOND APPEL COMPOTE	93
	005	24000190257	DEL MONTE TOMATO PASTA	93
	006	38900014605	DOLE PINEAPPLE ON JUICE	93
	007	3083680844048	BOND ITALIAN MIX	93
	008	8718114412160	FRUCTIS 2 IN 1 SHAMPOO	2
	009	5410091686352	SWARZKOPF SHAMPOO PEACH	2
	010	4005808128600	NIVEA FOR MEN SPORT	2

< Previous
Discard changes
Save

Figure 63: Connection made to external MySQL database, showing table 'products'

The primary key(s) is automatically selected from the table’s primary key property, if available. Now we need to press the plus-sign (+) on the columns that contain the unique ID of the product and the column containing the description of the product.

Primary key and unique ID are two separate values. In our demo product-table it is to allow duplicate ID’s for products that may have multiple valid barcodes. That means that ‘Barcode’ is the key (completely unique per row) and ‘ProductId’ is the unique ID (unique per product, not necessarily per row). Of course, you can also assign both the primary key and unique ID to the same column.

Configure SQL connection

Product table

products

NotUsed	ProductId	Barcode	Description	Group
	001	3083680012256	BONDUELLE CARROTS	93
	002	3083680915816	BONDUELLE FANTASIA FESTINI	93
	003	3083680823609	BOND BUNTER MIX	93
	004	3083680047760	BOND APPEL COMPOTE	93
	005	24000190257	DEL MONTE TOMATO PASTA	93
	006	38900014605	DOLE PINEAPPLE ON JUICE	93
	007	3083680844048	BOND ITALIAN MIX	93
	008	8718114412160	FRUCTIS 2 IN 1 SHAMPOO	2
	009	5410091686352	SWARZKOPF SHAMPOO PEACH	2
	010	4005808128600	NIVEA FOR MEN SPORT	2

< Previous Edit Next >

Figure 64: UID and Description columns selected

Once you have selected the columns, press “Save” to store your settings and then “Next >” to move on to the next step.

8.4.2 Reload frequency

As your database is likely hosted on a different device, outside users may be editing the information stored in the database. To enable ESL Web Server to stay up to date with these external updates to the information, you can configure to frequency at which ESL Web Server reloads the information from the database.

NOTE: In the next step, you can more precisely set up the amount of data each reload uses, if you are concerned about the size of your products database and therefore bandwidth use.

Configure SQL connection

How often do you want to reload the data?

Every 3 Hours

Starting 2021/10/01 18:00

Immediately update ESLs and the database when changes to the data are made in the ESL server.

< Previous Save

Figure 65: Product data reload configuration

The first parameter allows you to set up how often (and at what interval) you want to reload the data, the second parameter allows you to set up when this interval starts.

You can place a checkmark in the first row to specify if you want to update your ESLs and the products table in the database immediately on change, or if you want these changes to remain in a work queue until the next reload occurs.


Press “Save” when you are done with this step to move on to the next one.

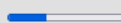
8.4.3 Reload details

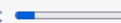
To make a more precise setup of the reload strategy, you can lessen the strain on your (external) database and the use of bandwidth. To enable this, there are 2 different options available to you.

Configure SQL connection

If your data table has many records, and the reload time is small, this could put a big load on the database and the network. To prevent this, you can choose one of the following options to save data. If the reload time is large, or if the data usage is not a concern, you can just choose the default setting.

Basic Data usage: 
 The esl server will reload and compare the entire data table every time. This can put a big load on the database, network and cpu, but if this is no concern in your scenario, this option is the simplest.

Staging + Triggers (recommended) Data usage: 
 If you want to update your data frequently without taxing the network / database too much, you can add triggers and a staging table to your database. These triggers will automatically copy any changes to the data table to the staging table. The ESL server will only retrieve the staging table. This significantly reduces the load, since it doesn't have to retrieve and compare all records if nothing changed.

Load full product table in memory Data/memory usage: 
 If your product table isn't large, then caching your product table in memory will make searching for products faster. However, if your product table is large, then this option will use more time and bandwidth at start-up and may cause your device to run out of memory.

[< Previous](#) [Choose](#)

8.4.3.1 Basic

This setup lets ESL Web Server simply reload all the information in the products table with each reload interval. If you are working with a local database, or a small database, this is the easiest option to implement. You'll always have access to all the information in your product table, making linking and searching for products in the product table smooth with no noticeable lag.

8.4.3.2 Staging + triggers

ESL Web Server will attempt to set up an additional table with a similar construction as the product table, with an extra column (named “DELETE”, to allow for deletion of records). This table is named “<product table>_staging” and is best understood as a “to do list” for changes to the product table on your ESL Web Server. Once this table is added to your database, it will add triggers to your product table too. Every change (edit, insert, delete) made to the original product table will cause the trigger to send a copy of the action to the staging table. ESL Web Server will only read the records from the staging table and delete them once retrieved. This way you massively reduce the amount of data retrieved from the database during synchronizations, which allows for more frequent reloading of data.

NOTE: If more than one ESL Web Server instance uses the same product table and you want to use staging and triggers, you will need a separate staging table or separate database per instance of the ESL Web Server.

8.4.3.3 Load full product table in memory

By default, the ESL Web server will load the entire product table in memory during start-up. This will make searching for products in your database smooth. However, if your product table is exceptionally large, then this option will use more time and bandwidth at start-up and may even cause your device to run out of memory. Unchecking this option will disable the caching of the product table in memory. Searching for a product will become a bit slower, because each search request will be sent to the SQL server.

8.4.4 System tables

As mentioned in more detail in chapter [8.1.2 System tables](#), the system tables hold all information that are important to this instance of ESL Web Server. As mentioned in more detail in chapter [8.2 Available](#), the location of these system tables is flexible. This step of the database wizard allows you to implement your preferred setup.

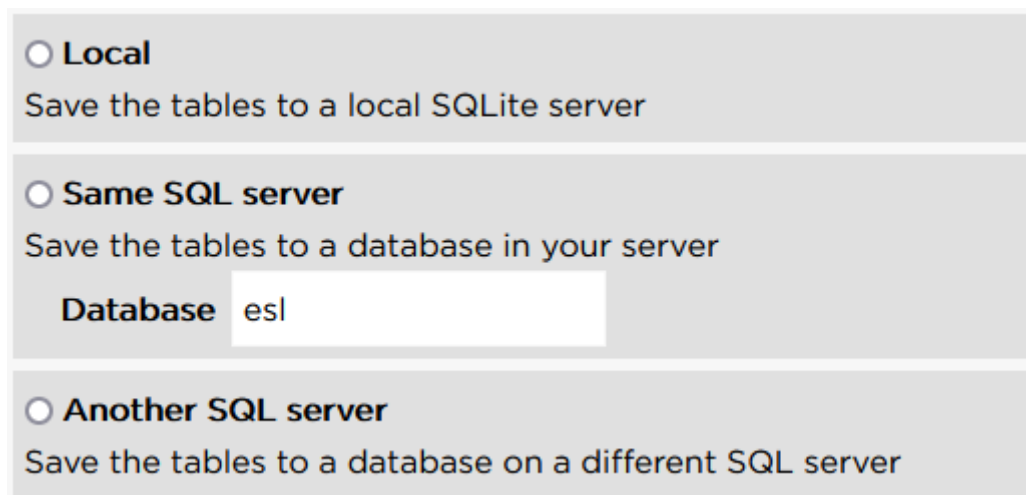


Figure 66: System tables location selector in the SQL Wizard

The first option, “Local”, stores all your system tables in an SQLite database on the EBS-50 itself (or on the device hosting the ESL Web Server).

The second option, “Same SQL server”, stores your system tables on the same database server that you used for your Products. You can supply a different database name than where your products are stored. This way, you can serve multiple ESL Web Server instances efficiently.

NOTE: This option is not available when you upload a CSV file as your database.

The third option, “Another SQL server”, can be used to store your system tables on a different database server altogether. This can be an external database, or the internal MySQL database hosted on the EBS-50.

8.4.5 All data external recommendations

If you are interested in hosting an “All data external” setup, you would want to choose between “Same SQL server” or “Another SQL server”.

When choosing “Same SQL server” we highly recommend using different databases for different instances of ESL Web Server. If multiple EBS-50’s are reading and writing into the same link tables and log files, you can cause racing conditions. Debugging also becomes problematic, as all problems from several instances are logged into the same log tables.

When choosing “Another SQL server” the same rule applies; make sure to have dedicated databases or database servers available for each instance of the ESL Web Server.

8.4.6 All data internal recommendations

If you want to store all data internally, you could choose any of the options.

Choose “Local” to store all system tables in an SQLite data file on the EBS-50 itself (or in the folder that ESL Web Server is running from when hosting it on another device).

NOTE: If your product database is a local SQLite file, this option creates a secondary SQLite file used only for the system tables, keeping product and system tables separate.

Choose “Same SQL server” to store the data on the same server that you used for products (on the EBS-50; either the SQLite database file or the local MySQL database).

Choose “Another SQL server” when you want to store your data in a different database server than your products. On an EBS-50 this would mean an SQLite product database and a MySQL system database. When hosting on your own hardware, you could have a MySQL database running for your products, and a PostgreSQL for your system tables.

8.4.7 Hybrid solution recommendations

If you want a hybrid solution, you can choose “Local” or “Another SQL server”. The “hybrid” in this context means “some data is external, some is internal”, so the option you’ll want for storing your system tables is dependent on the option you chose for storing your product table.

Choose “Local” to store all system tables in an SQLite data file on the EBS-50 itself (or in the folder that ESL Web Server is running from when hosting it on another device).

Choose “Another SQL server” to store your system tables on a database server that is separate from the source of your product tables.

8.4.8 Rights on the Products database

In the next step of the wizard, you will need to instruct ESL Web Server how it should respond to changes made to product data from the ESL Web Server itself. Do you want to allow these changes to be forwarded to the database with the original product table? Or do you want to keep these changes locally? If changes are kept locally, how should ESL Web Server behave during a synchronization with the original product table?

NOTE: The product table viewer (menu bar: “Products”, default <https://ebs50.local/products>) allows you to edit product information.

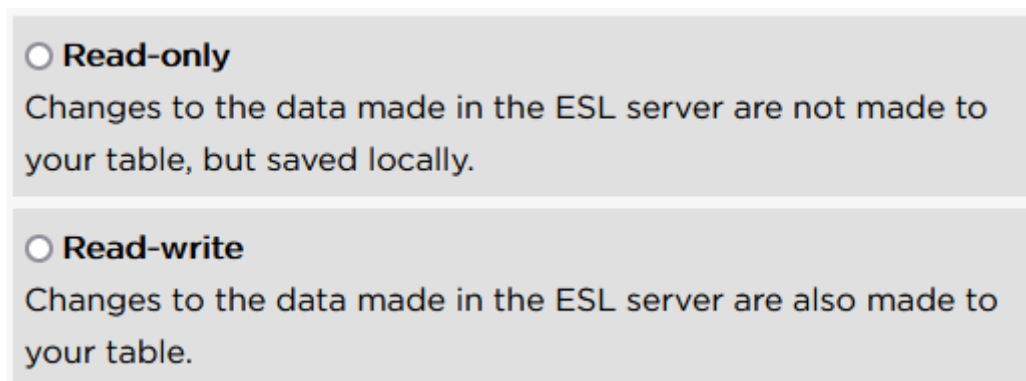


Figure 67: Rights on the product table

The first option, “Read-only”, informs ESL Web Server that it is not allowed to make edits to the original product table. Choose this when you want your product tables to stay intact. Any changes made to ESL Web Server will only be stored (and used) by this instance of ESL Web Server.

The second option, “Read-write”, allows ESL Web Server to push edits to the original product table. Choose this when you want to ensure that your database is up to date with changes, and when you are certain that the people with the right to edit products (see chapter [11 Accounts](#) for more information on user rights in ESL Web Server) can be trusted. This option removes any possible disparity between the original and the ESL Web Server.

8.4.9 Behavior on syncing with the product database

NOTE: This option is only shown when you set the product table in a read-only mode.

If your product table may not to be touched by ESL Web Server, you can still edit products on a local level. However, you will also need to instruct ESL Web Server how to behave when synchronizing with the original product table.

NOTE: You can recognize local edits by the yellow highlight on the row when viewing the product table in the ESL Web Server software.

There are three options available.

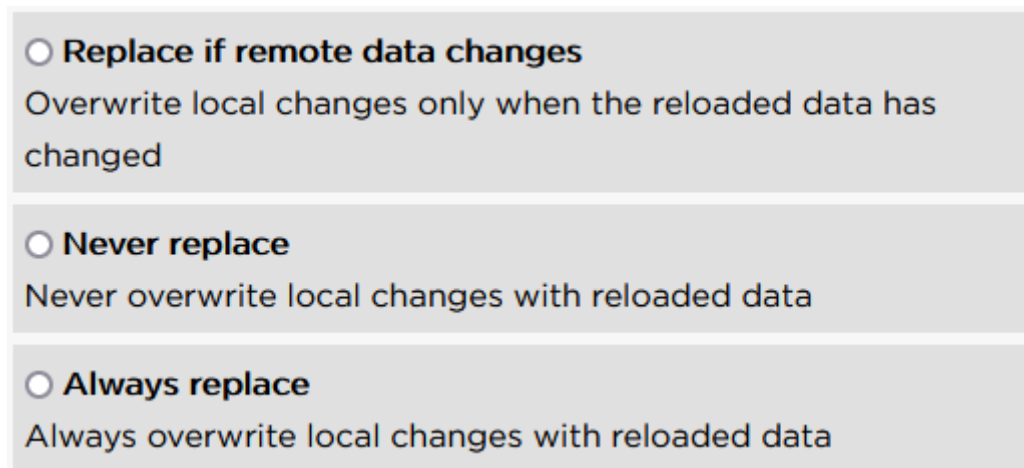


Figure 68: Behavior options on syncing with product table

The first option, “Replace if remote data changes”, will replace any of your local edits when the record has been edited in the original product table. Say you changed product ‘A’ from €3 to €2, and the original product table now reports “product ‘A’ changed from €3 to €2,50”, then your local edit will be removed, and the external edit takes precedence.

The second option “Never replace” will never replace any of your local edits during synchronization.

NOTE: To recover the original row, simply remove your edited product (go to the product table, and click on the garbage can icon) and either await synchronization or force synchronization (click the button “Refresh” on the product table page).

The last option, “Always replace”, will remove any edited product rows when synchronizing. This option will ensure that during synchronization the ESL Web Server will be identical to the original product table. Edited rows that are not present in the original product table (unicity check is made on the column containing the unique ID) will not be overwritten.

8.5 Change database settings

Once you have set up your database through the database wizard, you may want to edit some of the settings without walking through the entire wizard again. For this, you can edit the database settings. Select Products > Change database settings (default <https://ebs50.local/database/settings>) to open the settings page.

Change database settings

New data source

ID column	ProductId	▼
Description column	Description	▼
Refresh data every	1	Minutes ▼
Starting	3/9/22 2:47:54 PM +01	
Data saving option	Staging + triggers	▼
Memory saving option	<input checked="" type="checkbox"/> Load all product data in memory	
Read-only / Read-write	Read-only	▼
Read-only data update mode	Replace if remote data changes	▼

▶ Advanced

Save

Figure 69: Change database settings page

The configurable options are:

- Changing the column containing the Unique ID in the product table
- Changing the column containing the Description in the product table
- The frequency of synchronizing with the original product table
- Starting time of synchronizing with the original product table
- Which option (see chapter [8.4.3 Reload details](#)) you want to use when synchronizing with the original product table
- Whether you want the ESL Web Server to load the product table in memory
- Whether you want to give ESL Web Server read-only or read-write access to the original product table/database.

The “Advanced” dropdown opens to show you the names of all the system tables that ESL Web Server uses. These are more advanced options, allowing you to make a backup of a table, and create a new empty table that ESL Web Server can work with through a database editor. Through the Advanced dropdown you can switch ESL Web Server from the current table to the new table.

If you have an SQL-based database connection and enabled staging + triggers, you can find the button for the staging and triggers status menu in the Advanced dropdown.

NOTE: You can't change which database(s) your product table and system tables reside in. To change these options, you need to walk through the database wizard again to set up these large changes. Press the 'new data source' button to select your desired database format.

8.5.1 Staging and Trigger status

This submenu shows you the status of your staging tables and triggers, if these are enabled. To summarize, staging tables allow you to synchronize with your database more efficiently as these tables contain changes to the original table made since the last synchronization. The ESL Web Server reads, processes and then empties these tables, so you can view them as a to-do list. Triggers are automatic processes on your database server to ensure that changes to the original table (inserts, updates and deletes) are instantly copied to the staging table. You can reach the Staging and Trigger status page through the Products → Change database settings menu and clicking the “Status staging/triggers” button in the Advanced dropdown, by clicking on the warning message on the dashboard (shown only if there is an issue), or by surfing to the page (by default <https://ebs50.local/Database/StagingNTriggerStatus>).

The page will show the database type of the Product table and the database type of the Links table (part of the system tables), whether the staging and triggers options have been turned on or off for these tables and, if applicable, what the creation queries for the tables and triggers are.

8.6 Calendar synchronization

The calendar synchronization option allows you to use calendars as a data source. This data source is separate from the product and system-tables setup you have. You can reach the calendar connection configuration page by selecting the menu option “Products” → “Set up new connection” and choose “Configure calendar connection”.

To use the calendar synchronization option, you will need a specific type of calendar export; an iCalendar (.ics) file that can be pulled from a URL.

The iCalendar is a text-based format that represents a calendar and the events within that calendar. This is an example of the iCalendar format:

```
BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//ZContent.net//Zap Calendar 1.0//EN
CALSCALE:GREGORIAN
METHOD:PUBLISH
BEGIN:VEVENT
SUMMARY:Abraham Lincoln
```

```

UID:c7614cff-3549-4a00-9152-d25cc1fe077d
SEQUENCE:0
STATUS:CONFIRMED
TRANSP:TRANSPARENT
RRULE:FREQ=YEARLY;INTERVAL=1;BYMONTH=2;BYMONTHDAY=12
DTSTART:20080212
DTEND:20080213
DTSTAMP:20150421T141403
CATEGORIES:U.S. Presidents,Civil War People
LOCATION:Hodgenville\, Kentucky
GEO:37.5739497;-85.7399606
DESCRIPTION:Born February 12\, 1809\nSixteenth President (1861-1865)\n\n\n
\nhttp://AmericanHistoryCalendar.com
URL:http://americanhistorycalendar.com/peoplecalendar/1,328-abraham-lincoln
END:VEVENT
END:VCALENDAR
    
```

Practically all calendar providers offer an option to import such files, and many also offer the option to export them. Calendars that are stored online often offer the option to share a link, where the most up-to-date export can be downloaded by others. This last option is what makes it possible for the ESL Web Server to connect with a calendar and show upcoming events on an e-paper.

8.6.1 Preparation

As stated in the introduction, the calendar synchronization leans on the ability to automatically retrieve a read-only copy of your calendar(s) from a URL. Getting this URL depends on your calendar tool.

8.6.1.1 ICS URL from Office 365

To retrieve the ICS URL to your own calendar, log in to your Office 365 account (i.e. <https://portal.office365.com>) and open Outlook (<https://outlook.office.com>). In the top right, press on the settings wheel to open the Settings menu.

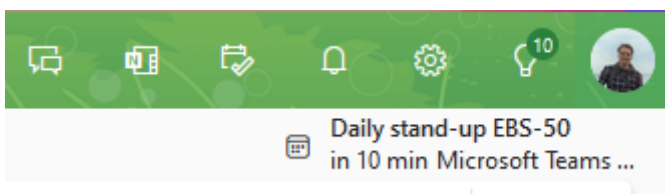


Figure 70: Settings wheel in the Outlook menu bar

In the menu on the left, select “Calendar” (could be listed under ‘All settings’). Then choose “Shared calendars”, and under “Publish a calendar” select the calendar from your account you wish to share (each calendar gets its own URL), the type of output (choose “Can view all details” for a complete copy) and note the ICS link. The ICS link ends with “.ics”.

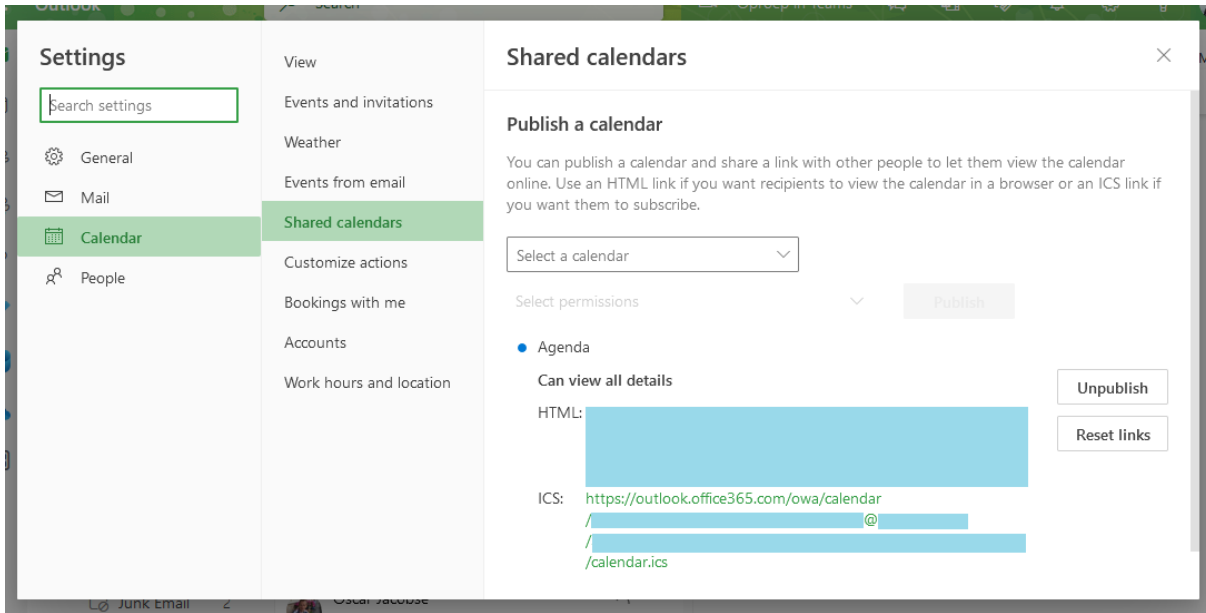


Figure 71: Location of the ICS sharing URL

Click on the ICS link to copy the URL. Once you have this ICS URL, your preparation is ready. Proceed to chapter [8.6.2 Connecting ESL Web Server to your calendar](#).

8.6.1.2 ICS URL from Google Calendar

To retrieve the ICS URL to any of your Google calendars, visit calendar.google.com and log in to your account. On the left side of the screen, hover over the name of the calendar you want to share (the top one in the list is usually your main calendar) and click on the menu button.

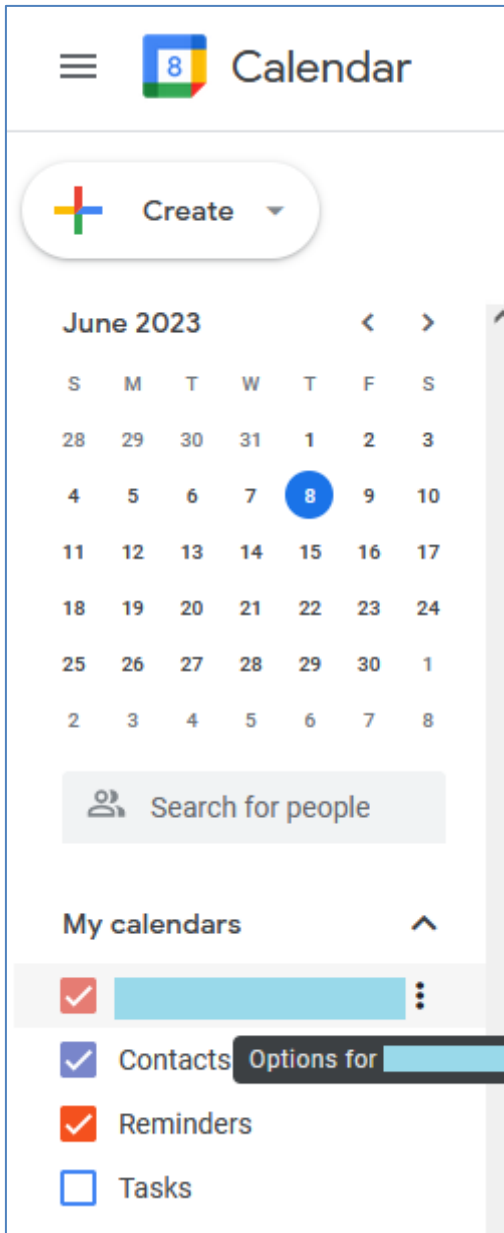


Figure 72: Google Calendar menu

In the menu, select “Settings and sharing”. Scroll down in the list until you see “Secret address in iCal format”

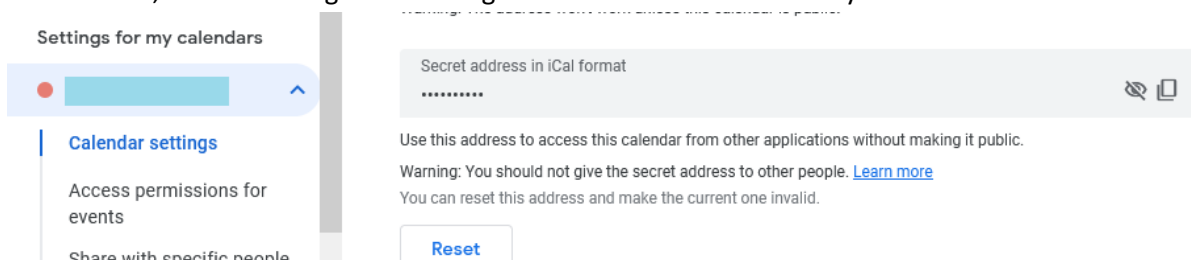


Figure 73: Google Calendar ICS URL

Press the copy button to retrieve the URL. Your preparation for Google Calendar is done, proceed to chapter [8.6.2 Connecting ESL Web Server to your calendar.](#)

8.6.1.3 Apple iCloud Calendar

Go to icloud.com/calendar and log in with your Apple iCloud account. On the left of the screen, you can see your calendar list. Press the icon to the right of the name to open the sharing menu. Place a checkmark at “Public Calendar” to generate a URL.

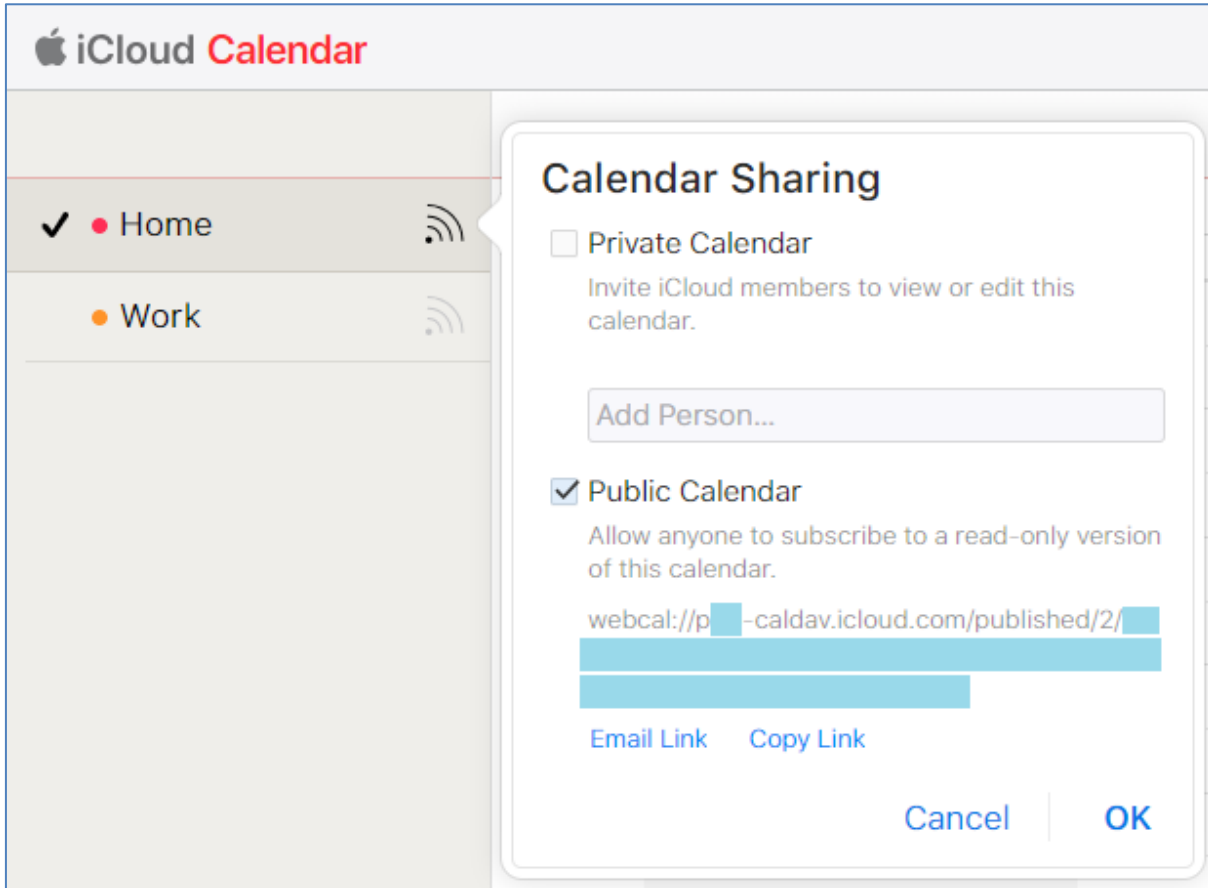


Figure 74: iCloud Calendar web interface

Press “Copy Link” to get the ICS URL. Now that you have this URL you can proceed to chapter [8.6.2 Connecting ESL Web Server to your calendar](#).

8.6.2 Connecting ESL Web Server to your calendar

Browse to your ESL Web Server and log in. Under Products select the option “Configure syncing with Calendar”. You will be presented with your current list of calendars (if applicable) and any issues with the setup (if applicable).

8.6.2.1 Setting up a prefix

8.6.2.1.1 First prefix

When you connect the ESL Web Server to your calendar for the very first time, you will need to perform a little bit of extra configuration. At the top of the page, change the switch from OFF to ON, and you will be prompted to create a unique calendar prefix.

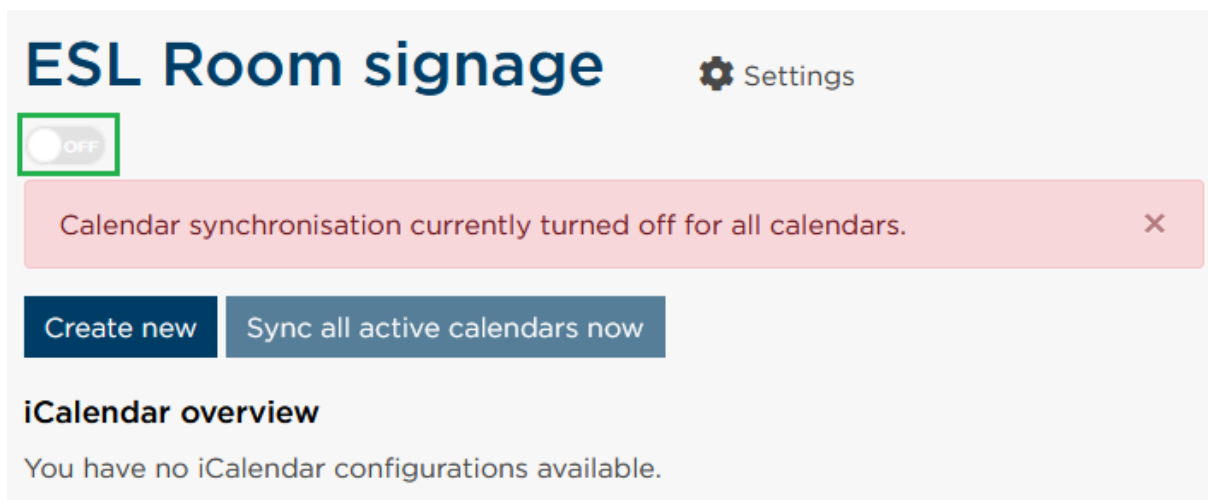


Figure 75: Pill switch

The prefix is needed to ensure that ESL Web Server understands which links in the link table should use a calendar as the source of information, rather than the product table. ESLs are linked to the value in the column that has been assigned the “Product ID”. Therefore, your prefix needs to be a value that is not present in your product table’s Product ID column, and the calendar configuration page offers you an easy way to test this.

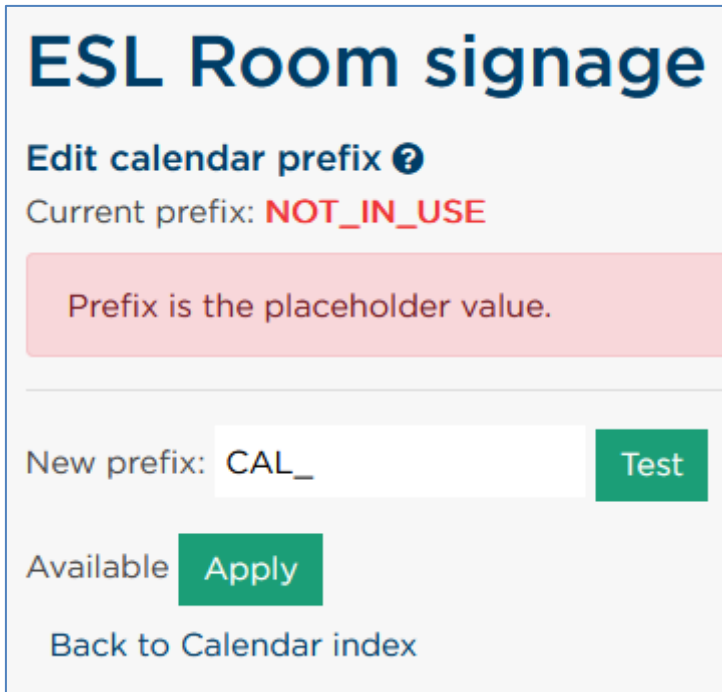


Figure 76: Calendar prefix configuration page

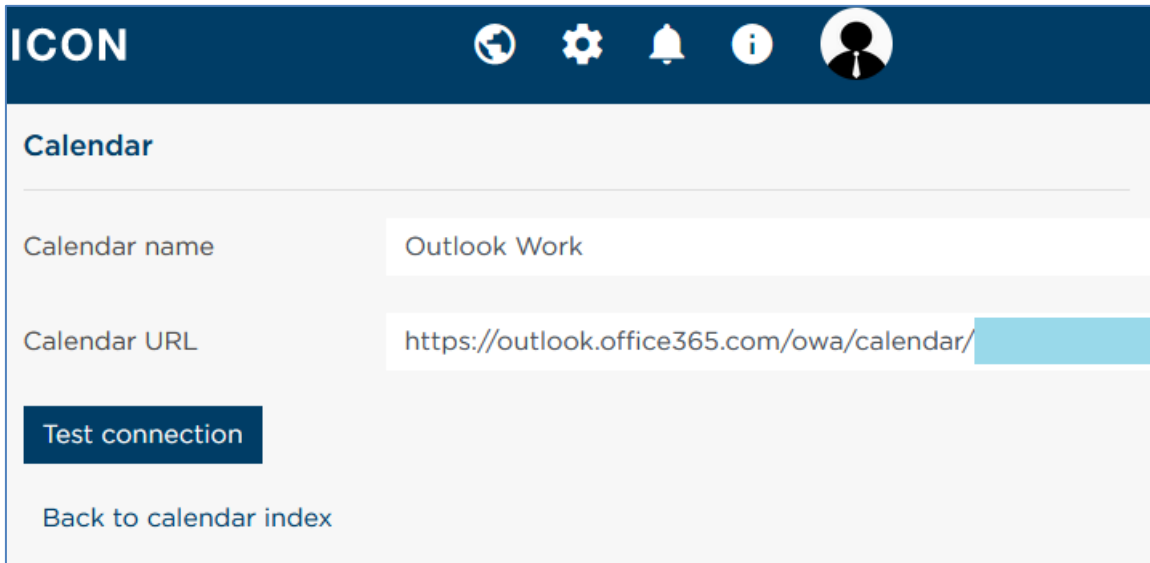
Fill in a prefix that you want to use. Something easily recognizable like “CAL_” is recommended. Press “Test” to see if the prefix you want is available. If it is, the “Apply” button becomes available. Press it to set this prefix.

8.6.2.1.2 Changing existing prefix

To change the existing prefix, go to the Calendar overview page (Products -> Configure syncing with Calendar) and press the small settings wheel icon at the top of the screen to open the settings menu. It will show the current prefix and offers an Edit button.

8.6.2.2 Setting up a calendar

On the calendar overview page (Products -> Configure syncing with calendar) you can start the connection wizard to set up a new calendar. Press the “Create new” button at the top of the screen, and the first step of the wizard appears on screen.



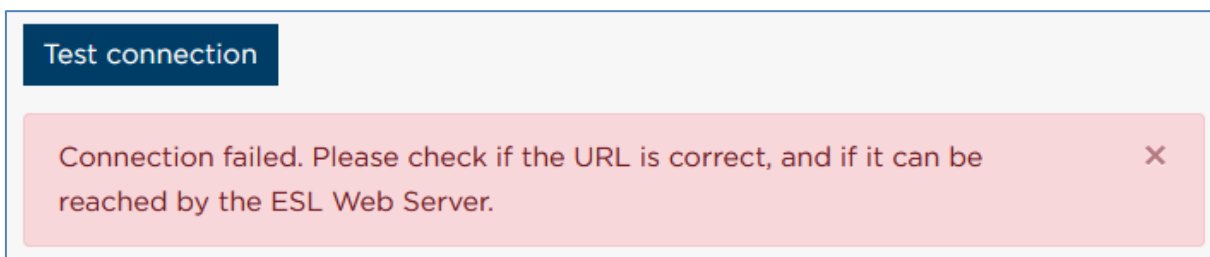
The screenshot shows the 'Calendar' setup wizard. At the top, there is a dark blue header with the 'OPTICON' logo on the left and five icons (globe, gear, bell, information, and user profile) on the right. Below the header, the page title is 'Calendar'. There are two input fields: 'Calendar name' with the value 'Outlook Work' and 'Calendar URL' with the value 'https://outlook.office365.com/owa/calendar/'. Below the URL field is a dark blue button labeled 'Test connection'. At the bottom of the form is a link labeled 'Back to calendar index'.

Figure 77: Setup wizard first step

The calendar name box is the identifier for this specific calendar. You will find your calendar under this name when you link ESLs to an event in this calendar.

The URL is the link to the calendar that you retrieved in the preparation step.

When you press “Test connection”, the ESL Web Server will try to pull information from this calendar and process it.



The screenshot shows a warning message box. At the top left of the box is a dark blue button labeled 'Test connection'. Below it is a light red message box with the text: 'Connection failed. Please check if the URL is correct, and if it can be reached by the ESL Web Server.' There is a small 'X' icon in the top right corner of the message box to close it.

Figure 78: Warning when the connection fails

If the connection fails, you are warned about it. Make sure that the URL is correct and that your EBS-50 (or the server hosting the ESL Web Server software) can connect to the URL.

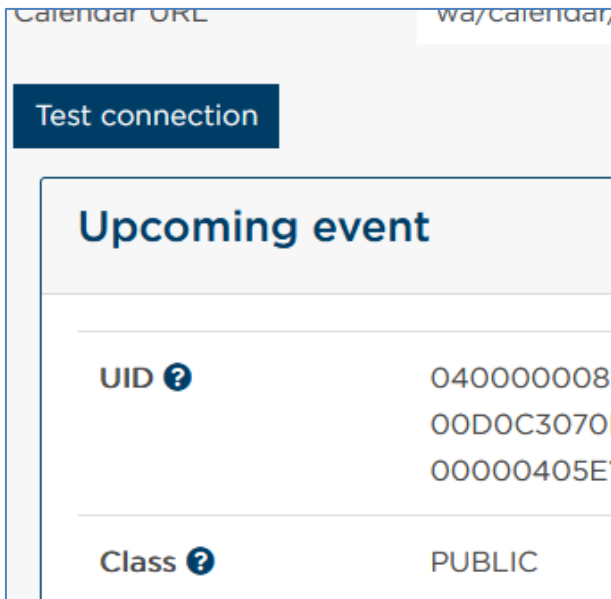


Figure 79: Connection successful, previewing first upcoming event

If the connection succeeds, it will automatically search for the first event coming up in the next 30 days. If the connection succeeds but there are no events in the upcoming period, it will expand its search scope and warn you about it.

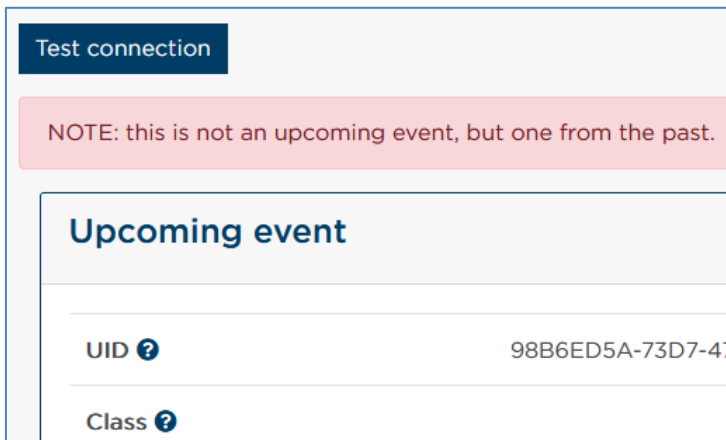


Figure 80: Previewing an event outside of the normal search scope

Continue to the next page by pressing the button “Complete setup >”

On this page you can specify how far ahead in the future you want to scrape events, how many upcoming events you want to store for use on ESLs and how often you want to scrape data.

Press “Apply” when you have filled in these elements.

Calendar

Calendar name: Outlook Work

Calendar URL: https://outlook.office365.com/owa/calendar/

Lookahead period: 30 days

Number of events to store: 1

Synchronization interval: 15 minutes


Apply

Figure 81: Calendar configuration settings

8.6.3 Managing your calendars

When you visit “Products -> Configure calendar connection” you are shown a list of calendar configurations that are currently available, along with their most important settings. Each entry in this list has a button that you can press to edit that calendar configuration, as well as a button to delete that configuration.

ESL room signage

 Settings

ON

Add calendar **Sync all active calendars now**

Calendar overview

Name	Number of events	Status	Lookahead	Sync interval	Action
Outlook Work	1	Active	30.00:00:00	00:15:00	Edit Remove

Figure 82: Overview page of calendar configurations

Pressing “Edit” shows you the settings of the calendar, as well as its first upcoming event. If there are no events in the calendar for the specified lookahead period, the event will be filled with dummy data.

8.6.4 Linking to a calendar

For linking to a calendar, you need a template designed specifically for calendars. Refer to chapter [9 Templates](#) for Templates in general, and chapter [9.2.8.1 Dynamic content on calendar templates](#) specifically for information on how to display data from a calendar event on an ESL.

The names used in the Template Designer for the calendar elements are also displayed as tooltips on the preview of events. Depending on the calendar software some elements may be unused, so it is recommended to have a preview present while designing.

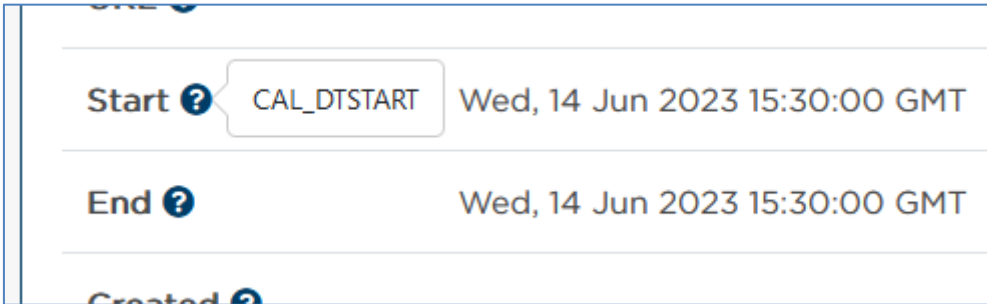


Figure 83: Preview of an event, in the Edit page of a calendar

Once you have a calendar template available on your system for your variant of ESL, you can start linking ESLs to calendar events.

8.6.4.1 Manual linking to calendar events

Click on an ESL to open the Link screen or place a checkmark at the ESL(s) you want to link and select the action “Link ESL”.

Press on the calendar icon (📅) to open the calendar selection. Select a calendar and an event in this calendar. Click apply, watch the preview, and if you’re happy with it, press “Link”.

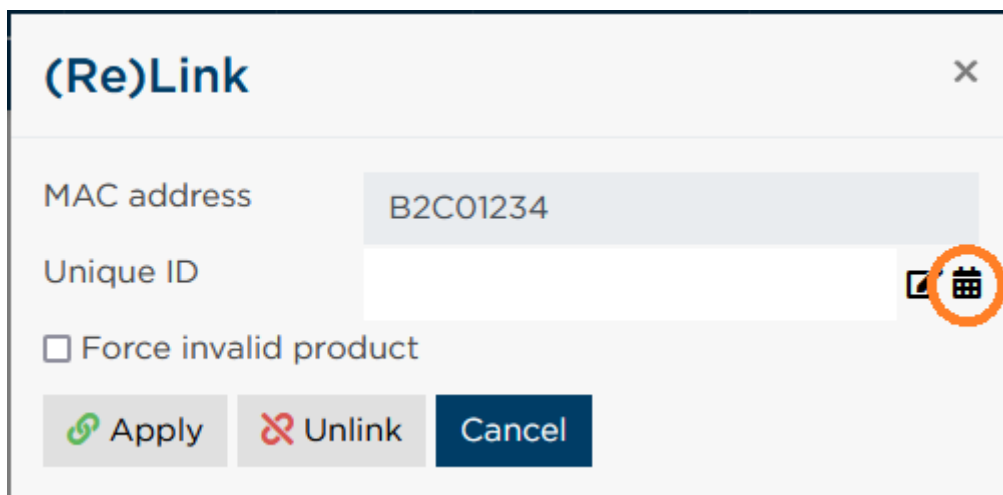


Figure 84: Opening the calendar selector

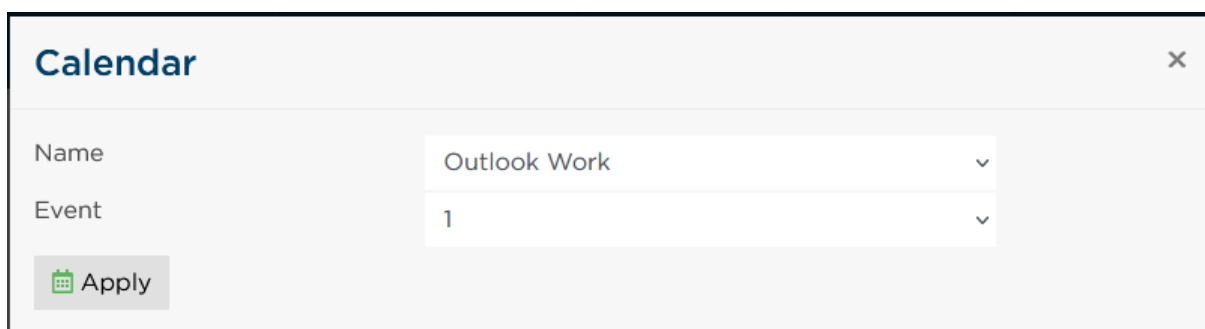


Figure 85: The calendar selector menu

The link’s Unique ID will start with the prefix you specified, so you can easily find calendar links by using the search bar on the ESL page and search for your prefix.

In the description column you will see the name of the calendar, and the event within that calendar that the ESL is linked to.

Details >>				
<input type="checkbox"/>	🔍 Unique ID ⚡	🔍 MAC address ⚡	🔍 Description ⚡	🔍 Variant ⚡
<input type="checkbox"/>	CAL_1_01	B2C01234	Outlook Work (1)	EE750R

Figure 86: ESL linked to a calendar

8.6.4.2 Quick Link to calendar events

Should you want to link ESLs in bulk, you can use the Quick Link option.

Go to the Quick Link page (Link -> Quick Link) and at the top of the page a new icon is added next to the “Scan ESL and Product” header.

Quick Link ?

Scan ESL and product

Quick Link to a calendar event

Force invalid product

Figure 87: Quick Link to a calendar option added

Pressing the -icon will send you through to the Quick Link calendar page.

Quick Link calendar

Scan ESL and select calendar event



MAC address	<input type="text" value="B2C01234"/>
Name	<input type="text" value="Outlook Work"/> 
Event	<input type="text" value="3"/> 

Figure 88: Quick Link calendar page

Using the page is straightforward. Type or scan the MAC address of an ESL, select the name of the calendar containing the event you want to link, then select the requested event and press “Link”.

To go back to the default Quick Link for products, press the -icon.

9 Templates

Probably the most important step in the customization process of the ESL system is specifying the images that should be displayed on the ESLs. Editing and creating templates is done in the *Opticon ESL Template Designer* which is available to download on the Opticon website, through <https://opticon.com/product/ebs-50>.

Template editing consists of 2 parts:

- **Template selection** Determines which template should be shown on which ESL variant and under which conditions (i.e. discount or no discount).
- **Template editing** Determines the layout of the image that will be shown on the ESL.

Template editing requires the Template designer tool, which can be found in the ESL Web Server Toolkit.

Template selection can be done both on the EBS-50 and using the Template designer tool.

9.1 Templates in the ESL Web Server software

The current templates can be found on the template page of the ESL Web Server software. To see the templates for a certain ESL variant, simply open the select box and click on the desired ESL variant.

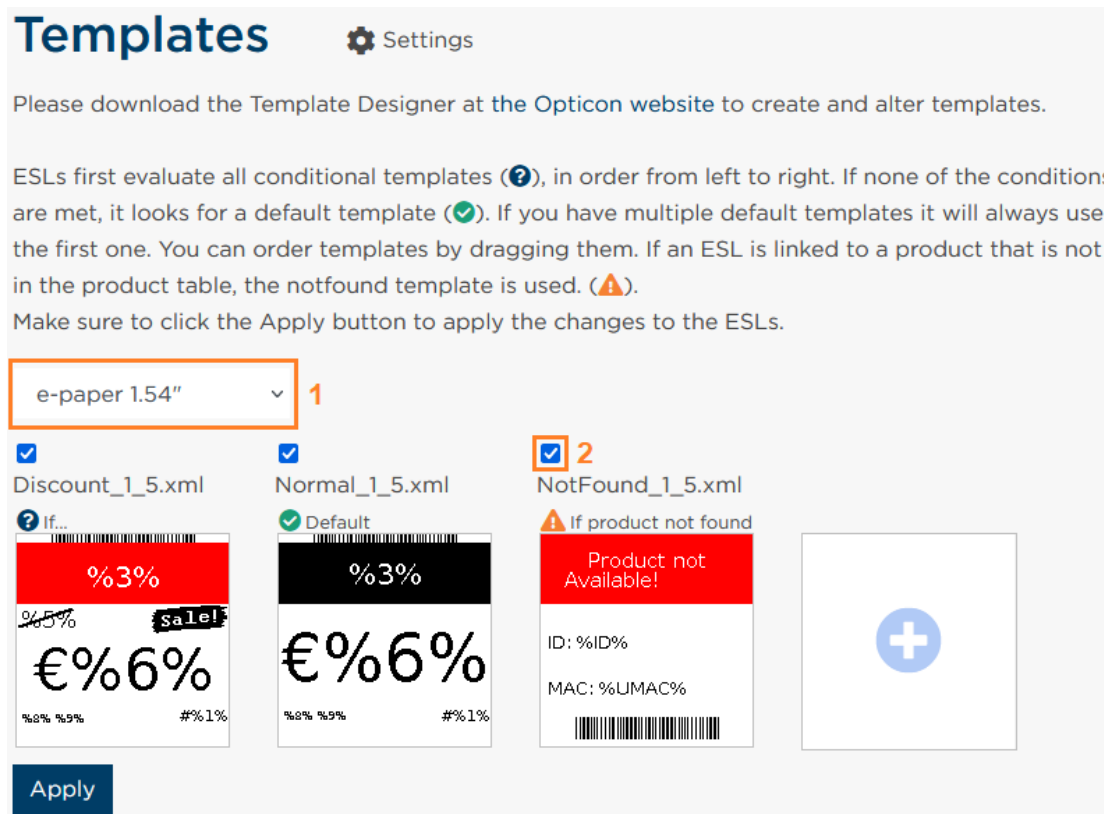


Figure 89: Template overview

The ESL variant select box is highlighted with '1' in [Figure 89: Template overview](#).

To enable or disable a template, click on the checkbox of the template highlighted with '2' in [Figure 89: Template overview](#).

The template candidates for ESL links are evaluated as described in the templates-description in [Figure 90: Template conditional editor](#).

To change the evaluation order of the templates simply drag a template to the left or to the right from its current position.

To add a template, click on the plus button to the right of the templates and then upload the desired template *xml* file.

9.1.1 Conditions

It is also possible to change the conditions of when a template should be used. This is done by clicking on the desired template to open the template properties window.

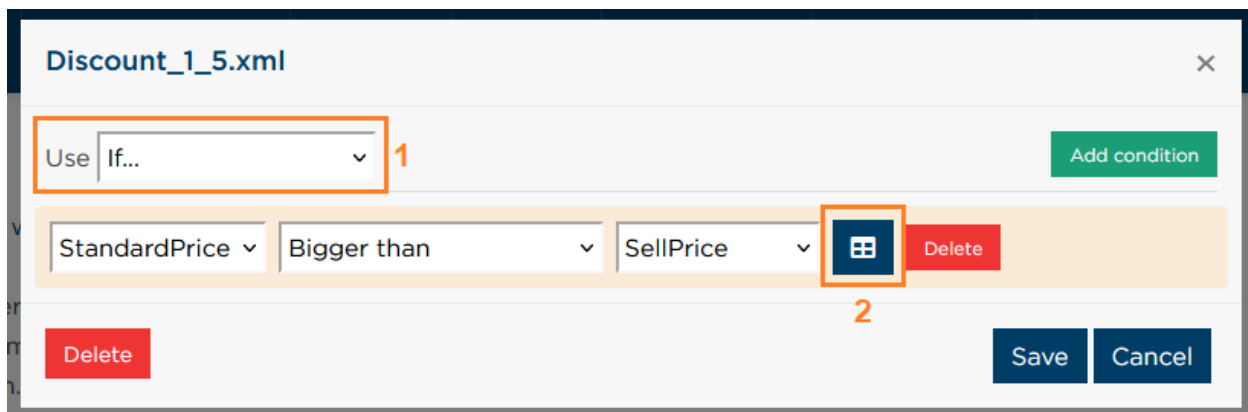


Figure 90: Template conditional editor

In the properties window you can change the type of the template to `Default`-template, `Not found`-template or Conditional template by selecting the desired type in the `Use` select box highlighted with `1` in [Figure 90: Template conditional editor](#).

If the Conditional template type is selected, you can add conditions by pressing the green `Add condition`-button. If any of the template conditions are true, the template will be selected. The right-hand operand of conditions can contain either a dynamic or a fixed value.

If a dynamic value is used, you should select the desired value type in the right-hand operand select box.

If you wish to use a fixed value, press the button at the right of the condition select boxes, highlighted with `2` in [Figure 90: Template conditional editor](#). Then you will be able to enter the value in the right-hand operand input box.

After you are done with changing the template properties, click on the *Save* button at the bottom right corner. You are also able to delete conditions by clicking on the *Delete* button to the right of the condition. If you wish to delete the entire template, click on the *Delete* button at the bottom left corner. Be aware that this is irreversible.

9.1.2 Applying templates

After changing templates and conditions, press the “Apply” button on the template page to apply the changes. This is the moment at which the ESL Web Server will re-process all linked ESLs using the new templates to check if any ESLs need to be updated with a new image. If many ESLs are linked, this can take a few minutes.

9.1.3 Import/Export templates

Under Templates > Import/Export templates (default <https://ebs50.local/template/importexporttemplates>) you'll find the main interface between the Template Designer tool and the web interface of the EBS-50.

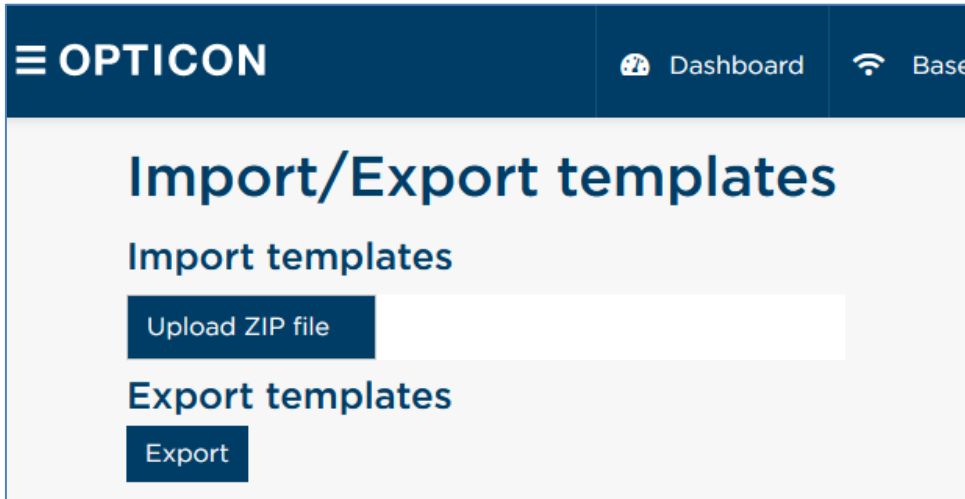


Figure 91: Template importer

Import allows you to import a .zip file containing the template and conditions that you've made using the Template Designer.

Export allows you to export the current templates and conditions from this ESL Web Server into a .zip file, so you can edit them in the Template Designer or upload them to another ESL Web Server.

9.1.4 Periodically fetch templates from an SFTP server

To automatically update templates, it is possible to fetch templates (in a .zip file) from a remote SFTP server. In the menu choose Templates > Configure SFTP server.

To configure the periodic downloading of templates from a remote SFTP server. Follow the instructions on the 'SFTP auto-fetching' page.

- Fill in the connection details to login to the SFTP server
- Go to the directory to download the template-file from
- Set the time frequency at which the server will check for updated templates

SFTP auto-fetching ON ?

SSH hostname

SSH port

SSH username

SSH use key file

SSH password

Next >

Instructions

1. Fill in the fields on the left to login to the SFTP server containing the central templates folder.
2. After logging in to the SFTP server, go to the directory used to share the templates ZIP file. Click the save button to save the SFTP templates directory.
3. Set the time frequency at which the templates will be auto-fetched and press the save button to complete the setup.

SFTP auto-fetching ON ?

How often do you want to check for new templates?

Fetch templates every

Save

9.2 Template Designer tool

Currently the template designer is a stand-alone application. The nature of ESL images (images with limited color depth and no anti-aliasing) makes it difficult to create templates using a web browser.

The template designer tool can be found in the ESL Web Server Toolkit and can be installed on basically any Windows PC.

9.2.1 ESL template characteristics

When designing the layout of an ESL it is important to know the limitations of what can and what cannot be displayed on an ESL.

The main characteristics of ESLs are:

- Fixed resolution (i.e. 250 x 233 pixels for the EE214R).
- Monochrome images (for black & white ESLs) or black/white with red and/or yellow images (for BWR and BWRY ESLs).
- No anti-aliasing can be used on fonts (limiting the number of available fonts).
- Black and white (and if applicable red/yellow) company logos or other images can be added to the layout.
- 1D- and 2D-Barcodes can be added using information from the database.
- Texts, images and barcodes can be rotated in steps of 90°.
- Dynamic texts, using information from the database and status information of the ESLs can be added and aligned as desired.

9.2.2 Template designer wizard

The main page of the *Opticon ESL Template designer* shows five steps describing the process of exporting templates from the ESL Web Server to the Template Designer and back.

The location of the EBS-50 can be entered at the top of the Wizard as shown in the image below. You can also use the *find* button to launch the *EBS Finder* tool that scans the network for Base Stations. Simply click on the correct EBS-50 and the address will be entered in the Template designer. When the URL of the ESL Web Server is entered, it is easier to perform certain steps, as you will be automatically directed to the right locations within the ESL Web Server.

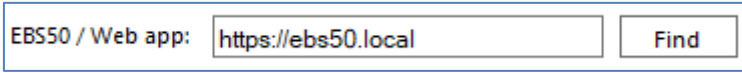


Figure 92: Top bar in Template Designer wizard

9.2.2.1 Step 1: Create a back-up of the EBS-50

This step is intended to make a copy of the current templates of your EBS-50. If the entered address of your EBS-50 is correct, you will be re-directed to the back-up page of the EBS-50 when you press the 'Create back-up' button.

If you don't want to start editing from the current templates on your EBS-50, but rather use an existing template file, then this step can be skipped.

9.2.2.2 Step 2: Import the back-up on the EBS-50

By pressing the 'Import' button, you can import the back-up file that you've created in "Step 1" or you can import another Template-file (i.e. the 'Default Templates.zip' file from the ESL Web Server Toolkit)

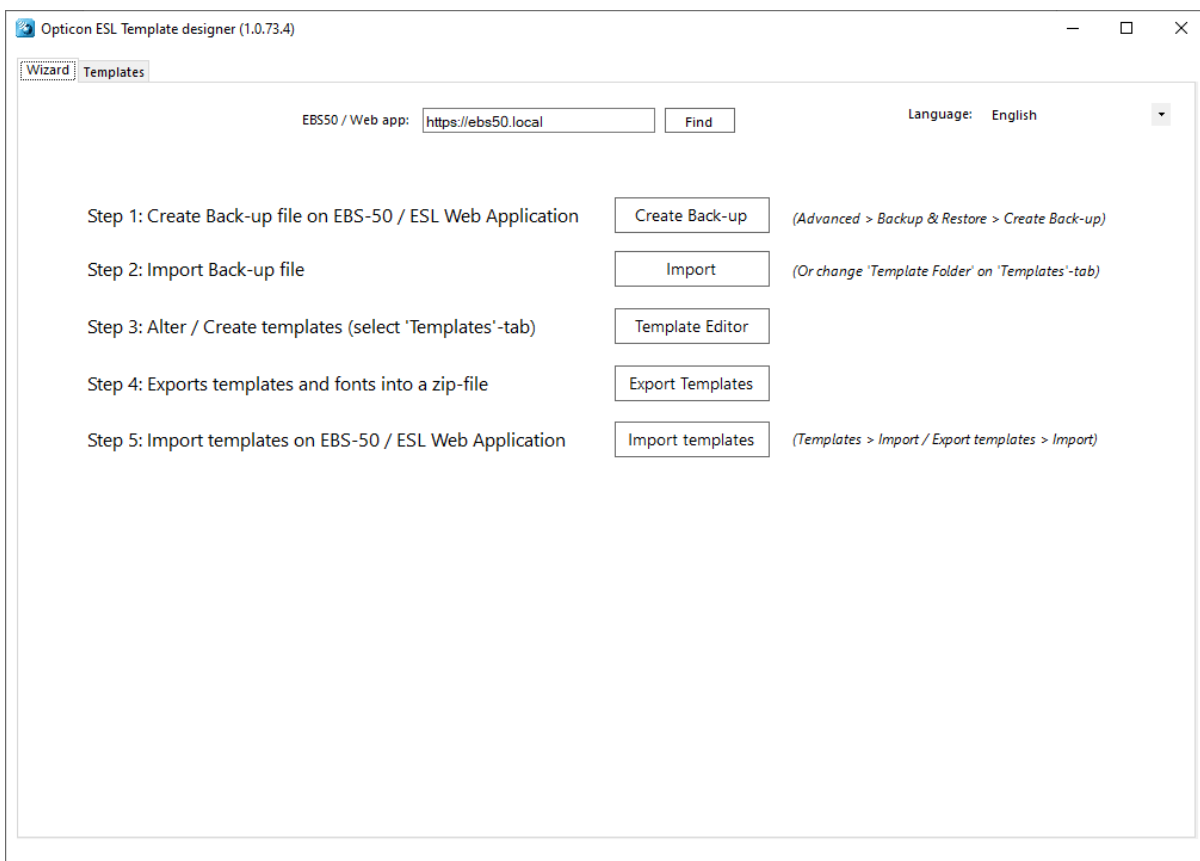


Figure 93: Template designer wizard

9.2.2.3 Step 3: Alter / Create templates

Pressing the 'Template editor' button will redirect you to the Templates-tab at which you can alter the conditions and add/alter/delete templates.

See chapter [9.2.2 Template designer wizard](#) and chapter [9.2.3 Template Selection](#) for more details on how to design templates.

9.2.2.4 Step 4: Export templates and fonts to a file

When you're done editing the templates, you can save the templates and fonts using the 'Export templates' button. This will create a .zip file that can be imported on any EBS-50.

9.2.2.5 Step 5: Import templates and fonts on the EBS-50

Pressing the 'Import templates' button will re-direct you to the page on the EBS-50 at which you can import the templates and fonts on the EBS-50.

If new fonts were installed after importing the ZIP-file in the ESL Web Server software, a restart of the EBS-50 is required before they can be used by the templates in the ESL Web Server software.

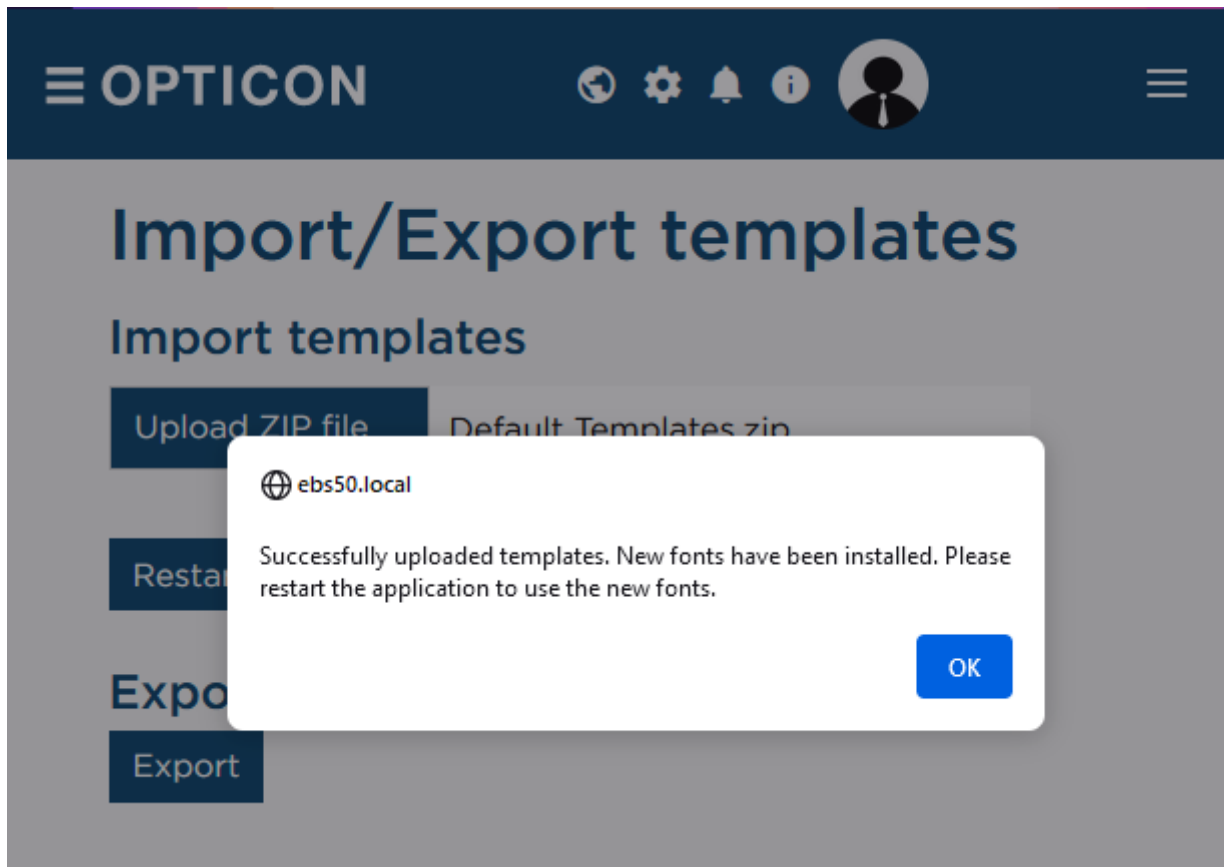


Figure 94: Template importer/exporter

9.2.3 Template Selection

Template selection determines which image template is used under which conditions.

The template selection area lists all the found templates in the specified 'Template folder' and shows if the template is currently enabled and, if so, under which condition it must be used.

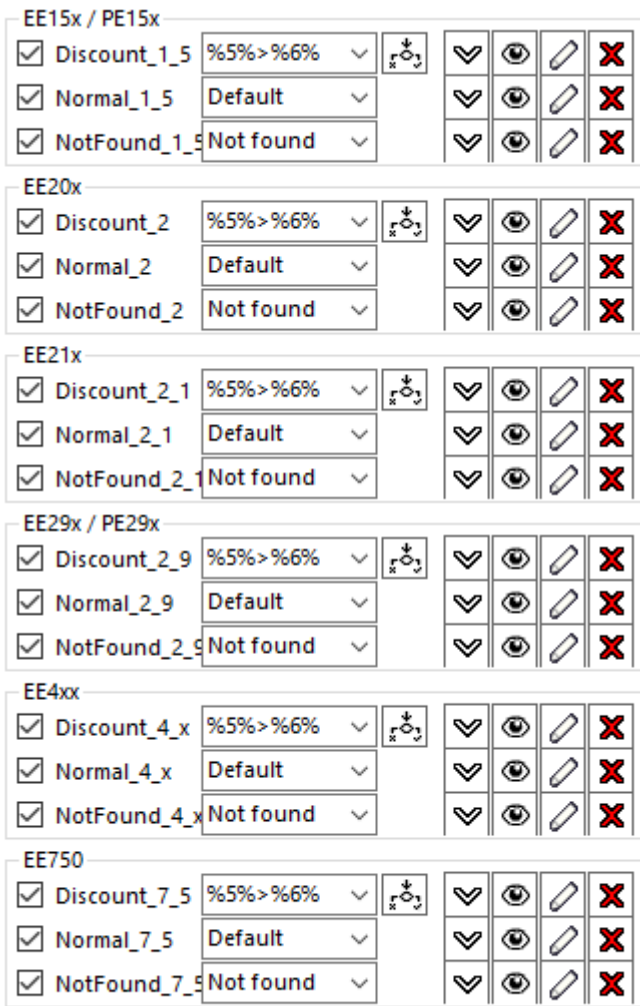


Figure 95: Template selection window

To make it possible to use different templates under different conditions, a template can be configured as:

- 'Default'- template Used if an ESL is linked to a **known** product.
- 'Not found'-template Used if an ESL is linked to an **unknown** product.
- Conditional template Used when the specified condition is TRUE.

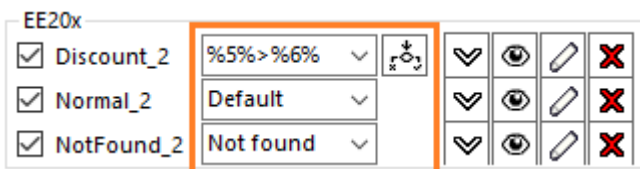


Figure 96: Template selection of the 2.0" ESLs

Conditional templates can be configured by selecting <Conditional> in the dropdown-list or can be edited by pressing the *Condition editor* icon as shown below.

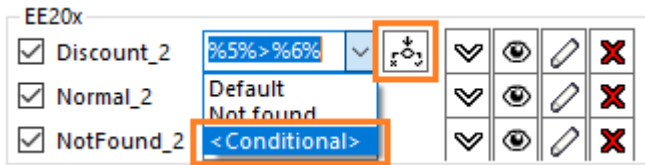


Figure 97: Template selection; condition selector

The condition editor allows you to specify up to 4 conditions under which the template should be used.

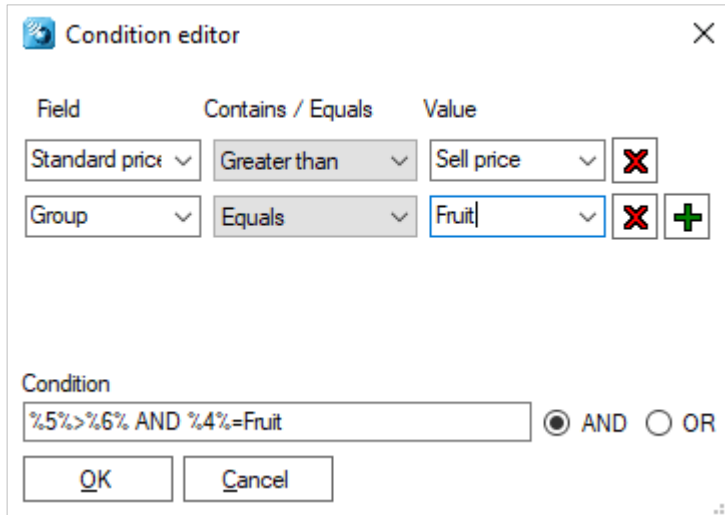


Figure 98: Condition editor window

Press OK to apply the condition for this template.

9.2.3.1 Hints and tips

- Conditional templates will be listed first, because the first template with a matching condition will be used.
- If none of the conditions were met, it looks for the first available default template.
- If none of the conditions were met and no default template was found, the 'Not found'-template will be used.
- Use the -button to change the template sequence.
- Use the -button to preview a template.
- Use the -button to edit a template.
- Use the -button to **permanently** delete a template.
- When done editing the template selection, press the 'Save' button to save the template selection.
- Use 'Reset' to revert all changes in the template selection.

NOTE: deleted templates cannot be reverted!



Figure 99: Save and Reset buttons under template selection

- To create a new template, press the New template-button, after which the 'Create New Template'-dialog will appear to create a new template for a specific type of ESL.

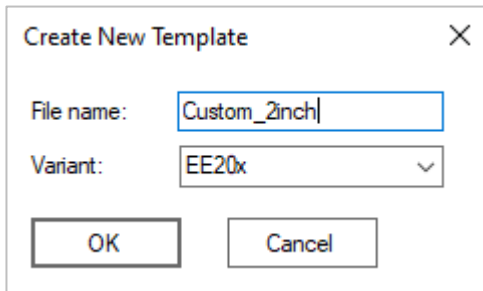



Figure 100: New template creation window

After pressing the 'OK'-button a new template is created, which you can start editing immediate. Please note that this new template is **disabled** by default after creation to prevent accidentally sending an unfinished template to linked ESLs.

9.2.4 Using the Template editor

Templates can be created and edited to design your own label layout.

To edit an image layout template, press the -button to the right of an existing template or press the

-button to create a new template.

The opened template will be displayed on the right.

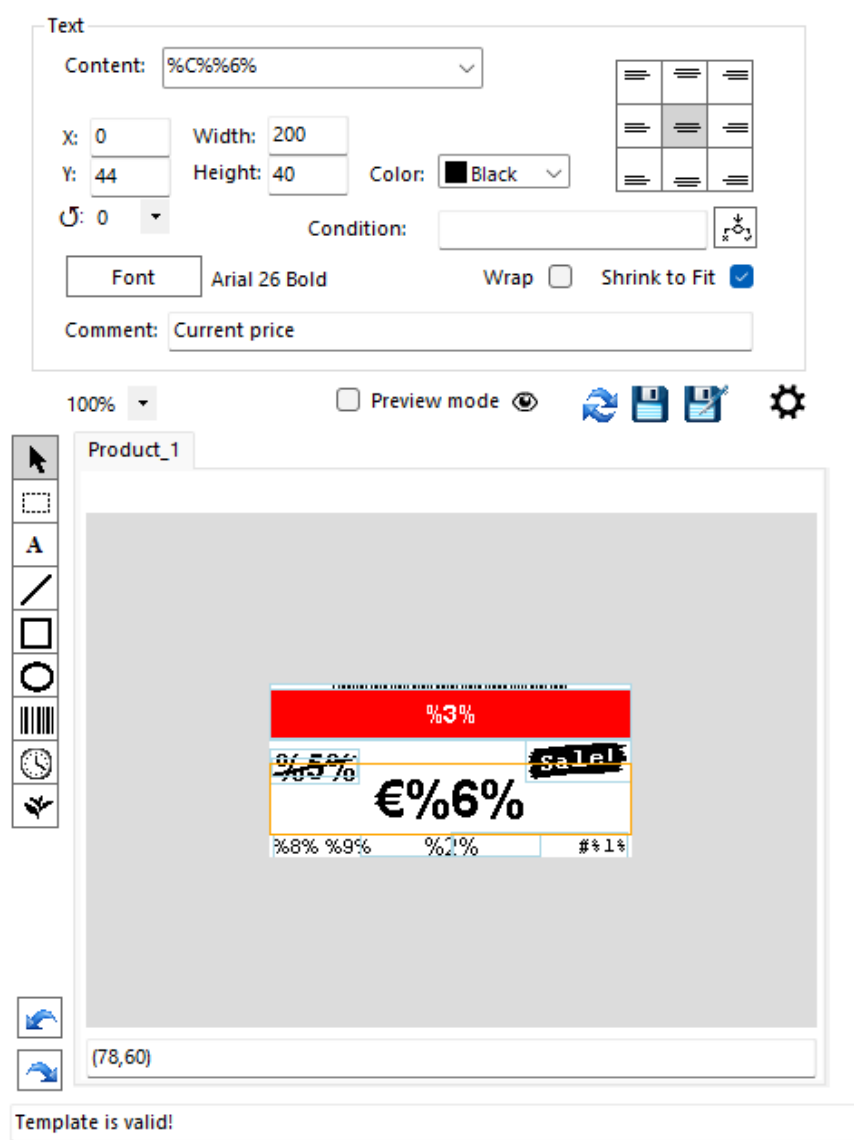




Figure 101: Template loaded into template editor

9.2.5 Selecting and moving objects

When selecting the black arrow on the left , you can click on an existing object in the template to edit its properties. Press and hold the Control-key to select multiple objects.

To select an area with one or more objects, select the dotted rectangle  and draw a rectangle around the object(s) that you wish to select. Objects can also be moved by dragging and resized by selecting an object and dragging its borders.

NOTE: The arrow keys can also be used to move a selected object.

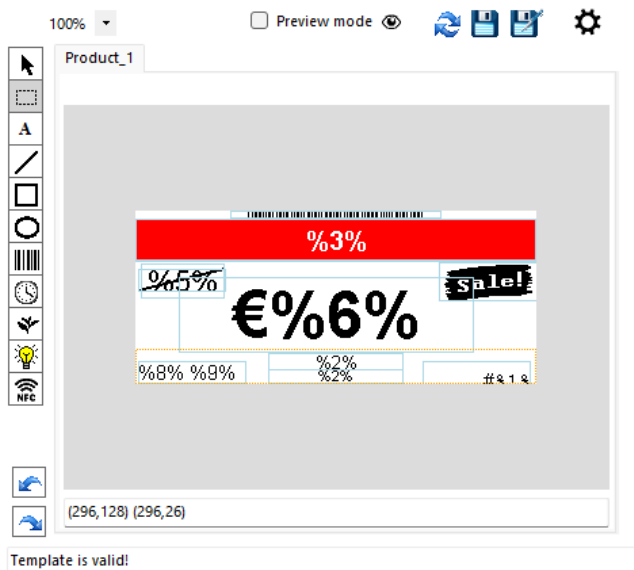


Figure 102: Selecting (multiple) objects using the area selection

9.2.6 Template objects

Image templates currently support 7 types of objects that can be added to design the ESL layout:

	Text (fixed and dynamic)
	Lines
	Rectangles (filled / non-filled)
	Ellipses (filled / non-filled)
	Barcodes
	Images (monochrome or black/white/red; fixed and dynamic)
	Time stamp (of the last image update)

To add an object to the template, select the type of object that you want to add by pressing the corresponding button and draw a rectangle on the image to indicate the position of the new object. After drawing the object, its properties can be changed as desired.

To edit an existing object, press the -button and left-click on the object that you want to edit.

9.2.7 Preview / edit mode

To preview the template, enable **Preview mode** to get a realistic view of the result. See chapter [9.2.12 Using Example data](#) on how to use Example data to get an even better preview.



Figure 103: Default editor (guides visible)



Figure 104: Preview mode (actual image as it would be displayed by ESL)

9.2.8 Static and dynamic content

Static content of barcodes, images and text can be added by typing in the content-box.

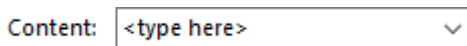


Figure 105: Content input

Dynamic content is added by specifying a column from your product database using the dropdown-list of the content-box:

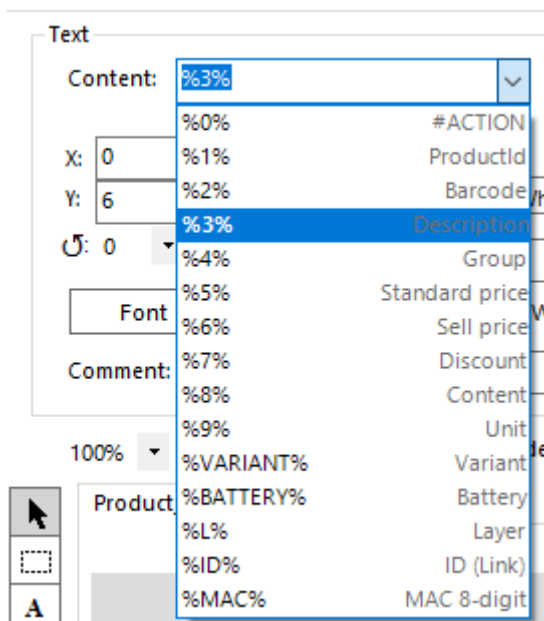


Figure 106: Dynamic content selector

It is also allowed to combine static context and/or multiple dynamic contents.

To add a certain column of a database record to your template, add the column number between two ‘%’-characters in the content field of the object.

Example:

Content:

Figure 107: Example of combining static and dynamic data

9.2.8.1 Dynamic content on calendar templates

To design a template for a calendar event, create a new template in Template Designer and place a checkmark in the “Calendar mode” box.

The screenshot shows a dialog box titled "Create New Template" with a close button (X) in the top right corner. It contains the following fields and controls:

- Name:** A text input field containing "Calendar_7_5".
- Variant:** A dropdown menu showing "EE750".
- Portrait mode:** A checked checkbox.
- Calendar mode:** A checked checkbox.
- Nr. of events:** A spinner control set to "1".
- Background layer:** An unchecked checkbox.
- At the bottom, there are "OK" and "Cancel" buttons.
- At the very bottom, a status bar shows "Calendar_7_5.xml : 384 x 640" with a small icon on the right.

Figure 108: Example of creating a calendar template

When you do, the content-dropdown will give you the option to select dynamic data from an event in the calendar instead of columns in a product database.

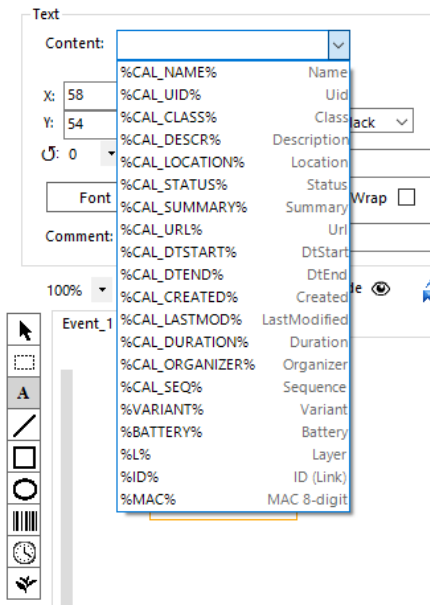


Figure 109: Content dropdown menu for calendar templates

Please note that depending on the provider you’re using to manage your calendar, some dynamic data fields may be empty or truncated. Go to your calendar and click the “Edit” button of your configuration to see the first upcoming event and which fields are used by your calendar provider.

One special note is with regards to the CAL_DTSTART and CAL_DTEND fields. These represent an instant in time, typically the complete date and time of the day that the event starts and ends respectively.

You can use the Comment box in the Template Designer to add your own formatting, allowing you to print out the data in the way you want to view it. A good resource to use is <https://www.c-sharpcorner.com/blogs/date-and-time-format-in-c-sharp-programming1>, which has an overview of the various ways you can format a string. Example: you have an event starting on May 23rd, 2023, at a quarter past two in the afternoon. If you want only the start time, and you want that in a 12-hour notation with AM/PM, you can use “h:mm tt” to show the time as “2:15 PM”. If you want a leading zero use “hh:mm tt” for “02:15 PM”. If you want 24-hour notation without a leading zero, use “H:mm” for “14:15”.

9.2.9 Text fonts

When using a text object, you can select a font from the fonts list as shown in [Figure 110: Font picker](#). The fonts list contains all fonts available on the system. However, be aware that, as anti-aliasing is not supported for fonts, not all fonts are suitable. When saving a template all the used fonts are stored in the templates-directory. This makes it possible to install the fonts on the EBS-50 when importing the templates directory.

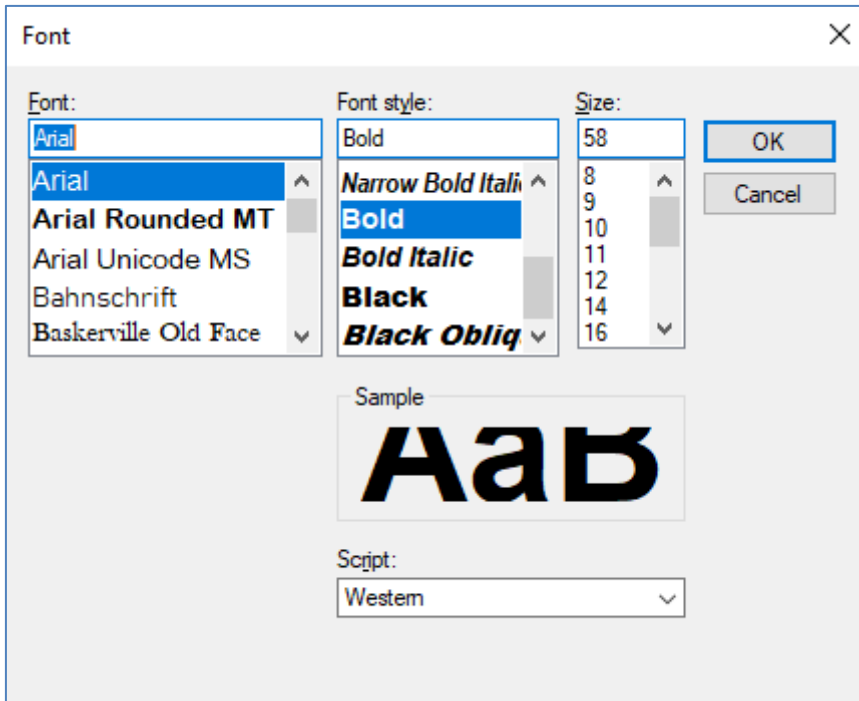


Figure 110: Font picker

9.2.10 ESL properties / battery status

It is possible to add properties of an ESL to a template. For example: the battery voltage of an ESL.

The ESL will display the status of this property at the time the image was last generated.

Please note that the ESL Web Server will NOT automatically update the ESL when the battery status (or any other property) changes to avoid increased battery consumption. So, the displayed battery status is the battery status at the time the ESL was last updated.

Below you will find a list of currently supported ESL properties.

Property	Description
%DESCRIPTION%	Description-field of the product database
%POLL_INTERVAL%	Min. poll interval in seconds
%POLL_TIMEOUT%	Poll timeout in polls
%SCAN_INTERVAL%	Associate interval in seconds
%CHANNEL%	RF-channel of the Base Station
%BATTERY%	Battery voltage / battery icon **
%VARIANT%	Hardware variant of the ESL (i.e. EE201)
%VERSION%	Firmware version of the ESL
%LQI%	Link-Quality-Index measured by the EBS
%LQI_RX%	Link-Quality-Index measured by the ESL
%BASE_STATION%	IP-address of the connected Base Station
%BOOT_COUNT%	Boot count of the ESL firmware
%LANID%	Configured LAN-ID (0000 is not set)
%PANID%	PAN-ID of the connected Base Station
%WIDTH%	Width of the ESL display in pixels
%HEIGHT%	Height of the ESL display in pixels


%TEMPERATURE%	Temperature in degrees Celsius during last image update *
---------------	-----------------------------------------------------------

* The reported temperature is the temperature that was measured by the ESL during the latest image update, so it is not necessarily the current room temperature.

** The accuracy of the measured battery voltage depends on the hardware variant and temperature. Small ESLs (1.5", 2" and 2.9") only have a 0.17V accuracy and use coin cells that will stay at ~3.0V most of their battery life. Larger ESLs with AA or AAA batteries have a more accurate battery voltage and a more linear voltage drop.

9.2.11 Conditional objects

Any type of object can be made conditional, meaning that it is only shown in the resulting image if specified condition is matched (i.e. a certain column contains a certain value).

This can be done by pressing the -button next to the 'Condition'-textbox to open the condition editor.

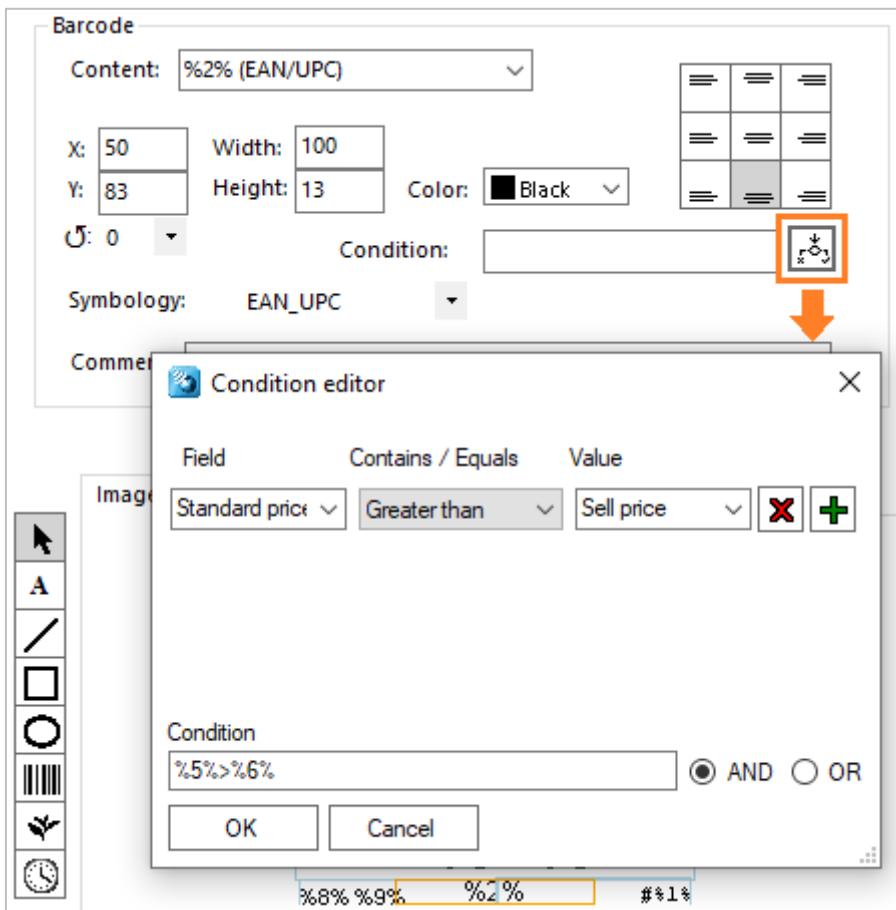


Figure 111: Condition editor on a template element

9.2.12 Using Example data

The 'Example data' area next to the Template selection provides the possibility to preview the image template with actual product data.

Example data

Select product

0:	<0:#ACTION>	^
1:	<1:Article No.>	
2:	<2:EAN/UPC>	
3:	<3:Description>	
4:	<4:Group>	
5:	<5:Standard pri	
6:	<6:Sell price>	
7:	<7:Discount %>	
8:	<8:Content>	
9:	<9:Unit>	
10:	<Field 10>	
11:	<Field 11>	
12:	<Field 12>	

Figure 112: Example data screen

If you leave these 'Example data' fields empty, then the preview of the Image template will show its text 'as is' in the previewer. You can either change the 'Example data' manually or you can select one product from the product database by pressing the Select product button. This way you can be sure the generated image will be correct.



Figure 113: Image preview with example data

10 Advanced

The Advanced menu gives you access to settings you can use to configure your system’s behavior, beyond the settings that you have encountered in ESLs, Base Stations, links and products.

10.1 Event handler

The event handler is a tool that can be used to make ESL Web Server pass information to other systems. One example is the NFC capabilities of the PE-range ESLs. Since the reaction expected from a tap can be very different (do you want to verify the user’s account? Add an item to a virtual basket? Both?) you would forward all information to a customer’s own Back Office system.

The event handler page can be reached through the menu bar Advanced > Event handler (default <https://ebs50.local/eventhandler>).



Figure 114: Event handler page

At the top of the page is a switch to turn all event handlers on or off simultaneously, which is useful for maintenance, or for preparing a system to go live with a single switch.

To create a new event handler, click on the large card decorated with the plus sign. This will open the event handler creation window.

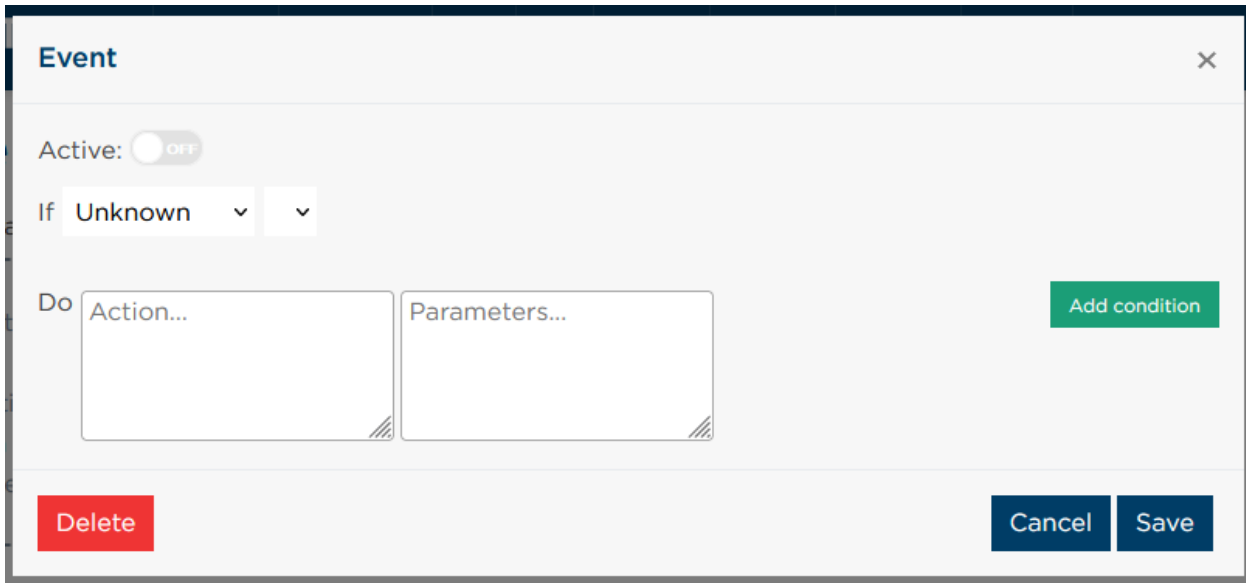


Figure 115: Event handler creation window

The very first option is a switch that designates whether this event is active.

NOTE: this switch is ignored if the global switch controlling all events, located on the main event handler page, is switched off.

The second option is a set of dropdowns, the left one regarding the source of the event, and the right one regarding the specific trigger within that event source you want to respond to. The following sources and triggers are available:

- ESL
 - Any; which means any of the following triggers happened.
 - Reset; ESL received the command to shut down and reboot.
 - Battery empty; the voltage reported by the ESL indicates the battery is empty.
 - Hardware failed; ESL was asked to perform a task (like showing an image) and an unknown error occurred.
 - Image update failed; the ESL was asked to update the image shown on its screen and this task failed.
 - Image update OK; the ESL was asked to update the image shown on its screen and has reported it did so successfully.
 - Firmware update failed; ESL was asked to update its firmware and this task failed.
 - Firmware update OK; ESL was asked to update its firmware and has reported it did so successfully.
 - Online; ESL is associated with a Base Station and is now available to perform tasks.
 - Offline; ESL has disassociated from a Base Station and is no longer available to perform tasks.
 - Exception; an unknown error, separate from those listed above, has occurred.
 - Linked; ESL now has a product from the database associated with it.
 - Unlinked; ESL is no longer associated with a product from the database.
- Base Station
 - Any; which means any of the following triggers happened.
 - Online; the Base Station is connected to the ESL Web Server and communications with the ESLs on this Base Station are available.
 - Offline; the Base Station is disconnected from ESL Web Server, all ESLs on this Base Station are no longer available.

- Modified; reserved for future use.
 - Exception; an unknown error, separate from those listed above, has occurred.
- Button
 - All actions are reserved for future use.
- Application
 - Any; which means any of the following triggers happened.
 - Started; the ESL Web Server has completed starting up and is ready for use.
 - Stopped; the ESL Web Server received the command to shut down.
 - Warning; a non-fatal exception occurred, was intercepted, and has been added to the Event log.
 - Exception; an unexpected exception occurred and has been added to the Event log.
 - User action; a change to the system (Base Station added, API command received) was performed by a user and added to the Change log.
 - Message; a noteworthy but non-fatal problem (like a table missing in the database, or an uploaded file was unusable) was encountered by ESL Web Server, has been dealt with, and has been added to the Log Messages log.
- Scheduled
 - Time; at a specific time every day (or, by checking a checkbox, every minute) this event is triggered automatically.
 - *NOTE: Can't be stacked with other conditions*
- NFC
 - Any; which means any of the following triggers happened.
 - Entered; an NFC card entered the detection field of an ESL and the contents have been read and sent to ESL Web Server.
 - Read; the previously detected card has left the detection field of the ESL within a short time (a “tap”)
 - Long read; the previously detected card was still within the detection field after a short time ended (an “untap”).

The third option consists of two textboxes: the action to perform and the parameters to send to the action. Valid actions are an API endpoint (make sure the URL is prepended with “http”), a path to an XML file (present on the host device) to execute, a path to a SQL file (present on the host device) to execute or a path to any other type of executable (present on the host device) to be performed.

Parameters are variables that you want to supply to the performed action. These can be static or read from the event (and therefore dependent on the type of event) like “%UMAC%” for the 8-digit long MAC address of the ESL raising the event, or %ID% for the UID of the product the ESL raising the event is linked to. Parameters on an API endpoint action are added to the URL query string, for the other actions they are supplied as parameters appended to the command line tool calling the action.

Besides the trigger source and event selected in the dropdown, you can specify another condition before the action is performed. This condition can be used to narrow down the specific event you want to react to. For instance, an ESL that has an empty battery is only an issue if the ESL is linked to a product.

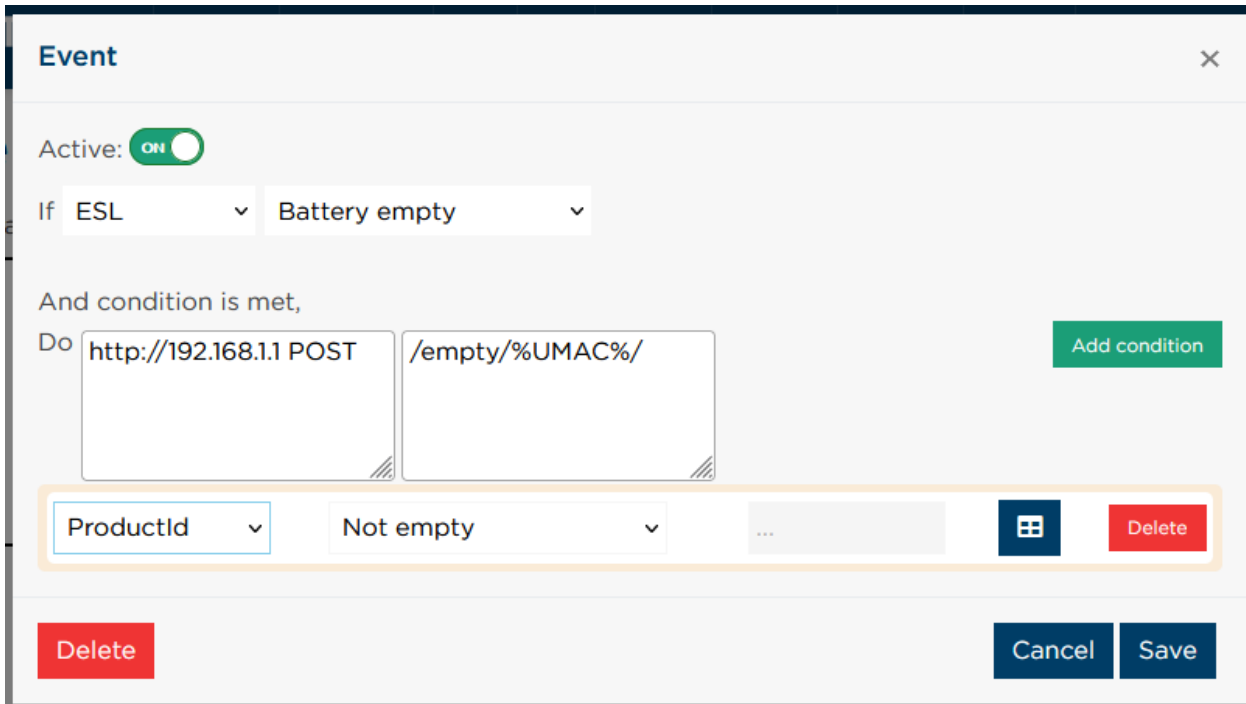


Figure 116: Event that calls an endpoint when a linked ESL is empty

With the help of a (set of) conditionals, you can specify the exact issue you wish to react to.

10.2 Application settings

This is a collection of settings that are normally found spread out over multiple pages. For Power Users, this screen acts as an overview of these settings. If you don't know what you are doing, it is best to leave it alone. When you need help with debugging any issue, the information available on this page may be requested from you.

10.3 System settings

NOTE: Applies to the EBS-50 only.

System settings are configuration options for the Linux microcomputer embedded in the EBS-50, such as network settings and firmware updating.

10.3.1 Hostname settings

By default, the EBS-50 is available on your network through <https://ebs50.local>. Changing the hostname to a different value will change the URL too.

10.3.2 Network settings

The network settings configure how your EBS-50 connects to your network.

10.3.2.1 Ethernet

You can change the EBS-50 from its default setting (DHCP for automatic configuration) to a static IP. Configure these settings with the local properties provided by your network manager.

10.3.2.2 Wi-Fi

Your EBS-50 can be configured as a Wi-Fi client or a Wi-Fi server. The Wi-Fi capabilities need to be provided by a compatible third-party Wi-Fi dongle connected on the USB port of the EBS-50. Contact support@opticon.com for more information on the compatibility of your preferred Wi-Fi dongle.

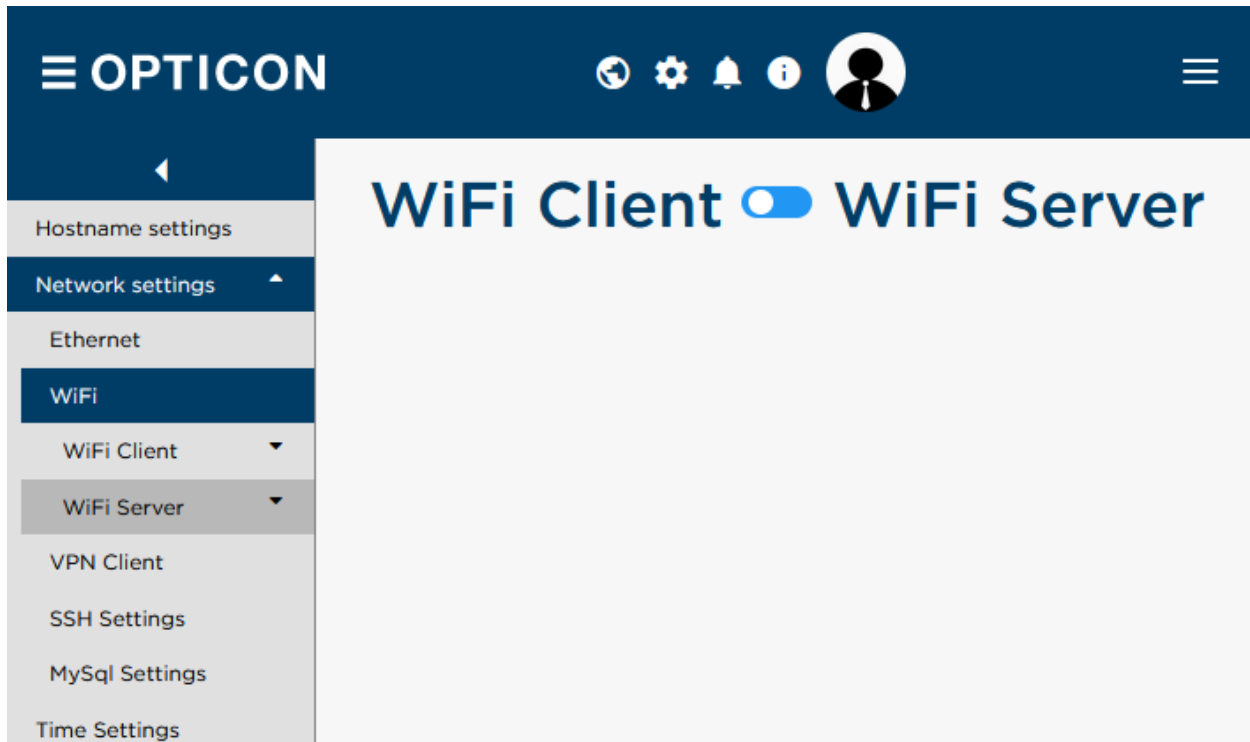


Figure 117: Wi-Fi option switch

10.3.2.2.1 Wi-Fi client

When an EBS-50 is a Wi-Fi client, it connects to an existing Wi-Fi network to wirelessly join a network and (if applicable) get an internet connection. The Wi-Fi dongle will be instructed to scan public networks in the vicinity and list them with the network names sorted by signal strength.

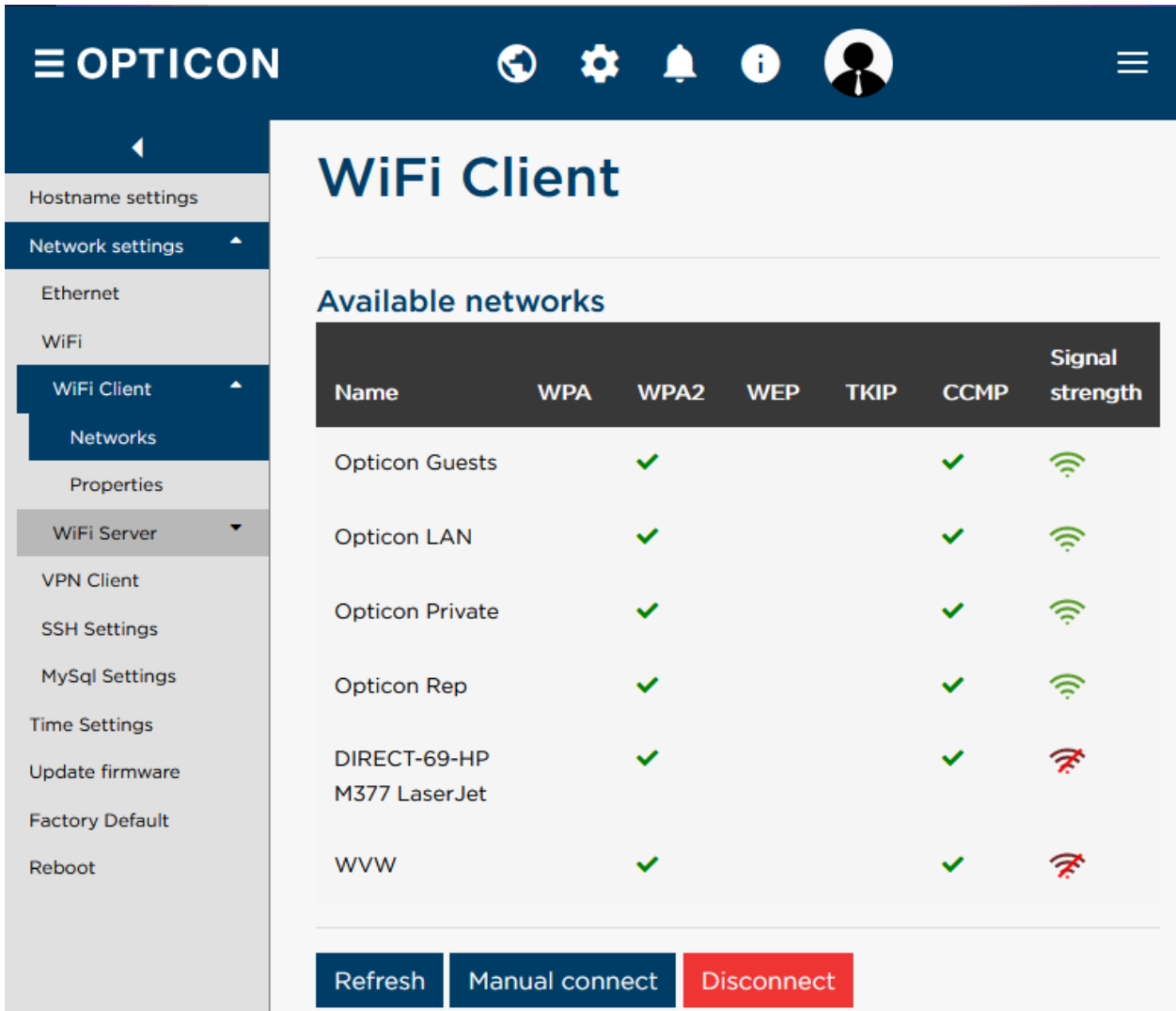


Figure 118: Found wireless networks

When you select a network, you will be prompted to supply the password and the EBS-50 will attempt to join the network with these credentials.

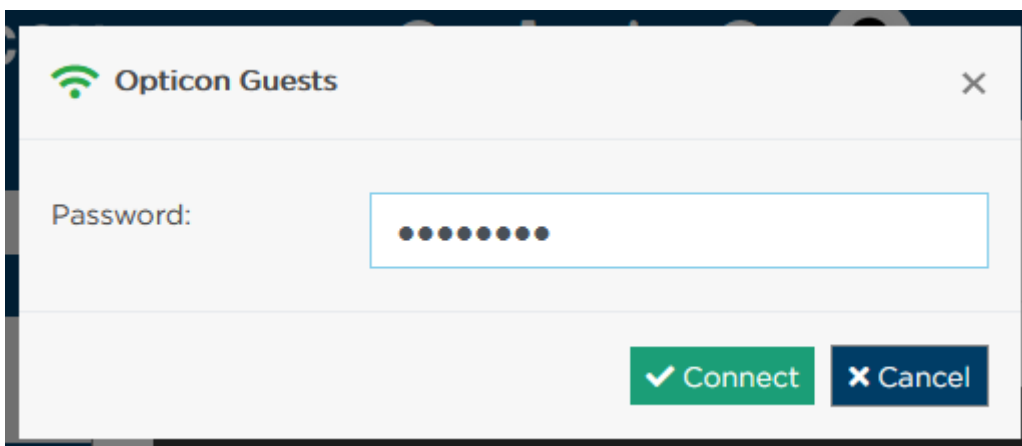


Figure 119: Password prompt

If the connection succeeds, the Wi-Fi status page will show all information on the EBS-50 (like IP-address) which you can use for accessing the EBS-50 from other devices in the network.

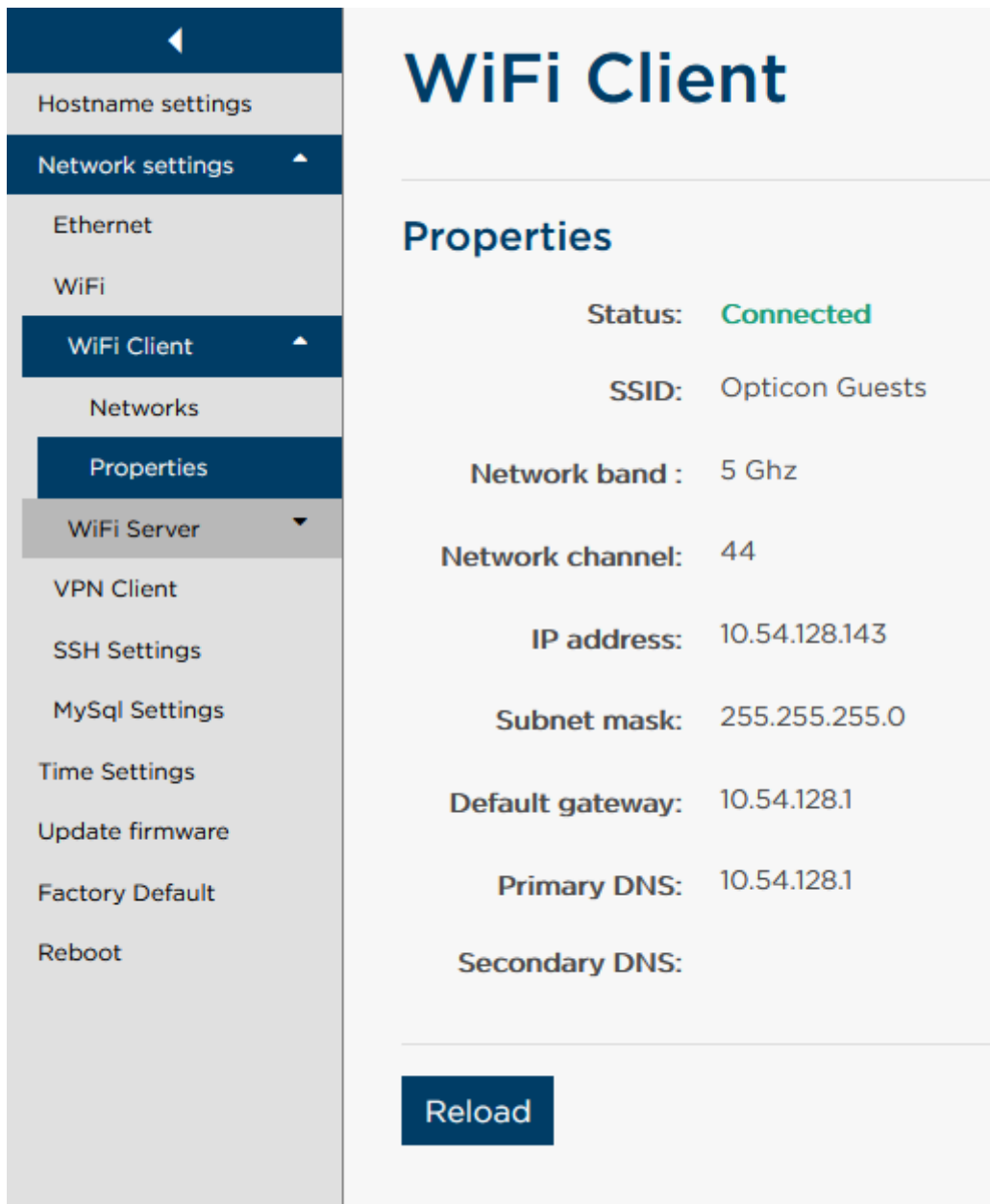


Figure 120: Properties of the EBS-50 as a Wi-Fi client

10.3.2.2.2 Wi-Fi server

When you choose the Wi-Fi server option, you can host your own wireless network that other devices can connect to. The configuration is split into three parts.

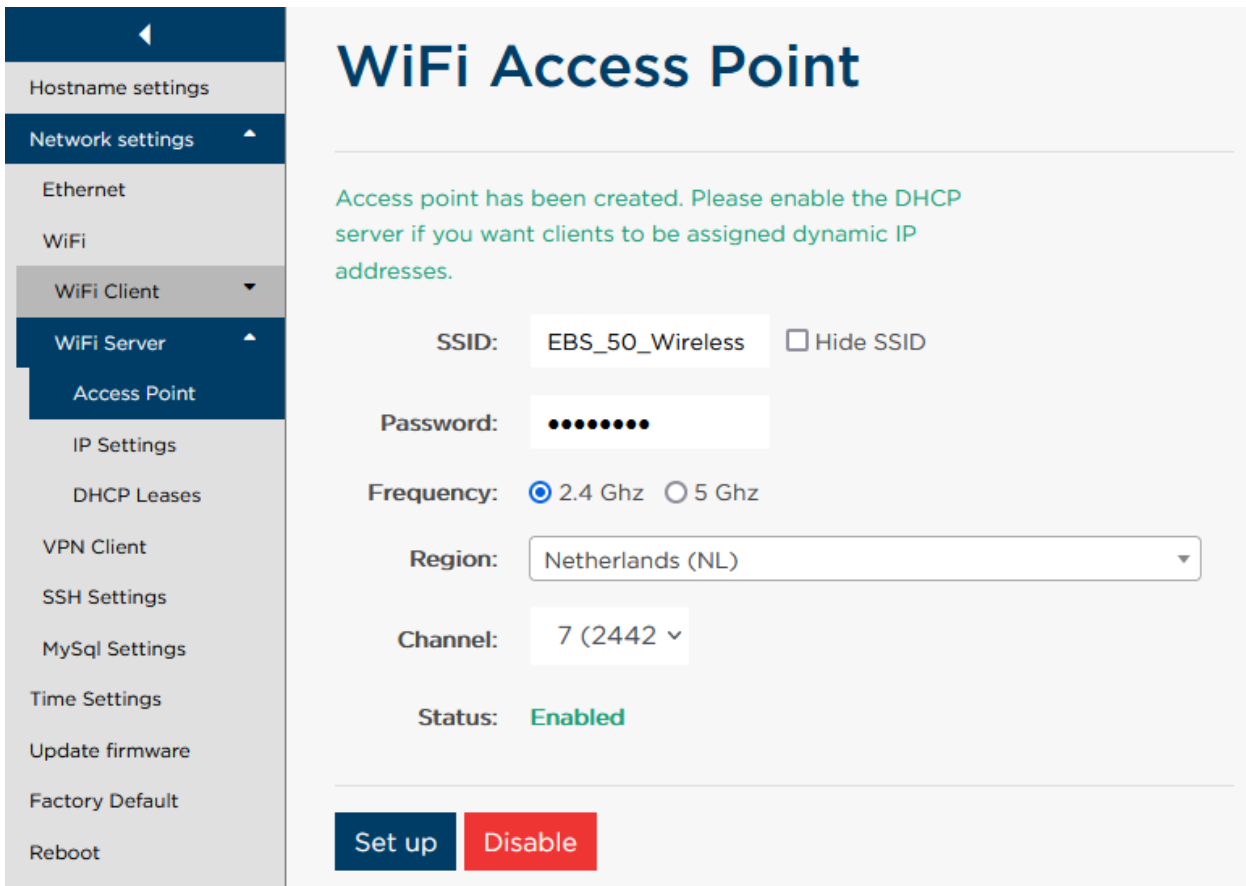


Figure 121: Access Point configuration screen

The first section is the Wi-Fi Access Point screen. Here you can specify the SSID of the network (you can optionally hide this, so it isn't broadcast), the password (WPA2/PSK), and the wireless frequency and channel to broadcast on, where the chosen region specifies which frequencies and channels are available. The SSID and password are required for other devices to connect to the EBS-50.

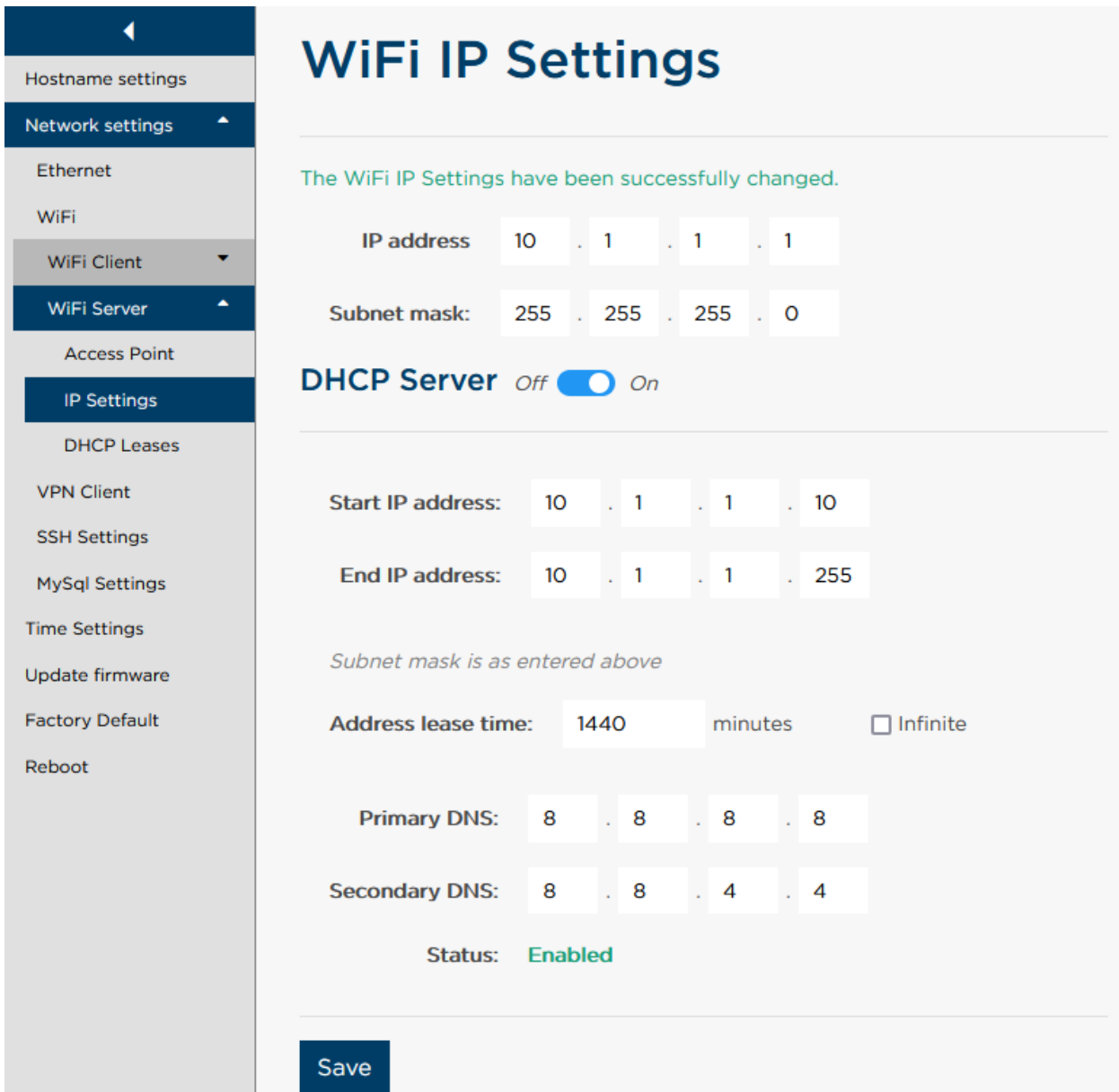


Figure 122: Wi-Fi IP settings screen

The second screen is the Wi-Fi IP settings screen. Here you can specify on what IP-address your EBS-50 is available when you connect. The subnet mask can be used to limit the range of static IP addresses that are available to client devices.

You can turn on a DHCP server as well, to avoid having clients set up a connection with a static IP address and instead let the EBS-50 provide the client with a dynamic IP. To make DHCP Server work, you will need to provide a range of valid addresses, lease time on the addresses, and a couple of DNS servers. The EBS-50 will not bridge the Wi-Fi and ethernet ports, so DNS is not critical, only required. Any valid IP address will do.

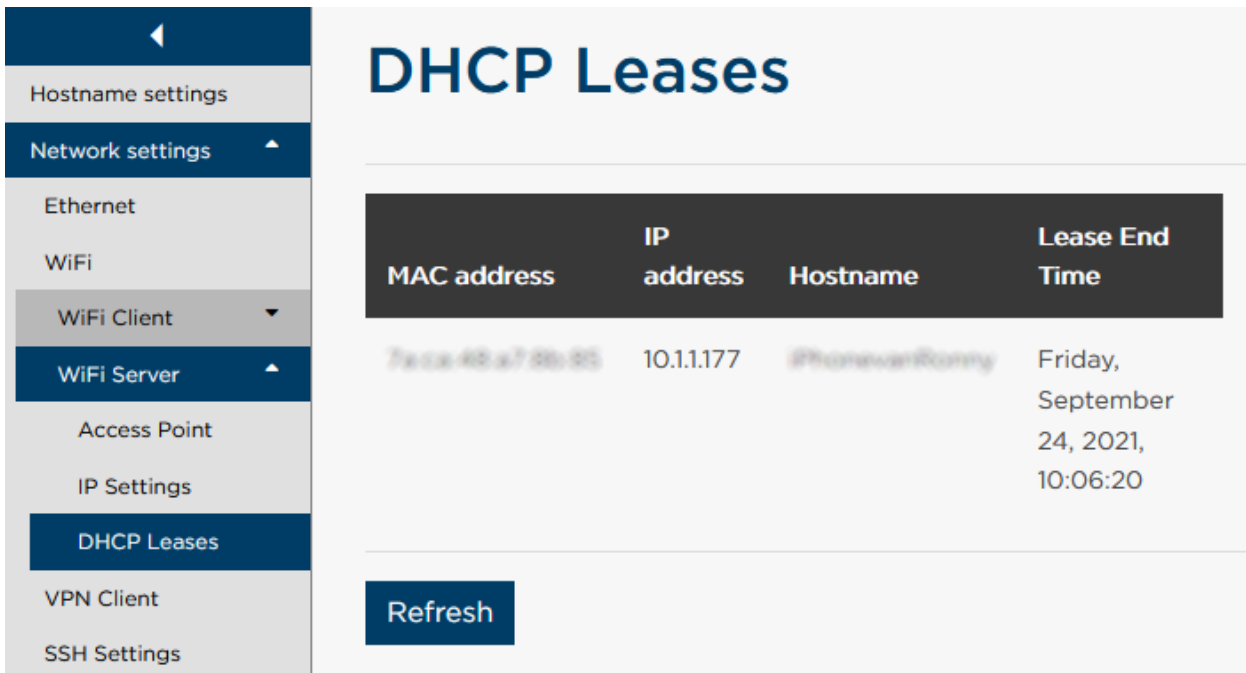


Figure 123: DHCP Lease screen

The last screen is the DHCP Lease screen. On this screen you can see which devices are connected to the wireless network of your EBS-50 and the IP-address assigned to them.

10.3.3 VPN client

With a VPN (virtual private network) you can let the EBS-50 log in to a separate network as though it were a local member. You can use this, for instance, to allow multiple EBS-50's that are physically separate to connect to the main office's network so you can manage your ESLs from a central location.

To set up an OpenVPN client connection on the EBS-50, a ZIP file containing the OpenVPN client connection profile must be uploaded from the OpenVPN section in the network settings page.

When using the open-source project of OpenVPN the client connection profile often consists of a .conf or .ovpn configuration file, the certificate files and the key files. The configuration file contains the required OpenVPN directives and references the required certificate files and key files. A client connection profile could for example consist of the following files:

- CACert.pem
- cert.pem
- client.ovpn
- private.key

Nowadays, if you use OpenVPN Access Server, it is possible to generate a configuration file incorporating all the referenced certificate and key files. To fetch the DNS servers addresses from the *dhcp-option DNS options* passed by the OpenVPN server, a script is used. This script comes with the OpenVPN package and runs when the VPN connection goes up, and when it goes down. To use this script, simply add the following instructions at the bottom of the OpenVPN client configuration file:

```
script-security 2
up /etc/openvpn/update-resolv-conf
down /etc/openvpn/update-resolv-conf
```

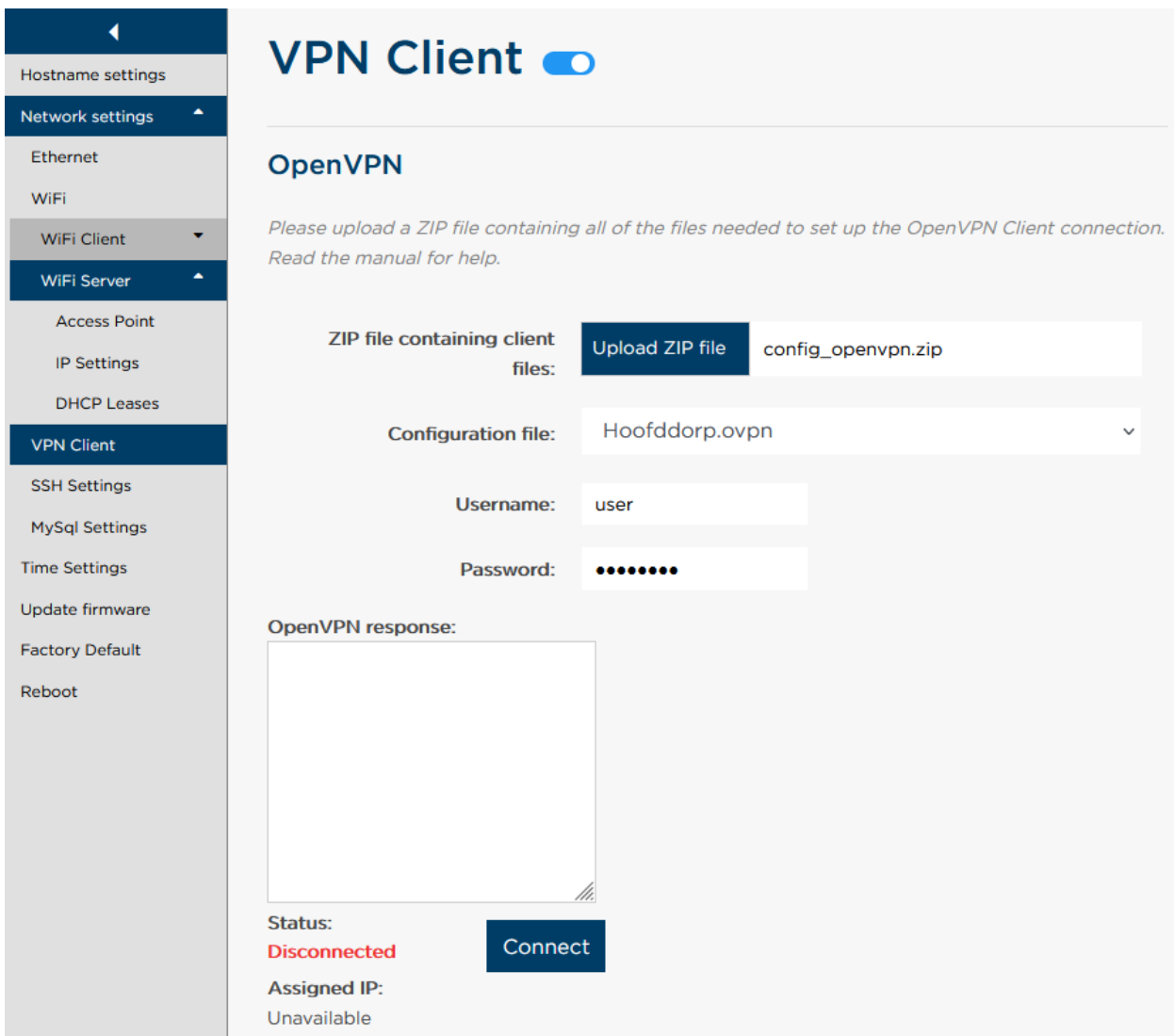


Figure 124: VPN Client setup screen

After uploading the ZIP file containing the client connection profile, the configuration file must be selected from the ZIP contents. Finally, the user credentials must be entered, which will be used for authentication when setting up the OpenVPN client connection. When the connect button is pressed, OpenVPN tries to set up the client connection with the given client files and credentials. The response to this will be shown in the OpenVPN response area. If OpenVPN was able to connect successfully, the status will be changed to “Connected” and the assigned IP address will be shown.

NOTE: The connection can be verified by using the `ifconfig` command in the EBS-50 terminal as root. A `tun0` network adapter should be in the list. See chapter [13 Log in by SSH using WinSCP/PuTTY](#) for more information.

10.3.4 SSH settings

With SSH, you can connect to the EBS-50 for low-level access to the hardware. By default, the username is “root”, and the password is “admin”. In chapter [13 Log in by SSH using WinSCP/PuTTY](#) these credentials are used to leverage the possibilities of hardware access.

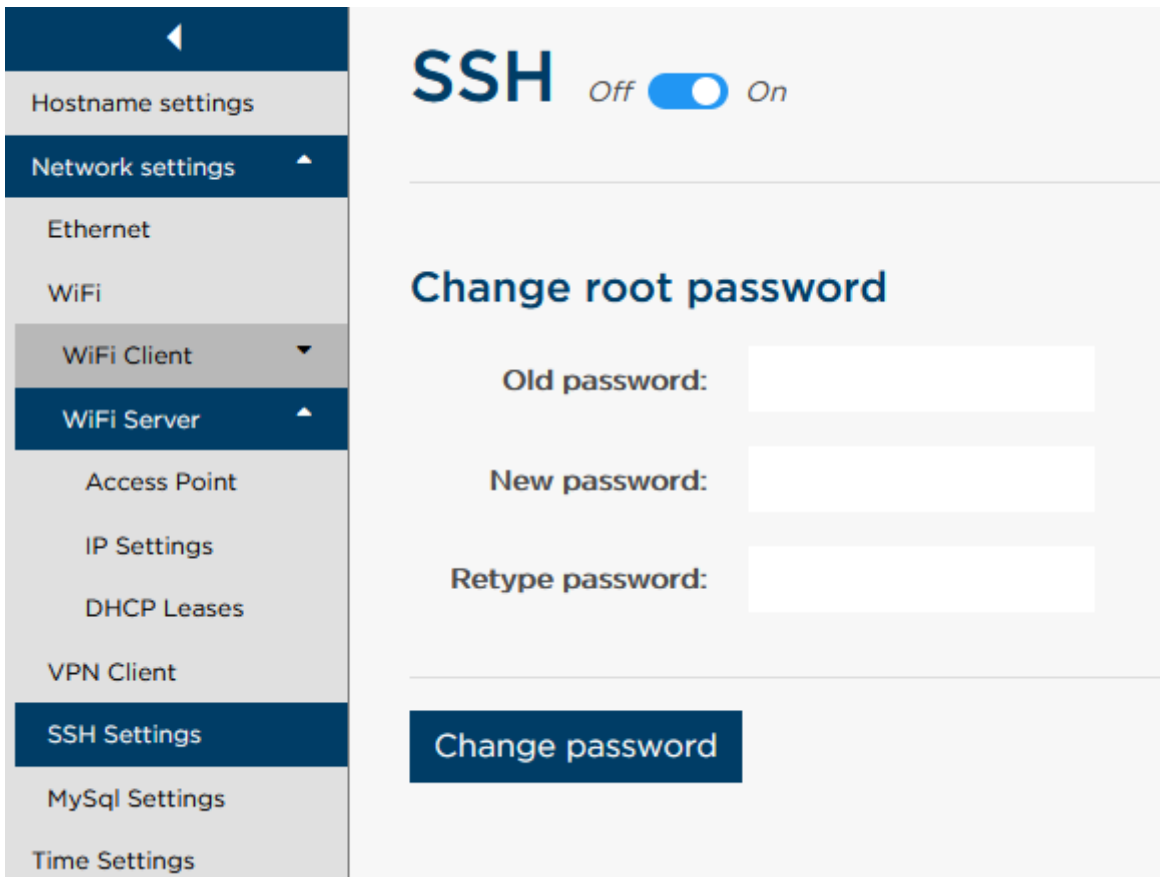


Figure 125: SSH settings screen

Through the SSH settings screen you can turn off the SSH port completely, disallowing access over the network. You can also change the password for the user “root” to a new password.

NOTE: low-level access through the micro-USB port will always be available as a fallback option when the software crashes and the SSH port is closed.

10.3.5 SQL settings

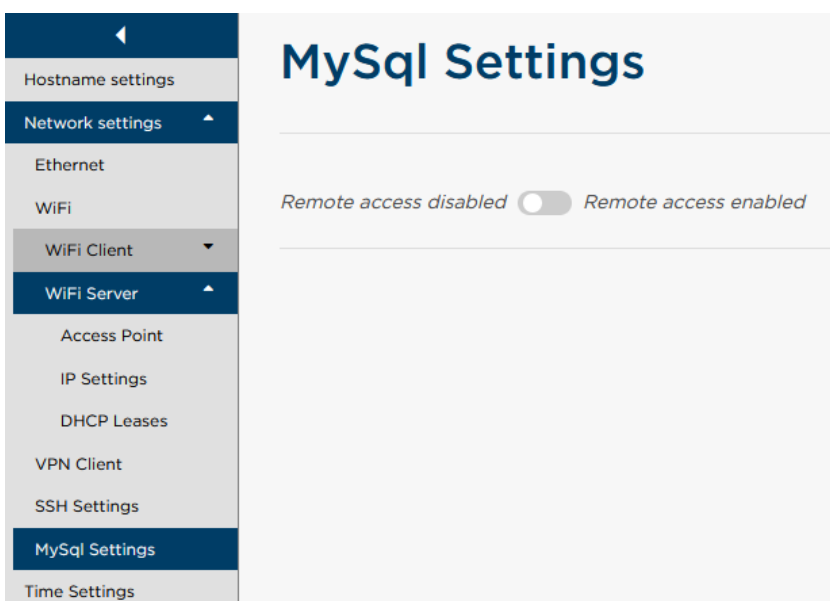


Figure 126: SQL settings screen

The MySQL settings screen is very simple; you can either allow or disallow remote access over IP to the database. With the switch set to “enabled” you can connect to the internal MySQL database with a standard TCP/IP connection on port 3306, with the username/password combination of “user” and “eslpassword”.

When you set the switch to “disabled” no external communications are allowed by MySQL. Using a TCP/IP over SSH connection, you can still communicate with the database, but the SSH tunnel adds security compared to standard TCP/IP.

To change the credentials of the MySQL database itself, you will need to use management tools like MySQL Workbench or the command line tool.

10.3.6 Time settings

For time-sensitive tasks, like logging messages, the EBS-50 needs to know the time. By default, it will try to synchronize with a time server on the internet. If an internet connection is not available, the EBS-50 can be supplied manually with the correct time information.

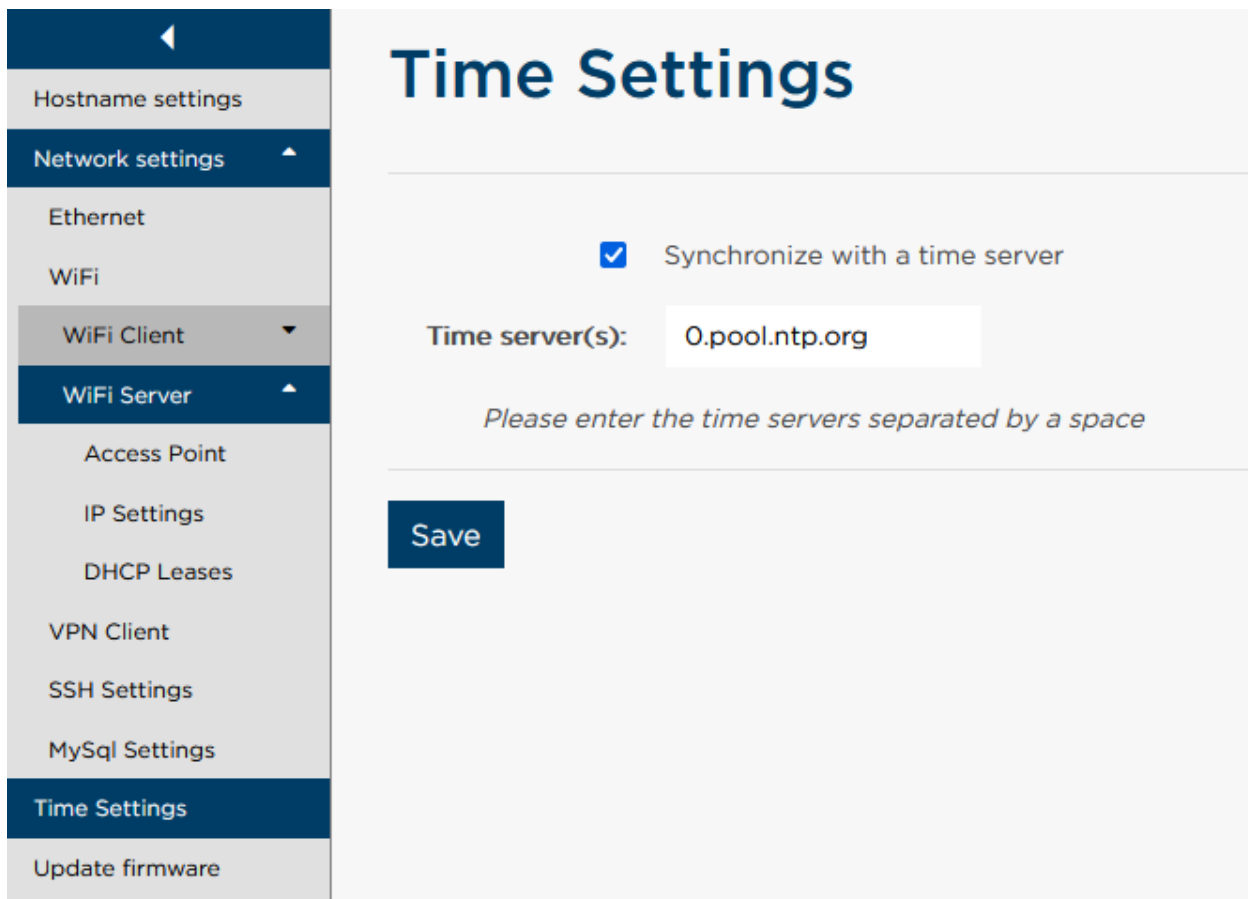


Figure 127: Time settings screen when synchronizing with a time server

When synchronizing with a time server, you will need to supply a valid time server that the EBS-50 can reach over the network.

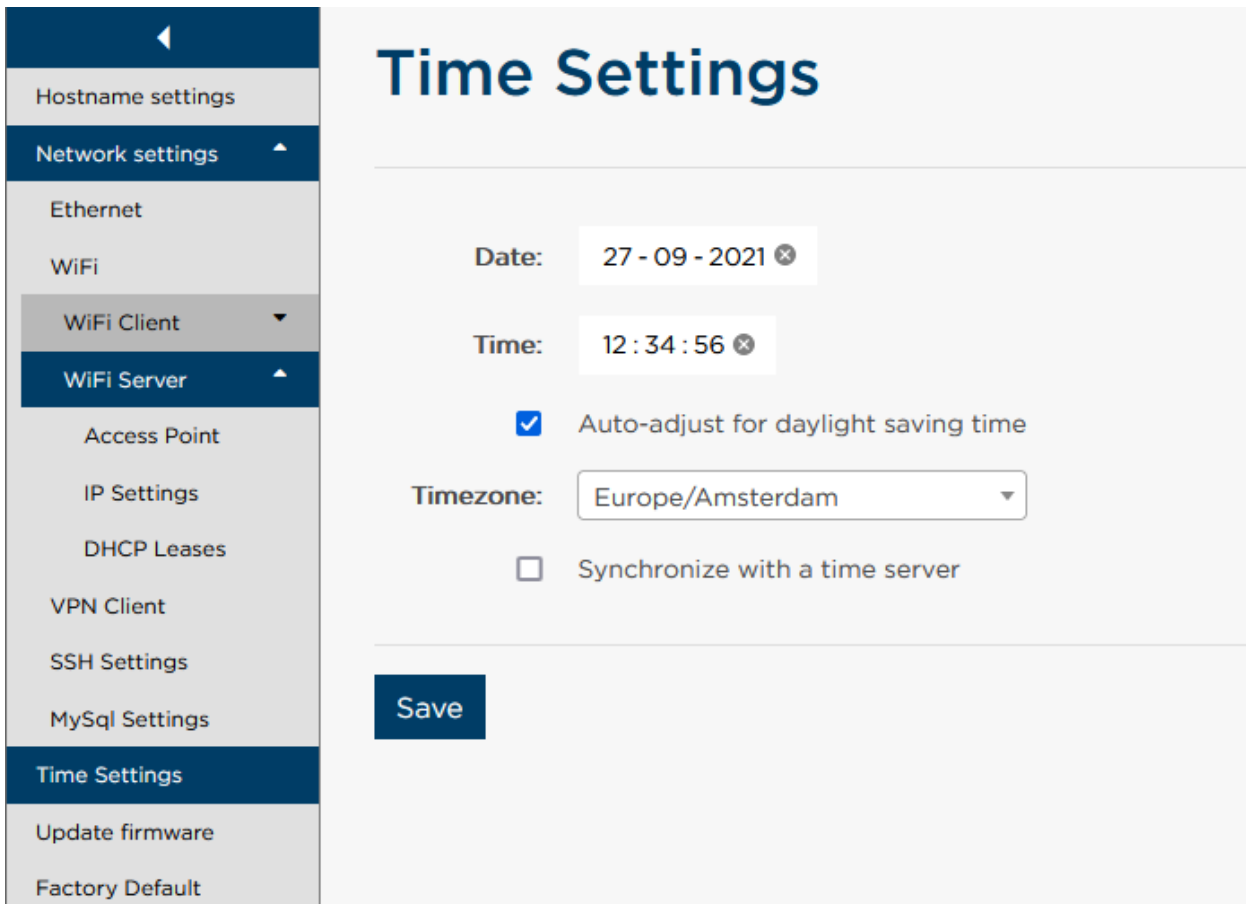


Figure 128: Time settings with manual configuration

When you remove the checkmark on “Synchronize with a time server” you can supply the correct date and time, as well as an optional checkmark to allow automatic adjustment for daylight saving time based on your locale.

10.3.7 Update firmware

Through the Update firmware screen, you can update the firmware of your EBS-50 which updates both the EBS-50 hardware platform as well as the ESL Web Server software running on the device.

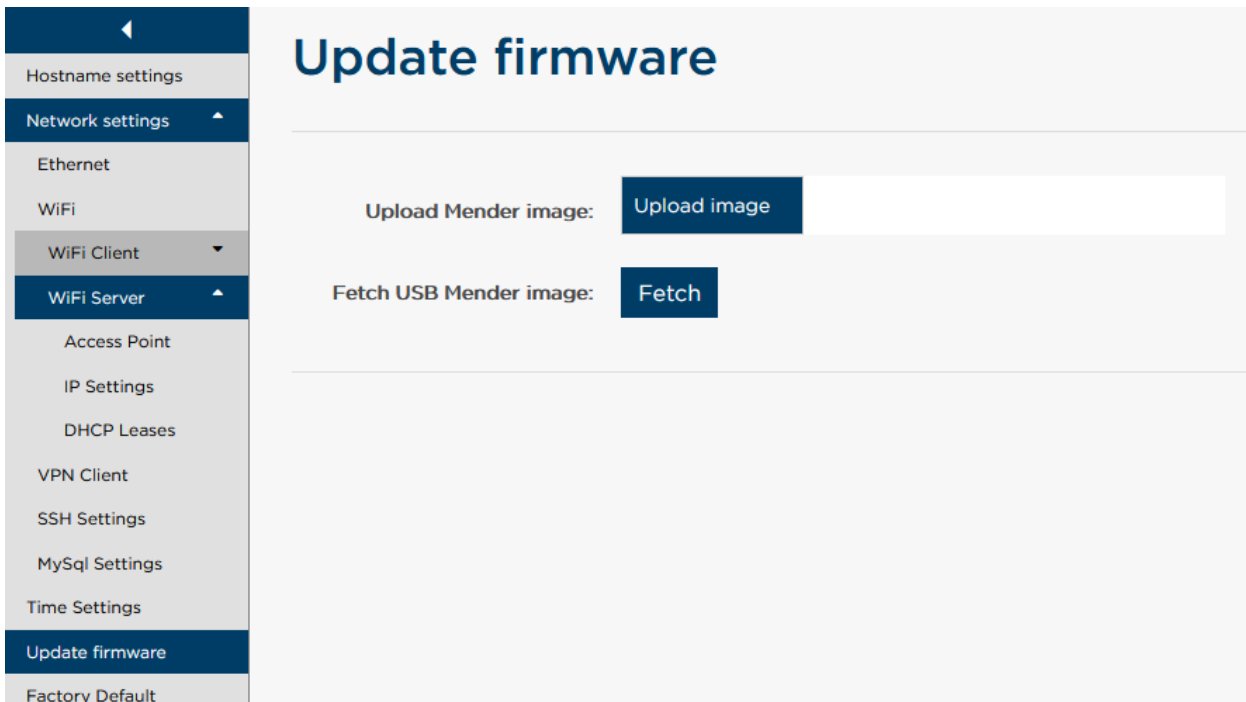


Figure 129: Update firmware screen

On this screen you see the two available options; uploading a Mender image containing the update to the device, or by fetching it from a USB-stick that has the Mender image on it.

First you will need to download the Mender image from Opticon’s website (<https://opticon.com/ebs-50>) to your computer for distribution to your EBS-50 device(s). Unpack the zip file after downloading.

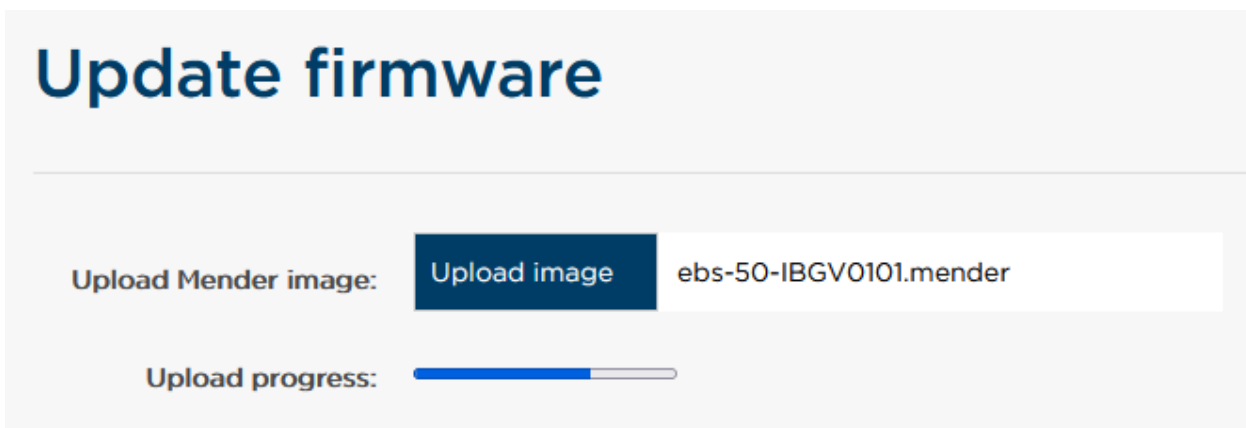


Figure 130: Uploading a Mender image

With the option “Upload Mender image” you will need a network connection between your computer and the EBS-50. Select and upload the file from your device to the EBS-50. After the upload is completed, the update will start.

With the option “Fetch USB Mender image” you will need to create a usable USB drive. This drive must be formatted as NTFS, and the Mender image needs to be placed in the root of the device (so do not place it in a folder on the USB drive). Plug the USB drive into your EBS-50 and click on “Fetch”. Once the image is found, the update will start.

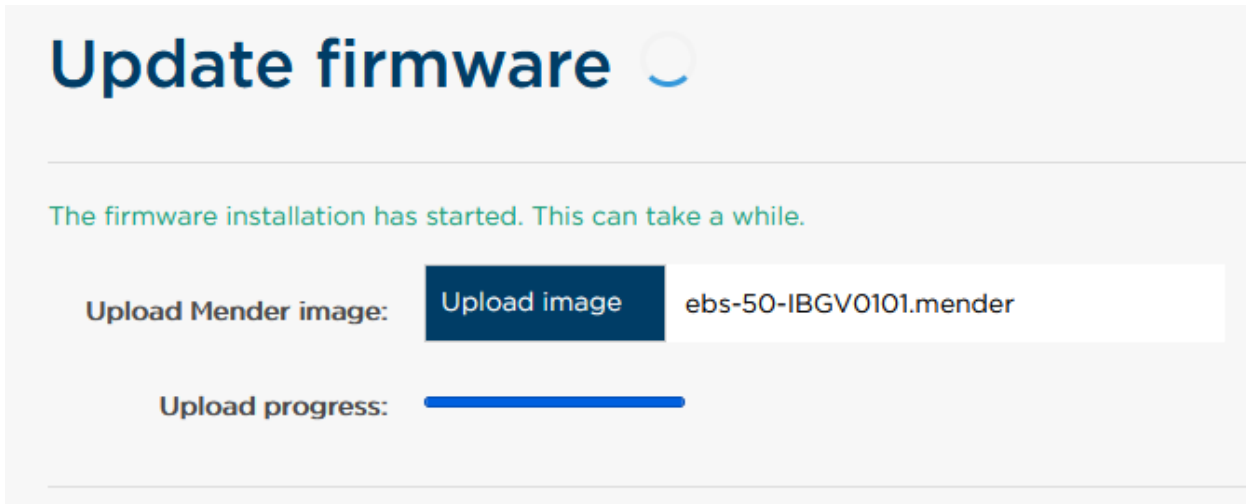


Figure 131: Updating in progress

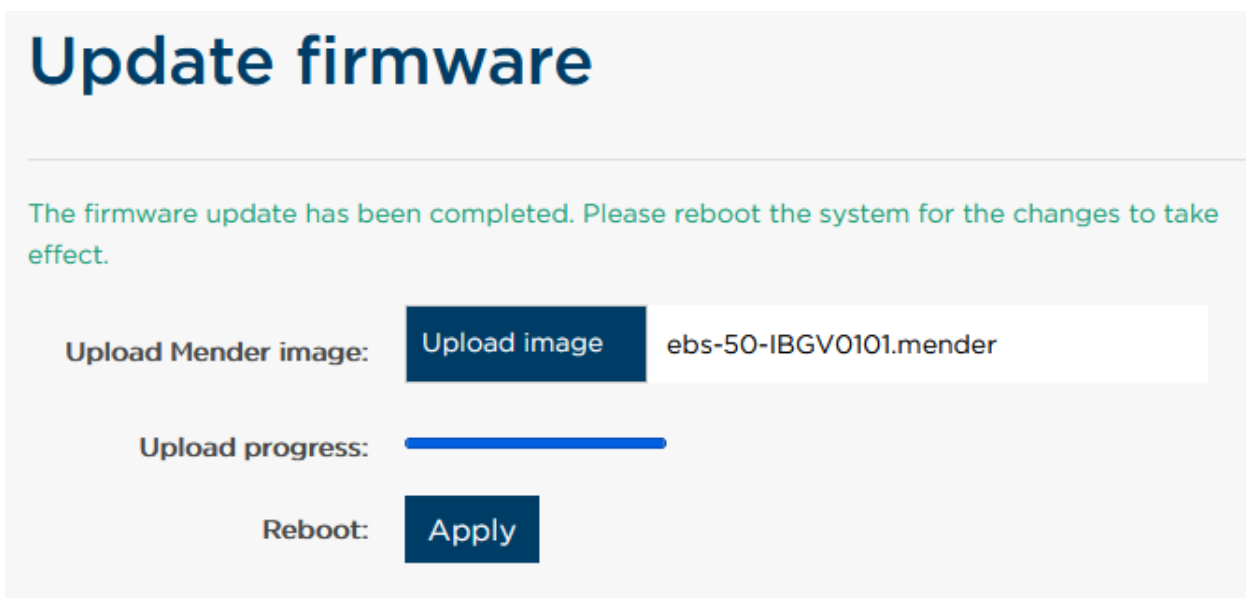


Figure 132: Updating completed

Once updating has been completed, you will be prompted to reboot the system to finalize the update process. The EBS-50 will take roughly 30 seconds to reboot, though it is not uncommon for it to take longer.

NOTE: It is recommended to update the EBS-50 outside of operating hours.

10.3.8 Factory default

Factory defaulting allows you to revert all the system settings to the factory defaults. Your database, links, connected base stations, user accounts et cetera will all remain intact.

NOTE: Only your system settings will be reverted to factory defaults. To completely wipe all data on your device, please refer to chapter [10.8 Flashing the EBS-50 hardware](#).

The factory default for all your settings is as follows:

- Hostname reverts to ebs50 (and the local address to <https://ebs50.local> as a result).
- Ethernet settings revert to dynamic (DHCP).
- Wi-Fi reverts to “Client” mode and the network it was connected to (if applicable) is forgotten.
- All VPN files and settings supplied (if applicable) are removed from the system.
- SSH port is disabled, and the user/password combination reverted to “root/admin”.

- MySQL external access is disabled.
- Time setting will revert to make the EBS-50 synchronize with the default NTP time server.

10.3.9 Reboot

Through this menu you can easily instruct your EBS-50 to gracefully shut down its operating system and subsequently restart the device.

NOTE: After pressing “reboot”, the device will take roughly 30 to 60 seconds to reboot the hardware and restart the ESL Web Server software.

10.4 Backup & restore

When you have created your first customized EBS-50, that is just the way you want it, you’ll want to be able to easily transfer this setup to other EBS-50’s when expanding to other locations. Or perhaps you want to make sure that all your hard work won’t be lost when your EBS-50 is stolen, destroyed or otherwise crashed and unrecoverable. The backup and restore menu in the advanced options is the tool you want.

10.4.1 Restore/Import configuration

The following restore options are available:

- Import/ from file
- Fetch from (EBS-50 only; manual or daily)
- Import from SFTP

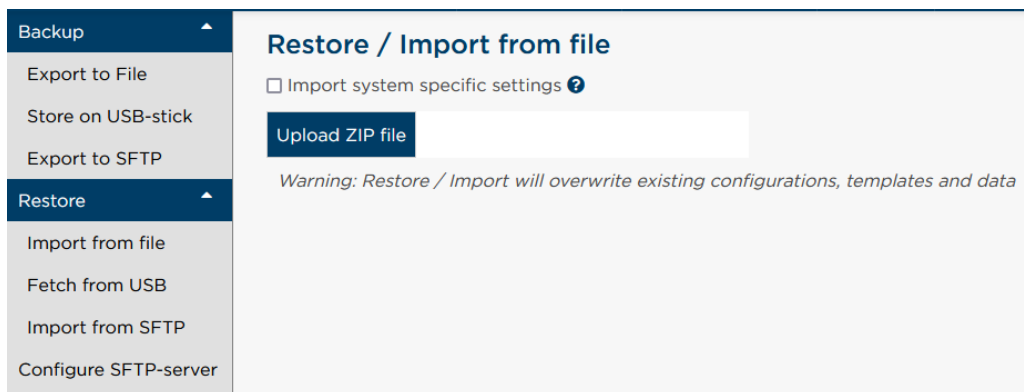


Figure 133: Restore/import screen

By default, “Import system specific settings” is turned off. These settings include VPN credentials and Cloud Dashboard credentials, which would make your EBS-50 an exact clone of another device, making them practically indistinguishable. If you wish to recreate an EBS-50 that has been removed, turn this setting on to make a carbon copy of the original.

WARNING: Cloning VPN credentials will cause your VPN connection to be granted to the first EBS-50 that tries to log in, and others may be unable to log in. Cloning credentials for the Cloud Dashboard will cause multiple EBS-50’s reporting their status under the same system name, with Cloud Dashboard only granting access to the first EBS-50 that posts its status.

10.4.2 Backup

The following backup options are available:

- Backup to file (download to the device you’re browsing from)
- Backup to USB-stick (EBS-50 only; manual or daily)
- Backup to SFTP (manual or periodic)

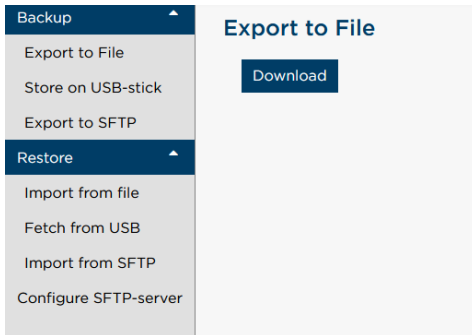


Figure 134: Backup screen

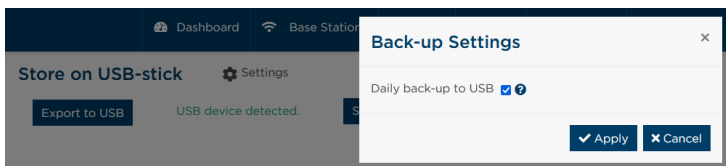
The output file will be a zip-file consisting of the following sections:

- Templates (includes conditionals, fonts and static images)
- Copy of the product database
- Copy of the local system tables (if applicable)
- Links
- System settings (i.e., network settings)
- Application settings (i.e., currency symbol, behavior of ESLs on unlinking)
- Database settings (configuration of internal or external database sources; location of product tables and system tables)
- OpenVPN configuration and credentials (if applicable)

The file will by default have a name corresponding to the time of creation.

10.4.3 Automatic daily backup (USB)

By pressing the -icon after selecting ‘Store on USB-stick’ you can enable a daily back-up to USB (at midnight)



10.4.4 Periodic backup to SFTP

To configure a periodic backup to a remote SFTP server. Follow the instructions on the ‘Configure SFTP-server’ page.

- Fill in the connection details to login to the SFTP server
- Go to the directory used to upload the backup file to.

- Set the time frequency at which the backup will be created

10.4.5 Restore from SFTP

To restore a specific backup from an SFTP server, press the ‘Download from SFTP’ button to list all available backups on the SFTP server.

Select the backup file and press ‘Start’ to restore the selected configuration.

10.5 Logs

When the ESL Web Server encounters an issue, or when someone makes a system change (connecting a new database, connecting a new Base Station) these events are logged. If an issue is causing problems, the logs are a great starting point to find the root cause.

10.5.1 Log tables

10.5.1.1 Event log

The Event log tracks all events, both fatal and non-fatal. These include ESLs reporting an image update failure, Base Stations switching between offline and online status, but also the ESL Web Server software starting up or someone adding/removing a Base Station.

10.5.1.2 Change log

The Change log tracks events that are a change to the current setup. These include linking ESLs, importing new product data or templates, and adding/removing a Base Station.

10.5.1.3 Log messages

The Log messages contain exceptions and issues that occur in the actual code of ESL Web Server. These may not be fatal issues, but could point out underlying issues that may become fatal if not dealt with. Messages in this log may seem cryptic, as they may also print out environment variables that the code of ESL Web Server was trying to process when an exception occurred.

10.5.1.4 Label status

The Label status log contains a record of every single ESL that has ever been part of the ESL Web Server software. These are ESLs that are, or have been, online on your Base Stations and are ESLs that are, or have been, present in your Link tables (and are not necessarily units that have been online). Each record contains information on the ESL type, last reported poll time (if applicable), firmware version, image name (if applicable) and many more. If you have labels that have gone offline, this log will provide you with all their most recent information that may help you troubleshoot (i.e., it reported a low battery when last seen)

10.5.1.5 Base Station status

The Base Station status log contains a record of every single Base Station that has ever been connected to the ESL Web Server software. The log contains all the settings of the Base Station when it was last seen, like IP address, firmware version et cetera.

10.5.2 Log settings

You can change which messages are logged by clicking the “Settings” button on the Logging page. This will open the settings popup.

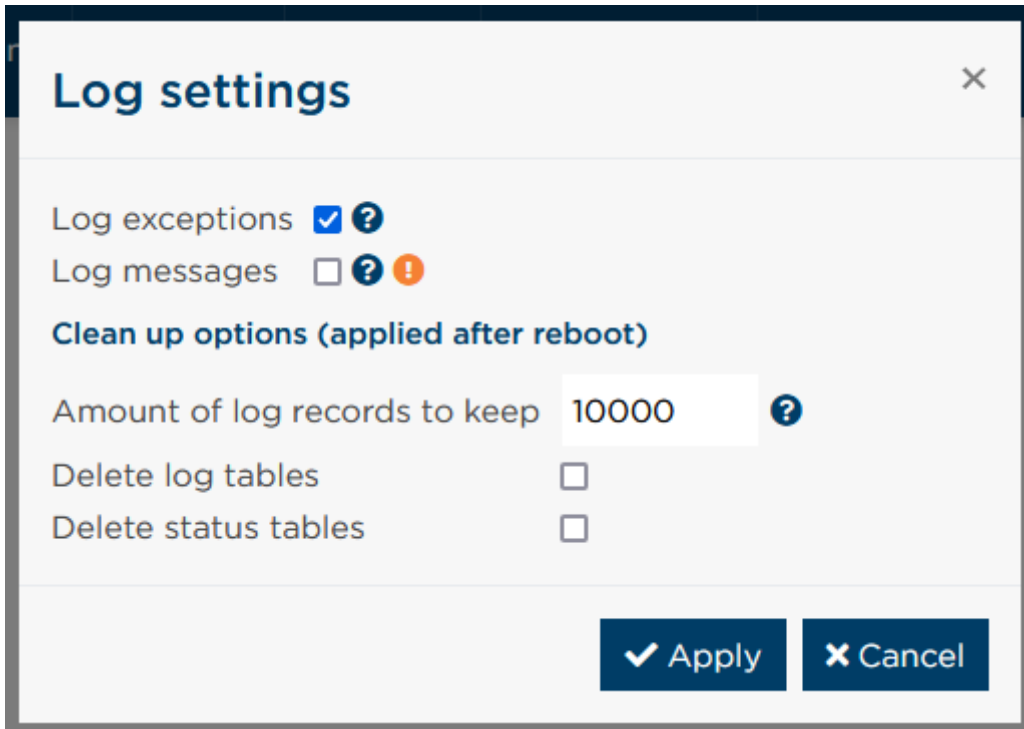


Figure 135: Log Settings

You can log exceptions; errors that were unexpected. This feature is turned on by default. You can also log messages, warnings and informational messages. These can help you pinpoint where any uncaught errors or breaking issues are taking place. As this feature puts a lot of strain on your database connection it is turned off by default for normal use.

Clean up options allow you to limit the number of records to keep in the logs, and whether you want to completely empty your log tables (Event log, Change log and Log messages) and/or your status tables (Label status and Base Station status). Changes to these options are applied after a reboot of the ESL Web Server software. See chapter [10.3.9 Reboot](#) on how to reboot your EBS-50.

10.6 ESL Cloud Dashboard

The optional ESL Cloud Dashboard allows you to periodically upload the information visible in ESL Web Server’s dashboard to be uploaded to a central Cloud Dashboard that can be used to monitor several ESL Web Server instances from a single page.

Once your ESL Cloud Dashboard is set up and online, you will need to register your ESL Web Server with the help of this interface.

Figure 136: Cloud Dashboard connection interface

The first option, “Activate cloud status posting” allows you to easily switch posting to the cloud on and off. The second option, “Cloud Dashboard endpoint: is the fully specified web address on which the Cloud Dashboard website is hosted.

NOTE: if the specifier http:// or https:// is missing, the ESL Web Server can’t assert which type of connection it should use.

The third option, “Cloud Dashboard default API-key”, is the key that will allow you access to post data to the ESL Cloud Dashboard. This is a non-optional safety feature that helps protect the Cloud Dashboard website from abuse.

The fourth option, “Post status every x minutes/hours/days”, allows you to specify how often you want the health status of this ESL Web Server to be posted. It is also used by the Cloud Dashboard to keep track of missed polls from ESL Web Servers, which is also indicative of the health.

The fifth option, “System name”, is the name under which this ESL Web Server will post its status to the Cloud Dashboard. This name is checked on uniqueness during the first connection setup. Once the name is verified, this field becomes uneditable except through the edit button (see chapter [10.6.3 Changing the system name](#))

10.6.1 Setting up a cloud connection

Ensure that the externally hosted Cloud Dashboard website is running and can be accessed from the network that the EBS-50 (or the device hosting the ESL Web Server software) is connected to.

Fill in the Cloud Dashboard endpoint, its API key (known by the administrator of the Cloud Dashboard), the posting interval and the preferred system name. Press “Save” to start the handshake. If any step fails, ESL Web Server will provide you with an error message indicating what went wrong and how to resolve the issue. If all steps succeed, your ESL Web Server will immediately send the Cloud Dashboard site its current health status and from then on keep sending it at the specified interval.

10.6.2 Editing a cloud connection

If you want to change the interval with which you post updates, or if the Cloud Dashboard changes its endpoint or API key, you can easily change these in the same interface that you used to set up the cloud connection. Simply fill in the new settings and press the “Apply” button. The handshake will be performed to check if the new settings are applicable. If any step fails, the UI will provide you with an error message indicating what went wrong and how to resolve the issue. If all steps succeed, your ESL Web Server will immediately send the Cloud Dashboard site its current health status and from then on keep sending it at the specified interval.

10.6.3 Changing the system name

Changing the system name of the ESL Web Server is a bit more complicated, as you may want to keep the history of this ESL Web Server instance intact, but ported to the new name. Press the “Edit” button next to the grayed-out system name to start the rename wizard.

It will set up a connection to the Cloud Dashboard and double-check your current credentials. If they are correct, you will be asked if you want to retain history. Then it will ask you for a new system name that will be checked on uniqueness. Based on your answers, you will either continue your history under a new name or clear the Cloud Dashboard of the old information and start a new history.

10.6.4 Safety

The Cloud Dashboard is designed to allow external users to view the health status of ESL Web Server instances without requiring them to connect with the ESL Web Server itself. This might infer that the Cloud Dashboard opens a back door to edit these ESL Web Server instances too. It is important to note that only the health status is posted, and that the initiative to post it lies with ESL Web Server. The Cloud Dashboard has no access to the ESL Web Server settings, its database, links, products or labels. All these important properties are secure on the ESL Web Server software. The only thing Cloud Dashboard does is show health, but to fix issues, you will need access to the ESL Web Server that has those issues.

10.7 License and registration

For users that have purchased an EBS-50 or other Opticon base stations, a full license for the ESL Web Server software is included and can be activated by a one-time registration

NOTE: before 2023, the EBS-50 and licenses for the ESL Web Server software were offered as 2 separate items.

10.7.1 Differences between a licensed and non-licensed version

Until the license of an ESL Web Server has been activated, the system is able to connect to a single Base Station (in the case of the EBS-50, it can only connect to the built-in Base Station) and can manage 20 labels of 2.9” screen diameter and below, or 3 labels above 2.9” screen diameter. After activating the license, there are no limitations.

If your license has not been activated yet, the ESL server will show a warning in the top left corner. To enter the license page, either press on the warning or go to ‘Advanced’ > ‘License’

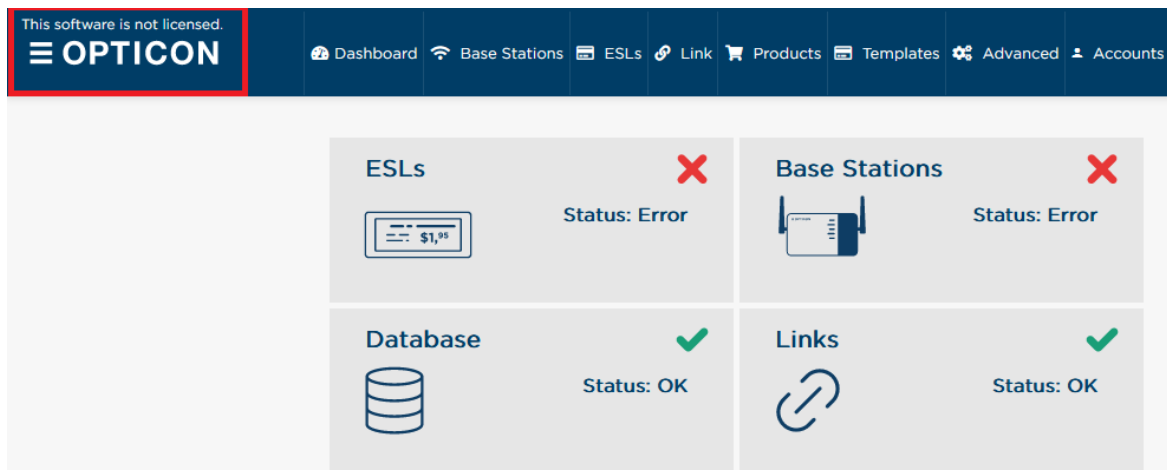


Figure 137: ESL Web Server ‘Not licensed’ warning

10.7.2 License page

On the license page, you can see the correct status of your license. If it’s already licensed previously, then it will show the current license expiry date.

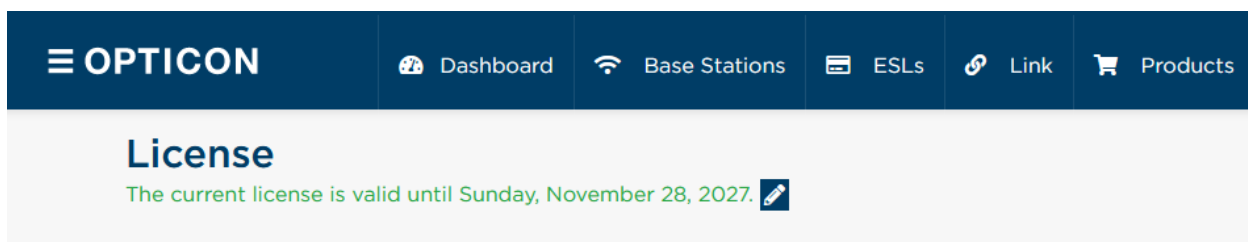


Figure 138: ESL Web Server license page with a valid license

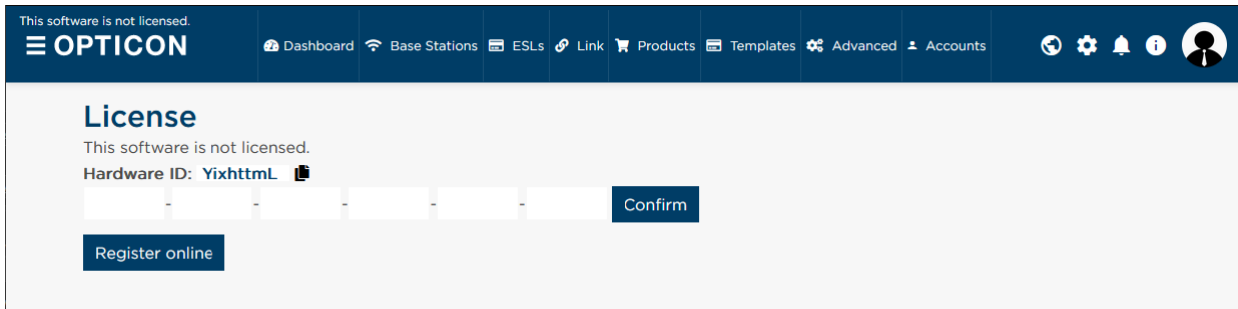


Figure 139: ESL Web Server license page without a valid license

If you already have a license key, then it can be entered or copied here manually.

To request a new license, press on the ‘Register online’ button to visit to registration portal at <https://registration.opticon.com>.

Note: Previously activated licenses on dashboard.opticon.com will maintain valid and have been automatically transferred to <https://registration.opticon.com>.

If your EBS-50 or ESL Web Server is connected to the internet, then it will automatically retrieve the license if it has been previously registered or has just been created.

If your EBS-50 or ESL Web Server does not have a connection to the internet, visit <https://registration.opticon.com> with a device that does to retrieve the license code and copy it to your clipboard, or send it to your email address. Enter it on your ESL Web Server manually.

10.7.3 Registration and login

After pressing the ‘Register online’ button, you’ll be redirected to the registration web site.

- If you have previously registered on <https://registration.opticon.com> then fill in your credentials and log in.
- If you don’t have an account yet, press the ‘Sign up’ button and follow the registration process.
- If you’ve already had an account on dashboard.opticon.com, your account has been migrated. However, you will have to reset your password using the ‘Forgot your password’ option, because passwords can’t be migrated.

After login, you are automatically shown the “Request license” page. Here you can fill in the unique ID for your system (which is shown on your ESL Web Server’s license page and is automatically filled in for you when you clicked on the “Register online” button there) and the label.

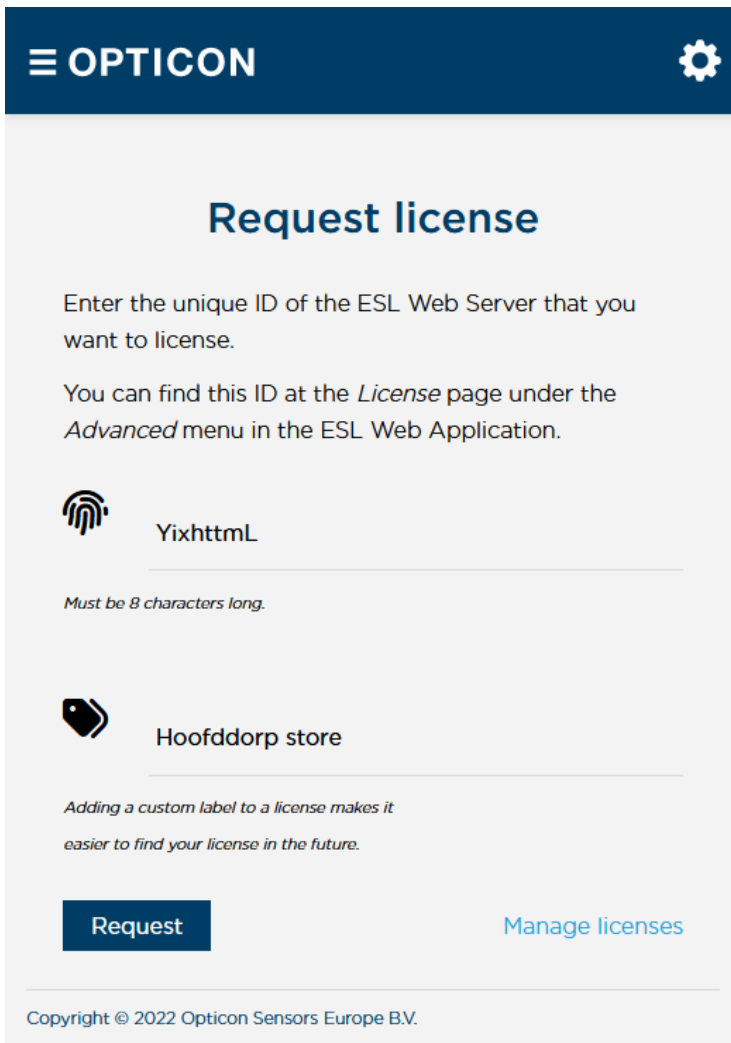


Figure 140: Request license page

With the ID and label filled in, simply press “Request” to get your system’s key, which will show at the bottom of the page.

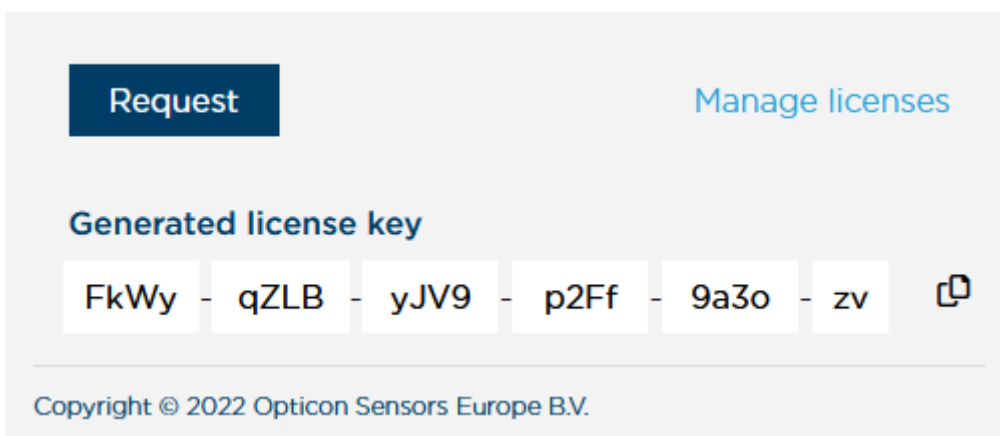


Figure 141: Generated license key

You will also receive an email with your registration info, which you can use to back up your info safely.

10.7.4 Managing licenses

If you don't want to generate a new license, but rather review your existing licenses that are part of your account, click on "Manage licenses" on the bottom right of the form.

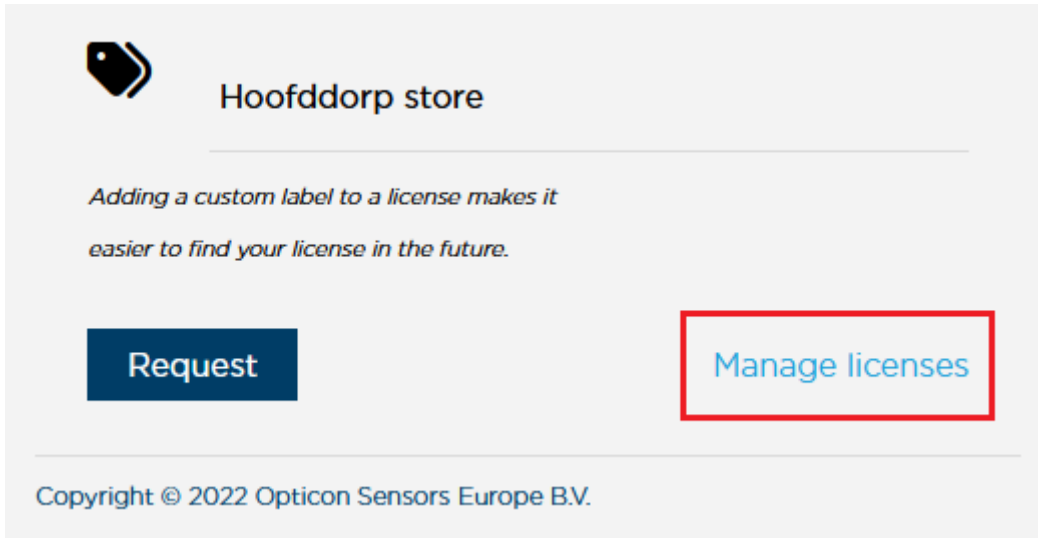


Figure 142: Manage licenses button

This leads you to a page with an overview of your licenses. Here you can check the expiry date, recover license keys and edit the label. Once a key expires, you can click the renew icon to generate a new license key that will be valid for five years.

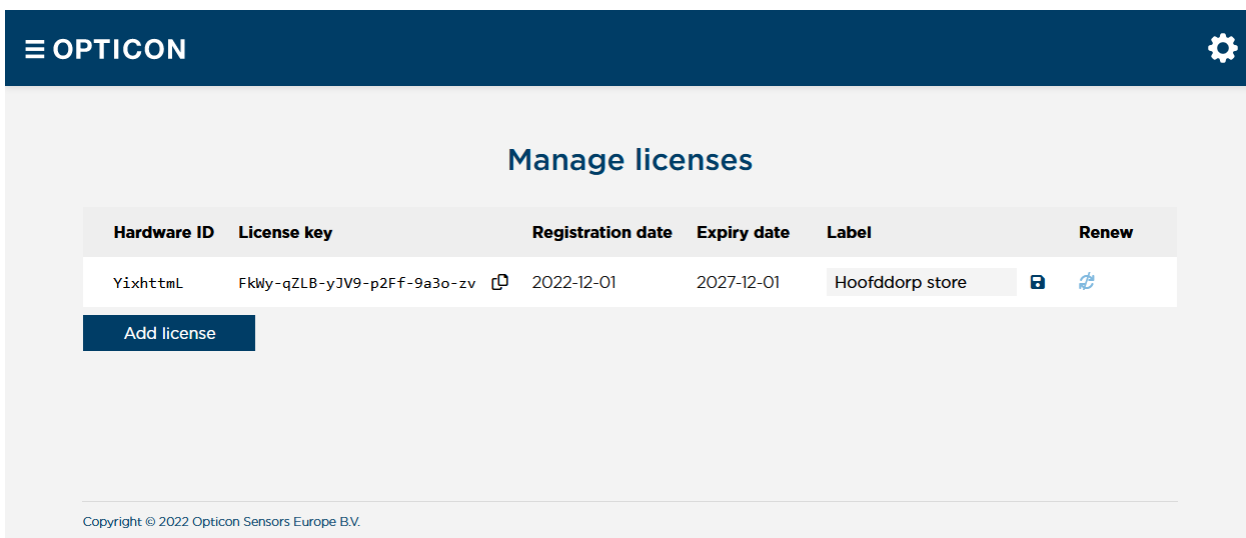


Figure 143: License management page

To copy the license key of a system to your clipboard, click on the copy symbol () next to the key. To change the label of your license, type in a new label and click on the save icon () next to the label. To renew the license (only activates once the license expires), click the renew icon ()

10.8 Flashing the EBS-50 hardware

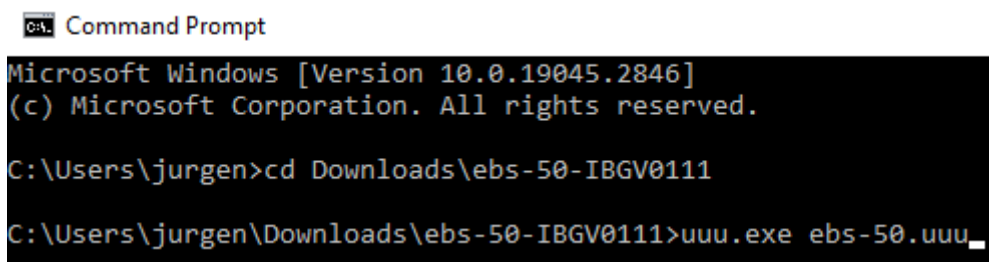
NOTE: This is not an option in the ESL Web Server interface’s “Advanced” menu, but a tutorial on the hardware. This section is not applicable if you use the ESL Web Server software hosted on another platform.

If for whatever reason you would like to completely wipe all the settings from your EBS-50 and factory reset the unit you can use a Windows PC to perform a flash command.

NOTE: The EBS-50 flash tool will wipe all the settings from your EBS-50 device. PRODUCT DATABASE CONNECTION, LOCAL DATABASE FILES, TEMPLATE FILES, CLOUD DASHBOARD CONNECTION AND NETWORK SETUP WILL BE REMOVED

10.8.1 Flashing procedure

- Turn off the power to the EBS-50
- Attach your EBS-50 to a Windows 10 or 11 PC using the micro-USB port on the EBS-50. DO NOT YET POWER THE EBS-50
- Download the flash file from our website (<https://www.opticon.com/support/Display%20Solutions/EBS-50/EBS-50%20flash%20tool.zip>)
- Unpack the contents, and use a tool like Command Prompt or PowerShell
- Type the command `uuu.exe ebs-50.uuu` on Command Prompt, or the command `.\uuu.exe .\ebs-50.uuu` on PowerShell

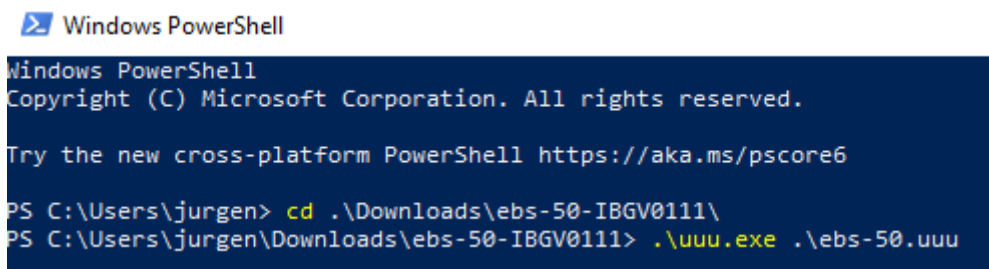


```

C:\> Command Prompt
Microsoft Windows [Version 10.0.19045.2846]
(c) Microsoft Corporation. All rights reserved.

C:\Users\jürgen>cd Downloads\ebs-50-IBGV0111
C:\Users\jürgen\Downloads\ebs-50-IBGV0111>uuu.exe ebs-50.uuu
    
```

Figure 144: Example for Command Prompt



```

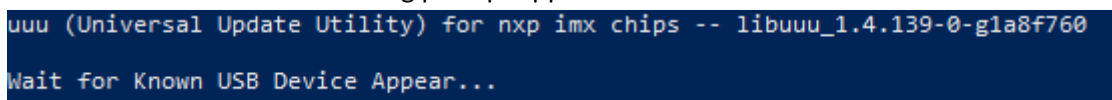
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\jürgen> cd .\Downloads\ebs-50-IBGV0111\
PS C:\Users\jürgen\Downloads\ebs-50-IBGV0111> .\uuu.exe .\ebs-50.uuu
    
```

Figure 145: Example for PowerShell

- Press Enter and the following prompt appears:



```

uuu (Universal Update Utility) for nxp imx chips -- libuuu_1.4.139-0-g1a8f760
Wait for Known USB Device Appear...
    
```

- While pressing on the small button next to the power plug, power on your EBS-50. Keep the button pressed until the device is recognized by your PC and starts its update process:

```
uuu (Universal Update Utility) for nxp imx chips -- libuuu_1.4.139-0-g1a8f760
Success 0   Failure 0

2:32      6/10 [==>                8%                ] FB: flash -raw2sparse rootfs1 .\files\eps-50-IBGV0111.ext4
```

This screen should appear within five seconds after powering up the device. If it doesn't you may attempt this step again or look at the troubleshooting guide in the next chapter

- This progress bar will walk through a 10-step installation loop.
- Once it is done, the EBS-50 will reboot and configure its first boot set-up routine. **DO NOT REMOVE POWER FROM THE DEVICE**, or you may corrupt the settings and need to restart the entire flashing progress.
- After a couple of boots (your PC will probably play USB plug/unplug jingles and list messages like “setting up device” or “new network detected”) the unit will finish its initial setup process. If you use EBSFinder, the device will now appear in your list again. A good indicator that setup is fully complete is when the channel is set to 11 and the LAN ID is ‘0000’ (four numbers).
- Try connecting to <https://192.168.100.5>, the static IP address of the RNDIS (virtual ethernet port on a USB cable) interface. If it works correctly, try its ethernet port address too.

10.8.2 Troubleshooting if the device is not recognized

Normally on Windows 10 and 11 the WinUSB driver is already available, but it is not uncommon that the device driver is still missing. To check if the driver is present, boot up the EBS-50 in debug mode: plug in the micro-USB cable, apply power while pressing the small black button next to the power port. You may hear a sound notification from Windows recognizing a new device on the USB port.

Open Device Manager (press Win+R, type “devmgmt.msc” and press enter) and check if under Universal Serial Bus devices, you see a device called “USB download gadget”:

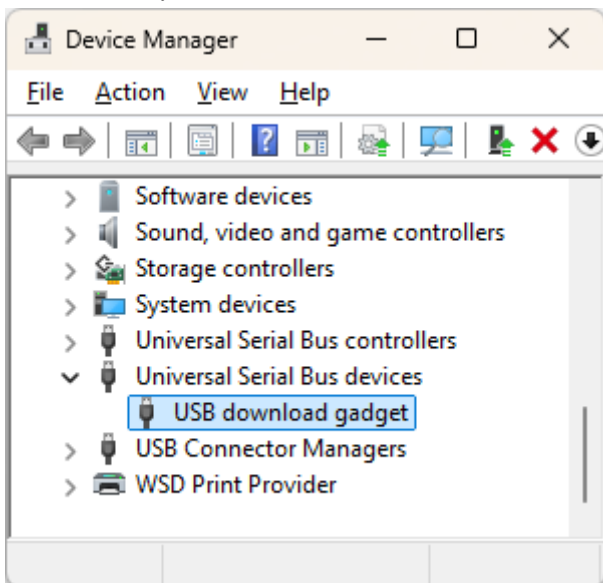


Figure 146: device correctly identified

If you see it, your drivers are installed correctly, and you can start flashing the device.

If you don't see it, it's probably listed under Unknown devices, and the driver is missing.

In the flash tool package, there is a driver install tool called “zadig-2.5.exe”. Run it, press “Options” → “List all devices” and select the device from the list. If you don’t know which device is the EBS-50, simply unplug the USB-A end from your PC (the EBS-50 will remain in bootloader mode) and run “List all devices” a second time. Now your list should be one device shorter.

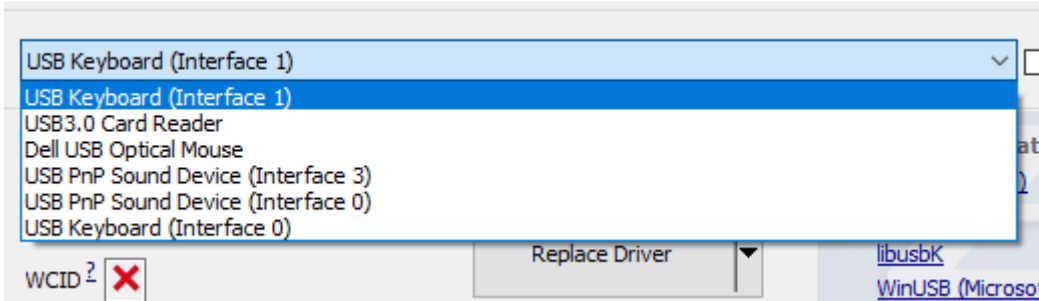


Figure 147: Enumerated USB devices without EBS-50 connected

Plug the micro-USB back in the EBS-50 and run “List all devices” again. The new device is the one you want to select:

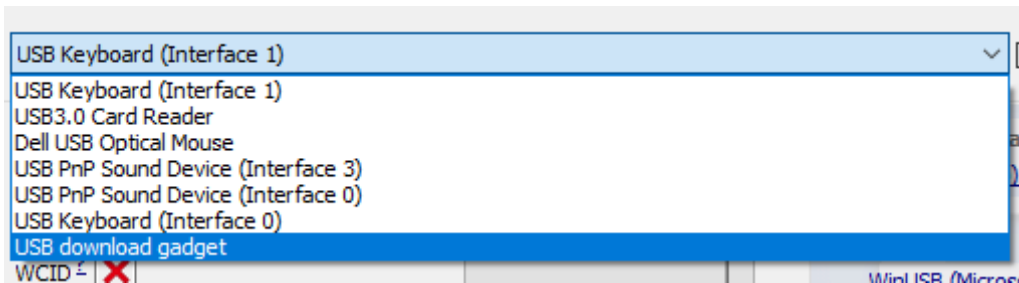


Figure 148: Enumerated USB devices with EBS-50 connected

Now tell Zadig to install the driver “WinUSB” for this device.

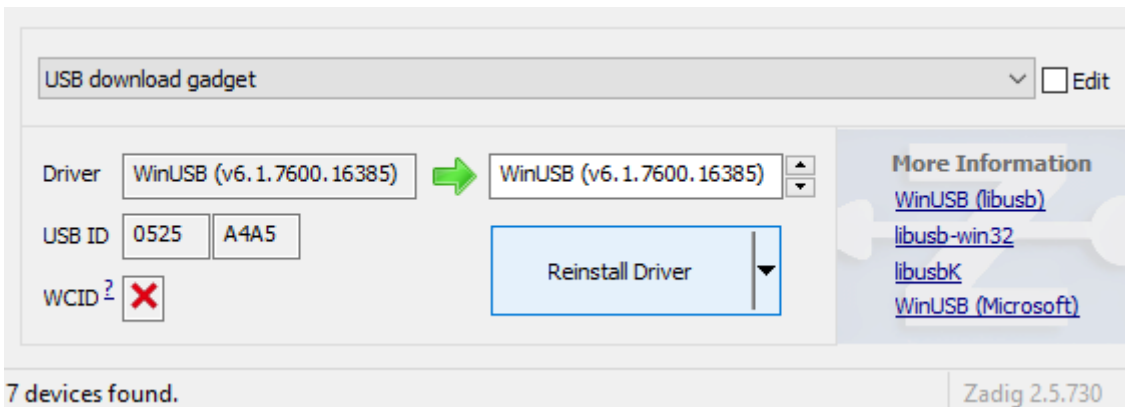


Figure 149: Zadig shows the driver currently installed for the device

The EBS-50 will now be properly recognized by Windows and can be accessed by the flash tool. Follow the flashing guide again to factory default your EBS-50.

10.9 RNDIS virtual network port

NOTE: This is not an option in the “Advanced” menu of the ESL Web Server software, but an advanced option of the EBS-50 hardware. If you are using a different host for the ESL Web Server software this chapter is not applicable.

RNDIS, Remote Network Driver Interface Specification, allows a USB port to act like a network port. It is a very useful tool that allows you to connect to the EBS-50 when it is in a private network without network discovery, has a static IP setting that is incorrect, the dongle no longer connects to your Wi-Fi network, or for any other reason does not seem to appear on your local network.

To connect to your EBS-50 with RNDIS, use a micro-USB cable and plug the micro-side into the EBS-50 and plug the other end into a Windows PC. You should hear a “device found” jingle, and under Network Settings on your PC you should see a new network appear. The most likely cause if this does not happen is that the micro-USB cable does not contain data pins and is made for charging only; try another cable.

Once connected, the EBS-50 will be available on the static IP of <https://192.168.100.5>. Surfing to this address will show you the web interface. You can also use this address to connect to the EBS-50 with PuTTY or WinSCP tools.

See chapter [13 Log in by SSH using WinSCP/PuTTY](#) for more information.

If you go to the Advanced → System Settings menu and ask for ethernet settings, you can easily find what the settings are for the ethernet port and make your adjustments if necessary.

11 Accounts

The ESL Web Server software contains a user and role system with which you can control what users can and cannot do in the application. For example, you can have an admin role with full permissions and another role for a stock clerk that only has the minimal required permissions for his position within the store. Every user in the application has exactly one role assigned to it.

11.1 Register

At the Register page you can register a new user (default <https://ebs50.local/account/register>). Registering new users is allowed for users with register-permissions. To register a new user, enter a username and a password and select the role to be assigned to the new user.

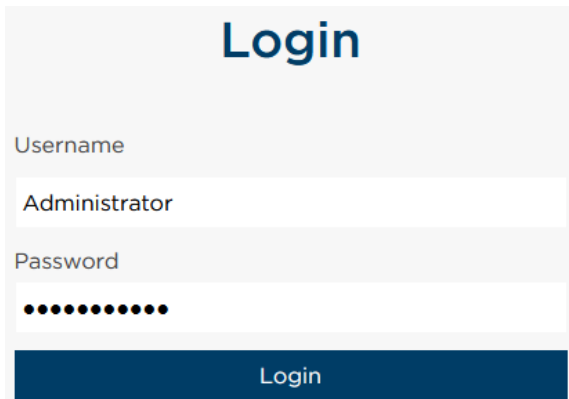
The screenshot shows a registration form titled "Register". It contains three text input fields labeled "Username", "Password", and "Retype password". Below these fields is a "Select a role" section with three radio button options: "Admin", "Manager", and "Restock clerk". At the bottom left of the form is a dark blue button with the text "Register" in white.

Figure 150: Register screen

The logged-in user that is registering the new user can select a role that is either equal to his role, or a role that has strictly fewer permissions than his role. See chapter [11.7 Role hierarchy](#) for more information. When the application is started for the first time, only the user “admin” with password “admin” exists and this user has all permissions. It is therefore important to register a new admin user secured with a custom password. After the first user has been registered the default Admin user is not usable anymore.

NOTE: if all the of the users are removed, the default “admin/admin” account becomes available again.

11.2 Logging in



The screenshot shows a login form with the title "Login". It contains two input fields: "Username" with the text "Administrator" and "Password" with masked characters. A blue "Login" button is positioned below the fields.

Figure 151: Login prompt

By default, the first screen you encounter when opening the ESL Web Server is the login screen. Provide your credentials and you will be logged in.

NOTE: After logging in you will remain so until you log out, or after 16 minutes of inactivity. Logging out will redirect you back to the login screen.

11.3 Logging out

Logging out is done by clicking on the profile picture at the right upper corner in the header and then clicking on the Logout button.

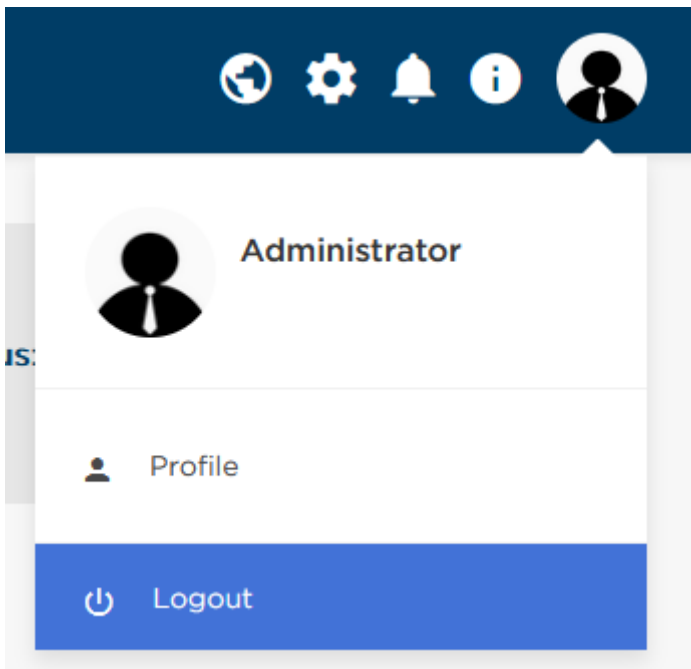


Figure 152: User menu opened

NOTE: Users are automatically logged out after 16 minutes of inactivity.

11.4 User profile page

When a user is logged in, the option “Profile” is added to the account menu.

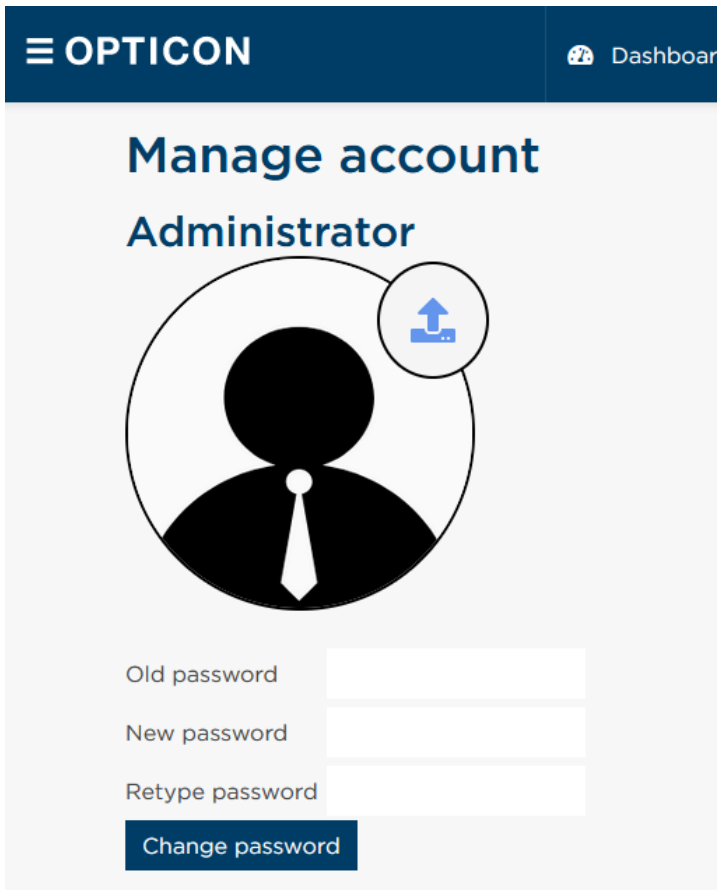


Figure 153: Account profile screen

Opening this page (Accounts > Profile, default <https://ebs50.local/account>) allows the user to change their profile picture and password (if these actions are allowed by the role the user is in).

11.5 Manage users

The manage users page (Accounts > Manage users, default <https://ebs50.local/account/manageusers>) gives you an overview of all users.

Manage users

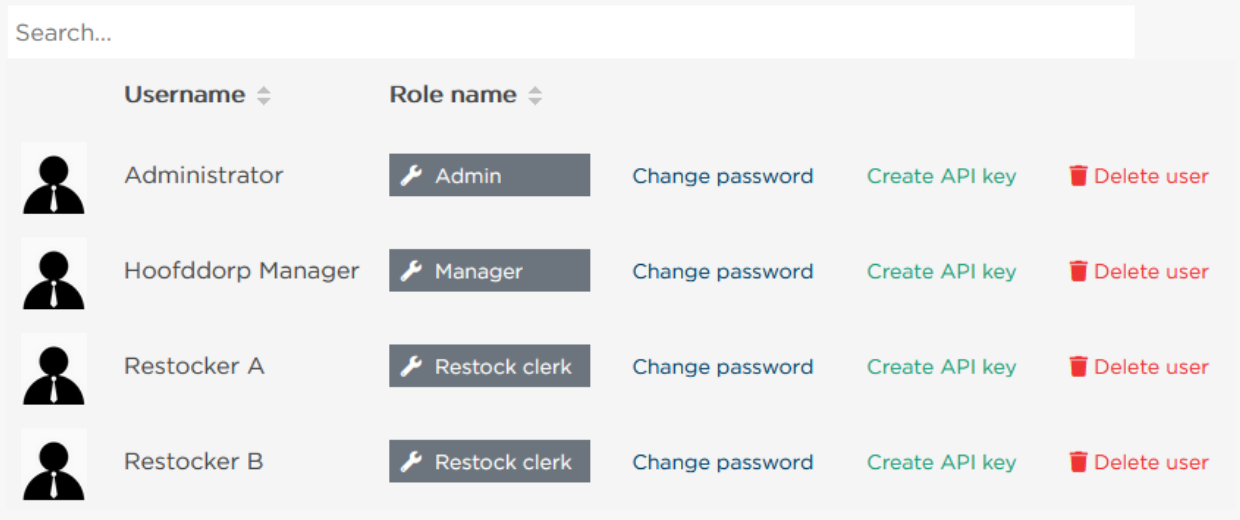


Figure 154: Manage users screen

A user is only able to change a certain attribute of another user if their role gives them permission to do so. For the permissions required for these actions see chapter [11.6 Manage roles](#). The following operations are supported:

- Changing roles of users
- Changing passwords of users
- Creating and revoking API keys of users
- Permanently deleting users

To perform a certain operation, simply click on the according button for the desired user.

11.6 Manage roles

On the Manage roles page you can create, modify, and delete roles. Role permissions are divided into the following seven categories:

- View / Edit
- ESL
- Base Stations
- Account
- Import/Export
- System (only available on the EBS-50)
- Notifications

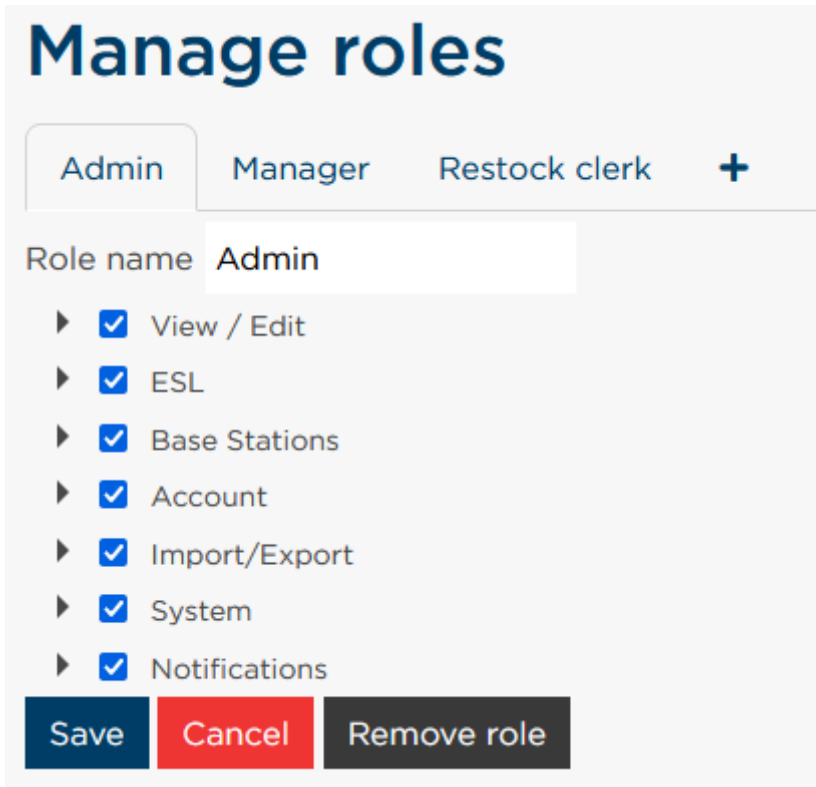


Figure 155: Manage roles screen

To create a new role, click on the plus button to the right of the roles in the header.

To delete a role, select it in the header, then click the “Remove role” button.

NOTE: Removing a role causes all users that have this role assigned to them to suddenly have a non-existent role. As a result, this disables all the permissions for these users, and an existing role should be assigned to these users at the manage users page by a user with the permissions to do so.

11.6.1 View/Edit permissions

Under View / Edit permissions you can set view permissions and edit permissions for different pages in the application. View permissions allow users to see the corresponding page of the item. Edit permissions are write-permissions and allow users to make permanent changes to the data of the page.

View / Edit		View	Edit
Dashboard	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
View base station page	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
View ESL page	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
View profile	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Users	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
View logs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Links	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> ?
Products	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> ?
Templates	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> ?
Database settings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Cloud Dashboard settings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> ?
Event Handler	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Roles	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> ?
Global settings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
License	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Figure 156: View/Edit permission options

For more information on what “Edit” rights precisely entail for a specific type, you can read the information bubble by hovering over the “?” icon.

Due to their extended options, the ESL page, Base Station page and Users (account) page have their own role permissions categories, they do not have an edit permission option under the View / Edit category.

Furthermore, all users have edit rights for their profile page, so a role edit permission for this page is unnecessary.

Finally, the dashboard page and logs page only contain read-only data, so an edit permission is not applicable for these pages.

NOTE: Be aware that if a user has edit permissions for the roles page, the user is able to create, edit and remove roles, even their own roles. So, users that have edit permissions for roles are admins in the application.

11.6.2 ESL permissions

Under the ESL permissions category, you can set the permissions for operations to perform on ESLs.

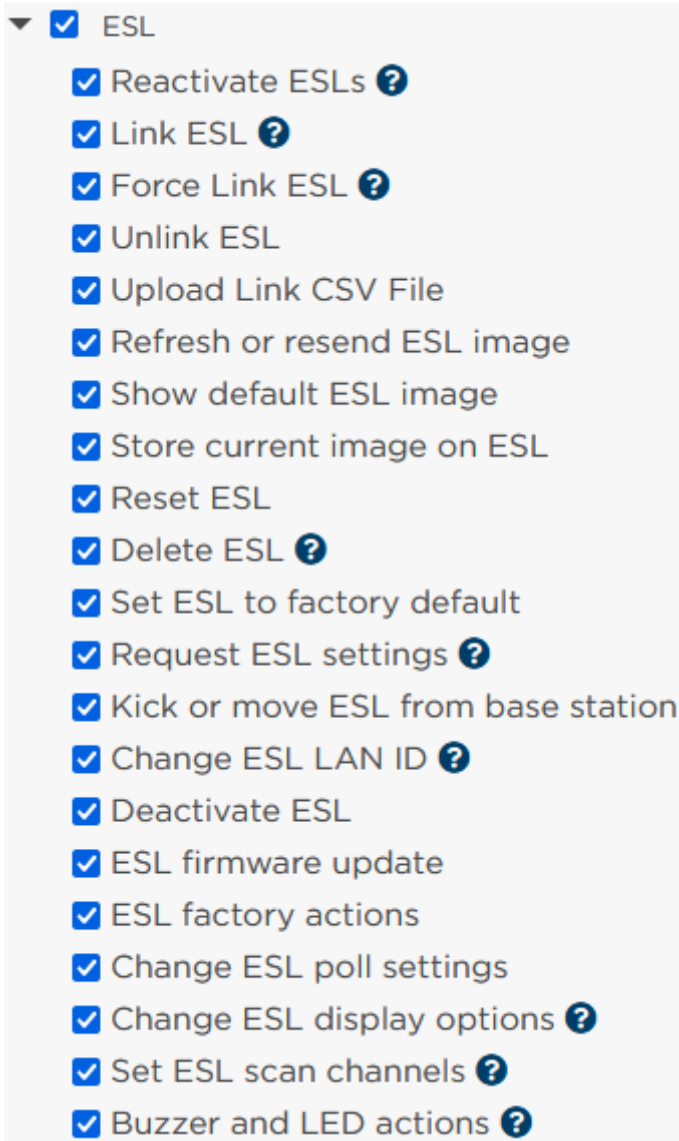


Figure 157: ESL permission options

The operations are explained in more detail in chapter [6.1.3 Action dropdown](#).

11.6.3 Base Station permissions

The Base Stations permissions category contains permissions for all the operations that can be performed on Base Stations.

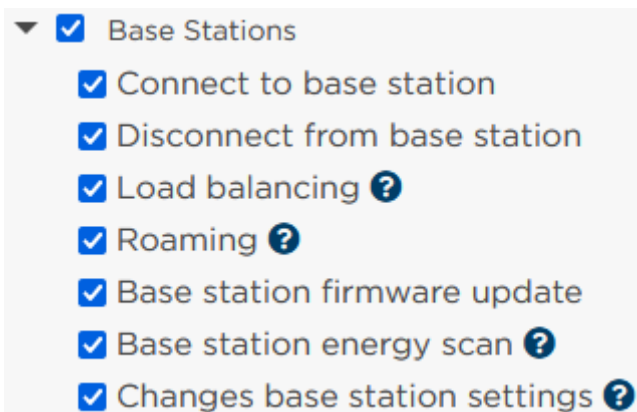
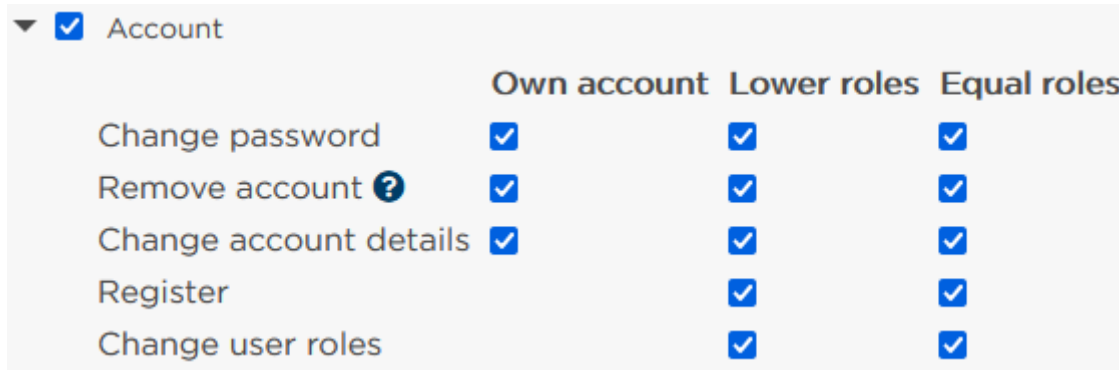


Figure 158: Base Station permission options

To read more about these operations, please refer to chapter [5 Base Stations](#).

11.6.4 Account permissions

The account permissions category contains the permissions for operations to be performed on accounts.

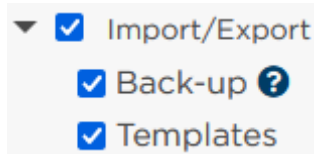


	Own account	Lower roles	Equal roles
Change password	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Remove account ?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Change account details	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Register		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Change user roles		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 159: Account permission options

The permissions are divided into permissions for your own account, for accounts of users with lower roles, and for accounts of users with the same role. To define what role(s) are lower, please refer to chapter [11.7 Role hierarchy](#).

11.6.5 Import/Export permissions



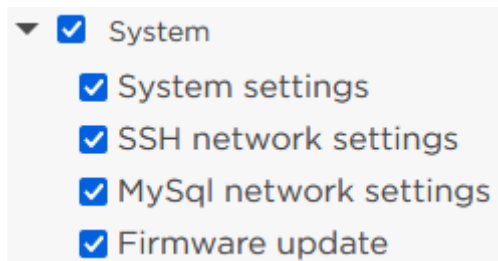
<input checked="" type="checkbox"/> Import/Export
<input checked="" type="checkbox"/> Back-up ?
<input checked="" type="checkbox"/> Templates

Figure 160: Import/Export permission options

The Import/Export permissions category allows you to set the permission for importing and exporting a back-up of the entirety of the ESL Web Server (see chapter [10.4 Backup & restore](#)) and importing/exporting the templates used by the ESL Web Server (see chapter [9.1.3 Import/Export templates](#)).

11.6.6 System permissions

The system permissions are a set of permissions that apply specifically to the configurability of the EBS-50.



<input checked="" type="checkbox"/> System
<input checked="" type="checkbox"/> System settings
<input checked="" type="checkbox"/> SSH network settings
<input checked="" type="checkbox"/> MySQL network settings
<input checked="" type="checkbox"/> Firmware update

Figure 161: System permission options

System settings allow the user to change the network options of the EBS-50 like hostname, ethernet settings and Wi-Fi settings.

SSH network settings allows the user to configure the SSH options of the EBS-50.

MySQL network settings allow the user to configure external access to the EBS-50's built-in MySQL database.

Firmware update allows the user to update the EBS-50's firmware to a newer version.

All these options are explored in depth in chapter [10.3 System settings](#).

11.6.7 Notifications permissions

The notification permissions define what type of alerts are notified to users in this role.

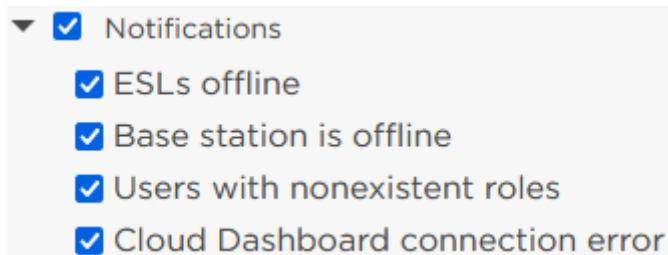


Figure 162: Notification permission options

When an issue is raised and a notification is in order, users will receive individual updates. As these notifications are on a per-user basis, any user will be alerted of issues that may have occurred while they were not logged in.

11.7 Role hierarchy

To define seniority based on a user’s role you can use the role hierarchy screen. You can find this screen through Account > Role hierarchy (default <https://ebs50.local/account/rolehierarchy>).

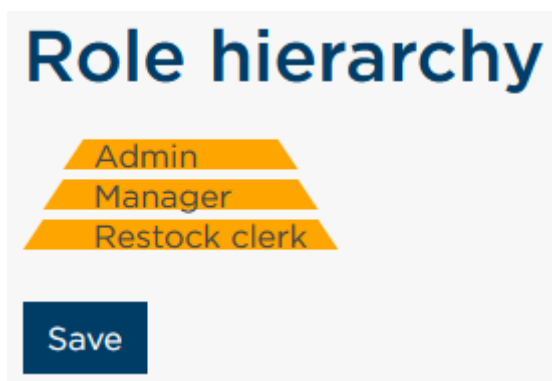


Figure 163: Role hierarchy screen

Simply drag and drop the individual roles to define the seniority. In the example, the admin has the right to edit Manager and Restock clerk roles, but not the other way around. If you are happy with your edits, press the “Save” button to persist your changes.

12 API

12.1 REST API

The ESL Web Server software has a REST API that communicates over a set of HTTP endpoints. Using the correct verbs (GET to receive information, PUT for new information, POST for changes to information, DELETE for removal of information) this API allows you to manage the ESL Web Server software programmatically without use of the web interface that you would use for manual operation. All of the actions that you can perform on the API and the way you specify that action are listed in chapter [16 REST API commands](#).

12.1.1 Connecting to the API

The EBS-50 is a network device and is accessible through any device with a browser that can communicate on this network. This applies to both the web interface and the API. If you can communicate to your device (by default; <https://ebs50.local>) then you should also be able to see that the API is online by requesting from <https://ebs50.local/api/>

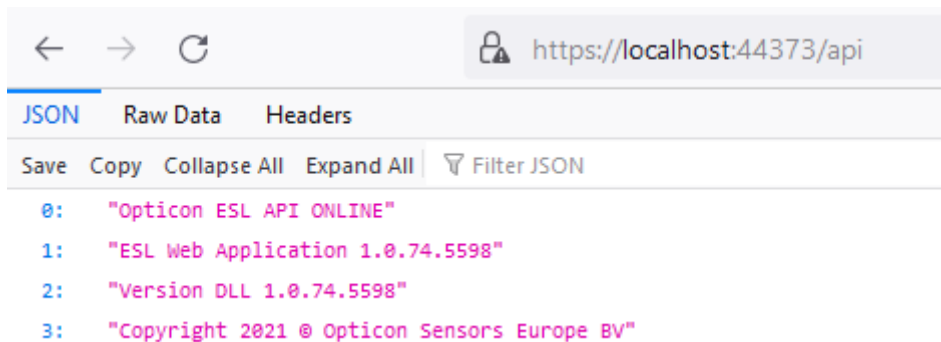


Figure 164: API endpoint "is alive" message

As the EBS-50 is protected by a user/password system, the API uses a similar authentication scheme but with API keys. The API key is used to verify that you are allowed in the system, and that you are allowed to perform the action.

See chapter [11.5 Manage users](#) and [11.6 Manage roles](#) for the creation of users, and assigning them to roles. A role allows the system administrator to set boundaries on what actions users are allowed to perform. For instance, you'll want to allow an external party to change the links between ESLs and products, but not allow them to modify the product database itself. In the role required for each of the endpoints is specified. You can create a specific role for an API user through the Manage roles page on the web interface. Once you have created the role, you'll need to assign a (new) user to this role.

12.1.2 API Versioning

To enable future expansion, the API is versioned. API version can be set through the request header (with key "api-version") or through the URI (i.e. <https://ebs50.local/api/v1.0>). If both request header and URI contain a version request, then the URI is leading. If no API version is specified in either, version 1.0 is selected by default.

12.1.3 Specifying data format

As this REST API communicates over an HTTPS connection, it can serialize to some of the main formats used on the web. By default, the API returns data in the JSON format. XML can be requested through the header (key

“Accept”) or through the URI (append ?format=xml). JSON formatting can be turned from implicit to explicit using the same points. URI parameter is leading, followed by the Accept header, followed by the server default.

12.1.4 API set up walkthrough

12.1.4.1 Creating a Role for the API user.

For more in-depth details, refer to chapter [11 Accounts](#). For this tutorial we will create a new role, “Manager”, to emulate a store manager.

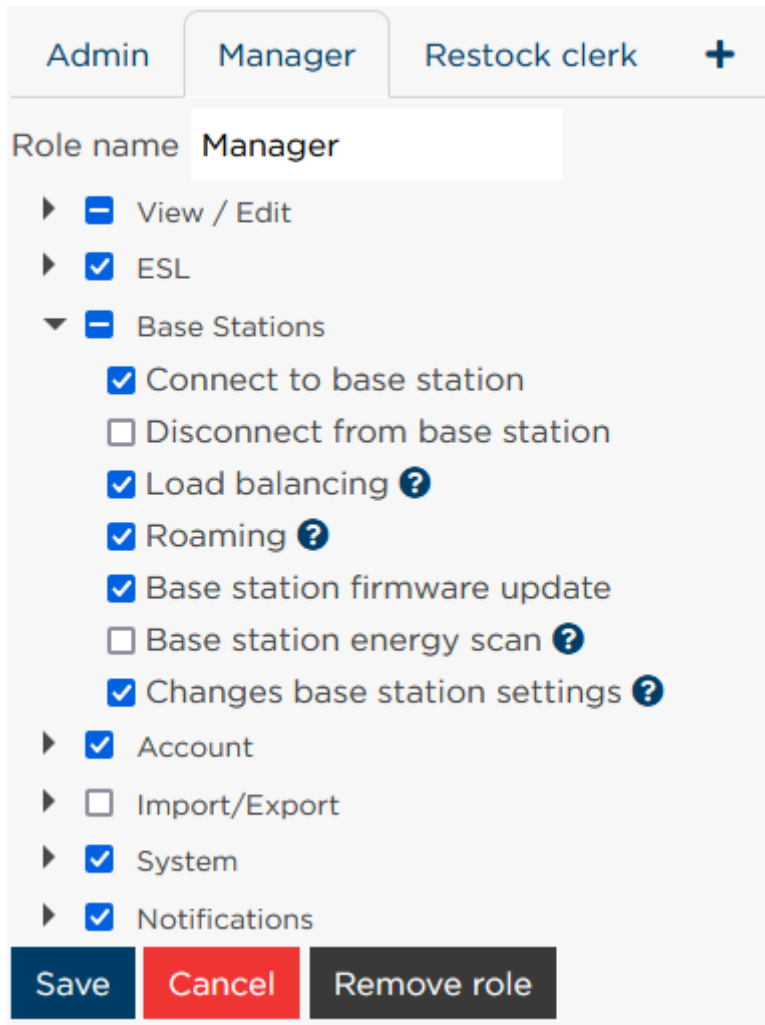


Figure 165: example of a customized Role

In [Figure 165](#) you can see how a role called “Manager” allows users assigned to that role to connect to Base Stations, but not disconnect from them.

12.1.4.2 Generating an API key for the user

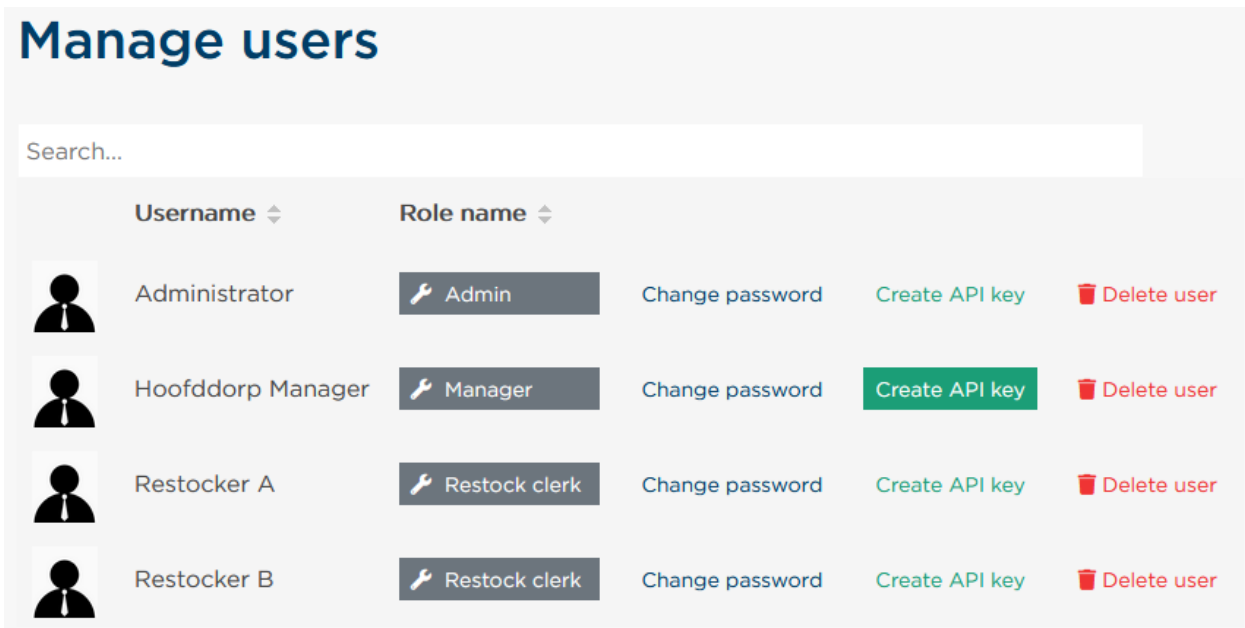


Figure 166: User management screen

In [Figure 166: User management screen](#) we have a user, called “Hoofddorp Manager” that is assigned to the “Manager” role we created in the previous step. We can now create an API key for this user by pressing the “Create API key” button.

NOTE: When you create an API key, it will only be shown once. It is non-recoverable, so store it safely.

The API key is proof that you have the Role required for an action. The API key is placed in the header of your request. The header works as a key-value system, with “x-api-key” as the key and the API key (dashes included) as the value. The API key cannot be placed in the URI for safety reasons; the URI is transmitted unencrypted, and sharing an URI would inadvertently leak your API key.

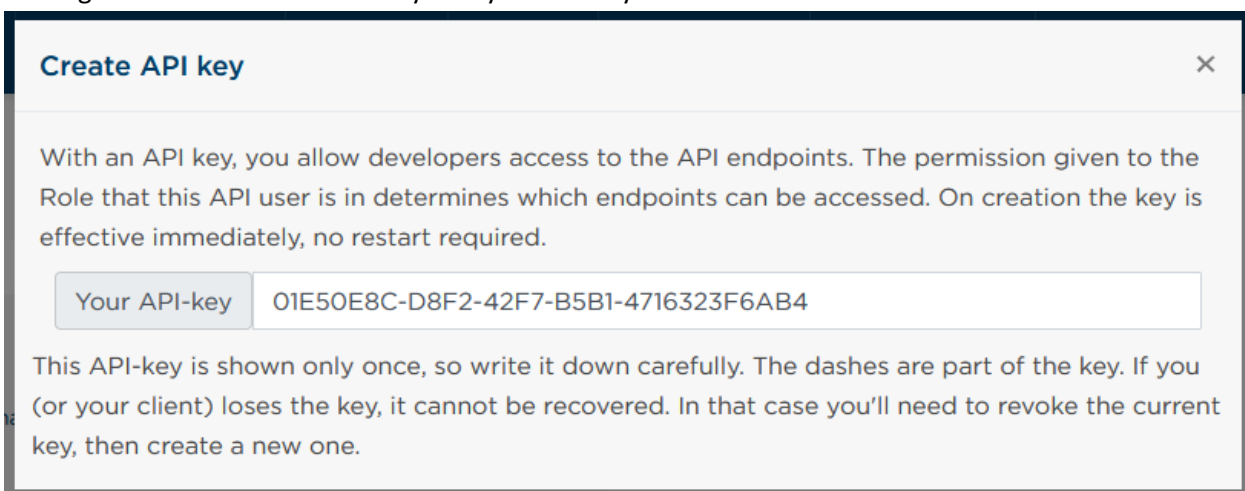


Figure 167: API-key generated

Now that we have a key, we can use this to gain access to the API and perform actions.

12.1.4.3 Formatting your request

Since we allowed our user to connect to Base Stations, but not disconnect from them, this demonstration will show how to setup those requests and the responses they give.

Let's start with connecting to the endpoint itself, without any validation.

With software like the RESTer browser plugin, you can easily create requests to test if they work correctly. Of course, most programming languages also allow you to construct these requests. Choose whatever platform you are most comfortable with.

The request for adding a Base Station is listed under [POST/DELETE requests for EBS](#). In the URI you see the endpoint and required parameters, and this request is configured as a POST command. If you have the URI or verb incorrect, the server will give an automatic reply. Expect HTTP 404 if the endpoint does not exist, or HTTP 405 if the verb is incorrect.

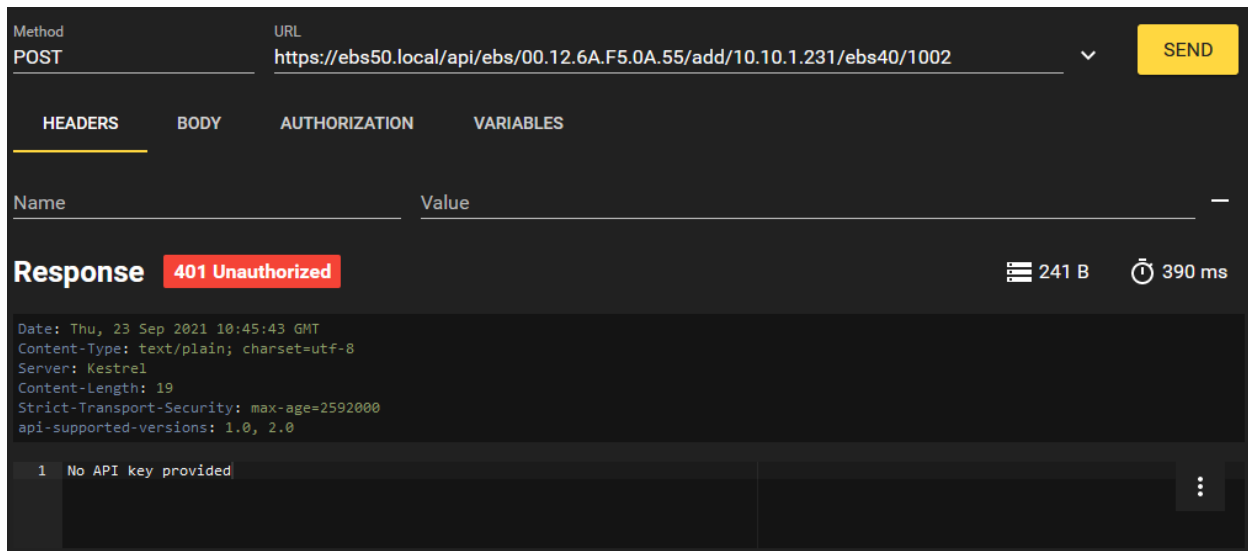


Figure 168: Error 401 - no API key provided

As you can see in [Figure 168](#), we receive an unauthorized exception (HTTP 401) with a human readable message specifying why; we did not provide an API key. This means that we did get the endpoint and verb correct, but we were not allowed to perform the action since we didn't verify our identity as trusted.

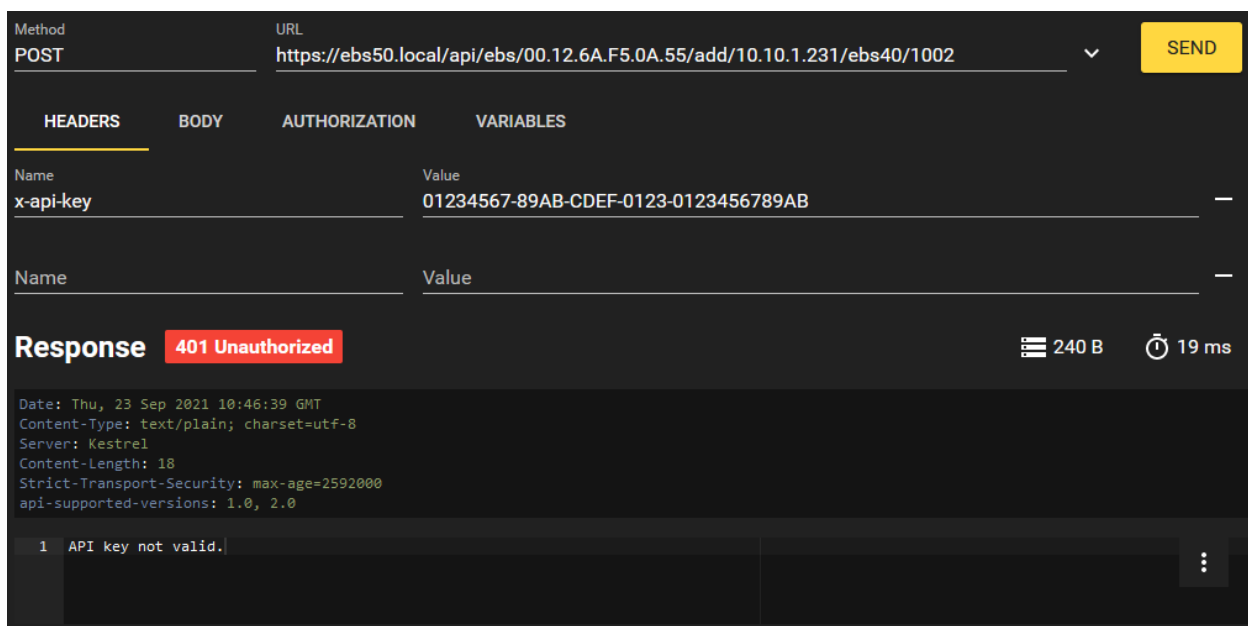


Figure 169: Error 401 - Nonsense key not accepted

Now we have specified in the headers that we have a key “x-api-key” with some nonsense data as the value. Now we still get an unauthorized exception (HTTP 401) but with a different message: API key not valid.



Figure 170: API key for user "SupermarketMgr" accepted

With the actual API-key we do get a response. It is formatted in JSON by default. Adding ?format=xml to the URI parameters or adding the header key/value of “Accept”/”text/xml” will format the response to XML.

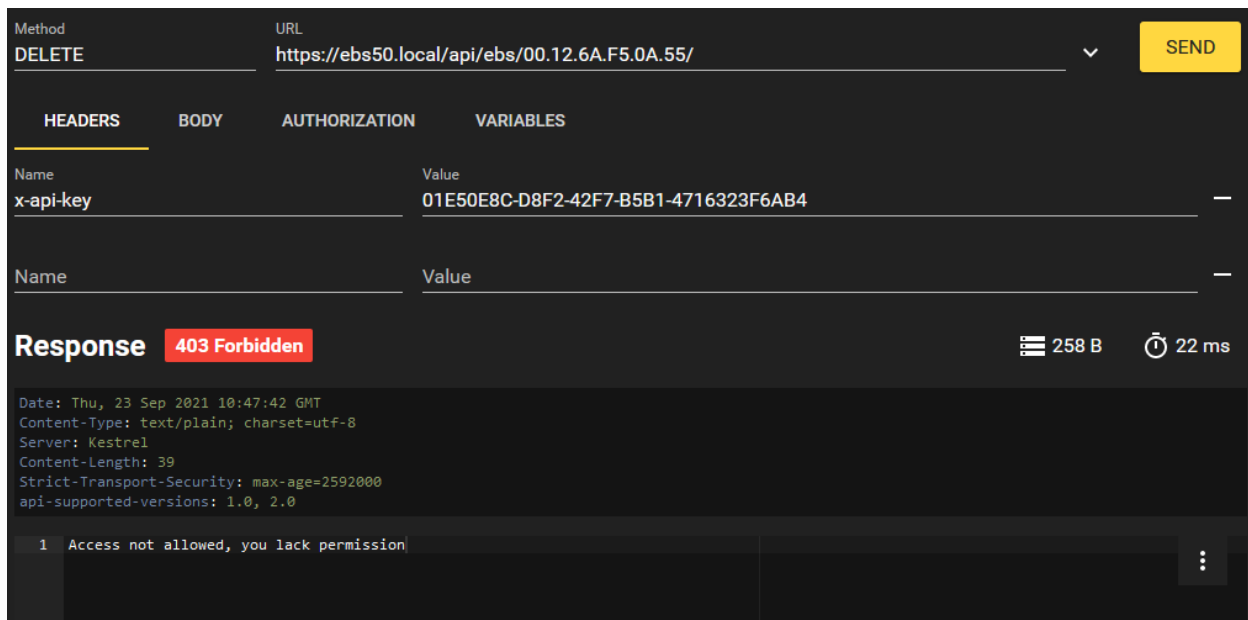


Figure 171: API key for user "Manager Hoofddorp" not sufficient for action

Adding a Base Station is allowed according to the Role our User is in. Deleting it is not, as you can see in the response of the figure above. We receive a forbidden exception (HTTP 403). To allow the user in, you need to

change either the permission of the Role, or assign a new Role to the User through the user management interface.

13 Log in by SSH using WinSCP/PuTTY

For more advanced users, the EBS-50 can be reached by using SSH to access the file system of the Linux operating system. Log in using the following credentials:

Host name: ebs50.local (port 22)

Default login: root / admin

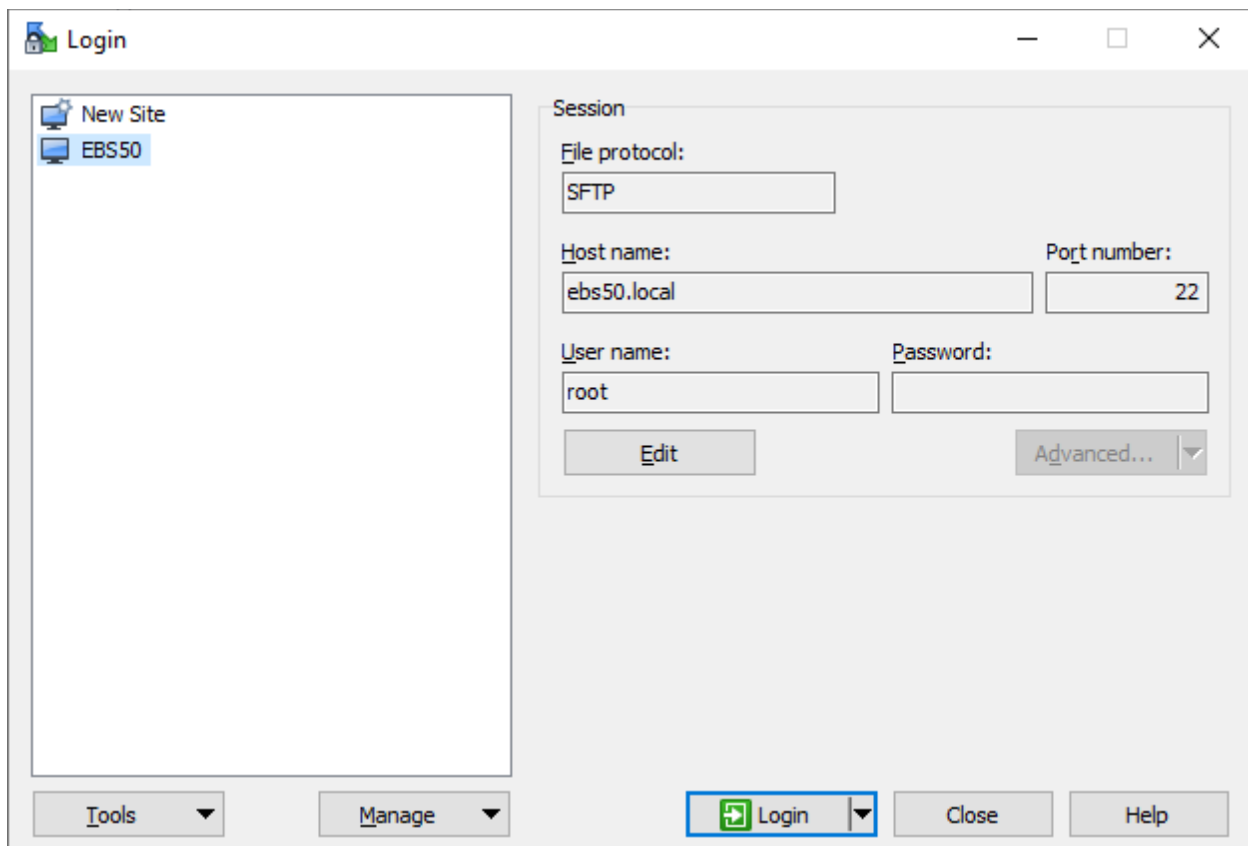


Figure 172: WinSCP login prompt

13.1 Disabling or changing access by SSH

For security reasons it is recommended to change the default password or disable SSH access. This can be configured in the ESL Web Server (Advanced > System settings > Network settings > SSH). See chapter [10.3.4 SSH settings](#) for more information.

13.2 Log-in by SSH using micro-USB

In case you run into network issues or have disabled SSH, your EBS-50 can still be accessed by SSH using the micro-USB port.

First make sure you have the latest WinUSB driver installed (which is included in the Mender flash tool from <https://opticon.com/product/ebs-50>). For help with the WinUSB drive refer to chapter [10.8.2 Troubleshooting if the device is not recognized](#).

When the EBS-50 is connected by micro-USB it should create a USB Serial COM port, which can be found using Device manager.

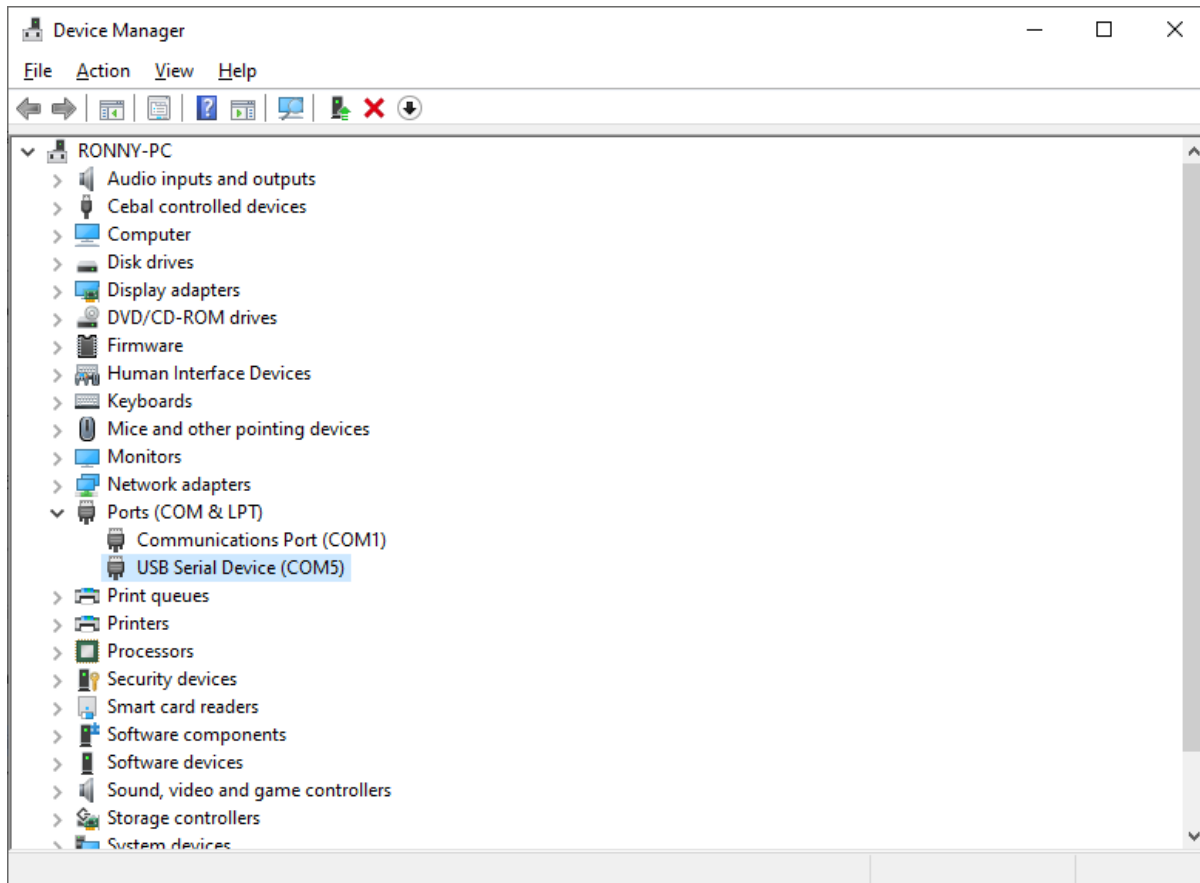


Figure 173: Windows Device Manager

Use the following setting when using PuTTY:

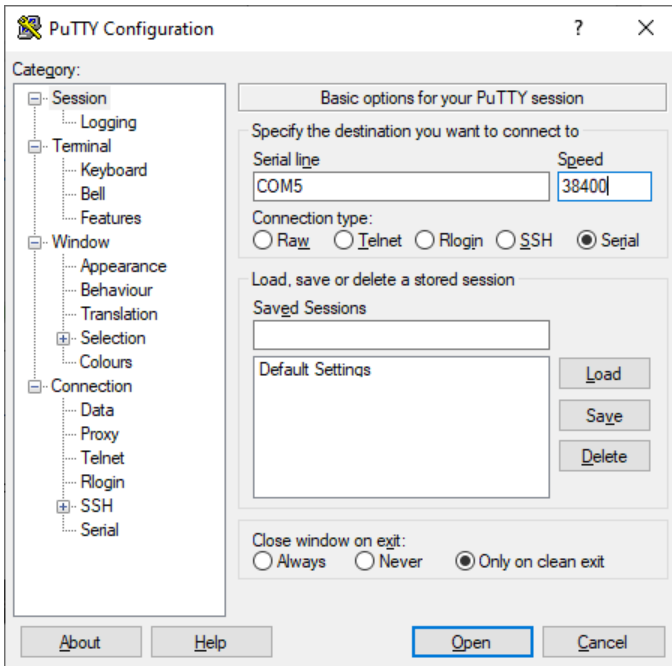


Figure 174: PuTTY configuration for COM access

Make sure to change “Serial line” to the COM number that device manager shows. After clicking on the button “Open” the command line will start and when connected, it will prompt you for login. By default., the user is “root”, and the password is “admin”.

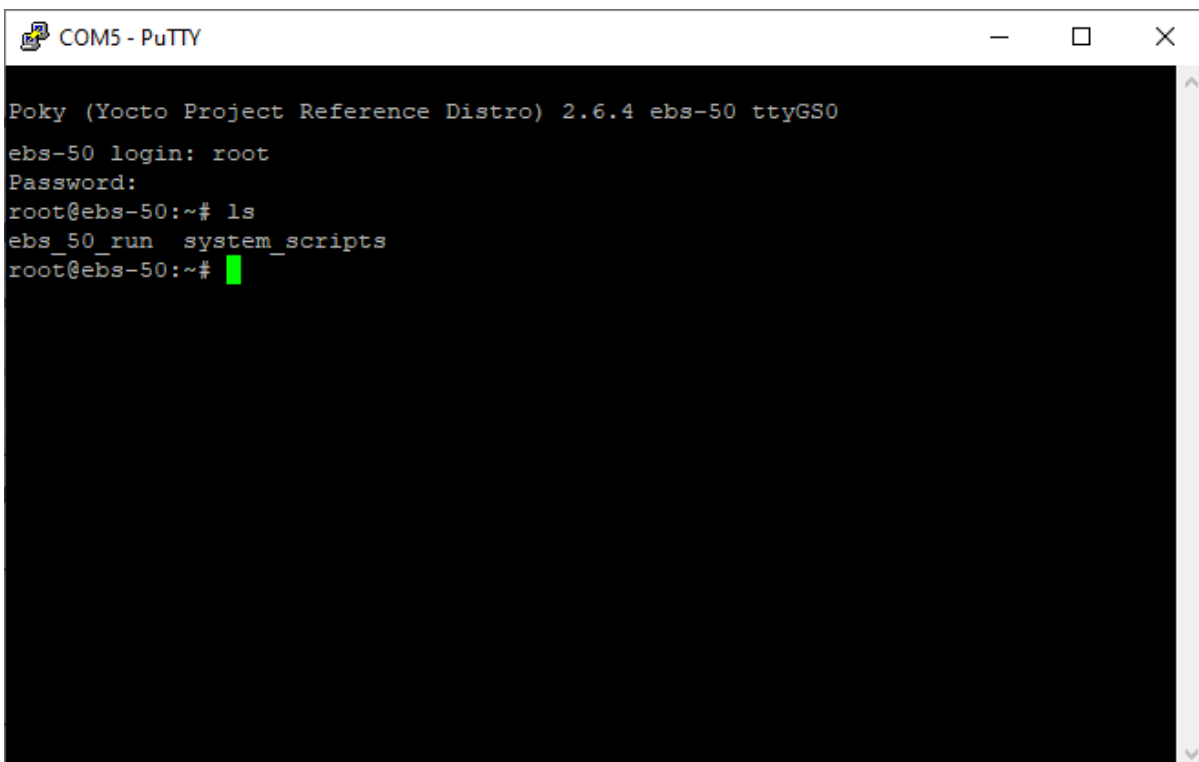


Figure 175: PuTTY connected through a COM interface

14 Troubleshooting

14.1 Base stations

14.1.1 I've lost connection to the Base Station

- Make sure that the device still has power.
- Make sure there is an ethernet cable connected to your Base Station and that the LEDs on the ethernet port are blinking.
- The Base Station may have been assigned a new IP address. Usually, the ESL Web Server software can automatically recover from such changes, unless Discovery is not possible (see question "[Searching Base Station yields no results](#)"). If you cannot find the Base Station through searching, manually add the Base Station (see chapter [5.3 Finding and adding Base Stations](#)) and, if possible, assign a static IP to the Base Station to prevent further connection losses.

14.1.2 The Base Station switches between Connected and Disconnected

- This is often caused when another ESL Web Server instance is connected to the same Base Station. People using ESL Web Server on multiple devices at the same time does not cause this issue, as they are all using the same ESL Web Server.
- Ensure no other devices in the network are trying to set up a connection to the Base Station. The web-app interface of the EBS-40 may be overloaded by network crawlers, causing issues for ESL Web Server's connection. Visit the web-app interface of the EBS-40 by browsing to its IP address and clear the checkmark at "Display Web Page" if the problem persists. The web interface of the EBS-40 can be restored by resetting the Base Station to factory default.

14.1.3 I can't find my labels

- Ensure that the ESL have power and that they are not deactivated (if so, the word DEACTIVATED is visible on the screen of the ESL unit in the top left).
- Place the ESLs closer to the Base Station to improve the chance of a connection.
- Your ESLs may have been disconnected for a long period and will search for a Base Station less frequently; waiting times for a connection could get up to 15 minutes.
- Ensure that the ESLs Scan Channels include the channel on which your Base Station is operating (by default, ESLs search for Base Stations on channels 11, 15, 20, 25, 26).
- Set your Base Stations LAN-ID setting to '0000'.
- Ensure that the wireless band you are using has a low amount of traffic (see chapter [5.4 Energy scan](#)).
- If above does not help, set the channel to '11' and the LAN-ID to '0000', ESLs will always look for a Base Station with these factory settings.

14.1.4 Searching Base Station yields no results

- Your network may not allow network discovery. Ask your network administrator. As a workaround, manually add the Base Station; (see chapter [5.3 Finding and adding Base Stations](#)). To identify the Base Station in your network router, use the MAC address printed on the sticker on the underside of the unit.
- One or more of the following ports is blocked or in use by another process: 23, 8723 or 1002.
- The base station is not on the same IP subnet as the ESL Web Server

14.1.5 Updating firmware fails

- One or more of the following ports is in use by another process: 67, 68, 69, 1002 or 13633
- The Base Station is not on the same IP subnet as the ESL Web Server.

14.1.6 Factory resetting the EBS-40

NOTE: All the personalized network/channel/LAN/PAN settings that you may have will be lost by factory resetting. For the guide on factory resetting the EBS-50 read chapter [10.8 Flashing the EBS-50 hardware](#).

- Start by unplugging the EBS-40 from the power. Press the small reset button next to the power socket. While holding the button, apply power to the EBS-40. Keep hold of the button for 10 more seconds and release. The EBS-40 will now be using its factory default settings again.

14.2 ESLs

14.2.1 My ESL displays an image of a record it is not linked to.

- ESL is offline (check Label status log and search for the MAC address, see what the last poll time was).
- ESL image needs to be resent (select ESL in ESL page, choose action “Resend image”).
- ESL is unlinked, but the option “Show default image after unlinking” was not enabled (default is disabled) in the settings on the Templates page.

14.2.2 My ESL displays a corrupt image

- Error checking the wireless transmission may have given a false positive. Select the ESL in the ESL page, choose action “Resend image” to try again.

14.2.3 I want to speed up ESLs; make them faster/more responsive

- Change the poll settings of the ESL. See chapter [6.1.3.16 Change ESL poll settings](#).

14.2.4 My ESL displays the image upside down

- The ESL could have been mounted upside down
- The ESL may be configured to display its image upside down (for when it is meant to be mounted upside down). Change the ESL display option, see chapter [6.1.3.17 Change ESL display options](#).

14.2.5 Many of my ESLs have a bad connection

- ESLs are designed to stay with their original Base Station as long as they can set up a connection. By default, they will start to search for a new Base Station after 10 failed. After physically moving around, they may be better off on a new Base Station. You can balance the ESLs (see chapter [5.9 Balancing](#)), or approach it more hands on with the actions “Move ESL to best Base Station”, “Kick ESL from Base Station” or “Move ESL to another Base Station”. (See chapter [6.1.3 Action dropdown](#))
- The channel that your Base Station uses to communicate with ESLs may experience interference from other devices operating on the same channel. See chapter [5.4 Energy scan](#) to ensure your radio channel is free to use. Make sure that your ESLs also operate on the new channel if you select anything other than the default channels of 11, 15, 20, 25 or 26. See chapter [6.1.3.18 Set ESL scan channels](#).

14.2.6 My ESLs say ‘deactivated’

- See chapter [6.2 Reactivate ESLs](#) for more information.

14.2.7 My ESL is activated, but I don’t see it online

- If you have another Base Station powered, it is very likely that while Base Station ‘A’ was activating, Base Station ‘B’ was receiving the activated labels. Activation makes normal communications unavailable, so the label will start looking for a Base Station that is available for normal communications.
- The ESL might be out of range of the Base Station, move it somewhere within 2 meters (7ft) for best results.
- The Base Station may have been set to a channel and/or LAN ID that doesn’t match the ESL’s Scan Channel setting and/or LAN ID settings. Channel 11 and LAN ID 0000 are the “catch-all” settings for the Base Station that every ESL will be able to find.
- The batteries may be empty.

14.3 EBS-50

14.3.1 I want to factory reset my EBS-50

Factory resetting your EBS-50 will delete all data ever placed on the EBS-50 itself. If the on-board database is used for system tables this includes user accounts, links, logs et cetera. If the on-board database is used for product-tables this includes all product information. All other files present on the system, like Templates and optional Calendar configuration, will also be deleted.

To wipe your EBS-50 and revert all of its contents back to a freshly produced unit, please refer to chapter [10.8 Flashing the EBS-50 hardware](#).

15 Demo barcodes

The quickest way to set up an ESL demonstration with barcode terminal is to simply use the included sample database and example templates. After installation of the software and hardware, the only configuration steps necessary are finding and adding of the Base Station and configuring the serial port of the barcode terminal. The example database file will automatically be sent to the barcode terminal and then you can link your ESLs using the barcode terminal and the product barcodes in the images below. (See chapter [7.2 Quick Link](#)).



16 REST API commands

Read chapter [12.1 REST API](#) for information on how to set up the REST API to listen to commands and how to acquire the API key needed to access it. See chapter 16 for a list of all endpoints, their parameters and the Role (see chapter [11.5 Manage users](#) and [11.6 Manage roles](#)) that the user needs to have in order to perform the action.

16.1 Root API

To ensure that your API is active and your server publicly available, you can send a GET request to the root. This request does not require any identification or authorization.

HTTP VERB	MAC	ACTION	Param(s)	Role
GET				n/a
Endpoint	https://ebs50.local/api/			
Return	A list of strings containing version numbers for the ESL Web Server and its backend.			

16.2 ESL API

16.2.1 GET requests for ESLs

HTTP VERB	MAC	ACTION	Param(s)	Role
GET				View ESL page
Endpoint	https://ebs50.local/api/ESL			
Return	Returns all ESLs and their properties of this ESL Web Server			
GET	MAC of ESL or ID of Product			View ESL page
Endpoint	https://ebs50.local/api/ESL/{mac_or_id}			
Return	Returns the ESL with the specified MAC address or all ESLs linked to the specified Product ID, with all properties of each ESL			
GET		Reactivate		Reactivate ESLs
Endpoint	https://ebs50.local/api/ESL/REACTIVATE			
Return	Returns a human-readable string array with the number of units currently awoken by the REACTIVATE action (see POST for REACTIVATION) and reactivation time remaining. If reactivation is not performed, the return is "not activating"			
GET	MAC of ESL		Property name	View ESL page
Endpoint	https://ebs50.local/api/ESL/{mac}/{property}			
Return	Returns the requested property of the ESL with the specified MAC address			

The following is a list of properties of an ESL object in code that can be requested.

Property	Description
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ID	Unique article ID to which the ESL is linked. <Null> or empty if the ESL is/was present in the ESL system, but not linked. ID column is set during the connection wizard for the database.
DESCRIPTION	If the ESL is linked, this field will contain the configured product description. <Null> if not linked or unknown. Description column is set during the connection wizard for the database.
IMAGE_FILE	If the ESL is linked, this field will contain the file name of the automatically generated image content. <Null> if not linked.
POLL_INTERVAL	If the ESL is/was physically present, this field will contain the poll interval of the ESL. <Null> if the poll interval is unknown.
POLL_TIMEOUT	If the ESL is/was physically present, this field will contain the poll timeout of the ESL. <Null> if the poll timeout is unknown
SCAN_INTERVAL	If the ESL is/was physically present, this field will contain the scan/associate interval of the ESL. <Null> if the interval is unknown.
CHANNEL	If the ESL is physically present, this field will contain the channel on which the label is active (dependent on the Base Station that the label is connected to).
SCAN_CHANNELS	This field contains a string value of the channels that a label is configured to search on when not connected to a Base Station. <Null> = unknown. Note: to set the channels, you need to provide an integer representing the channels. See the POST for more details.
BATTERY_STATUS	If the ESL is/was physically present, this field will contain the battery status of the ESL. 1=OK, 0=Low, <Null> = Unknown
BATTERY_VOLTAGE	If the ESL is/was physically present, this field will contain the battery voltage of the ESL as a value with maximum of two decimal points.
VARIANT	If the ESL is physically present or linked, this field will contain the hardware variant of the ESL (i.e.EE213R), <Null> = Unknown
FIRMWARE_VERSION	This field will contain the software version of the ESL. Typically, in the format: Ixxxxnnnn, <Null> = Unknown Note: in the other two GETs, this value is serialized as “Version”. They refer to the same property, but this endpoint uses the fully specified name to prevent ambiguity.
SUB_VERSION	This field will contain the software subversion of the ESL. Typically, not used by e-paper based ESLs. <Null> = Unknown
IMAGE_ID	This field contains the image ID of the image shown on the ESL. 0=default image; 1...127 incrementing image ID; <Null> = Unknown.
IMAGE_ID_LOCAL	This field contains the image ID of the image that is present on the ESL Web Server. 0=default image; 1...127 incrementing image ID. If the local image ID of the ESL is lower than IMAGE_ID, then the ESL hasn’t completed updating the image for the label yet.
BACKLIGHT	If the ESL is physically present, this field will contain the back light setting (ranging from 5-100(%), <Null> = unknown). Only used by TFT based ESLs

DISPLAY_OPTIONS	If the ESL is/was physically present, this field will contain the image orientation. 0=Normal, 1=Upside-down, <Null> = unknown
LED_OPTIONS	If the ESL is/was physically present and contains LEDs (i.e., the PE-range labels), this field contains the LED mode and color. Modes: OFF, ON, FLASH, BY_API (LEDs controlled by API). Colors: RED, GREEN, ORANGE, BLUE, MAGENTA, PURPLE, CYAN, WHITE. <Null> means not applicable or label has never been online.
NFC_OPTIONS	If the ESL is/was physically present and contains NFC (i.e., the PE-range labels), this field contains the NFC availability and settings. ENCRYPTION_OFF Only default radio encryption (not customized) NTAG_OFF NTAG/Ultralight reading disabled UID_ONLY “Any card” mode (only reads UID) PAYMENT_CARDS Reading payment cards enabled FELICA Reading FeliCa cards enabled NFC_A_B Hardware chip can read NFC-B and FeliCa NFC_OFF Hardware chip turned off. <Null> means not applicable or label has never been online.
LQI	This field will contain the last received Link-Quality-Index, indicating the connection strength from the label to the Base Station. -1 Unknown / not connected 0-3 Link quality is poor and high packet loss (>40%) 4-7 Link quality is poor and significant packet loss (>20%) 8-10 Link quality is poor, but no significant packet loss (<20%) >10 Link quality is good and no significant packet loss
LQI_RX	Same as LQI but indicating the connection strength as perceived by the label instead of the base station.
LAST_POLL	This field will contain the UTC time of the last received poll for data. <Null> means unknown / never received. (This field is may not be updated on each poll to reduce the amount of SQL queries executed by the ESL Web Server).
LAST_INFO	This field will contain the UTC time of the last time the ESL reported its complete status. <Null> means unknown / never received.
LAST_IMAGE	This field will contain the UTC time of the last successful image update. <Null> means unknown or hasn't been updated.
BASE_STATION	If the ESL is/was connected to a Base Station, this field will contain the IP address of the last Base Station it was connected to. String format is xxx.xxx.xxx.xxx (i.e., 192.168.0.12). <Null> = unknown or never connected. Use the 'STATUS' field to verify if the ESL is currently connected or not.
STATUS	This field contains a string value representing the last reported status of the ESL. <ul style="list-style-type: none"> • <NULL> Unknown • ASSOCIATED • POLLING

	<ul style="list-style-type: none"> • INFO RECEIVED • DISASSOCIATED • COMMAND COMPLETED • COMMAND_NOT_ACCEPTED • POLL TIMEOUT • COMMAND_TIMEOUT • ADDRESS CHANGED (factory status only) • DEACTIVATED • IMAGE_UPDATE_COMPLETED • IMAGE_UPDATE_FAILED • FIRMWARE_UPDATE_COMPLETED • FIRMWARE_UPDATE_STARTED • FIRMWARE_UPDATE_FAILED • REACTIVATED • IMAGE_PROCESSING
IMAGE_STATUS	<p>This field contains a string value representing the last reported image status of the ESL (multiple values can be appended, for example: "Failed, Pending")</p> <ul style="list-style-type: none"> • Unknown • Idle • Pending • Queued • Failed • Completed • Error • NoRefresh • Processing
FIRMWARE_STATUS	<p>This field contains a string value representation of the firmware update status:</p> <p>Unknown Idle Pending Queued Failed Completed</p>
BOOT_COUNT	Shows how many times the firmware of the ESL was reset
TEMPERATURE	Shows the temperature range on which the ESL is supposed to run on (0=default; higher values are to compensate for low temperatures). Please note that low temperatures and values > 0 will increase power consumption!
LANID	Shows the LAN-ID this label is set to use. LAN-ID = 0000 means ESL will associate to all Base Stations. Any other value means ESLs will only associate to Base Stations with the same LAN-ID or with LAN-ID 0000

PANID	Shows the PAN-ID of this label. Refers to the PAN-ID of the Base Station that the label is connected to (or was connected to when last seen online). Value is "-" when the label has never been online.
WIDTH, HEIGHT	If the ESL is linked, these fields contain an integer value of the width and height (in pixels) of the generated image on the ESL. Generally, these values will be 200 x 96 for the EE201. <Null> = Unknown or not linked
IMG_FORMAT	If an e-paper ESL is linked, this field will generally be set to '1' indicating that the image is transmitted compressed to the ESL. If the data is sent uncompressed it would be '0'. Other values are reserved for TFT based ESLs (TIFF=2, JPG=3, GIF=4, FIRMWARE=5). <Null> = Unknown or not linked
IMG_IX	This field will generally be '0'. Only if multiple products will be shown on a single large ESL, then IMG_IX will be different for each image that is displayed on the ESL. <Null> = Unknown or not linked
X, Y	If the ESL is linked, these fields contain an integer value of the X-, Y-offset of the generated image on the ESL. Generally, these values will be '0'. <Null> = Unknown or not linked

16.2.2 POST & DELETE requests for ESLs

All these endpoints return an `EsServerApiObject`, which returns the received action, mac and params, as well as the result.

HTTP VERB	ACTION	MAC	Param(s)	Role
POST	RESET	MAC of ESL		Delete ESL
Endpoint	https://ebs50.local/api/ESL/{mac}/RESET			
POST	DEFAULT_IMAGE	MAC of ESL		Show default ESL image
Endpoint	https://ebs50.local/api/ESL/{mac}/DEFAULT_IMAGE			
POST	REFRESH_IMAGE	MAC of ESL		Refresh or resend ESL image
Endpoint	https://ebs50.local/api/ESL/{mac}/REFRESH_IMAGE			
POST	RESEND_IMAGE	MAC of ESL		Refresh or resend ESL image
Endpoint	https://ebs50.local/api/ESL/{mac}/RESEND_IMAGE			
POST	REQUEST_SETTINGS	MAC of ESL		Request ESL settings
Endpoint	https://ebs50.local/api/ESL/{mac}/REQUEST_SETTINGS			
POST	LINK	MAC of ESL	ID, Barcode or Description of product	Link ESLs
Endpoint	https://ebs50.local/api/ESL/{mac}/LINK/{id}			

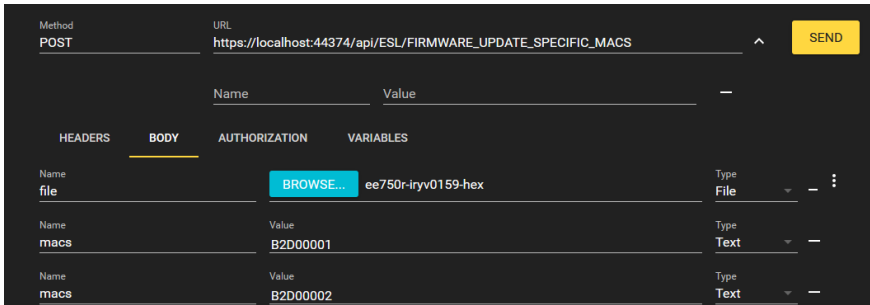
DELETE	LINK	MAC of ESL		Unlink ESL
Endpoint	https://ebs50.local/api/ESL/{mac}/LINK			
POST	UNLINK	MAC of ESL		Unlink ESL
Endpoint	https://ebs50.local/api/ESL/{mac}/UNLINK			
DELETE		MAC of ESL		Delete ESL
Endpoint	https://ebs50.local/api/ESL/{mac}			
Note	DELETE will unlink the ESL and remove it from the status table.			
POST	REASSOCIATE	MAC of ESL		Kick or move ESL from Base Station
Endpoint	https://ebs50.local/api/ESL/{mac}/REASSOCIATE			
Note	REASSOCIATE tells a label to disconnect from its current Base Station and to connect to the very first Base Station it finds, which may be its previous Base Station. Also see KICK_FROM_EBS			
POST	KICK_FROM_EBS	MAC of ESL		Kick or move ESL from Base Station
Endpoint	https://ebs50.local/api/ESL/{mac}/KICK_FROM_EBS			
Note	KICK specifies the ESL to stay away from the Base Station it was last connected to for 10 polls. If it does not find any other Base Station in that time, it will return to its previous Base Station. Also see REASSOCIATE			
POST	MOVE_TO_EBS	MAC of ESL	MAC of Base Station (12 chars)	Kick or move ESL from Base Station
Endpoint	https://ebs50.local/api/ESL/{mac}/MOVE_TO_EBS/{ebs}			
POST	SET_LANID	MAC of ESL	MAC of Base Station (12 chars)	Set LANID of ESL to the LANID of the Base Station
Endpoint	https://ebs50.local/api/ESL/{mac}/SET_LANID			
POST	CLEAR_LANID	MAC of ESL	MAC of Base Station (12 chars)	Clear LANID of ESL to 0000 (default)
Endpoint	https://ebs50.local/api/ESL/{mac}/CLEAR_LANID			
POST	REACTIVATE	MAC of Base Station (12 chars)	Type of ESL (string), start of ESL MAC range (8 chars), end of ESL MAC range (8 chars), duration (int, seconds)	Reactivate ESLs
Endpoints	https://ebs50.local/api/ESL/REACTIVATE/{ebsmac}/{type}/{from}/{to}/{duration} https://ebs50.local/api/ESL/REACTIVATE/{ebsmac}/{duration}			

Note	The start and end of the range will limit which labels are awoken. The duration will automatically stop waking up units and allows the Base Station to return to normal mode. 15 minutes (900 seconds) is a recommended time. Say you have EE213R's, from B2600000 to B26001FF and you want to wake them up with EBS 00.12.6A.F5.01.23: https://ebs50.local/api/ESL/REACTIVATE/00.12.6a.f5.01.23/ee213r/b2600000/b26001ff/900 To activate all ESL in range use (not recommended): https://ebs50.local/api/ESL/REACTIVATE/{ebsmac}/{duration}			
POST	REACTIVATE			Reactivate ESLs
Endpoint	https://ebs50.local/api/ESL/REACTIVATE/KEEP-ALIVE			
Note	Reset the reactivation timer to keep the reactivation going			
DELETE	REACTIVATE			Reactivate ESLs
Endpoint	https://ebs50.local/api/ESL/REACTIVATE			
Note	Stops reactivation (if still ongoing) and wipes the existing timer (see POST for REACTIVATE)			
POST	DEACTIVATE	MAC of ESL		Deactivate ESLs
Endpoint	https://ebs50.local/api/ESL/{mac}/DEACTIVATE			
POST	FACTORY_DEFAULT	MAC of ESL		Set ESL to factory default
Endpoint	https://ebs50.local/api/ESL/{mac}/FACTORY_DEFAULT			
POST	LED	MAC of ESL	Setting (0 or 1), mode and color (two strings, separated by pipe ' '), duty cycle (three integers, separated by pipe ' ')	Buzzer and LED actions
Endpoint	https://ebs50.local/api/ESL/{mac}/LED/{setting}/{mode_and_color}/{duty_cycle}			
Notes	The params are formatted in the following way: Setting: 0 (don't remember after power cycle), 1 (remember) Mode and color: {mode} {color}. Mode: ON (continuous, ignores the duty cycle settings), FLASH (further specified with the duty cycle settings). Color: RED / GREEN / BLUE / ORANGE / PURPLE / CYAN Duty cycle: {period in ms} {on percentage} {nr of periods}. Example: "2000 50 15" means 2000ms, of which 50% of the time on, repeated 15 times. Example of 5 seconds worth of short flashing orange LEDs: ESL/{mac}/LED/0/FLASH ORANGE/500 20 10			
POST	SOUND	MAC of ESL	Tone duration in ms (int), volume	Buzzer and LED actions

			(string), tones as comma separated values in Hz (string)	
Endpoint	https://ebs50.local/api/ESL/{mac}/SOUND/{tone_duration}/{volume}/{csv_tones}			
Notes	The params are formatted in the following way: Tone duration: Expressed in milliseconds, i.e., 130 = 130 milliseconds per tone Volume: VERY_LOW, LOW, STANDARD, MEDIUM or HIGH CSV tones: The tones in Hz (range 1000 – 5000Hz), comma separated (max 20) Example: ESL/{mac}/SOUND/130/HIGH/1318,1567,2637,2093,2349,3135			
POST	MIDI_SOUND	MAC of ESL	Empty string (reserved for future use), volume (string), RTTTL tune (string)	Buzzer and LED actions
Endpoint	https://ebs50.local/api/ESL/{mac}/MIDI_SOUND/{reserved}/{volume}/{rtttl_tune}			
Notes	The params are formatted in the following way: Empty string: Reserved for future use, currently ignored. A zero will suffice. Volume: VERY_LOW, LOW, STANDARD, MEDIUM or HIGH RTTTL tune: A tune based on the RTTTL standard (https://en.wikipedia.org/wiki/Ring_Tone_Transfer_Language) but with an exception; '#' needs to be changed to an 's' due to URI constraints. If any of the tones falls outside the 1000Hz – 5000Hz range, the tune is raised one octave. Example: ESL/{mac}/MIDI_SOUND/0/VERY_LOW/simpsons:d=4,o=5,b=160:c.6,e6,fs6,8a6,g.6,e6,c6,8a,8fs,8fs,8fs,2g			
POST	POLL_INTERVAL	MAC of ESL	Poll interval in seconds (min 5*, default 20**, max 300) (int)	Change ESL poll settings
Endpoint	https://ebs50.local/api/ESL/{mac}/POLL_INTERVAL/{value}			
Notes	* Powered ESLs can have a minimum poll interval of 1 second. ** EE150R, EE153R, SE-214F have a default poll interval of 30 seconds			
POST	POLL_TIMEOUT	MAC of ESL	Number of polls before timing out (min 5, default 10, max 50) (int)	Change ESL poll settings

Endpoint	https://ebs50.local/api/ESL/{mac}/POLL_TIMEOUT/{value}			
POST	SCAN_INTERVAL	MAC of ESL	Associate interval in seconds (min 60*, default 60**, max 600)	Change ESL poll settings
Endpoint	https://ebs50.local/api/ESL/{mac}/SCAN_INTERVAL/{value}			
Notes	* Powered ESLs have a fixed associate interval and a minimum of 5 seconds. ** Battery powered ESLs will increase the associate interval over time to reduce power consumption when being disconnected for a long period of time			
POST	DISPLAY_OPTIONS	MAC of ESL	0: normal, 1: upside down	Change ESL display options
Endpoint	https://ebs50.local/api/ESL/{mac}/DISPLAY_OPTIONS/{value}			
POST	SCAN_CHANNELS	MAC of ESL	Integer or hex string representing channel flags	Set ESL scan channels
Endpoint	https://ebs50.local/api/ESL/{mac}/SCAN_CHANNELS/{value}			
Notes	Scan channels are a set of flags, with the following hexadecimal values: 11: 0x00000800 19: 0x00080000 12: 0x00001000 20: 0x00100000 13: 0x00002000 21: 0x00200000 14: 0x00004000 22: 0x00400000 15: 0x00008000 23: 0x00800000 16: 0x00010000 24: 0x01000000 17: 0x00020000 25: 0x02000000 18: 0x00040000 26: 0x04000000 The default channels are 11, 15, 20, 25 and 26. You can send this value as a hexadecimal string 0x06108800 (0x prefix mandatory) or as its integer value of 101746688.			

16.2.3 POST/DELETE request for automatic firmware updates of ESLs

HTTP VERB	MAC	ACTION	Param(s)	Role
POST		Update firmware		Firmware update
<i>Endpoint</i>	https://ebs50.local/api/ESL/FIRMWARE_UPDATE			
<i>Return</i>	Starts the automatic firmware update of all compatible ESLs			
<i>Notes</i>	<p>(Additional) header: Content-Type: multipart/form-data</p> <p>Form-data body: file: The firmware image file (binary upload). (i.e. EE214RY_IYAX0188.HEX)</p> <p>Automatic firmware update continues until the DELETE request is called, or the ESL Web server was reset.</p>			
DELETE		Stop updating firmware		Firmware update
<i>Endpoint</i>	https://ebs50.local/api/ESL/FIRMWARE_UPDATE			
<i>Return</i>	Stops the automatic firmware update of all ESLs			
POST		Update firmware		Firmware update
<i>Endpoint</i>	https://ebs50.local/api/ESL/FIRMWARE_UPDATE_SPECIFIC_MACS			
<i>Return</i>	Starts the automatic firmware update for the provided list of MAC addresses			
<i>Notes</i>	<p>(Additional) header: Content-Type: multipart/form-data</p> <p>Form-data body: file: The firmware image file (binary upload). (i.e. EE214RY_IYAX0188.HEX) macs: One or more MAC addresses of ESLs that should be updated.</p> <p>Example:</p> 			

16.3 EBS API (v1.0)

16.3.1 GET requests for EBS

HTTP VERB	MAC	ACTION	Param(s)	Role
GET				View Base Station page
Endpoint	https://ebs50.local/api/EBS			
Return	Returns all settings of all Base Stations that are currently on the list of connected Base Stations (and therefore ready for commands).			
GET		ALL		View Base Station page
Endpoint	https://ebs50.local/api/EBS/ALL			
Return	Returns all settings of all Base Stations that are currently in the list of Base Stations that are added to the network controller, even if they are not online. (if STATUS does not equal "Connected" the Base Station is not ready for commands).			
GET	Base Station MAC (12 chars)			View Base Station page
Endpoint	https://ebs50.local/api/EBS/{mac}			
Return	Returns all the settings of a single Base Station			
GET		DISCOVER		View Base Station page
Endpoint	https://ebs50.local/api/EBS/DISCOVER			
Return	Returns all settings of all Base Stations that can be found on the current network.			
GET	Base Station MAC (12 chars)		Property name (string)	View Base Station page
Endpoint	https://ebs50.local/api/EBS/{mac}/{property}			
Return	Returns a single setting of a single Base Station.			

Property	Description
IP	Current IP address of the Base Station
PORT	Current IP port number of the Base Station
MODEL	Hardware model of the Base Station (EBS30/EBS40/EBS50)
LOCAL_NAME	Current local name of the Base Station
LANID	Current LAN-ID assigned to the Base Station. LAN-ID 0000 is default; this means all ESLs can associate with this Base Station. Any other value means that only ESLs with their own LAN-ID set to either 0000 or the same LAN-ID as the Base Station can connect.
PANID	Current PAN-ID of the Base Station. By default, the last four hexadecimal digits of the MAC-address.
CHANNEL	Current RF channel that the Base Station uses to communicate with labels
VERSION	Firmware version of the Base Station
STATUS	Current connection status (Connected or Disconnected)
NR_OF_ESL	Current number of labels associated with this Base Station

16.3.2 POST/DELETE requests for specific EBS

All these endpoints return an EslServerApiObject, which returns the received action, mac and params, as well as the result.

HTTP VERB	MAC	ACTION	Param(s)	Role
Endpoint	https://ebs50.local/api/EBS/{mac}/RESET			
Note	Resetting a Base Station might change its IP. Please ensure that after rebooting the Base Station is still connected, network settings may prevent ESL Web Server from correctly reconnecting.			
POST	Base station MAC (12 chars)	ADD	IP (string in xxx.xxx.xxx.xxx format), port (int), variant (string; EBS40 or EBS30)	Connect to Base Station
Endpoint	https://ebs50.local/api/EBS/{mac}/ADD/{ip}/{port}/{variant}			
DELETE	Base station MAC (12 chars)			Disconnect from Base Station
Endpoint	https://ebs50.local/api/EBS/{mac}			
POST	Base station MAC (12 chars)	FIRMWARE_UPDATE	Filename (string)	Base station firmware update
Endpoint	https://ebs50.local/api/EBS/{mac}/FIRMWARE_UPDATE/{filename}			
Note	This endpoint is part of the original API. It assumes that you have already placed the firmware update hex file in the Input folder of the application and then use this command to start the update on a specific Base Station.			
DELETE	Base station MAC (12 chars)			Disconnect from Base Station
Endpoint	https://ebs50.local/api/EBS/{mac}			
POST	Base station MAC (12 chars)		Property name (string), new value for the property (string)	Change Base Station settings
Endpoint	https://ebs50.local/api/EBS/{mac}/{property}/{value}			
Note	See the list below for the property names and the optional values that can be set for each.			

Property	Value
PORT	Int, default 1002. Range depends on host system
LOCAL_NAME	String, default EBSyy_xxxx where yy is the model number and xxxx the last 4 digits of MAC (example; EBS40_0123)
LANID	Hexadecimal string length 4, default 0000. Range from 0000 to FFFE

PANID	Hexadecimal string length 4, default last 4 digits of MAC (example 0123). Range from 0000 to FFFE
CHANNEL	Int, default 11. Range from 11 to 26. (In Japan range from 11 to 28).

16.3.3 POST requests for all EBS

The main difference with the POST requests for specific Base Station, is that these commands apply to all Base Stations that ESL Web Server is connected to. Therefore, the endpoints are set up differently.

HTTP VERB	MAC	ACTION	Param(s)	Role
POST		BALANCE_ESLS		Load balancing
Endpoint	https://ebs50.local/api/BALANCE_ESLS			
Note	Like the ESL REASSOCIATE command (see ESL API), but sent to all labels with an LQI lower than 10. Labels may be offline for 15 minutes, so only perform when this poses no problems. Balancing can only be performed once per day by default.			
POST		REFRESH_ESLS		Refresh or resend ESL image
Endpoint	https://ebs50.local/api/REFRESH_ESLS			
Note	Tells all ESLs to refresh its screen.			

16.3.4 GET/POST/DELETE Roaming

HTTP VERB	MAC	ACTION	Param(s)	Role
GET		Get roaming status		Roaming
Endpoint	https://ebs50.local/api/EBS/Roaming			
Return	The current Roaming status			
DELETE		Disable roaming		Roaming
Endpoint	https://ebs50.local/api/EBS/Roaming			
Return	The current Roaming status			
GET		Change roaming		Roaming
Endpoint	https://ebs50.local/api/EBS/Roaming/{boolean} (True or False)			
Return	Set the roaming status			

16.4 EBS API (v2.0)

Please note that for the v2.0 EBS API endpoints, you need to specify the version number through either the URL or HTTP Headers. URL is leading. See chapter [12.1.2 API Versioning](#) for details. These examples use the URL specifier for clarity.

16.4.1 GET requests for EBS

HTTP VERB	MAC	ACTION	Param(s)	Role
GET		DISCOVER		View Base Station page
Endpoint	https://ebs50.local/api/v2.0/EBS/DISCOVER			
Return	Returns all settings of all Base Stations that can be found on the current network.			
Note	Like the v1.0 endpoint, but with extra thread safety added.			

16.4.2 POST/DELETE requests for EBS

HTTP VERB	MAC	ACTION	Param(s)	Role
POST		ADD	IP (string in xxx.xxx.xxx.xxx format), port (int), variant (string; EBS30, EBS40)	Connect to Base Station
Endpoint	https://ebs50.local/api/v2.0/EBS/ADD/{ip}/{port}/{variant}			
Note	Like the v1.0 endpoint, but here the MAC is resolved by the ESL Web Server software.			
POST	Base station MAC (12 chars)		EbsInfo object (in body)	Connect to Base Station
Endpoint	https://ebs50.local/api/v2.0/EBS/{mac}			
Note	The EbsInfo object can be placed in the body in XML or JSON format. For example, a serialized EbsInfo object performs a GET on a MAC (see GET requests for EBS). With this endpoint you can set multiple properties in a single request.			

16.4.3 EBS-4x Firmware update

HTTP VERB	MAC	ACTION	Param(s)	Role
POST	Base station MAC (12 chars)	Update EBS firmware	Firmware file (.bin)	Firmware update
Endpoint	https://ebs50.local/api/v2.0/EBS/{mac}/UPDATE			
Return	Starts the firmware update for the specified base station			
Notes	<p>(Additional) header: Content-Type: multipart/form-data</p> <p>Form-data body: file: The firmware file (binary upload). (i.e. IAUV0011_IBUV0072.bin)</p> <p>Form-data body: file: The firmware image file (binary upload). (i.e. EE214RY_IYAX0188.HEX) macs: One or more MAC addresses of ESLs that should be updated.</p> <p>Example:</p>			

GET	Base station MAC (12 chars)	Progress of EBS firmware update	Firmware update
Endpoint	https://ebs50.local/api/v2.0/EBS/{mac}/UPDATE		
Return	Returns the status of the firmware update as a percentage (0...100)		

16.5 Links API (v1.0)

16.5.1 GET requests for Links

HTTP VERB	ACTION	Param(s)	Role
GET			View link page
Endpoint	https://ebs50.local/api/Links		
Return	Returns all the links of the system.		
GET		MAC of ESL (string, 8 chars) or product identifier (UID of the product table)	View link page
Endpoint	https://ebs50.local/api/Links/{mac_or_id}		
Return	Returns all the links associated with the ESL or the specified product		
Note	<p>The unique ID column is set in the database wizard. See chapter 8.4 Database Wizard</p> <p>If you are searching for an ID that contains a URL reserved character, which are <code>+ \$, / ? % # [] (space)</code>, it is best to use the V2.0 endpoint and place the search term in the headers.</p> <p>You can try to escape the characters, but different servers (by default Kestrel, but you can also use IIS, Apache, Nginx) will give different results and are not reliably predictable.</p>		
GET			View link page
Endpoint	https://ebs50.local/api/Links/Layering		
Return	Returns the status of the setting for Layering.		

16.5.2 POST/DELETE requests for Links

HTTP VERB	ACTION	Param(s)	Role
POST		MAC of ESL (string, 8 chars), product identifier (string, Unique ID or key column)	Link ESLs
Endpoint	https://ebs50.local/api/Links/{mac}/{id}		

Return	EslServerApiObject with result parameter OK if succeeded, otherwise result contains a failure message.		
Note	The unique ID is set in the database wizard, key column (i.e. barcode) is a property of the database table itself. See chapter 8.4 Database Wizard .		
POST		MAC of ESL (string, 8 chars), product identifier (string, Unique ID or key column)	Link ESLs
Endpoint	https://ebs50.local/api/Links/{mac}/{id}		
Return	EslServerApiObject with result parameter OK if succeeded, otherwise result contains a failure message.		
Note	The unique ID is set in the database wizard, key column (i.e. barcode) is a property of the database table itself. See chapter 8.4 Database Wizard .		
POST		Setting (string, either 'true' or 'false')	Change database settings
Endpoint	https://ebs50.local/api/Links/Layering/{setting}		
Return	OK response if succeeded, Accepted (202) with "Layering already enabled/disabled" message if input matches current setting, else reason why switching layering on/off failed.		
Note	Turning layering on/off changes the link database, so "Change database settings" is required. Turning off layering preserves only the latest link made to an ESL, turning on layering is non-destructive. Layering requires special Templates.		
DELETE		MAC of ESL (string, 8 chars) or product identifier (string, UID of product table)	Unlink ESLs
Endpoint	https://ebs50.local/api/Links/{mac_or_id}		
Return	EslServerApiObject with result parameter OK if succeeded, otherwise result contains a failure message.		
Note	When using default settings: Deletes single link associated to an ESL with the provided MAC or deletes ALL links associated to the provided Unique ID. When using layering: Deletes all links of the ESL with the provided MAC, or deletes ALL links to the provided UID (but only unlinks the layers with the UID provided).		
DELETE		MAC of ESL (string, 8 chars) or product identifier (string, UID of product table), Layer (string, name)	Unlink ESLs
Endpoint	https://ebs50.local/api/Links/{mac_or_id}/{layer}		
Return	EslServerApiObject with result parameter OK if succeeded, otherwise result contains a failure message. Always returns an error if layering is disabled.		
Note	As URI is case-insensitive by design, Layer is processed case-insensitive.		
DELETE			Change database settings
Endpoint	https://ebs50.local/api/Links/Layering/		

Return	OK response if succeeded, Accepted (202) with “Layering already disabled” message if input matches current setting, else reason why switching layering off failed.
Note	Turning layering off changes the link database, so “Change database settings” is required. Turning off layering preserves only the latest link made to an ESL.

16.6 Links API (v2.0)

16.6.1 GET request for Links

HTTP VERB	ACTION	Param(s)	Role
GET		Optional; header with key “x-mac-or-id”	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links		
Return	If header “x-mac-or-id” is not supplied or empty, returns all known links of the system. If supplied and can’t be parsed to a MAC address it will return the links of the ESL with that address, 204 Empty if that ESL is not linked. If supplied and can’t be parsed to a MAC-address it will return the links to that product ID. If that product is unknown or no links exist, a 204 Empty is returned.		
Note	Usable for all links, but designed to support IDs containing the URL reserved characters; <code>+ \$, / ? % # [] (space)</code> .		

16.6.2 POST/DELETE requests for Links

HTTP VERB	ACTION	Param(s)	Role
POST	Link	Header with key “x-mac” and “x-id”	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/Link		
Return	If header “x-mac” and/or “x-id” is not present, returns a message with an error. If x-mac is supplied but can’t be parsed to a MAC-address, returns a message with an error. If both are supplied, links the ESL with the supplied MAC address to the supplied ID/key, with a warning message if the ESL is inactive, or an OK if the ESL is known. If the x-id can’t be parsed to a product either on the ID column (‘Product ID’) or the key column (‘Barcode’), the link is made regardless.		
Note	Usable for all links, but designed to support IDs containing the URL reserved characters; <code>+ \$, / ? % # [] (space)</code> .		
POST	ChangeStrings	Content body containing string array formatted like link CSV	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/ChangeStrings		
Return	EslServerApiObject, with “Result” set to “OK” if processing succeeded, and “Param1” containing a message of “X links changed”. If processing failed, “Result” set to “Error: <error message>”.		
Note	Accepts a string array of lines like in link CSV files. This is a very compressed format, usable for larger uploads. Can optionally contain an “Action” column specifying if you want to [D]elete files, or [I]nsert/[U]pdate them. Without the “Action” column all lines are processed as insert/update. Can be supplied as JSON format, or XML. Set the Content-Type to application/json or application/xml respectively.		

	Example for JSON: ["011;EE750R;B2C01111","012;EE420R;B2A01111"] Example for XML: <ArrayOfString xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema"> <string>011;EE750R;B2C01111</string> <string>012;EE420R;B2A01111</string> </ArrayOfString>		
POST	ChangeLinks	Content body containing EslLink object array	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/ChangeLinks		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded, and "Param1" containing a message of "X links changed". If processing failed, "Result" set to "Error: <error message>".		
Note	Adds/updates existing links. Cannot drop links. Input of EslLink objects, formatting is like the output of the /api/Links GET method that returns serialized EslLink objects. Can be supplied as JSON or XML, set Content-Type header to application/json or application/xml respectively.		
POST	ChangeFile	Content form containing a CSV link file	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/ChangeFile		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded, and "Param1" containing a message of "X links changed". If processing failed, "Result" set to "Error: <error message>".		
Note	The file is read from the body. This form should contain a file parameter named 'csv', and the Content-Type header set to multipart/form-data. Link CSV can optionally contain an "Action" column specifying if you want to [D]elete files, or [I]nsert/[U]pdate them. Without the "Action" column all lines are processed as insert/update.		
POST	ReplaceStrings	Content body containing string array formatted like link CSV	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/ReplaceStrings		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded, and "Param1" containing a message of "X links changed". If processing failed, "Result" set to "Error: <error message>".		
Note	Acts like the endpoint POST ChangeStrings, but here all existing links are dropped and replaced by the incoming record. All other details listed in Note POST ChangeStrings still apply.		
POST	ReplaceLinks	Content body containing EslLink object array	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/ReplaceLinks		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded, and "Param1" containing a message of "X links changed". If processing failed, "Result" set to "Error: <error message>".		

Note	This endpoint will drop all existing links and replace it with the given input. Input of EsLink objects, formatting is like the output of the /api/Links GET method that returns serialized EsLink objects. Can be supplied as JSON or XML, set Content-Type header to application/json or application/xml respectively.		
POST	ReplaceFile	Content form containing a CSV link file	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/ReplaceFile		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded, and "Param1" containing a message of "X links changed". If processing failed, "Result" set to "Error: <error message>".		
Note	Acts like the endpoint POST ChangeFile, but here all existing links are dropped and replaced by the incoming record. All other details listed in Note POST ChangeFile still apply.		
POST		Header with key "x-mac-or-id"	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/Unlink		
Return	If header "x-mac-or-id" is not present, returns a message with an error. If supplied and can be parsed to a MAC address it will delete the link(s) of the ESL with that address, "Link not found" message if the ESL has no links. If supplied and can be parsed to an ID, it will delete the link of every ESL that is linked to the product. If the ID is not known or no links are available, a "Link not found" message is returned.		
Note	Usable for all links, but designed to support IDs containing the URL reserved characters; + \$, / ? % # [] (space).		
DELETE		Header with key "x-mac-or-id"	Link ESLs
Endpoint	https://ebs50.local/api/v2.0/Links/Link		
Note	Behavior is the same as the POST to Unlink described above.		

16.7 Logs API

16.7.1 GET requests for Logs

HTTP VERB	ACTION	Param(s)	Role
GET		Name of the log; EventLog, ChangeLog, LogMessages, Images LabelStatus or BaseStationStatus	View logs
Endpoint	https://ebs50.local/api/Logs/{name}		
Return	All rows from the requested log. If nonexistent a 204 No Content result		
Note	Maximum of 100,000 rows can be stored per log.		

16.8 Products API (v1.0)

16.8.1 GET requests for Products

HTTP VERB	ACTION	Param(s)	Role
GET			View product page
Endpoint	https://ebs50.local/api/Products		
Return	All rows from the product table, if available		
GET		Article (a string, representing Product UID, key value or Description)	View product page
Endpoint	https://ebs50.local/api/Products/{article}		
Return	First searches on the ID column and returns the result(s) found. If nothing found, expands the search to the key column(s) and description column and returns the result(s) found.		
GET		Article (a string, representing Product UID, key value or Description), Column (a string with the column name or an integer zero-based column index)	View product page
Endpoint	https://ebs50.local/api/Products/{article}/{column}		
Return	Searches on the ID first and takes the first match. If no result is found it expands the search on the product key value and description. If more than one result is found it takes the first match. Then it returns only the value from the column requested.		
GET		Article (a string, representing Product UID, key value or Description)	View product page
Endpoint	https://ebs50.local/api/Products/getdescription/{article}		
Return	Searches on the ID first and takes the first match. If no result is found it expands the search on the product key value and description. If more than one result is found it takes the first match. Then it returns only the value from the column set as "Description" in the database settings.		
GET		Article (a string, representing Product UID, key value or Description)	View product page
Endpoint	https://ebs50.local/api/Products/getid/{article}		
Return	Searches on the ID first and takes the first match. If no result is found it expands the search on the product key value and description. If more than one result is found it takes the first match. Then it returns only the value from the column set as "Product ID" in the database settings.		

16.8.2 PUT/POST/DELETE requests for Products

HTTP VERB	ACTION	Param(s)	Role
PUT		[Request Body] An array of product rows, formatted like the "GET /api/Products" return value	Alter products
Endpoint	https://ebs50.local/api/Products		
Note	"Put" will only add new products. Existing products will not be overwritten (see POST)		
POST		[Request Body] An array of product rows, formatted like the "GET /api/Products" return value	Alter products
Endpoint	https://ebs50.local/api/Products		
Note	"Post" will add all products, overwriting existing products (see PUT)		
POST		Article (string, representing Product UID, key value or Description), Column (string with the column name or an integer zero-based column index), Value (string)	Alter products
Endpoint	https://ebs50.local/api/Products/{article}/{column}/{value}		
Note	The value provided should adhere to the database constraints for that column. This method will only update a single Product.		
DELETE		[Request Body] An array of product rows, formatted like the "GET /api/Products" return value	Alter products
Endpoint	https://ebs50.local/api/Products		
DELETE		Article (string, representing Product UID, key value or Description),	Alter products
Endpoint	https://ebs50.local/api/Products/{article}		
Note	This will delete only a single product. If the Article parameter is ambiguous, the first search result will be deleted.		

16.9 Products API (v2.0)

16.9.1 POST requests for Products

POST	ChangeStrings	Content body containing string array formatted like product CSV	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ChangeStrings		
Return	EslServerApiObject, with “Result” set to “OK” if processing succeeded. If processing failed, “Result” set to “Error: <error message>”.		
Note	<p>Accepts a string array of lines like in product CSV files. The format depends on the structure of your product table. CSV can be uploaded even when using a SQL format database. This is a very compressed format, usable for larger uploads. Can optionally contain an “Action” column specifying if you want to [D]elete files, or [I]nsert/[U]pdate them. Without the “Action” column all lines are processed as insert/update.</p> <p>Can be supplied as JSON format, or XML. Set the Content-Type to application/json or application/xml respectively.</p> <p>Example for JSON (note, this is an example using the structure of the demo database):</p> <pre>[“;001;3083680012256;New product name;93;0,95;0,95;;180;GR”]</pre> <p>Example for XML (note, this is an example using the structure of the demo database):</p> <pre><ArrayOfString xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema"> <string>;001;3083680012256;New product name;93;0,95;0,95;;180;GR</string> </ArrayOfString></pre>		
POST	ChangeProducts	Content body containing SerializableDataTable object array	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ChangeProducts		
Return	EslServerApiObject, with “Result” set to “OK” if processing succeeded, and “Param1” containing a message of “X links changed”. If processing failed, “Result” set to “Error: <error message>”.		
Note	Adds/updates existing products. Cannot drop products. Input of SerializableDataTable objects, formatting is like the output of the /api/Products GET method that returns serialized product objects. Can be supplied as JSON or XML, set Content-Type header to application/json or application/xml respectively.		
POST	ChangeFile	Content form containing a CSV products file	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ChangeFile		
Return	EslServerApiObject, with “Result” set to “OK” if processing succeeded. If processing failed, “Result” set to “Error: <error message>”.		

Note	The file is read from the body. This form should contain a file parameter named 'csv', and the Content-Type header set to multipart/form-data. Product CSV can optionally contain an "Action" column specifying if you want to [D]elete files, or [I]nsert/[U]pdate them. Without the "Action" column all lines are processed as insert/update. The format depends on the structure of your product table. CSV can be uploaded even when using a SQL format database.		
POST	ReplaceStrings	Content body containing string array formatted like product CSV	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ReplaceStrings		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	Acts like the endpoint POST ChangeStrings, but here all existing products are dropped and replaced by the incoming record. As it will drop the existing database, the validity check is harsher. If you are using a CSV based database, the endpoint expects the same headers and the same separator character as seen in the original database. If you are using a SQL based database and never used CSV, the semicolon is expected as separator character. All other details listed in Note POST ChangeStrings still apply.		
POST	ReplaceLinks	Content body containing SerializableDataTable object array	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ReplaceProducts		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	This endpoint will drop all existing products and replace it with the given input. Input of SerializableDataTable objects, formatting is like the output of the /api/Product GET method that returns serialized product objects. Can be supplied as JSON or XML, set Content-Type header to application/json or application/xml respectively.		
POST	ReplaceFile	Content form containing a CSV product file	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ReplaceFile		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	Acts like the endpoint POST ChangeFile, but here all existing products are dropped and replaced by the incoming record. All other details listed in Note POST ChangeFile still apply.		

16.10 Account API

16.10.1 GET requests for Account

HTTP VERB	ACTION	Param(s)	Role
GET	GenerateAPIKey		View account page
Endpoint	https://ebs50.local/api/Account/GenerateAPIKey		
Return	200 OK with an API key that is guaranteed unique. Can be used for POST ChangeAPIKey 500 Server Error if the API key unicity couldn't be checked in the user database.		

16.10.2 POST requests for Account

HTTP VERB	ACTION	Param(s)	Role
POST	ChangeAPIKey	Header with key "x-new-api-key"	Change own password
Endpoint	https://ebs50.local/api/Account/ChangeAPIKey		
Return	200 OK if the key was updated correctly. 400 Bad Request if the key is not in a GUID format. 401 Unavailable if no "x-new-api-key" is supplied. 500 Server Error if the API key could not be stored in the user database, or if the key was not unique.		
Note	For a randomized unique API key you can use GET generate API key. If you try to change your API key to one that is already in use for a different user, your new key is not accepted and the other user's key is also removed for safety reasons.		

16.11 CMS API

16.11.1 POST requests for CMS

HTTP VERB	ACTION	Param(s)	Role
POST	UploadZip	Zip with XML+BMP for CMS in file, part of multiform-data named "zipfile"	Link ESLs
Endpoint	https://ebs50.local/api/cms/uploadzip		
Note	In the headers the content-type should be set to "multipart/form-data". In the body place a single file with key "zipfile", value is the zip with the XML+BMP and type is "file".		

16.12 Application settings API

16.12.1 GET/PUT requests for Application settings

HTTP VERB	ACTION	Param(s)	Role
GET			View link page
Endpoint	https://ebs50.local/api/Settings/Application		
Return	Returns all the application settings and their current values.		
GET			View link page
Endpoint	https://ebs50.local/api/Settings/Application/{setting}		
Return	Return the given application settings of the system. (Use <i>api/Settings/Application</i> to return a list of all supported settings)		
PUT			View link page
Endpoint	https://ebs50.local/api/Settings/Application/{setting}/{value}		
Note	Sets the given application {setting} of the system with the desired {value} . Some settings are used in complex setups (i.e., Cloud Dashboard has an endpoint, an API key, et cetera) and will return an error. (Use <i>api/Settings/Application</i> to return a list of all supported settings)		

17 Database configuration examples

The example files referred to in these appendices can be found in the ESL Web Server Toolkit, available from <https://opticon.com/product/ebs-50>

17.1 MySQL example configuration

The example query for the product table can be found in the ESL Web Server Toolkit, in the folder “Examples/MySQL”. Use a database manager like MySQL Workbench to create a database called ‘esl’ on your database server. Create the product table with the help of example query file.

Ensure your database can be reached from the EBS-50 (or the host device running the ESL Web Server), for instance by opening the correct port on your firewall.

In ESL Web Server navigate to “Products > Configure SQL Connection” and edit the connection parameters to connect to the database (see image for an example).

Configure SQL connection

Refresh current connection

Edit connection

Connection method
TCP_IP

SQL format
MySQL

Server address
localhost

Port
3306

Username
user

Password
●●●●●●●●

Database
esl

Next >

Figure 176: MySQL over IP example

Press the button labelled “Next” to test your setup. If the connection can be made, you’ll go to the next step in the connection wizard. Refer to chapter [8.4.1.2 SQL database](#) for more information on these steps.

17.2 MS-SQL example configuration

The example query for the product table can be found in the ESL Web Server Toolkit, in the folder “Examples/MS-SQL”. Use a database manager like SQL Server Manager to create a database called ‘esl’ on your database server. Create the product table with the help of example query file.

Ensure your database can be reached from the EBS-50 (or the host device running the ESL Web Server), for instance by opening the correct port on your firewall.

In ESL Web Server navigate to “Products > Configure SQL Connection” and edit the connection parameters to connect to the database (see image for an example).

Figure 177: MS-SQL over IP example

Press the button labelled “Next” to test your setup. If the connection can be made, you’ll go to the next step in the connection wizard. Refer to chapter [8.4.1.2 SQL database](#) for more information on these steps.

17.3 Oracle example configuration

The example query for the product table can be found in the ESL Web Server Toolkit, in the folder “Examples/Oracle”. Create a database called ESL and Open a SQL Worksheet in Oracle SQL developer. Create the product table with the help of example query file.

Ensure your database can be reached from the EBS-50 (or the host device running the ESL Web Server), for instance by opening the correct port on your firewall.

In ESL Web Server navigate to “Products > Configure SQL Connection” and edit the connection parameters to connect to the database (see image for an example).

Figure 178: Oracle over IP example

Press the button labelled “Next” to test your setup. If the connection can be made, you’ll go to the next step in the connection wizard. Refer to chapter [8.4.1.2 SQL database](#) for more information on these steps.

17.4 PostgreSQL example configuration

The example query for the product table can be found in the ESL Web Server Toolkit, in the folder “Examples/PostgreSQL”. Use a PostgreSQL editor like pgAdmin to create a database called ‘esl’ on your database server. Create the product table with the help of example query file.

Ensure your database can be reached from the EBS-50 (or the host device running the ESL Web Server), for instance by opening the correct port on your firewall.

In ESL Web Server navigate to “Products > Configure SQL Connection” and edit the connection parameters to connect to the database (see image for an example).

Configure SQL connection

Refresh current connection

Edit connection

Connection method
TCP_IP

SQL format
PgSQL

Server address
localhost

Port
5432

Username
postgres

Password
●●●●●●●●

Database
esl

Schema
public

Next >

Figure 179: PostgreSQL over IP example

Press the button labelled “Next” to test your setup. If the connection can be made, you’ll go to the next step in the connection wizard. Refer to chapter [8.4.1.2 SQL database](#) for more information on these steps.

17.5 SQLite example configuration

SQLite is not a database server, but a relational database stored in a file. By default, the ESL Web Server will store this file in its installation folder, in the subfolder “Output”. See chapter [13 Log in by SSH using WinSCP/PuTTY](#) on information on how to reach the file system of your EBS-50. If you are hosting the ESL Web Server software on a different host, you’ll need to adapt to your hosts setting.

The example queries to create a product table can be found in the ESL Web Server Toolkit, in the folder “Examples/SQLite”. Use WinSCP to move the file “esl.sqlite3” to the EBS-50 in the folder “/home/root/ebs_50_run/Output”. When hosting ESL Web Server software on your own Linux system, the default path is “/var/www/eslcorewebapplication/Output”, when hosting ESL Web Server software on your Windows system the default path is “C:\Opticon\ESL Web Server software\Output”.

In ESL Web Server navigate to “Products > Configure SQL Connection” and edit the connection parameters to connect to the database (see image for an example).

The screenshot shows a web interface titled "Configure SQL connection". At the top, there is a dark blue button labeled "Refresh current connection". Below this is a section titled "Edit connection". Under "Edit connection", there are four configuration fields, each with a dropdown arrow:

- Connection method:** Set to "TCP_IP".
- SQL format:** Set to "SQLite".
- Server address:** Set to "localhost".
- Database:** Set to "esl".

At the bottom of the configuration section, there is a dark blue button labeled "Next >".

Figure 180: SQLite default settings

Press the button labelled “Next” to test your setup. If the connection can be made, you’ll go to the next step in the connection wizard. Refer to chapter [8.4.1.2 SQL database](#) for more information on these steps.

17.6 External Content Management System (CMS) configuration

Using an External Content Management System (CMS) means a 3rd party system will supply images and XML-files to the ESL Web Server Application by placing them into the Input-folder or uploading them to the API. See [chapter 0](#)

17.7 Products API (v2.0)

17.7.1 POST requests for Products

POST	ChangeStrings	Content body containing string array formatted like product CSV	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ChangeStrings		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	<p>Accepts a string array of lines like in product CSV files. The format depends on the structure of your product table. CSV can be uploaded even when using a SQL format database. This is a very compressed format, usable for larger uploads. Can optionally contain an "Action" column specifying if you want to [D]elete files, or [I]nsert/[U]pdate them. Without the "Action" column all lines are processed as insert/update.</p> <p>Can be supplied as JSON format, or XML. Set the Content-Type to application/json or application/xml respectively.</p> <p>Example for JSON (note, this is an example using the structure of the demo database):</p> <pre>[";001;3083680012256;New product name;93;0,95;0,95;;180;GR"]</pre> <p>Example for XML (note, this is an example using the structure of the demo database):</p> <pre><ArrayOfString xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema"> <string>;001;3083680012256;New product name;93;0,95;0,95;;180;GR</string> </ArrayOfString></pre>		
POST	ChangeProducts	Content body containing SerializableDataTable object array	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ChangeProducts		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded, and "Param1" containing a message of "X links changed". If processing failed, "Result" set to "Error: <error message>".		
Note	Adds/updates existing products. Cannot drop products. Input of SerializableDataTable objects, formatting is like the output of the /api/Products GET method that returns serialized product objects. Can be supplied as JSON or XML, set Content-Type header to application/json or application/xml respectively.		
POST	ChangeFile	Content form containing a CSV products file	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ChangeFile		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		

Note	The file is read from the body. This form should contain a file parameter named 'csv', and the Content-Type header set to multipart/form-data. Product CSV can optionally contain an "Action" column specifying if you want to [D]elete files, or [I]nsert/[U]pdate them. Without the "Action" column all lines are processed as insert/update. The format depends on the structure of your product table. CSV can be uploaded even when using a SQL format database.		
POST	ReplaceStrings	Content body containing string array formatted like product CSV	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ReplaceStrings		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	Acts like the endpoint POST ChangeStrings, but here all existing products are dropped and replaced by the incoming record. As it will drop the existing database, the validity check is harsher. If you are using a CSV based database, the endpoint expects the same headers and the same separator character as seen in the original database. If you are using a SQL based database and never used CSV, the semicolon is expected as separator character. All other details listed in Note POST ChangeStrings still apply.		
POST	ReplaceLinks	Content body containing SerializableDataTable object array	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ReplaceProducts		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	This endpoint will drop all existing products and replace it with the given input. Input of SerializableDataTable objects, formatting is like the output of the /api/Product GET method that returns serialized product objects. Can be supplied as JSON or XML, set Content-Type header to application/json or application/xml respectively.		
POST	ReplaceFile	Content form containing a CSV product file	Change products
Endpoint	https://ebs50.local/api/v2.0/Products/ReplaceFile		
Return	EslServerApiObject, with "Result" set to "OK" if processing succeeded. If processing failed, "Result" set to "Error: <error message>".		
Note	Acts like the endpoint POST ChangeFile, but here all existing products are dropped and replaced by the incoming record. All other details listed in Note POST ChangeFile still apply.		

17.8 Account API

17.8.1 GET requests for Account

HTTP VERB	ACTION	Param(s)	Role
GET	GenerateAPIKey		View account page
Endpoint	https://ebs50.local/api/Account/GenerateAPIKey		
Return	200 OK with an API key that is guaranteed unique. Can be used for POST ChangeAPIKey 500 Server Error if the API key unicity couldn't be checked in the user database.		

17.8.2 POST requests for Account

HTTP VERB	ACTION	Param(s)	Role
POST	ChangeAPIKey	Header with key "x-new-api-key"	Change own password
Endpoint	https://ebs50.local/api/Account/ChangeAPIKey		
Return	200 OK if the key was updated correctly. 400 Bad Request if the key is not in a GUID format. 401 Unavailable if no "x-new-api-key" is supplied. 500 Server Error if the API key could not be stored in the user database, or if the key was not unique.		
Note	For a randomized unique API key you can use GET generate API key. If you try to change your API key to one that is already in use for a different user, your new key is not accepted and the other user's key is also removed for safety reasons.		

CMS API for more information.

To configure the ESL Web application in External Content Management System set-up, start by selecting the menu option Products > Configure External CMS (default <https://ebs50.local/database/cms>). On this page you'll be shown an example XML-File, which you can copy to your clipboard.

XML-Example 

```
<EslImageInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <ImageFile>B00FFF08.bmp</ImageFile>
  <ID>018</ID>
  <Note>Cola Cola 33cl</Note>
  <Label>B00FFF08</Label>
</EslImageInfo>
```

Image: <mac address>.bmp / .png / .gif
ID: Product identifier
Note: Description
Label: <8-digit MAC address>

Figure 181: CMS XML example

You can find an example XML and image file in the ESL Web Server Toolkit, in the folder “Examples/External CMS”.

The CMS page will also show where the image/XML files should be placed on the EBS-50 for them to be automatically processed.

Use of the Input-folder

/home/root/ebs_50_run/


Name

- ..
- clidriver
- en
- Examples
- Firmware
- fr
- Input
- it
- nl
- Output
- pt
- Templates
- wwwroot
- certificate.json
- key.pem
- app.config
- appsettings.json
- BarcodeLib.dll
- BarcodeLib.pdb
- BarcodeLib2D.dll
- BarcodeLib2D.pdb

Name	Size
..	
B00FFF08.xml	1 KB
B00FFF08.bmp	65 KB

```
<EslImageInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <ImageFile>B00FFF08.bmp</ImageFile>
  <ID>018</ID>
  <Note>Cola Cola 33cl</Note>
  <Label>B00FFF08</Label>
</EslImageInfo>
```

B00FFF08.xml



B00FFF08.bmp

(Templates and product data will be ignored)

Next>

Figure 182: EBS-50 location of input and output folders

Preferably, you can also add one or multiple image/XML files into a ZIP file and place it in the Input folder. The reason this is preferred is because if you upload an XML file referring to an image that is not yet available, the XML will be deemed unprocessable and moved to the Output folder.

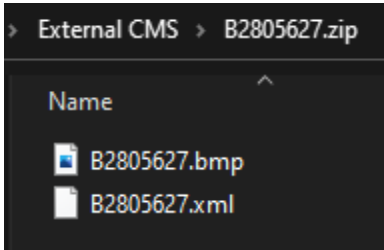


Figure 183: CMS ZIP file with both XML and image

After pressing next, you can select where you want additional tables to be stored. The simplest option is by storing these locally in an SQLite database.

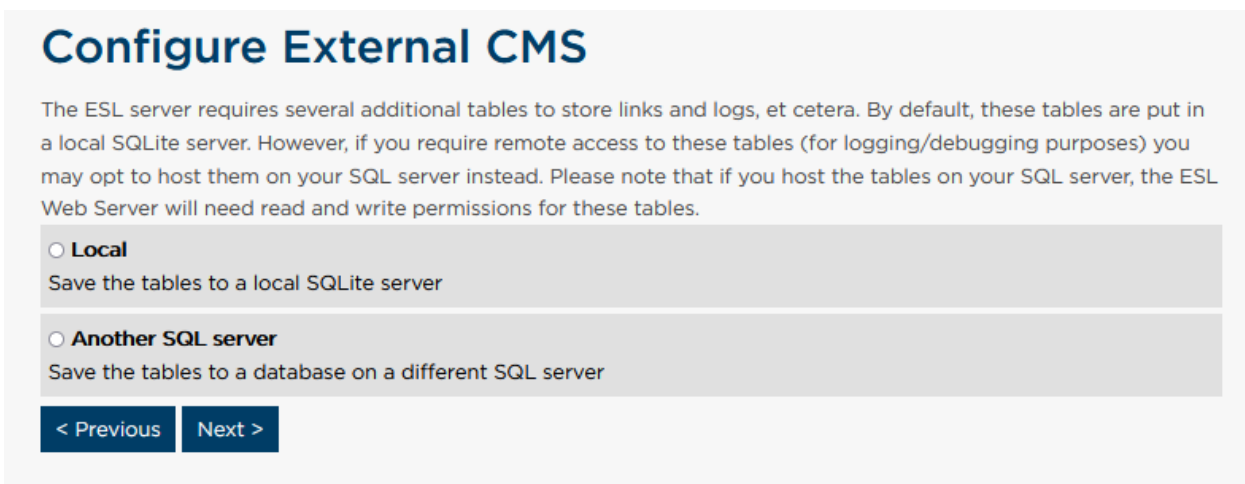


Figure 184: System table storage location

After the wizard, you'll be forwarded to the product page, which will be empty, because product data won't be used.

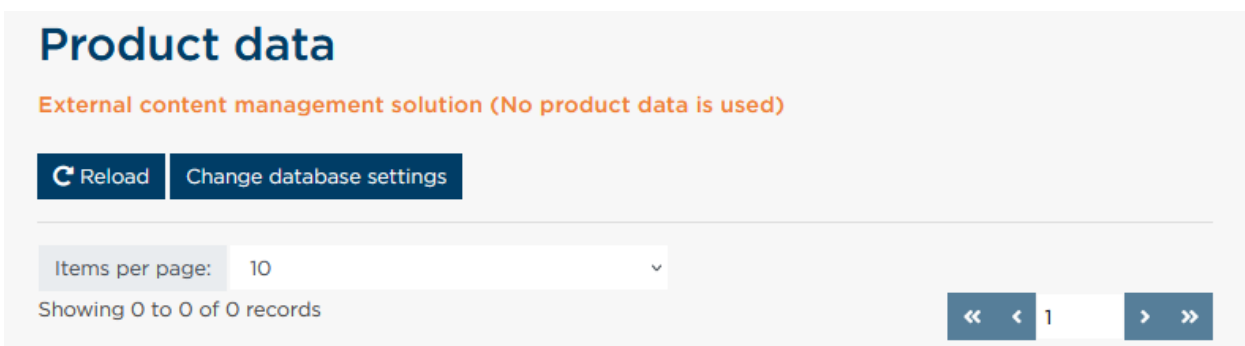


Figure 185: emptied Product table when CMS is enabled

Place the example file from the ESL Web Server Toolkit, subfolder Examples/External CMS into the Input folder of the EBS-50 to link an ESL to an example image.

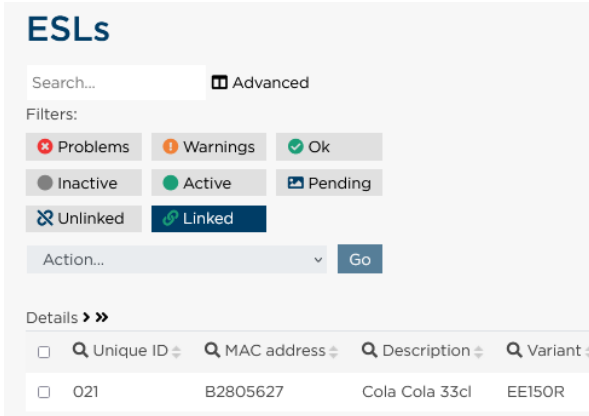


Figure 186: ESL list containing CMS example

Change the name of the example file and both MAC-address in the XML-file to the MAC-address of your ESL to update the image of your own ESL.

When the images for ESLs are generated and supplied by the content management system, then they must meet the following criteria:

- The image format must be either .bmp, .gif, .tif or .png
- The images must be monochrome or black/white/red/yellow (so no gray scale or anti-aliasing allowed!).
- Each image file must be uniquely named for each ESL (it's not allowed to use the same image file for multiple ESLs)

To process image files automatically by the ESL server, they should be placed in the configured 'Input'-folder, accompanied by a matching xml-info file.

The XML info file provides the ESL server application with information on which image should be shown on which ESL and some other optional information which is displayed in the ESL Web application.

The file name of the XML info file is predetermined to <MAC address>.XML (i.e., B2600123.xml).

Example of an XML info file:

```
<?xml version="1.0" encoding="utf-8"?>
<EslImageInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
<ImageFile>B2600123.png</ImageFile>
<ID>018</ID>
<Note>Pickwick Tea Mint</Note>
</EslImageInfo>
```

The variable fields have the following use:

<ID>	Unique product identifier
<ImageFile>	Must match the image file name for this ESL (.bmp, .gif or .png), and must be unique (no two ESLs can use the same image)
<Note>	Note field is intended to supply additional information to the user about the product in the ESL list of the ESL Web Server (useful for sorting or searching)

To unlink an ESL, place an XML-file into the 'Input'-folder with same name format: <MAC address>.XML. To indicate this ESL should be unlinked supply an empty ImageFile-field:

```
<?xml version="1.0" encoding="utf-8"?>
<EslImageInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
<ImageFile></ImageFile>
</EslImageInfo>
```

18 Version history

DATE	NOTES	VERSION
Sept 1, 2021	First preliminary release	IBGV0101
Oct 1, 2021	First official release	IBGV0102
Nov 29, 2021	Major update <ul style="list-style-type: none"> Added support of 22-character demo licenses (30 days by default) When changing the database sync time, the new time is now used immediately Writeable flag incorrectly set after importing/creating config file Fixed losing of cloud system name after update Added Anti-Forgery token validation to Ajax calls, except for GET requests. Added support for SSH key files in addition to SSH password. SSH port can now also be configured for SQL connections over SSH. Improved error feedback when setting up databases. Server address is now hidden for SQLite, as it is not used for SQLite. Users are now able to select the time zone they are in when using NTP servers. Added API CSV as a valid way of retrieving a Database CSV updates failed when a product change file had DELETE rows Added a "Previous" button on the CSV preview page, in case loading fails Changed the timestamp on the backup export to ISO 8601 style Updated the Layout page with a warning when the license timeout is approaching Changed: Never stop posting overview to cloud (only log error once) EBS and ESL licenses are now checked on the API too. 	IBGV0103
Feb 10, 2022	Major update <ul style="list-style-type: none"> Updated firmware for ESLs (V0178) to resolve roaming & show default image' issues Added support of EE293R_NFC (Use new template designer to add NFC records) EbsFinder now also discovers ESL servers on the same network Various performance updates Resolved various database issues (SQL, SQLite, CSV, API and SFTP related) Add EBS-50 passthrough mode (connect an EBS-50 as if it's an EBS-40; enable 'AllowRemoteConnections') Fix finding of products when using linked only products table Added cookie consent warning Improved back-up and restore functionality Fixed association issues after reactivation Added the option to remove all notifications with one click. Improved Cloud connectivity and made it easier to recover from a reflash of the EBS-50 Fixed editing of rows when using multiple column primary keys 	IBGV0105
March 11, 2022	Major update <ul style="list-style-type: none"> Made supplying a 'schema' for MSSQL/DB2/PostgreSQL optional (empty = default) Add Trigger and Staging queries to UI in database wizard to manually create them Corrected queries for creating staging tables and triggers Added External Content Management System (CMS) support (by Input-folder and API) Fixed possible lockup when applying a new connection Add support of processing zip-files (containing images and xml files) Added manual and daily back-up to USB option and added restore from USB Resolved issues with tables with multiple primary keys Fixed 'Immediate Updates' option and removed configurability (is now always on) Show information message on products page in case of database problems Resolved issue with images not updating if products were changed while offline Resolved issue with SFTP causing the file to be processed twice Split 'linked only products' and 'Staging + Trigger' into two separate options Various improvements to 'load link only' product table option Various improvements to 'default' database option (now called 'Basic') Fixed Link-button next to product row (when using multiple primary keys) Fixed issues in database wizard (current and new settings were occasionally mixed up) Fixes for the 'never', 'always' and 'if changed' database options Database wizard now properly checks for existence of both the staging table(s) and the triggers. Fixed possible lock-up on logging of a database exception Updated to ESL Cloud API v1.1 Default configuration (after re-flashing) changed to MySQL with staging table + triggers 	IBGV0106
April 29, 2022	Major update <ul style="list-style-type: none"> Updated from .Net Core 2.0 -> .Net 6 Removed platform dependent graphics library (libGDIplus). Replaced by SkiaSharp New template designer & EBSFinder released Added support of PE293 (powered black & white 2.9" ESL with LEDs, no active NFC) Implemented back-up / restore using a remote SFTP server Added support for periodic fetching of templates from a remote SFTP server 	IBGV0108

	<ul style="list-style-type: none"> • Performance update on loading large CSV files (line breaks within quoted fields are no longer supported) • Allow changing of settings from multiple ESLs at once • Changed EBS settings weren't displayed on EBSFinder until reboot • Unable to add base stations after importing configuration until reboot • Centered text misalignment of wrapped text • Imported fonts weren't always used on EBS-50 & Linux • Styling options of fonts (bold/italic/condensed) weren't always rendered correctly • System recovery issues with ESL cloud • Changing the time of the system could cause next database sync to be incorrect • If EBS-50 time is not set, then time is now automatically set when a user logs in. • Resolved ESL firmware update issue (introduced in V0105) • Racing conditions between periodic syncing and setting up a new connection • Corrected battery low/empty link on Dashboard-page • Allow local API calls in event-handler • Custom column names in CSV files • Linking with white space around ID & MAC input fields • Resolved crash of template designer with a database with more than 50 columns 	
May 18, 2022	<p>Performance update & bug fixes</p> <ul style="list-style-type: none"> • EBS-50: Resolved radio communication performance issues (introduced in V0108) • Updated EBSFinder (Added option to connect by IP (right click) and a refresh list button) • Improvements to import and exporting configurations • Only back-up sensible files of the output-folder (not all processed and temp files) • Backup label-status and base station-status tables as CSV • Fixed issues with importing / exporting of users-table • Fixed 'not licensed' message after importing configuration from another device 	IBGV0109
May 24, 2022	<p>PC-installer update</p> <ul style="list-style-type: none"> • Added website port number configurability • Show 'launch' button after installation to visit the installed website • Added command line arguments: <ul style="list-style-type: none"> ○ --console : run installer as console application (wait for key when done) ○ --silent : run installer as console application (closes when done) ○ --port={port} to change default port number ○ --path={path} to change installation folder 	IBGV0109 (installer only)
Jun 6, 2022	<p>Performance update & bug fixes</p> <ul style="list-style-type: none"> • Fixed configuration issue with Ethernet settings • Add serial to info and license dialog (EBS-50 only) • Fixed XML-serialization option of the REST-API • Fixed crash on generation of images which contained data fields with enters in it • Resolved issue with downloading product data CSV-file from an API 	IBGV0110 1.0.10.0
Dec 9, 2022	<p>Major update</p> <ul style="list-style-type: none"> • Resolved issues when changing column settings in database settings • Stopped creation of .tmp files in Images-folder • Resolved short reconnect loop after reactivating ESLs • Fixed 'product not found' links not being processed when processing a new csv-file • Performance upgrade: Images are now always generated in a separate thread • CSV: Fixed issues with processing product row changes and input folder • Don't remove offline ESLs from the ESL List on unlinking (so it can still be found) • Fixed minor redirect issue after re-login (on Restore/backup page) • Add support of using VIEWS and TABLES without (unique) primary key • Added daily clean-up routine to prevent the file system from overflowing • Fixed issue with connecting EBS-30/40's with older firmware versions • Disassociate all labels when changing LANID/PANID/channel and after reactivation • Fixed base station connection issues • API & GUI: Added uploading full and modification CSV-files • Fixed reported LQI/LQI_RX of ESLs • Changed licensing system (automatic license detection; online activation / registration) • Fixed issues related to ET350/ET1002/ET1100 • Improved efficiency of SFTP (only download if content changes) • Fixed issues with changing id, description and primary key columns • Fixed issues with column headers with spaces • Pre-render images on templates to black/white/(red), so preview matches image on ESL • Performance improvements on image and firmware updates • Fixed firmware update issue on ESLs with external flash memory (versions lyyXzzzz) • Added hostname to SFTP backup name • Limit number of notifications to 100 (it slowed down the GUI) • Fixed double login issue when time was not set 	IBGV0111 1.0.11.14
Jul 19, 2023	<ul style="list-style-type: none"> • Added EE261R (2.6") support / EE214R support (2.1" with higher resolution than EE213R) 	IBGV0113

	<ul style="list-style-type: none"> Fixed issues with EE202R support Added Calendar / Room signage support Added layering support (multiple products / events on a single display) Resolved various Oracle issues Installer update: (to run multiple instances on same server): <ul style="list-style-type: none"> --console : run installer as console application (wait for key when done) --silent : run installer as console application (closes when done) --port={port} to change default port number (default: 5001) --website={name} : Web site name in IIS (default: "OpticonESLWebServer") --apppool={apppool} : App pool name in IIS (default: "OpticonESLServerAppPool") --path={installation path} : Installation path (i.e: "C:\Opticon\ESLWebServer") Updated tool kit with new firmware and default templates EBS-50: Resolved rare issue with random restarts Fixed issue with deleting products not being reflected on ESLs Fixed issue with storing images as file (bmp) Fixed issues with parsing product and link CSV-files Added support for downloading product CSV-files from FTP (not recommended) Performance improvements on executing large queries and product changes Fixed database error on dashboard when using CMS mode Template editor: <ul style="list-style-type: none"> Allow Select, move, copy cut, paste of multiple objects Added Calendar (iCalendar / .ics) support Added Layering support (multiple products / events on single display) Added support for black/white/red/yellow displays Automatic resizing of templates when changing variant/portrait mode Added variant selection on preview dialog by right-clicking 	1.0.13.0
Oct 4, 2023	<ul style="list-style-type: none"> Fixed issue when editing products from the UI if the key column contained a dot or was empty Fixed layout issue on "reactivate ESLs"-page Database triggers updated so that changing a key value is now better supported Fixed issue with Oracle v19 and added support for Int64 Importing fonts when uploading a Template zip now supported on Windows Fixed an issue with long filenames not being supported on the ET-1002 "Restart service" option from EBS-50 now also supported on Windows and Linux New check for the existence of staging tables and triggers Triggers on the link table turned off by default for performance reasons Reset option added to the Edit page of Base Stations Fixed issue where the status table could be updated during synchronization causing problems Stability upgrades for Oracle databases speeding up query execution Quick Link page now offers feedback if the link is made to an offline ESL Fixed issue where images for offline and pending ESLs were counted on the dashboard as "OK" When connected to Cloud Dashboard the ESL Web Server will now show the system name in the header Added syntax highlighting to SQL code shown on Trigger/Staging status page and added manual override Windows installation now runs as a service and no longer needs IIS Manager to work 	IBGV0114 1.0.14.0
March 7, 2024	<ul style="list-style-type: none"> Added API CSV explanation Redesign of the front page Overhaul of text formatting; indentation, references, font styles are more consistent 	IBGV0114 1.0.14.1
March 8, 2024	<ul style="list-style-type: none"> Waiting screen added. Web interface comes online even if the code managing the ESLs is still busy booting. Preliminary information on tunnelling (feature to be expanded) added. 	IBGV0115 1.0.15.0
April 10, 2024	<ul style="list-style-type: none"> Fixed issue when unlinking through Link CSV files causing links not to be deleted Fixed issue with short CSV database files where the delimiter check would also check comment lines for a delimiter, causing the determination to fail 	IBGV0115a 1.0.15.1
July 22, 2024	<ul style="list-style-type: none"> PostgreSQL fix, allowing View tables to be found correctly. Fixed issues with switching database types (some properties of old connection were not cleared correctly) Minor issue with flipped display images fixed. Improvements to image verification after sending data to large e-paper displays (4" and above). Repeating anti-forgery tokens in the UI have been removed. Repeating SignalR library loading in the UI has been removed. Added support for brackets in the text of product table data. Speed increase on parsing CSV tables by streamlining the SQL shadow table queries. HTTP Clients that talk to external resources (API-CSV, Cloud Dashboard, License check) now come from a shared pool, port exhaustion (though rare) should not occur anymore "Default image on unlinking" option now available on the Link table page Fixed a bug when layering and using a vertically oriented EE420R template API endpoint for activating ESLs was inaccessible. Access restored and improved the user feedback Web interface code overhauled to ensure consistency of styling and libraries 	IBGV0116 1.0.16.0
September 9, 2024	<ul style="list-style-type: none"> Fixed an issue with multi-line insert queries, they are now properly capped at 1000 lines. ESL Web Server / ESL Cloud Dashboard support of automatic changing of the post internal (load balancing) 	IBGV0117 1.0.17.0

	<ul style="list-style-type: none"> • Communicating with ESL Cloud Dashboard now only sends changes since the last status update • API-CSV and SFTP would interpret empty results as valid CSV-files. It now properly falls back • Fixed the issue that when an empty database was fixed labels with a "Product not Found" wouldn't update • Moved the database types for connection in the Products menu dropdown to generic select page • When Manual CMS is enabled, Calendar synchronization is not possible. Syncing, now stops with warning • Endpoints added to Products to allow retrieval of the information from the Description and ID column. • Fixed an issue where some API endpoints would return no data or return a 404 exception. • V2 Endpoint added to Links API to support product ID's containing URL-reserved characters. 	
<p>January 31, 2025</p>	<ul style="list-style-type: none"> • Renamed EE261 to EE266 and 2.6" to 2.66" • Added SE-range support (SE-214x, SE-266x, SE-290x, SE-420x, SE-583x, SE-1160x) • Fixed SFTP/SSH-key files issues • Added API endpoints for rebooting the EBS-50 / ESL Web Server software service • Fixed: Backup of links not performed when the refresh method was set to Manual csv • Improvements to daily backups • Fixed issue with selection of multiple ESLs • Added check if selected firmware is already in the EBS, if so, do not load it again and just start the update • Made moving of ESLs to another EBS faster • Fixed deletion of key files in the output folder during cleanup • Fixed redirect issues upon clicking on dashboard tiles • Allow duplicate mac addresses in link files to avoid the whole file from being dropped • Added preliminary support for SE-290A / SE-290AR • Added dimming of LEDs when duty cycle is high (only for ESLs with RGB) • Added possibility to scan a range of IP addresses in EbsFinder 	<p>IBGV0118 2..0.2.8851</p>
<p>July 15, 2025</p>	<ul style="list-style-type: none"> • ESL Web Server (Windows/Linux) Added automatic firmware update checks • EBS-50: Added automatic firmware update download and installation on EBS-50 (configurable) • Resolved high CPU load issue on EBS-50's being remotely controlled • Fixed firmware update issue on the SE-583RY (EBS-50 only) • Fixed rare exceptions when log folder did not exist • EBS-50: Reduced memory usage by not keeping any rendered images in memory • Fixed issue with back-up files containing .zip files (kept increasing in size) • Performance improvements on processing databases, links and generation of images • Resolved issues with EBS-50 mac addresses. (could either show 00:12:6A:xx:xx:xx or 38:89:DC:xx:xx:x) • Filter ESL servers from the discovered list of EBS • Added support of EBS-4x firmware with bootloader and improved update reliability • Allow adding base station with MAC address only (instead of IP) • Unescape regex strings in templates, so <code>\r \n \t</code> can be used on product data • MS-SQL: Fixed issue with multi line insert queries and autoincrement columns • Added endpoint to reactivate all: <code>/api/ESL/REACTIVATE/<MAC>/<duration in sec></code> • Added <code>api/ESL/REACTIVATE/KEEP-ALIVE</code> endpoint to reset activation timer • Removed obsolete TFT-variants support (ET350 / ET1002 / ET1100) • Allow EBS-4x firmware updating across different subnets (requires IBUV0072 or higher) • Resolved issue with double log messages after logging/database problems • Added Firebird SQL database support • Added support for loading multiple images on ESLs (by CMS or API). Requires firmware V0195 or higher • Removed support of storing images as files in the Output-folder (images are now always stored in Images-table to be able to support loading multiple images on ESLs) • Fixed communication issue when connecting to an EBS on a different subnet • Added API endpoints to support the new EslConnect app with BLE labels • External CMS mode: <ul style="list-style-type: none"> ○ Added support for uploading images and XMLs for multiple MACs in one ZIP file. ○ Added support of LED and NFC settings in XML-files ○ Fixed relinking the same product ○ General Bug fixes and improvements ○ Added support of loading multiple images • SE-290A(RY): Added handshaking, sequence number checks, retries and feedback on button press events • Added support for a brightness parameter in LED API command and templates (SE-Range only) • Template designer: <ul style="list-style-type: none"> ○ Added multiple image support ○ Show only Templates for selected variants ○ Allow preview of specific color variant ○ Removed save & reset button (changes are now instant) ○ Fixed rare logging exception at start-up ○ Allow more than 5 conditions in the condition editor ○ Fixed B/W/R(/Y) support to SE-1160x • Added support to run ESL Web Application on Azure (for the EslConnect app) • Fixed LED control command issues by API for EE- and PE-labels • Fixed issues with CSV-files containing NULL characters • EBS-50 Changed MySQL database engine to Aria (less chance of corruption on power loss) 	<p>IBGV0119 3.0.0</p>

	<ul style="list-style-type: none"> Expanded the Log API endpoint. Now you can request how many items per page Improvements related to downloading CSV files by SFTP and using SSH key files Fixed issue with expired self-signed certificate when time was not set upon generation Added EBS-41 support (EBS-40 with PoE) Added support for OTF and TTC font files working with Template export and import. Increased image update timeout on image transfer with a lot of data Fixed ESL status issue after a restart Added 'SET_LANID' and 'CLEAR_LANID' endpoint 	
July 25, 2025	Bug fixes <ul style="list-style-type: none"> Show base stations on different subnets (when currently connected) (discover / move to ebs) Fixed reactivation issue on SE-214F API endpoint api/ESL/{mac}/IMAGE_STATUS API endpoint cms/uploadzip CMS: Fixed issue where images were unnecessary resend or showed 'error' after a reboot CMS: Fixed issue where identical images were unnecessary resend upon uploading a new zip-file SE-290A / SE290ARY: Customizable button actions (requires firmware V0197 or higher) 	IBGV0119 3.0.1
August 8, 2025	<ul style="list-style-type: none"> Improvements to storing settings and clean-up of legacy settings Fixed ESL variant recognition issue on certain models upon receiving info (i.e. EE153R / EE293R) Decreased file system write-actions on EBS-50 (less chance of corruption due to sudden loss of power) Added 'Allow remote connections'-option to EBS-50 configuration page (for easier access) Added clickable IP-addresses on base station page Added "Images" table to log table overview Preparations to push additional info to ESL Cloud and trigger automatic firmware updates 	IBGV0120 3.0.4
September 2, 2025	Hotfix <ul style="list-style-type: none"> Fixed crash when 'shrink to fit' text option with an empty product table field Fixed issues with CSV-files when having multiple primary key columns Raised the limit for the 'Import Backup' action to 100MB 	IBGV0120a 3.0.5
September 25, 2025	Bugs fixes & new features <ul style="list-style-type: none"> Fixed issue with the displayed template order Fixed issues with layering (showing multiple products on a single ESL) Improvements to the importing of configuration files, templates, and back-ups Added headless operation feature (use the 'DisabledGUI' application setting) Added API-endpoints for roaming, changing application settings, perform ESL firmware updates Fixed USB Realtek Wi-Fi driver issue (TP-Link T3U) Added preliminary 1.54" (ME-154R / ME-154RY) support with 200x200 pixels (1.5" HD) 	IBGV0120b 3.0.6
October 22, 2025	Critical update <ul style="list-style-type: none"> Resolved rare issue with corrupt SQLite / MySQL databases after sudden power-loss (EBS-50) Resolved rare application reboot upon generating new images (EBS-50) Added preliminary 2.66" support with 360x184 pixels (2.6" HD) Template designer: Fixed issues with scrollbars on 200%/400% zoom, skiasharp.dll and first boot issue Updated jQuery 3.3.1 to 3.7.1 and other libraries (incl. removal of unused files / libraries / themes) Fixed issue with importing backup files from systems using a CSV/SQLite set-up (EBS-50 only) Updated default Example configuration files with improved default settings SE-290A: Extended support of configurable button events and actions (requires V0199 or higher) 	IBGV0121 3.0.8
November 7, 2025	Hotfix <ul style="list-style-type: none"> Resolved issue with layered templates Resolved issue with SE-420xx firmware update Fixed issues with executing LED settings (by API and templates) Fixed unnecessary image generation/transmission upon product/template updates when nothing changed Added possibility to respond to a web request (fired by the event handler) with an API-call request Security update and fixes (method was ignored) for API-calls send by event handler Improved SE-290A button event handling (requires firmware V0200 or higher) Released SE-290A white paper on button event handling 	IBGV0121a 3.0.9
November 24, 2025	<ul style="list-style-type: none"> SQL (basic mode): Row changes in GUI were processed twice SE-290A performance improvements on button handling (requires firmware V0204 or higher) Roaming: Added firmware version check (EE-range (lxxV0164 or higher) / SE-Range (lxxx0203 or higher). Roaming: Sped up updating of the EBS roaming list, so channel and EBS changes are reflected sooner EBSFinder / Template designer: Sped up EBSFinder search results Fixed reactivate "all types" option Fixed issue with incorrectly processing of reported image update errors Added ME153R variant with 152x152 resolution Fixed issue with unlinking of ESLs reporting an image error (due to missing template and such) Fixed issues with 'resend image' action (all pages are now resent and a potential crash fixed) Improvements for EsIConnect (App for BLE ESLs) Added 'channel' column to label status table, so all most recent connection info is present to the logs Resolves issues with unnecessary system settings spinners 	IBGV0122 3.0.11

<p>March 6, 2026</p>	<p>Bugfixes & improvements</p> <ul style="list-style-type: none"> • Added LSL-104 / LSL107 support • Removed models from reactivate variant list that don't need activation • SE420RY: Fixed incorrect address range in reactivate window • Resolved ghost link issue when switching between databases • API improvements to linking/unlinking (with and without layers) • ESL Firmware update reliability improvements • Fixed ME-153R rotation bug • Improved API feeding by local loopback (localhost / 127.0.0.1 / ::1) • Show last info as last poll when last poll is unknown • Allow placing 'backup_***.zip files in the Input folder to import a backup file • EBS-50: fixed rare start-up issue (when MAC address was not set or invalid) • Improvements to the importing of back-up files • Fixed issues with the use of transparent PNG images in templates • Export now outputs all 5 important logs (Event Log, Change Log, Log Messages (esllog), Base Station Status and Label Status) for support purposes • Fixed calendar synchronisation issue • EE293R_N: Fixed issue with NFC content not being send (introduced in V0119) • Fixed api call ESL/{MAC}/REFRESH_PAGE • Wizard improvements to the creation of triggers • CMS: Fixed issue with certain images being only partially loaded from a zip-file • Resolved issue with running headless (without GUI) • Resolved rare issue where linked ESLs weren't shown as linked on ESL page • Improved logging (i.e. import errors are now showing in the log) • Resolved 'primary key not found' (and 0 products loaded) error after fixing a non-working SQL connection • Label status information is now preserved when upgrading from version 118 or lower • Fixed bug where remotely connected EBS-50's could send unwanted 'show default image' requests • Fixed issues with 'load only linked products' causing 'Product not found' errors and showing incomplete results on the products tab • Added products V2 API endpoints equivalents of the UI's "Upload CSV File" option. • Added links V2 API endpoints equivalents of the UI's "Upload CSV Link File" option. • Added account API endpoints to generate a new random API key and to change your API key. <p>Template designer:</p> <ul style="list-style-type: none"> • Fixed issue with LED, button and NFC object properties not showing the correctly value • Fixed issue with DEL and arrow keys not working correctly in the template editor • Fixed issue with using transparent images in templates • Fixed issue with unwanted font changes when selecting a text object • Added preliminary 2.6" HD template support <p>EBSFinder</p> <ul style="list-style-type: none"> • Improved discovering of base stations 	<p>IBGV0123 3.0.14.9751</p>
<p>April 2, 2026</p>	<p>Bugfixes and performance</p> <ul style="list-style-type: none"> • SQL performance updates (image table) • New SQLite driver (to support Windows ARM64) • Fixed issue with listing VIEWS on MySQL • Resolved EE420R/EE750R firmware update issue • Backup SQL tables with a DROP TABLE query to allow altering of the product table and restoring content • Performance updates to loading of the list of ESLs from the base station • EBS-50: Added detection of a failing internal EBS process (reboots when it occurs) • Performance update on the dashboard and base station overview • Fixed: When processing CSV files from input-folder they only moved to processed if any rows changed. • Cloud dashboard: Fixed issue incorrect online/offline/busy base station counters • Fixed API issues with uploading CSV files • Added API-endpoints for EBS-4x firmware updates • Fixed rare issue where ESL-product link alterations weren't detected until the next restart • Resolved issue with product table backup, which contained products with line separators • Fixed rare date time issues with notifications • Added hostname input restriction (Hostname must be 1–32 characters, letters/numbers/hyphens only) <p>Template designer (1.1.23.9799):</p> <ul style="list-style-type: none"> • Resolved unnecessary error message when importing a back-up • Fixed issue with loading example data from a back-up 	<p>IBGV0124 3.0.17.9866</p>
<p>April 15, 2026</p>	<p>Hotfix</p> <ul style="list-style-type: none"> • Resolved issues with MS-SQL, event handlers and importing backups (introduced by new SQLite driver) • Improved user feedback on ESL firmware updates when selecting identical or incompatible firmware • Toolkit: Updated ESL firmware (ME-154RY, SE-214F, SE-1160RY, SE-290A, SE-420RY) • Templates & designer: Resolved issue with regular expression containing a backslash (\) 	<p>IBGV0125 3.0.19.9898</p>