eo

Installation Guide: EO Hub and EO Genius V1.1

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1   Introduction

This document details the physical installation instructions for the Hub, how to connect it to the Genius charging stations and how to configure the settings on the EO Hub.

This document is designed to complement the EO Academy training days and it is still mandatory for Installers to attend a training day before installing a genius and hub.

The details of all EO Academy training events can be found here: www.eocharging.eventbrite.co.uk

Experience has shown that often the most difficult part of the installation is enabling the communications between the EO Hub and the eoCloud back office portal. Therefore it is recommended that the IT settings (section 3.4) are discussed with the client as soon as possible.

2   Wiring Connections for the Genius Charging stations and the serial bus

Each Genius charging station has a short two wire serial cable protruding from it. This needs to be connected to the other stations and the hub in a daisy chain fashion (with the hub at one end).
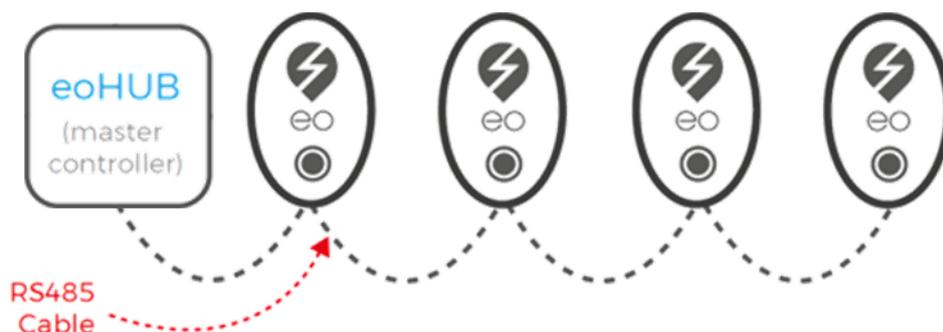
Figure 1 - EO Hub and EO Genius serial communication bus

Different cables have been used in the manufacture of Genius charging stations and therefore the Comms A and Comms B could be either of the following

- Comms A – Red or Blue&White stripe
- Comms B – Black or White&Blue stripe

Serial cable needs to be run from the hub to the genius charging station in order to connect the two together. Without full communication in place the EO Genius the charging station will perform identically in operation to an eoBasic and will not offer any advanced functionality.

When the charging stations are daisy chained, please note the following recommendations and best practices:

- Terminate the RS485 cable from the charging station into a breakout box
- Use Wago connectors to join the two cables together to create the serial bus.
- When post mounting, the breakout box can be placed within the post
- When wall mounting, the breakout box can be placed within the trunking

This best practice is shown in Figure 2 below.

Figure 2 - Wago connectors linking up the serial bus

Although very short cable runs can be achieved using CAT5E cable, for reliable operation the following RS485 products are recommended. Note that by using a 600V rated serial cable this allows the installer to run serial bus cable together in the same containment as the conductors

- Belbin 9841 – LSZH 600V – Link
- Belbin 9841 – SWA LSZH – Link

2.1   Fitting termination resistors to the RS485 Serial Bus

To ensure reliable communication on RS485 serial cable runs of greater than 25m, a 120 ohm 0.25W terminating resistor should be applied at each end of the bus. The following link provides guidance on selection of a termination resistor:

https://maximintegratedsupport.force.com/support/s/article/RS-485-Termination-Resistor-Power-Rating

2.2   Earthing of the Serial Bus

With to the current mounting mechanism of the serial cable in the genius station, this is the recommended best practice for the earthing of the serial bus:

- Connect the shield of the serial cable to Pin 1 on the RJ45 connector at the hub (refer to section 3.2)
- Connect all of the shields of the serial cables together at each breakout box
- DO NOT connect the shield of the cable to the earth of the charging station

2.3   Connecting the Serial cable to the RJ45 connector on the hub

The serial connector on the hub is an RJ45 socket i.e. a standard Ethernet socket. The thickness of the recommended serial cable is too thick to be connected into an RJ45 connector. To overcome this, use the following steps:

- Take a standard Ethernet cable
- Cut a short length with the RJ45/Ethernet plug on one end.

- Strip and expose the bare wires for pins 4&5 for Comms A&B and pin 1 for earth
- Connect the serial cable to the bare wires using a 3 way level connector

A typical finished connection is shown below in Figure 3

Figure 3 - Connecting the serial cable to the RJ45 socket on the hub

3 Wiring Connections for the Hub

There are four connections to the hub

- Power
- Serial Comms to the charging stations
- CT Clamps
- Ethernet connection for internet access

Figure 4 - Connections to the Genius Hub

3.1 Power

This is supplied via a standard IEC plug. It is recommended that this cable is terminated directly into a 5A fused connection unit (ie not using the 3-pin plug). This avoids the risk of it being unplugged in error.

Regulations state charging equipment must have a dedicated final radial circuit, so EO Hub must not be powered on the same radial as the charging stations. Where a dedicated EV distribution board is fitted, we recommend a single phase supply is taken from this this same board.

3.2   EO Genius RS485 serial Comms

The EO Genius charging station needs to connect to the EO Hub via an serial bus. Charging stations are daisy chained together with the final connection to the EO Hub. The serial bus connects to the hub via an RJ45 connection. The wiring of the EO Hub RJ45 connector for serial comms is as follows:

- Pin 1 – Earth
- Pin 2 – Unused but connected to GND
- Pin 3 – Unused but connected to GND
- Pin 4 – Comms A – Blue with white stripe
- Pin 5 – Comms B – White with blue stripe
- Pin 6 – Unused but connected to GND
- Pin 7 – Unused but connected to GND
- Pin 8 – Unused but connected to GND
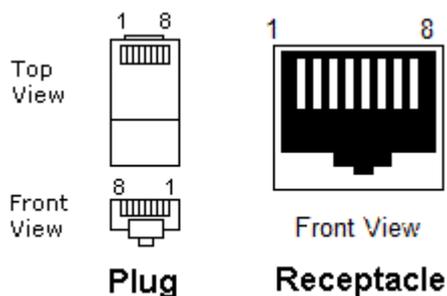
3.3   CT Clamps

If automatic load management is going to be used at the installation then CT clamps need to be installed and connected to the EO Hub. Connections to the EO Hub is as follows

- Pin 1 – L1 – White
- Pin 2 – L1 – Black
- Pin 3 – L2 – White
- Pin 4 – L2 – Black
- Pin 5 – L3 – White
- Pin 6 – L3 – Black

Pin 1 is the left hand pin of the connector shown in Figure 4.

3.4   Ethernet connection & Network Security Settings

For the EO Hub to communicate to the eoCloud back office Portal, an internet enabled ethernet connection needs to be provided using an RJ45 connector.

As standard, the EO Hub IP address and DNS server address are assigned via DHCP. Once assigned, it is best if the IP address is reserved in the DHCP table. For sites where a fixed IP address is required please contact EO Support for advice.

For most non-domestic installations, the following firewall settings must be applied to allow the EO Hub to connect to EO servers.

Please share these details with the appropriate site IT manager to ensure setting are correctly applied ready for completion of your installation!!!

- TCP ports 4455-4456 must to be open allow the outgoing connection
- TCP and UDP port 53 must be open for DNS and is critical

For sophisticated firewall systems, the following addresses must all be reachable

- hubsvr1.eocharging.uk   Secondary eoCloud server
- hubsvr2.eocharging.uk   Primary eoCloud server
- hubsvr4.eocharging.uk   Test eoCloud server
- hubsvr5.eocharging.uk   eoCloud server
- hubsvr6.eocharging.uk   eoCloud server
- postie.ccsys.uk   Email exchange server
- 8.8.8.8   Primary DNS
- 8.8.4.4   Secondary DNS

Once the settings have been configured, it's possible to test the whether the ports are open by navigating to:

http://porttest.eocharging.com:4455
http://porttest.eocharging.com:4456

3.4.1 GPRS Modems

Rather than using a wired internet connection, it is possible to connect the EO Hub to a wireless 4G modem. Eo can supply these pre configured but if a third party modem is used then consider the following points to ensure that a connection is trouble free:

- Update the APN settings for the mobile network
- Turn off any VPN settings

3.5 Boot Up

On power up, the EO Hub performs a boot up sequence which can take around 90sec to complete. When a successful boot up sequence has completed, then the left hand LED and the middle LED are solid green.

These LEDs can also provide diagnostic information for the support team.

3.6 LEDs

There are three status LEDs on the EO Hub as shown in Figure 4. LED1 is on the far left, LED2 is in the middle and LED3 is on the far right. These LEDs are either illuminated green or off. The LEDs indicate different stages of operation with the principle stages being "Start Up" and "Normal Operation"

3.6.1 Start Up

Stage	LED1	LED2	LED3	Repeats	Description
1	■	■	■	6 times	Start Up
2		■		Solid	Error state – contact EO
3		■		2 Flashes	Connecting to primary server
4			■	2 Flashes	Connecting to Secondary server if primary failed

Stage	LED1	LED2	LED3	Repeats	Description
5		■		6 times	Failure to Connect – Check Internet connections
			■		
6		■		6 times	Start Up successful
	■				
7	■		■	5 times	Fatal Error – Contact EO
		■			

After a successful start up, then the EO Hub shall enter into Normal Operation.

3.6.2 Normal Operation

Stage	LED1	LED2	LED3	Repeats	Description
1	■			6 times	Secondary Start Up
		■			
			■		
2	■			Solid	Internet Connection Test
3	■	■		Solid	Configuring Hub – this can take up to 60sec
4	■	■	■	LED1&2= Solid LED3 = Blinks rapidly	The EO Hub is communicating with the EO Genius charging stations. This is the normal operational state.
5	■	■	■	LED1,2,3 = Solid	The EO Hub is connected to the EO Cloud but no charging stations have been allocated to the EO Hub

4 Web setup for the EO Hub

The EO Hub can be configured using a web interface. This powerful interface will allow the installer to:

1) Configure the hub to communicate to the eoCloud or a 3rd party OCPP server
2) Configure specific IP settings
3) Set up charging stations
4) Perform diagnostic checks on the charging stations

4.1 High level steps for configuring an EO Hub

The following sequence is expected to be followed in order to set up the hub

1) Before visiting the site
    a. Set up the host in the eoPortal
    b. Assign the hub to the host
    c. Assign the charging stations to the hub
2) On site
    a. Join the wifi hotspot set up by the hub
    b. Log in to the hub as an administrator
    c. Change the default security settings and wifi hotspot ssid
    d. Login again using the new credentials
    e. Set up the hub mode – eoCloud or OCPP
    f. Configure any specific IP settings
    g. Check that the charging stations are listed in the hub's inventory
    h. Perform diagnostic tests:
        i. Check the Internet connection to eoCloud or OCPP server
        ii. Check the CT clamps are working OK
        iii. Check that the hub can communicate with all of the connected EO Genius charging stations

The details are listed below in the following sections

4.2 Actions before visiting the site

Before visiting the premise it is important to set up in the eoCloud the host and allocate the chargers to the host. This is so that the hub can be updated with the communication details of the charging stations that are assigned to it. Then, when the hub is connected to the eoCloud, then it can start to communicate with the attached EO Genius stations.

The installer is responsible for the following actions:

1) Set up the host
2) Assign a hub from the installer's stock to the host
3) Assign genius charging stations from the host's stock to the hub

4) If the hub is going to be set up without an internet connection then the installer will need to export the list of charging stations from the host
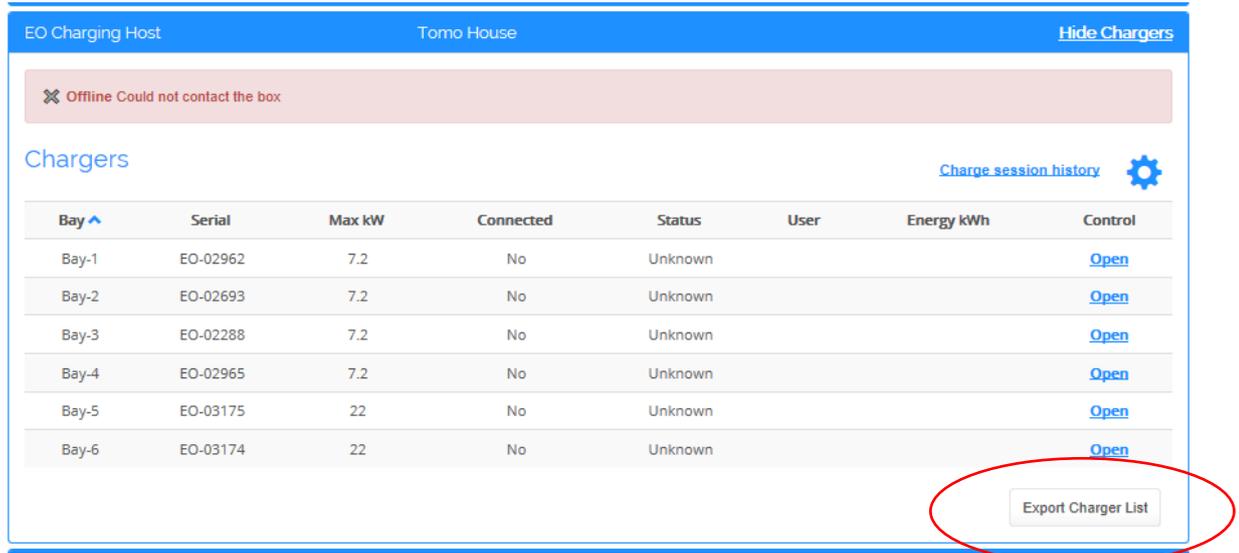
Figure 5 - Exporting charger list

5) Save the exported list of chargers into a local text file
6) Create a host Admin
7) Set up hosted drivers if applicable

All of these actions are described in the eoPortal User Guide - EO Portal User Guide

4.3   Join the wifi hotspot set up by the hub

When the installer is on site, it is possible to log onto the wifi Hot spot. The default hotspot details are:

- SSID – eoHUB-####
- Password – please contact support@eocharging.com for the password for the specific hub.

4.4   Log in to the hub as an administrator

Now that the EO Hub's hotspot has been joined, then it is now possible to login into the the EO Hub as an administrator

- Load a web browser e.g. Edge or Chrome
- Go to http://192.168.4.1 to display the login screen
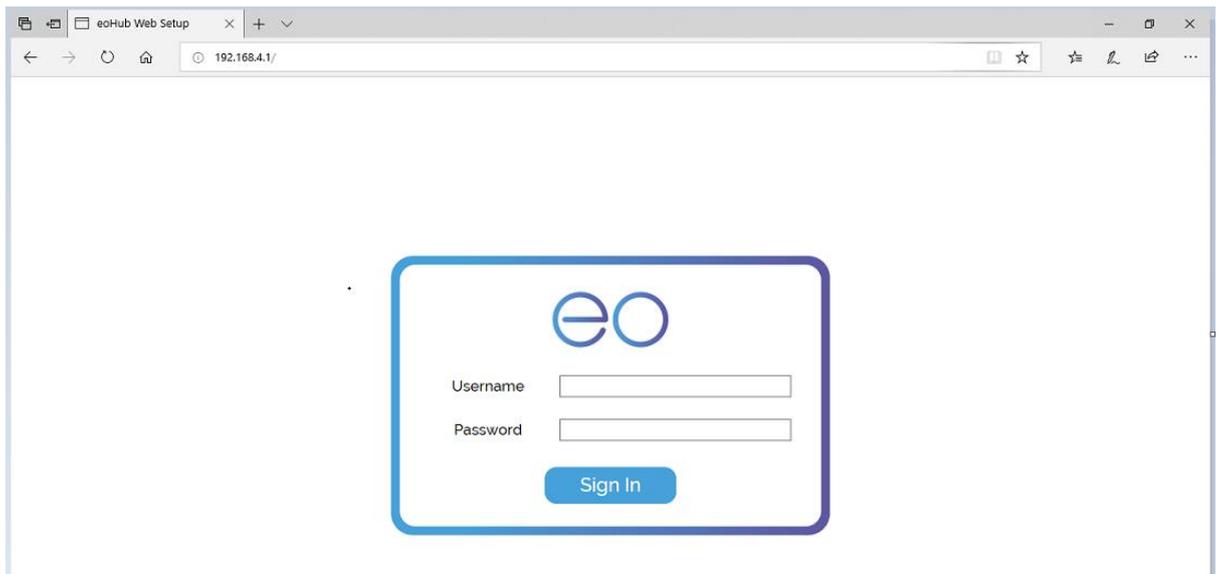
Figure 6 - EO Hub login screen

- Login using the default credentials:
  - o Username – eoadmin
  - o Password – Please contact Support@eocharging.com for the password for the hub
- Upon successful logon, the following screen is displayed.
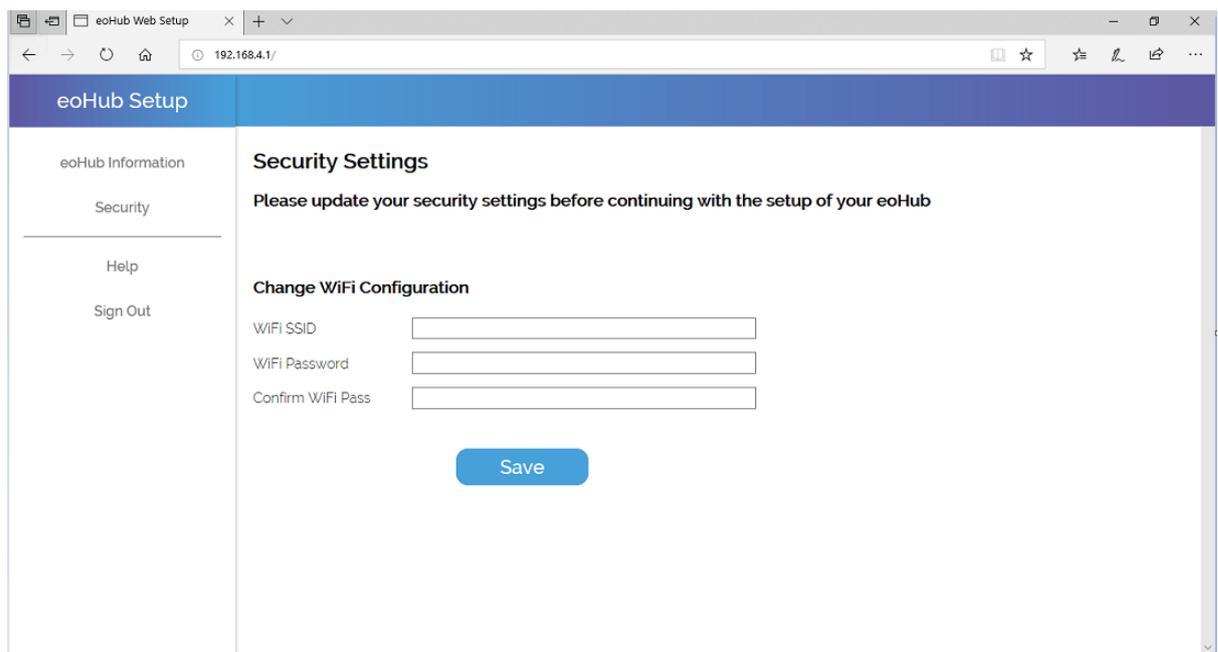
Figure 7 - first successful login screen requesting a change of security details

4.5 Change the default security settings and wifi hotspot ssid

Now that the user has logged in for the first time using default credentials (see Figure 7), the user is directed to change the default settings to a user specific setting. The following settings must be changed:

- EO Hub SSID & password
- administrator password
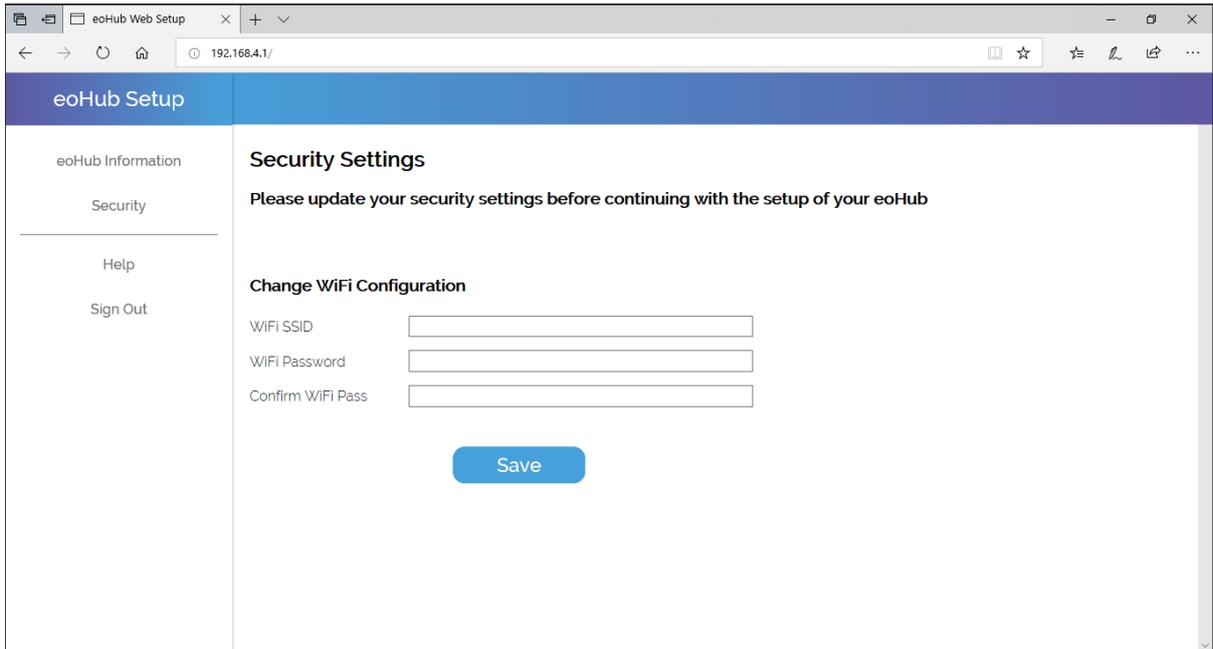
Figure 8 - Changing the default SSID to a user specific choice
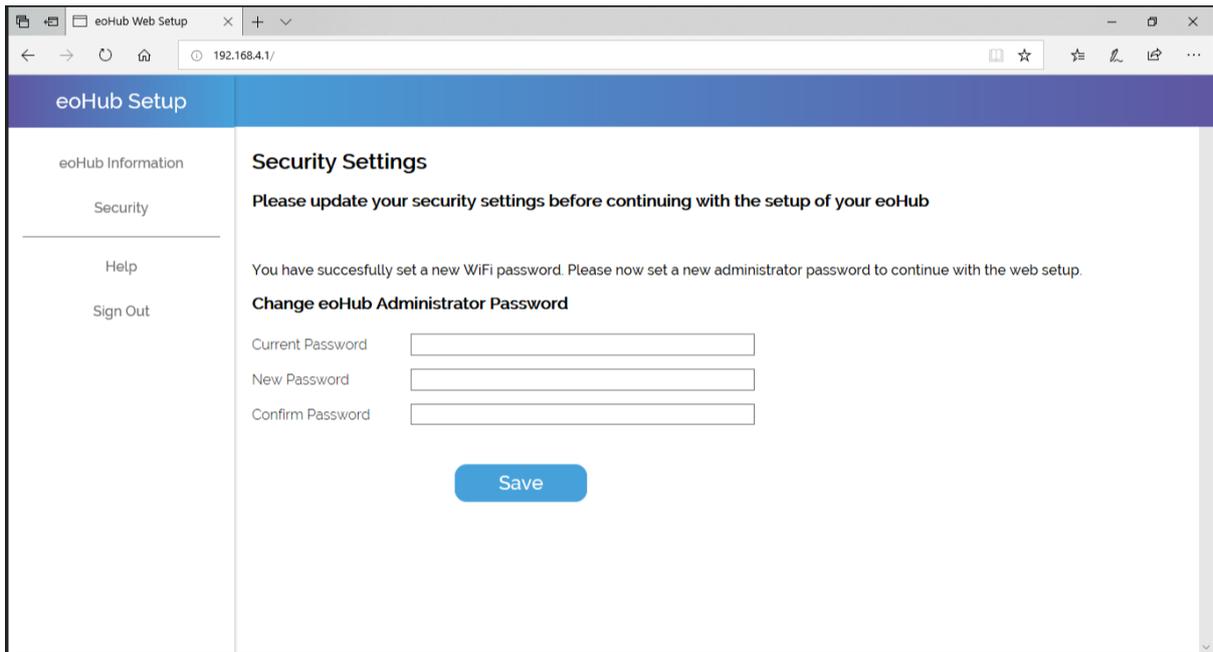
Figure 9 - changing the eoadmin password to a user specific password

At this point the user will be informed that the hub must be rebooted in order for the changes to occur

NOTE – **please note down the new SSID, the SSID password and the administrator password.** These will be needed to log in into the hub. These should be passed to the site Administrator for safe keeping!!

Figure 10 - a hub reboot is required

A HUB REBOOT MUST BE PERFORMED AT THIS POINT

It may take up to 60sec for the hub to reboot

Figure 11 - Hub rebooting which can take 60sec

4.6   Login again using the new credentials

When the hub has been rebooted then the user must rejoin the hub using the new non default credentials.

The user must

    i)   **Login into the hub using the new wifi hotspot SSID**
    ii)   **Login using the new password for eoadmin**

When the user has successfully joined the new SSID and logged in as the administrator, the full suite of configuration options will be available to the administrator
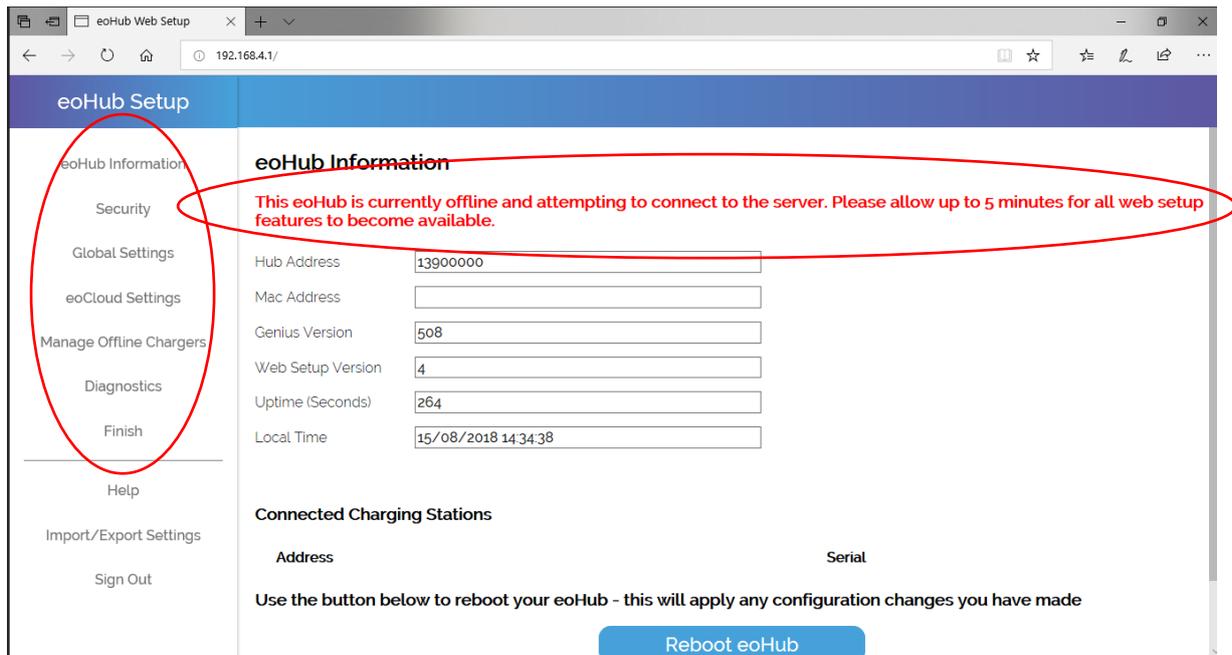
Figure 12 - new options once security credentials have been updated

When the administrator logs in then there are two items worth highlighting that are circled in Figure 12:

1) The new hub configuration options on the left hand side
2) A warning that the hub is currently not connected to the internet. This will not be shown if the hub is indeed connected to the internet.

The first option available is to change the security settings which is the same as section 4.5. The subsequent options are then described in the sections below.

4.7   Set up the hub mode – eoCloud or OCPP

If the system is to be setup to communicate to the eoCloud then the eoCloud option should be enabled.
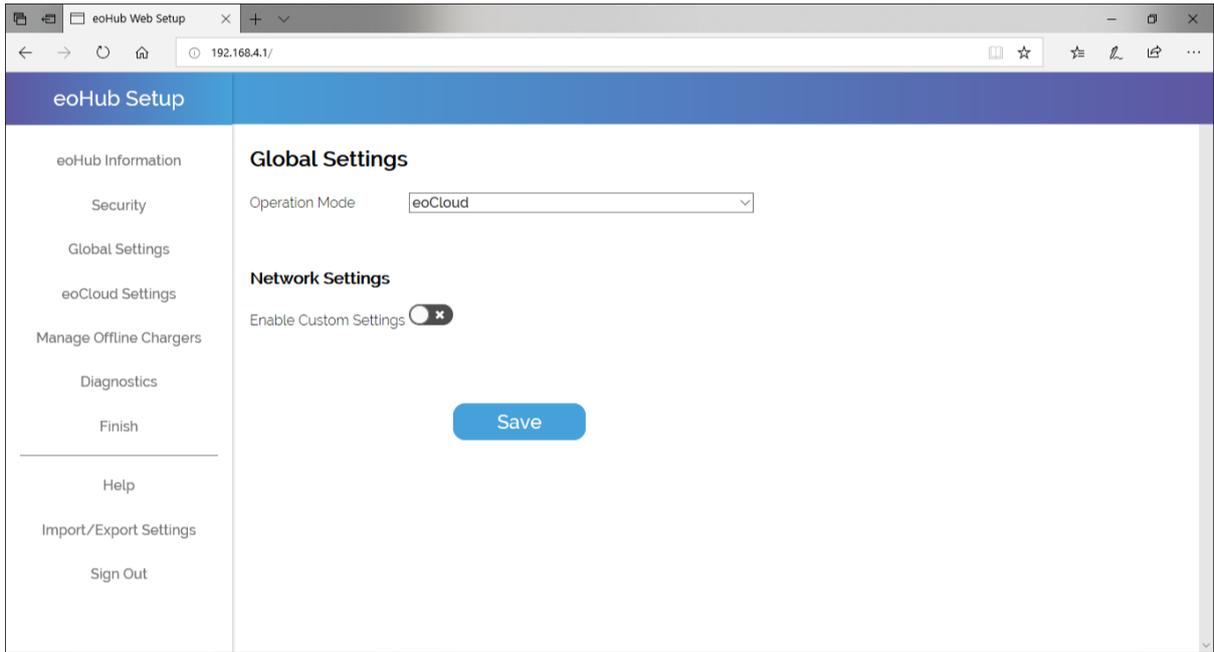
Figure 13 - setting eoCloud operation

4.8   Configure any specific IP settings

Sometimes, hosts want to specify specific IP settings for the EO Hub e.g. a static IP address. It is now possible to modify these settings. Firstly select the "Enable Custom Settings" switch as shown in Figure 13.

This will enable the following options to be made available
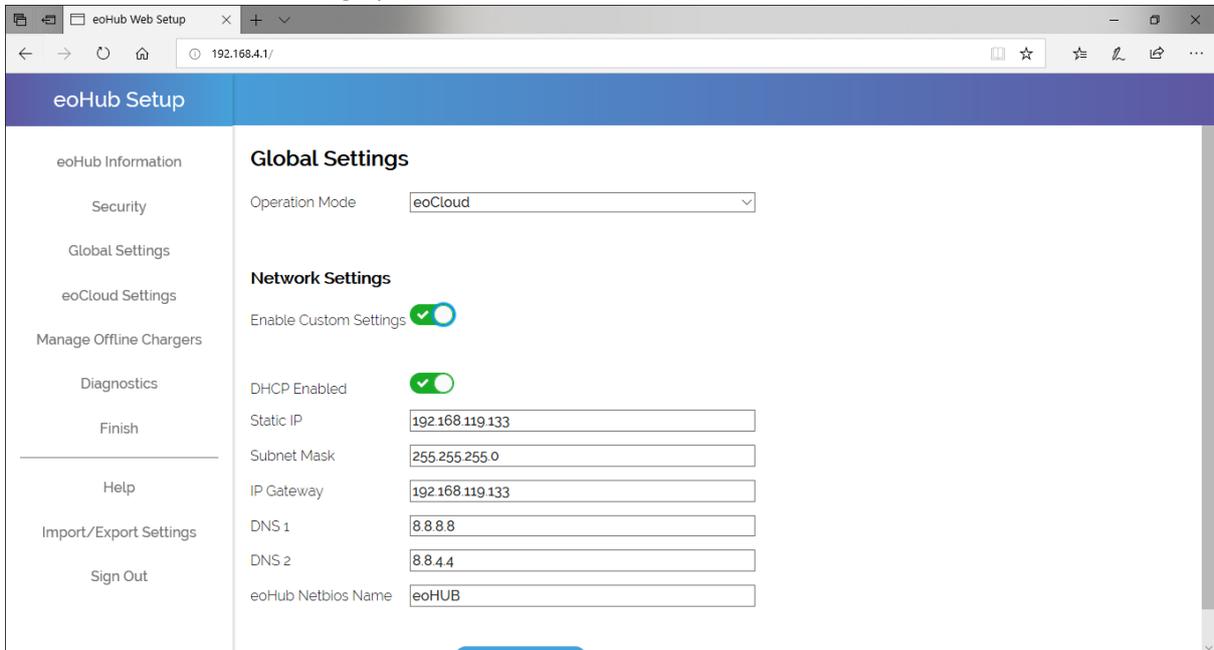
Figure 14 - Custom IP settings

The administrator will now be able to set the custom IP settings. Click save in order to save the settings.

4.9   Check that the charging stations are listed in the hub's inventory

Now that the IP settings have been set up the next task is to set up the charging stations. If the hub is being set up without an internet connection, then it is possible to tell the EO Hub which charging stations it is supposed to be communicating with.

If the hub has access to the eoCloud then the cloud will automatically send down the list of charging stations to the EO Hub. However this depends on the installer having set up the host in the eoCloud prior to the installation – see section 4.2

4.9.1   Online

If the host has been set up in the eoCloud AND the EO Hub has internet access then the EO Hub will automatically be populated with the correct list of charging stations. The "Manage Offline Chargers" will be empty and the list of chargers will be displayed in the "Diagnostics" screen.

There is nothing else at this point for the installer to do.

4.9.2   Offline

If the EO Hub does not have internet connection then it is still possible to add charging stations to the EO Hub manually.

When the "Manage Offline Chargers" page is selected then the following is shown as per Figure 15.
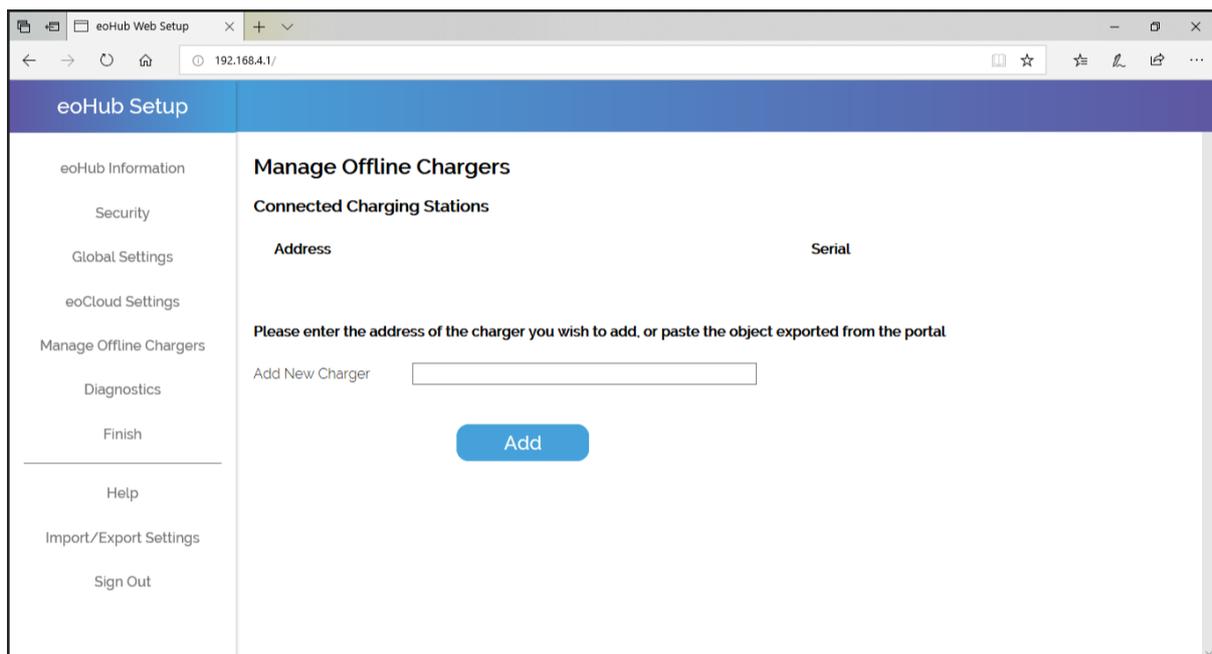
Figure 15 - Adding offline chargers without internet connection

At this point the installer needs to add the address of the EO Genius charging stations to the EO Hub in order to enable the hub to communicate with a charging station:

This information needs to be extracted from the eoPortal by the Installer following the instructions in 4.2 i.e. clicking on the "Export Charger List" button from the portal

Figure 16 - exporting charger list

At this point, the installer can simply add the exported list all at once OR add the station addresses one by one.

If the installer has exported the list of addresses and serial numbers from the portal and saved them in a text file, then this information can simply be copied and pasted into the "Add New Charger" field in the "Manage Offline Charger" page of the EO Hub

Figure 17 - Adding charging stations to the EO Hub in offline mode

When the Add button has been clicked then the list of chargers should be displayed
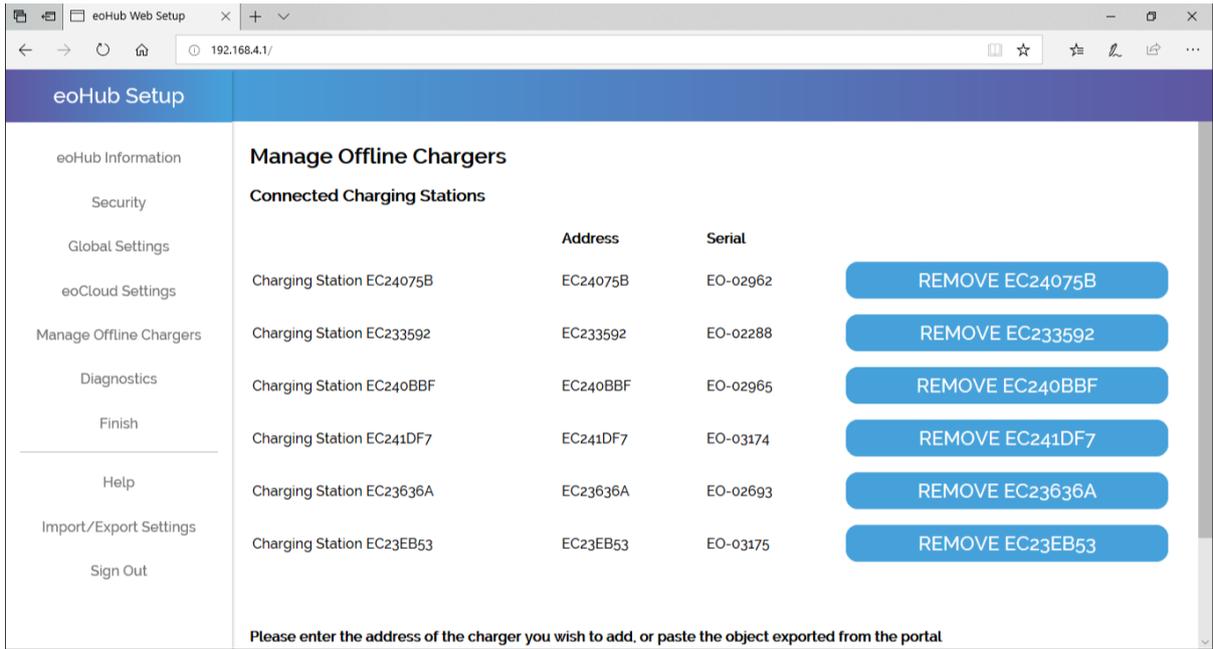
Figure 18 - manually added charging stations

Alternatively the installer can simply manually add the station addresses to the Offline Charger list one by one and simply click Add.

At this point, the only task remaining is to perform the diagnostic tests

4.10 Perform diagnostic tests

There are three types of Diagnostic tests available:

- Check the Connection to the internet
- Check the CT Clamps
- Check that the EO Hub can communicate to the EO Genius stations

The diagnostic tests are shown below in Figure 19.
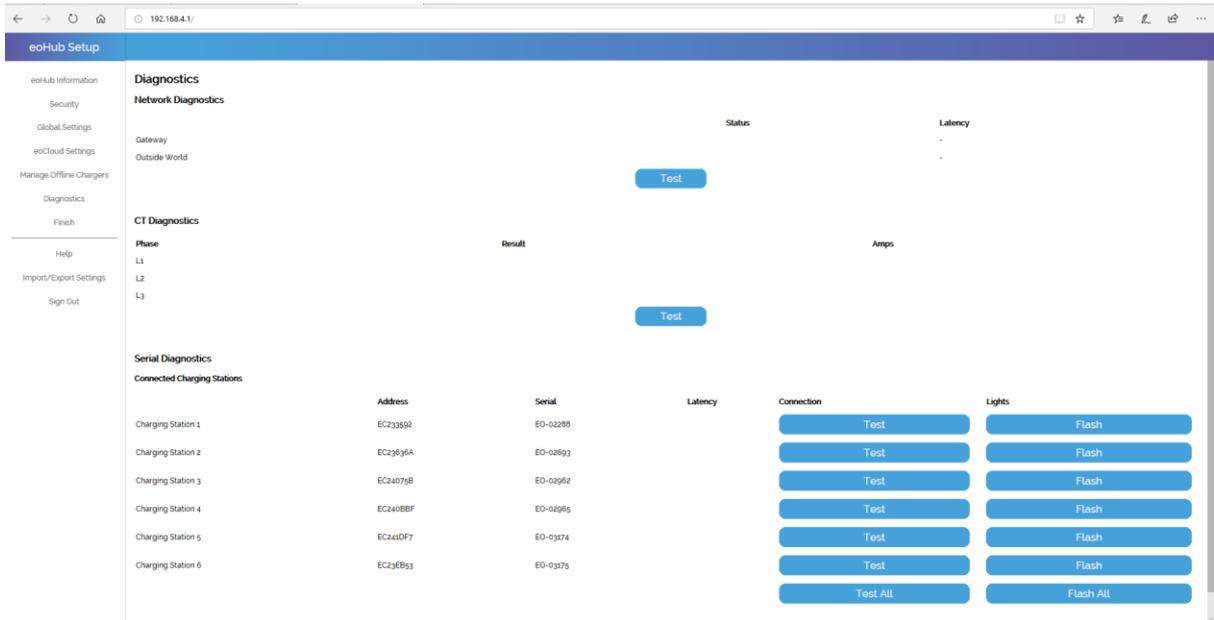
Figure 19 - Diagnostic Tests

The Network test checks the connection to the eoCloud or OCPP server

Network Diagnostics

	Status	Latency
Gateway	Success	0.468 ms
Outside World	Success	17.6 ms

Figure 20 - Successful Network Test

The CT Test checks that the CTs are connected correctly and displays the instantaneous current consumption

CT Diagnostics

Phase	Result	Amps
L1	Success	1.891
L2	Success	3.59
L3	Success	2.219

Figure 21 - Successful CT Test

The Serial Diagnostics Test checks that the EO Genius charging stations are connected correctly. It is possible to determine the comms latency between the charging stations.

Serial Diagnostics

Connected Charging Stations

	Address	Serial	Latency	Connection	Lights
Charging Station 1	EC233592	EO-02288	6109ms	✓	Flash
Charging Station 2	EC23636A	EO-02693	9142ms	✓	Flash
Charging Station 3	EC24075B	EO-02962	7124ms	✓	Flash
Charging Station 4	EC240BBF	EO-02965	1052ms	✓	Flash
Charging Station 5	EC241DF7	EO-03174	3064ms	✓	Flash
Charging Station 6	EC23EB53	EO-03175	4084ms	✓	Flash
				✓	Flash All

Figure 22 - Successful charging station comms test

4.11 Finalise Installation

When the tests have passed it is now possible to run a final system test. Click on the Finish page and then run the system test.

eoHub Setup	
eoHub Information	**Finalise installation**
Security	Run System Test
Global Settings	
eoCloud Settings	**Test Description** / **Test Result**
Manage Offline Chargers	Testing port 4455 is open — Success
Diagnostics	Testing port 4456 is open — Success
Finish	Testing CT Clamps — Success
	Gateway ping test — Success
Help	World ping test — Success
Import/Export Settings	Testing all chargers — Success
Sign Out	Logging in to eoCloud — Success

All tests have passed - your eoHub is online and ready for use. Please log in to the eo Portal to configure additional settings such as load management, charge pricing, and availability. Finally, use the reboot button below to apply your settings

Reboot eoHub

Figure 23 - Successful System Test

At this point the last action is to reboot the hub as this will apply all the settings to the hub.

5 Configuring the EO Hub to communicate to a 3rd party OCPP back office server

If the EO Hub is to be set up to communicate to a 3rd party OCPP back office server then the following steps must be made:

1) Set up a host in eoCloud
2) Assign the hub to the host
3) Assign the charging stations to the hub
4) Power up the hub and check that the charging station list is downloaded to the hub by checking the status in the portal
5) Load up the EO Hub web set up
6) Switch the EO Hub into OCPP mode on the Global Settings
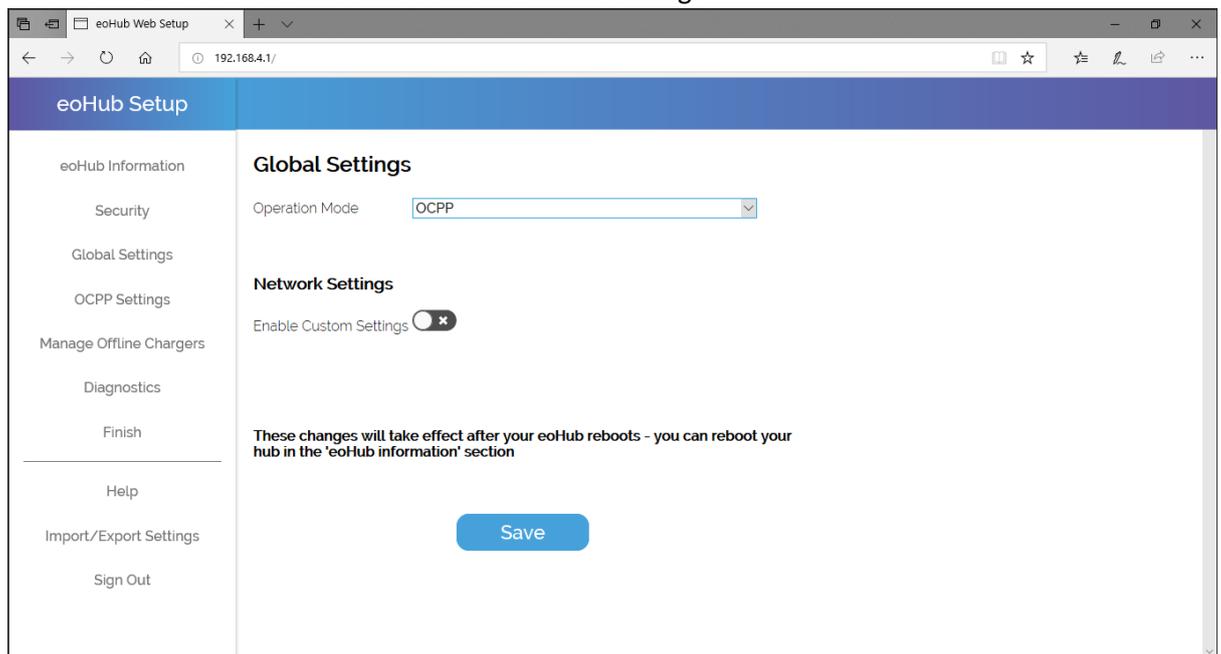
Figure 24 - setting the hub up to OCPP mode

7) Update the OCPP connection setting in the OCPP Settings Page

Figure 25 - setting the OCPP configuration settings

Alternatively, it is possible to configure the EO Hub directly into OCPP mode, but the installer will need to know the addresses of the EO Genius charging stations so that these can be manually added to the offline charger list. This list of addresses can be provided by EO.

6   Further Technical Support

All EO Charging technical documentation is published in the EO Resource Centre, this is found at:
https://www.eocharging.com/service-support/

The EO Support team can be reached at:

- Email: support@eocharging.com
- Phone: +44 (0) 333 77 20383

7   Revision History

Version	Date	Changes
1.0	21st Nov 2018	First Draft
1.1	3rd Oct 2019	Updated the password details for the hubs and also the list of required servers