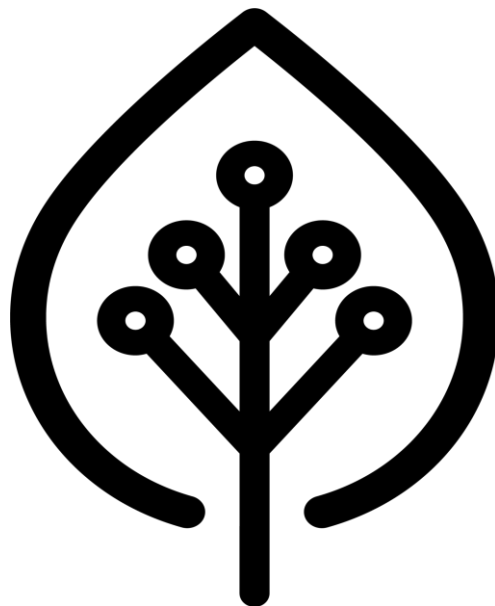


Installation and User Instructions

LinkRay



September 2024

User Manual Version 3.11 (Firmware Version 1.3.13)

EN

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Document revisions

Date	Version Number	Document Changes
24-04-2024	3.01	Updating for firmware release 1.3.0
02-05-2024	3.02	Updating for firmware release 1.3.2
16-05-2024	3.03	Updating for firmware release 1.3.3
07-06-2024	3.05	Updating for firmware release 1.3.6
21-06-2024	3.06	Updating for firmware release 1.3.7
26-06-2024	3.07	Updating for firmware release 1.3.8
01-07-2024	3.08	Updating for firmware release 1.3.9 Updated information regarding phase rotation
31-07-2024	3.09	Updating for firmware release 1.3.11
19-8-2024	3.10	Updating for firmware release 1.3.12
04-09-2024	3.11	Updating for firmware release 1.3.13

Firmware Revisions

Version Number	Document Changes
1.3.0	<ul style="list-style-type: none"> Payment integration Charger Priority NEM12 support Timezone support for all times and dates shown Dashboard changes Meter voltage reading Charger friendly names Sorting of chargers shown on info screen now alphabetically Remote connection timeout set to 200 seconds for NAT routing
1.3.1	<ul style="list-style-type: none"> Removed web messages in RFID page and potential for the RFID save button not being accessible Support for separate meters for A and V measurements Update meter config variables now Remote start of unauthorized tags now allowed
1.3.2	<ul style="list-style-type: none"> Fix for auto refresh with friendly names populated Dual connector chargers now use unique stack levels Potential UI freeze modification Charger changes now actioned immediately (reboot needed before)
1.3.3	<ul style="list-style-type: none"> Import/Export settings now supported Start time in the automatic firmware update page shown correctly when 00:00 Auto-refresh on L3 instantaneously power (info page) fix
1.3.4	<ul style="list-style-type: none"> V not shown on my meter UI Thread lock out in some instances. BV blink charger support Fix for split phase and simulated chargers
1.3.5	<ul style="list-style-type: none"> UI lock when going over group limit Split phase mode A reading fix Malformed transaction in some csv files
1.3.6	<ul style="list-style-type: none"> Blink brand chargers now start at a minimum of 6A (due to charger start limitations)

	<p>Transactions could temporarily give an error when writing to database</p> <p>OS fix for potential PMIC brownout issue when system is idle</p>
1.3.7	<p>Transactions now show up locally when connected to a CSMS.</p> <p>Changes for cached offline transactions now translate the local transaction ID to that of the CSMS when reconnecting.</p> <p>More robust handling of transactions with commas in descriptions on the charger details</p>
1.3.8	<p>Correction to some transactions when operating with an internet outage then reconnecting to CSMS shortly after.</p> <p>Change to apply static IP address without needing a reboot.</p>
1.3.9	<p>Added control over the TxDefaultProfile sent to chargers on boot and support for flexible minimum charger values.</p> <p>Fixed a UI item showing number of connected chargers on info screen.</p>
1.3.11	<p>Adding site graph visualization to Transaction page</p> <p>Proxy support to tunnel to neighboring IP devices</p> <p>Ethernet, Wi-Fi and 4G priority route support on network screen now.</p> <p>Fix for some meter configuration issues when parameters are missing.</p> <p>Support for Autel MaxiCharger (leading slash issue with charger and adding this for CSMS communications)</p> <p>4G connection watchdog update</p> <p>Remote services are not restarted when linkray service is restarted (this makes uploading meter settings easier)</p> <p>Voltage input boxes have more error checking for human error</p> <p>Meter voltages of 0 are discarded now rather than used for computation.</p> <p>Group limit description now clearly show measurement is in Amps</p> <p>Online charger count on Info screen now functional</p> <p>Allow offline charging (standalone mode) by default is enabled now.</p>
1.3.12	<p>Graphs with missing meter data don't show connected lines between missing points.</p> <p>Meter modbus voltage and current datatypes can be different</p> <p>Testing with Alfen and Autel (Sevadis Maxicharger) chargers</p> <p>FIFO mode in groups now functional</p> <p>CSMS URL + identity condensed into one line</p> <p>Voltage shown to 3 DP</p>

	<p>Proxy routing now handles continuously open connections</p> <p>Enhanced modbus library integration</p> <p>RFID now case insensitive</p> <p>"Seconds" removed from system uptime, LC uptime</p> <p>Meter graph shown in local time not UTC.</p> <p>Degraded mode (meter not working) support added</p> <p>Issue with some charger names affecting transaction log</p> <p>Measurands showing historic data if chargers stopped sending updates now fixed.</p> <p>Meter values now shown on Info screen.</p>
1.3.13	<p>Graph of transactions supports stacked and non-stacked modes of viewing charge sessions.</p> <p>Charging schedule times now link to branding and selection is inverted for consistency.</p> <p>Anti spamming measure have been added to stop CSMS connections opening and closing more than once per minute.</p> <p>CSMS URL / Identity fix</p> <p>Factory reset now includes removing network settings.</p>

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1 About this user guide

Who is this instruction manual for?

The LinkRay instruction manual is for electrical engineers and product installers. It includes information on how to assemble the LinkRay and use the Versinetic software to configure the LinkRay.

Wiring work involving live electrical current should always be performed by a qualified electrician.

Updates to this user guide

Firmware and Documentation updates can be found at

<https://docs.versinetic.com>

2 Safety Instructions

WARNING



Read and understand this manual and its safety instructions before using this product. Failure to follow the safety instructions can result in serious injury or death and/or damage to equipment.

Explanation of safety warnings

Versinetic use the following safety warnings and messages in our documentation:

NOTICE

Indicates information considered important, but not hazard-related.

NOTICE

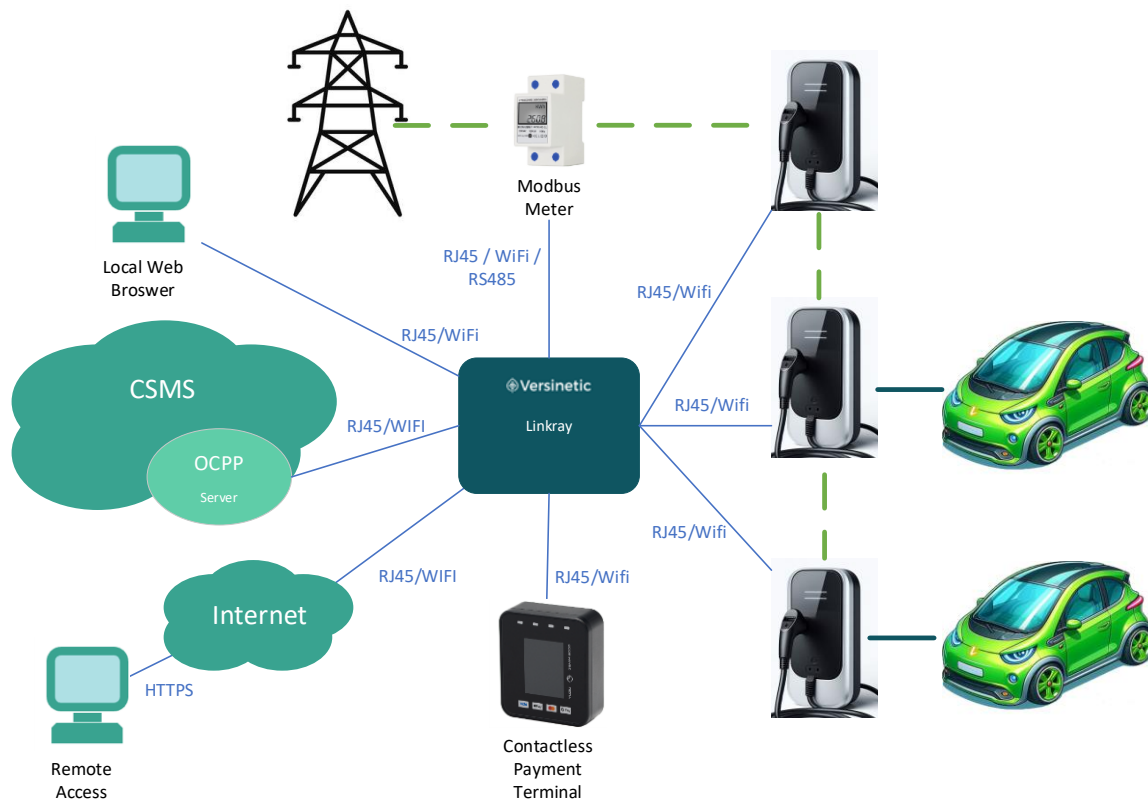
Indicates there is a risk of electrostatic discharge (ESD). Take anti-static precautions. Failure to do so could result in electrical damage to equipment.

3 LinkRay overview

LinkRay is a local controller for the dynamic load management (DLM) of EV chargers.

It is designed to be installed onsite, local to the EV chargers, where it:

- Monitors OCPP messages relating to charging limits
- Monitors energy use on-site using a meter using TCP/RS485 (optional)
- Automatically adjusts the EV charger limits so that the load is balanced to the site.
- Works with single and three phase systems
- Works with AC and/or DC chargers
- LinkRay can be configured locally or remotely using its website interface
- Support for whitelists of RFIDs (when used without a CSMS)
- Downloading of transactions is now supported in CSV and NEM12 format
- Supports grouping of chargers for separate cable run limits, and priority channels
- Payment terminal integration is included (optional).
- Network proxy allows access to configure other 3rd party IP devices using Linkray



Intended use

LinkRay is designed to be used in two scenarios:

- Online - As a local load balancer, authorizing transactions through a cloud-based charge station management system (CSMS).
Provides backup of transactions in the event of an internet outage.
- Offline- As a local load balancer with local authorization.
In this mode RFID tags are used and/or the payment terminal

Installation

LinkRay can be DIN mounted in an equipment cabinet, this is not essential and it can be used without being secured to a DIN rail if preferred.

To use the LinkRay outdoors, you must install it inside a suitable waterproof enclosure. For details, contact customer support.

LED Indication

One side of LinkRay features a dual Green / Red LED that gives an instant indication of status.

The follows states can be shown:

- Solid green** - Starting up / updating
- Blinking green** - Normal operation
- Solid red** - Fault / Error condition

Faults include:

- CSMS field is populated but LinkRay disconnected from the CSMS.
- One or more configured chargers are not currently connected.
- RS485/TCP external meter configured but not connected

Faults are also shown in the web interface information Info page, for example:



Specifications

Attribute	Description
Dimensions	110mm x 110mm x 20mm (approximate)
Weight	150g (approximate)
Board	LinkRay circuit board used for communications with the server.
Ports	1 x RJ45 for Ethernet connection Wi-Fi Antennae 1 x RS485 connection
Wi-Fi Frequency	2.4Ghz
Input voltage	8-15V (Nominal 1 Watt)
Operating Temp	-20c to +70c, 5% till 95%, non-condensing

4 Quick Start Steps

When setting up a new device these are the recommended steps:

- Connect via
 - Remote Access (see Page 55)
 - Wired Ethernet (see Page 17)
- Log in using the **Assembler** login and default password (see Page 21)
- Configure the network (see Page 23)
 - Make Ethernet the primary connection, if possible, for maximum reliability.
 - When using DHCP be sure to add your MAC address of the LinkRay to your server or router so that the IP address doesn't move in the future, otherwise choose a static IP address for LinkRay.
 - If you are intending on using the modem for communications, ensure there is no gateway on the Ethernet/Wi-Fi otherwise routing will not go over the modem for external communications.
- Change the passwords from the defaults for security purposes (see Page 80).
- Configure parameters on the **Configuration** page for your site requirements.
 - Include the CSMS uplink if you have a CSMS backend (see page 29)
 - Enter the site power input (see page 39)
 - Enable the external meter if applicable (see Page 62)
 - Configure chargers to point to the IP address of LinkRay (see Page 32)
 - Ensure the chargers, PC/Laptop and internet connections are configured on networks that can communicate with each other. If in doubt request help from Versinetic support or your inhouse network engineers.
 - Wi-Fi and Ethernet can be enabled simultaneously on different networks if required.
 - Ensure that if a network is internal use only it does not have a gateway set otherwise this may be used for remote access connections in error.
- Configure each connected charger (see Page 32)
 - Set the mode of operation for the charger either Single/Three Phase
 - Physical electrical connections of the chargers (L1/L2/L3)
 - Maximum power each charger can utilize.
 - Current reported in Amps or Watts in their charger's smart profile
 - Assign a friendly name (optional) for each charger
- When running offline (no CSMS)
 - Configure RFID tags if available (see Page 47)
 - Configure payment terminal if available (see Page 51)

5 Setting up the LinkRay hardware on Ethernet

What's In the Box:

1. LinkRay unit
2. LinkRay Power/RS485 Cable
3. Wi-Fi antenna

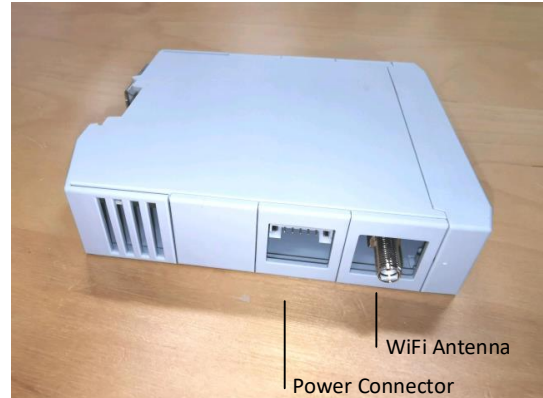


Not included:

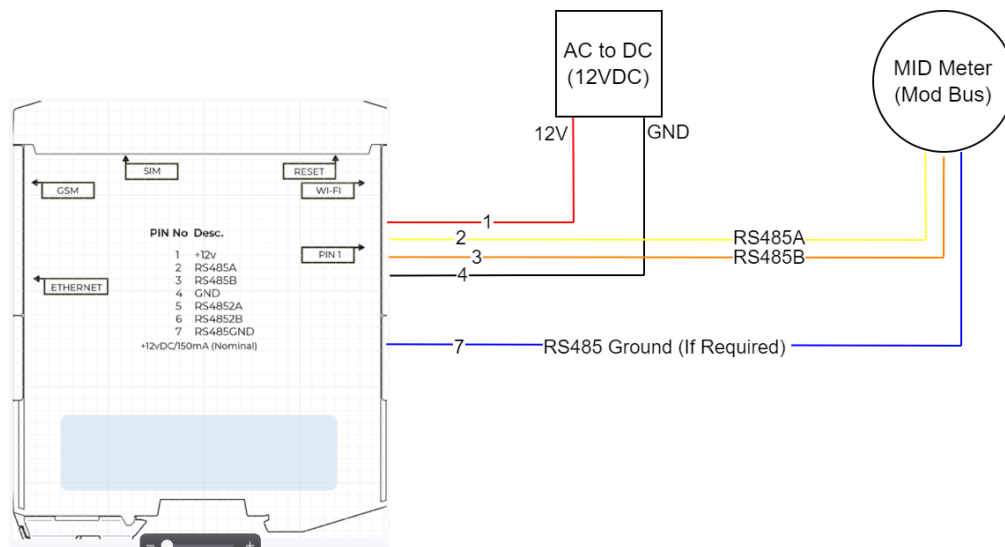
1. 12V DC PSU – 1A will be sufficient
2. Cellular Antenna

A quick way to set up LinkRay is to use Ethernet on a DHCP enabled network.

1. Firstly, connect LinkRay to the network using the exposed RJ45 port.



2. Next connect the power connector pin out is shown below:



Pin out with wiring colours as supplied for connection.

See Page 84 for details on external meters.

⚠ CAUTION

If you need to remove the cables from the LinkRay, hold the connector housing and gently pull the cables free. Applying too much force to the cables can cause damage.

Note: The system will take 1-2 minutes to boot, and if it needs to update will take up to an additional 10 minutes (depending on the number of updates).

After booting the device will be accessible on the network using:

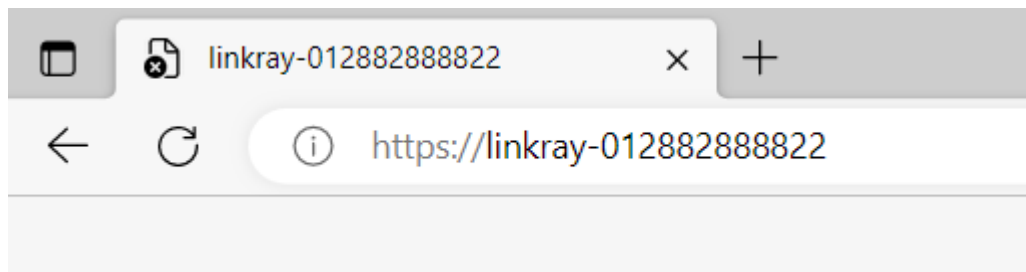
1 – Remote access services (this is the easiest and preferred mechanism)

To connect using the remote services see chapter 17 Remote Access to LinkRay devices. This involves an account to be sent to you to manage your devices all in one area and is the quickest way to add new devices, you simply plug them into an Ethernet cable with internet access and then connect to them when they have booted by their name under your account which is automatically set up for you.

2 - Its network name

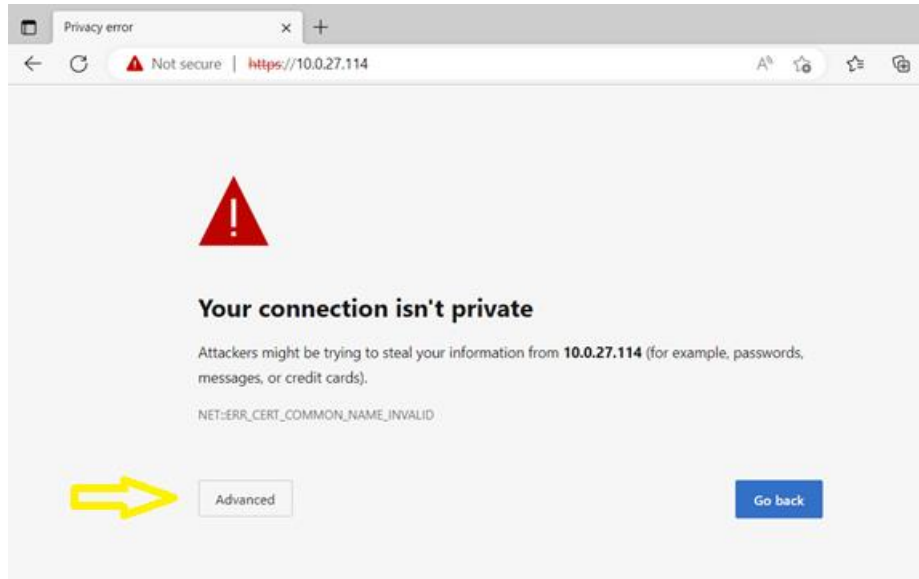
This network name is supplied in the format of linkray-XXXXXXX for example:

This network name can be entered into a web browser rather than using the IP address given by the DHCP server:



If this fails the IP address can be found by looking at the DHCP list on your server/router for the network name linkray-xxxx or by using an IP scanner such as angryIP (see <https://angryip.org/>)

Note: No valid signed certificate will be available for this network name, as this is a HTTPS secure connection it will give a browser warning that must be dismissed to continue to the website:



Click on “Advanced”, then “Continue to xx.xx.xx.xx”:



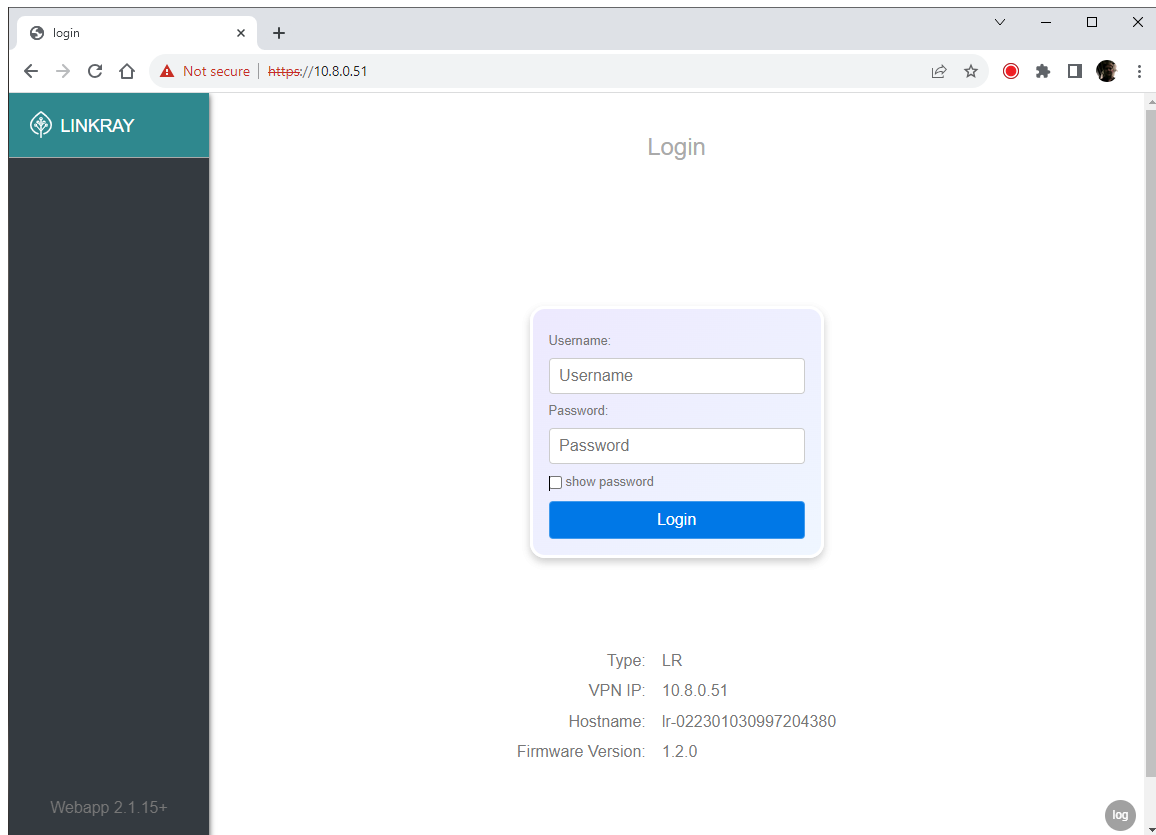
Once connected you should log on to the web interface, see Logging-on for the first time on page 21.

6 Logging-on for the first time

There are three default accounts, each with different permissions.
For setting up the LinkRay, log in as **Assembler** using the follow details:

Username: Assembler

Password: 2WW%[4%9nU`HWhGe



When you log in, the browser refreshes and shows the **Info** page. You can now use the various settings to configure your LinkRay.

7 Logins and user types

There are three default logins for LinkRay. The three logins represent the three user types, each of which has access to different features based on their level (level 1 is lowest and level 3 is highest).

Level 1 login:

Username: EV

Password: r&`kxa6D=/7mAZy!

Level 2 login:

Username: Installer

Password:]n%?4BUq{?WGEkNx

Level 3 login:

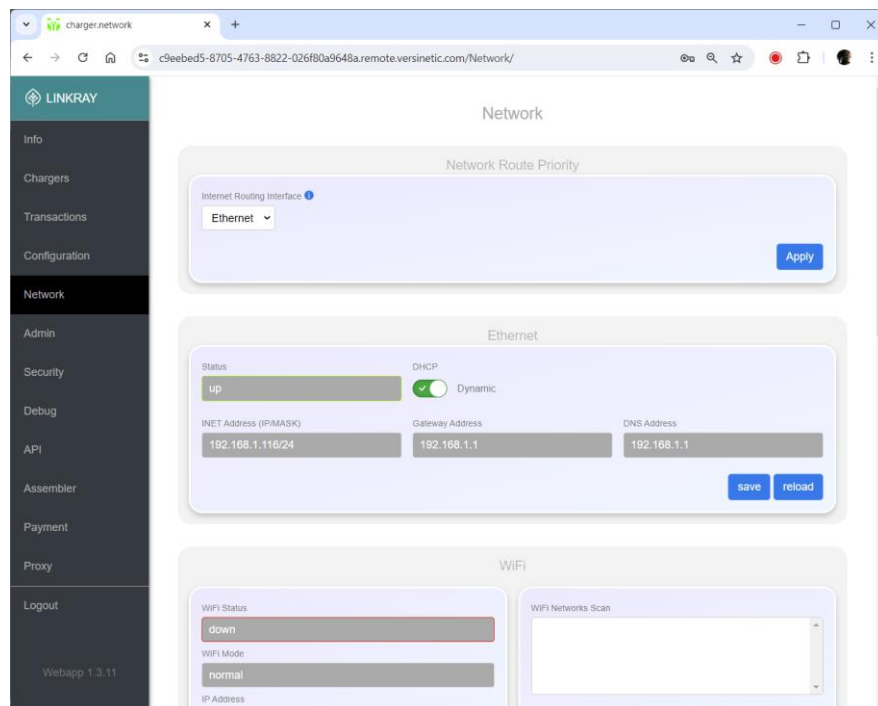
Username: Assembler

Password: 2WW%[4%9nU`HWhGe

Note that the Assembler is the highest-level access, most of the LinkRay settings in this document are assuming the user has logged in with this level.

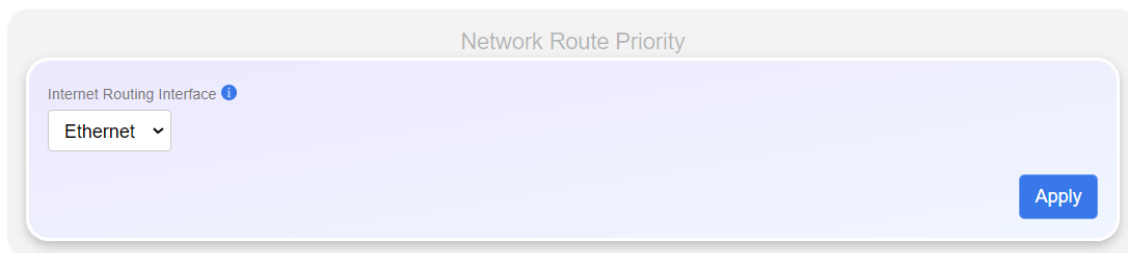
8 Network Setup

Once connected to LinkRay you should confirm your network settings in the Network page:



Network Route Priority

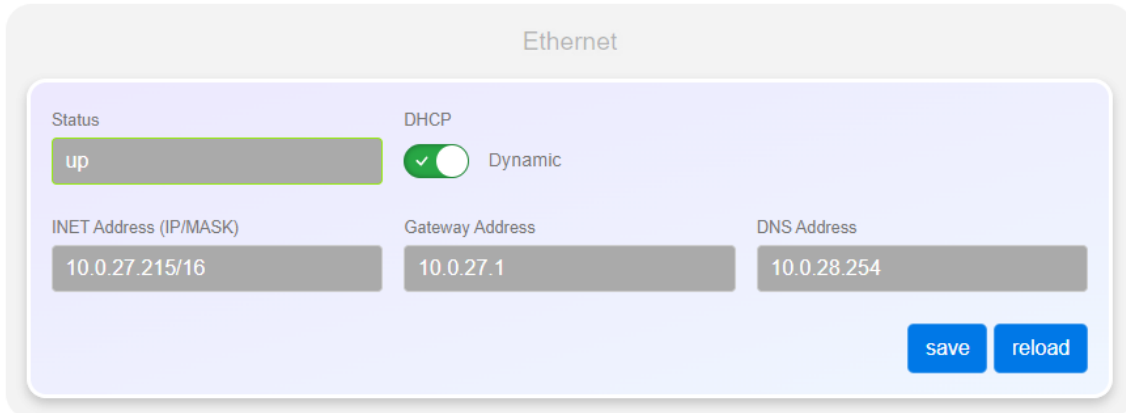
If you are using multiple networks (Ethernet + Wi-Fi), (Ethernet + 4G) you should tell LinkRay which connection gives you a path to the internet by selecting the internet interface:



You may wish to set a number of chargers up on Ethernet, then use the 4G onboard modem for remote access/monitoring, in this case you would select 4G in the box here.

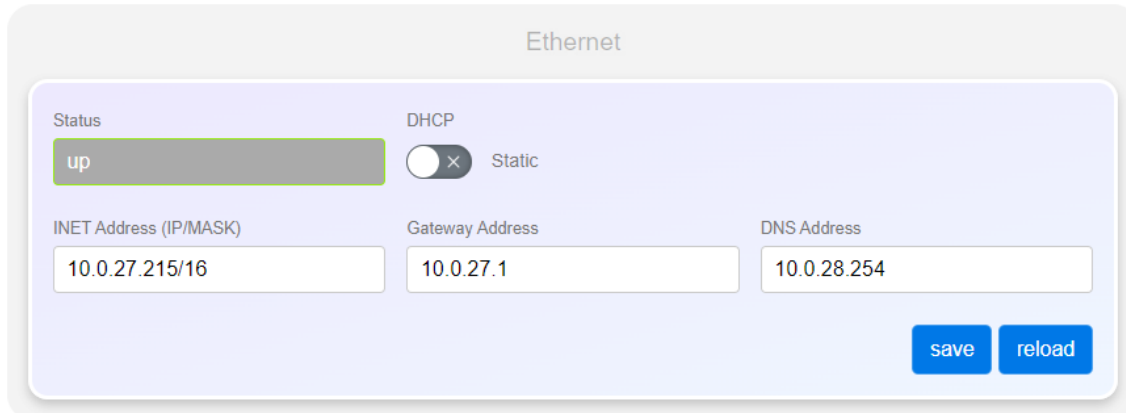
Ethernet

Ethernet if connected will show its status, IP address, DNS gateway and DNS server when on DHCP mode:



The screenshot shows the Ethernet configuration interface. At the top, the title "Ethernet" is centered. Below it, the "Status" is "up" in a green box. The "DHCP" mode is selected, indicated by a green toggle switch and the word "Dynamic". Below this, three input fields are shown: "INET Address (IP/MASK)" with the value "10.0.27.215/16", "Gateway Address" with "10.0.27.1", and "DNS Address" with "10.0.28.254". At the bottom right, there are two blue buttons labeled "save" and "reload".

Turn DHCP off to enter static IP information:



The screenshot shows the Ethernet configuration interface with DHCP turned off. The "Status" is "up" in a green box. The "DHCP" mode is "Static", indicated by a grey toggle switch with an 'x' and the word "Static". Below this, three input fields are shown: "INET Address (IP/MASK)" with the value "10.0.27.215/16", "Gateway Address" with "10.0.27.1", and "DNS Address" with "10.0.28.254". At the bottom right, there are two blue buttons labeled "save" and "reload".

When entering static address, be sure to enter gateway and DNS servers if you are connecting to a CSMS else domain names and addresses off the current local subnet cannot be contacted.

The IP address when working on static IPs is entered with the IP/CIDR, this means a subnet mask of 255.255.255.0 is a CIDR of /24, for an IP address 10.0.27.114 it would be entered as:

10.0.27.114/24

If you are using DHCP ensure your router has the LinkRay device listed as a reserved IP address, i.e. it will constantly get the same IP address. Failure to do so will mean the IP address may change over time, any chargers connecting to the old address will be disconnected.

Wi-Fi

If using WI-FI this must be enabled before it can be configured, it is disabled by default. Note WEP support is not included WPA2 should be used for security on the router preferably.



WiFi

WiFi Status
down

WiFi Mode
normal

IP Address

WiFi Networks Scan

Refresh List Use as WiFi SSID

Settings

WiFi
 Disabled

Apply

Once enabled further options will be shown:

WiFi

WiFi Status
down

WiFi Mode
normal

IP Address

WiFi Networks Scan

Refresh List Use as WiFi SSID

Settings

WiFi
 Enable

WiFi SSID WiFi Password (PSK) show DHCP Dynamic

WiFi INET Address (IP/MASK) WiFi Gateway WiFi DNS

Apply

Clicking on “refresh list” will search for all local SSIDs:

WiFi Status
down

WiFi Mode
normal

IP Address

WiFi Networks Scan

VodafoneConnect60856903 @ 43.8%
bytesnap_guest @ 21.3%
bluesky_2.4ghz @ 21.3%
bluesky @ 22.5%

Refresh List Use as WiFi SSID

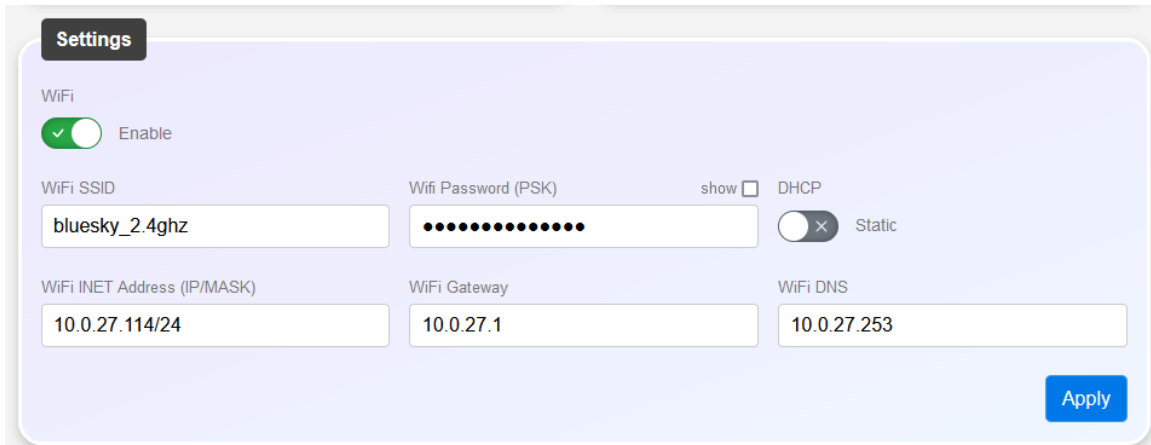
The user can **double click** on one to copy the SSID, or the SSID can be entered manually, the password must always be entered manually:

WiFi
 Enable

WiFi SSID WiFi PSK show DHCP Dynamic

bluesky_2.4ghz

DHCP can be enabled or a static IP entered, typically DHCP is the default:



Settings

WiFi
 Enable

WiFi SSID: bluesky_2.4ghz
WiFi Password (PSK): show DHCP Static

WiFi INET Address (IP/MASK): 10.0.27.114/24
WiFi Gateway: 10.0.27.1
WiFi DNS: 10.0.27.253

Apply

The IP address when working on static IPs is entered with the IP and CIDR, this means a subnet mask of 255.255.255.0 is a CIDR of /24, for an IP address 10.0.27.253 it would be entered as:

10.0.27.253/24

Cellular Support

LinkRay supports a cellular LTE CAT M1 modem. The modem requires a 2G/LTE-CAT M1 enabled SIM to be fitted.

Cellular

Status

ICCID	IMSI	IMEI
89457387300004348010	234500070027491	865456053320972
COPS	RSSI [dBm]	IoT Mode
Automatic	unknown	CAT-M
Registration Status	EPS Registration Status	
Disable network registration. Not registered	Disable network registration. Not registered	

Testing

SIM Status	IP	PING IP	PING Test
SIM OK	failed to get IP address	8.8.8.8	failed

[restart modem \(interface + service\)](#) [refresh modem info](#)

Settings

APN	Username	Password	show <input type="checkbox"/>
has.to.be	giffgaff	*****	

[save](#)

The user should enter the network SIM **APN**, **username**, **password** and click **save**.

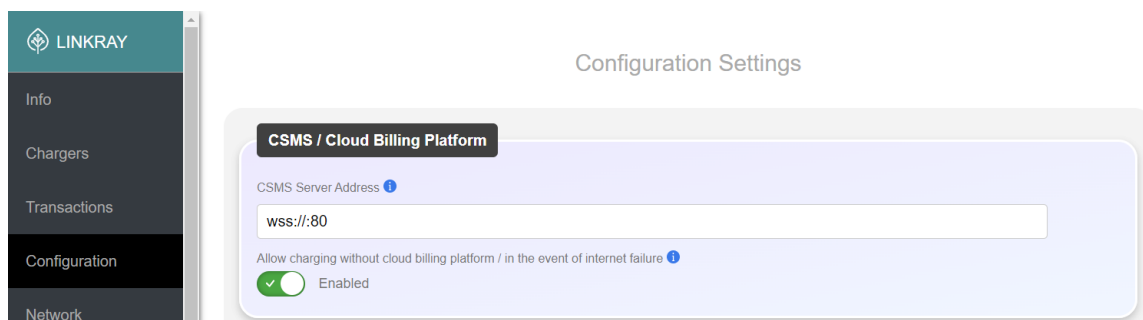
Note If a gateway is present on ethernet/Wi-Fi the system will attempt to use this for the remote cloud services, if no internet capability is available, you can use a SIM for the 4G modem, ensure that the Route to Internet option at the top of the screen is set to Cellular to tell LinkRay to route internet traffic appropriately.

Note The 2G/LTE-CAT M1 when operating in 2G mode is expected to be used for remote access as the bandwidth is low, if you are using this as a gateway to the CSMS the data tunnel speed should be tested at the deployment site with the number of chargers you have installed.

9 Connect LinkRay to a CSMS backend (optional)

You can connect your LinkRay to a Charging Station Management System (CSMS) and then use the CSMS to authorise charging requests. If you are not using a CSMS the default settings will result in LinkRay not attempting to connect to a cloud billing platform, if this is intended this section can be skipped.

To use a CSMS with LinkRay, set up the connection on the Configuration page, entering the cloud billing platform (CSMS) into the server address box below:



To connect your LinkRay to a CSMS:

1. Navigate to the **Configuration** page.
1. Enter the **CSMS Server Address**. Set this as your CSMS protocol, address and port number using this format:

`<protocol>://<IP>:<Port>`

For example:

`ws://10.0.27.81:80`

NOTICE

WS (no SSL) defaults to using port 80 if no port is specified

WSS (SSL encryption) defaults to using port 443 if no port is specified

It is best to be explicit and include the port in the above connection string for clarity

2. You can optionally add a prefix to your CSMS address, this is then passed with every message to the CSMS, this makes it clearer that a charger is part of a particular LinkRay installation:

For example

CSMS Server Address	<code>wss://ocpp-toolkit-api.site.app/</code>
Identity	<code>zone1</code>
Charger ID	<code>mp-012345678</code>

Would result in a charger connecting to:

wss://ocpp-toolkit-api.site.app/zone1/mp-012345678

3. Allow charging without cloud billing platform (in Standalone mode) - default Enabled

Allow charging without cloud billing platform / in the event of internet failure



Enabled

Enabled - will let new charge sessions continue without CSMS authentication (this will use the local whitelist if enabled or just auto accept transactions if the RFID whitelist is disabled)

Disabled - will stop any new sessions from starting unless a CSMS is attached, any in progress transaction will be allowed to complete.

- **Note** When no CSMS is used, this should be set to **Enabled** or otherwise no new charging sessions will be allowed

4. Select **Save**.
5. Log in to each of your chargers. Configure chargers to use the LinkRay's IP address as the CSMS for the charger. Note use port 8887 for WS and 8886 for WSS on LinkRay.

An example of a charger connecting to link ray located at 192.168.1.116:

Settings

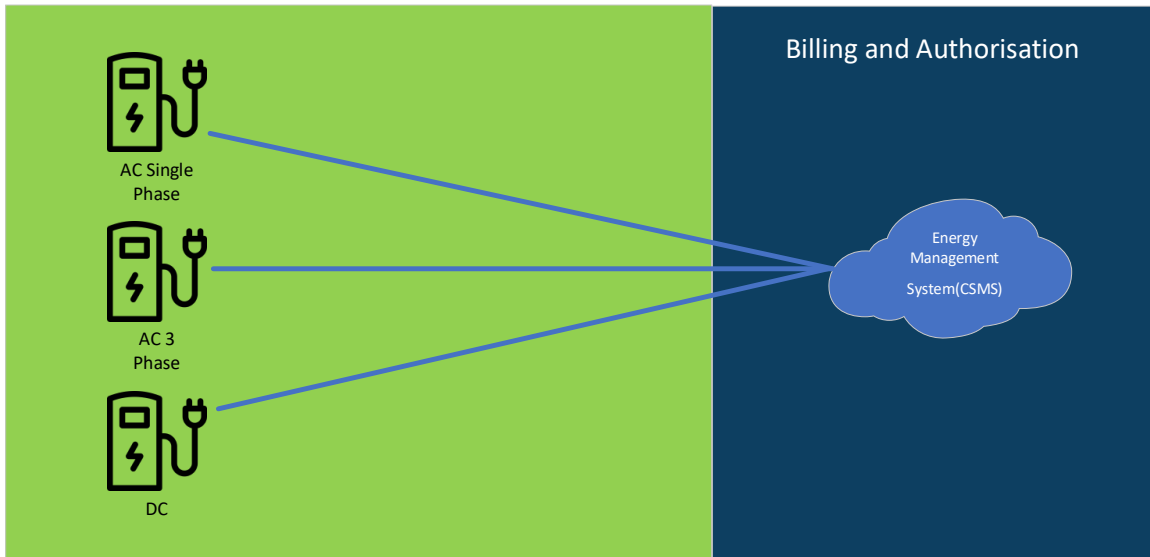
CSMS endpoint URL

ws://192.168.1.116:8887

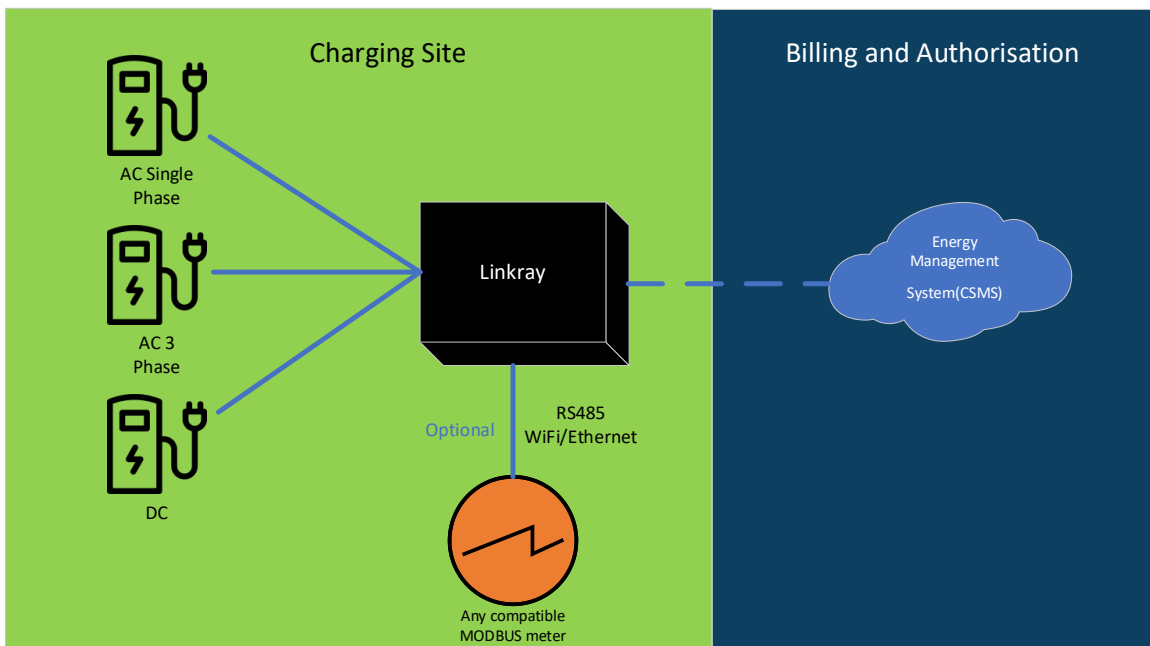
Example of the CSMS entered on the **Charger**

6. The goal is for the chargers to connect to the CSMS via the LinkRay rather than directly. For instance, your site diagram may look like:

Charging Site Without LinkRay



Charging Site With LinkRay



To find the LinkRay's IP address, see Network Setup on page 23.

Refer to the documentation for your EV charger for details on how to set the CSMS reference to use the LinkRay's IP address.

7. Log in to your CSMS and configure it to allow the chargers that have the LinkRay **Identity** prefix is required.

For details, refer to the manufacturer's documentation for your CSMS.

10 Configuring New Chargers

Once a charger has connected with LinkRay it will show up in the available chargers on the **Info** screen.

The **Info** page shown without any chargers:



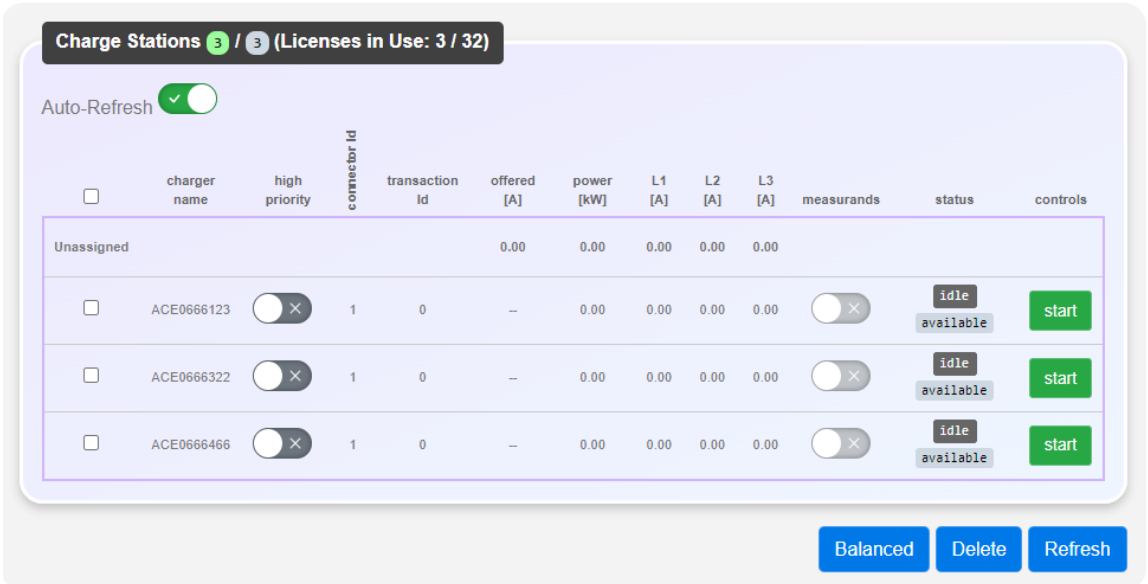
Charge Stations **0 / 0** (Max: 32)

Auto-Update

No Saved Charge Stations Found

Balanced Delete Refresh

With chargers connected:



Charge Stations **3 / 3** (Licenses in Use: 3 / 32)

Auto-Refresh

<input type="checkbox"/>	charger name	high priority	connector id	transaction id	offered [A]	power [kW]	L1 [A]	L2 [A]	L3 [A]	measurands	status	controls
<input type="checkbox"/>	Unassigned				0.00	0.00	0.00	0.00	0.00			
<input type="checkbox"/>	ACE0666123	<input checked="" type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input checked="" type="checkbox"/>	idle available	start
<input type="checkbox"/>	ACE0666322	<input checked="" type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input checked="" type="checkbox"/>	idle available	start
<input type="checkbox"/>	ACE0666466	<input checked="" type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input checked="" type="checkbox"/>	idle available	start

Balanced Delete Refresh

Navigate to the **Chargers** page to configure the new device:

Chargers

Charger Name i	Friendly Name i	Single/Three Phase i	Phase Connection i	Max power per charger in A (Per Phase) or kW (Total) i	Start new transactions with zero power i	Min power to allow charging (use 6 for default) i	Charge Rate Unit i	Group i
<input type="checkbox"/> ACE0666123	BAY1	1 ▼	L1 ▼	150	<input checked="" type="checkbox"/>	6	A (Amps) ▼	unassigned ▼
<input type="checkbox"/> ACE0666322	BAY2	1 ▼	L1 ▼	32	<input checked="" type="checkbox"/>	6	A (Amps) ▼	unassigned ▼
<input type="checkbox"/> ACE0666466	BAY3	1 ▼	L1 ▼	32	<input checked="" type="checkbox"/>	6	A (Amps) ▼	unassigned ▼

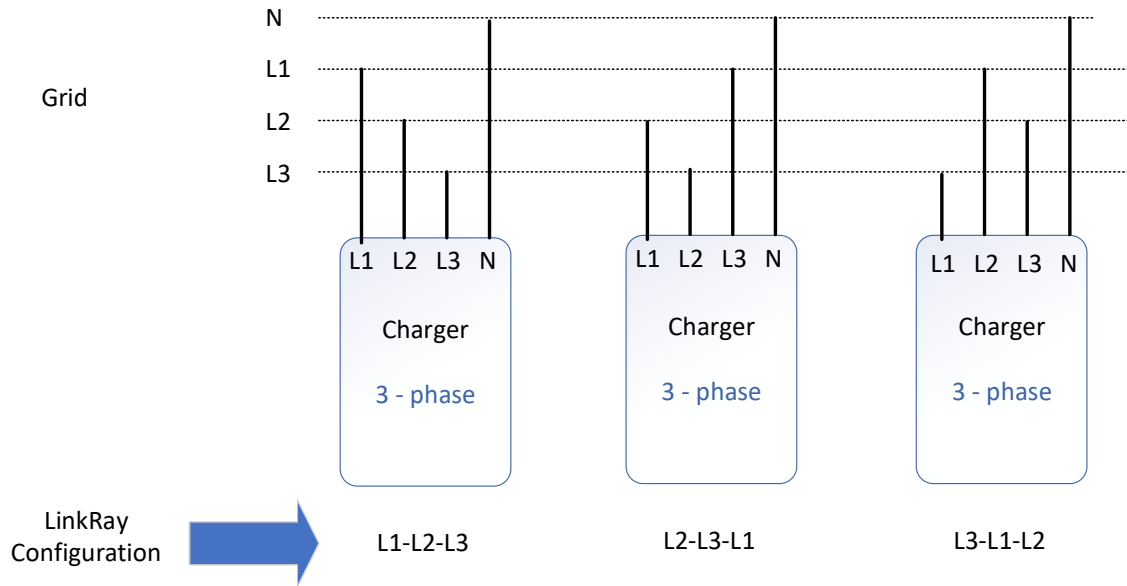
Save

The charger can be configured to be Single / Three Phase (default single phase):

Charger Name i	Friendly Name i	Single/Three Phase i
<input type="checkbox"/> ACE0666123	BAY1	1 ▼
<input type="checkbox"/> ACE0666322	BAY2	1 ▼

3 Phase selection

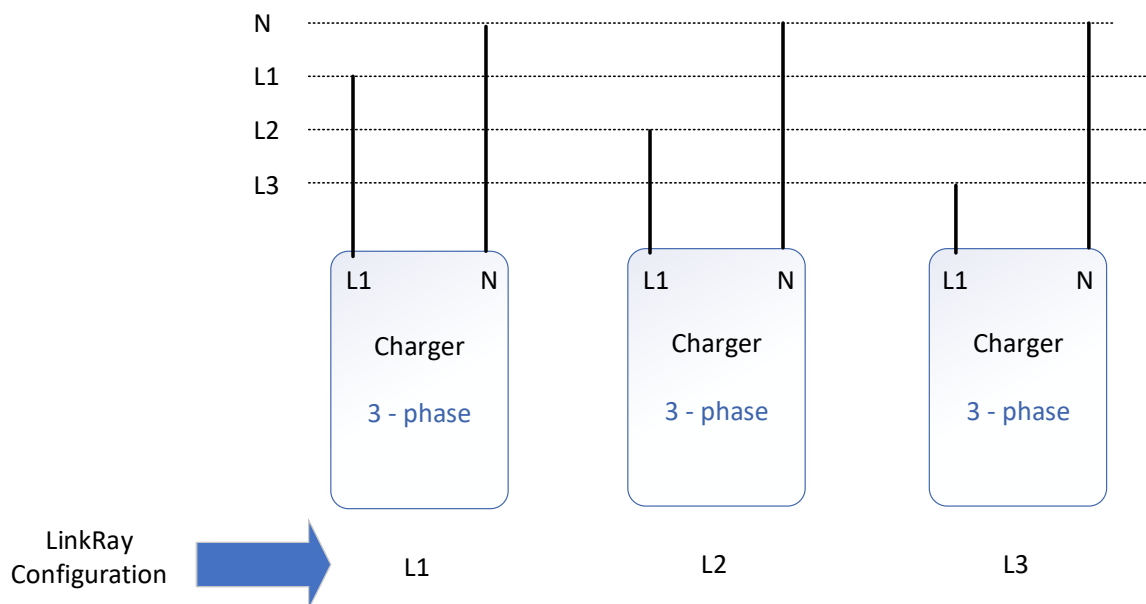
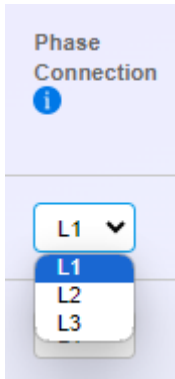
Using three phase chargers the following wiring combinations can be selected (default L1-L2-L3):



Choose the configuration to reflect the way the charger is connected to the grid.

Single Phase selection

Using single phase chargers the connected phase can be selected, default (L1):



Choose the configuration to reflect the way the charger is connected to the grid.

Phase Rotation and LinkRay Reporting / Control

Phase rotation configuration allows LinkRay to understand how the charger is reporting charge, it is not used to control how the charger can offer selection of phases to the car.

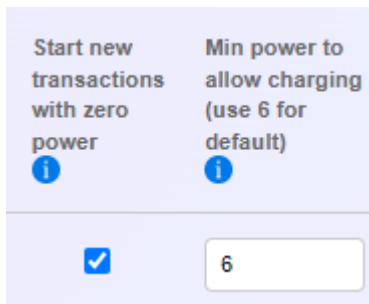
For instance, a single-phase charger (unless the charger supports its physical connection in its own configuration) will report power on L1 only, LinkRay uses its configuration to understand the charger is really connected to L2 or L3, despite it being reported on L1 by the charger.

Some chargers may have a phase configuration built in, if this is the case you do not need to configure it on LinkRay, configuring it on both ends will cancel out the reported configuration. It is advisable to only configure phase rotation on LinkRay then all your charger configurations can be viewed in one place for easier understanding of the site.

Three phase systems AC chargers typically draw power off all phases equally when connected to a car, some single-phase only cars however may only draw power from the first phase even if all three are present. In these circumstances the install of the chargers may rotate the phases to different chargers to balance the system. LinkRay needs to understand this rotation to make sure it correctly monitors power reported by the chargers, the configuration cannot control how the charger offers phases physically to the car only the limits on all phases available and their reporting.

Minimum Power Requirements Settings

Some AC and DC chargers require a minimum power given to them before they will show as available / online for charging. The default settings are:



Start new transactions with zero power	Min power to allow charging (use 6 for default)
<input checked="" type="checkbox"/>	6

If your charger is showing it is unavailable to charge or offline when connected to LinkRay you may need to change these settings, firstly:

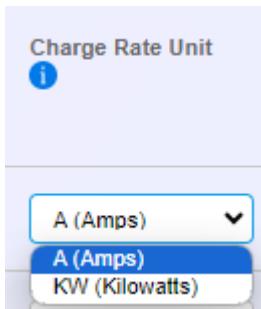
- Untick the zero-power check box, this will indicate to chargers that they can charge at the min power level immediately after authentication (the default is 6A per phase).
- After the transaction starts LinkRay may increase this to the max or decrease it to pause charging as normal
- The drawbacks of this are a delay of 4-5 seconds to pause the charger if it isn't allowed to charge because of timing constraints, FIFO mode, or overall site power won't allow any further charging.

Typically, 6A is the minimum most AC chargers expect below this they may turn off. Some chargers may require a higher minimum, if this is the case it can be overridden in the "Min power to allow charging" box.

DC chargers may have a minimum they can supply, check your manual for this, after setting the charge type to Kilowatts for DC put the minimum the charger expects, such as 25 or 50 KW as per the user guide or manual testing.

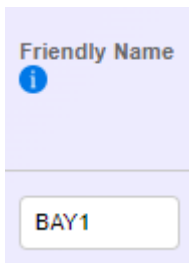
Charging Rate Unit

The smart charging profile can be selected in Amps or Watts, AC chargers use Amps, DC chargers will be configured in Watts, default is (A):



Friendly Names

Friendly names can be given to chargers to more easily identify them, these are displayed on the info screen then in brackets to the user, they are also used in the transaction logs or when using the payment terminal to identify the charger/bay.



Examples

Example of a single-phase charger connected on L1 with a 32A max, smart profile in Amps.

<input type="checkbox"/>	Charger Name	Friendly Name	Single/Three Phase	Phase Connection	Max power per charger in A (Per Phase) or kW (Total)	Start new transactions with zero power	Min power to allow charging (use 6 for default)	Charge Rate Unit	Group
<input type="checkbox"/>	ACE0666123	BAY1	1	L1	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1

For three phase chargers note that the current specified is specified per phase, so a three phase 22KWh charger, capable of 3 x 32A feeds should be set to 32A:

<input type="checkbox"/>	Charger Name	Friendly Name	Single/Three Phase	Phase Connection	Max power per charger in A (Per Phase) or kW (Total)	Start new transactions with zero power	Min power to allow charging (use 6 for default)	Charge Rate Unit	Group
<input type="checkbox"/>	ACE0666123	BAY1	3	L1-L2-L3	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1

AC single phase chargers on alternating phases:

<input type="checkbox"/>	Charger Name	Friendly Name	Single/Three Phase	Phase Connection	Max power per charger in A (Per Phase) or kW (Total)	Start new transactions with zero power	Min power to allow charging (use 6 for default)	Charge Rate Unit	Group
<input type="checkbox"/>	ACE0666123	BAY1	1	L1	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1
<input type="checkbox"/>	ACE0666322	BAY2	1	L2	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1
<input type="checkbox"/>	ACE0666466	BAY3	1	L3	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1

Batch configuration

If you have a large number of similar chargers, you can select one or all of the chargers:

<input checked="" type="checkbox"/>	ACE0666123	BAY1	1	L1	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1
<input checked="" type="checkbox"/>	ACE0666322	BAY2	1	L2	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1
<input checked="" type="checkbox"/>	ACE0666466	BAY3	1	L3	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1
<input type="checkbox"/>	ACE0666482		3	L1-L2-L3	32	<input checked="" type="checkbox"/>	6	A (Amps)	Level1
<input type="checkbox"/>	ACE0666489		3	L2-L3-L1	32	<input checked="" type="checkbox"/>	7	A (Amps)	Level1

Then use the batch update feature to set the same value for all the selected items (you can use “unchanged” if any elements should remain the same):

Batch Update

Selected Chargers	Single/Three Phase	Phase Connection	Max power per charger in A (Per Phase) or kW (Total)	Start new transactions with zero power	Min power to allow charging (use 6 for default)	Charge Rate Unit	Group
ACE0666489				<input type="checkbox"/>			
ACE0666482	unchanged		unchanged	<input type="checkbox"/>	unchanged	unchanged	unchanged
ACE0666466							
ACE0666322							

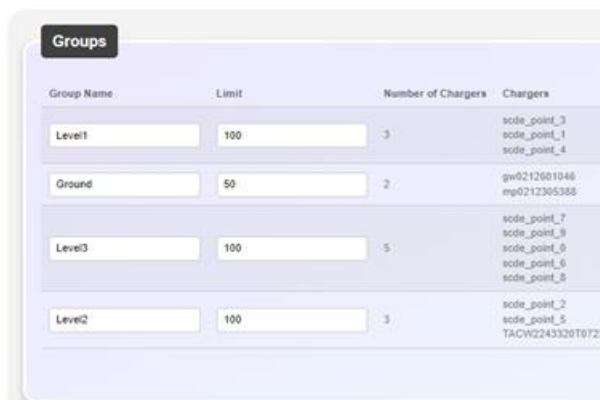
Configure chargers as a group

Chargers can be grouped together, first use the add group to append a new group and limit in A. The limit is taken as the current on all phases, i.e. 100A will limit L1/L2/L3 to 100A each (for a total of 300A) if using three phase.

Groups can be given a descriptive name:



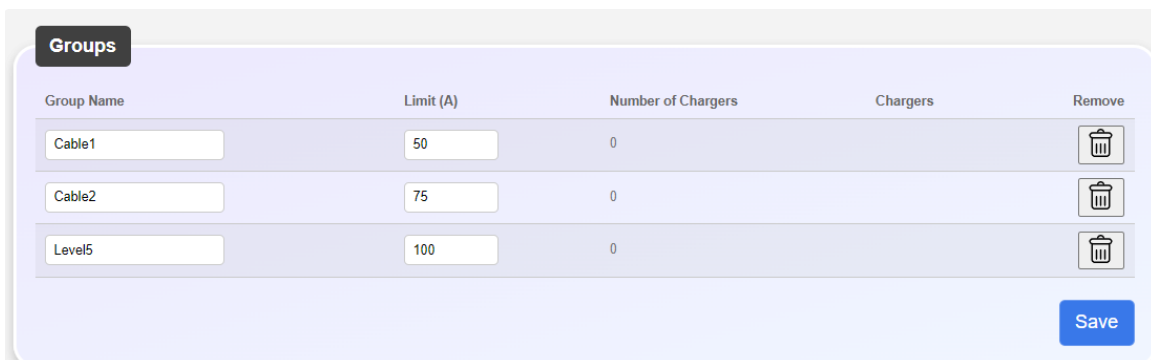
Assigning chargers to the groups will be shown then under the group section. The limits and name can be changed here.






Group Name	Limit	Number of Chargers	Chargers
Level1	100	3	sode_point_3 sode_point_1 sode_point_4
Ground	50	2	gw0212001046 mp0212305388
Level3	100	5	sode_point_7 sode_point_9 sode_point_0 sode_point_6 sode_point_8
Level2	100	3	sode_point_2 sode_point_5 TACW2243320T0723

Removing Groups

Groups can be removed using the trash icon next to the group:




Group Name	Limit (A)	Number of Chargers	Chargers	Remove
Cable1	50	0		
Cable2	75	0		
Level5	100	0		

Set the site power usage

To perform load balancing, LinkRay needs to know the site voltage and the total amount of current available to the site. These two values are used in LinkRay's calculations. You can find out the site voltage and total amount of available current from your energy supplier.

When you have this information, enter it into the LinkRay settings:

8. Log into the web interface.
9. Select **Configuration**.
10. In the **Site Configuration** section, enter the values for your site:



The screenshot shows the 'Site Configuration' web interface. It features several input fields and toggle switches. The 'Voltage [V] (L-N)' field is set to 244. The 'Split Mode (Line to Line)' toggle is disabled. The 'Total Power [kW]' field is 73.2, and the 'L1 [A]', 'L2 [A]', and 'L3 [A]' fields are all set to 100. The 'Measurand Interval [s]' field is set to 10. The 'Line to Line Voltage (208V / 240V)' toggle is disabled. The 'FIFO Charging Mode' and 'Use Meter' toggles are also disabled. A 'Save All' button is located at the bottom right of the configuration panel.

- **Voltage**
The voltage from L1 to N, normally 230v, on three phase systems this is NOT the voltage between phases.
- **Amps on L1/L2/L3**
The amount of current that the site can use on each phase. You may want to reserve some on particular phases if that are connected to buildings, lighting etc. which are connected to these.
- **Total Power (kW)**
This is read-only, this shows an indication of the site power based on the voltage and current limits entered by the user.
- **Measurand Interval (s)**
The number of seconds between requested charger updates, used to calculate charger power consumption.
- **FIFO Charging Mode**
When enabled chargers will offer power on a first come first served basis, when power is not available any additional chargers will be paused until charging

sessions have completed. This way active charging is done at full speed for some and paused until power is available to others.

When disabled (default) power is evenly distributed to all charging sessions simultaneously, all sessions will get some power but with every subsequent new charging session active charging will become slower.

- **Use Meter**

If LinkRay should use an external meter to calculate power used by buildings, lighting or other systems such as solar in its load balancing calculations. Meters can be connected on RS485 or TCP/IP Modbus. A configuration file should be loaded through the **Assembler** screen for the meter you are using (see known meters Page 84).

Site Configuration

<p>Voltage [V] (L-N) i</p> <input style="width: 80%;" type="text" value="247"/>	<p>Split Mode (Line to Line) i</p> <p><input checked="" type="checkbox"/> Disabled</p>	<p>Total Power [kW]</p> <div style="background-color: #ccc; padding: 2px;">44.46</div>	<p>L1 [A]</p> <div style="background-color: #ccc; padding: 2px;">60</div>	<p>L2 [A]</p> <div style="background-color: #ccc; padding: 2px;">60</div>	<p>L3 [A]</p> <div style="background-color: #ccc; padding: 2px;">60</div>
<p>Measurand Interval [s] i</p> <input style="width: 80%;" type="text" value="10"/>	<p>Line to Line Voltage (208V / 240V) i</p> <p><input checked="" type="checkbox"/> 240V (Dual Phase)</p>				
<p>FIFO Charging Mode i</p> <p><input checked="" type="checkbox"/> Disabled</p>					
<p>Use Meter i</p> <p><input checked="" type="checkbox"/> Enabled</p>					

	<p>Total Power [kW]</p> <div style="background-color: #ccc; padding: 2px;">0.81</div>	<p>L1 [A]</p> <div style="background-color: #ccc; padding: 2px;">3.23</div>	<p>L2 [A]</p> <div style="background-color: #ccc; padding: 2px;">0.02</div>	<p>L3 [A]</p> <div style="background-color: #ccc; padding: 2px;">0.02</div>
	<p>L1 [V]</p> <div style="background-color: #ccc; padding: 2px;">247.72</div>	<p>L2 [V]</p> <div style="background-color: #ccc; padding: 2px;">247.68</div>	<p>L3 [V]</p> <div style="background-color: #ccc; padding: 2px;">247.83</div>	

Use the following current limits if the meter is not working:

<p>L1 [A]</p> <div style="background-color: #ccc; padding: 2px;">30</div>	<p>L2 [A]</p> <div style="background-color: #ccc; padding: 2px;">30</div>	<p>L3 [A]</p> <div style="background-color: #ccc; padding: 2px;">30</div>
---	---	---

Meter Configuration

▶ WEM3080TTCP

When enabled the meter configuration used can be shown, the meter readings are shown for the instantaneous values of the Current and Voltage on, L1, L2, L3 phases. When the voltage is read from the meter this is automatically used for the site voltage. When running on a single-phase system only L1[V] has to be present, L2[V] and L3[V] will be blank if they are not read or return 0.

With this enabled the degraded mode limits are exposed, see **Degraded Mode**

- **Degraded Mode**

When a meter is enabled a second set of current limits are exposed, these allow the user to enter a lower charger limit in the event of the meter failing:

Total Power [kW]	L1 [A]	L2 [A]	L3 [A]
0.81	3.23	0.02	0.02
L1 [V]			
247.72			
L2 [V]			
247.68			
L3 [V]			
247.83			
Use the following current limits if the meter is not working:			
L1 [A]	L2 [A]	L3 [A]	
30	30	30	

The default for this is 0 (charging disabled).

- **Split Mode**

In North America chargers may be wired across both 120V phases of L1/L2 making a 240V output. This charger measurands are duplicated in both phases in this mode, without this turned on the L2 phase will look unused by the chargers.

Site Configuration

Voltage [V] (L-N) <input type="text" value="244"/>	Split Mode (Line to Line) <input checked="" type="checkbox"/> Enabled	Total Power [kW] <input type="text" value="73.2"/>	L1 [A] <input type="text" value="100"/>	L2 [A] <input type="text" value="100"/>	L3 [A] <input type="text" value="100"/>
Measurand Interval [s] <input type="text" value="10"/>	Line to Line Voltage (208V / 240V) <input type="checkbox"/> 240V (Dual Phase)				
FIFO Charging Mode <input type="checkbox"/> Disabled					
Use Meter <input type="checkbox"/> Disabled					

[Save All](#)

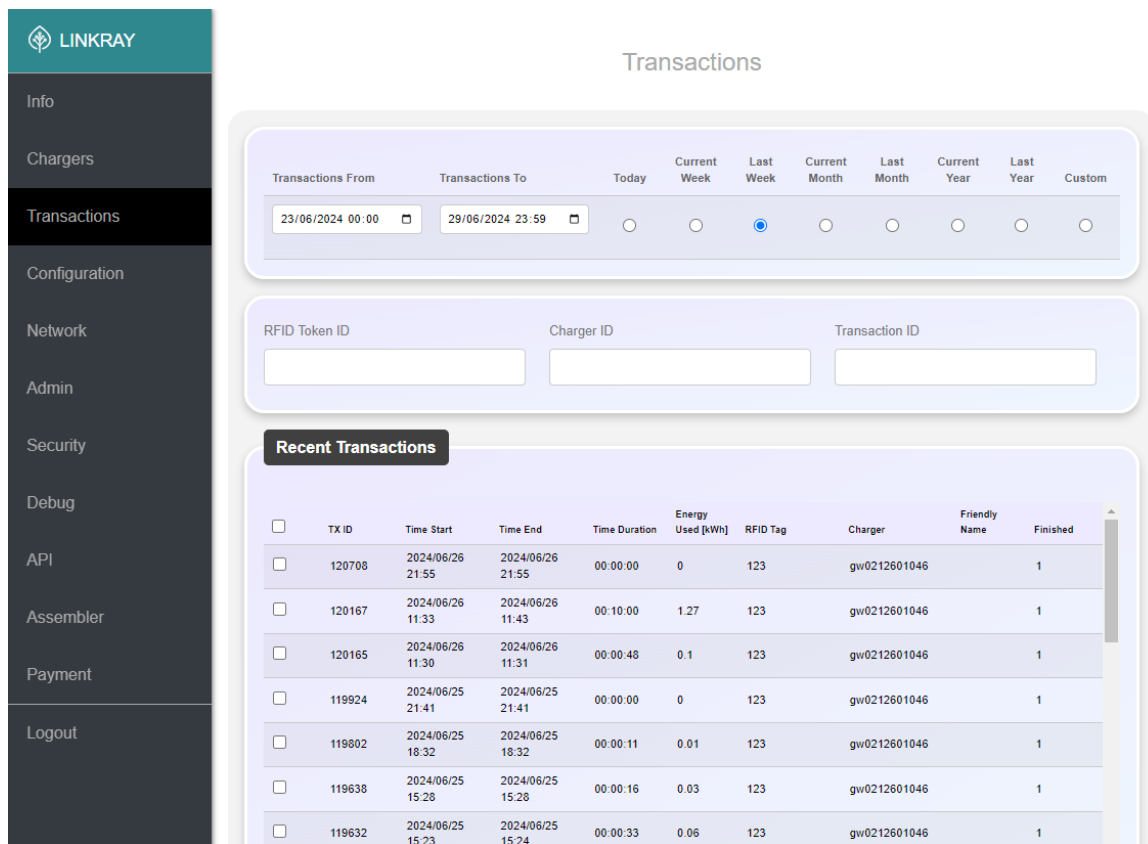
- **Split Mode – Line to line**

Enable both Split mode and line to line to indicate that in North America the charger has been connected across two phases of a 120V system with 3 phases. This results in a 208V voltage and the charger configuration is limited to L1-L2, L2-L3 or L3-L1. With this option enabled the charger measurand values are duplicated into both phases.

11. Select **Save**.

11 Charging Transactions

Historical charging sessions can be viewed and exported using the **Transactions** page. There are some quick select boxes for transactions that have completed today, this week (Mon-Sun), last week, current month, last month, current year and last year. All times shown are in the current time zone set for the LinkRay.

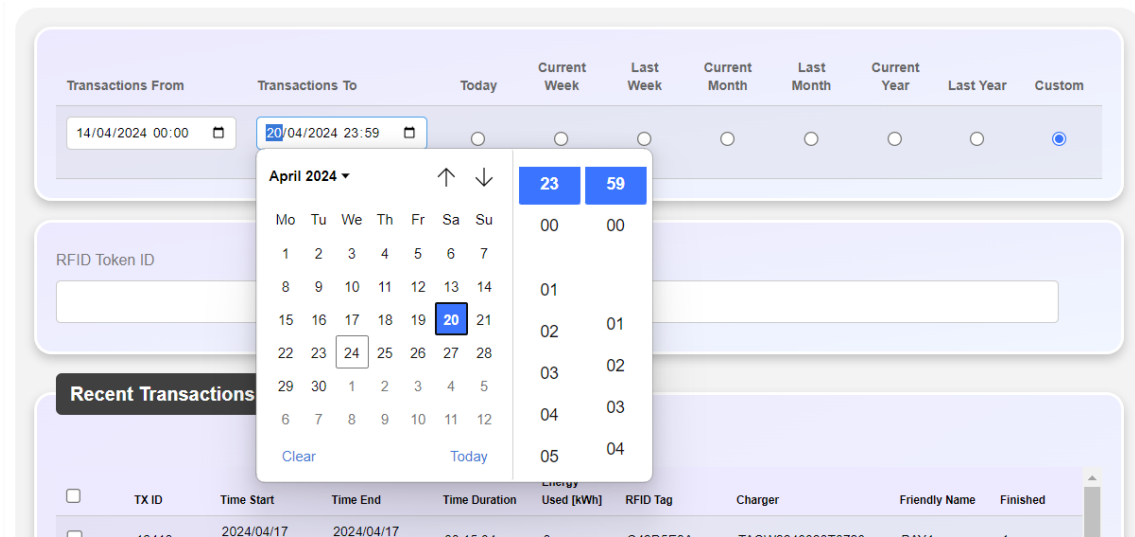


The screenshot shows the LinkRay interface for the Transactions page. On the left is a dark sidebar with a teal header containing the LinkRay logo and the text 'LINKRAY'. Below the header are menu items: Info, Chargers, Transactions (highlighted), Configuration, Network, Admin, Security, Debug, API, Assembler, Payment, and Logout. The main content area is titled 'Transactions' and features a filter bar with options: Transactions From (23/06/2024 00:00), Transactions To (29/06/2024 23:59), Today, Current Week, Last Week (selected), Current Month, Last Month, Current Year, Last Year, and Custom. Below the filter bar are three input fields for RFID Token ID, Charger ID, and Transaction ID. A 'Recent Transactions' section contains a table with the following data:

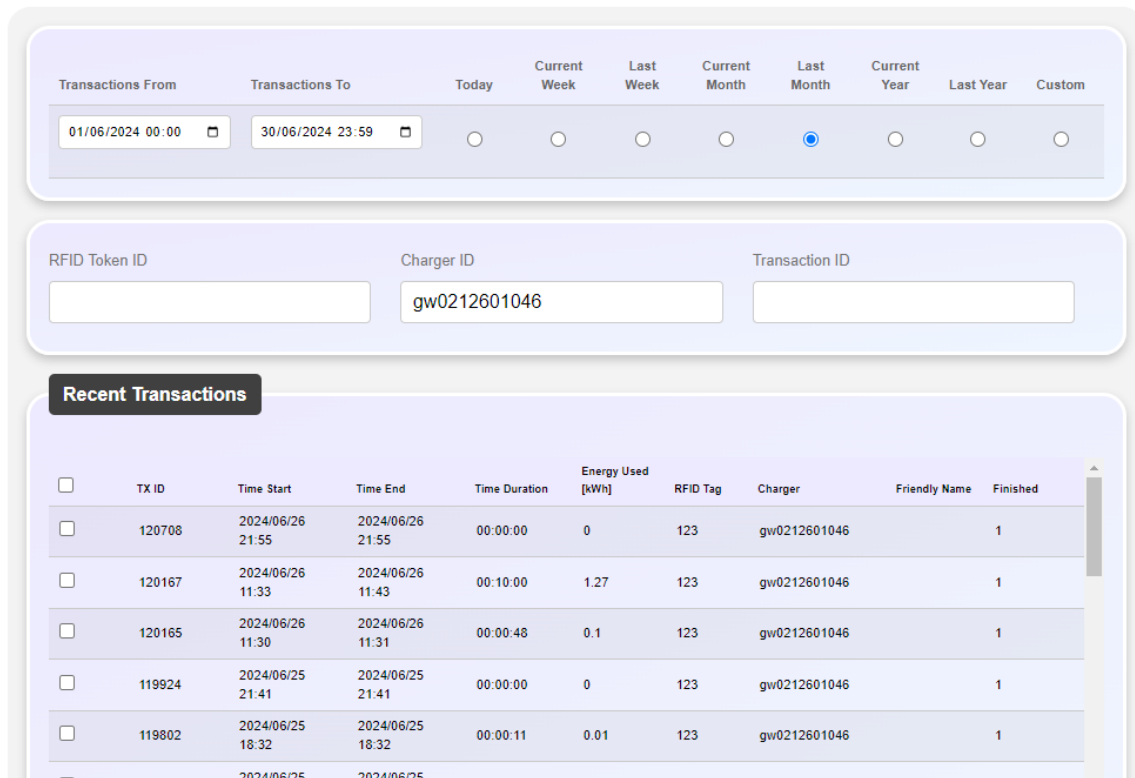
<input type="checkbox"/>	TX ID	Time Start	Time End	Time Duration	Energy Used [kWh]	RFID Tag	Charger	Friendly Name	Finished
<input type="checkbox"/>	120708	2024/06/26 21:55	2024/06/26 21:55	00:00:00	0	123	gw0212601046		1
<input type="checkbox"/>	120167	2024/06/26 11:33	2024/06/26 11:43	00:10:00	1.27	123	gw0212601046		1
<input type="checkbox"/>	120165	2024/06/26 11:30	2024/06/26 11:31	00:00:48	0.1	123	gw0212601046		1
<input type="checkbox"/>	119924	2024/06/25 21:41	2024/06/25 21:41	00:00:00	0	123	gw0212601046		1
<input type="checkbox"/>	119802	2024/06/25 18:32	2024/06/25 18:32	00:00:11	0.01	123	gw0212601046		1
<input type="checkbox"/>	119638	2024/06/25 15:28	2024/06/25 15:28	00:00:16	0.03	123	gw0212601046		1
<input type="checkbox"/>	119632	2024/06/25 15:23	2024/06/25 15:24	00:00:33	0.06	123	gw0212601046		1

The RFID, Charger ID and Transaction ID filter boxes enable you to filter results also by these parameters.

If you are looking for another date or time range you can choose an exact day and time:



Transactions can be ordered by any of the columns by clicking on the heading, here is a sort for all transactions this year, filtering for the charger “gw0212601046” and then ordering of the energy used in descending order:



Note the filters need to be matched exactly, part of the charger name will not find all matches.

Site daily graphs can be shown by selecting the appropriate day from the selection you have searched for, up to a month can be loaded at a time, click on the day you want to view:

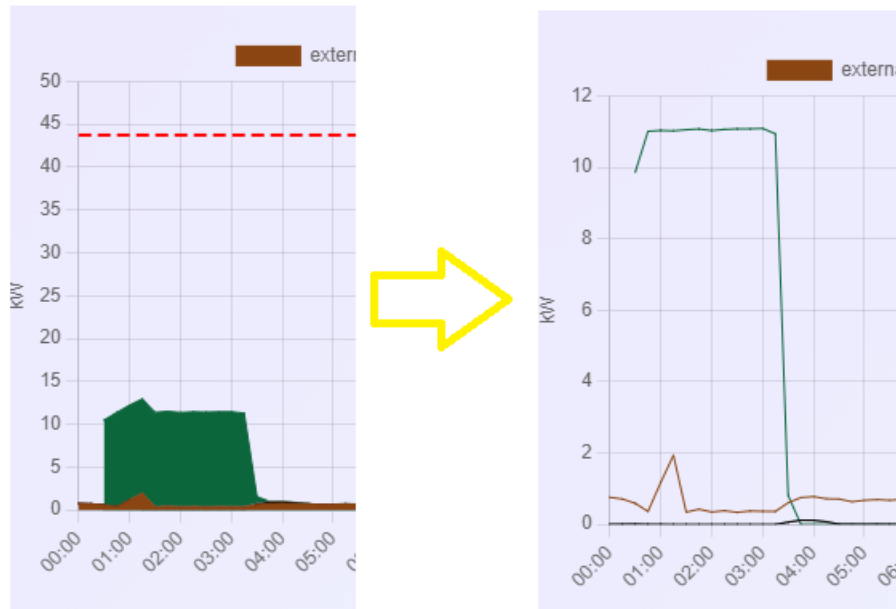
20/07/2024
21/07/2024
22/07/2024
23/07/2024
24/07/2024
25/07/2024
26/07/2024

27/07/2024

The site power and phases will be shown if a meter is present, without a meter the site power (top graph) is shown only. This is an important tool to check historic loading. Note that all power is averaged in 15-minute intervals, charging of less than 15 minutes may not show.



Clicking on “Show Non-Stacked” / “Show Stacked” toggles between a stacked or overlaid view of the Site usage.



The stacked view also includes the site limit and accumulates each charger on top of each other to give a site view.

The non-stacked shows each charger when charging from 0 to better show the per charger view.

12 Whitelists

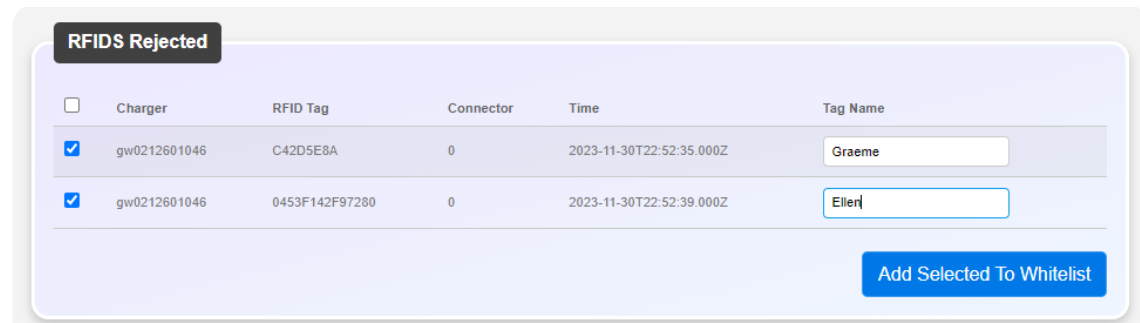
LinkRay can use a Whitelist to enable charging sessions from a list of RFID tags on any of the connected chargers found in the Transaction page.

To use this whitelist option LinkRay should not be connected to a CSMS, the “allow charging” in the configuration is enabled the whitelist function enabled.

Without the whitelist being enabled all charging sessions will be accepted in the offline mode with any Token or RFID given by the charger.

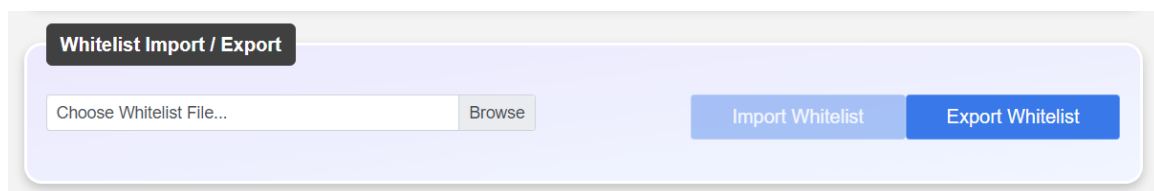


RFID tags can be added to the whitelist in a number of ways. One way is to present the RFID tag to a connected charger, this will then show up in the RFIDs rejected list:

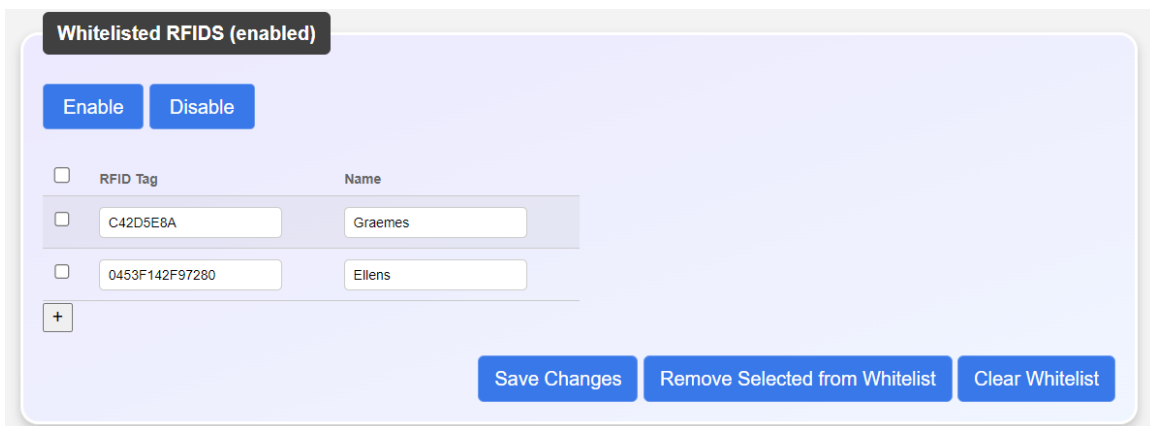


A descriptive name can be added and the “add selected to whitelist” button will save the tag. Note that the rejected tag will remain shown as it was rejected at that time and is part of the historical log even if it is whitelisted from now on.

A second way it to use the whitelist import/export feature:

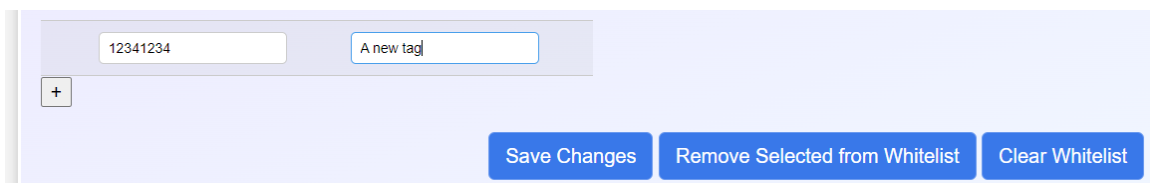


After adding the RFID tags can be edited, selected and deleted or the entire list cleared:



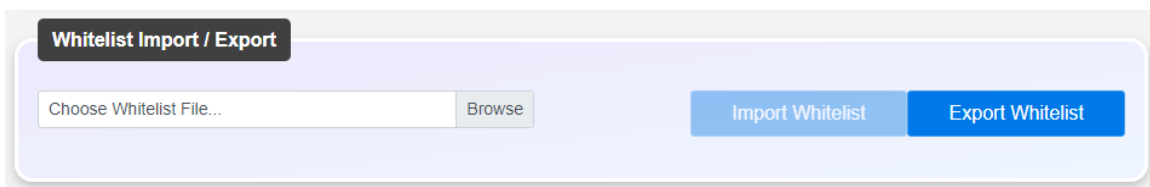
<input type="checkbox"/>	RFID Tag	Name
<input type="checkbox"/>	C42D5E8A	Graemes
<input type="checkbox"/>	0453F142F97280	Ellens

Users can add tags manually using the '+' button, type the tag number and name and save to add.



<input type="checkbox"/>	RFID Tag	Name
<input type="checkbox"/>	12341234	A new tag

Or export outputs the RFID tags as a CSV file for saving or later importing in other LinkRay devices.



Example CSV:

```
0453F142F97280,Ellen  
C42D5E8A,Graeme
```


13 Charging times and Time Zones

LinkRay supports setting a series of profiles that will exclude charging on *all chargers* between specific times. The times can be controlled on a Mon-Sun basis, allowing you to set charging exclusions for weekdays, weekends or other combinations. The **Configuration** page includes this:

Charging Schedule

Mon
Tue
Wed
Thu
Fri
Sat
Sun

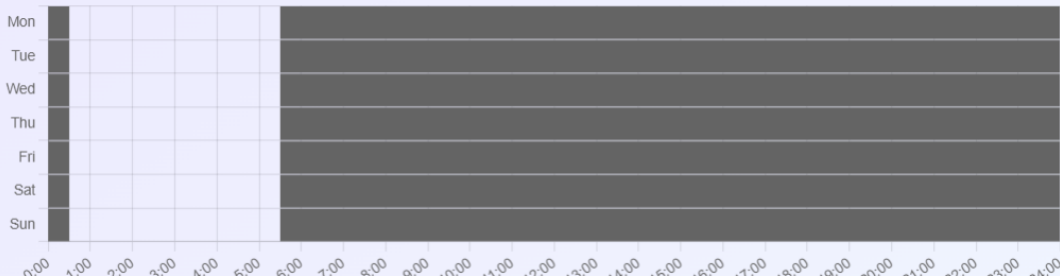
Don't Charge Between

Start:

End:

Add
Clear Schedule

Current Schedule



Schedule

Mon	Tue	Wed	Thu	Fri	Sat	Sun
00:00 - 00:30	00:00 - 00:30	00:00 - 00:30	00:00 - 00:30	00:00 - 00:30	00:00 - 00:30	00:00 - 00:30
05:30 - 23:59	05:30 - 23:59	05:30 - 23:59	05:30 - 23:59	05:30 - 23:59	05:30 - 23:59	05:30 - 23:59

Ensure that the time zone is set to the correct for your region as this is used for timing schedules:

Timezone

Europe/Amsterdam

(UTC+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna
▼

14 Importing and Exporting Settings

LinkRay supports saving the current configuration and importing this onto a new device or the same device in the future to restore settings.

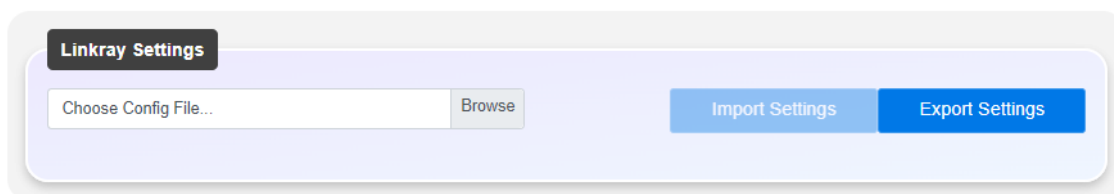
The export includes:

- Charger configuration (phase info/friendly name/groups)
- All group settings
- CSMS settings
- Site configuration
- Charging schedule
- Firmware update settings and URLs
- Payment terminal settings

What it doesn't include:

- Branding packs
- Meter configuration
- Network configuration
- Linkray license
- Remote access license

This is available in the Configuration page:



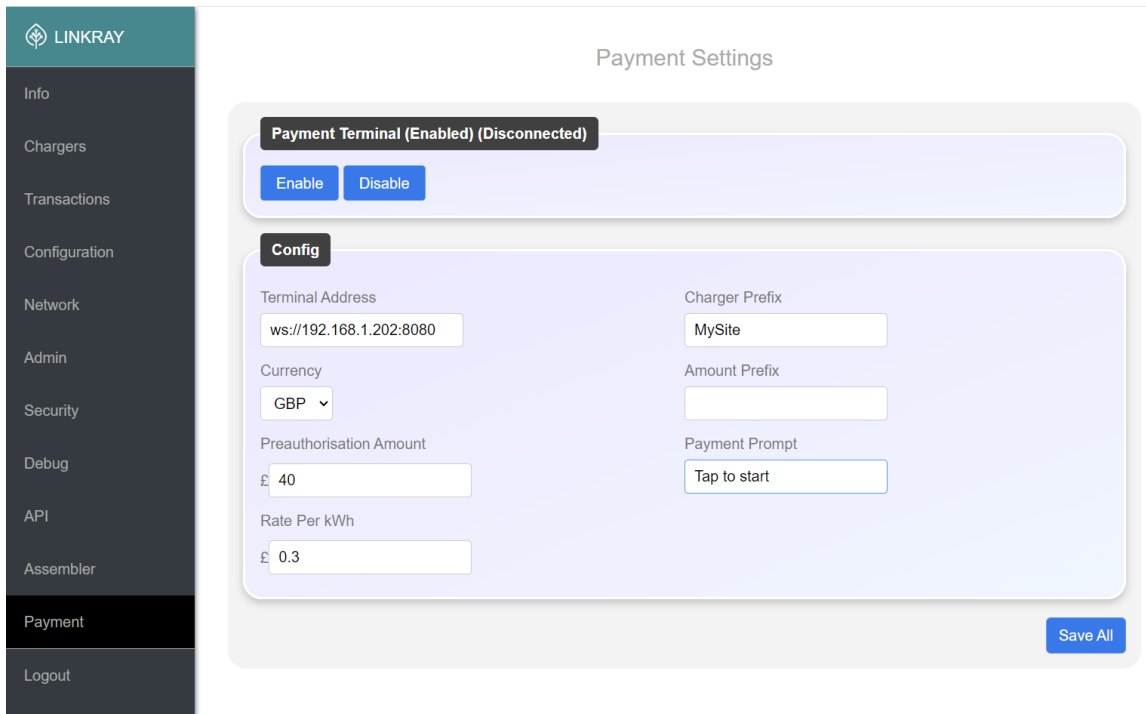
15 Payment Terminal

LinkRay can be used with a payment terminal to authorize and take credit card payment for transactions without the need for a CSMS.

One LinkRay and one Payment terminal can be used for many chargers.

LinkRay is currently compatible with the Gemini2K payment terminal.

To configure this, navigate to the payment screen:



On here is the following:

- Status of the payment terminal (Enabled/Disabled, Disconnected/Connected)
- The terminal address normally as:
 - ws://<IPAddress>:8080
- The currency of the terminal
- The pre-authorization amount
 - The actual amount of the transaction will be sent after, it should be less than the pre-authorization amount

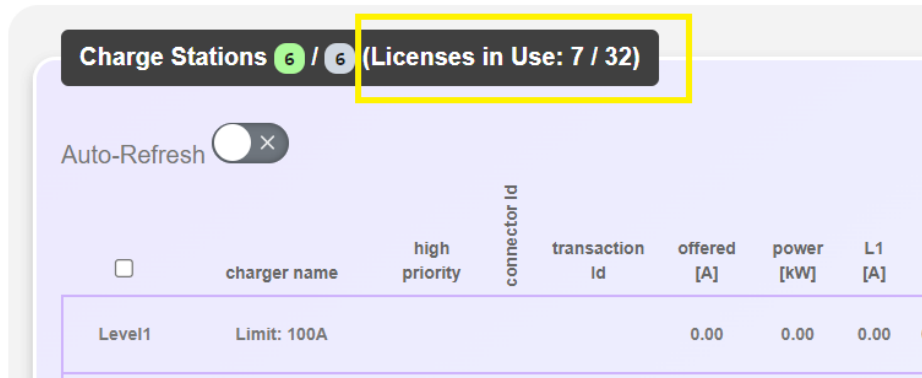
- Rate per kWh
- Charger Prefix is the site name
- Amount prefix can be a symbol
- The message when payment is requested

When connected if a charger is plugged into a car, it can be authorized by either a tag from the white list or the payment terminal. Payment is taken after the transaction is stopped by LinkRay or the car.

16 LinkRay Licensing

LinkRay contains a limit to the number of chargers and/or connectors that can be attached.

The **Info** page show the count under the charge stations:



In the above example 32 chargers or connectors are allowed. This can be for instance 16 x dual socket chargers, 32 single socket chargers or other combinations.

The first set of numbers 6 / 6 indicates the number of configured and connected chargers.

If a new LinkRay license is issued as an upgrade from Versinetic support, this can be imported in the **Assembler** page:

- LINKRAY
- Info
- Chargers
- Transactions
- Configuration
- Network
- Admin
- Security
- Debug
- API
- Assembler**
- Logout

Assembler Settings

Custom Branding Import

Choose Branding package zip (or json) file...

Import Meter Configuration

Choose meter configuration package...

License Key

Choose License Key...

17 Remote Access to LinkRay devices

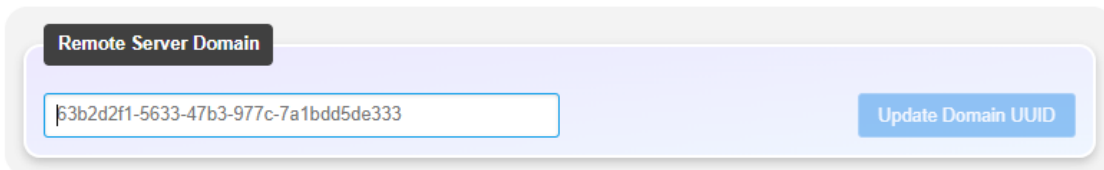
Customers can monitor devices availability, configure and update firmware remotely using this feature. Other examples would be to access a LinkRay in the field to change site power limits, download transaction logs or add RFIDs to whitelists.

If your device is already set up you can skip the domain setup and head straight to accessing the device.

Domain Setup

Out of the box your device may need adopting onto your customer account. To do this you will be given a unique domain ID in the form of a GUID (a number such as 233063d1-d33d-4254-bb57-733317335a18).

Log onto your device using the local network, navigate to the **Assembler** page, copy the GUID number into the **Domain** field and select Import Domain ID.



Remote Server Domain

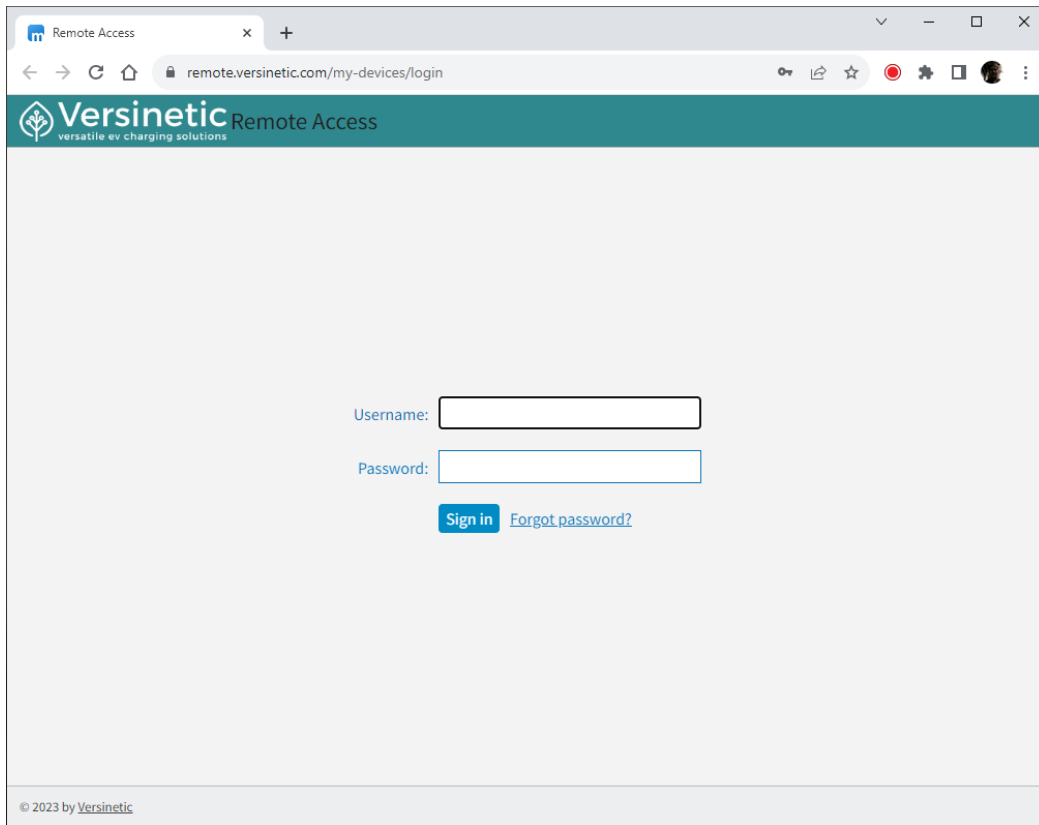
Contact Versinetic support when you **have completed** this stage, Versinetic support will then validate this and accept your device onto the customer domain, this process may take 24-48 hours.

Accessing the device through the public portal

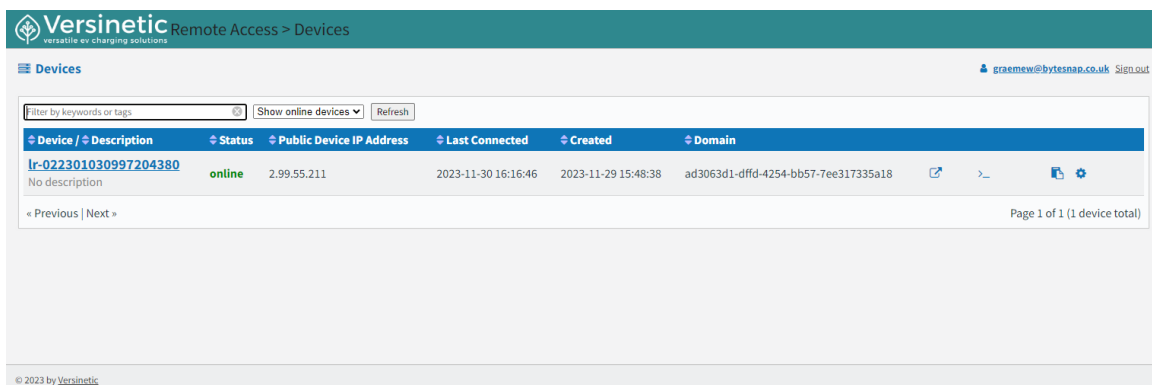
To access you will be given an account and password. Using this navigate to the link

<https://remote.versinetic.com>

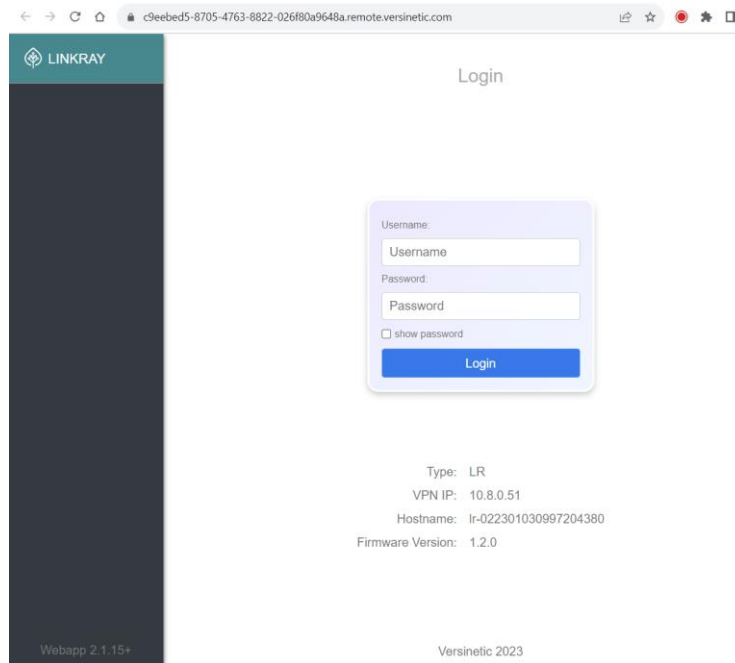
You will be presented with your login details given to you from Versinetic support:



Enter your account details, you will then see devices you have on your accounts:

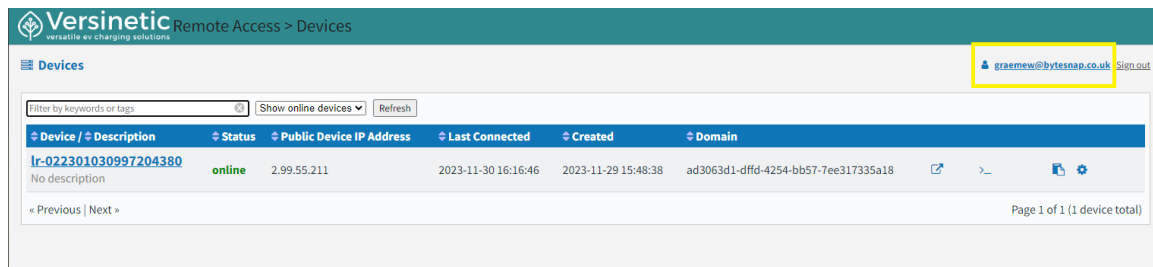


Clicking on the device name will open a tab and take you directly to the login page for that device. The current status, last connected and created information are available in the event of a problem.

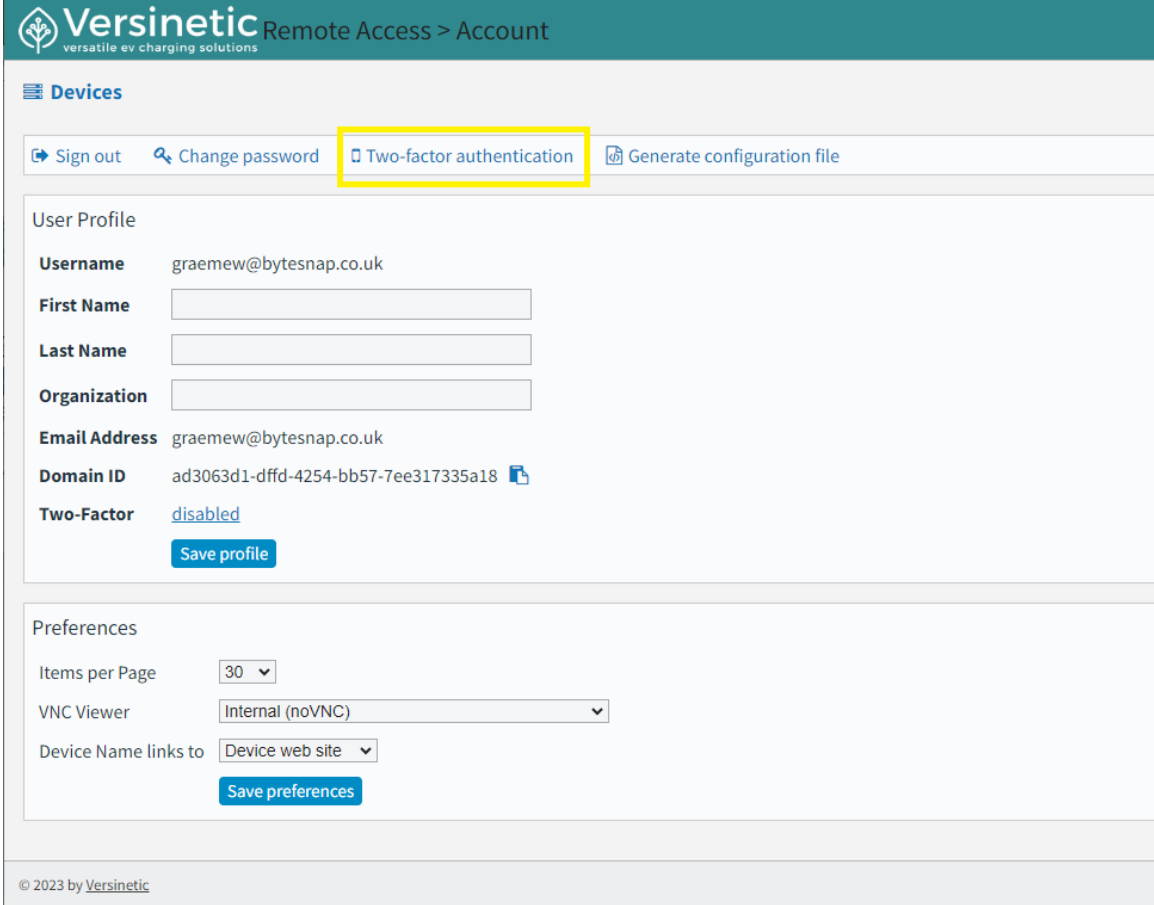


If your LinkRay fails to load you may find that the router or gateway is aggressively closing connections, if this happens wait 1-2 minutes then re-click on the remote device and it should have re-established a connection to the internet.

You can enable two factor authentication for any accounts with access to live chargers, this is available under the user account (top right):



Then select Two-factor authentication:



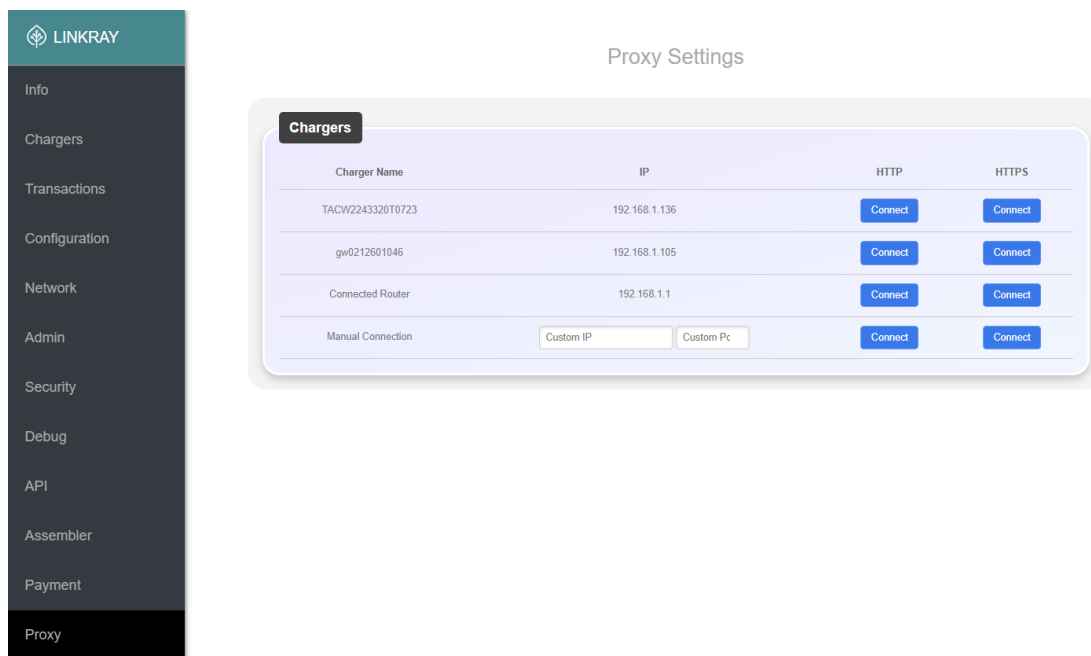
The screenshot shows the 'Account' page in the Versinetic Remote Access interface. At the top, the Versinetic logo and 'Remote Access > Account' are visible. Below the header, there is a 'Devices' section with a navigation bar containing 'Sign out', 'Change password', 'Two-factor authentication' (highlighted with a yellow box), and 'Generate configuration file'. The main content area is divided into two sections: 'User Profile' and 'Preferences'. The 'User Profile' section includes fields for Username (graemew@bytesnap.co.uk), First Name, Last Name, Organization, Email Address (graemew@bytesnap.co.uk), Domain ID (ad3063d1-dffd-4254-bb57-7ee317335a18), and Two-Factor (disabled). A 'Save profile' button is located at the bottom of this section. The 'Preferences' section includes 'Items per Page' (30), 'VNC Viewer' (Internal (noVNC)), and 'Device Name links to' (Device web site). A 'Save preferences' button is located at the bottom of this section. The footer of the page reads '© 2023 by Versinetic'.

From here you will have to re-enter your password, then using google authenticator scan the QR code given on the web site. Your google authenticator will then generate login codes for you when you log into your account in the future.

18 Accessing 3rd Party Network Devices Through Linkray (Proxy)

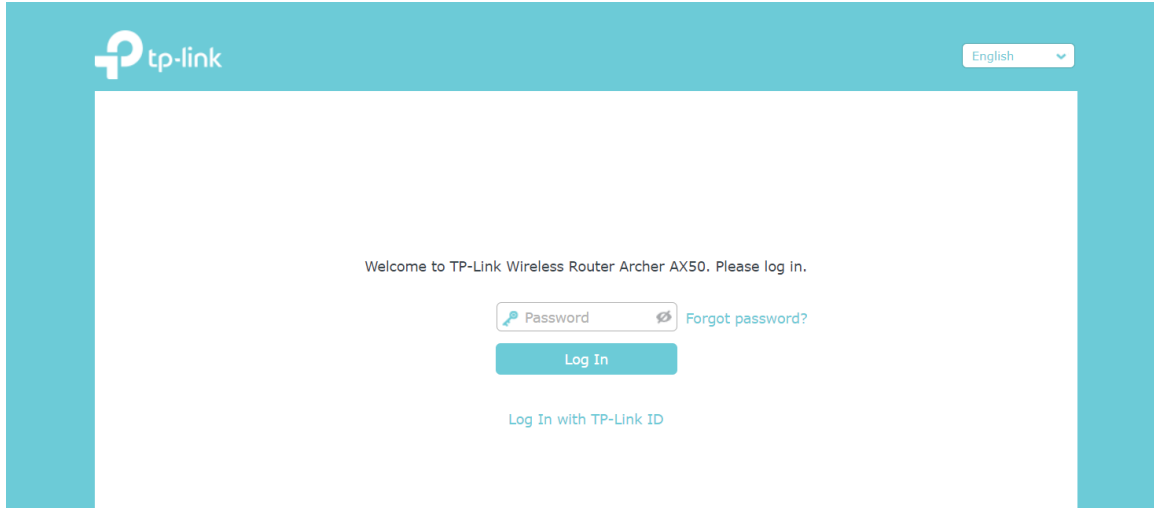
Linkray can be used to configure other network devices including chargers, routers or meters on the same network as LinkRay through the Proxy page. Note that only one connection can be made at a time, if you have multiple devices you will need to access them in turn.

Navigate to the proxy screen:



You will be shown all connected chargers and their IP addresses, the gateway device and a manual field to enter any network address / port. Click on any of the connect buttons to attempt a connection with the devices, by default the http will open a port 80 connection and the https an SSL connection with port 443.

You should be presented with the device's web page:



If you experience an error, refresh the window or go back and click the link to retry.

Note This tunnel connection does not keep web sockets open, each http request is a separate open/close so some complex logins that use Ajax or rely on a single open session for authentication may not work. If your device requires this type of login, it is possible using an installed application on a Windows PC, if this is required please contact Versinetic support.

19 Uncontactable Chargers / Meters and Load Balancing

If a charger is added to the configuration but connection is lost, the load balancing algorithm assumes that it is still functioning and the site power maybe exceeded if we don't consider it in the calculations unless there is a meter connected to LinkRay that does this is not the case.

For example, we have 100A for the site budget and 5 x 32A chargers. If one of the chargers is turned off / removed or communications drop to it, LinkRay will assume it still maybe in use and will reduce the budget from 100A to 68A for the other chargers (with no meter)

If this unit is permanently not to be included in the load balancing it should be removed using the UI on the /Info page, freeing up this 32A back into the pool. (see Delete a charger on page 72).

When a meter is connected and functioning LinkRay will ignore any chargers that aren't connected as the site is being safely monitored through the connected meter.

If the meter is configured but not functioning LinkRay will not allow charging, in this case it is important to repair the meter/connection, or if the meter is intentionally removed review the static power requirements and disable the meter option in LinkRay.

20 LinkRay load balancing configuration

LinkRay can load balance using either an external Modbus meter or from the total site power budget and connected chargers only where there is no meter available.

Using the site without a connected meter

LinkRay can be configured without an external meter, this will calculate load balancing based on the maximum site power allowed and the connected chargers alone.

If other buildings/systems are likely to take power from this budget, then these should be subtracted from the maximum to allow a safe limit of power.

Using the site with a connected meter

If there is a connected external meter, LinkRay will use this to calculate any power differences between the available site power and the connected chargers.

LinkRay supports RS485 and TCPIP Modbus but needs a configuration file for the target meter. Contact Versinetic support for more information on external meters (see Page 84).

Note reading of the voltage is optional on the meter, if it is configured LinkRay will use this for calculations rather than any set value, however.

The following are example of load balancing setups

Scenario 1 – A 3 phase site with an even amount per phase available for chargers, all chargers are single phase AC 7.2kW chargers.

The site has 200A per phase so the entered site limit would be 600A.

All chargers have their settings for Single Phase and the Leg (Phase) they are connected to along with their max current, normally 32A.

LinkRay would read the current used on all chargers. Any active chargers on L1/L2/L3 would be load balanced up to a maximum of 200A per phase.

All idle chargers and chargers using less than their offered current will have their currents shared out to other chargers and their offer reduced. For instance, 24A being offered to a charger which is only using 12A may be subsequently offered 14A. This balancing may take a short while to settle in an active system.

Scenario 2 – A 3 phase site with an even amount per phase available for chargers, all chargers are single phase AC 7kW chargers, a building is on the site and an external meter is present.

The site has 200A per phase, the entered site limit would give us a total of 600A.

All chargers have their settings for Single Phase and the Leg (Phase) they are connected to along with their max current, normally 32A.

LinkRay would read the current used on all chargers. Any active chargers on L1/L2/L3 would be load balanced up to a maximum of 200A per phase minus any amount that the building is using. This usage is calculated as the site maximum minus any usage that the meter indicates that isn't already accounted for on the active chargers.

All idle chargers and chargers using less than their offered current will have their currents shared out to other chargers and their offer reduced. For instance, 24A being offered to a

charger which is only using 12A may be subsequently offered 14A. This balancing may take a short while to settle in an active system.

21 Load Balancing FAQs

The following section explains how LinkRay shares the available power, and what circumstances can affect the load balancing calculations:

How does LinkRay share the available power between chargers?

When the LinkRay has calculated the available power, it will initially give all active chargers an equal share of that power based on percentage of their maximum power output regardless of AC or DC, single or three phase.

Any active chargers not using their limit will have their offering reduced and the surplus given to other active chargers.

Using an external meter, the site usage power is taken away from the total budget and the remaining power given to the active chargers. If the site usage goes up the amount given to chargers is reduced, the meter is monitored every second for changes and measurands from the chargers are configurable (default is 10 seconds). Profile updates are sent immediately as the power goes over, if the building usage goes down LinkRay then waits 30-60 seconds to adjust chargers back up again, this delay allows us to deal with fluctuating power.

Does LinkRay monitor L1/L2/L3 separately?

L1/L2/L3 are monitored where the charger reports on these individually, otherwise the assumption is that three phases are equal when no information is returned by the charger.

Is DC efficiency taken into account?

DC charger efficiency is calculated by looking at the power offered, and subsequent power taken, any power over the offering is calculated as the AC->DC efficiency.

What if the chargers are trying to use more power than is available?

If the chargers request more power than is available, LinkRay will instruct the chargers to use less power. LinkRay checks the power requests of the chargers every second.

What happens when there is more power available?

LinkRay actively monitors the power requests and the amount of available power. If there is a surplus of power available, LinkRay will:

1. Check to see if there were any new charge profiles (requests for charging).
2. If there were no charge profiles, LinkRay instructs the chargers that they can use more power. (If there were new charge profiles, there would be no changes to the amount of power each charger can use).




What happens when one or more devices are not using all their offered power?

LinkRay actively monitors the power used by chargers, when their usage is considerably lower than their offered amount the offering will be reduced and distributed to other active devices.

How do I apply a safety margin for the power consumption?

If you need to add a safety margin for power consumption, reduce the overall site power (see

Groups

Group Name	Limit (A)	Number of Chargers	Chargers	Remove
<input type="text" value="Cable1"/>	<input type="text" value="50"/>	0		
<input type="text" value="Cable2"/>	<input type="text" value="75"/>	0		
<input type="text" value="Level5"/>	<input type="text" value="100"/>	0		

Set on page 39).

For example, if the site is set to 100A total power, and you need a 10A safety margin, reduce the total power to 90A.

Do offline chargers affect the load balancing calculations?

Yes, when there is no meter present, chargers that are offline are assumed to be charging and so affect the available power calculation. When there is a meter LinkRay can see the site load and isn't reliant on all its reading coming from the connected chargers.

If you have any permanently unavailable chargers, you should remove them from the list of chargers (see Delete a charger on page 72).

What limits are there for the number of chargers connected?

Standard licenses are set up for 8 and 32 charger/connectors, if you have a higher license need request through Versinetic support for pricing.

When a CSMS goes offline what happens to in progress charging sessions

If the CSMS is uncontactable LinkRay will buffer messages, when the CSMS is available again all messages are uploaded.

Message memory is intended to supply 24 hours of backup for active connections. If the CSMS remains uncontactable new messages will be discarded after memory eventually fills up.

If a site meter fails with communications to LinkRay what happens?

If a meter fails communications, LinkRay uses half the total used for charging at the point of failure. This will continue until the meter communications are restored.

So, for instance the site limit is 100A, the meter is showing that the building is using 10A, leaving 90A for charging, but only 40A are being actively used for charging. Communications are then lost to the meter, LinkRay will allow up to 20A (half the active 40A) for charging leaving a safe margin for the building until the meter is restored.

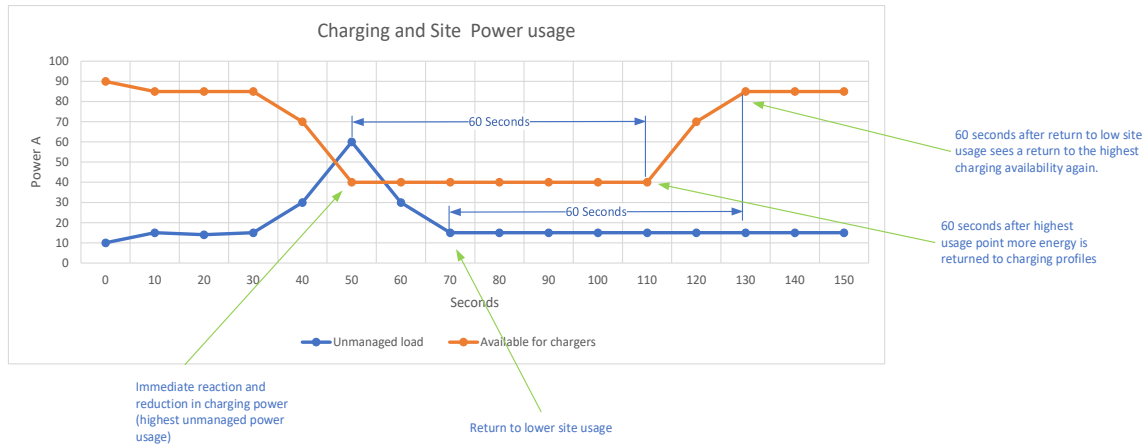
Note that if Linkray is reset with the meter communications in a failed state or if the meter fails when no charging is being performed then no power will be allowed for charging until the meter communications are restored or until the meter is disabled.

With an external meter power how fast is power reduced to chargers?

The external meter is read every second, the chargers report their power at the rate of the measurands (default 10 seconds, lowest setting is 5 seconds). The chargers aren't expected to quickly increase their power output but ramp usage, any fast changes at the site using unmanaged power will be seen within 1-2 seconds, chargers are immediately told to offer less power. This results in having a total response time of 2-4 seconds from spike to reduction.

Power is increased after the maximum site usage falls for a rolling 60 seconds similar to a high-water mark, this is done to reduce offerings to the charger from changing too frequently.

In a simple example of a site using more power, then reducing again this affects charging like so:



How does FIFO charging work?

When enabled chargers are given full power whilst power is available, for instance at a site with 3 chargers (32A single phase), and a site limit of 64A.

Charger 1 session starts – This is offered 32A

Charger 2 session starts – This is offered 32A

Charger 3 session starts – This is offered 0A (as no power is available)

Charger 1 session stops (either the charge session completed or the car draws no power)

Charger 3 is offered 32A

With an external meter charger offering will be adapted with the building load in addition to this behavior. Any chargers set to priority will be given power first (again in FIFO order) over normal priority FIFO chargers.

How does priority charging work?

Priority charging will give power to any chargers set to high priority first. If there is any left over power it will be given to normal priority chargers.

If there is not enough power at the high priority level power will be evenly distributed between high priority chargers.

If a charger is charging but is not using its offered amount, after approx. one minute its power will be distributed to other chargers in the same priority band or lower as appropriate.

Define how often LinkRay monitors the EV chargers for status

The LinkRay will receive data from the EV chargers at regular intervals. You can set the interval in the **Info** settings.

1. Navigate to the **Info** page.

2. Use the **Measurand Interval (Seconds)** setting to define how often LinkRay requests data from the EV chargers the minimum allowable is 5 seconds.

When setting the interval, it is important to get a reasonable balance. Longer intervals give more useful power usage readings, while shorter intervals provide more up-to-date readings. We recommend the default interval of 10 seconds for most sites.

Define what happens when LinkRay cannot communicate with the CSMS

There may be times where your LinkRay cannot communicate with your CSMS (Charging Station Management System). For example, if the internet service is down and communications are temporarily lost. You can use the LinkRay settings to define what happens in these situations.

1. Navigate to the **Configuration** page.
2. Use the **Allow New Charging** switch to control what happens when LinkRay cannot communicate with a CSMS:
 - **Enabled (Default)**
The LinkRay will allow new charge requests from vehicles when disconnected from the CSMS, either allowing all devices or those in the whitelist (depending on if whitelist is enabled or not).
 - **Disabled**
The LinkRay will allow any existing charging to continue but will prevent new charging sessions from being started.
3. Select **Save**.

Note when not using a CSMS make sure you enable “Allow New Charging when CSMS offline” as this is the mode you will be operating in.

View the current charge and available charge

The **Info** page has information about the instantaneous energy available and used:

Instantaneous Energy

Used by Charge Stations			Available for Charge Stations			
L1 [A]	L2 [A]	L3 [A]	Voltage [V]	L1 [A]	L2 [A]	L3 [A]
0.00	0.00	0.00	243.52	50.70	59.97	59.95
Total Power [kW]			Total Power [kW]	L1 [kW]	L2 [kW]	L3 [kW]
0.00			41.55	12.35	14.60	14.60
Meter Readings						
Total Power [kW]		L1 [A]	L2 [A]	L3 [A]		
0.81		3.26	0.02	0.03		
		L1 [V]	L2 [V]	L3 [V]		
		243.50	243.47	243.61		

Charge Limits

L1 [A]	L2 [A]	L3 [A]
60.00	60.00	60.00

On the left the power used by charge stations is shown in both A and combined Kw.

On the right is shown the available for charge stations. This is shown in both A and kW for ease of use. The total available for use by chargers is either the site limit if no meter is used or when an external meter is available this is calculated from the site limit minus any non-charger power consumption. The current L1 Voltage to N is also shown.

When a meter is enabled the Meter Readings are shown. The total site limits are shown below this in “Charge Limits”, if the meter is enabled but functioning it will show the degraded mode limits (defaulting to 0 unless configured otherwise):

Charge Limits

Degraded Mode

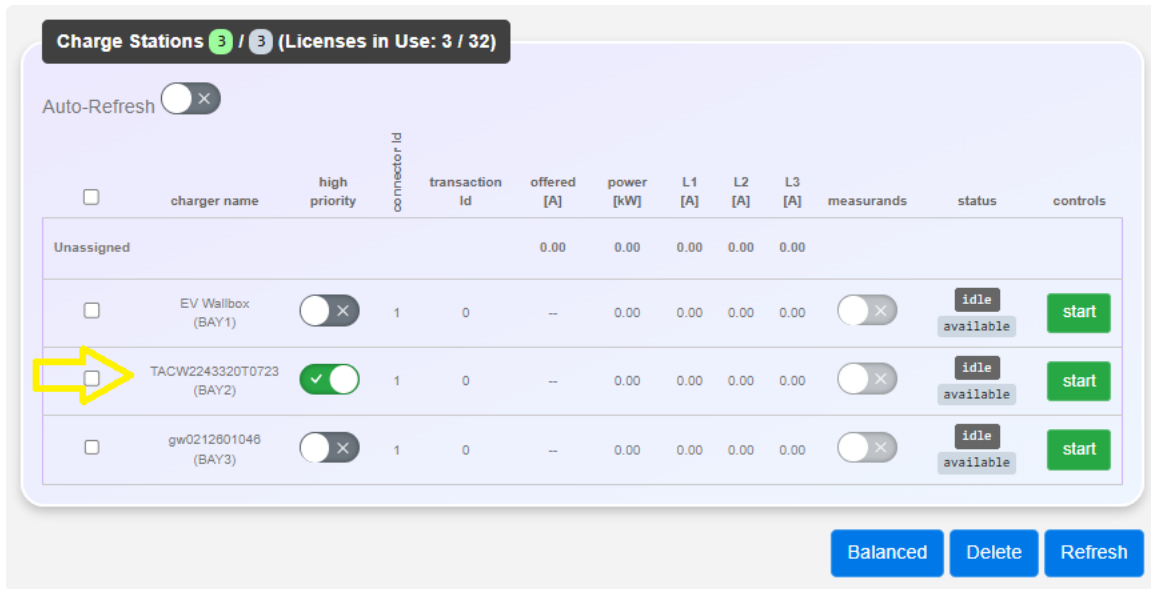
Meter is enabled but is not working

L1 [A]	L2 [A]	L3 [A]
16	16	16

22 Information and control of chargers

To remove a charger from the load balancing pool and set it to maximum power:

1. Navigate to the **Info** page.
2. In the **Chargers** section, find the row for the charger you want to control.
3. Use the **Priority** switch to toggle a charger between normal and high priority.
 - High priority means the LinkRay will give power these chargers in preference to normal priority chargers.



Charge Stations 3 / 3 (Licenses in Use: 3 / 32)

Auto-Refresh

<input type="checkbox"/>	charger name	high priority	connector id	transaction id	offered [A]	power [kW]	L1 [A]	L2 [A]	L3 [A]	measurands	status	controls
	Unassigned				0.00	0.00	0.00	0.00	0.00			
<input type="checkbox"/>	EV Wallbox (BAY1)	<input type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input type="checkbox"/>	idle available	start
<input checked="" type="checkbox"/>	TACW2243320T0723 (BAY2)	<input checked="" type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input type="checkbox"/>	idle available	start
<input type="checkbox"/>	gw0212601046 (BAY3)	<input type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input type="checkbox"/>	idle available	start

Balanced Delete Refresh

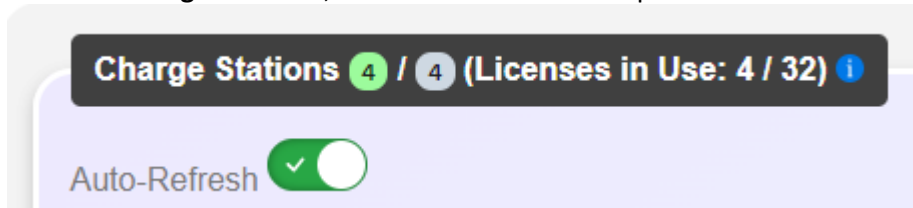
On this screen is listed also:

- Charger ID and friendly name
- Transaction IDs for chargers
- Current offered (per phase)
- Total power and individual phase currents consumed
- Status of the charger
- Group (if chargers are grouped at all otherwise "Unassigned")
- Start/Stop for manual control

Auto Update

To start

1. Navigate to the **Info** page.
2. In the **Chargers** section, check the box for Auto-Update

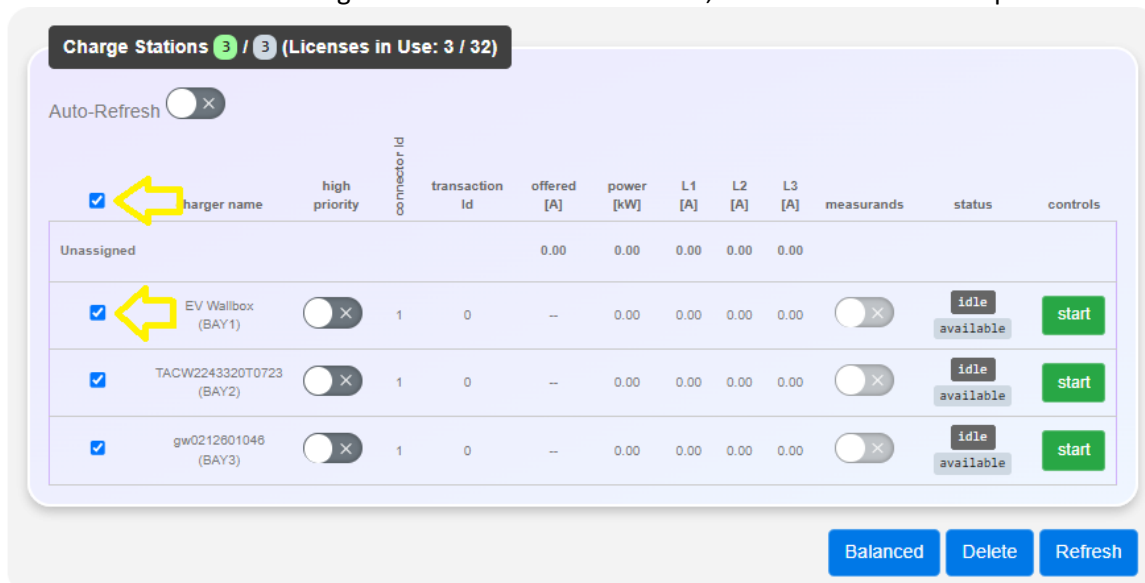


This will poll LinkRay every 3 seconds for changes to the charger status and instantaneous energy values.

Multiple charger configuration changes (bulk control)

To take control of multiple chargers manually, rather than control them individually:

1. Navigate to the **Info** page.
2. In the **Chargers** section, check the box for each charger that you want to control. You can select one or more chargers. To select them all at once, check the box at the top of the list.



<input checked="" type="checkbox"/>	charger name	high priority	connector id	transaction id	offered [A]	power [kW]	L1 [A]	L2 [A]	L3 [A]	measurands	status	controls
Unassigned												
<input checked="" type="checkbox"/>	EV Wallbox (BAY1)	<input type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input type="checkbox"/>	idle available	start
<input checked="" type="checkbox"/>	TACW2243320T0723 (BAY2)	<input type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input type="checkbox"/>	idle available	start
<input checked="" type="checkbox"/>	gw0212801048 (BAY3)	<input type="checkbox"/>	1	0	--	0.00	0.00	0.00	0.00	<input type="checkbox"/>	idle available	start

3. Use the buttons above the list to issue a command:

- **Balanced**
To set the LinkRay to return any selected chargers to normal from high priority.
- **Delete**
Deletes the selected chargers from the LinkRay. To remove them completely, you will need to reconfigure the chargers (see Delete a charger on page 72).

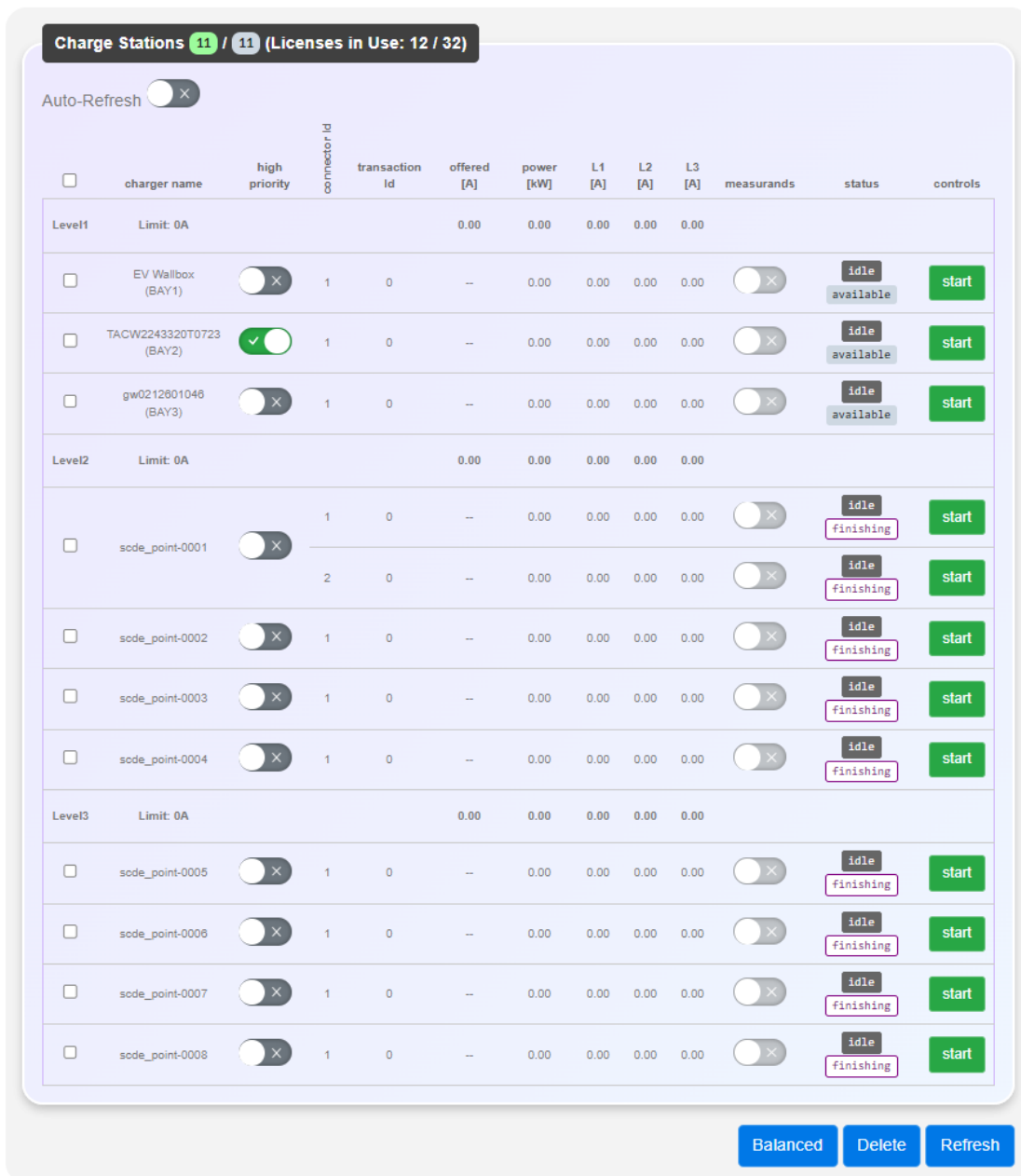
- **Refresh**
Reloads the webpage view. This can be useful to manually refresh if required.

Delete a charger

Every charger that is set up to connect to the LinkRay as its CSMS is listed in the **Chargers** section on the **Info** page. When LinkRay calculates the available power, it considers all of the chargers as capable of charging, including those that are offline. For this reason, it is a good idea to delete any chargers that are connected to LinkRay but are no longer in use. If you do not disconnect them, they will continue to affect the load sharing, even though they are not used for charging.

Group Control

When chargers are grouped into separate groups the info screen shows each group, the chargers in the group and totals for the group:

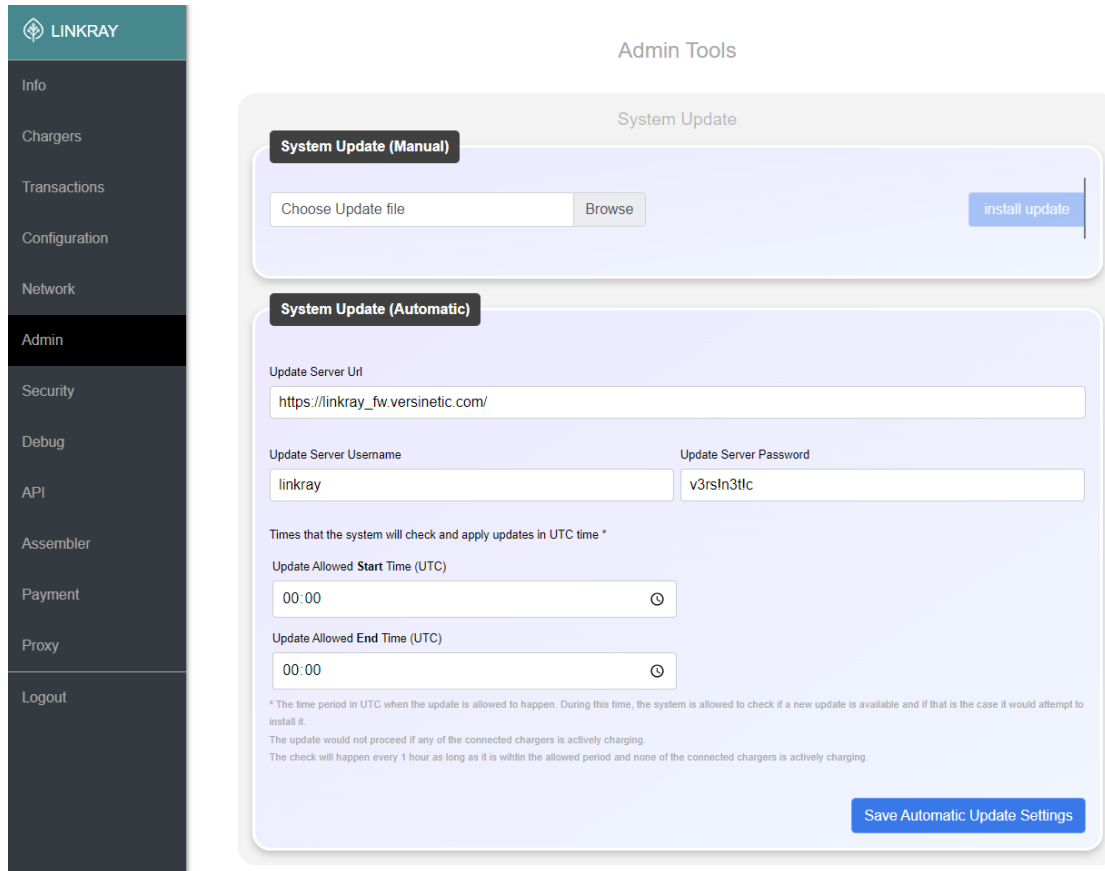


The screenshot shows a web interface for managing charge stations. At the top, it displays 'Charge Stations 11 / 11 (Licenses in Use: 12 / 32)' and an 'Auto-Refresh' toggle. Below is a table with columns: , charger name, high priority, connector id, transaction id, offered [A], power [kW], L1 [A], L2 [A], L3 [A], measurands, status, and controls. The table is organized into three groups: Level1, Level2, and Level3, each with a 'Limit: 0A' header. Level1 contains three stations: 'EV Wallbox (BAY1)', 'TACW2243320T0723 (BAY2)', and 'gw0212001046 (BAY3)'. Level2 contains five 'sode_point' stations (0001-0004). Level3 contains four 'sode_point' stations (0005-0008). Each station row includes a checkbox, a high priority toggle, a status indicator (idle or finishing), and a green 'start' button. At the bottom right, there are three blue buttons: 'Balanced', 'Delete', and 'Refresh'.

In the example above there are a number of groups with limits of 50A, 100A, a mix of AC and DC chargers in different groups in different states.

23 Admin and System Update

The **Admin** page is intended for system update, restarting and downloading of log messages.



LINKRAY

Info

Chargers

Transactions

Configuration

Network

Admin

Security

Debug

API

Assembler

Payment

Proxy

Logout

Admin Tools

System Update

System Update (Manual)

Choose Update file Browse

System Update (Automatic)

Update Server Uri

Update Server Username Update Server Password

Times that the system will check and apply updates in UTC time *

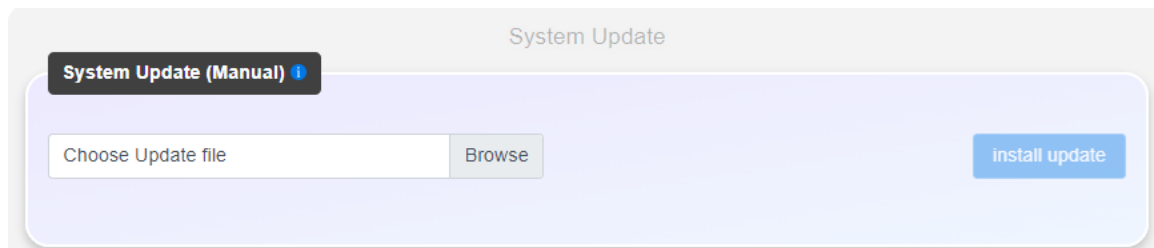
Update Allowed Start Time (UTC)

Update Allowed End Time (UTC)

* The time period in UTC when the update is allowed to happen. During this time, the system is allowed to check if a new update is available and if that is the case it would attempt to install it.
The update would not proceed if any of the connected chargers is actively charging.
The check will happen every 1 hour as long as it is within the allowed period and none of the connected chargers is actively charging.

System Update (Manual)

Installing a firmware update can be performed by clicking on the “browse” button, and navigating to your update file, note this will be a .enc file:



System Update

System Update (Manual)

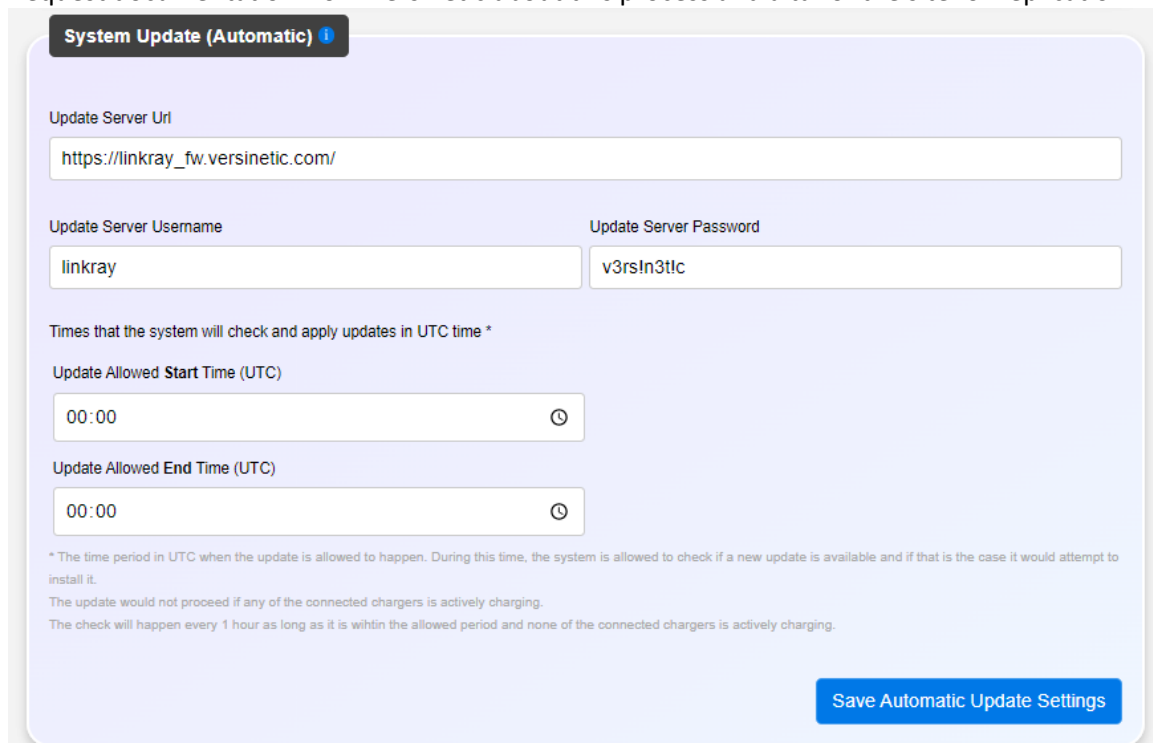
Choose Update file Browse

Then select **Upload File** to upload and perform the update. The update may take up to 10 minutes to complete, the system should automatically reboot afterwards. **Note** Do Not reboot the system within this time, doing so may result in permanent software failure.

System Update (Automatic)

Installing firmware can be left to automatic, the default server settings will check the Versinetic server for updates each hour, if you wish to disable this clear the server URL, if you wish to host your own server this should include the HTTP or HTTPS URL, and any username/password of your site instead.

Request documentation from Versinetic about this process and a tar of the site for replication.



System Update (Automatic)

Update Server Uri

Update Server Username Update Server Password

Times that the system will check and apply updates in UTC time *

Update Allowed Start Time (UTC)

Update Allowed End Time (UTC)

* The time period in UTC when the update is allowed to happen. During this time, the system is allowed to check if a new update is available and if that is the case it would attempt to install it.
The update would not proceed if any of the connected chargers is actively charging.
The check will happen every 1 hour as long as it is within the allowed period and none of the connected chargers is actively charging.

[Save Automatic Update Settings](#)

Default LinkRay settings

Site https://linkray_fw.versinetic.com

User linkray

Password v3rs!n3t!c

The system will only check and update when no active charging is taking place.

The system will only check between the hours given (note the time is in UTC) for updates.

The check is performed once per hour at a random minute period set on boot.

If an update is found it is downloaded and applied, the system will automatically reboot.

Note: "00:00" may be shown in the browser as "--:--"

To disable this feature, delete the download site URL.

Service Control

This allows the user to reset parts of the LinkRay system, it can be used if you experience problems:

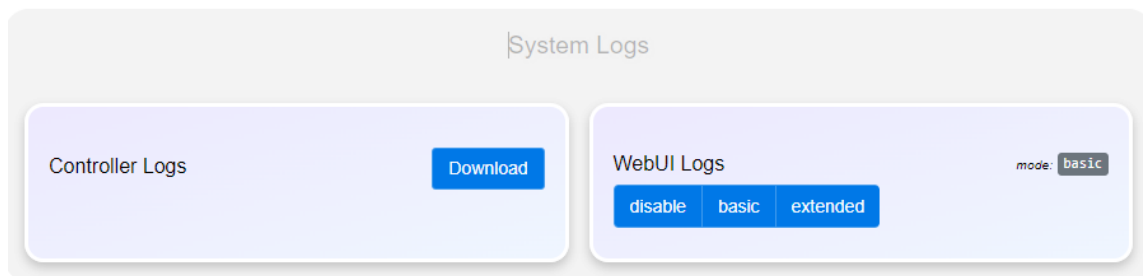
1. OS
 - Restarting this will reboot the board and all the software, all user settings are retained.
2. Controller App
 - Restarting this will restart only the load balancing application.
3. Web App
 - Restarting this will restart the web server element.
4. Debug SSH
 - Factory Diagnostics mode, not accessible to customers.

If you are experiencing problems restarting the LinkRay element is the quickest route, any further issues restarting the OS is a more complete solution.

System Logs

If requested by a service engineer you can download and email the LinkRay logs using this feature.

The logs default to storing basic information, it may be use for support to enable extended logs, these capture much more information but wrap quickly so are only useful for capturing specific events.



24 LEDs and reset

From Firmware release 1.2.6 and compatible hardware the user can both reset the device to factory defaults and have an indication of the good operating behavior from the LED appearance.

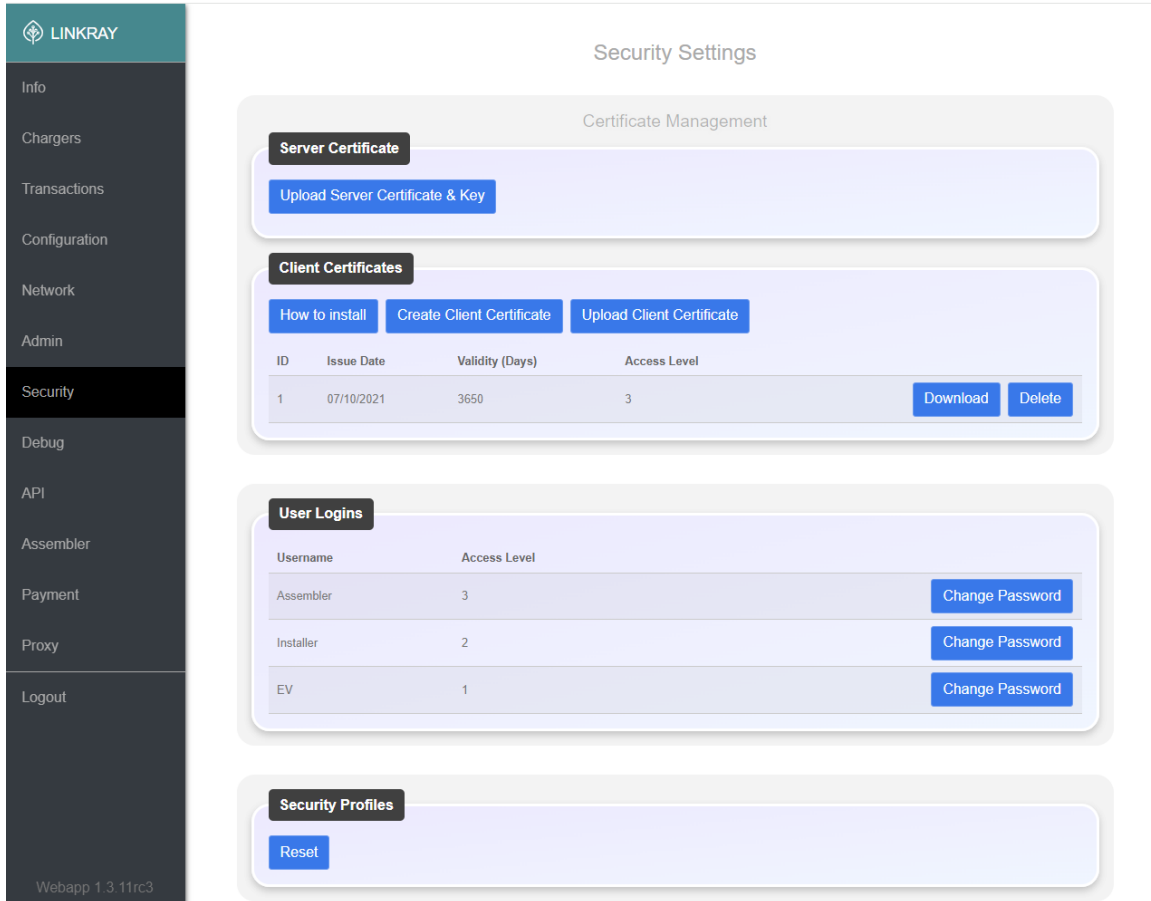
To reset to factory defaults press and hold the reset button for 5 seconds, the LED will quickly flash, and the unit will reset when the button is released.

In normal operation the LED will flash or show a solid colour. A green flashing LED indicated that the balancing loop is running and a solid Red LED indicates an error status (I.E Charger disconnected or an external Mid meter not communicating). The Error reports are shown in the bottom right-hand corner of the web app “info page” upon refresh.

25 Security

The **Security** settings allow you to create and manage the security certificates and change the password for each type of user.

1. Navigate to the **Security** page.



2. Use the **Security** settings to:
 - Upload a server certificate and key
 - Change a user password.

NOTICE

The client certificate settings are designed for future use as part of a 2FA (2 factor authentication) solution. This is not currently supported by the LinkRay.

Upload a server certificate and key

If your LinkRay does not have a security certificate, you will get a warning each time you try to log in to the LinkRay web interface. To prevent this from happening, log in as an assembler and then create and upload a server certificate.

1. Make sure the LinkRay is powered on and is connected to your PC directly or via Wi-Fi or your local network (connected to router).
2. You must log in as an **Assembler**.
3. Install OpenSSL from <https://www.openssl.org/> on your PC.
4. Use OpenSSL to issue the commands for generating a self-signed certificate and a device key.

To generate a self-signed certificate, use the following commands:

```
openssl genrsa -out device_signing.key 4096
openssl rsa -in device_signing.key -pubout -out
device_signing.pub
openssl req -new -sha256 -key device_signing.key -out
device_signing.csr
openssl x509 -req -sha256 -days 3650 -in device_signing.csr -
signkey device_signing.key -out device_signing.crt
```

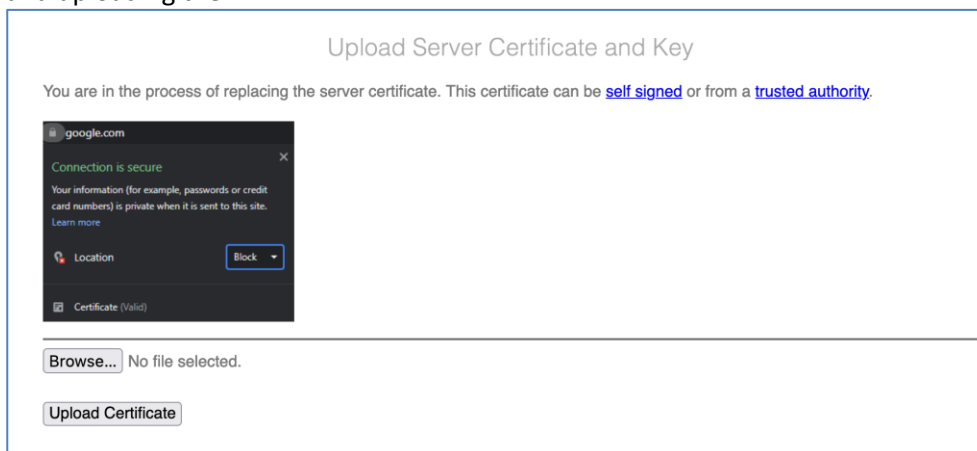
To generate a device key, use the following commands:

```
openssl genrsa -out device.key 4096
openssl rsa -in device.key -pubout -out device.pub
openssl req -new -sha256 -key device.key -out device.csr -config
san.cnf
openssl x509 -req -in device.csr -CA device_signing.crt -CAkey
device_signing.key -CAcreateserial -out device.crt -days 3650 -
sha256 -extfile v3.cnf
```

You should now have a device.crt and a device.key.

5. Select **Security**.
6. Select **Upload Server Certificate and Key**.

The Upload Server Certificate and Key page appears. It has settings for browsing to your files and uploading them.

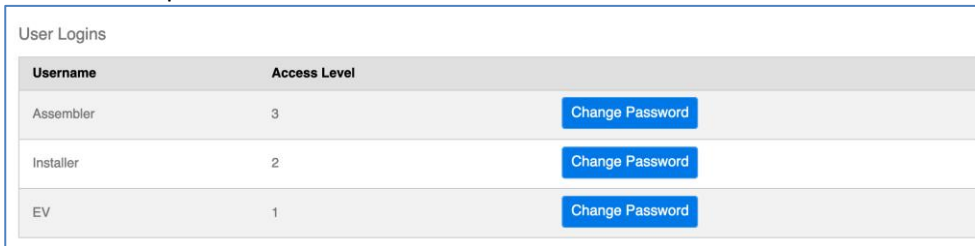


7. Use the **Browse** button to locate your certificate and key files.
8. Select **Upload Certificate** to upload them.
9. The user also needs to install the certificate on their Laptop/PC to remove the message. This is outside of the scope of this document to detail this procedure.

Change a user password

To change the password for a user:

1. Navigate to the **Security** page.
2. In the **User Logins** section, select the **Change Password** button for the user account you want to update.



Username	Access Level	
Assembler	3	Change Password
Installer	2	Change Password
EV	1	Change Password

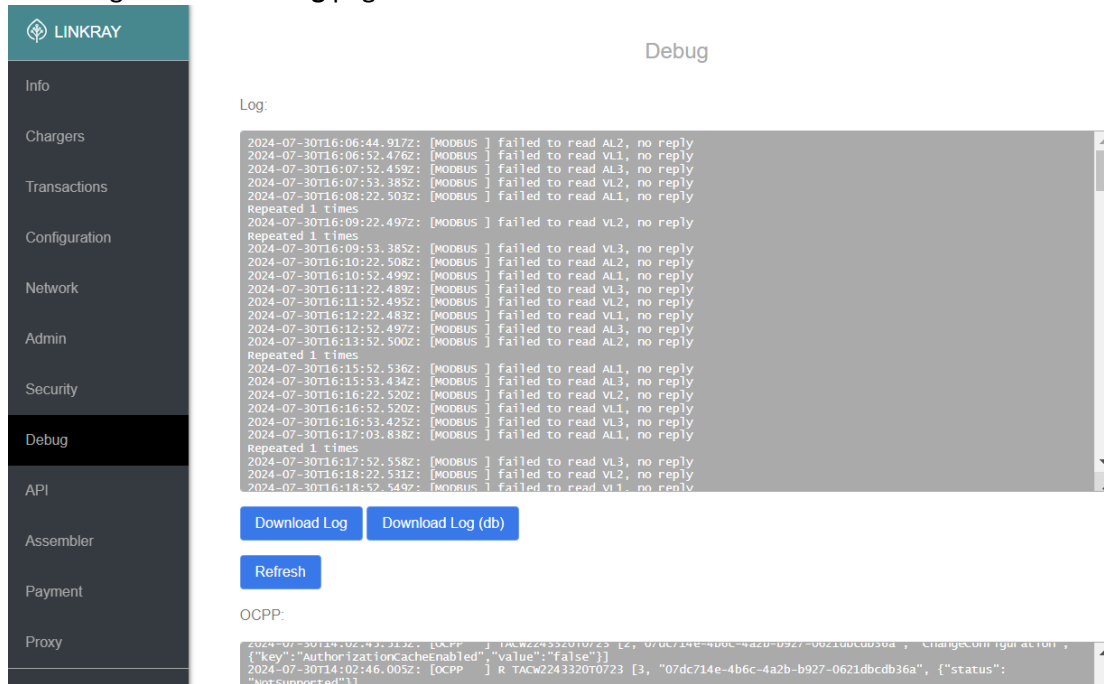
3. Enter the new password.
4. Enter the new password again in the confirm new password field. It has to be an exact match to the password you entered in step 4. If you enter a password that does not match, the software will reject your password change when you select the **Update** button in the next step.
5. Select **Update**.

26 View and Download the Debug log

If you have a problem with your LinkRay, customer support may ask you to provide the debug log or system log files.

You can download the LinkRay log from the Debug page or from the **Admin** page.

1. Navigate to the **Debug** page.



The Debug page shows the LinkRay log. It contains recorded data up to the time when the Debug page loaded. It is not a live update and requires **Refresh** to show the latest information.

2. Select **Download LinkRay Log** to download the log to your PC

Below the normal LinkRay log is the OCPP log, this is a transaction list of messages from chargers to linkray, also messages from linkray to the CSMS:

OCPP:

```

2024-07-30T14:02:43.313Z: [OCPP ] TACW2243320T0723 [2, "07dc714e-4b6c-4a2b-b927-0621dbcd36a", "ChangeConfiguration",
{"key": "AuthorizationCacheEnabled", "value": "false"}]
2024-07-30T14:02:46.005Z: [OCPP ] R TACW2243320T0723 [3, "07dc714e-4b6c-4a2b-b927-0621dbcd36a", {"status":
"NotSupported"}]
2024-07-30T14:02:46.006Z: [OCPP ] TACW2243320T0723 [2, "2b066ad1-653e-41e8-bd43-08761fc8575", "changeconfiguration",
{"key": "AuthorizeRemoteTxRequests", "value": "true"}]
2024-07-30T14:02:46.506Z: [OCPP ] R TACW2243320T0723 [3, "2b066ad1-653e-41e8-bd43-08761fc8575", {"status":
"Accepted"}]
2024-07-30T14:02:46.506Z: [OCPP ] TACW2243320T0723 [2, "4fe56405-3cbe-4f1b-9563-2a1ec2ccaa71", "ChangeConfiguration",
{"key": "AllowOfflineTxForUnknownId", "value": "false"}]
2024-07-30T14:02:47.006Z: [OCPP ] R TACW2243320T0723 [3, "4fe56405-3cbe-4f1b-9563-2a1ec2ccaa71", {"status":
"Accepted"}]
2024-07-30T14:02:47.007Z: [OCPP ] TACW2243320T0723 [2, "3f295d99-ec88-42e0-a306-76b9e4f71bdb", "ChangeConfiguration",
{"key": "MeterValuesSampledData", "value": "Current.Import,Energy.Active.Import.Register"}]
2024-07-30T14:02:47.536Z: [OCPP ] R TACW2243320T0723 [3, "3f295d99-ec88-42e0-a306-76b9e4f71bdb", {"status":
"Accepted"}]
2024-07-30T14:02:48.989Z: [OCPP ] R TACW2243320T0723 [2, "3508678", "StopTransaction", {"meterStop": 1, "idTag":
"123", "timestamp": "2024-07-30T14:01:52.000Z", "transactionId": 12362, "reason": "Remote"}]
2024-07-30T14:02:48.996Z: [OCPP ] TACW2243320T0723 [3, "3508678", {}]
2024-07-30T16:53:06.776Z: [OCPP ] TACW2243320T0723 [2, "0b7d57a0-bcca-4626-9670-4cb3b2bd7e0a", "ChangeConfiguration",
{"key": "MeterValuesSampleInterval", "value": "10"}]
2024-07-30T16:53:06.777Z: [OCPP ] gw0212601046 [2, "7ecda4e2-240b-4977-8f0d-3b451d32a544", "ChangeConfiguration",
{"key": "MeterValuesSampleInterval", "value": "10"}]
2024-07-30T16:53:06.816Z: [OCPP ] R TACW2243320T0723 [3, "0b7d57a0-bcca-4626-9670-4cb3b2bd7e0a", {"status":
"Accepted"}]
2024-07-30T16:53:06.830Z: [OCPP ] R gw0212601046 [3, "7ecda4e2-240b-4977-8f0d-3b451d32a544", {"status": "Accepted"}]

```

[Download OCPP](#)
[OCPP.1](#)
[OCPP.2](#)
[OCPP.3](#)
[OCPP.4](#)

[Refresh](#)

27 Assembler

This is a configuration page for branding and external meter configuration uploads.

Custom UI Branding

This should be a zip file containing a **branding.json** file and any images.

Custom branding files should be obtained through Versinetic support, below shows a working example of a simple branding file:

```
{
  "Navigation" : {
    "HeadText": "",
    "HeadImg": "logo.png",
    "HeadImgHeight": 150,
    "HeadImgLeftOffset": 4,
    "HeadImgRightOffset": 0,
    "HeadImgBottomOffset": 12,
    "HeadOrderReverse": 0,
    "HeadStyle": "font-size: 100%"
  },
  "Content" : {
    "FootText": "© 2023 My Company - All rights reserved",
    "FootStyle": "color: #000000",
    "SectionBack": "#CECECD",
    "CardBack": "#F3F2F2",
    "CardLabel": "#FFFFFF",
    "CardLabelBack": "#EF3340",
    "Button": "#FFFFFF",
    "ButtonBack": "#3E6DBE",
    "ToggleOn": "#FFFFFF",
    "ToggleOnBack": "#3E6DBE",
    "ToggleOff": "#FFFFFF",
    "ToggleOffBack": "#CECECD"
  },
  "Colors": {
    "Primary" : "#FFFFFF",
    "PrimaryBack" : "#404040",
    "Secondary" : "#FFFFFF",
    "SecondaryBack" : "#FFFFFF"
  }
}
```

Where logo.png is an image file with a transparent background.

To clear any branding upload a zip containing a branding.json with only.

```
{
}
```

External Meter Configuration

The meter config file is a JSON file with the following content (**Note this is case sensitive**):

```
{
  "name": "friendly name",           // put in the name of the meter you want to see
  "tcp":true,                        // true when on ethernet/Wi-Fi, false on RS485
  "IP":"192.168.1.110",              // only enter this when tcp is true
  "Baud":9200                        // for RS485 mode this is the baud rate
  "AddressA":1,                      // the address of the meter for current readings
  "ReadCmd":3,                      // the command to read, normally 3
  "ARegisterL1":1,                  // the address of the L1 Current
  "ARegisterL2":11,                // the address of the L2 Current
  "ARegisterL3":21,                // the address of the L3 Current
  "DataTypeA":"Short",              // Ushort (U16), Short (S16)
                                      // Ulong (U32), Long (S32)
                                      // Float
                                      // NOTE Types are CASE SENSITIVE!

  "MultiplyA":0.01,                 // The amount to multiply to get whole A

  "AddressV":1,                     // meter address for voltage (if different from A)
  "VRegisterL1":0,                  // the address of the L1 Voltage
  "VRegisterL2":10,                 // the address of the L2 Voltage
  "VRegisterL3":20,                 // the address of the L3 Voltage
  "DataTypeV":"Short",              // data size for the Voltage register
                                      // see DataTypeA for examples

  "MultiplyV":0.01,                 // multiply to get whole V (if different from A)

  "PhasesReported":3                // Number of phases reported
}
```

Note If the voltage read is lower than 90v or above 260v the entry is ignored and the default manual Voltage is taken. When applying a new meter configuration if you get a blank value. check the address, the type and also the multiply value as something out of range will not be shown.

Please contact support if your meter is not listed, the following are reference examples for supported meters:

Meter	JSON
IAMMETER WEM3080T TCP/IP	<pre>{"name": "WEM3080TTCP", "tcp":true, "IP":"192.168.1.110","Address":1, "ReadCmd":3, "ARegisterL1":1, "ARegisterL2":11, "ARegisterL3":21, "VRegisterL1":0, "VRegisterL2":10, "VRegisterL3":20, "DataType":"Short", "Multiply":0.01, "PhasesReported":3}</pre> <p>Replace the IP with the real IP of the meter.</p>
HAGER ECR300C	<pre>{"name":"ECR300C", "tcp":false, "Baud":19200,"Address":1, "ReadCmd":3, "ARegisterL1":45065, "ARegisterL2":45067, "ARegisterL3":45069, "VRegisterL1":45056, "VRegisterL2":45057, "VRegisterL3":45058, "DataType":"ULong", "Multiply":0.001, "PhasesReported":3 }</pre> <p>Note change baud rate to the configured setting on your meter, 19200 is the default.</p>
Eastron SDM72D-M	<pre>{"Baud":9600, "Address":1, "ReadCmd":4, "DataType":"Float", "KwhRegister":342,"kWh":true, "name":"MD72"}</pre>
Eastron SDM3xx	<pre>{"tcp":false, "Baud":9600,"Address":1, "ReadCmd":4, "ARegisterL1":6, "ARegisterL2":8, "ARegisterL3":10, "DataType":"Float", "PhasesReported":3, "name":"SDM3xx"}</pre>
ABB B21 / B23 / B24	<pre>{"Baud":9600, "Address":1, "ReadCmd":3, "ARegisterL1":23308, "ARegisterL2":23310, "ARegisterL3":23312, "DataType":"ULong", "Multiply":0.001, "MultiplyA":0.001, "MultiplyV":0.1, "PhasesReported":3, "VRegisterL1":23296, "VRegisterL2":23298, "VRegisterL3":23300, "name":"B21B23B24"}</pre> <p>NOTE: On the ABB meter please ensure in the menu – 1. Baud = 9600, Parity = none, Phase = 1 or 3 (depending on the supply of 3 phase or single phase)</p> <p>Mod bus wiring = Pin 3 from LinkRay (Orange color wire) connects to the pin labelled “A” on the ABB meter side Pin 2 from LinkRay (Yellow color wire) connects to the pin labelled “B” on the ABB meter side.</p>
Carlo Gavazzi EM210	<pre>{"tcp":false, "Baud":9600,"Address":1, "ReadCmd":3, "ARegisterL1":12, "ARegisterL2":14, "ARegisterL3":16, "DataType":"ULong", "Multiply":0.001, "PhasesReported":3, "name":"EM210"}</pre>
SDM630MCT-1L-TCP	<pre>{"tcp":true, "IP":"1.2.3.4","Address":1, "ReadCmd":4, "ARegisterL1":6, "ARegisterL2":8, "ARegisterL3":10, "DataType":"Float", "PhasesReported":3, "name":"SDM6xx-tcp"}</pre> <p>Note update the IP to the meter IP!</p>

SOCOMEC M-50 U-10 (address2) I-30 (address3)	<pre>{ "tcp":true,"IP":"192.168.0.201","ReadCmd":3,"AddressA":3,"ARegisterL1":18458,"ARegisterL2":18460,"ARegisterL3":18462,"DataTypeA":"ULong","DataTypeV":"ULong","MultiplyA":0.001,"PhasesReported":3,"AddressV":2,"VRegisterL1":36869,"VRegisterL2":36871,"VRegisterL3":36873,"MultiplyV":0.01,"name":"SOCOMECE-i30"}</pre> <p>Note update the IP to the meter IP Note Ensure that AddressA and AddressV are the addresses of the i-30 / U-10 units</p>
Schneider iEM3100/3200/3300	<pre>{ "tcp":false,"Baud":9600,"Address":1,"ReadCmd":3,"ARegisterL1":2999,"ARegisterL2":3001,"ARegisterL3":3003,"DataType":"Float","Multiply":1.0,"PhasesReported":3,"VRegisterL1":3027,"VRegisterL2":3029,"VRegisterL3":3031,"name":"iEM3100"}</pre> <p>Note datasheet specifies registers 3000,3002,3004 but it was found that register-1 had to be used. Note check baud as well as 19200 is also common</p>
Schneider PM3250 / PM3255	<p>Note Same as iEM3x00 above, check the baud rate as sometimes they are 9600 or 19200</p>
AcuRev 1312	<pre>{ "Baud":19200,"Address":1,"ReadCmd":3,"ARegisterL1":8194,"ARegisterL2":8196,"ARegisterL3":8198,"VRegisterL1":8202,"VRegisterL2":8204,"VRegisterL3":8206,"DataType":"Float","PhasesReported":3,"name":"AcuRev1312"}</pre>
IPD3100C/IPD3005C	<pre>{ "Baud":9600,"Address":100,"ReadCmd":3,"ARegisterL1":16,"ARegisterL2":18,"ARegisterL3":20,"DataType":"Float","Multiply":1.0,"PhasesReported":3,"VRegisterL1":0,"VRegisterL2":2,"VRegisterL3":4,"name":"IPD3100C/IPD3005C"}</pre> <p>Note change the RS485 to 8N1 (the default on the meter is 8E1), also check the address matches above.</p>

To use the above save the JSON information to a file with a “.meter” extension and upload to the Assembly screen.

LINKRAY

Assembler Settings

Custom Branding Import

Choose Branding package zip (or json) file...

Import Meter Configuration

Choose meter configuration package...

The Modbus registers can be checked in the Configuration screen:

Site Configuration

Voltage [V] (L-N) Total Power [kW] L1 [A] L2 [A] L3 [A]

Measurand Interval [s]

FIFO Charging Mode Disabled

Use Meter Enabled

Total Power [kW] L1 [A] L2 [A] L3 [A]

L1 [V] L2 [V] L3 [V]

Meter Configuration

▼ iammeter wem3080

tcp	IP	Address	ReadCmd	ARegisterL1	ARegisterL2
<input type="text" value="1"/>	<input type="text" value="192.168.1.110"/>	<input type="text" value="1"/>	<input type="text" value="3"/>	<input type="text" value="1"/>	<input type="text" value="11"/>
ARegisterL3	VRegisterL1	VRegisterL2	VRegisterL3	DataType	Multiply
<input type="text" value="21"/>	<input type="text" value="0"/>	<input type="text" value="10"/>	<input type="text" value="20"/>	<input type="text" value="Short"/>	<input type="text" value="0.01"/>
PhasesReported	name				
<input type="text" value="3"/>	<input type="text" value="iammeter wem3080"/>				

Modbus Troubleshooting

Things to check:

- Specified MODBUS baud rate is the same as the meter
- Specified MODBUS address is the same as the meter
- LinkRay supports 8N1 (8 bits no parity one error bit)
- The RS485 wiring is incorrect, if in doubt swap the D+/D- (A/B)
- Modbus RTU should be selected (if there is an ASCII/RTU mode)

28 API (Application Programming Interface)

The LinkRay has an API (Application Programming Interface) that can be used to interface other systems to LinkRay. Depending on your requirements, this can be set to only read configuration and status or allow updating as well.

The API uses HTTPS web requests and a JSON file format to communicate, contact support directly for more information on this file format.

To enable the API, you will need to:

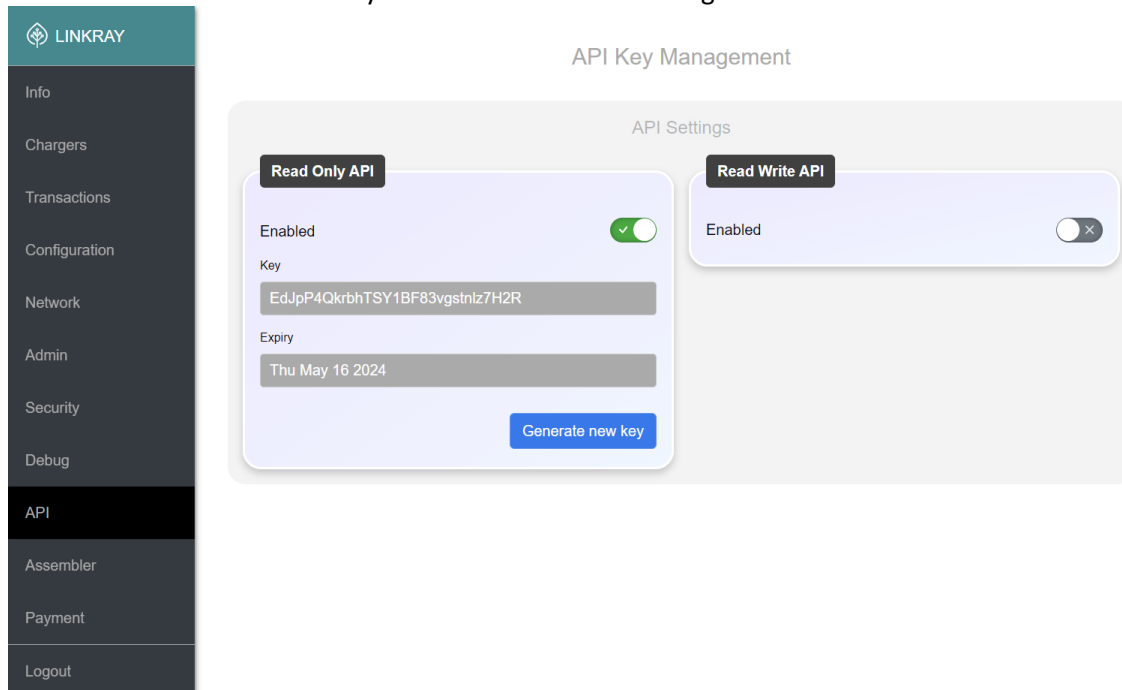
- Set up the API keys that allow the connection to the LinkRay, read only or read writable.
- Make your web fetch from linkray using the secure token to gain access.

Enable or Disable the API key function

To use the API to access the LinkRay's data:

1. Navigate to the **API** page.

The API page has two sections. The top section is for the **Read Only API** and the bottom section is for the **Read Write API**. They both have their own settings.



2. Enable or disable each key as appropriate.

There is a switch for a read-only key and a read-write key. Depending on what you want to use the API for, you will need to enable one or both keys.

To find out what key you will need, see Endpoints (on page 91). There, we explain what endpoints and parameters are available, what they do, and which key they require.

3. Select **Generate new key**.
4. Enter the time period that the key will remain valid. When this time is reached, the API will become unavailable using this key and you will need to generate a new one.
5. Select **Generate**.

The Versinetic software adds the key information to the **Key** and **Expiry** fields automatically.

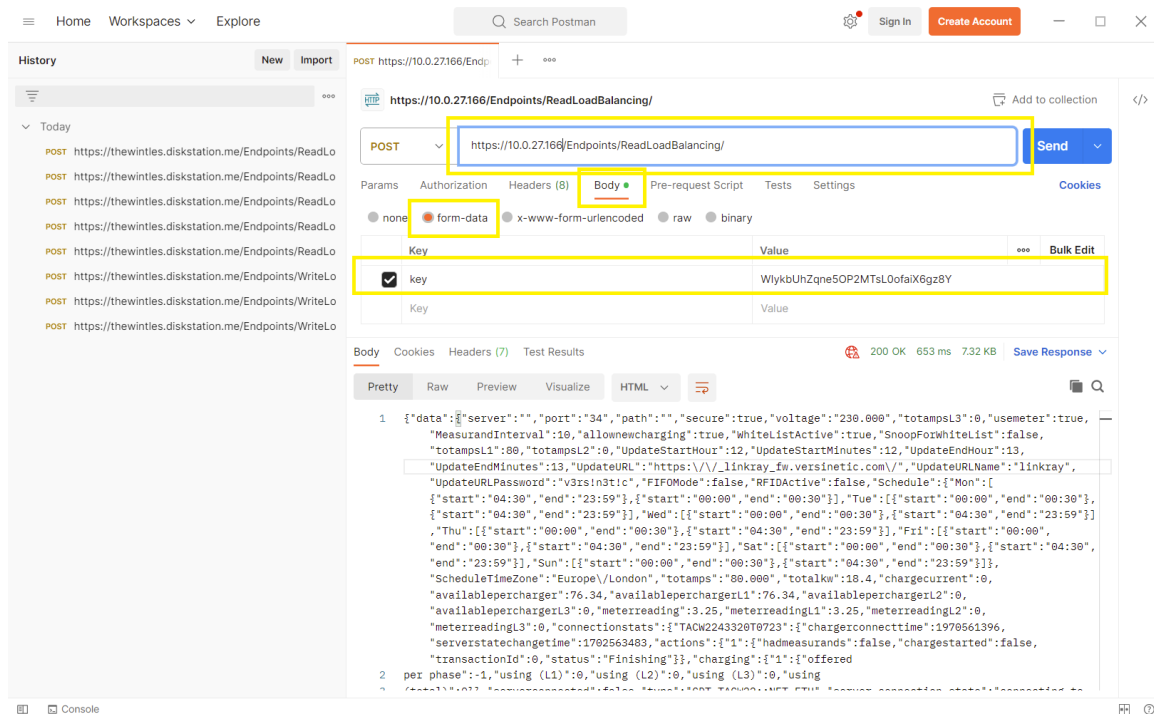
Endpoints

The API has these endpoints:

- Read load balancing (see page 91)
- Write load balancing (see page 93).

These should be issued to the board a HTTPS post; the key should be included in a multipart/formdata.

This example is using postman:



Read load balancing

Use to read the load balancing data that is present on the Info page of the LinkRay web interface. You can use **either of the API keys to read the data** (see Enable or Disable the API key on page 89).

URL:	/Endpoints/ReadLoadBalancing/ Example: https://<LinkRayIP>/Endpoints/ReadLoadBalancing/	
Request format:	Key:	API key
Response format:	Data:	JSON data that is displayed in the fields on the Info page.

	apiStatus:	A number indicating the status. 1 = Request is successful 2 = API key is disabled 3 = Invalid API key submitted
	errorMessage:	Text representation of the apiStatus when the apiStatus is 2 or 3.

Write load balancing

Use to write the load-balancing data. You must use a **Read Write API** key to write the data (see [Enable or Disable the API key on page 89](#)).

URL:	/Endpoints/WriteLoadBalancing/ Example: https://LinkRay/Endpoints/WriteLoadBalancing/	
Request format:	Key:	API key data
	Data:	Load balancing JSON data to write
Response format:	Data:	JSON data that is displayed in the fields on the Info page.
	apiStatus:	A number indicating the status. 1 = Request is successful 2 = API key is disabled 3 = Invalid API key submitted 4 = No data sent to write
	errorMessage:	Text representation of the apiStatus when the apiStatus is 2, 3, or 4.

Example write request

```
{ "server": "10.0.27.81", "port": "8887", "path": "\\LinkRaytest", "secure": false, "voltage": "230", "totamps": "20", "usemeter": false, "MeasurandInterval": 10, "allownewcharging": true, "chargecurrent": 0, "availablepercharger": 20, "meterreading": -1, "connectionstats": [], "savedchargers": { "Garage": { "fullpower": false, "connectors": [1], "kWh": true } }, "URL": "ws://10.0.27.81:8887", "identityprepend": "LinkRaytest", "LinkRayVersion": "1.0.0" }
```

Example response

```
{ "data": { "server": "10.0.27.81", "port": "8887", "path": "\\LinkRaytest", "secure": false, "voltage": "230", "totamps": "20", "usemeter": false, "MeasurandInterval": 10, "allownewcharging": true, "chargecurrent": 0, "availablepercharger": 20, "meterreading": -1, "connectionstats": [], "savedchargers": { "Garage": { "fullpower": false, "connectors": [1], "kWh": true } }, "URL": "ws://10.0.27.81:8887", "identityprepend": "LinkRaytest", "LinkRayVersion": "1.0.0", "apiStatus": 1 } }
```

Parameters

You can use the following parameters with the endpoints. Include them in your request inside double quotes (for examples of the correct syntax, see [Write load balancing on page 93](#)).

Parameter	Description	Values	Access
server	CSMS server address IP/host	String	Read write
port	CSMS server address port	String	Read only
path	Identity of LinkRay	String	Read write
secure	Use WS or WSS	Bool	Read only
voltage	Site voltage	Float	Read write
totalamps	Site total Amps (alternative to W)	Float	Read write
totalampsL1	Site total Amps for L1	Float	Read write?
totalampsL2	Site total Amps for L2	Float	Read write?
totalampsL3	Site total Amps for L3	Float	Read write?
Totalkw	Used KWatts	Integer	Read write
usemeter	Use a power meter to balance power with other power users	Boolean	Read write
meterreading	Total of all phases reported by Meter	Float	Read
MeasurandInterval	Measure and interval (seconds). How often the values are read from the EV charger.	Integer	Read write
allownewcharging	Defines what happens when the CSMS cannot be reached. When True, new charging is allowed without validation. When False, existing charging can continue but new charging sessions cannot be started.	Boolean	Read write
WhiteListActive	Reserved		
SnoopForWhitelist	Reserved		

Parameter	Description	Values	Access
chargecurrent	Current used for charging (A)	Float	Read only
availablepercharger	Current per charger (used for the charging profiles)	Float	Read only
Meterreading	Reading from the power meter (if a meter is used)	Integer	Read only
connectionstats	<p>Information about currently connected chargers.</p> <p>The connectionstats parameter has additional parameters that are included in square brackets.</p> <p>We explain these in Connectionstats per connector on page 96 and Connectionstats per charger on page 96.</p>	json	Read only
savedchargers	<p>Information about the chargers that have been detected</p> <p>The savedchargers parameter has additional parameters that are included in curly brackets.</p> <p>We explain these in Saved chargers on page 97.</p>	json	Mixed
URL	<p>URL of CSMS, for example, wss://csms.com:9101.</p> <p>Note / must be escaped i.e "wss:\\\\:80"</p>	String	Read write
Identityprepend	Identity of LinkRay.	String	Read only
LinkRayVersion	LinkRay version number, i.e. 1.0.6	String	Read only
Whitelist	Reserved		
ModbusConfig	See Description of the meters' modbus parameters see Modbusconfig (Page 99)	String	

Parameter	Description	Values	Access
UpdateStartHour	Time For Auto updates from server to start	Text	Read/Write
UpdateStartMinutes	Time For Auto updates from server to start	Text	Read/Write
UpdateEndHour	Time For Auto updates from server to finish	Text	Read/Write
UpdateEndMinutes	Time For Auto updates from server to finish	Text	Read/Write
UpdateURL	Auto update server	Text	Read/Write
UpdateURLName	Auto update server login	Text	Read/Write
UpdateURLPassword	Auto update server login	Text	Read/Write
FIFOMode	Turn on FIFO mode	Boolean	Read/Write
RFIDActive	Turn on a local RFID reader	Boolean	Read/Write
Schedule	JSON List of times for scheduled exclusions to charging	JSON	Read/Write
ScheduleTimeZone	Timezone of the Linkray	Text	Read/Write

Connectionstats per connector

For each connector, the connectionstats has additional parameters that are included inside square brackets, for example:

```
"connectionstats": [],
```

hadmeasurands	Meter values has been received.	Boolean	Read only
chargestarted	Charging session has been approved.	Boolean	Read only

Connectionstats per charger

For each connector, the connectionstats has additional parameters that are included inside square brackets, for example:

```
"connectionstats": [],
```


serverconnected	There is a connection to the CSMS for this charger.	Boolean	Read only
actions	Json array of the per connector information.	json	Read only

Saved chargers

The connectionstats has additional savedcharger parameters that are included inside curly brackets, for example:

```
"savedchargers":{"Garage":{"fullpower":false, "connectors":[1], "kWh":true}},
```

fullpower	The charger is not load balanced	Boolean	Read write														
connectors	Recognised charger connectors.	Json array with connectorIds	Read only														
kWh	The charger will be sent profiles in kilowatts per hour.	Boolean	Read only														
maxpower	Power in A	integer	Read write														
maxpowerUnit	Amp (A) or Watt (W)	String ("A" or "W")	Read write														
phases	List of <table border="1" data-bbox="480 1289 896 1499"> <thead> <tr> <th>Phases</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Single phase</td> <td>1</td> </tr> <tr> <td>Three phase</td> <td>2</td> </tr> </tbody> </table> <table border="1" data-bbox="480 1566 896 1837"> <thead> <tr> <th>Wired</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Single phase</td> <td>L1</td> </tr> <tr> <td>Single phase</td> <td>L2</td> </tr> <tr> <td>Single phase</td> <td>L3</td> </tr> </tbody> </table>	Phases	Value	Single phase	1	Three phase	2	Wired	Value	Single phase	L1	Single phase	L2	Single phase	L3	List of strings	Read write
Phases	Value																
Single phase	1																
Three phase	2																
Wired	Value																
Single phase	L1																
Single phase	L2																
Single phase	L3																

	Three Phase	L1-L2-L3			
	Bits	Value			
	Reserved	No not write			

Modbusconfig

This is a description of the JSON

tcp	True/false, when false RS485 is assumed	bool
IP	IP address of meter, only needed if tcp was true	string
port	TCP port of the meter. 502 if the field is missing. Only for tcp	int
Baud	Baud rate on RS485, not needed with tcp	int
Address	(0-255) modbus station address	int
kWh	true/false Meter values are in kWh	bool
PhasesReported	1/3 number of phases reported from the meter	int
Multiply	Number interger reading will be multiplied with, defaults to 0.01	float
ReadCmd	(0-255) Value used to send a read command (function byte)	int
DataType	(Short Long ULong Float) data type of the values to read	string
KwhRegister	Register that holds total kwh	int
ARegister	Register that holds total A	int
ARegisterL1	Register for L1 reading in A	int
ARegisterL2	Register for L2 reading in A	int
ARegisterL3	Register for L3 reading in A	Int
VRegisterL1	Register for L1 reading in V	int
VRegisterL2	Register for L2 reading in V	int
VRegisterL3	Register for L3 reading in V	Int



Tested Chargers

This is a list of some known chargers tested with LinkRay:

Charger	Notes	Image
EO Genuis 2 EO Mini Pro 3	From Version 1.0.0	
Autel MaxiChargerAC	From Version 1.3.11 Tested with MaxiCharger firmware Charge Control Module V1.51, previous to that load balancing profiles were not accepted.	
Autel 47KW DC	From Version 1.3.8	
ABB Terra AC W22 T RD MC 0 Firmware 1.6.6	From 1.1.7 onwards (tested with 1.6.9 and 1.8.0)	
Ratio io7	From Version 1.0.14	

Blink 30/40Kw DC charger	Testing in progress	
Hellonext DC 30Kw	From version 1.0.11	
Schneider EVlink Smart Wallbox	Tested with firmware 3.3.0.17	
EVBox Elvi AC	Unknown charger firmware.	
MSI EV Premium / EV AI / EV Life	Preproduction units tested. Tested with 1.1.6	
Trilog simulator	EV stack Tested with 1.1.7	

<p>Kevit DC Charger Dispenser 240KW</p>	<p>Remote testing and load balancing.</p>	 <p>DC charger-Dispenser 240 Capacity : 240kWh Type : CCS1, CCS2</p>
<p>ChargeSim</p>	<p>DC 3 Phase charger simulation. LinkRay tested with 50 DC units connected and charging simultaneously.</p>	
<p>Heliox DC chargers</p>	<p>Support from 1.2.0</p>	
<p>Dover Charging</p>	<p>Support from 1.1.7</p>	
<p>Blink IQ200</p>	<p>Limitation a minimum of 6A. Supported from 1.3.4</p> <p>Note for plug and charger the configuration of MaxEnergyOnInvalidID should be set to the full power otherwise output maybe limited</p>	

<p>Alpitronic / Hypercharger HYC400</p>	<p>Note on the charger configuration untick the start transaction with zero port and set the minimum to 25KW, this may be reduced but is known to function.</p>	
<p>Alfen Eve Single</p>	<p>From firmware 1.2.12 Tested with OCPP1.6</p>	

CSMS Tested

CSMS Provider	Notes
Saascharge	
WeVolt	
ChargeHub	
Monta	
Volttime	
Fuuse	
ChargeFox	

29 Log Out

To help prevent unauthorised use of the LinkRay, log out when you have finished working with the software.

1. Select **Logout**.
2. At the prompt, select the **Logout** button to complete the logging out process.

30 Customer Support

Contact customer support if you need:

- Technical assistance
- To order replacement documentation
- To report a problem.

To contact us call +44 (0) 121 828 9292 or email us at info@versinetic.com.

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