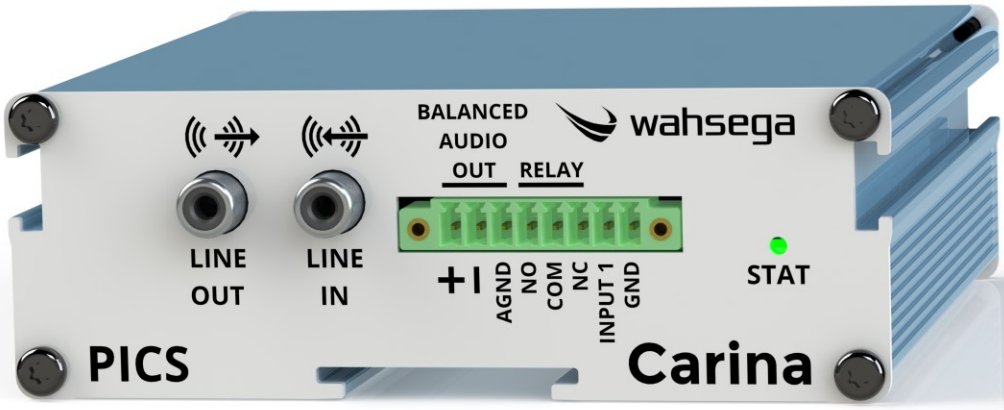
Carina PBX

Users Guide



Getting Started

This step by step guide will help you setup and install your Wahsega Carina PBX.

Important Notice

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Chapter 1
Overview

Wahsega's Carina PBX is a multi-functional device which can act as a PBX, DHCP server and VoIP gateway. With a Line In audio jack for background multicast music support and SIP-to-Multicast rebroadcast capability for paging, the many features and capabilities of the Carina PBX allow customers to easily create a full VoIP communication system with Wahsega's intercoms, paging adaptors and ceiling speakers as well as any third-party SIP-compliant devices such as an IP phone.

Functionality

- **Advanced IP PBX hardware appliance**
- **Built-in DHCP server**
- **SIP-to-multicast rebroadcast capability for IP phone paging**
    - Up to 64 paging groups
- **Line in audio jack for background multicast music support**
- **Up to 256 registered SIP VoIP clients**
- **Built-in Web server**
    - All configuration options accessible via easy-to-use HTTP interface
- **Easy installation**
    - Standard 1-U rack mount
- **PoE 802.3af powered**
    - 10/100 Ethernet port with Power-over-Ethernet (802.3af PoE)
    - +9V to +16V DC input (if not using PoE)
- **Multiple mono codecs to choose from**
    - Options include G.711, G.722, G.726 (16/24/32/40kbps), G.729, DVI4 (narrow/HD/Ultra HD), Linear PCM, iLBC, SPEEX, SILK
- **Reset to default software/configuration button**
- **Remote firmware upgradeable**

Quality Standards

Wahsega products achieve the highest standards of performance in the market by utilizing our complete quality assurance program encompassing software testing, product design and a multistage automated factory test program.

- Wahsega's ultimate goal is to provide a solution that is both cost effective and unsurpassed in quality. By leveraging existing relationships with suppliers to guarantee premium components at the lowest possible prices, we are able to ensure Wahsega products are the finest quality in the market while still offered at highly competitive prices directly to installers.

- In order to achieve the greatest possible voice clarity, all voice and related algorithms have been individually tested to ensure the highest potential MOS score. The accumulated error syndrome, which can cause poor voice quality, is mitigated through this testing process.

- Wahsega's engineering team utilizes a wide array of dedicated test servers to pull and build the various software projects multiple times per day. Each automatic build is then run through an extensive set of automated test cases to ensure the highest performance of each and every firmware version released. This test case coverage is expanded on a continual basis.

- All Wahsega products are 100% factory tested at the board level through a bed of nails full functional test, not just an "is it close enough?" flying probe test. Every finished product is 100% tested again after the final assembly via an automated test station to ensure the highest production quality product for installers.

- To assure the highest quality standards, all Wahsega products are designed, developed and manufactured in the USA.

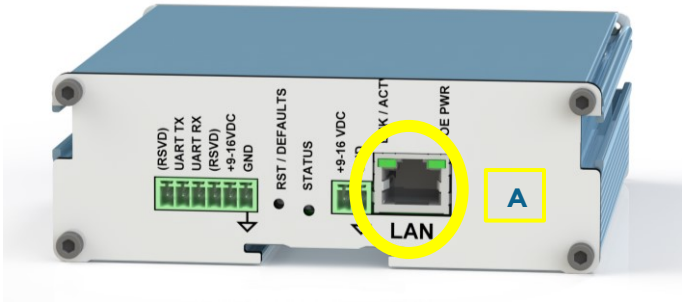
Chapter 2
General Hardware Installation

Wiring

Apply power to Carina PBX using ***either*** **Option A** ***or*** **Option B**. The status LED will increase in brightness as the Carina PBX is powering up and will remain steadily lit when the unit is successfully powered.

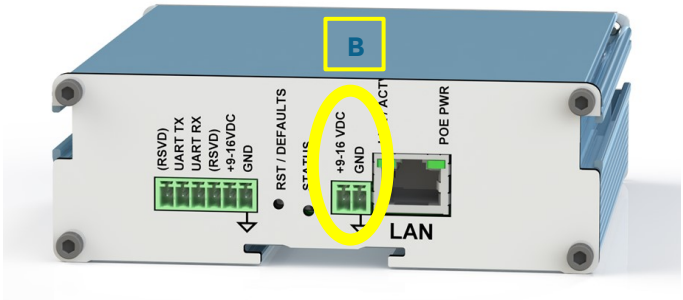
Power – Option A

- **LAN -** Using Power-over-Ethernet (PoE), route Cat 5e or Cat 6 Ethernet cable through a PoE injector to the LAN port.



Power – Option B

- **9-16V DC -** If using 9-16V DC power instead of PoE, plug in via 2-pin PCB terminal connector.



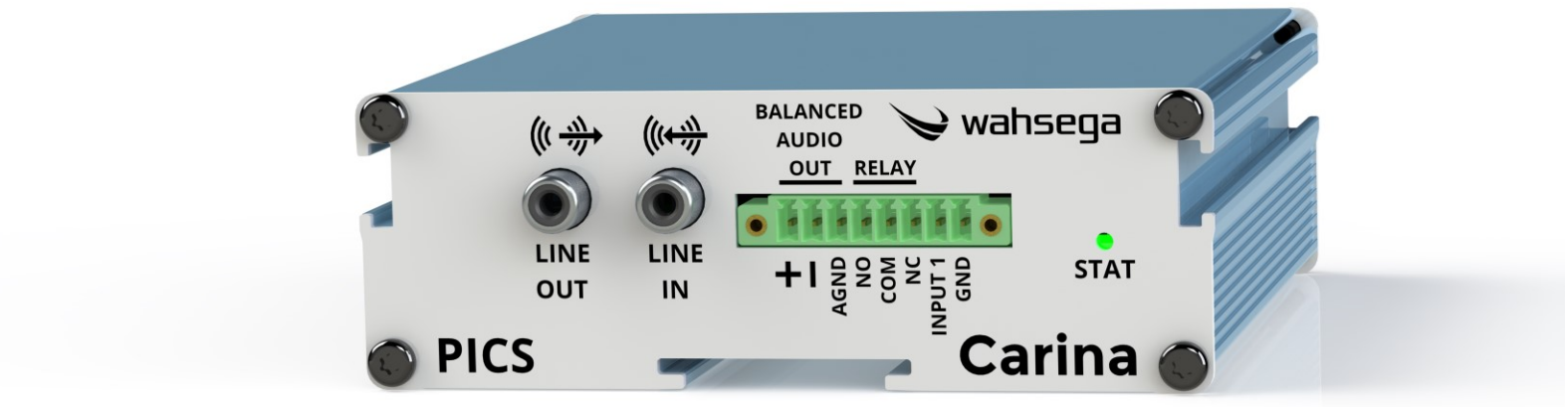
Audio Input

- **LINE IN –** Connect audio in via RCA mono cable with male connector. Configure audio settings in software as described in *Chapter 4: Configuration and Web Interface*.

- **LINE OUT –** Not used at this time.

- **STAT –** LED status feedback for audio line in.

Note: Terminal block connections are not used. Only connections listed above are supported by the Carina PBX firmware at this time.



Chapter 3
User Experience

Software Capabilities

The Carina PBX configuration webpages can be accessed via an HTTP Web interface, viewable from any Web browser on the same LAN.

Here you will configure your PBX, Gateway, DHCP and audio settings. You will also use these configuration webpages to configure your device's network/IP address and audio settings and access administrative functions such as firmware upgrade and configuration backup/restore.

The configuration is stored in two JSON files, which are human readable and can be edited by site administrators.

Getting Started

1. Connect the Carina PBX's Ethernet port to a network using a Power-over-Ethernet (PoE) Ethernet connection (*Option A*, page 5). When connected, it will power on immediately and the indicator light will begin to blink.

2. Locate and note your unit's MAC address. It is printed on a white sticker on the bottom of the device's enclosure.

3. Discover your device's IP address. When Carina PBX boots, it uses DHCP by default to automatically obtain a suitable IP address on your local area network (LAN). It also runs Simple Service Discovery Protocol (SSDP) so you can discover it from Windows Explorer or any SSDP-enabled application.

   From a Windows PC on the same LAN, open *My Computer*. In the left-hand pane, go to the *Network* view.

   Right-click in the right-hand Network panel and select *Refresh*. This will start a search for devices on the network. You may get a popup asking if you want to allow your PC to search the network, in which case you should click *yes* or *allow*.

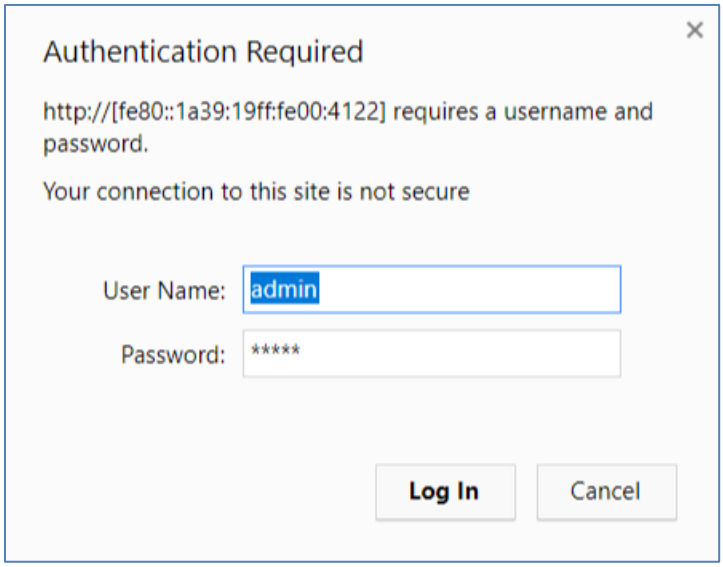
   If you are not using SSDP or cannot discover Carina PBX on your network, you can:

   - Consult your DHCP server's logs to determine its IP address;
   - Use a network discovery app (such as Fing on iOS and Android); or
   - Enter your device's IPv6 address into your browser's address bar. Your device's IPv6 address will be **`[fe80::1a39:19ff:feXX:XXXX]`** where the **X**'s represent the last six (6) characters of your device's MAC address.

4. Once the search is complete, Carina PBX will appear in the Network window as ***Wahsega PBX (:XX:XX).*** The last two octets of its MAC address will be included in its name, so you can easily distinguish multiple units. Double-click the icon to open its Web interface.

5. After you determine your device's IP address, navigate to that IP address in your Web browser (for example, ***http://123.456.78.9***).

6. When you access the webpages, Carina PBX will ask for a username and password. The default username and password are *admin* and *admin*.



7. On the right side of the page is the Status bar. It shows the status of the PBX and DHCP server as well as Carina PBX's current system information (current IP address, Ethernet MAC address and system time) and gateways account status.

8. To change the IP address settings, go to the Network tab and modify settings in the *WAN* section. For static IP addressing, click the *Static IP* radio button and fill in the relevant IP address fields with values from your network administrator. See **Network Configuration** on pages 26-28 for examples.

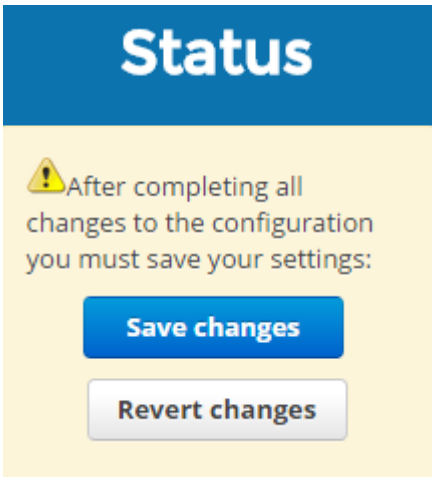
9. If using the DHCP Server feature of Carina PBX, be sure to set your device to a static IP address now. ***We recommend using a static IP for any Carina PBX application.***

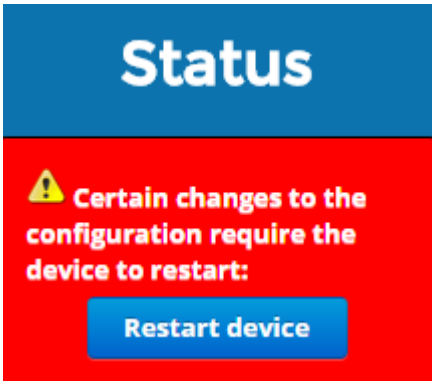
10. After configuring the network settings for Carina PBX, use the webpages described in the next section to customize your settings.

Chapter 4
Configuration and Web Interface

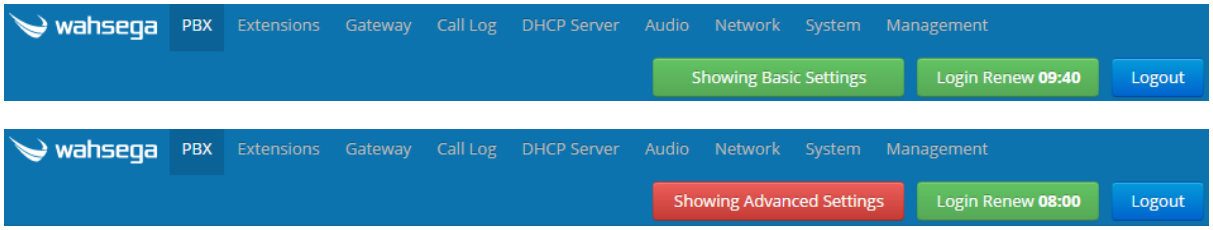
The Web interface allows Carina PBX to be configured from any computer or device with a Web browser. Wahsega configuration webpages are best viewed using Firefox or Chrome, but other browsers will work as well.

- As you configure various settings, you will be prompted to save changes and/or restart your device for those changes to take effect.





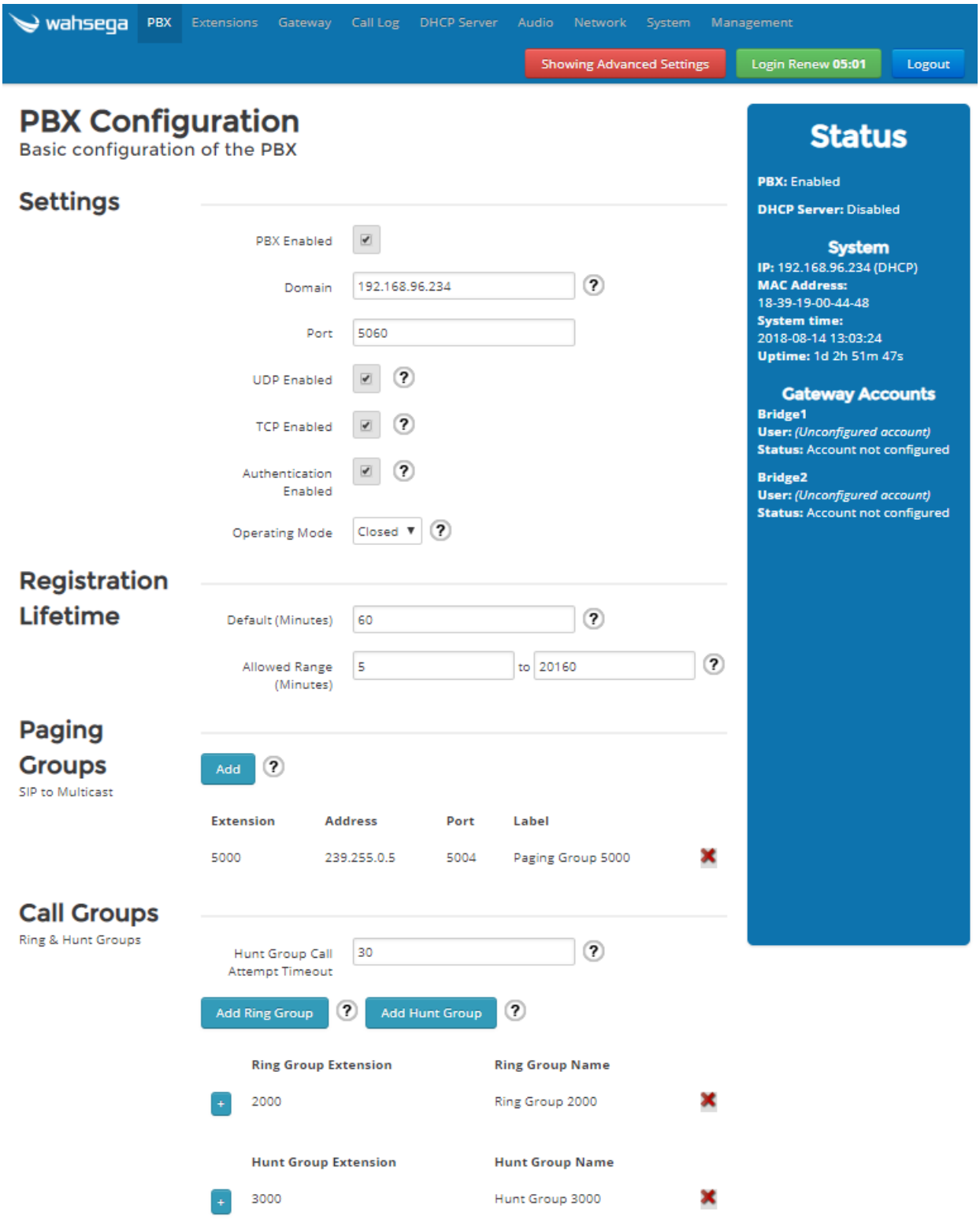
- All webpages in this document show Advanced Settings in addition to Basic Settings. To access the Advanced Settings, simply click the Showing Basic Settings button at the top of the page. *Caution: If you are not familiar with an advanced option, it is safest to leave the value at the factory default setting.*



- Logins will time out every 10 minutes for security purposes. Click Login Renew at any time to reset the timer.

PBX Configuration

Configure the basic settings of the PBX.



Settings

- **PBX Enabled –** Check this box to enable your PBX.

- **Domain –** This domain will be used to communicate with the server. The default is the local IP address of the Carina PBX.

- **Port (advanced) –** Default is 5060.

- **UDP Enabled (advanced) –** Checking this allows devices to connect to the PBX using UDP connections.

- **TCP Enabled (advanced) –** Checking this allows devices to connect to the PBX using TCP connections.

- **Authentication Enabled –** When this boxed is checked, Carina PBX will require each device to authenticate all communication.

- **Operating Mode (advanced) –** Describes whether or not the PBX requires extensions to be pre-configured.
    - **Closed (recommended)** – For a device to register with the PBX, it must use a pre-configured extension
    - **Open** – A device may register with the PBX with any extension, no pre-configuration required. *Warning: Open mode disables authentication.*

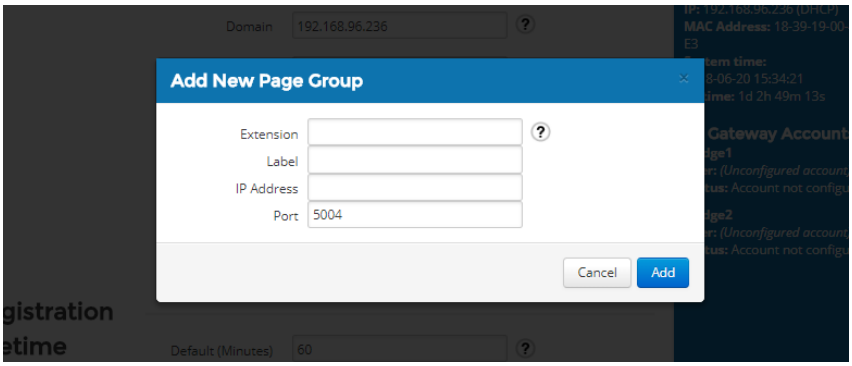
Registration Lifetime

- **Default (Minutes) –** This is the default registration lifetime set when a VoIP phone does not request a specific lifetime.

- **Allowed Range (Minutes) –** This is the allowed registration lifetime for VoIP devices to request.

Paging Groups (SIP to Multicast)

A paging group is an extension which can be dialed to send an audio announcement to multiple devices at the same time. For pages to work, these devices must be able to accept multicast audio at the IP address and port number designated here. Users can configure up to 64 paging groups within Carina PBX, and Carina PBX can support two (2) active pages at a time.



- **Extension –** When this number (or SIP extension) is called from another device, the audio will be broadcast to all devices listening at the multicast address (**IP Address**, below) listed.

- **Label –** Identifier for this page group.

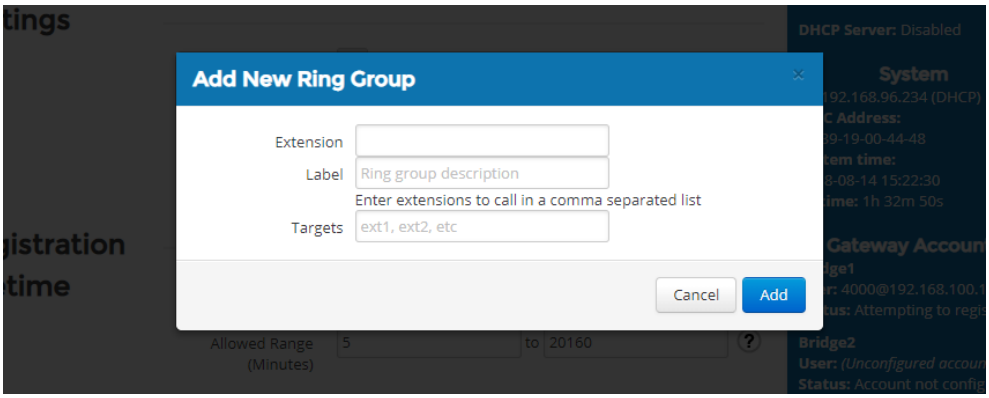
- **IP Address –** This is the RTP Multicast IP paging address. Audio from the paging extension (**Extension**, above) will be sent on this multicast IP address. Valid addresses range from `224.0.0.1` to `239.255.255.255`.
    - *Note: Some addresses, particularly in the `224.xx.xx.xx` range, are globally reserved and should not be used. Consider using addresses in the `239.255.xx.xx` range, which are "Administratively Scoped Local Addresses."*

- **Port –** Paging RTP Multicast port. Audio from the paging extension (**Extension**) will be sent on this UDP port. Valid ports range from `1` to `65535`. The default port is `5004`.

Call Groups (Ring Groups and Hunt Groups)

Users can configure up to 64 Call Groups within the Carina PBX. This can be a combination of Ring Groups and Hunt Groups. No more than two (2) Call Group calls may be active at one time.

A ***Ring Group*** is an extension which, when dialed, will attempt to connect the caller with one of multiple extensions described in the ring group. All extensions will ring simultaneously. The first extension to answer will be the only extension connected to the caller.

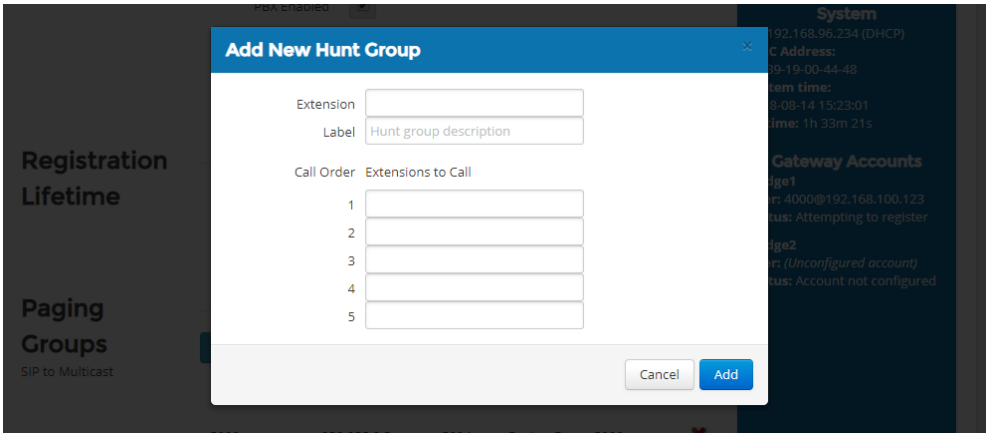


- **Extension –** The unique extension a caller will dial to activate this ring group.

- **Label –** A name to help identify this particular ring group.

- **Targets –** A comma separated list of extensions which belong to this ring group. When the ring group is activated, all of the extensions in this list will be called simultaneously.
    - Enter the individual extensions you wish to call, separating each extension by a comma (for example: `1001, 1002, 1003`).

A ***Hunt Group*** is an extension which, when dialed, will attempt to connect the caller with one of the extensions described in the hunt group in a particular order (not simultaneously, as in a Ring Group). If the first extension does not answer within the specified time period, the call will roll to the next extension listed.



- **Extension –** The unique extension a caller will dial to activate this hunt group.

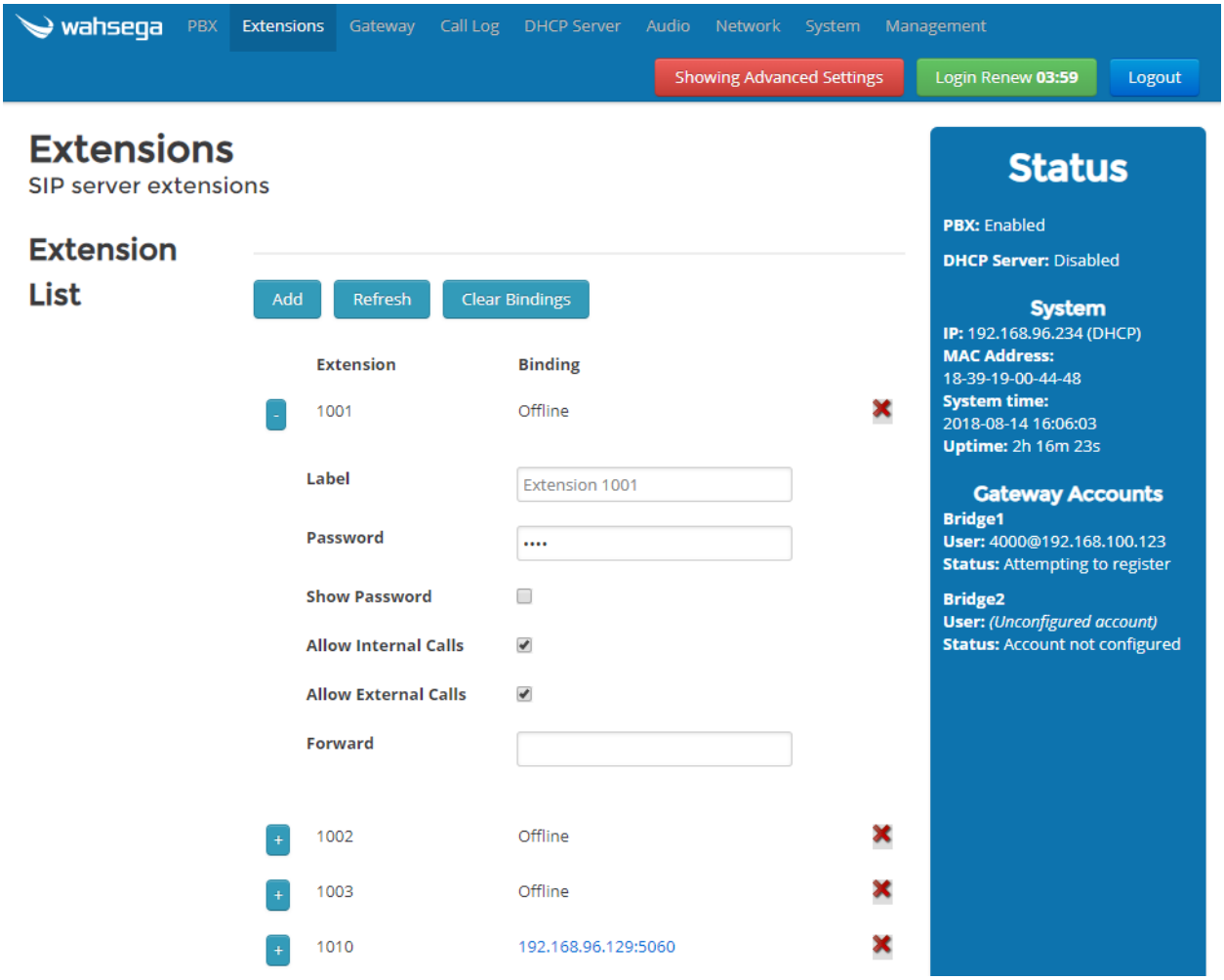
- **Label –** A name to help identify this particular hunt group.

- **Extensions to Call –** This is a list of extensions to call, listed in order of which they will be called. The amount of time each extension will ring before the call transfers to begin ringing the next extension on the list is determined by the **Hunt Group Call Attempt Timeout** setting on the main PBX page. The default timeout is 30 seconds per extension.

Extension Configuration

Configure SIP server extensions.

Carina PBX can support up to 256 unique extensions.



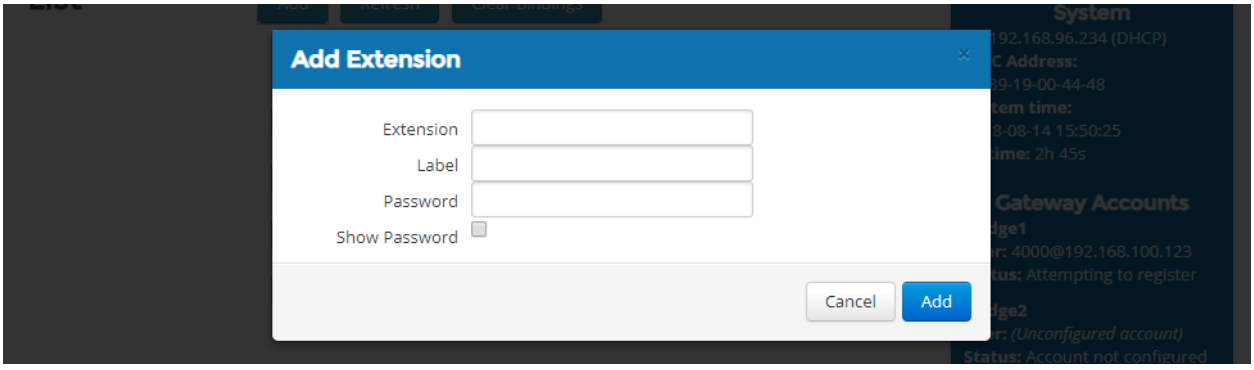
Preconfigured Extensions

- Extensions 1001, 1002, and 1003 are preconfigured for convenience but may be edited or deleted.

- Preconfigured extensions already have associated passwords. These passwords can be edited, but the default passwords are:

    - Extension 1001 password = `1001`
    - Extension 1002 password = `1002`
    - Extension 1003 password = `1003`

Add Extension

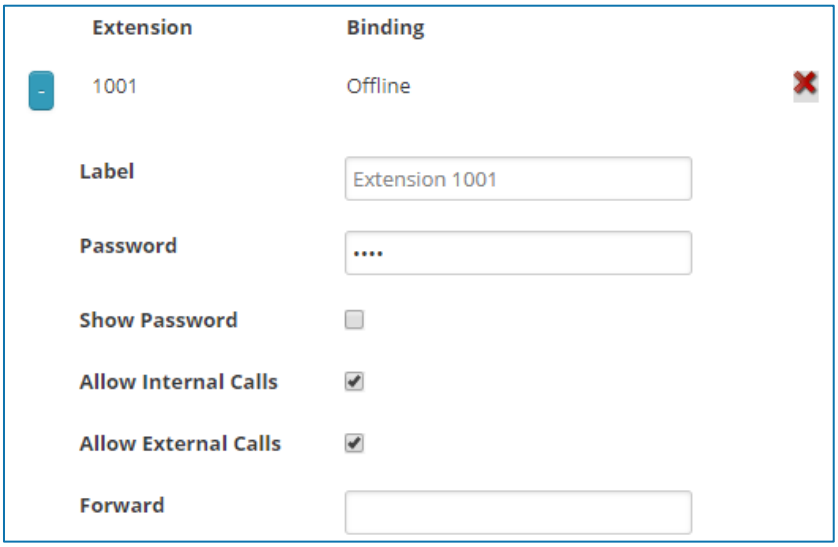


- **Extension –** Enter the number or alphanumeric name of the extension you would like to name. *Spaces are not allowed*.

- **Label –** Unique identifier to be used for Caller ID.

- **Password –** Password for new extension if required.

Extension List



- **Extension –** Default extensions and extensions you have added will appear in this column.
    - To delete an extension or change its settings after it has been added, simply click the "**+**" next to the extension and edit as needed.

    - **Allow Internal Calls (advanced) –** Checking this allows the extension to make calls to other extensions on the PBX.

    - **Allow External Calls (advanced) –** Checking this allows the extension to make calls through the gateway.

    - **Forward (advanced) –** Enter preconfigured extension this extension's calls will be forwarded to (if needed).

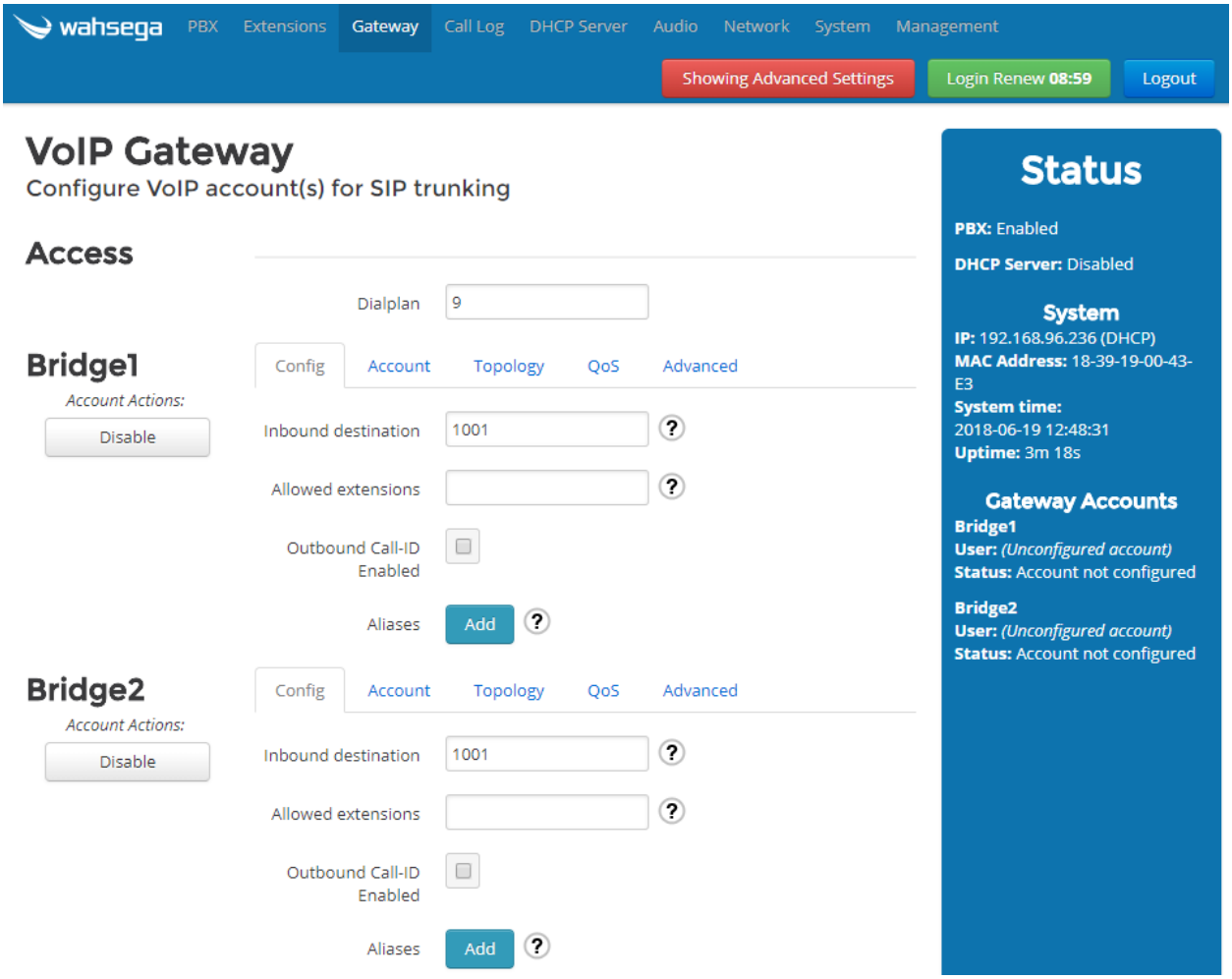
- **Binding –** Registered extensions and their IP addresses will appear in this column. Click a registered extension's hyperlink to open that device's configuration webpage in a new browser tab.

- **Refresh –** Click this button to see which extensions are currently registered.

Gateway Configuration

Configure VoIP account(s) for SIP trunking if needed.

Carina PBX can support up to two (2) VoIP gateways and up to two (2) system bridges per gateway. It supports up to two bridged calls at one time.



Note: See more information regarding SIP trunking with the VoIP Gateway(s) in ***Appendix B****.*

Access

- **Dialplan –** For calls to be routed through this gateway, the phone number must be prepended with the dialplan entered here.
  - Dialplan can be numbers or characters and can include spaces.
  - Be sure that your dialplan does not overlap any extensions. (For example, if your dialplan is **`10`**, the system will read a dialed number **`1001`** as **`10 + 01`**.)

Bridge

Configure VoIP account(s) for SIP trunking.

- **Inbound destination –** Extension where all inbound calls through this bridge will be directed.

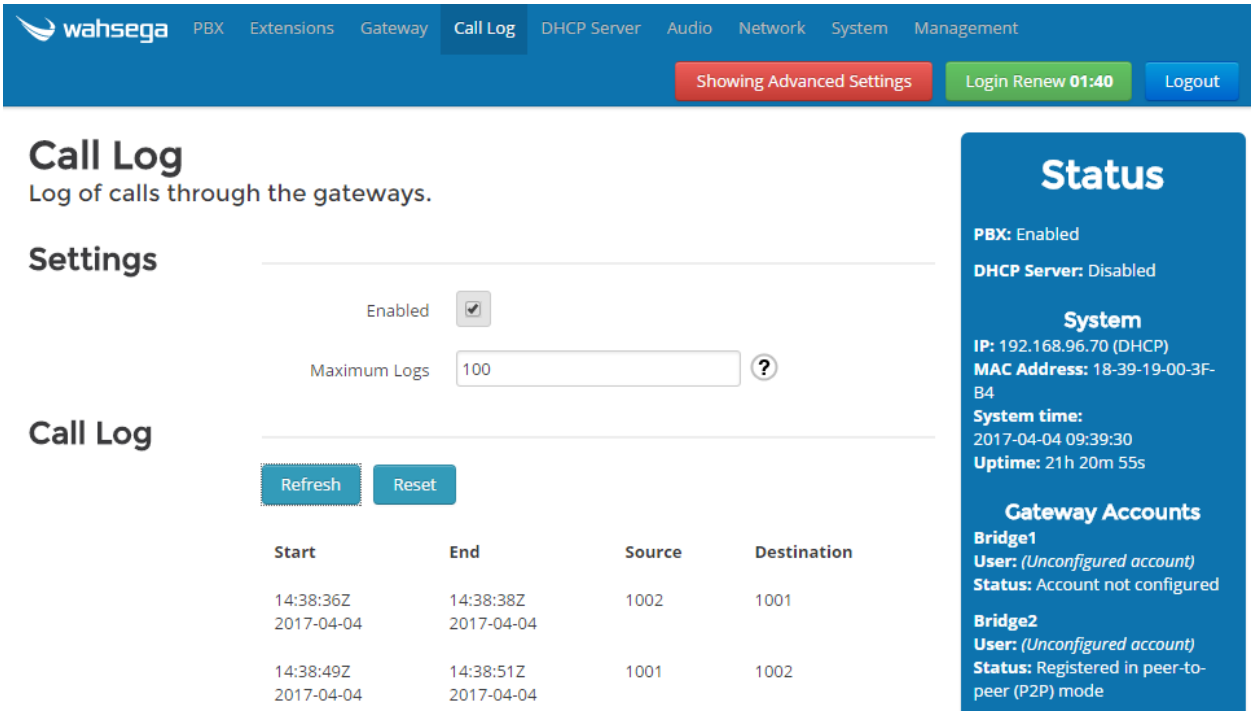
- **Allowed extensions (advanced) –** The list of extensions allowed to call out through this bridge. Multiple entries should be separated by commas (`1001, 1002, 1003`). If this field is blank, all extensions will be allowed to call out through this bridge.

- **Outbound Call-ID Enabled (advanced) –** If this box is checked, outbound calls will include caller ID information (extension Label as entered on the **Extensions** page).

- **Aliases –** An account alias is another name the account could be addressed as. This is common when connecting to SIP trunk services that may address the account with any of the phone numbers associated with the account.

Call Log

Enable, disable and view log of calls since last Carina PBX reboot.



Settings

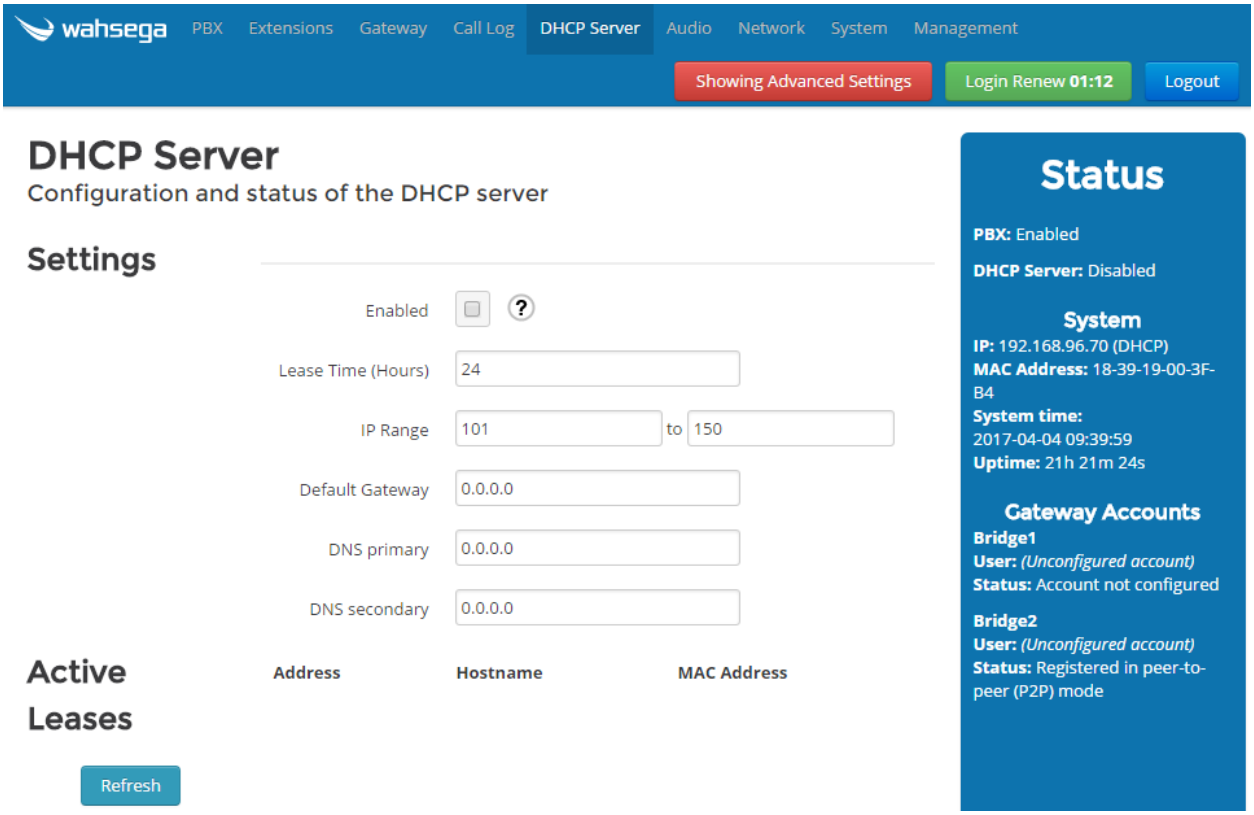
- **Enabled –** Enables the call log
- **Maximum Logs –** Maximum calls allowed to be logged. Once the number of calls logged reaches the maximum value listed here, the oldest call logs will be overwritten whenever a new log entry is created. Default is 100 calls logged.

Call Log

- **Refresh –** Click to see the latest calls logged.
- **Reset –** Click to delete and reset call log.

DHCP Server Configuration

Configure settings for the DHCP server.



Settings

- **Enabled –** Enables the DHCP server.
    - *Caution: Enabling the DHCP server can cause problems on the network if a DHCP server already exists. Leave DHCP disabled if you are connected to a network with a DHCP server!*

- **Lease Time (Hours) –** DHCP server lease time. Default is 24 hours.

- **IP Range –** Range of IP addresses allowed.

- **Default Gateway (advanced) –** Optional advanced setting.

- **DNS primary (advanced) –** Optional advanced setting.

- **DNS secondary (advanced) –** Optional advanced setting.

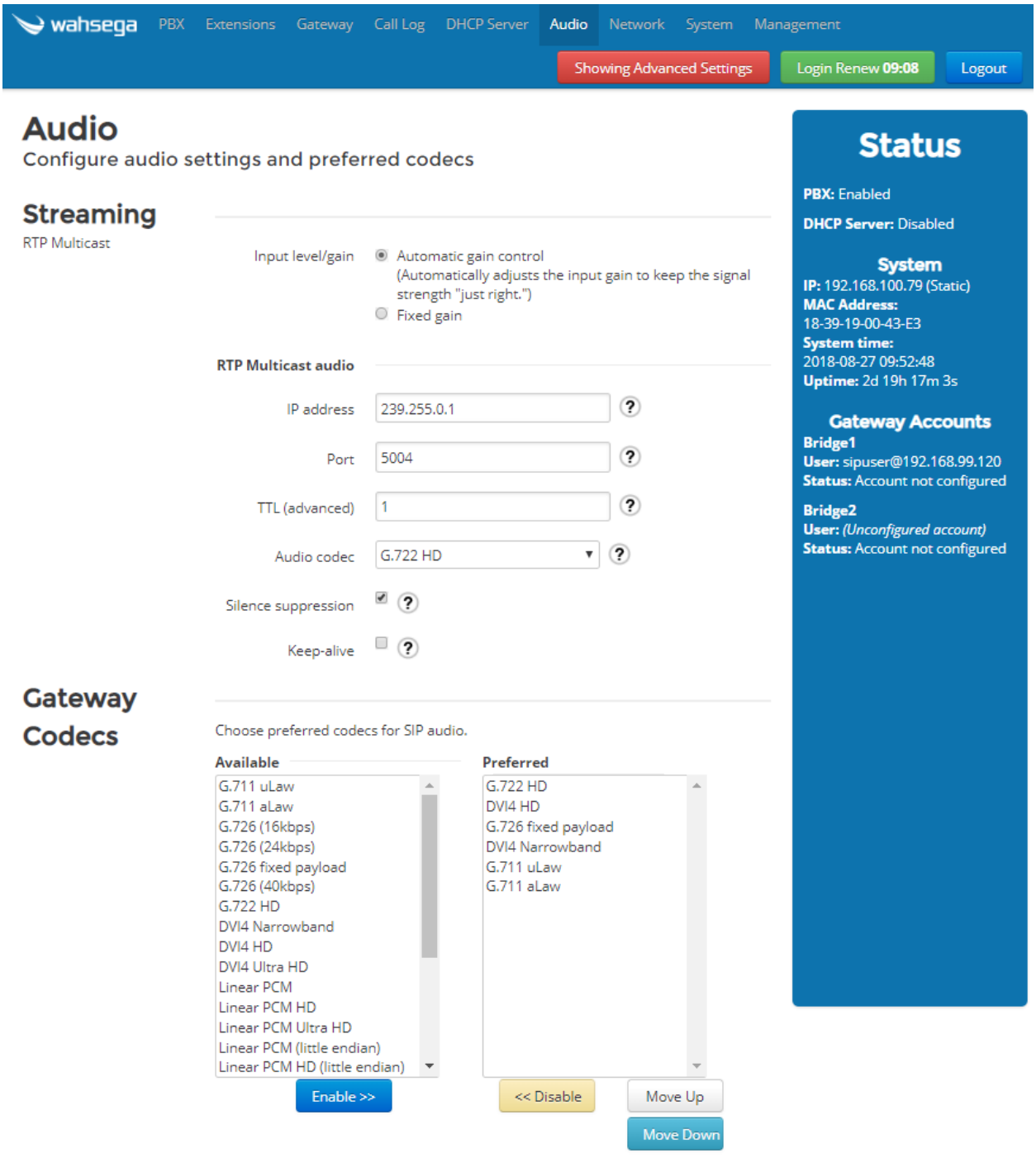
Active Leases

Any active DHCP address leases will be listed here, along with hostname and MAC address for each device. Click an individual device's hyperlink here to open that device's configuration webpages in a separate tab.

- **Refresh –** Click Refresh to see the most current list of IP addresses registered on this DHCP server.

Audio Settings

Configure specific audio and codec settings.



Streaming RTP Multicast

- **Input level/gain** –Configure the input level of your audio stream for the Carina PBX audio input (LINE IN).

    - **Automatic gain control –** Automatically adjusts the input gain to keep the signal strength "just right."

    - **Fixed gain –** User configured gain.

        - For a full-scale signal at *consumer audio line level* (-10 dBV nominal), set a fixed input gain of **`+12.0 dB`**.

        - For a full-scale signal at *professional audio line level* (+4 dBu nominal), set a fixed input gain of **`0.0 dB`**.

        - If you're unsure, use *consumer audio line level* (**`+12.0 dB`**).

- **RTP Multicast audio –** Choose settings here for encoding the audio on the Carina PBX audio input (LINE IN).

    - **IP address –** Audio will be sent on this multicast IP address. Valid addresses range from `224.0.0.1` to `239.255.255.255`
        - **Note:** Some addresses, particularly in the `224.xx.xx.xx` range, are globally reserved and should not be used! Consider using addresses in the `239.255.xx.xx` range, which are "Administratively Scoped Local Addresses."

    - **Port –** Audio will be sent on this UDP port. Valid ports range from `1` to `65535`. The default port is `5004`.

    - **TTL (advanced) –** Audio will be sent using this TTL (Time to Live) value. Valid TTL values range from `1` to `255`.

- **Audio codec –** RTP audio will be encoded using the selected codec. “HD” or “wideband” codecs have better audio quality. Default audio codec is **`G.722 HD`**.

- **Silence suppression (advanced) –** When enabled, RTP encoding will use silence suppression so that it can cease transmitting when there is no audio. Silence suppression is *enabled by default.*

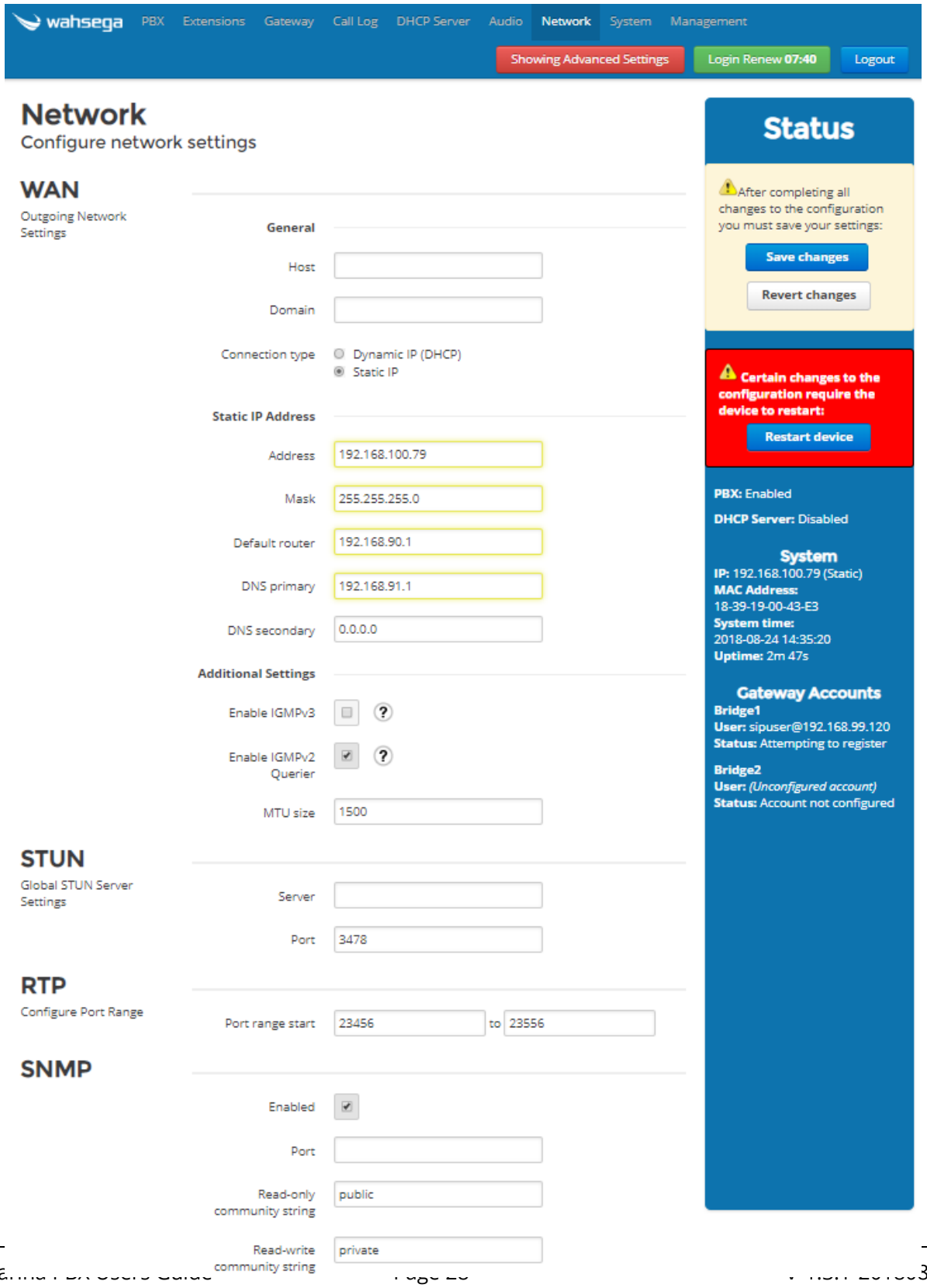
- **Keep-alive (advanced) –** When enabled, RTP encoding will send periodic keep-alive packets during periods of silence (when **Silence Suppression** is enabled). This may aid in keeping connections alive through a NAT or firewall, but as a result receiving devices will see the stream become momentarily active every 10 seconds. For that reason, keep-alive is *disabled by default.*

Gateway Codecs

- **Choose preferred codecs** – *Used only in gateway configurations*. These settings enable/disable audio codecs and set their order of use for the **VoIP Gateway**. The system will try codecs at the top of the `Preferred` list before trying codecs at the bottom of the list. Add, delete and change priority of codecs by using the `Enable`, `Disable` and `Move Up` buttons, respectively.

Network Configuration

Configure settings for TCP/IP networking.



WAN

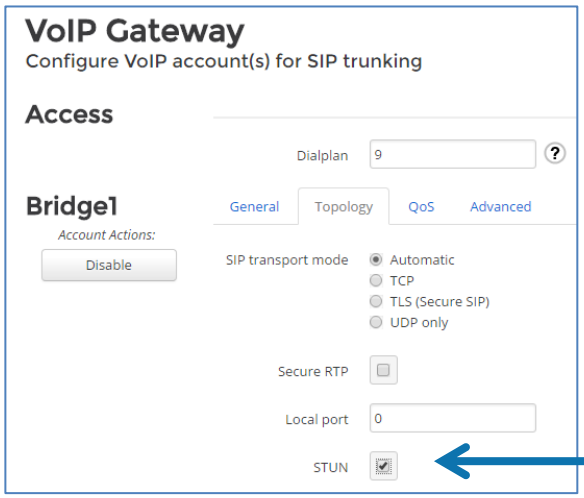
- **Connection Type**
    - **Dynamic IP** – Choose this to use DHCP to assign an address automatically. Note that when using DHCP, you will have to determine the IP address assigned to the Carina PBX using your DHCP server or through some other method in order to access the configuration webpages in the future.

    - **Static IP** – Choose this to enter IP address settings manually. *Warning: If you enter a configuration that is not accessible from your network, you may be unable to communicate with the Carina PBX! Double-check that the settings you enter are correct before rebooting the Carina PBX to apply them.*

- **Additional Settings**
    - **Enable IGMPv3 (advanced) –** Enables IGMP version 3. If unchecked, IGMP version 2 will be used. The default setting is *disabled* because IGMP version 3 will be ignored by routers which only support IGMP version 2. If you know that your routers have IGMPv3 enabled, you can safely enable this setting. *If unsure, leave disabled* to ensure support with routers that only use IGMPv2.

STUN

- **Server/Port** – Enter your STUN server here. STUN servers may be required to operate with a public SIP server from behind a NAT or router. If using a STUN server, make sure to indicate and select the appropriate settings on the **Gateway** page under **Topology**, accessible under **Advanced Settings**.



If using a STUN server, make sure to indicate and select the appropriate settings on the Gateway page under Topology, accessible in Advanced Settings.

RTP

- **Port range** – Select the UDP port range to use for sending RTP audio network traffic during a call.

SNMP

- **Enabled** – Simple Network Management Protocol (SNMP) agent enabled.

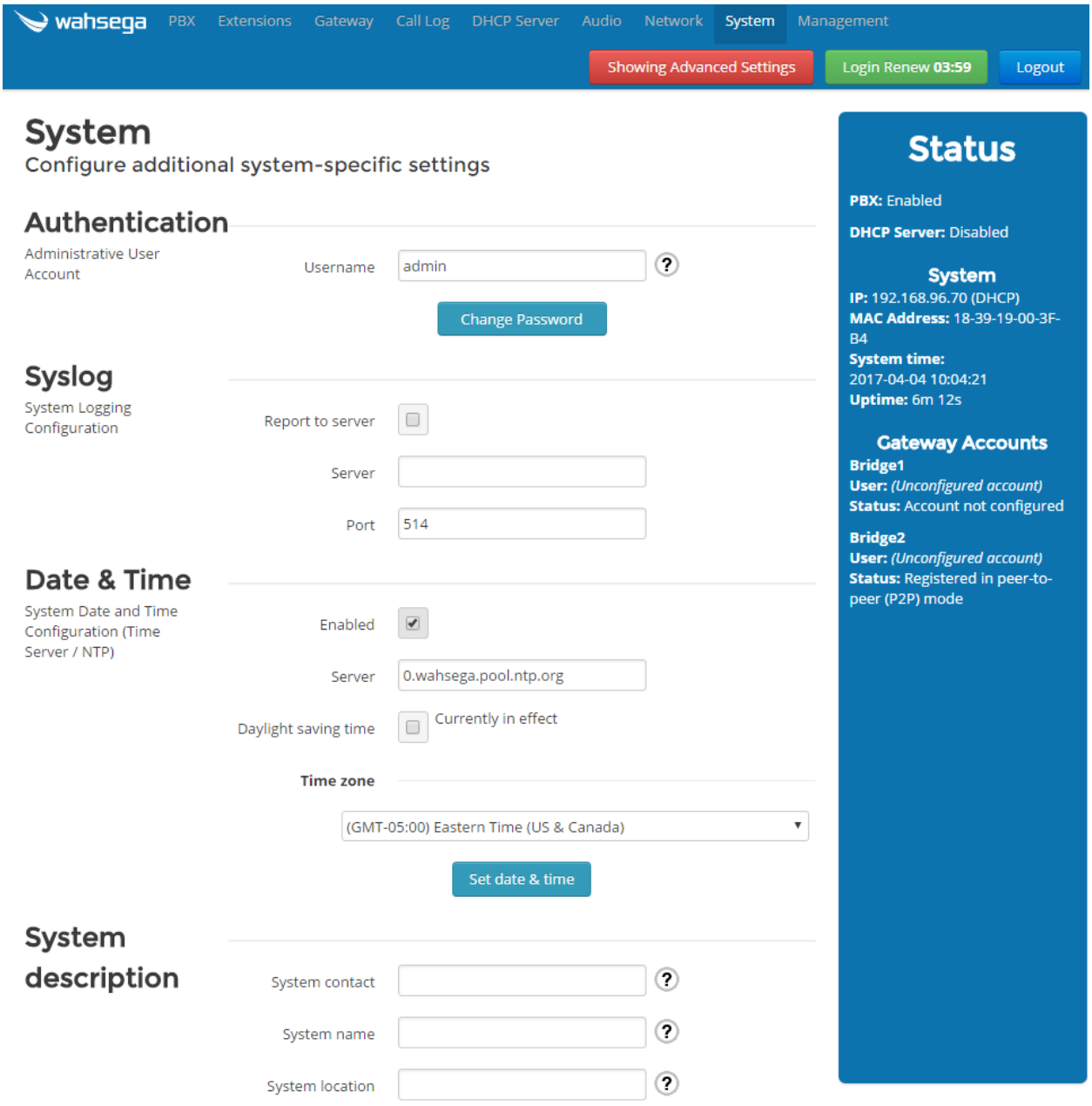
- **Port** – Default port is 161.

- **Read-only community string** – Default value is `public`.

- **Read-write community string** – Default value is `private`.

General System Configuration

Settings for operating system and other administrative functions.



Authentication

- **Username –** Set the username and password used on the configuration webpages and Telnet shell. Default username and password are `admin` and `admin`.

Syslog

- **Report to server -** Configures a syslog server that can receive system logs from the Carina PBX. This requires a PC or server running a syslog server to receive and store the logs.

Date & Time

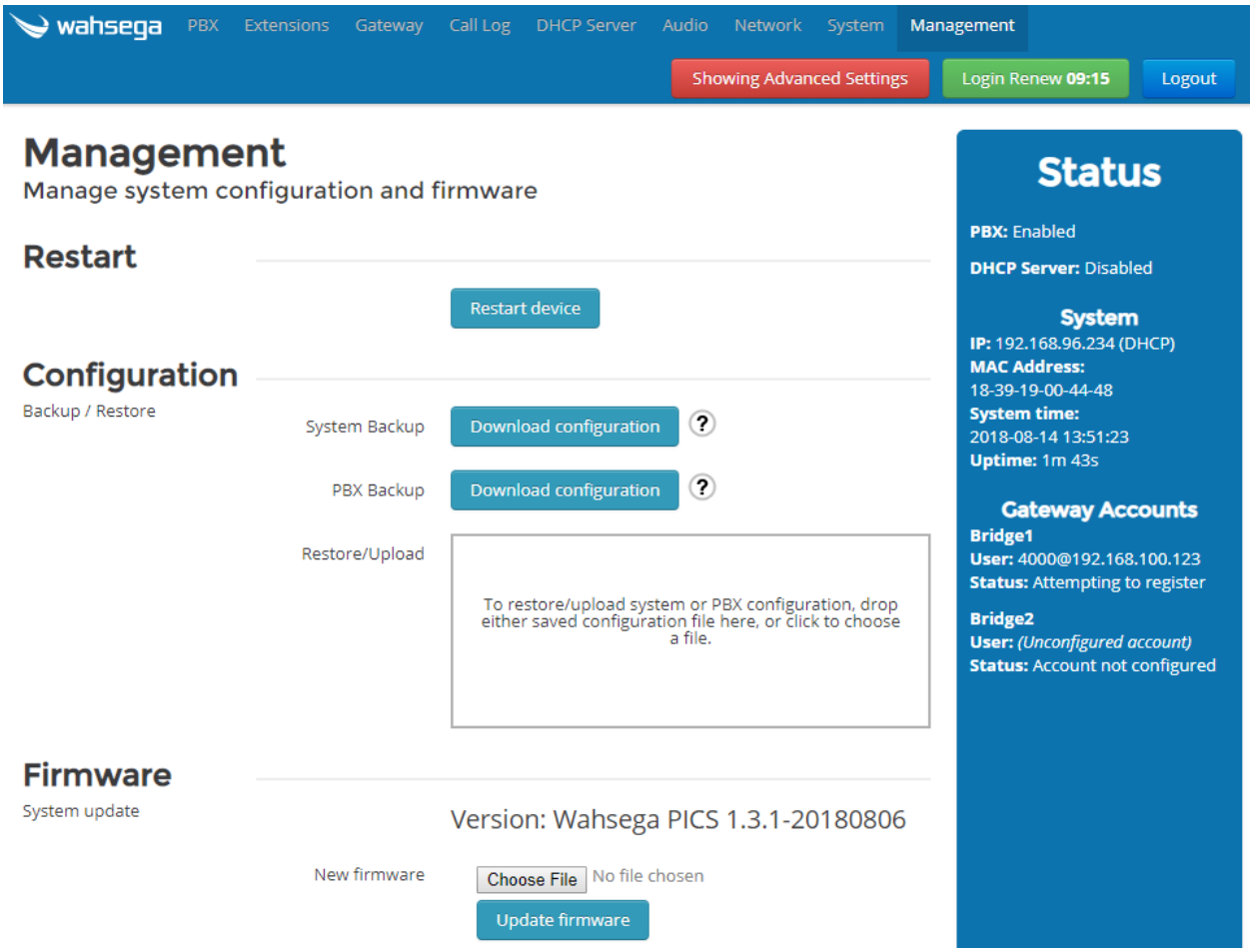
- **NTP Enabled –** Automatically determines the time of day using an NTP server. This is recommended, as the Carina PBX does not have a battery-backed clock.
- **Daylight saving time –** Select this only if daylight saving time is currently in effect in your location.
- **Time zone –** Select the region that most closely matches your time zone. (Note that daylight saving time is *not* automatically applied based on region.)

System description

- **System contact –** Text identifier for IT person to contact regarding this device. This setting is available through SNMP as `sysContact (1.3.6.1.2.1.1.4)`, as defined by RFC 1213.
- **System name –** An administratively-assigned name for this device. By SNMP convention, this is the device's fully-qualified domain name. This setting is available through SNMP as `sysName (1.3.6.1.2.1.1.5)`, as defined by RFC 1213.
- **System location –** The physical location of this device (e.g., "telephone closet, 3rd floor"). This setting is available through SNMP as `sysLocation (1.3.6.1.2.1.1.6)`, as defined by RFC 1213.

Firmware Management

Manage and update the Carina PBX configuration and firmware.



Restart

- **Restart device –** Click this button to restart your Carina PBX with no additional prompts.

Configuration

- **System Backup –** Use this to download a copy of the current Carina PBX *system* configuration (core services, SIP client account information and DHCP server settings) and save to disk.

- **PBX Backup –** Use this to download a copy of the Carina PBX's current *PBX* configuration (PBX specific settings, extension list and configured gateway mappings) and save to disk.
- **Restore/Upload –** Click this button *or* drag file here to upload a valid backup file (JSON format) for the Carina PBX.

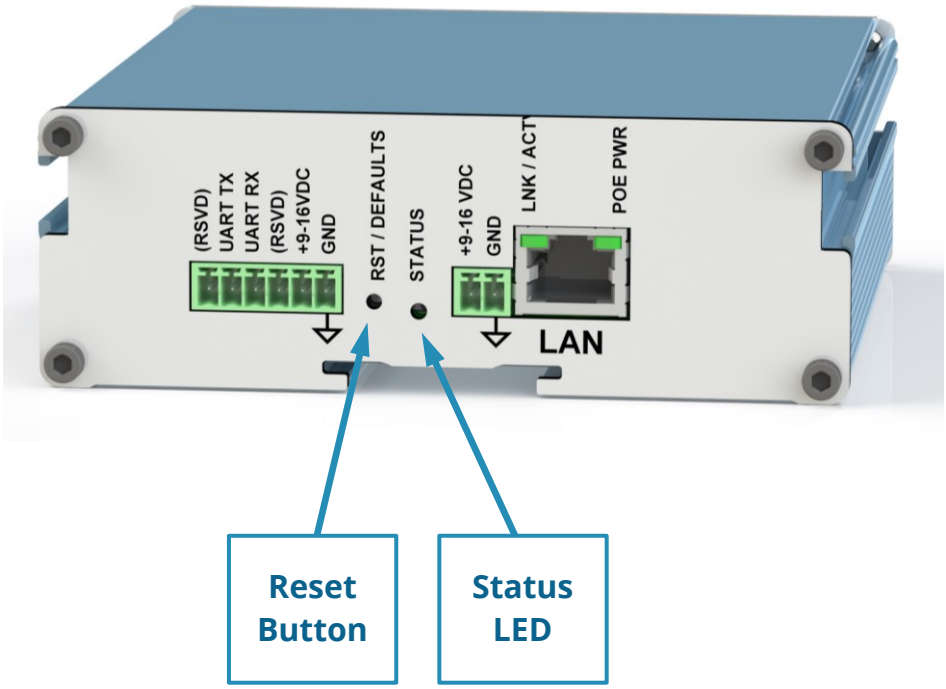
Note that a reboot will be required before new settings take effect.

Firmware

- **New firmware –** Use this to upload new firmware. First, click Choose File and select the file you would like to upload (`.bin` format). Once the correct file is uploaded, click Update firmware to complete the update.
    - *DO NOT UNPLUG THE CARINA PBX OR INTERRUPT THE FIRMWARE UPGRADE PROCESS BEFORE IT COMPLETES, OR IT MAY BE RENDERED UNUSABLE.*

Appendix A
Factory Reset

Software-Based Factory Reset



If you need to erase the configuration settings in the Carina PBX for any reason, you can do so in one of two ways. **Option A** returns all settings to factory default, and **Option B** returns only select settings to factory default.

Option A - Steps for activating a full factory reset:

1. Start with the Carina PBX powered off.

2. Using either method on pages 5-6, apply power to the Carina PBX. As soon as power is applied, hold the reset button until the status light begins to blink.

3. Once the light starts blinking, continue to hold the button for **at least 5 seconds**. NOTE 1

4. After 5 seconds, the status light will flash rapidly to indicate that the file system has been reformatted and all data has been erased from your device. NOTE 2

5. Unplug and restart the Carina PBX for the new settings to take effect. You have successfully reset your configuration!

Note 1: If you release the button early, Carina PBX will proceed with normal startup.

Note 2: If the status light instead begins to blink more slowly, the reset was not successful. Unplug and restart your device, and then attempt a reset once again.

Option B - Steps for activating a partial factory reset:

1. While the unit is running and the status LED is steadily lit, press and hold the reset button.

2. Continue to hold down the button as the status light first turns off and then begins to advance through reset options. Every 5 seconds, the status light will blink to indicate a different reset option as described below.

   1 blink = Reset type 1

   - Erases network configuration, reverting back to defaults *for network configuration only*. All other configuration settings remain unchanged.

   2 blinks = Reset type 2

   - Erases all configuration settings, reverting back to factory defaults. All other system files remain unchanged.

3. Release the button when you reach the type of reset you need. NOTE 3

4. The status light will flash rapidly to indicate that the selected settings have successfully been erased. NOTE 4

5. Restart the Carina PBX for the new settings to take effect. You have successfully reset your configuration!

Note 3: If you release the button before the LED begins to blink, nothing will be reset, and you will not need to reboot.

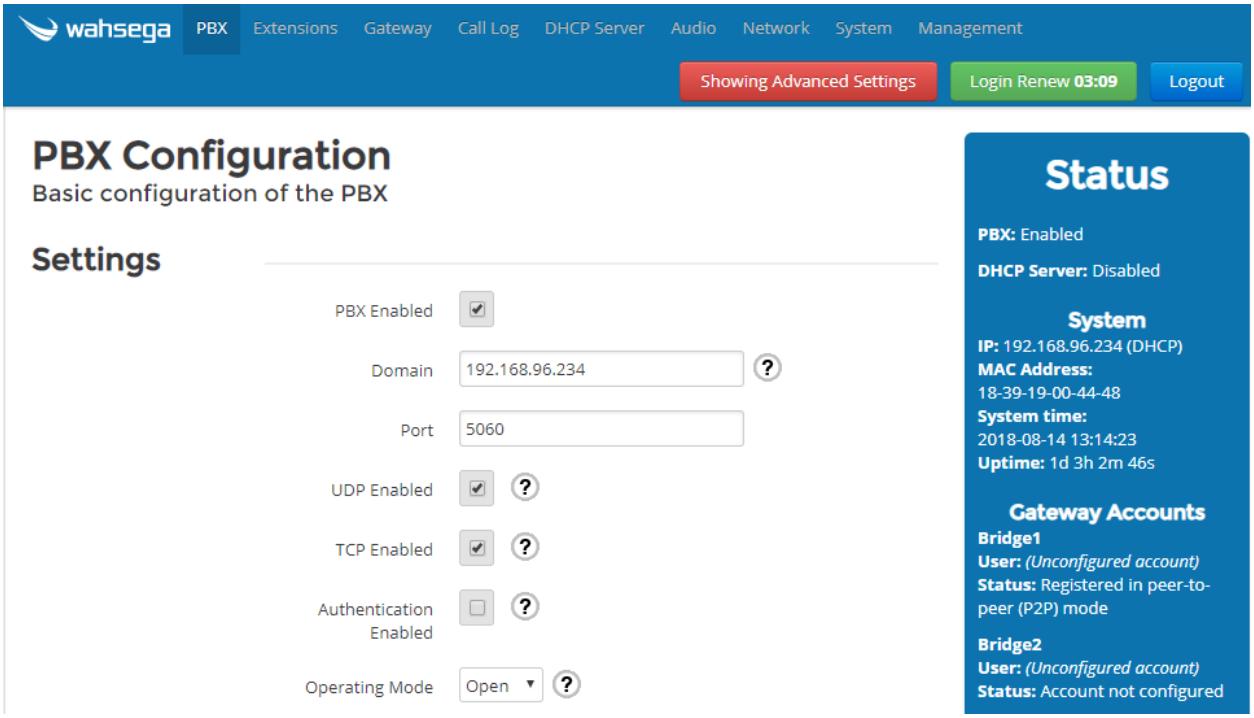
Note 4: If the status light begins to blink more slowly after you release the button, the reset was not successful. Unplug and restart your device, and then attempt a reset once again.

Appendix B
SIP Trunking

Setting up Carina PBX for Inbound Trunked Calls

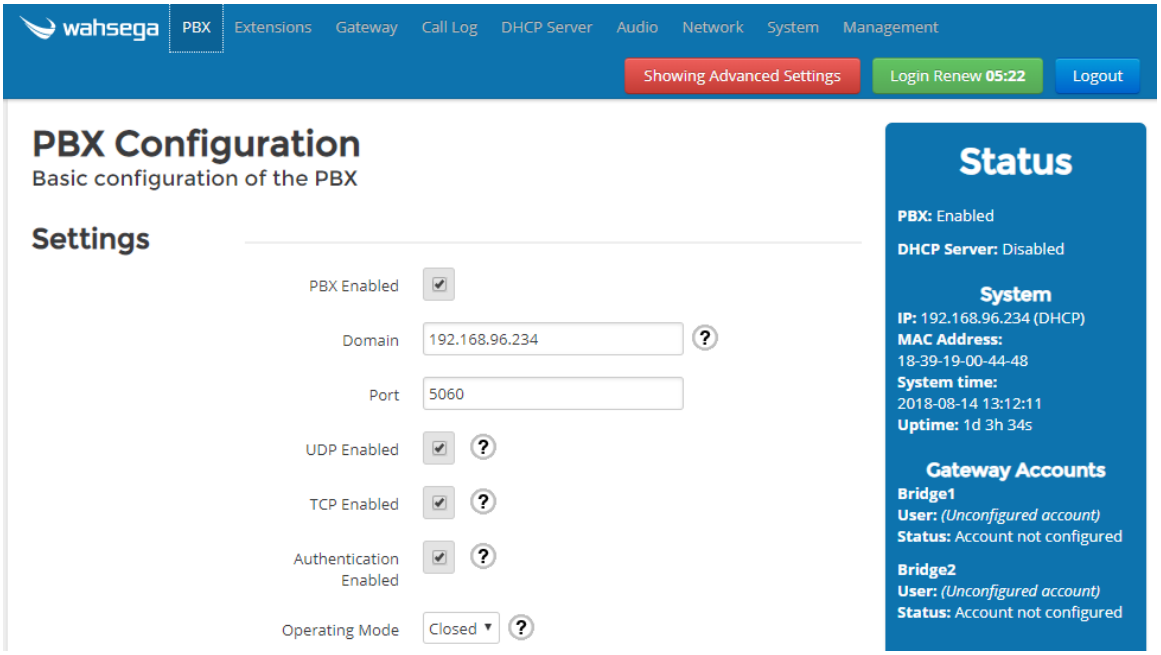
Method 1: No authentication required

1. Set the Carina PBX's **PBX Operating Mode** to Open. This both disables authentication and removes the requirement for pre-configuring extensions. (This is not typically recommended.)

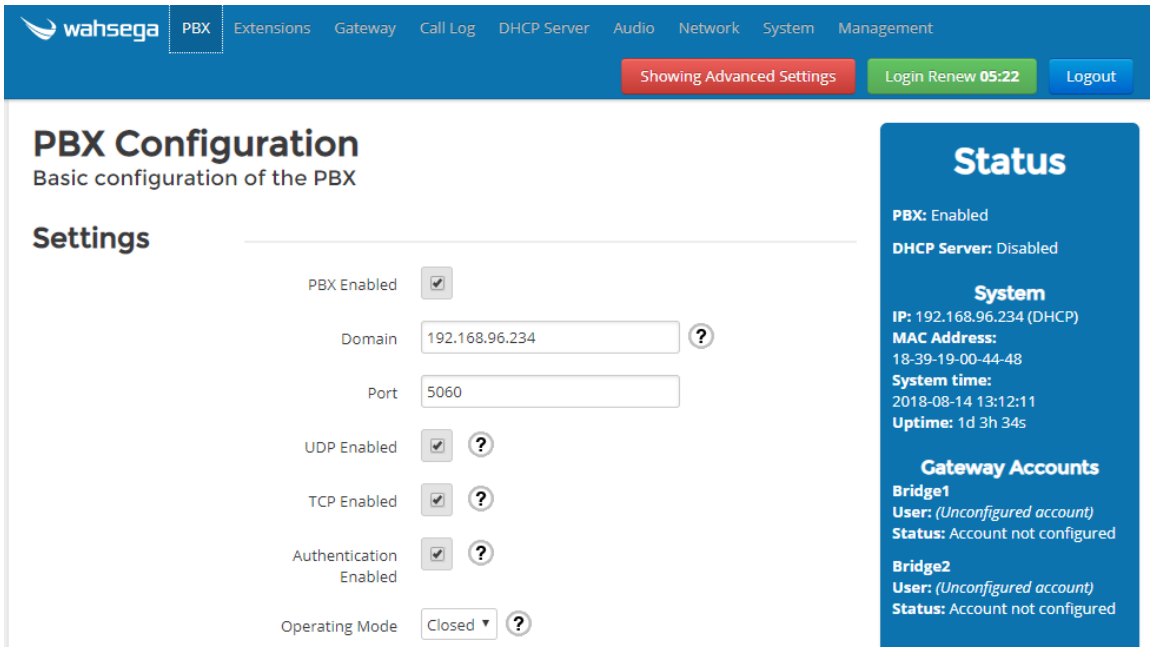


Method 2: Authentication Required

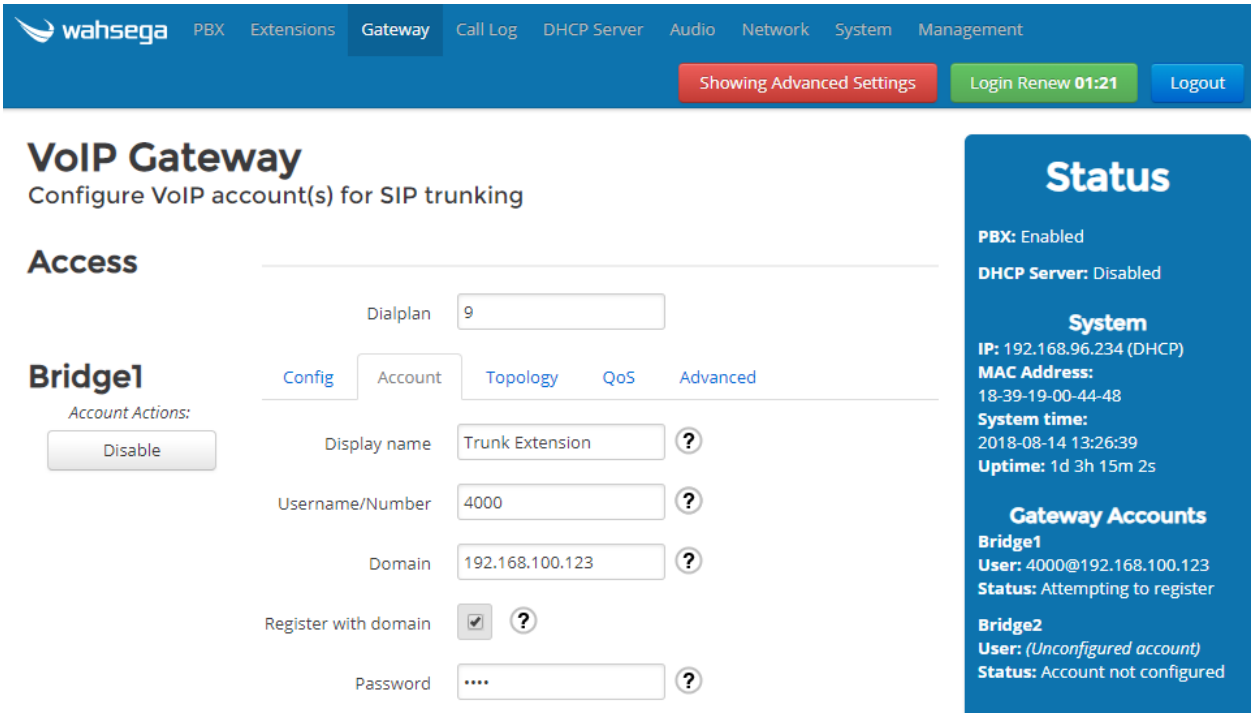
1. Set the Carina PBX's **PBX Operating Mode** to `Closed`.



2. Enable Authentication on the Carina PBX's **PBX**.



3. Create an extension on the Carina PBX that will be used by the trunking server.



4. Set up the trunking server to authenticate itself using the credentials from the extension created. The trunking server does not need to "register" with the Carina PBX.

Upon completion of this step, a trunking server will be able to call a registered extension directly on the Carina PBX.

Setting up Carina PBX for Outbound Trunked Calls

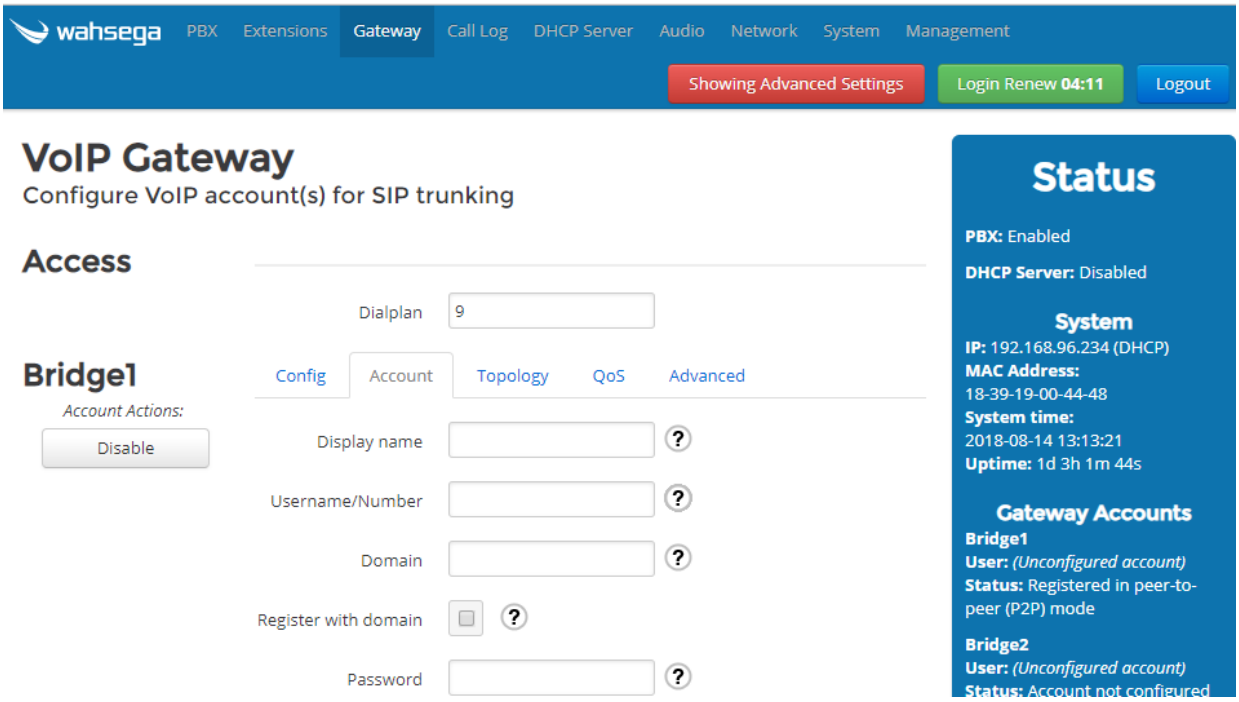
Method 1: No authentication required by trunking server

For the intercom or phone to call an extension on the trunked server, it simply must provide the extension and domain.

- For example, `<extension>@<trunked_domain>`

Method 2: Authentication required by trunking server [NOTE 5]

1. Set up a **VoIP Gateway** to point to the trunking server.
2. Verify that the authentication credentials for the gateway are correct.
3. Disable **Register with domain** under the **Account** tab on the gateway.



For the intercom or phone to call an extension on the trunked server, it must pre-pend the extension found on the trunked server with the **dialplan** set up for the gateway.

Upon completion of this step, devices registered with the Carina PBX will be able to call out to the trunked server.

Note 5: This method restricts the number of simultaneous outbound calls to the trunked server due to the fact that the outbound calls are going through the gateway. **The maximum number of simultaneous calls through the Carina PBX gateway is two (2).**

Carina PBX

WL-PBX-CAR

Users Guide

Version 1.3.1-20180806