



Lawo VSC

User Manual

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Table of Contents

- 1 Lawo VSC - Introduction 4
 - 1.1 Description 4
 - 1.2 Key Features 5
 - 1.3 Variants 5
 - 1.4 Licensing 5
 - 1.5 Specifications 6
- 2 Lawo VSC - System Requirements 7
 - 2.1 System Requirements 7
 - 2.2 Evaluating the System Resources 7
 - 2.3 Network Interface Card Bandwidths 8
- 3 Lawo VSC - Installation and Setup 9
 - 3.1 Lawo VSC - Installation 10
 - 3.2 Lawo VSC - First-time Startup 14
 - 3.3 Lawo VSC - License Activation 21
 - 3.4 Lawo VSC - Global Settings for Streaming 28
 - 3.5 Lawo VSC - Audio Device Quick Setup 32
 - 3.6 Lawo VSC - Synchronization 39
- 4 Lawo VSC - Operation 43
 - 4.1 Lawo VSC - Operating Principles 44
 - 4.2 Lawo VSC - Receiving Audio from the Network 51
 - 4.3 Lawo VSC - Sending Audio to the Network 55
 - 4.4 Lawo VSC - Audio Device Configuration 60
 - 4.5 Lawo VSC - Sender Parameters 66
 - 4.6 Lawo VSC - Receiver Parameters 68
- 5 Lawo VSC - Settings 69
 - 5.1 Lawo VSC - General Settings 71
 - 5.2 Lawo VSC - HOME Settings 72
 - 5.3 Lawo VSC - Streaming Settings 74
 - 5.4 Lawo VSC - Advanced Settings 76
 - 5.5 Lawo VSC - Logging 77
 - 5.6 Lawo VSC - Use License 78
- 6 Lawo VSC - Saving the Configuration 79
 - 6.1 What is Saved? 79
 - 6.2 Restarting the App 79
- 7 Lawo VSC - Integration with HOME 80
 - 7.1 Lawo VSC - HOME Integration 81
 - 7.2 Lawo VSC - HOME Integration Setup 85
 - 7.3 Lawo VSC - Device Settings (in HOME) 88

1 Lawo VSC - Introduction

Lawo VSC is a Virtual Sound Card and audio application for macOS systems. It can be used to convert local audio on your mac to RAVENNA/AES67 streams that can be shared to any AoIP network. Similarly, audio streams can be received from the network for local use on your computer.

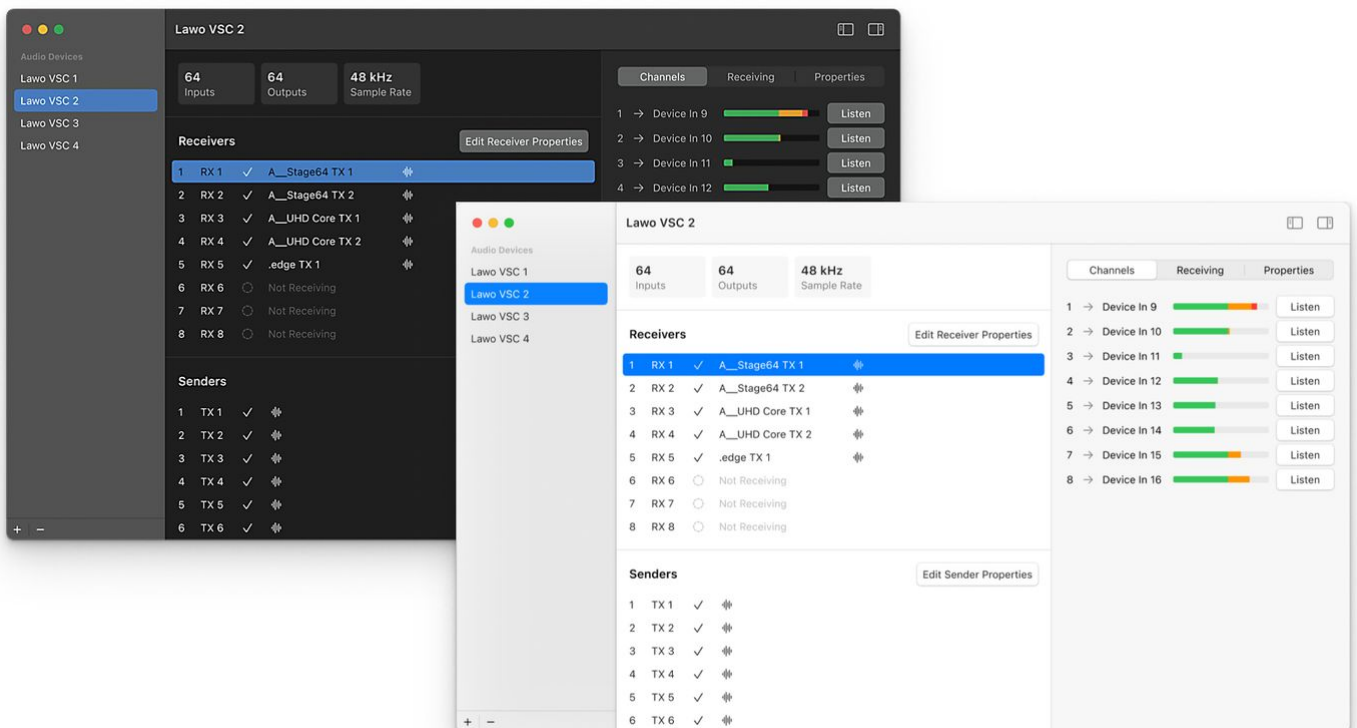
1.1 Description

Lawo VSC is built around a low-latency audio driver that supports sample rates of up to 96kHz and up to 128 audio channels per virtual audio device. Depending on the stream configurations, and resource usage of your computer, up to 128 virtual audio devices can be configured.

On the network side, the streams carry uncompressed, bi-directional audio channels. The streams are fully compatible with SMPTE ST2110-30/31, AES67 and RAVENNA. Redundant streaming, compatible with SMPTE ST2022-7, can be configured by using two network interfaces (for primary and secondary streaming).

Lawo VSC is configured using an intuitive GUI that can run in either dark or light mode (shown below). From here, you can configure the audio device(s), check the streams, listen to the audio channels and apply a 1kHz test tone signal. Once configured Lawo VSC runs as a service.

Lawo VSC supports native integration with HOME, Lawo's management platform for IP-based media infrastructures. If HOME integration is configured, then Lawo VSC appears as a device (in HOME's [Devices list](#)) and its streams can be patched to other hardware and software devices on the network (using HOME's [Stream Routing](#) page).





1.2 Key Features

- Up to 128 virtual audio devices.
- Up to 128 audio channels per device.
- Low-latency audio driver.
- Sample rates of up to 96kHz.
- Streams compatible with SMPTE ST2110-30/31, AES67 and RAVENNA.
- Redundant streaming is supported via SMPTE ST2022-7 (Seamless Protection Switching).
- Intuitive user interface that runs in either dark or light mode.
- PPM audio level meters for each audio channel.
- 1kHz test tone generator on any outgoing stream.
- Pre Listen monitoring using any external or built-in audio device.
- Native integration with HOME.

1.3 Variants

Lawo VSC can be used free of charge or with a paid license.

The **Free version** offers a single stereo audio device for both playback and recording. It is fully operational but is not intended to be used for live productions, due to the limited channel count and feature support.

The **Standard (Licensed) version** supports multiple audio devices, more channels and more features. To run this version you will need to install a Lawo VSC license.

The specifications table ([below](#)) can be used to compare the functionality of the versions.

1.4 Licensing

The Lawo VSC version is defined during the initial setup of the app. There are two possible options: either **Licensed** or **Free**.

If the **Free** version is selected, then no license is required and Lawo VSC runs with limited functionality. In this instance, all options are visible but an 'Upgrade License' dialog appears whenever you attempt to configure a restricted function. From here, you can upgrade to the licensed version to unlock the functionality, or cancel the operation and continue running the free version.

If the **Licensed** version is selected, then this starts a 15-minute grace period during which you can install a license. From the start of the grace period, Lawo VSC runs the full functionality of the app. If the grace period expires before a license is found, then white noise is inserted into the audio. The white noise is removed once a valid license is detected. If the license goes missing during runtime, then a new grace period (of 12 hours) begins.

Please note: It is possible to switch between the versions, at any time, by enabling or disabling the **Use license** option (in the [Settings](#) → [License](#) dialog).

The license activation is a one-time procedure that is described [later](#). For now, it is useful to know that:

- To unlock the features of the Standard version, you must select the **Licensed** version and install a **Lawo VSC license**.
- Lawo VSC licenses are managed by the **CodeMeter Runtime** licensing system. This is the same licensing system used by other Lawo products such as Power Core, crystal and diamond.
- Lawo VSC licenses can be ordered from your local Lawo sales representative. You will need 1x Lawo VSC license for each app instance/computer. The license code(s) are delivered via email once your order is processed.
- Each license code must be redeemed at <https://licenseportal.lawo.com> and installed into a license container. This can be a local container (on your computer), a remote container (on a networked server) or a USB dongle (for portability).
- Once installed, the license is detected automatically by Lawo VSC (providing the license container remains connected).
- A Lawo VSC license can be transferred to a different computer (by re-hosting the license via the online portal).

1.5 Specifications

	Lawo VSC - Free version	Lawo VSC – Standard version
Number of Virtual audio devices	1	Up to 128
Number of senders and receivers	Up to 2	Up to 128
In / Out per virtual device	Up to 2	Up To 128
Audio channel support per stream	Up to 2	1 – 64
Sampling rates	44.1 kHz or 48 kHz	44.1 - 96 kHz
PPM audio level meters	Yes	Yes
1kHz test tone generator	Yes	Yes
Pre-listen function	Yes	Yes
Synchronization options	PTP	PTP or sync on incoming stream
Minimum packet time on senders	1ms	0.125ms
Streaming modes	Unicast / Multicast	Unicast / Multicast
SMPTE 2022-7 (redundant stream support)	No	Yes
Stream announcement and discovery	mDNS and SAP	mDNS and SAP
Lawo HOME support	Yes	Yes
Ember+ support	Yes	Yes
NMOS support (IS-04/05)	Yes (via HOME)	Yes (via HOME)
Transferable license	N/A	Yes

2 Lawo VSC - System Requirements

Before installing the software, it is important to check that the host computer meets the system requirements for Lawo VSC.

2.1 System Requirements

Lawo VSC runs on a **macOS computer** that must meet the following system requirements.

- **Operating System:** macOS Sonoma (version 14.0) or higher.
- **Processor:** either Mac Silicon (M-series) or Intel.
- **RAM:** at least 8GB RAM is recommended; more may be required depending on the configuration of the streams.
- **Network Interface Card (NIC):** at least 1 Gigabit (minimum); 10 Gigabit interfaces may be required depending on the configuration of the streams.
- **Operation:** keyboard and mouse (for operation of the GUI).

The mac also requires a network interface (NIC) connection to a **media network where PTP is provided**. For more information about the PTP requirements, and other sync options, please see [Lawo VSC - Synchronization](#).

Important: The total system build should be evaluated according to the application scenario. i.e. how many VSC streams are required; what is the configuration of the streams; what other applications need to run alongside Lawo VSC.

2.2 Evaluating the System Resources

macOS differs from Windows in that the CPU utilization varies depending on the use case. This means that a system requirements chart (like the ones for Windows) cannot be provided. Instead, it is necessary to consider how many VSC streams are required, the configuration of the streams, and what other applications need to run alongside Lawo VSC.

Lawo VSC requires a minimum of macOS Sonoma (version 14.0) and can run on either Mac Silicon (M-series) or Intel processors.

In general, a higher specification is required if there are more senders and receivers (configured in Lawo VSC) plus other applications running on the computer.

Lawo VSC supports the full range of possibilities, but whether your configuration will work in practice is dependent on the overall usage of the macOS system.

A list of macOS Sonoma compatible Apple computers can be found [here](#).

2.3 Network Interface Card Bandwidths

Lawo VSC requires a network interface card (NIC) of at least 1 Gigabit (minimum). A higher bandwidth card may be required if there are more channels per stream and/or a higher sampling rate.

The table below lists some different stream configurations and indicates whether these can be supported by a 1 or 10 Gigabit NIC.

Please note: The examples given are theoretical and should be used only as a guide. Whether a stream configuration will work in practice is dependent on the network capability of the macOS.

Audio channels	Packet per sec	Sampling Rate	1 Gigabit NIC	10 Gigabit NIC
1 x 8	6	48 kHz	✓	✓
8 x 8	6	48 kHz	✓	✓
64 x 8	6	48 kHz	✗	✓
128 x 8	6	48 kHz	✗	✓
1 x 64	6	48 kHz	✓	✓
8 x 64	6	48 kHz	✓	✓
64 x 64	6	48 kHz	✗	✓
128 x 64	6	48 kHz	✗	✗
1 x 8	6	96 kHz	✓	✓
8 x 8	6	96 kHz	✓	✓
64 x 8	6	96 kHz	✗	✓
128 x 8	6	96 kHz	✗	✓
1 x 64	6	96 kHz	✓	✓
8 x 64	6	96 kHz	✗	✓
64 x 64	6	96 kHz	✗	✗
128 x 64	6	96 kHz	✗	✗



3 Lawo VSC - Installation and Setup

This chapter describes how to install and setup the software.

Lawo VSC is delivered as a software download only. To host the software, you will need a macOS computer which is not supplied.

To get your system operational, please complete each of the following steps:

1. Check that the host computer meets the system requirements.
2. Download and install the software.
3. Complete the first-time startup tasks.
4. Activate and install a license - optional.
5. Select the network interface(s) for streaming and check the synchronization.
6. Configure the audio device(s).

Please note: It is possible to skip the license activation and come back to this later. In this instance, the software will run the Free version (with limited functionality).

The topics in this chapter describe the process, step by step.

- [Lawo VSC - Installation](#)
- [Lawo VSC - First-time Startup](#)
- [Lawo VSC - License Activation](#)
- [Lawo VSC - Global Settings for Streaming](#)
- [Lawo VSC - Audio Device Quick Setup](#)
- [Lawo VSC - Synchronization](#)



3.1 Lawo VSC - Installation

This topic describes how to download and install the software.

What You Will Need

To install Lawo VSC you will need the **Lawo-VSC-[Version Number].dmg** file for the required release and a **macOS computer** that meets the system requirements (described [earlier](#)).

To unlock the features of the Standard version, you will also need a **Lawo VSC license** (described [here](#)). The license is optional and is installed after the software. If a license is not installed, then Lawo VSC will run the Free version (with limited functionality).

Downloading the Software

The software is delivered as a single file: **Lawo-VSC-[Version Number].dmg** where the [Version Number] describes the release.

If you have an existing Lawo user account, then all released versions are available from the [Download Center](#) (after login).

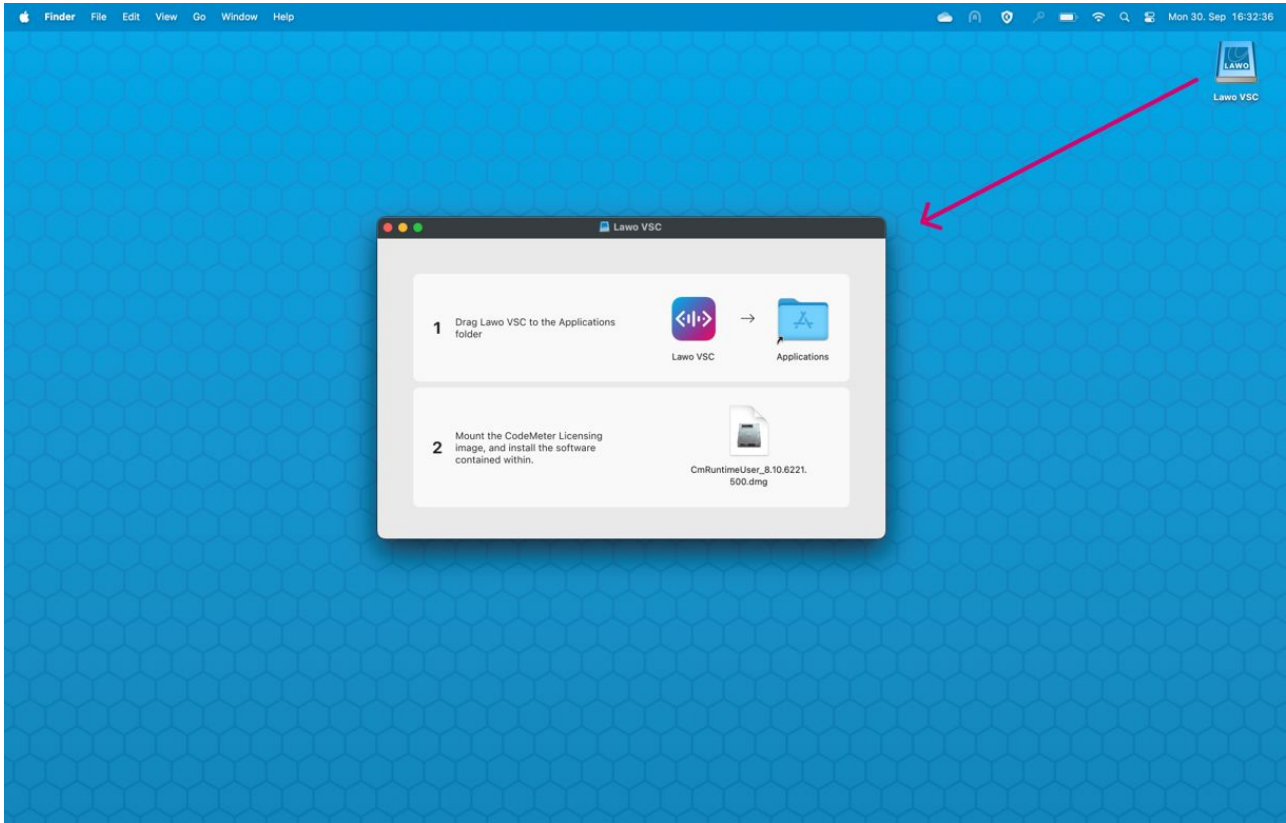
Alternatively, you can obtain a download link for the current release from the Lawo website as follows:

1. Visit the [Lawo VSC](#) webpage and click on the [Download VSC Software](#) link. A registration form appears.
2. Complete the details and click on **Submit**.
3. Following a successful registration, you will receive a confirmation email that contains a download link. The link is valid for one week from the date of registration.
4. Click on the link to download the installer.

For more information about the Lawo VSC releases, please see [Radio Products - Software Versions](#).

Installing the Software

1. Download or copy the **Lawo-VSC-[Version Number].dmg** file onto your host computer and double-click to mount the image.




Two files/steps are displayed:

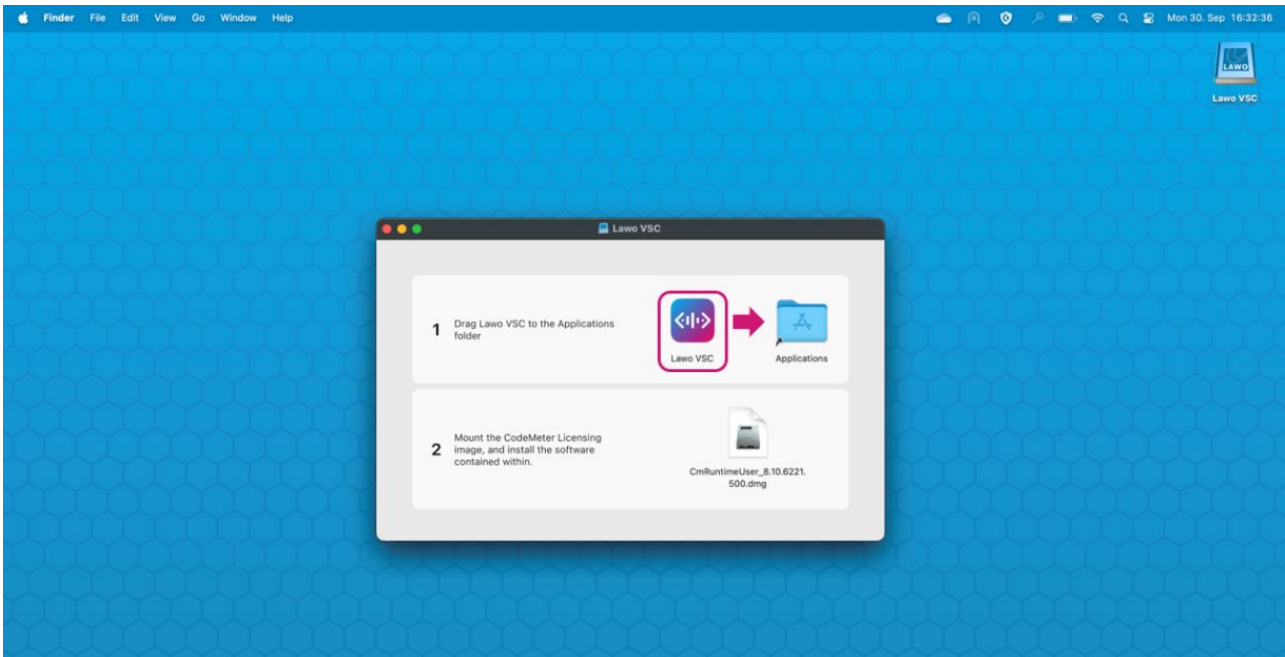
- The **Lawo VSC** file (1) installs the Lawo VSC application.
- The **CmRuntimeUser.dmg** image (2) can be used to install the CodeMeter licensing application.

Both apps are required to run the licensed version of Lawo VSC. If a license is not required, then the CodeMeter installation can be skipped. In this instance, Lawo VSC will run the Free version (with limited functionality).

It is recommended to install both apps now so that the system is prepared for licensing.

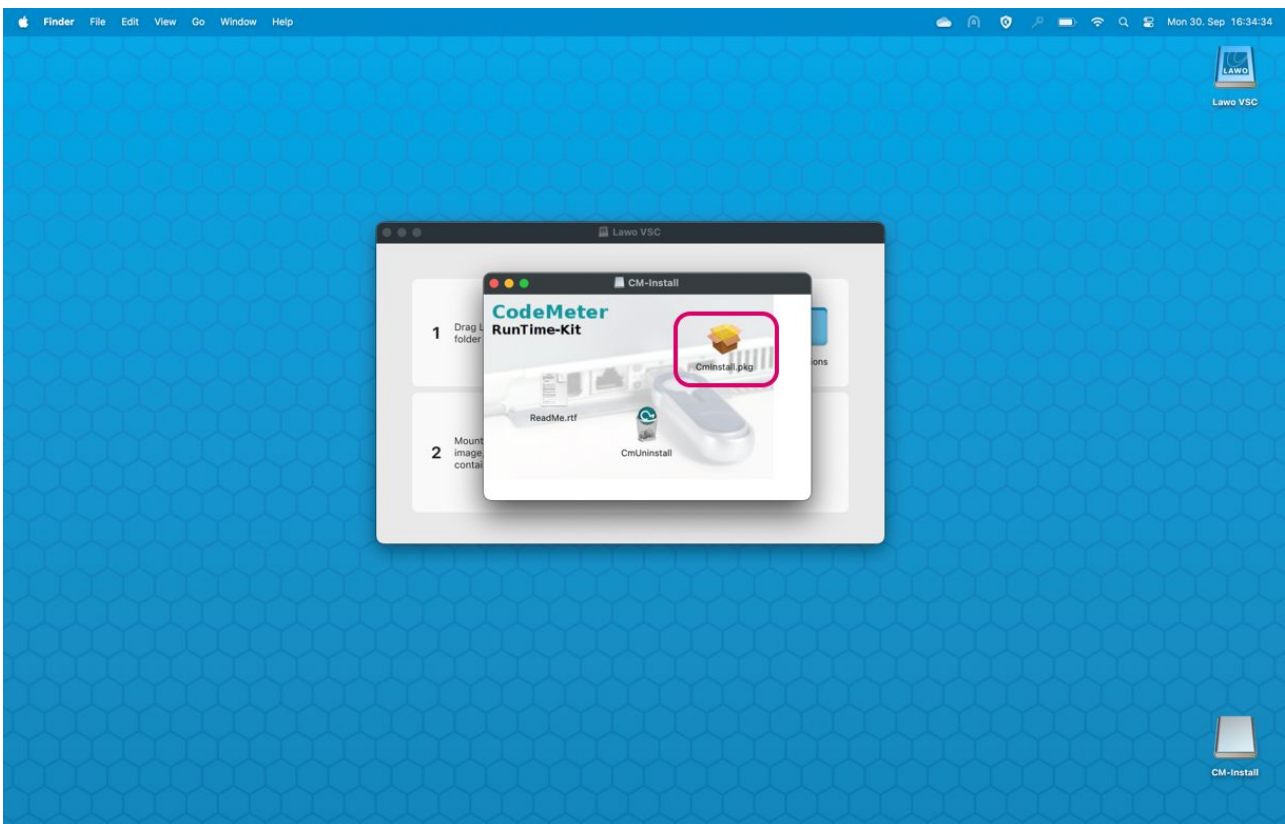
-  The number at the end of the **CmRuntimeUser.dmg** file describes the firmware version.
- If CodeMeter is already installed, then you only need to run the **CmRuntime** installer again if you wish to update the CodeMeter release and/or prepare a new license container.

- To install the Lawo VSC app, drag and drop the **Lawo VSC** file into the **Applications** folder (as shown below).



- To install the CodeMeter licensing app, please complete the following steps:

- Double-click on the **CmRuntimeUser[Firmware Version].dmg** file (to mount the CodeMeter Licensing image). Three files are displayed.
- Double-click on **CmInstall.pkg** (to start the installer).



- You are guided through the installation process. Please execute all of the steps, accepting the default options provided.
- Once the installation is complete, the **CodeMeter** app and local license container become available. These will be used during the license activation [later](#).



4. Once **Lawo VSC** is copied into the **Application** folder, the **Lawo VSC** disk image can be unmounted. The software installation is now complete and you can setup Lawo VSC (as described in the [next topic](#)).

Uninstalling the Software & Updates

Lawo VSC can be uninstalled in the usual macOS manner:

1. First, stop Lawo VSC by quitting the application.
2. Then, drag and drop "**Lawo VSC**" from the **Applications** folder into the **Trash**.

You can update Lawo VSC to a new version in the usual manner. There is no need to remove the older version.

1. Mount the new **Lawo-VSC-[Version Number].dmg** file.
2. Drag and drop the **Lawo VSC** file into the **Applications** folder and select **Replace** (to replace the existing version).

The latest configuration is stored locally and is loaded automatically after the update.

The licensing software is handled separately, so there is no need to run the **CmInstall** package again if there is an existing version of CodeMeter.

To uninstall the licensing software: open "**CodeMeter**" in the **Applications** folder and select the **CmUninstall** option.

3.2 Lawo VSC - First-time Startup

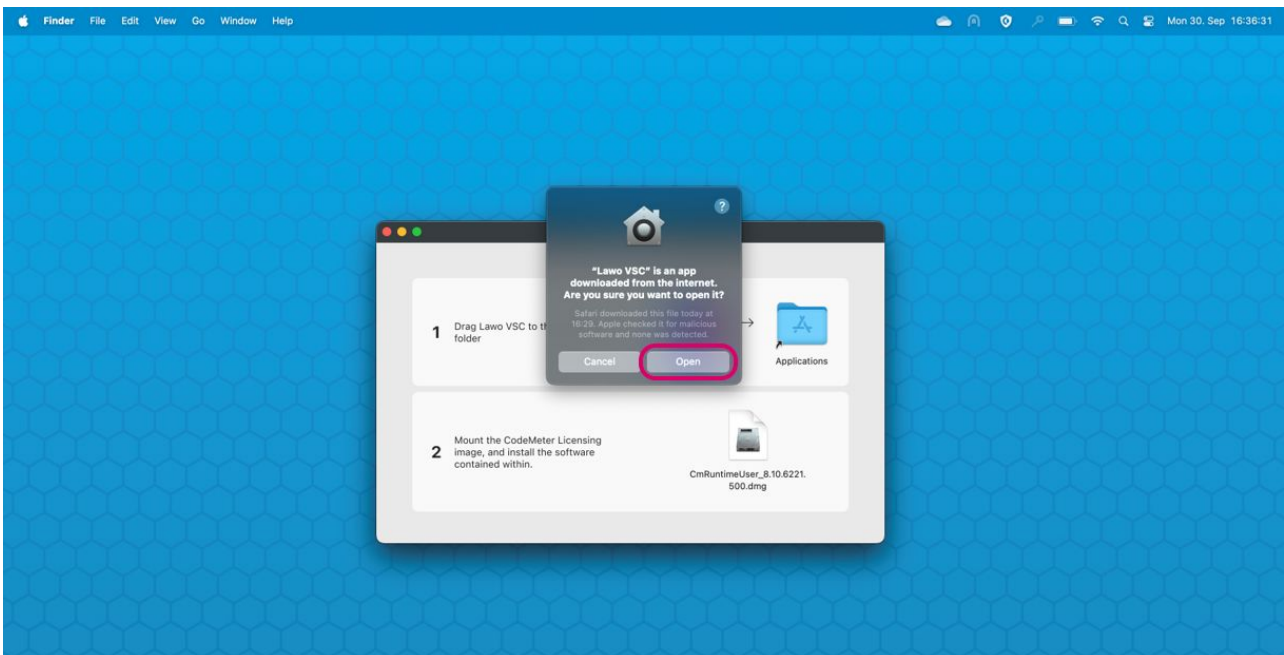
This topic describes the steps that must be completed when you start Lawo VSC for the first time.

There are three main tasks to complete: install the audio driver, approve the macOS permissions and choose the Lawo VSC version. All tasks are mandatory and so it is important to complete all of the steps.

i Lawo VSC requires two changes to the macOS permissions: to approve the system extension (for the audio driver) and background services (for the Lawo VSC Audio Engine and HOME).

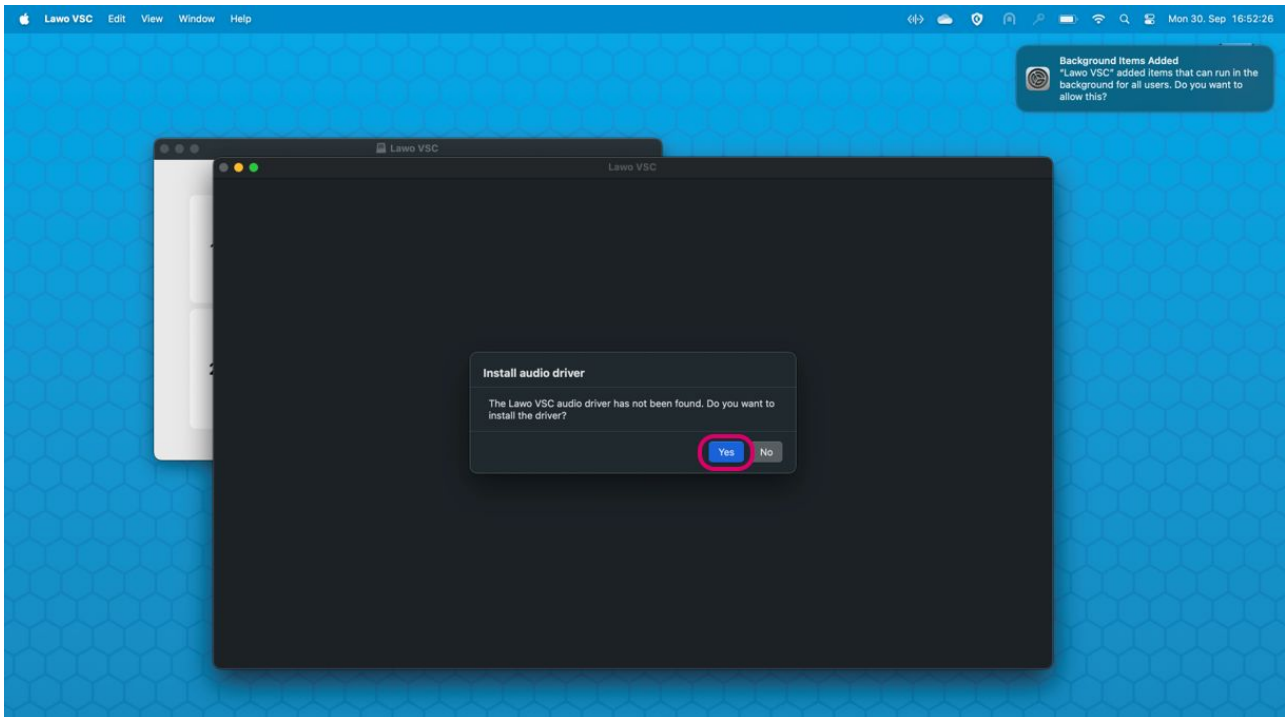
1. Start by launching **Lawo VSC** in the usual manner for a macOS app.

When the application starts for the first time, a security message appears. Select **Open** to run Lawo VSC.



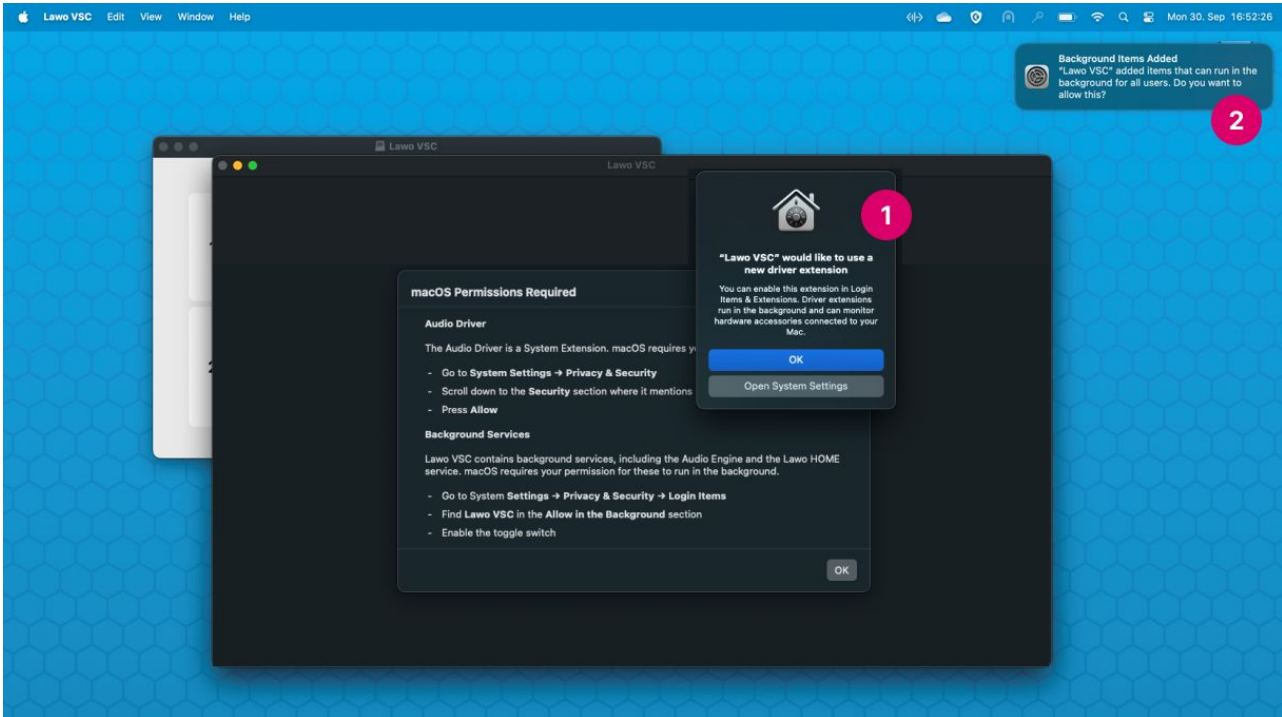
2. As there are no audio drivers installed, the application starts with the following message.

The audio driver is mandatory so please select **Yes** to continue.



3. Before the driver installation is allowed, you must approve the macOS permissions.

During this phase, you will see two pop-up messages (in the macOS) warning you that the driver extension is blocked (1) and some background items must be approved (2).



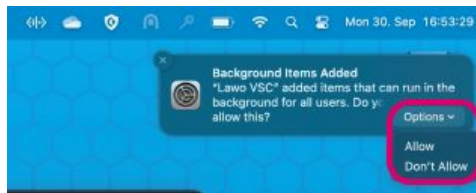
The order of approval does not matter, but both the system extension and background items must be approved.

4. To unblock the system extension for the audio driver, please complete the following steps:

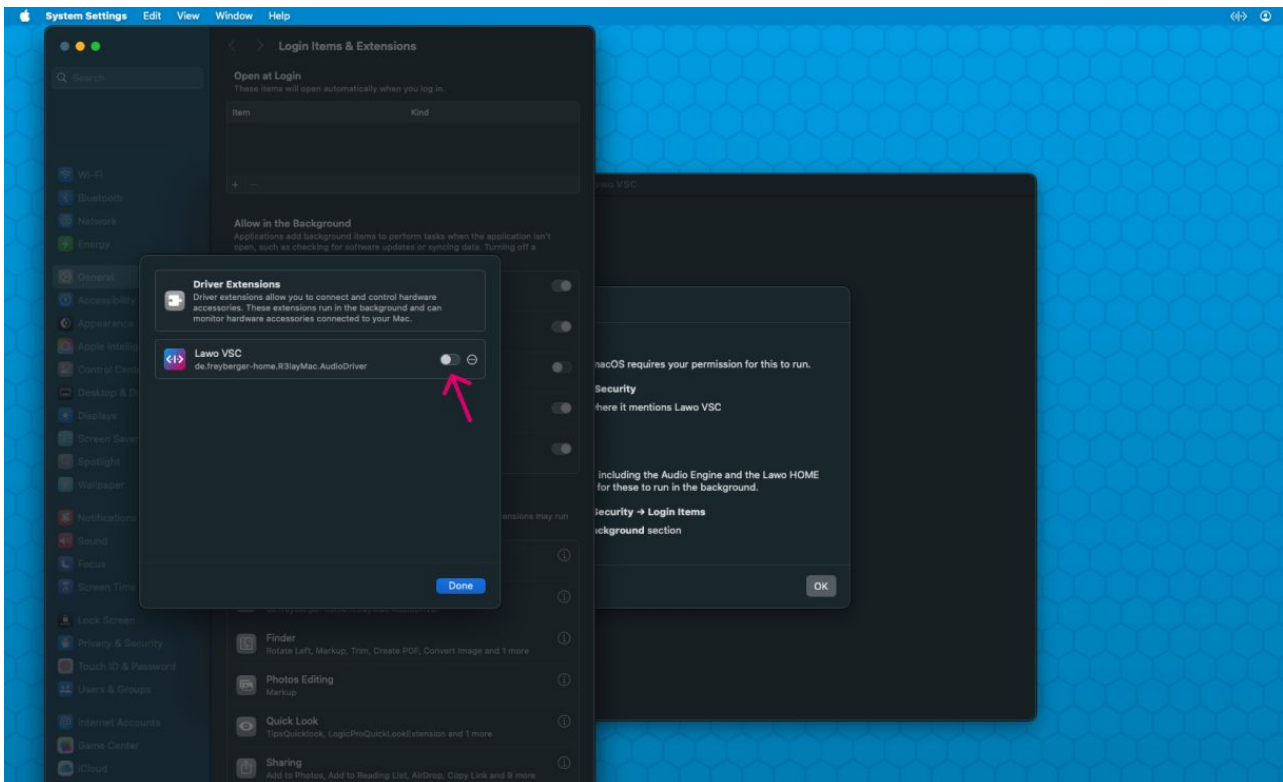
- In the macOS, either go to **System Settings** → **Privacy & Security**, or click on **Open System Settings** from the "new driver extension" warning message (shown above).
- Scroll down to the **Security** section where it mentions Lawo VSC.
- Press **Allow**.
- Confirm the change in permissions by entering the Login password of the macOS User Account.

5. To approve the background items for the Audio Engine and HOME, there are two possible methods.

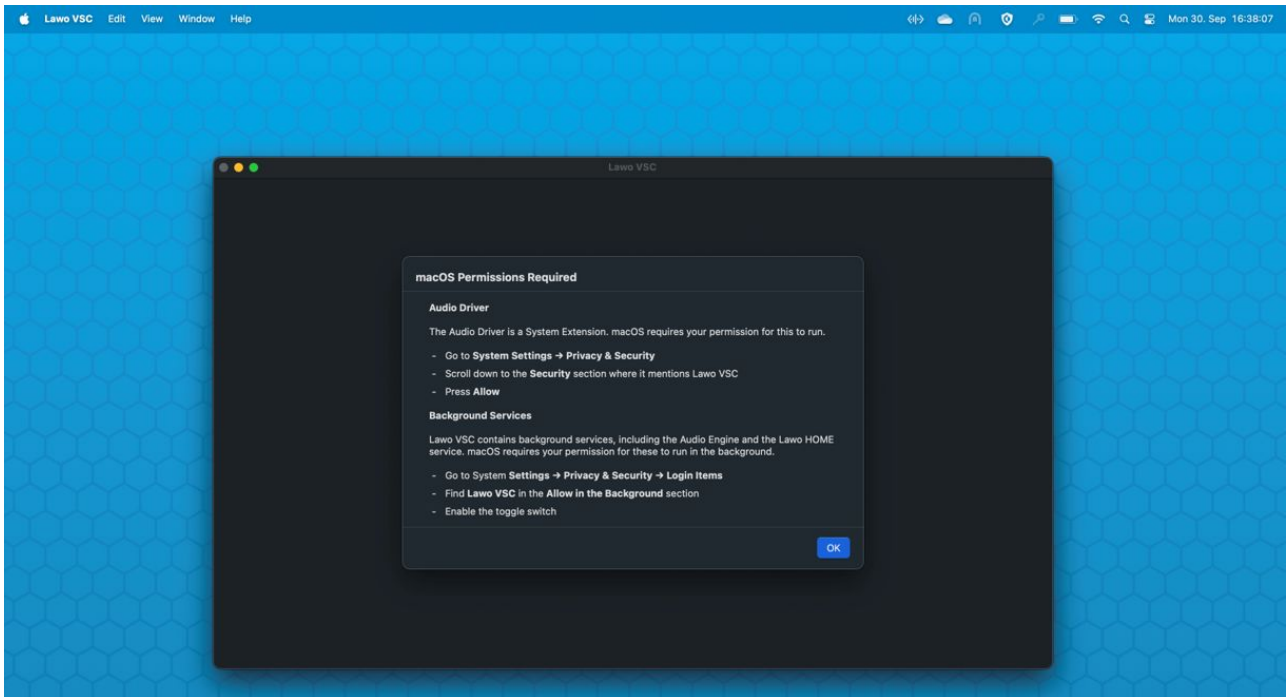
- From the "Background Items Added" warning message, click on **Options** and select **Allow**.



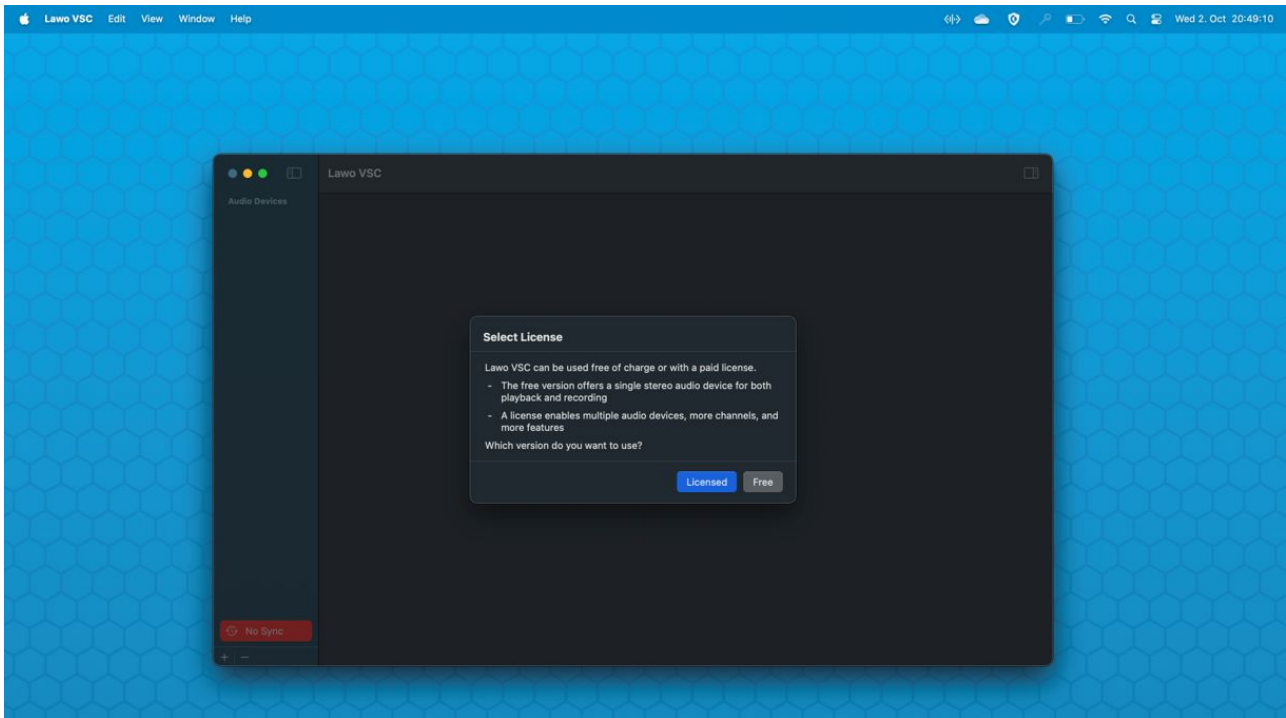
- Alternatively, open the system settings as follows:
 - Go to **System Settings** → **Privacy & Security**
 - Open **Login Items & Extensions**.
 - Find **Lawo VSC** in the "Allow in the Background" section and enable the toggle switch (indicated below).



6. Once both the system extension and background items are approved, return to the Lawo VSC GUI and select **OK**.



7. At the next screen, you are asked to choose a version of Lawo VSC.



There are two possible options: either **Licensed** or **Free**.

If the **Free** version is selected, then no license is required and Lawo VSC runs with limited functionality.

If the **Licensed** version is selected, then this starts a 15-minute grace period during which you can install a license.

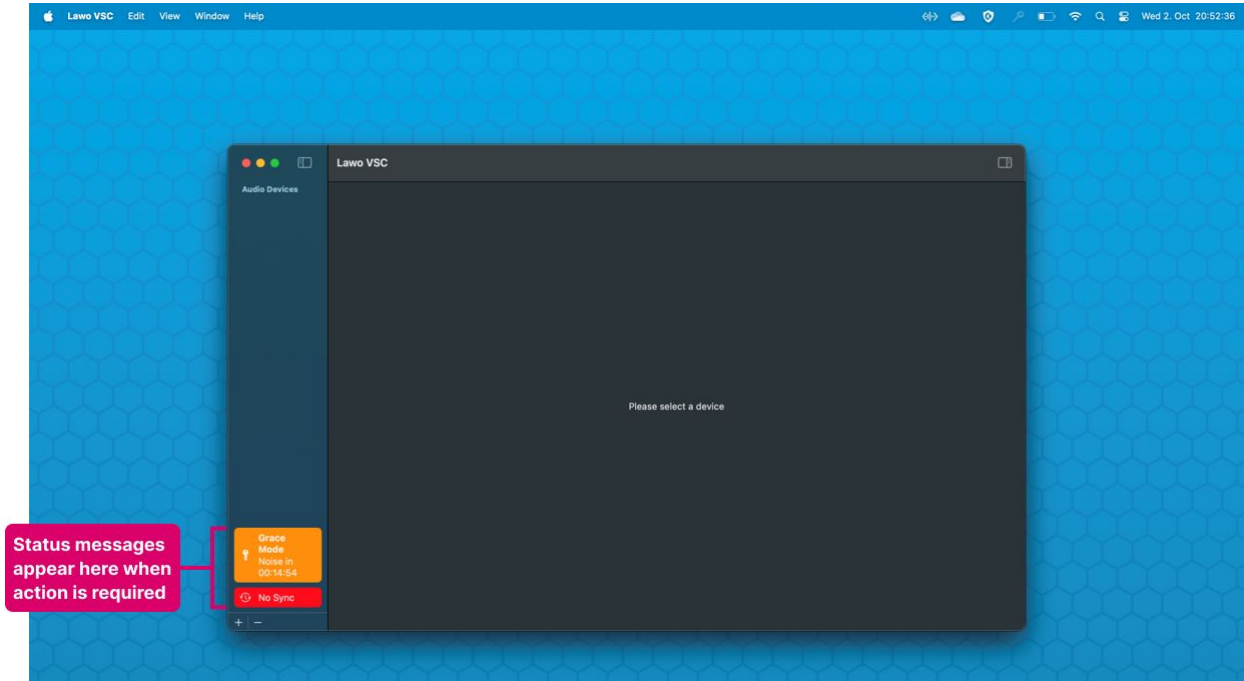
The license activation is a one-time procedure that is described in the [next topic](#). For now, it is useful to know that:

- To unlock the features of the Standard version, you must choose the **Licensed** version and install a Lawo VSC license.
- If the grace period expires before a license is found, then white noise is inserted into the audio. The white noise is removed once a valid license is detected.
- If you choose the **Free** version now, then you can upgrade to the **Licensed** version later. This can be done either by selecting **Upgrade** (from the '[Upgrade License](#)' dialog) or enabling the **Use license** option (in the '[Settings → License](#)' dialog).

8. Once a version is selected, the first-time startup tasks are complete.

The GUI working area is empty as there are no audio devices configured. At this stage, it is normal to see a **No Sync** message in the status area.

If the **Licensed** version is selected (in step 7), then you will also see a licensing status message. This shows that the licensed version is running in **Grace Mode** and the amount of time left before expiry. In this instance, please leave the Lawo VSC GUI open and follow the instructions in the [next topic](#) (to install a license).



Alternatively, if the **Free** version is selected (in step 7), then you can skip the license activation and go straight to the [Global Settings for Streaming](#) (to choose a network interface for streaming and resolve the sync status).

3.3 Lawo VSC - License Activation

This topic describes how to activate and install a Lawo VSC license. You will need to do this, once, when you switch to the licensed version for the first time.

Overview

The Lawo VSC version is defined during the initial setup of the app. There are two possible options: either **Licensed** or **Free**.

If the **Free** version is selected, then no license is required and Lawo VSC runs with limited functionality. In this instance, all options are visible but an 'Upgrade License' dialog appears whenever you attempt to configure a restricted function. From here, you can upgrade to the licensed version to unlock the functionality, or cancel the operation and continue running the free version.

If the **Licensed** version is selected, then this starts a 15-minute grace period during which you can install a license. From the start of the grace period, Lawo VSC runs the full functionality of the app. If the grace period expires before a license is found, then white noise is inserted into the audio. The white noise is removed once a valid license is detected. If the license goes missing during runtime, then a new grace period (of 12 hours) begins.

Please note: It is possible to switch between the versions, at any time, by enabling or disabling the **Use license** option (in the [Settings](#) → [License](#) dialog).

The license activation is a one-time procedure that is described [later](#). For now, it is useful to know that:

- To unlock the features of the Standard version, you must select the **Licensed** version and install a **Lawo VSC license**.
- Lawo VSC licenses are managed by the **CodeMeter Runtime** licensing system. This is the same licensing system used by other Lawo products such as Power Core, crystal and diamond.
- Lawo VSC licenses can be ordered from your local Lawo sales representative. You will need 1x Lawo VSC license for each app instance/computer. The license code(s) are delivered via email once your order is processed.
- Each license code must be redeemed at <https://licenseportal.lawo.com> and installed into a license container. This can be a local container (on your computer), a remote container (on a networked server) or a USB dongle (for portability).
- Once installed, the license is detected automatically by Lawo VSC (providing the license container remains connected).
- A Lawo VSC license can be transferred to a different computer (by re-hosting the license via the online portal).

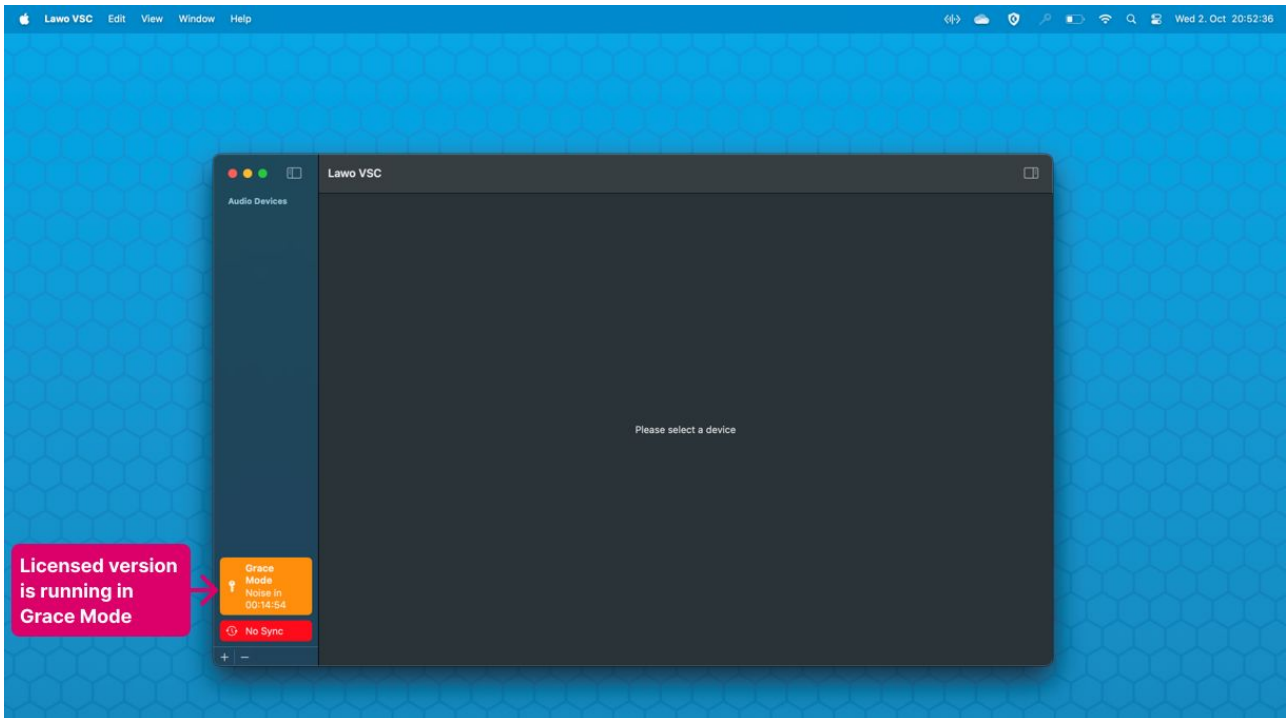
License Detection in Lawo VSC

Before looking at the activation procedure, it is useful to understand what happens if a license is not found.

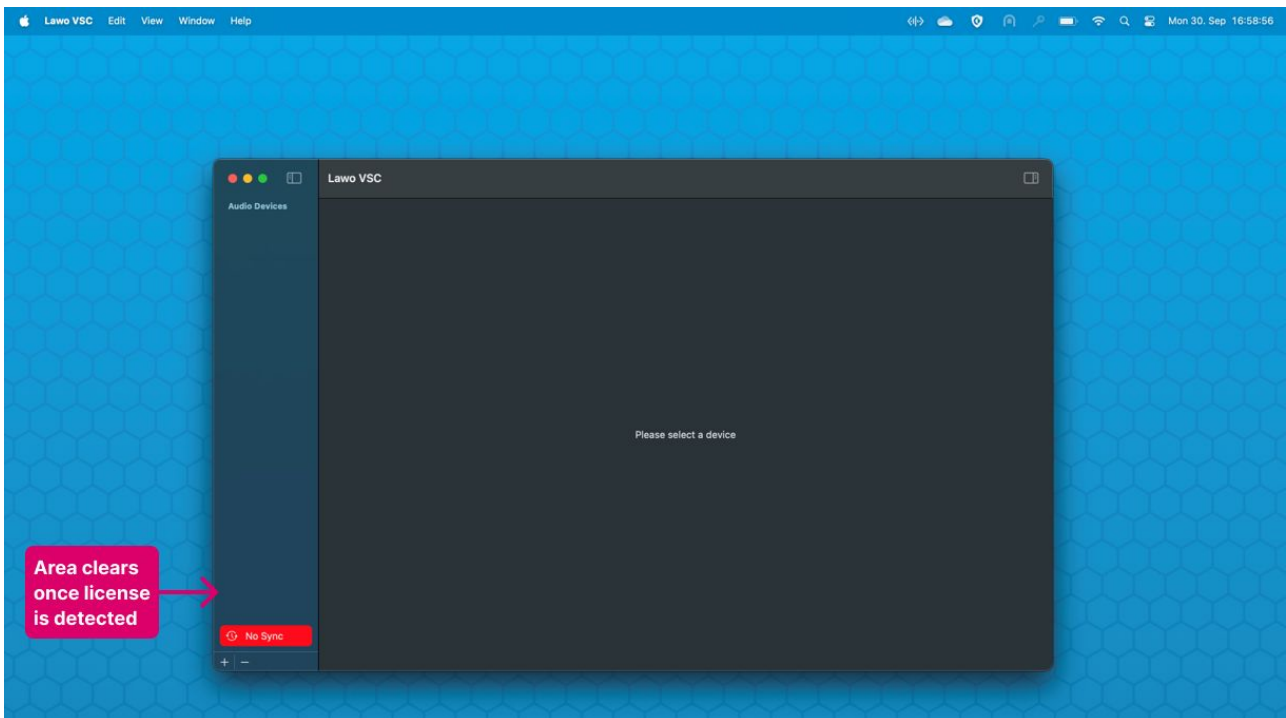
Once you upgrade to the licensed version, Lawo VSC checks for a valid license.

If a license is not found, then a 15-minute grace period begins and a message appears in the status area to show that the software is running in **Grace Mode**.

- During this time, Lawo VSC runs the full functionality of the app.
- The status message shows the amount of time remaining before the grace period expires.
- If the grace period expires before a license is found, then white noise is inserted into the audio.



Once a valid license is detected, the white noise is removed and the licensing message disappears.

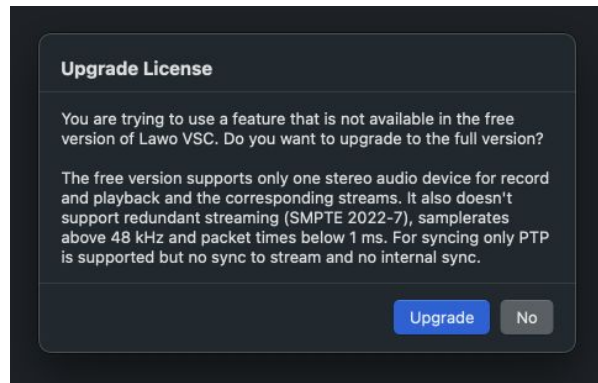


From here on, Lawo VSC checks periodically for a license both at start up and during runtime. If a previously installed license is not found, then a new grace period (of 12 hours) begins.

⚠ Important: If the license is installed on a USB dongle or network server, then it is important that the dongle or server remains connected. If not, the software assumes that the license is missing and a 12 hour grace period is triggered.

Upgrading to the Licensed Version

If you run the free version of Lawo VSC, then all options are visible but the following dialog appears if you attempt to configure a restricted option.



The dialog asks if you want to upgrade to the full version and explains the limitations of the free version.

Some examples that trigger the 'Upgrade License' dialog are:

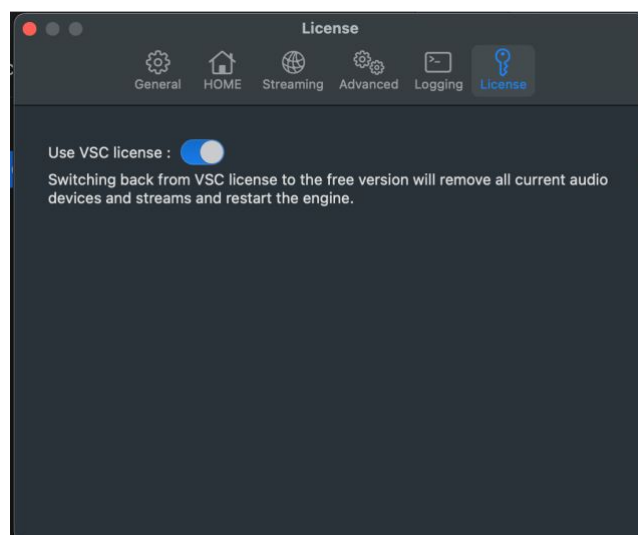
- Assigning more than 2 input or 2 output channels to the audio device (in the 'New Audio Device' dialog).
- Adding a second audio device (by selecting the + button at the bottom of the 'Audio Devices' list).
- Assigning a second network interface for redundant streaming (using the **NIC 2** field in the '[Settings → Streaming](#)' dialog).

If you choose to **Upgrade**, then Lawo VSC switches to the licensed version. This unlocks the full functionality of the app and starts a new grace period (as described [earlier](#)).

Alternatively, select **No** to abort the current operation and continue running the free version.

Switching Versions

It is possible to switch between the free and licensed versions by opening the '[Settings → License](#)' dialog and toggling the **Use license** option.



- When **Use VSC License** is turned on, Lawo VSC switches to the licensed version. This unlocks the full functionality of the app and starts a new grace period (as described [earlier](#)).
- When **Use VSC License** is turned off, Lawo VSC switches back to the free version. If you have audio devices and streams configured, then these are removed.

Turning off the **Use VSC License** option can be useful to reset to an empty configuration (with no audio devices or streams).

Important: Switching between the versions removes any audio devices and streams that have been configured and restarts the Audio Engine.

Preparing for Activation

The licensing system offers two ways to activate a license: either online or offline.

To use the online activation method (described below), you will need:

- A computer with an internet connection (and USB port if using a dongle).
- The WIBU systems USB memory stick (if using a dongle).
- The license code. This is delivered by email on completion of your order.

If your computer does not have an internet connection, then the offline activation method can be used. This is described in the "Licensing" documentation, see [License Activation - Offline Method](#).

The computer must be installed with **CodeMeter Runtime** (from WIBU systems)

Installing the Licensing Software

The correct version of **CodeMeter Runtime** is included with the software installation package for Lawo VSC. This means that it should already be installed, providing you followed the recommended installation procedure (described [earlier](#)).

On a macOS computer, you can check the installation by looking for the **CodeMeter** app.

If you skipped the CodeMeter Runtime installation earlier, then there are two options:

- either go back to your Lawo VSC software package and run the **Cm Runtime** installer,
- or download the installer from WIBU systems at: <https://www.wibu.com/support/user/user-software.html>. In this instance, take care to download the version for macOS.

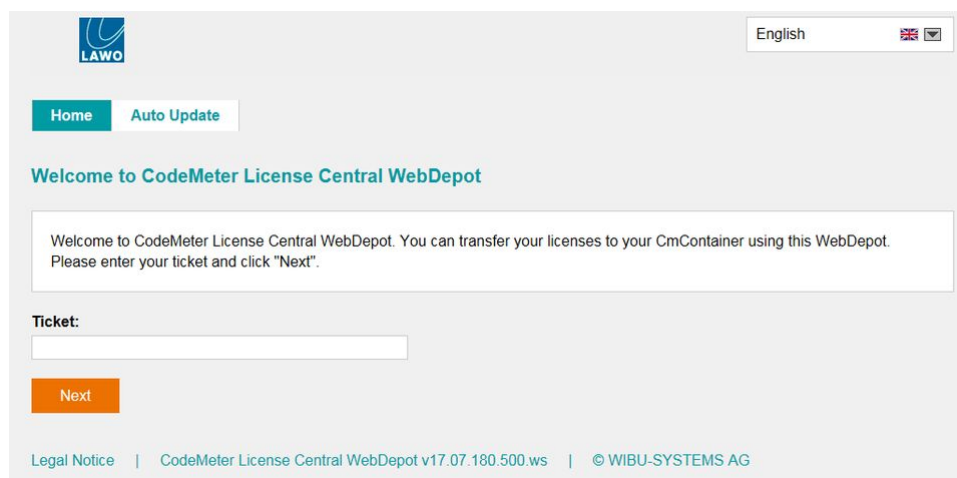
Activating a License Online

To use this method, your computer must have an internet connection. If this is not possible, then the [offline activation](#) method can be used.

When installing onto a dongle, the dongle must be connected to the computer's USB port.

Important: Currently, the activation process **does not work with Safari** and so a different browser must be used.

1. Open the Lawo licensing web page at <https://licenseportal.lawo.com>



The screenshot shows the 'CodeMeter License Central WebDepot' activation page. At the top left is the LAWO logo. At the top right is a language selection dropdown menu set to 'English'. Below the logo are two buttons: 'Home' and 'Auto Update'. The main heading is 'Welcome to CodeMeter License Central WebDepot'. A message box contains the text: 'Welcome to CodeMeter License Central WebDepot. You can transfer your licenses to your CmContainer using this WebDepot. Please enter your ticket and click "Next".' Below this is a 'Ticket:' label and an empty text input field. At the bottom of the input field is an orange 'Next' button. The footer contains links for 'Legal Notice', 'CodeMeter License Central WebDepot v17.07.180.500.ws', and '© WIBU-SYSTEMS AG'.



TIP: You can change the language using the drop-down menu at the top right of the page.

2. Copy your license ticket number into the 'Ticket' field and select **Next**.

The license code can be found on the delivery note shipped with the system or in the order confirmation email (for software-based products). It takes the form of a 25-digit ticket number such as the one shown below.

Ticket:

7MAMJ-8HZ95-N9VW5-3MKX6-LWUYM

3. The WebDepot searches for and displays your licenses. Select **Activate Licenses** to continue.

4. At the next page, select the storage method for your license.


There are two possibilities:

- **CmDongle** - to create a USB dongle.
- **CmActLicense** - to bind the license to the local computer.


Available Licenses - Select the binding for Your Licenses

You can bind your licenses either to a computer (**CmActLicense**) or to a dongle (**CmDongle**).

- When binding to a computer, the licenses are transferred to that machine. The licenses are associated with some properties of this computer.
- When binding to a CmDongle, the licenses are fully transferred into this dongle. This allows you to use these licenses on different computers.



I want my licenses in a dongle (**CmDongle**) to be able to use them on different computers.
 Firm Code: 102037



I want my licenses on one computer (**CmActLicense**).
 Firm Code: 5000161 | CmContainer: LAWO AG (0010)

5. At the next page, select the licenses you wish to activate and the CmContainer to be used for the license storage.

Available Licenses

To activate your licenses:

1. Select the licenses you want to activate.
2. Select the locally connected CmContainer to which you want to transfer the licenses.
3. Click "Activate Selected Licenses Now".

<input checked="" type="checkbox"/>	Name	Activated On	CmContainer	Status
<input checked="" type="checkbox"/>	*Product Name* <small>(License Quantity: 1)</small>			Available

Select CmContainer

128-2311304 (LAWO AG)

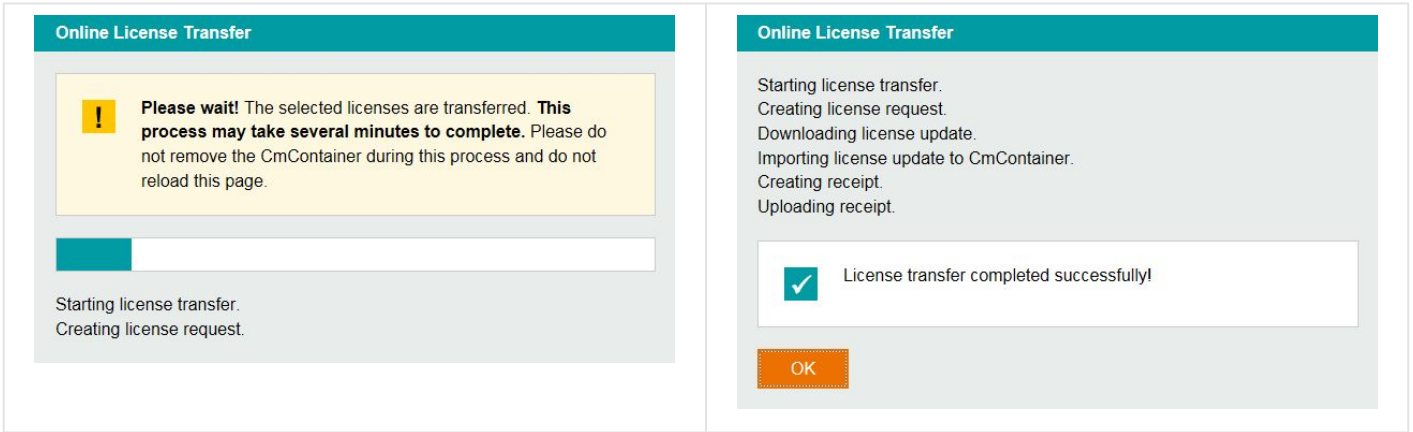
Activate Selected Licenses Now Offline license transfer

[Select binding](#)
[My Licenses](#)

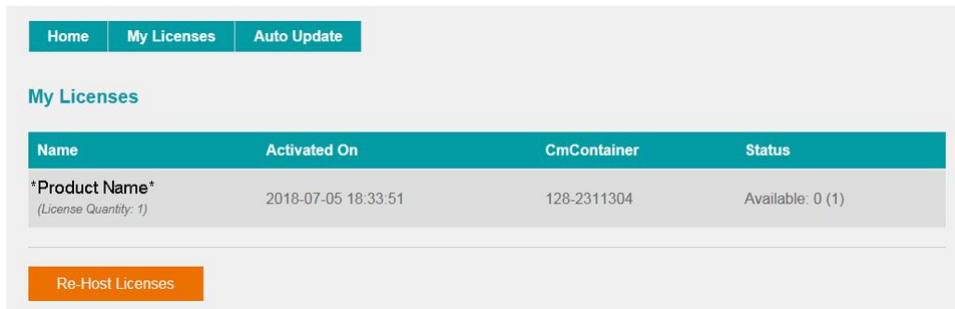
You can store multiple licenses in the same container. If no Cm containers are available, then you will see an option to "**Get CmContainer automatically**".

6. Click on **Activate Selected Licenses Now** and wait for a few seconds.

A confirmation message appears once the activation is successful.



7. After selecting **OK**, a summary appears.



8. You can now close the browser and return to your Lawo software application or install the USB dongle.

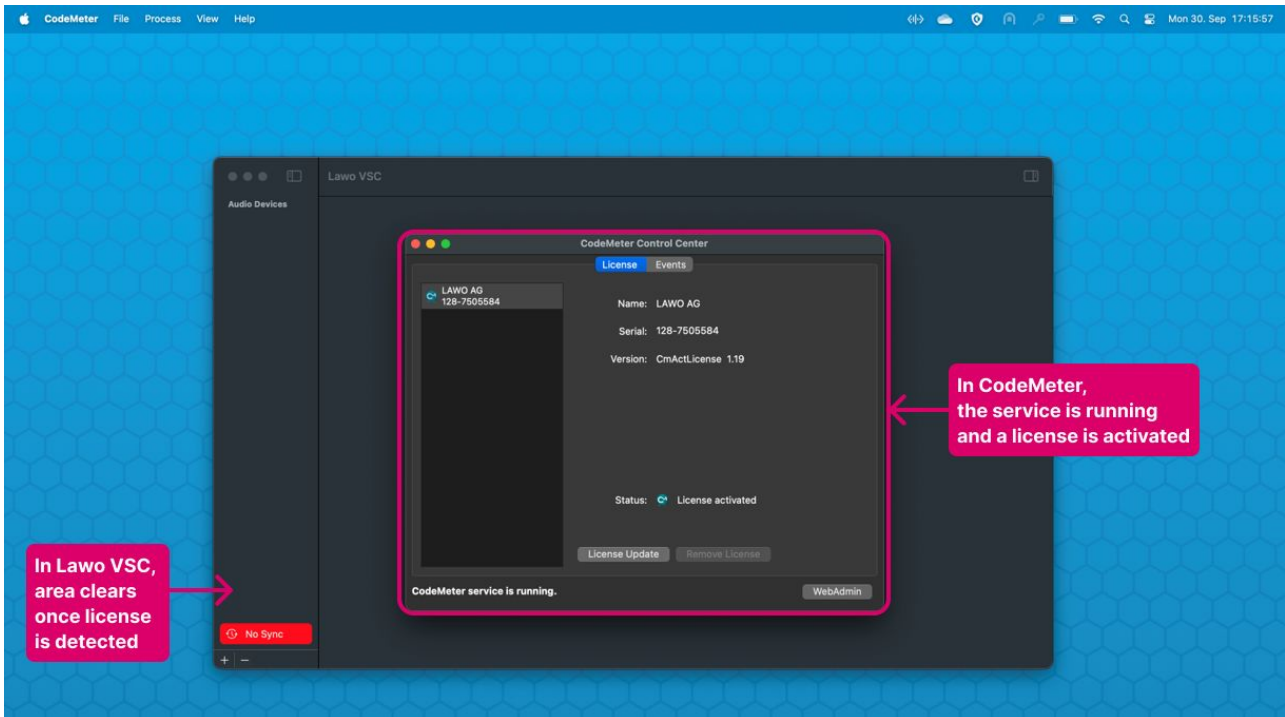
⚠ Once activated, it is **strongly recommended** that you backup your licenses (using the [CodeMeter Web Admin portal](#)). This will allow you to restore a license if the original is lost or damaged.

Next Steps

Once a license is installed, it is detected automatically by Lawo VSC.

The license detection can take 2-3 minutes, so please be patient for the Lawo VSC status area to update.

The license status can also be checked by opening the **CodeMeter** app. This shows that the CodeMeter service is running and that the license is activated.



The license installation is now complete and you can move onto the [next topic](#) (to choose a network interface for streaming).

Further Information

A number of other features are supported by the **CodeMeter** licensing system. These include re-hosting a license, offline activation, backup/restore and using a license server.

For more information, please see the "[License Activation](#)" documentation.

3.4 Lawo VSC - Global Settings for Streaming

This topic describes how to prepare Lawo VSC for streaming.

About the Streams

Lawo VSC can be used to stream uncompressed, bi-directional audio channels across a qualifying IP network.

The streams are fully compatible with SMPTE ST2110-30/31, AES67 and RAVENNA. To achieve redundant streaming, compatible with SMPTE ST2022-7, you must configure two network interfaces (for primary and secondary streaming).

The total Audio over IP capacity is up to 128 I/O channels per virtual audio device. This can be split into up to 128 streams, where each stream can be mono, stereo or multichannel. For each stream you can decide whether it will be transmitted or received via the primary, secondary or both interfaces.

The senders and receivers are defined when you configure an audio device (as described in the [next topic](#)).

The connection(s) must be made via a network switch and not directly to another streaming interface. You can find more details about the data network requirements and suitable components in the [Lawo IP Networking Guide](#).

⚠ Important: The media network must be properly managed and configured. i.e. it must use a suitable network architecture; all components must support multicast (as opposed to unicast); a proper Quality of Service (QoS) must be configured; and so on. Please DO NOT attempt to connect the streaming interfaces using an unqualifying IP network, as correct operation cannot be guaranteed.

Configuring the Network Interfaces

Lawo VSC connects to the IP network via the host computer's Network Interface Card (NIC). If the computer supports more than one NIC, then you can choose which interface(s) will be used from the '**Settings → Streaming**' dialog.

To establish communication, you must first configure the TCP/IP settings of each NIC in your macOS. The exact steps vary depending on your OS version.

- **IP Address** - this must be unique and lie within the same IP address range as the other streaming nodes connected to the network.
- **Netmask** - this must match the subnet mask of the other streaming nodes.
- **Gateway** - this setting is required if data packets are to be redirected. For example, if the streaming nodes are connected via a network switch with Layer 3 routing capability. Please contact your network administrator if this is the case.

Lawo VSC supports both DHCP and static IP addresses. If you are using Lawo VSC with other Lawo hardware streaming devices, then static IPs are recommended.

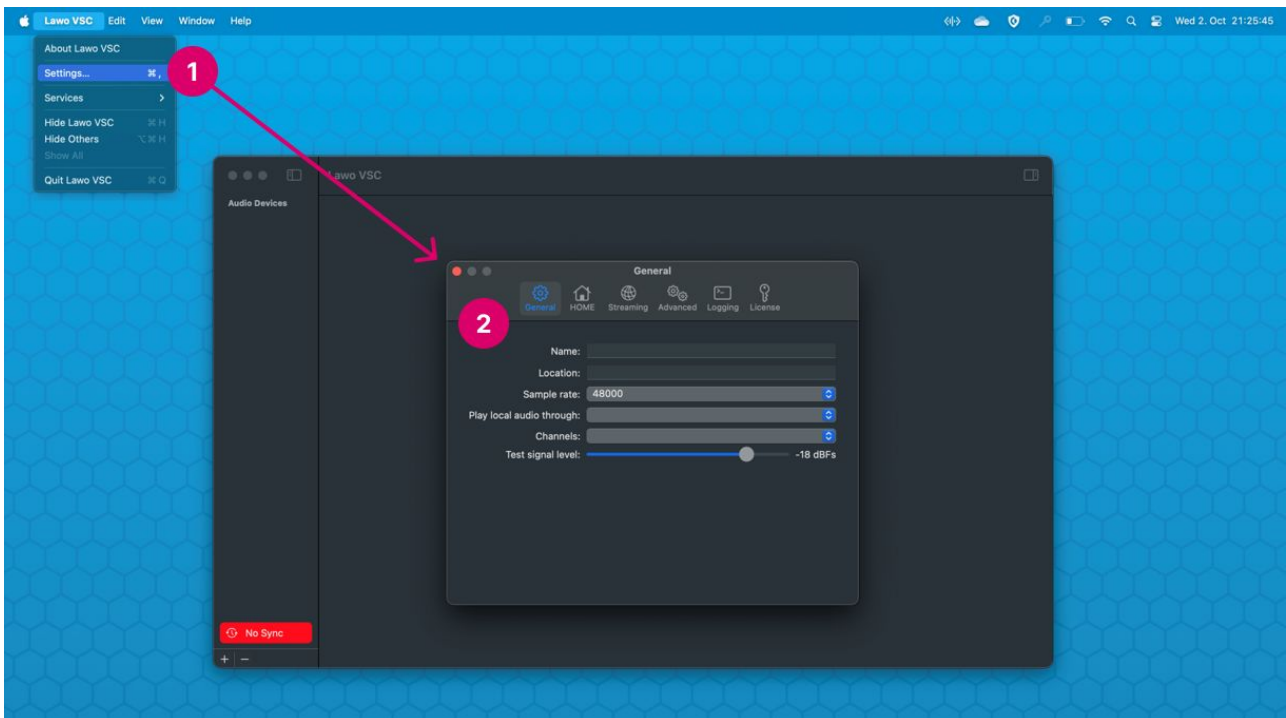
Global Settings

The global options for Lawo VSC's streams are defined in the '**Settings → Streaming**' dialog.

During the initial setup, the main tasks are to define the network interface(s) for streaming and check the synchronization mode.

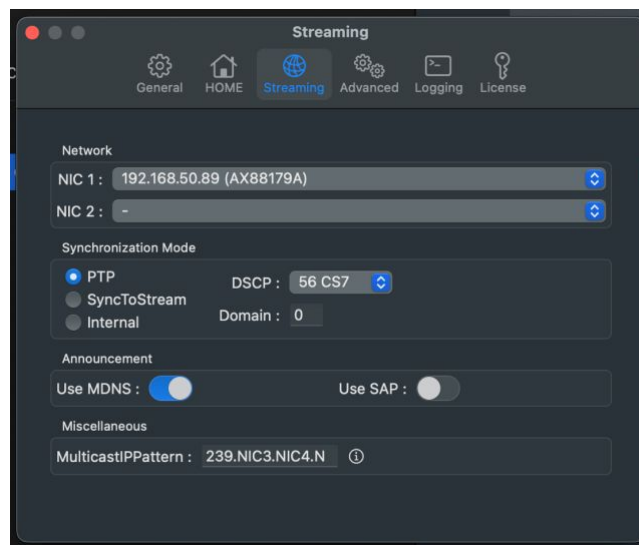
1. With Lawo VSC in focus, select **Settings** from the app menu (as shown below).

The 'Settings' dialog opens with the **General** page selected.



All of the available settings are described [later](#). Here, we deal with the settings required to prepare Lawo VSC for streaming.

2. Select the **Streaming** tab.



3. Under 'Network', define the network interface(s) for streaming: **NIC 1** = primary, **NIC 2** = secondary.

If a single interface is defined, then Lawo VSC can send and receive non-redundant streams only.

If you wish to support redundant streams, compatible with SMPTE ST2022-7, then both **NIC 1** and **NIC 2** must be defined.

Please note: To configure **NIC 2**, you must be running the licenced version of Lawo VSC. If you are running the free version, then the '[Upgrade License](#)' dialog appears if you try to assign **NIC 2**.

In each case, you can select any available network interface fitted to your macOS system. Choose the interface(s) that are connected to your media network.

4. Under 'Synchronization Mode', check that **PTP** is selected.

PTP (Precision Time Protocol) is the preferred sync option and must be used in larger networks with multiple streaming devices. The **SyncToStream** and **Internal** options are special use cases that are described [later](#).

Depending on the requirements of your network, a different **DSCP** value and **Domain** can be specified.

For more information about using PTP, please see [Lawo VSC - Synchronization](#).

5. Finally, check the advanced options under 'Announcement' and 'Miscellaneous'.

To enable stream announcements, there are two possibilities: **Use MDNS** and/or **Use SAP**.

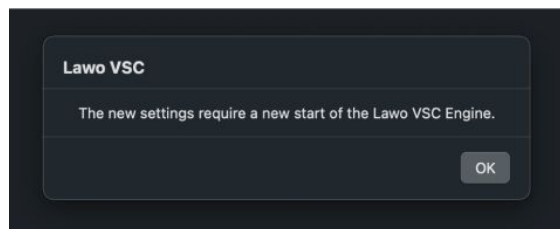
- The correct option(s) will depend on the requirements of your network.
- **Please note:** The stream announcement settings are global. It is not possible to enable MDNS or SAP on a per stream basis.

Under 'Miscellaneous', you can edit the **Multicast IP Pattern** (used during the creation of the outgoing streams).

- Click on the **i** icon to open an 'information' dialog that explains the format of the pattern.
- To edit the pattern, type into the field(s).

6. Once you are happy with the settings, click on the red circle (top left) to close the dialog (and save any changes).

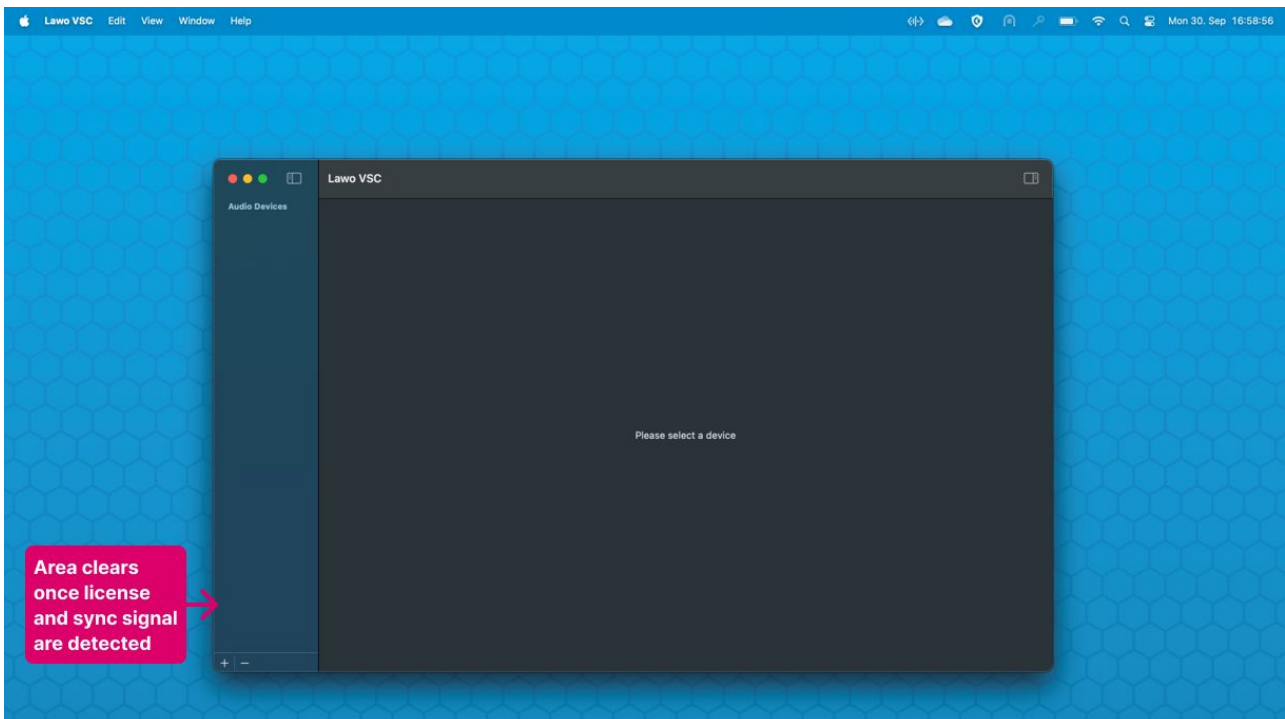
If a restart of the Audio Engine is required, then the following message appears.



7. Select **OK** to confirm - the Lawo VSC Engine restarts and the new settings are applied.

8. After the restart, Lawo VSC checks for a valid PTP signal arriving from the network via the NIC defined in step 3.

If everything is ok, the red **No Sync** status message disappears and the Lawo VSC GUI appears like this (with no status messages).



You are now ready to configure an audio device (as described in the [next topic](#)).

If Lawo VSC is to be used with HOME, then it is recommended to configure the connection to HOME now. This part of the setup is described later in [Lawo VSC - HOME Integration Setup](#).



Troubleshooting Sync Issues

If there is a problem with the synchronization, then the **No Sync** status message persists. In this instance, you must resolve the sync issue to ensure proper streaming to and from Lawo VSC.

Start by checking the following points:

- Is there a valid PTP clock source on the network?
- Is the correct interface specified in the **NIC 1** field, and is this connected to the media network?
- Is the 'Synchronization Mode' set to **PTP**? What are the requirements for the **DSCP** and **Domain** values?

Then check that you have closed the 'Settings' dialog (to save the changes and restart the Audio Engine). The new settings are only applied after the restart.

3.5 Lawo VSC - Audio Device Quick Setup

To stream audio to and from the media network, you will need to add an audio device.

This topic describes how to add a simple stereo audio device (to get up and running quickly). To learn more about the parameter options, please see [Lawo VSC - Audio Device Configuration](#).

Overview

The audio device(s) in Lawo VSC convert the local audio on your computer into IP senders and receivers.

Firstly, each audio device appears as a **Sound** device in the macOS system. This allows it be used by a local audio application such as a playout system or digital audio workstation.

- The number of inputs and outputs of the device defines how many channels can be handled. i.e. the I/O capacity of the audio driver.
- By configuring more than one audio device in Lawo VSC, you can create multiple audio drivers to support multiple applications.

Secondly, each audio device has IP senders and receivers (to stream the local audio to and from the media network). These are created for you, based on the configuration of the device, as follows:

- First, define the total number of inputs and outputs that the device can handle. e.g. 8 inputs and 8 outputs.
- Then, define the number of channels per stream and the number of channels per receiver. e.g. 8 or 2.
- The resultant senders and receivers are calculated by Lawo VSC. e.g. 1 x 8-channel sender + 1 x 8-channel receiver OR 4 x 2-channel senders + 4 x 2-channel receivers.

i The resultant stream size is defined by the number of channels, codec type and frame size. This is important if network bandwidth is an issue. Thus, the network topology should be considered before defining the number of channels per stream.

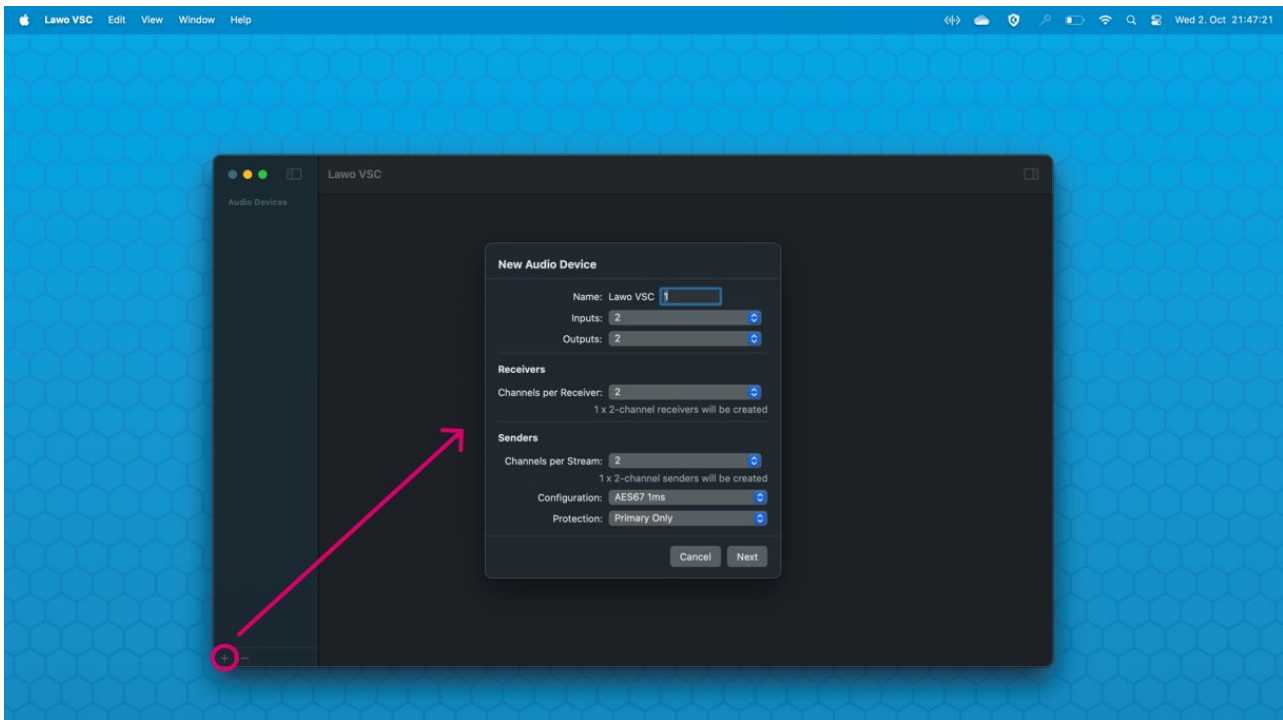
Please note:

- To stream audio to/from multiple applications on your computer, you must configure an audio device for each application.
- The free version of Lawo VSC supports a single stereo audio device for playback and recording. If you wish to create more than one audio device, or a device that can handle more than 2-channels, then you must upgrade to the licensed version (as described [earlier](#)).
- The licensed version of Lawo VSC supports up to 128 audio devices, with up to 128 audio channels per device.

Add a New Audio Device

1. Click on the + button (at the bottom of the 'Audio Devices' list).

The 'New Audio Device' dialog opens.



2. Check and, if necessary, edit the fields to define the audio device.

By default, the fields are completed to create a stereo playback and recording device that supports non-redundant streams that are AES67-compliant. For our example, the default values are fine.

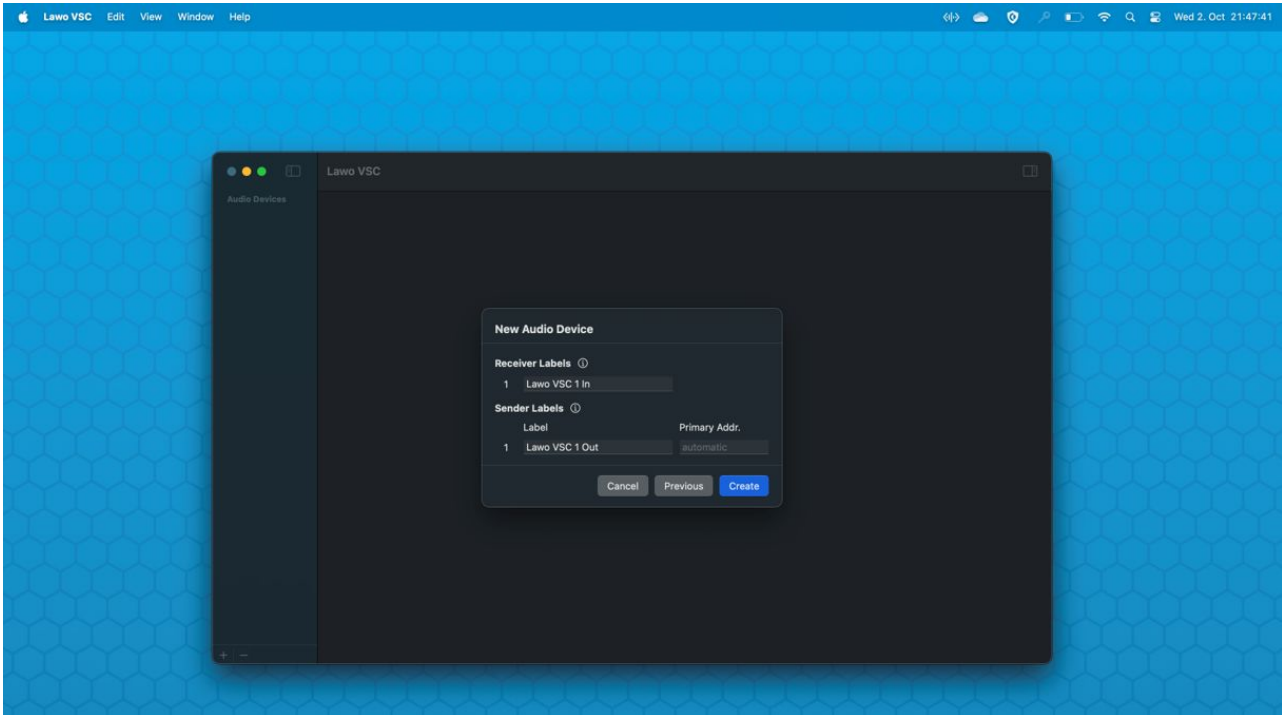
If you wish to edit the fields, then this can be done as follows. For more information about the parameter options, please see [Lawo VSC - Audio Device Configuration](#).

- **Name** - identifies the audio device in Lawo VSC and in the macOS.
The name always starts with "Lawo VSC"; this cannot be changed. The second part of the name can be edited.
- **Inputs** and **Outputs** - defines how many inputs and outputs the device can handle.
Please enter a value that meets the requirements of the local audio application/driver.
- **Channels per Receiver** and **Channels per Stream** - defines the number of IP receiver(s) and sender(s) according to the number of channels per receiver/stream.
Once a value is selected, Lawo VSC calculates the number of senders (or receivers) and displays this below the corresponding field.
- **Configuration** - defines the advanced parameters for the outgoing stream(s).
By default, an **AES67** preset is selected and the advanced parameters are hidden from view.
In most cases, it is recommended to accept the default preset (as this ensures that the streaming configuration is permitted, and that the streams are AES67-compliant).
If **Custom** is selected, then it is possible to edit the individual parameters. This is explained in more detail [later](#).
- **Protection** - defines the network interface(s) used to transmit the stream(s).
By default, **Primary Only** is selected (to be compatible with the free version of Lawo VSC).
To create redundant streams, compatible with SMPTE ST2022-7, you must change this option to **Dual Redundant**.

Please note: To support the **Dual Redundant** protection mode, you must [upgrade](#) to the licensed version of Lawo VSC. Then, assign a secondary streaming interface using the **NIC 2** field in the '[Settings → Streaming](#)' dialog.

3. Once you are happy with the configuration, click on **Next** to continue to the next screen.

Here you can check and, if necessary, edit the labels for the receiver(s) and sender(s), and define the multicast IP address(es) for the outgoing stream(s).



The labels identify the receiver(s) and stream(s) to other network users. The label fields cannot be left blank, and cannot be edited once you have created the audio device.

To save time, it is recommended to use the default labels. These start with the device name (entered earlier).

If there is more than one receiver or sender, then the labels end in a number that increments automatically. Thus, the default labels are:

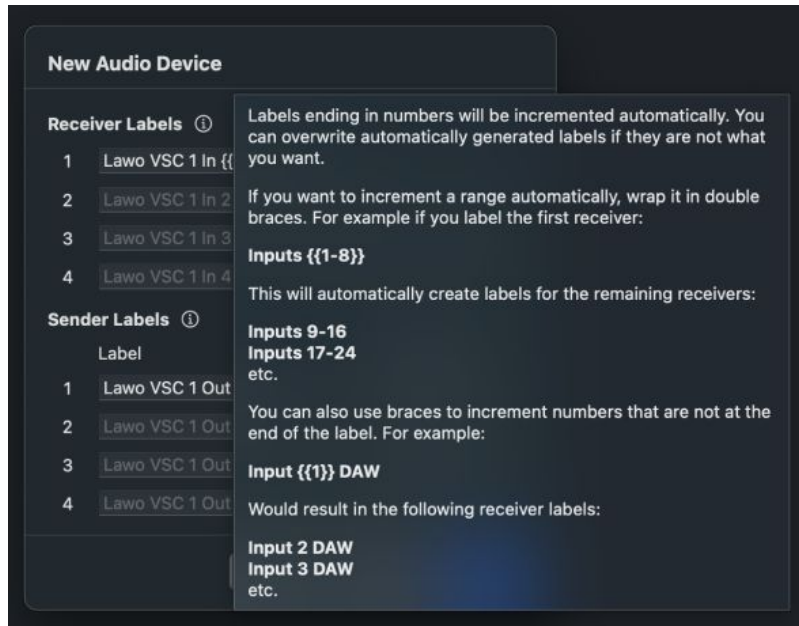
- **<device name> In n** - for receivers.
- **<device name> Out n** - for senders.

The default labels can be overwritten by typing into the fields.

i The identifier string must not contain the character "/" (ASCII/UTF-8: 47) and must begin with a letter or the lower line character "a"-"z", "A"-"Z", "_" (ASCII/UTF-8: 65-90, 97-122 ,95).

Each label must not exceed 28 characters.

To speed up the labelling for multiple receivers or senders, double braces can be used to automatically increment a number or range. Click on the **i** icon to open an "information" dialog that explains how to use this shortcut.



Beside the sender labels, the **Primary Addr.** field determines how the multicast IP addresses are created. There are two possibilities: either automatic or manual.

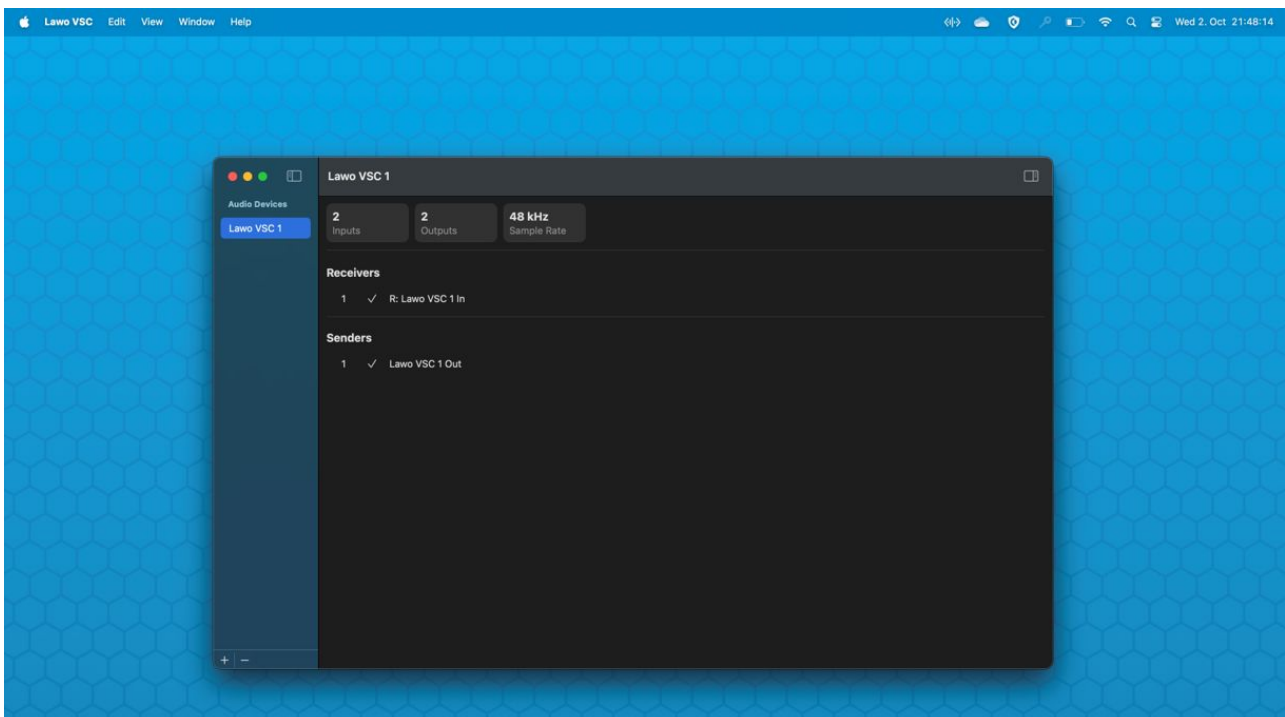
For our example, the default (automatic) mode is fine.

If you wish to edit the multicast addresses manually, or use a different UDP port number, then please see [Sender Multicast IP Addresses & UDP Port Number](#).

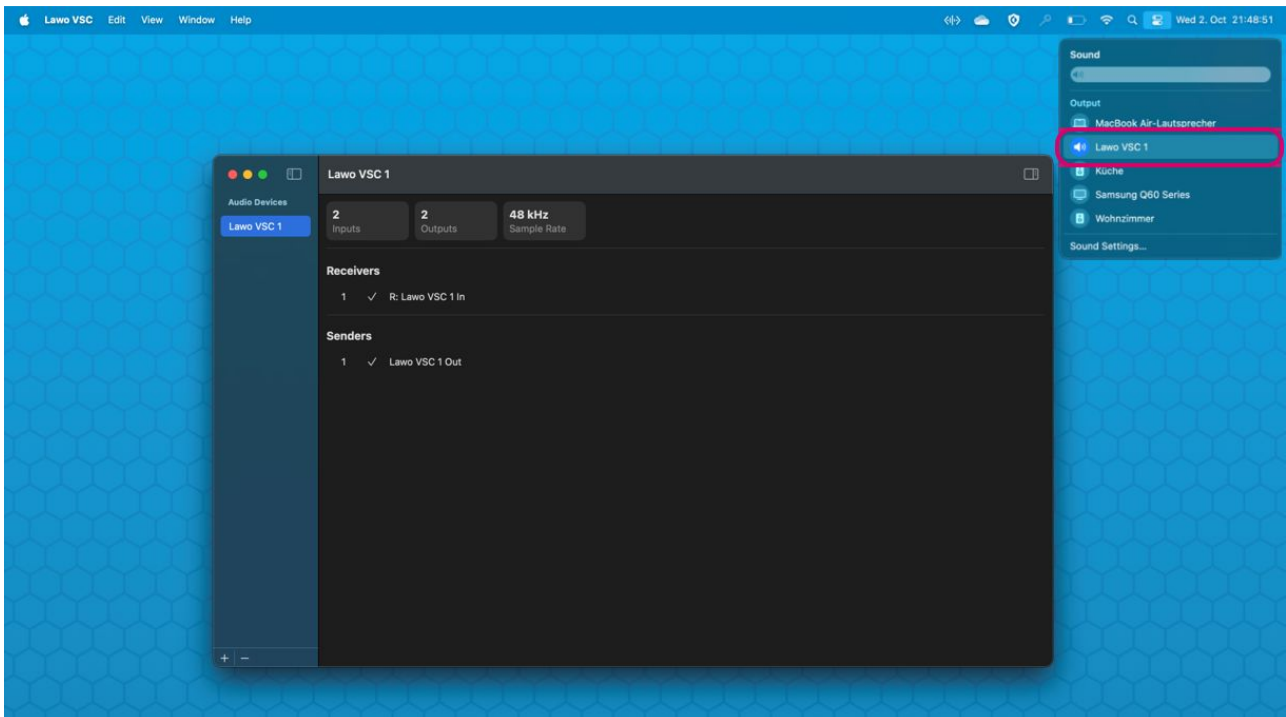
4. Once you are happy with the labels and multicast addresses, click on **Create** (to create the audio device).

The new device is added to the list of 'Audio Devices' and a summary of its configuration is shown in the main working area.

- On the network side, the receiver(s) and sender(s) are now active, and so their status is ticked.
- The setup of the audio device in Lawo VSC is now complete, and you are ready to connect your audio application.



Notice that the device called "Lawo VSC 1" appears in the list of **Sound** devices (in the macOS status menu). This confirms that the device is ready for use outside of Lawo VSC.

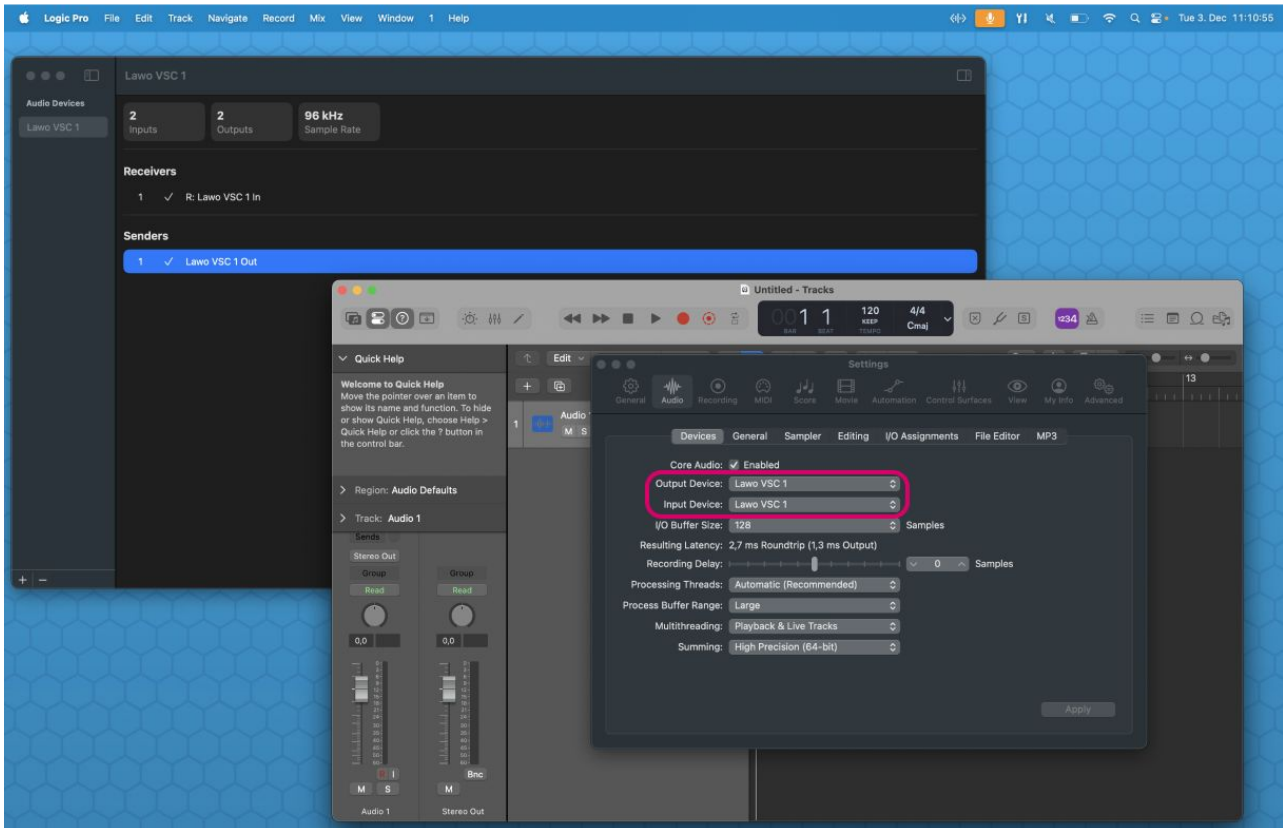


Connect an Audio Application

Once an audio device is created in Lawo VSC, it can be used by an application on your computer. This will allow you to use the audio received from the network (via the **Receivers**) and stream audio to the network (via the **Senders**).

This part of the setup is done in the audio application and so the method may vary.

In the example below, the audio device named "Lawo VSC 1" is assigned to the input and output device fields (in the settings for the digital audio workstation).



Please note:

- To stream audio to/from multiple applications, you must configure an audio device for each application. An audio device cannot be assigned to more than one application simultaneously.
- Sample rate conversion (SRC) is applied automatically to the audio (as required). For example, if a 48kHz stream is connected to a 96kHz application, then audio from the stream is decoded and up sampled.
- While Lawo VSC supports 96kHz and up to 128 audio devices, whether your configuration will work in practice is dependent on the overall usage of the macOS system.

Once the Lawo VSC audio device is assigned to its audio application, the setup is complete.


For the outgoing streams, you can use the Lawo VSC GUI to check the audio carried by the streams or edit, disable or remove the streams (as described in [Lawo VSC - Sending Audio to the Network](#)).

To receive audio from the network, you must setup a streaming connection to the device's receiver(s) This can be done either manually (by editing the receiver's SDP data) or dynamically (using **Select Stream** in Lawo VSC or the **Stream Routing** page in HOME). For more information, see [Lawo VSC - Receiving Audio from the Network](#).



Remove an Audio Device

The steps below describe how to remove an audio device from Lawo VSC.

 **Important:** If you remove an audio device, then this will delete all of its outgoing streams.

1. Select the device you wish to remove from the 'Audio Devices' list.

The selection highlights.

2. Click on the - button (at the bottom of the 'Audio Devices' list).
3. Select **Confirm** to continue (or **Cancel** to abort the operation).

3.6 Lawo VSC - Synchronization

Lawo VSC can sync to PTP arriving from the media network, to an incoming stream or to the internal timing (of the host computer).

PTP (Precision Time Protocol) is the preferred option and must be used in larger networks with multiple streaming devices.

The **SyncToStream** and **Internal** options are special use cases. They can be useful if there is no PTP available in a small network with say a single sending device. A typical scenario is described [later](#).

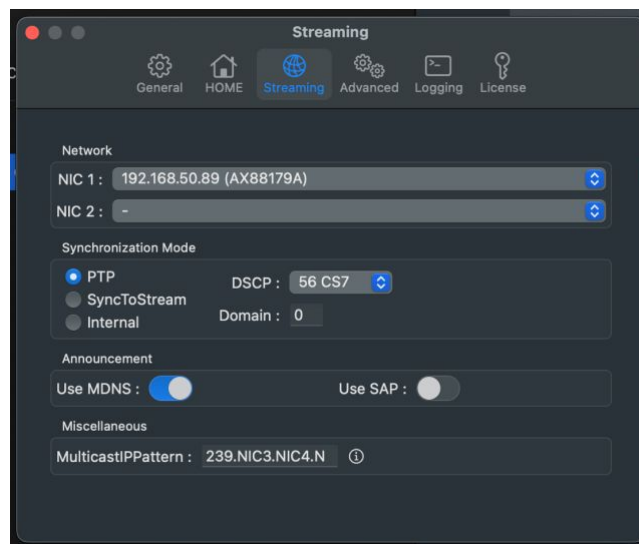
Changing the Sync Reference

The sync reference for Lawo VSC is defined in the **Settings** → **Streaming** dialog.

By default, **PTP** is selected with a **DSCP** value of 56 and **Domain** value of 0.

If you wish to change the sync reference or edit the DSCP or Domain values, follow the instructions below.

1. Open the **Settings** dialog (from the [App Menu](#)) and select the **Streaming** tab.



2. Under 'Synchronization Mode', use the radio buttons to set the reference.

There are three possible options:

- **PTP** - from the media network.
- **SyncToStream** - an incoming stream.
- **Internal** - the internal timing of the host computer.

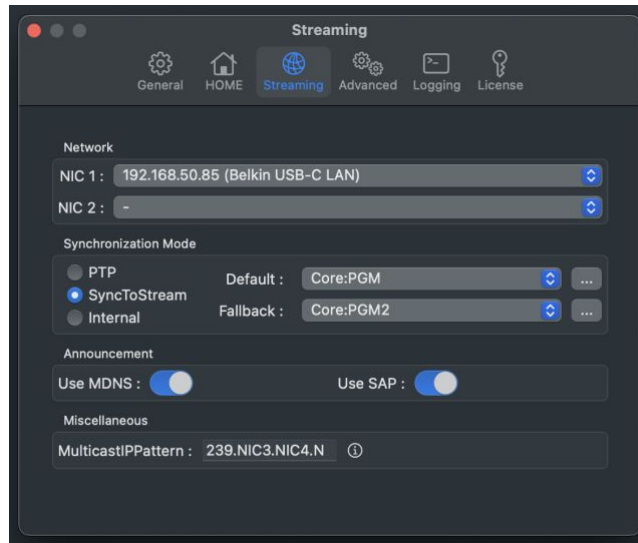
When **PTP** is selected, the **DSCP** and **Domain** values can be specified.

- The **DSCP** field can be used to assign a differentiated services code point, or quality class, to PTP sync requests. This can improve the timing of the system.
- The **Domain** field specifies the PTP domain.

In both cases, the values depend on the requirements of your network. If in doubt, please check with your network administrator.

i DSCP values are used within computer networks to classify and manage different types of network traffic. For example, to provide low-latency for critical network traffic such as media streaming, while providing best-effort services to non-critical services such as web traffic or file transfers.

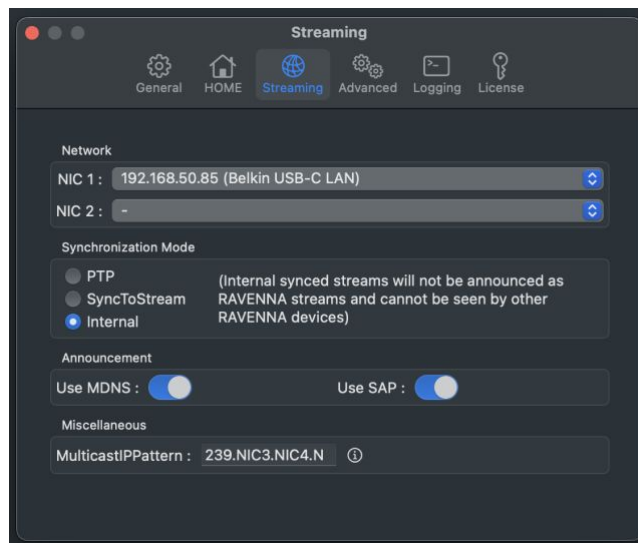
When **SyncToStream** is selected, two additional fields appear: **Default** and **Fallback**.



Lawo VSC will sync to the **Default** stream. If the **Default** stream disappears, then the **Fallback** stream is used.

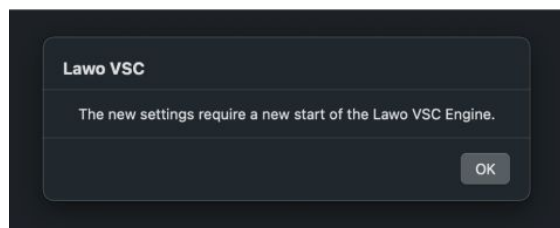
- In each case, use the drop-down menus to choose a stream. The menus list all Lawo VSC streams that are announced to the network.
- Alternatively, you can select a stream which has not been announced by clicking on the ... buttons - this opens a further dialog where you can enter the URL of the stream manually.

When **Internal** is selected, there are no further options to define. In this mode, the streams are not announced as RAVENNA streams and cannot be seen by other RAVENNA devices.



3. Once you are happy with the settings, click on the red circle (top left) to close the dialog (and save any changes).

If a restart of the Audio Engine is required, then the following message appears.



4. Select **OK** to confirm - the Lawo VSC Engine restarts and the new settings are applied.

Using PTP

For correct synchronization via PTP, the media network requires a PTP master clock source.

Lawo VSC acts as a PTP slave only and, therefore, a PTP master clock source must be installed somewhere on the network. This can be achieved by configuring another streaming node or installing a separate grandmaster device. A PTP master should be capable of taking an incoming sync signal and generating PTP clock. You can read more about the PTP implementation in the [Lawo IP Networking Guide](#). For now, it is useful to know that:

- At any moment in time, there can be only one PTP master operating on the network.
- If a device is set to master-slave mode, then the current mode is determined by the PTP priorities set within the device itself and all other streaming nodes.

In Lawo VSC, the system checks for PTP arriving via the network interface specified in the **NIC 1** field.

The message "**Synchronizing**" appears in the status area of the GUI while synchronization is occurring. The message disappears once a valid PTP source is detected; this can take a few seconds.

Using SyncToStream & Internal

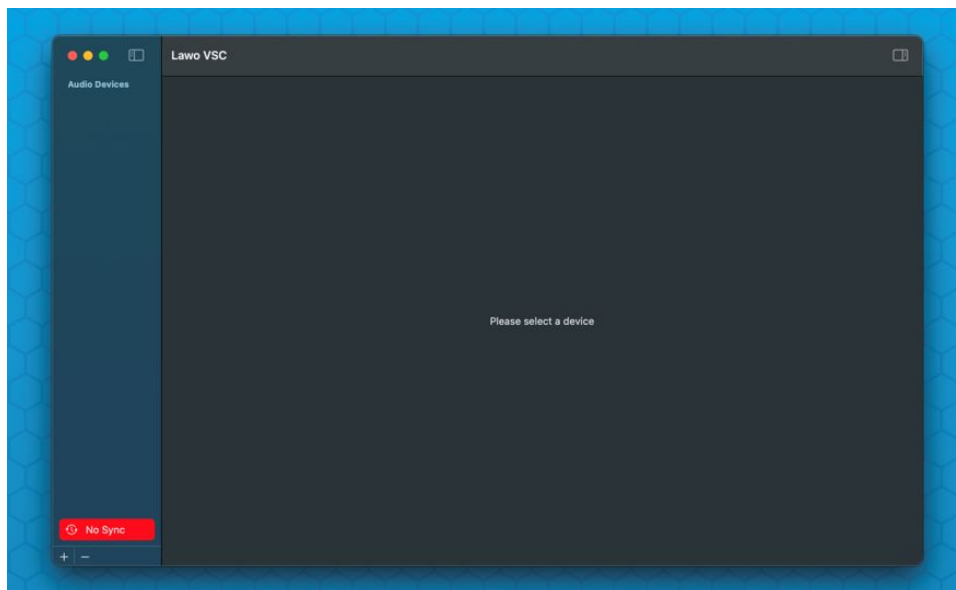
The **SyncToStream** and **Internal** options are special use cases. They can be useful if there is no PTP available in a small network with say a single sending device.

- If Lawo VSC locks to an incoming stream from the sending device, then its outgoing streams can be received (by the sending device) without clock drift. In this instance, set Lawo VSC to **SyncToStream** and define the incoming stream using the **Default** (and **Fallback**) fields as described above.
- If the sending device is another Lawo VSC, then this can be set to **Internal** while the receiving device is set to **SyncToStream**. This allows the two Lawo VSC computers to exchange streams that are locked to the timing of the **Internal** machine.

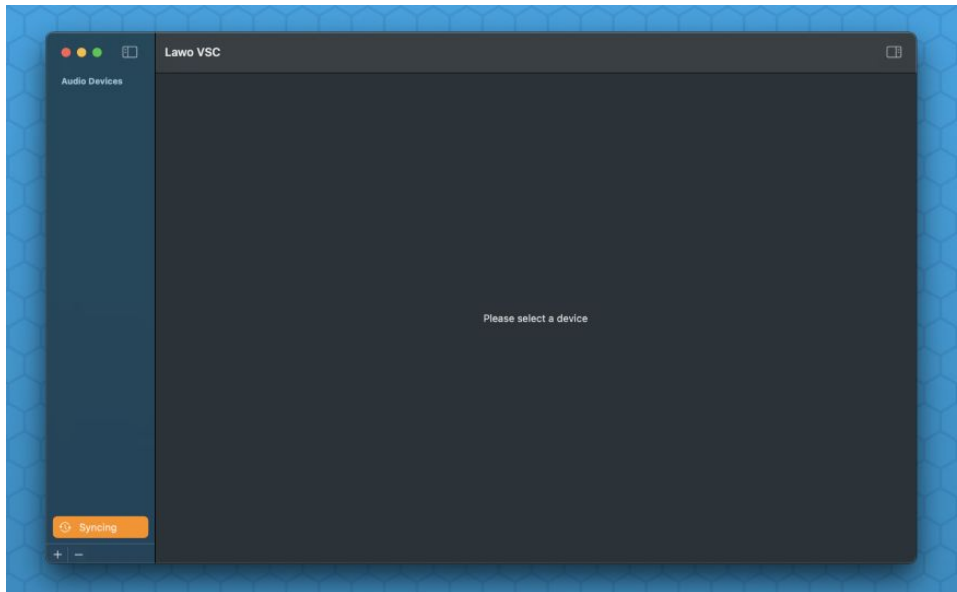
As before, the message "**Synchronizing**" appears in the status area of the GUI while synchronization is occurring. The message disappears once Lawo VSC is synced; this can take a few seconds.

Checking the Sync Status

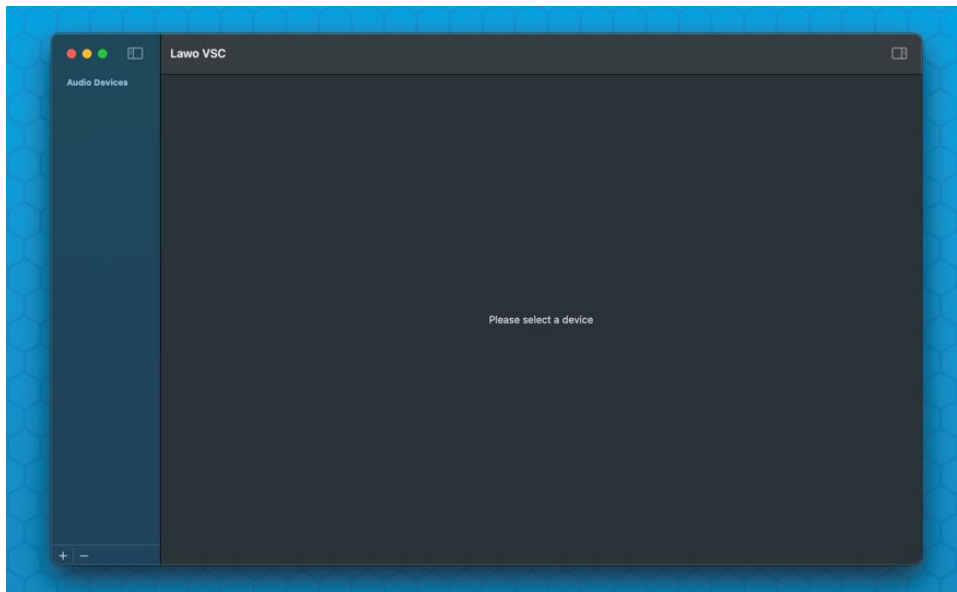
If there is a problem with the sync, then a red "**No Sync**" message appears in the status area at the bottom of the 'Audio Devices' list.



This changes to a yellow "**Synchronizing**" message appears once a clock source is detected and synchronization is occurring. It is normal for the synchronisation process to take a few seconds.



Once everything is ok and Lawo VSC is correctly synchronized, the messages clear leaving an empty status area.



Troubleshooting Sync Issues

If there is a problem with the synchronization, then the **No Sync** status message persists. In this instance, you must resolve the sync issue to ensure proper streaming to and from Lawo VSC.

Start by checking the following points:

- Is there a valid PTP clock source on the network?
- Is the correct interface specified in the **NIC 1** field, and is this connected to the media network?
- Is the 'Synchronization Mode' set to **PTP**? What are the requirements for the **DSCP** and **Domain** values?

Then check that you have closed the 'Settings' dialog (to save the changes and restart the Audio Engine). The new settings are only applied after the restart.



4 Lawo VSC - Operation

This chapter describes the operation of Lawo VSC once the software is installed and setup.

It is assumed that you have at least one audio device configured and connected to a local audio application. If this is not the case, then please see [Lawo VSC - Audio Device Quick Setup](#).

- [Lawo VSC - Operating Principles](#)
- [Lawo VSC - Receiving Audio from the Network](#)
- [Lawo VSC - Sending Audio to the Network](#)
- [Lawo VSC - Audio Device Configuration](#)
- [Lawo VSC - Sender Parameters](#)
- [Lawo VSC - Receiver Parameters](#)

4.1 Lawo VSC - Operating Principles

This topic describes the basic operation of Lawo VSC.

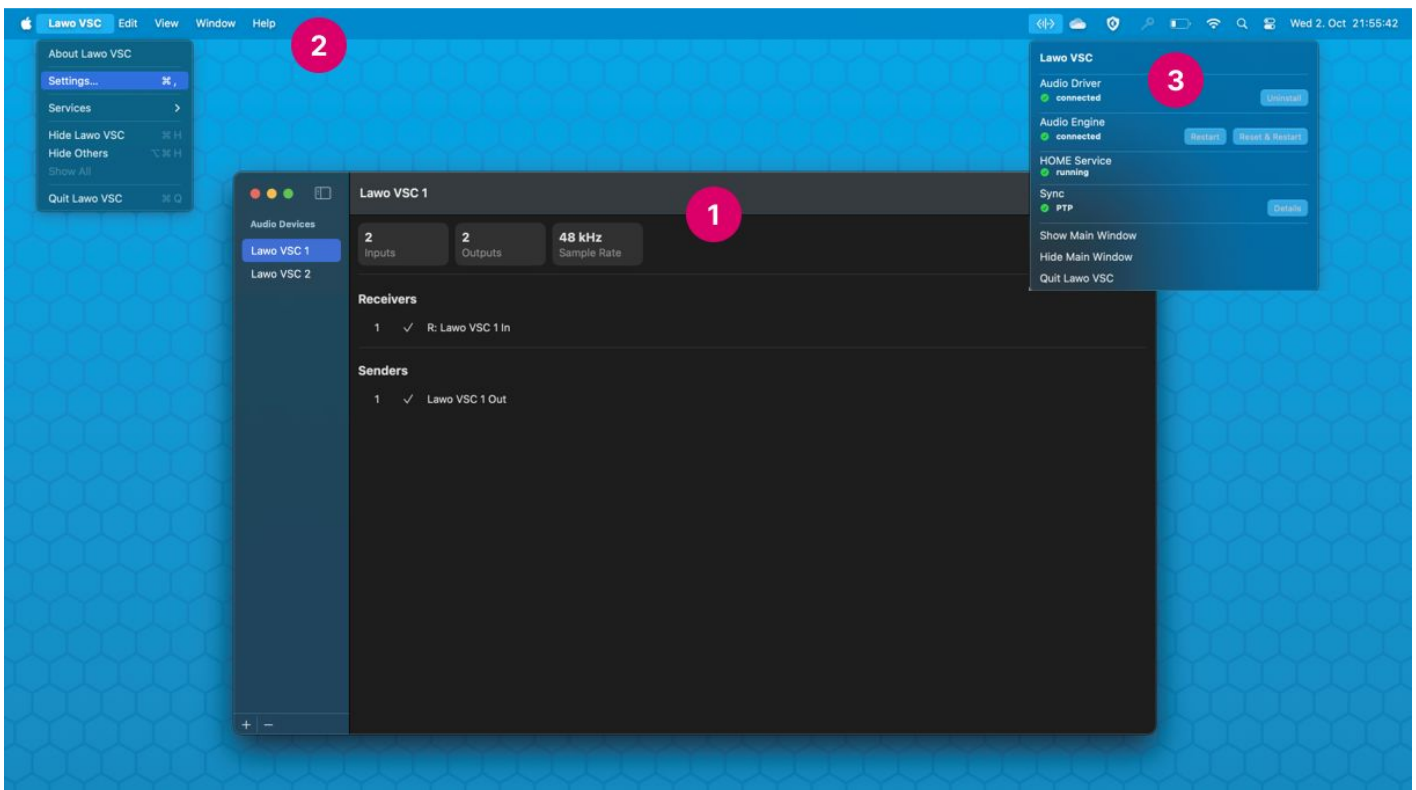
Starting the Application

Lawo VSC can be started in the usual manner for a macOS app. e.g. Select **Lawo VSC** from the **Applications** folder.

The first time you start the software, you will need to work through the first-time startup tasks (described [earlier](#)). On all subsequent startups, Lawo VSC loads the latest configuration.

When the application opens, the main [Lawo VSC window](#) (1) is in view. Here you can configure the audio devices and their streams.

Other functions, such as the 'Settings' dialog can be opened from the [app menus](#) (2). There is also a [status menu](#) (3) that can be opened from the macOS status area (as shown below).



Once the audio devices are configured, the main window can be hidden from view. This allows you to focus on your local audio applications during operation, once the streams are setup.

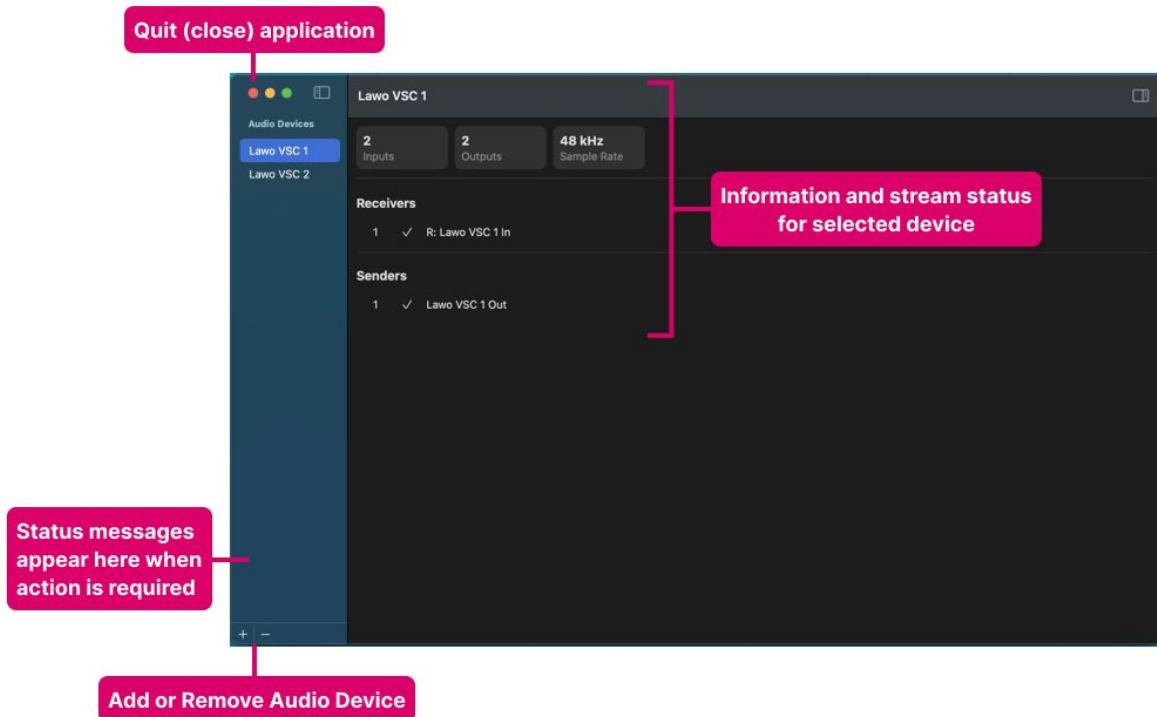
Closing the Application

Lawo VSC can be closed in one of the following ways: select **Quit Lawo VSC** from either the app or status menus (shown above) or use the keyboard shortcut (cmd + Q).

Depending on the **Stop Audio Engine on Quit** option (in the 'Settings → Advanced' dialog), Lawo VSC will either stop streaming when the application quits OR continue running as a background service (so that all existing streams and audio devices remain available). For more information about this option, please see [Lawo VSC - Advanced Settings](#).

Lawo VSC Main Window

The Lawo VSC window opens with a sidebar (on the left) and a main working area (on the right). If the window has been hidden from view, then use either the **Show All** option (in the app menu) or **Show Main Window** option (in the status menu) to bring it back into view.



The left-hand sidebar shows a list of the 'Audio Devices' that have been configured. You can use the **+** and **-** buttons at the bottom of this area to add or remove a device. Above the buttons is a status area that will show messages about the license and/or sync status if there is an issue to resolve.

The main working area shows the name of the selected device (in the title bar) plus the following information:

- The number of **Inputs** and **Outputs** defined for the selected device.
- The **Sample Rate** of the Audio Engine.
- The name and status of the **Receivers** and **Senders** for the selected device.

The device name always starts with "Lawo VSC", but the second part of the name can be edited. This is defined, along with the number of inputs, outputs, receivers and senders, by the [audio device configuration](#).

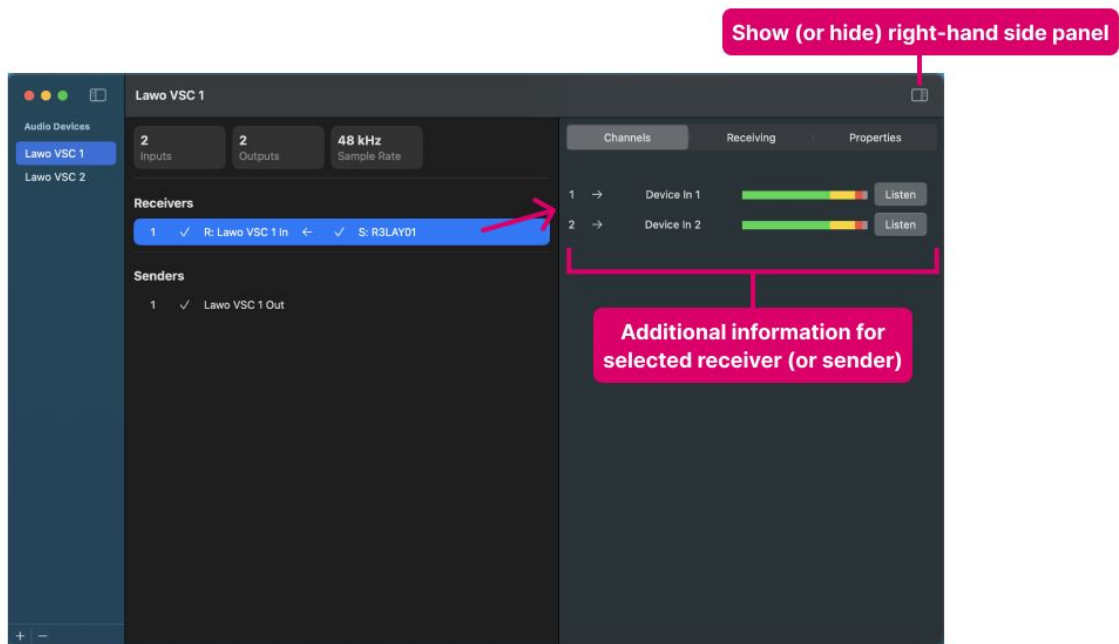
The sample rate is a global setting for Lawo VSC which can be changed from the '[Settings → General](#)' dialog.

Interrogating the Receivers & Senders

The following information is always displayed for each receiver and sender:

- **ID** - indicates the number of the receiver or sender.
The **ID** number is useful if there are multiple entries. For example, if a 64 input device has 8 x 8-channel receivers and you wish to check inputs 9-16, you will need to select receiver 2.
- **Status** - indicates the status of the connected stream (for a receiver) or the outgoing stream (for a sender). Hover over the icon to reveal more information.
If a receiver is not connected, then it is normal to see a yellow warning indicator. The warning will clear once a connection is made (providing that the stream subscription is successful).
- **Label** - identifies the receiver or sender within the network. The labels are defined as part of the [audio device configuration](#). They cannot be edited once the audio device is created.
- **Connected Source** (shown for receivers) - shows the status and name of the connected stream (once a connection is made).

If you select a receiver or sender, then more information and functionality can be revealed by clicking on the show/hide side panel icon (in the top right-hand corner).



In each case, there are three pages of functions that are selected by clicking on the tabs: **Channels**, **Receiving** (or **SDP**) and **Properties**.

Receiver Operations

When a receiver is selected, there are two pages of interest: **Channels** and **Receiving**. In the current release, the **Properties** page is empty and has no function.

The **Channels** page shows the individual audio channels of the selected receiver. From here you can:

- Meter the audio arriving from the connected stream (if a connection is made).
- Click on **Listen** to monitor the audio on the local playback device (defined in the '[Settings → General](#)' dialog).

The **Receiving** page shows information about the connected stream (if a connection is made). If there is no stream connected, then the fields are empty. From here you can:

- Setup a new streaming connection (using **Select Stream**).
- **Disconnect Stream** (to remove an existing connection).
- **View Advanced Details & Statistics** for the connected stream (for diagnostic purposes).

For more information, see [Lawo VSC - Receiving Audio from the Network](#).

Sender Operations

When a sender is selected, all three pages are populated.

The **Channels** page shows the individual audio channels of the selected sender. From here you can:

- Meter the audio carried by the outgoing stream.
- Click on **Listen** to monitor the audio on the local playback device (defined in the '[Settings → General](#)' dialog).

The **SDP** page shows the SDP data for the outgoing stream. This can be used to:

- Check the contents of the SDP data.
- Copy the SDP data to the clipboard (so that it can be used by another device/receiver).

The **Properties** page can be used to access the sender properties. From here you can:

- **Add Stream** - opens the 'New Stream Sender' dialog (to create a new stream). This option is only available if there is no existing stream.
- **Enable Sender** - enables (or disables) the stream. You can use this option to remove the stream from the network on a temporary basis.
- **Send Test Tone** - sends test tone to each channel of the selected sender in sequence. So, tone appears on channel 1 for a few seconds, then on channel 2 and so on until all channels are tested.
- **View Advanced Details & Statistics** - opens a dialog with the stream details and statistics (for diagnostic purposes).
- **Remove Stream** - deletes the stream. Click on **Remove** to confirm or **Cancel** to cancel the operation. Once the stream is removed, you can use **Add Stream** to configure a replacement.

For more information, see [Lawo VSC - Sending Audio to the Network](#).

Status Messages

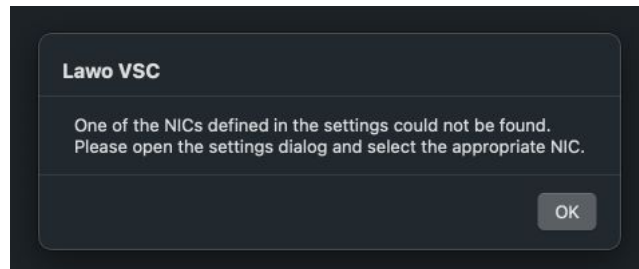
If there is a licensing or sync issue to resolve, then a message appears in the status area (at the bottom of the 'Audio Devices' list). There are two message types:

- **Grace Mode** - This message appears if you are running the licensed version of Lawo VSC and a valid license is not found.
 - To resolve the issue, either install a license or switch back to the Free version (as described in [Lawo VSC - License Activation](#)).
 - If the grace period expires before a license is found, then white noise is inserted into the audio.
- **No Sync** - This message appears if a valid clock source is not found.
 - To resolve the issue, please check the 'Synchronization Mode' and clock source (as described in [Lawo VSC - Synchronization](#)).

Once everything is ok, the status messages clear.

NICs Not Found

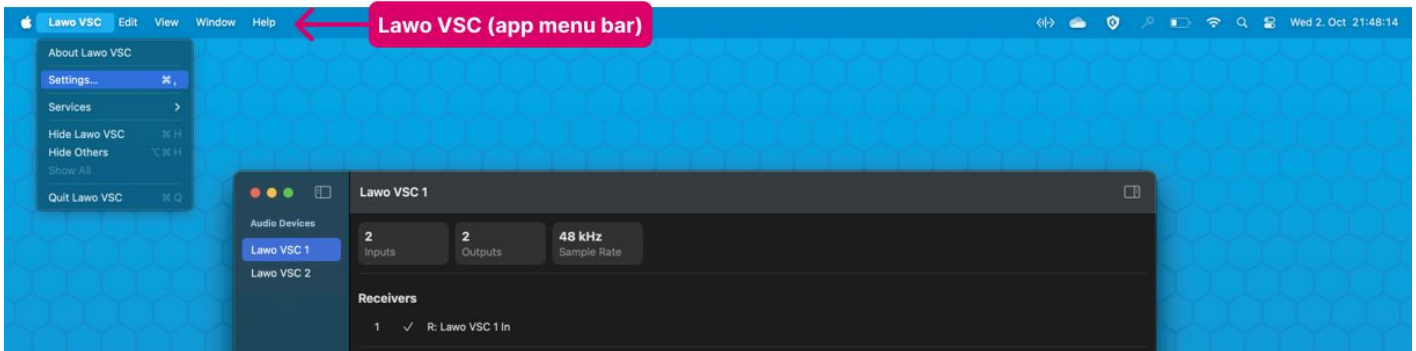
The following message appears if one of the Network Interface Cards (NICs) is not found.



To resolve the issue, open the '[Settings → Streaming](#)' dialog and choose a network interface for the **NIC 1** (and **NIC 2**) fields.

The App Menu

When the main Lawo VSC window is in focus, the application's menu bar is visible.



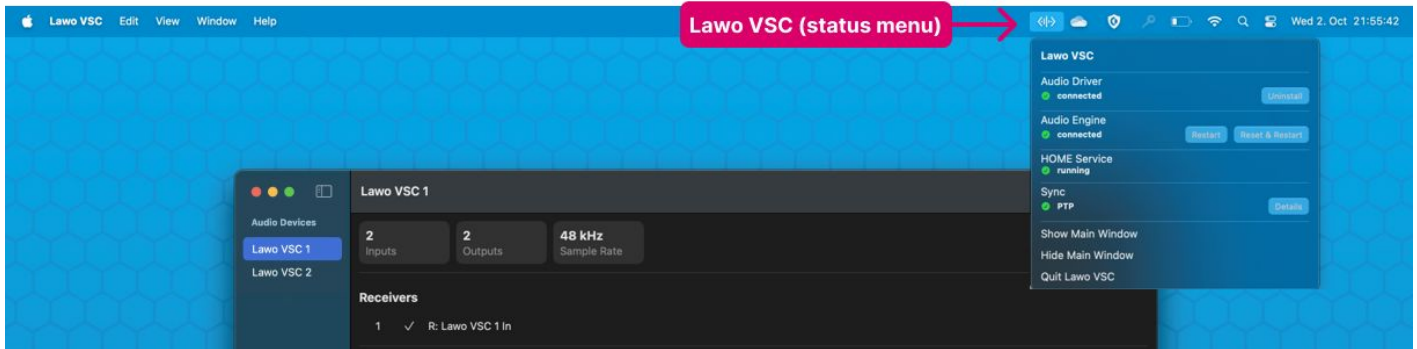
Click on **Lawo VSC** to access to the following options:

- **About Lawo VSC** - opens a dialog with information about the app. From here, you can check the release version of Lawo VSC.
- **Settings** - opens the 'Settings' dialog. From here, you can adjust all of the global settings for the app. For more information, please see [Lawo VSC - Settings](#).
- **Services** - refers to services for the macOS. There is nothing specific to Lawo VSC here.
- **Hide Lawo VSC**, **Hide Others** and **Show All** - these options can be used to show or hide the main Lawo VSC window.
- **Quit Lawo VSC** - this option will close the application. What happens to the streams is dependent on the **Stop Audio Engine on Quit** option. For more information, please see [Lawo VSC - Advanced Settings](#).

The other menus (**Edit**, **View**, **Window** and **Help**) offer the usual options for a macOS app. There is nothing specific to Lawo VSC here.

The Status Menu

The Lawo VSC status menu can be opened from the macOS status area (as shown below).



The first few fields show the status of the Lawo VSC services.

Audio Driver

The **Audio Driver** is always connected; it cannot be disconnected. During normal operation, the status shows as "connected" with a green flag.

The **Uninstall** option can be used to remove the audio driver. Note that this closes Lawo VSC (as the driver is mandatory).

Audio Engine

The **Audio Engine** is always connected; it cannot be disconnected. During normal operation, the status shows as "connected" with a green flag.

In the event of an issue, there are two options that can be used to perform a restart:

- **Restart** - restarts the Audio Engine and loads the latest configuration.
- **Reset & Restart** - resets (clears) the configuration and then restarts the Audio Engine. Note that if you choose this option, then all audio devices are removed.

HOME Service

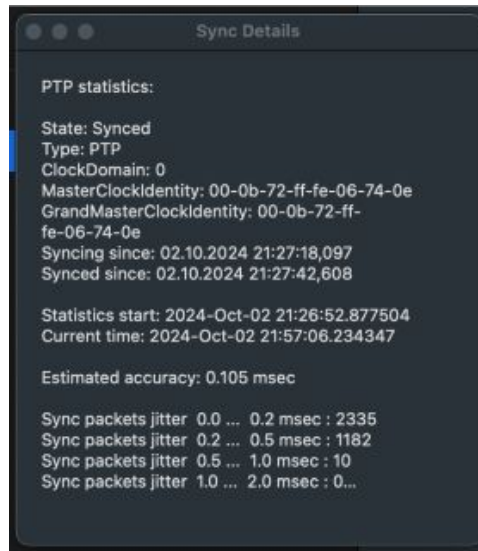
The **HOME Service** is always connected; it cannot be disconnected. During normal operation, the status shows as "running" with a green flag.

There are no further options for the HOME service (as the service is always running). If you wish to connect or disconnect a HOME system, then this can be done from the '[Settings → HOME](#)' dialog.

Sync

The **Sync** area shows the status of the incoming sync signal. If a valid clock signal is detected, then the status shows the type of signal (e.g. **PTP**) with a green flag.

The **Details** option can be used to open a dialog with more information about the clock signal. This is refreshed every 5 seconds. An example for PTP is shown below.



Other Functions

The **Show** and **Hide Main Window** options can be used to show or hide the main Lawo VSC window.

The **Quit Lawo VSC** option provides another way to close the application.

4.2 Lawo VSC - Receiving Audio from the Network

To use audio from the network, you must configure an audio device in Lawo VSC. Then connect an incoming stream to the audio device's receiver(s) and assign the device to your local audio application.

The streaming connection(s) can be made either manually (by editing the receiver's SDP data) or dynamically (using **Select Stream** in Lawo VSC or the **Stream Routing** page in HOME).

Channels Received & I/O Routing

Once a stream is connected, its audio channels are received on a 1:1 basis. If number of channels carried by the stream is different to the configuration of the receiver, then the incoming channels are received on a best-effort basis. For example:

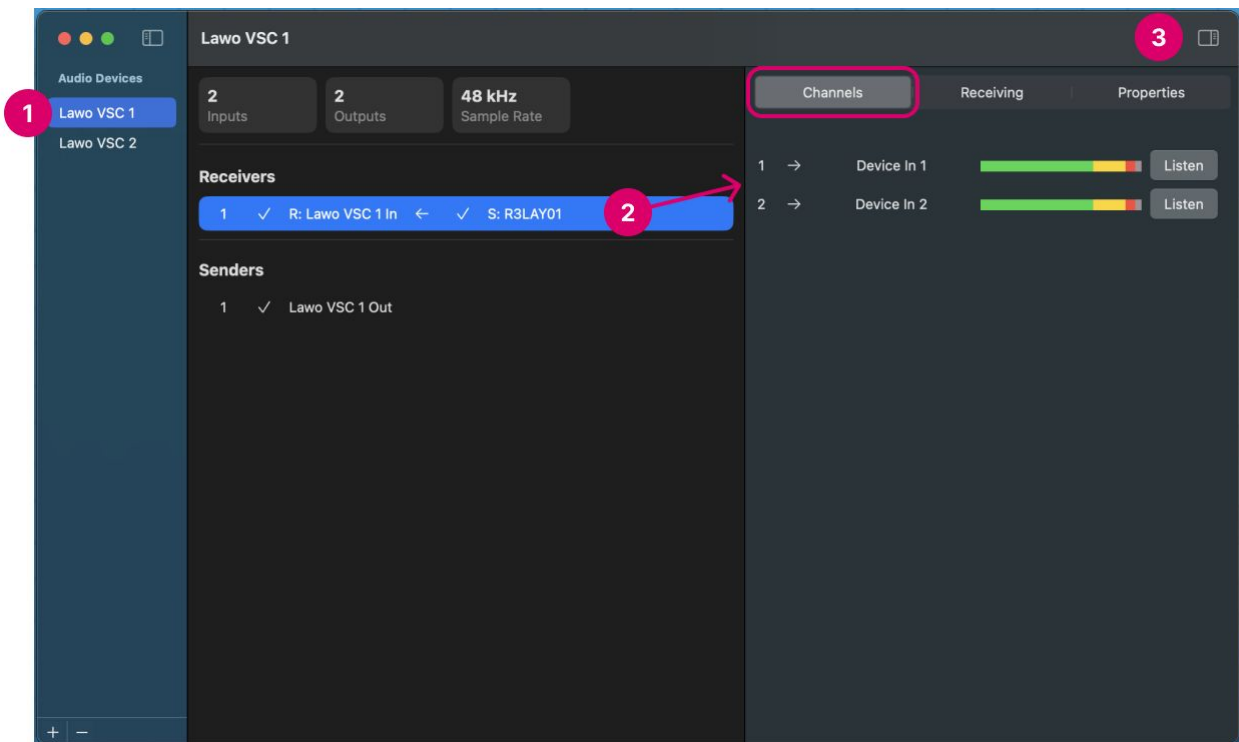
- If a stereo stream is connected to an 8-channel receiver, then the two source channels are assigned to channels 1 and 2 of the receiver (and channels 3 to 8 of the receiver are unused).
- If a 64-channel stream is connected to an 8-channel receiver, then the first eight source channels are assigned to channels 1 to 8 of the receiver (and the remaining source channels from the incoming stream are unused).

There is no user-defined I/O routing in Lawo VSC and so the received channels are connected to the local audio application on a 1:1 basis. If you wish to shuffle the audio channels, then this must be done in the external application.

Please note: Sample rate conversion (SRC) is applied automatically to the audio (as required). For example, if a 48kHz stream is connected to a 96kHz application, then audio from the stream is decoded and then up sampled.

Checking the Audio Inputs

The Lawo VSC GUI can be used to check the audio received on a channel-by-channel basis. This is done as follows.



1. Select the audio device in Lawo VSC (to reveal its **Receivers** and **Senders**).
 - The receiver status should be ticked (to confirm that the setup is ok).
 - The name of the connected source appears to the right of the receiver (e.g. **S: R3LAY01**). If there is no connected source, then check the streaming connection.
 - The connected source status should also be ticked. If a warning indicator appears, then the connected source cannot be found. Check the network connections from the Lawo VSC computer and the sending device.
2. Select a receiver (e.g. **R: Lawo VSC 1 In**).

3. Click on the show side panel icon (to view the right-hand side panel) and select the **Channels** page.
 - If audio is present, then you will see the level on the meters.
 - Click on **Listen** to monitor a channel on the local playback device (defined in the '[Settings](#) → [General](#)' dialog).

If the audio device has multiple receivers, then the number of the receiver can be used to identify the channels. For example, if a 64 input device has 8 x 8-channel receivers and you wish to check inputs 9-16, you will need to select receiver 2.

Listen Function

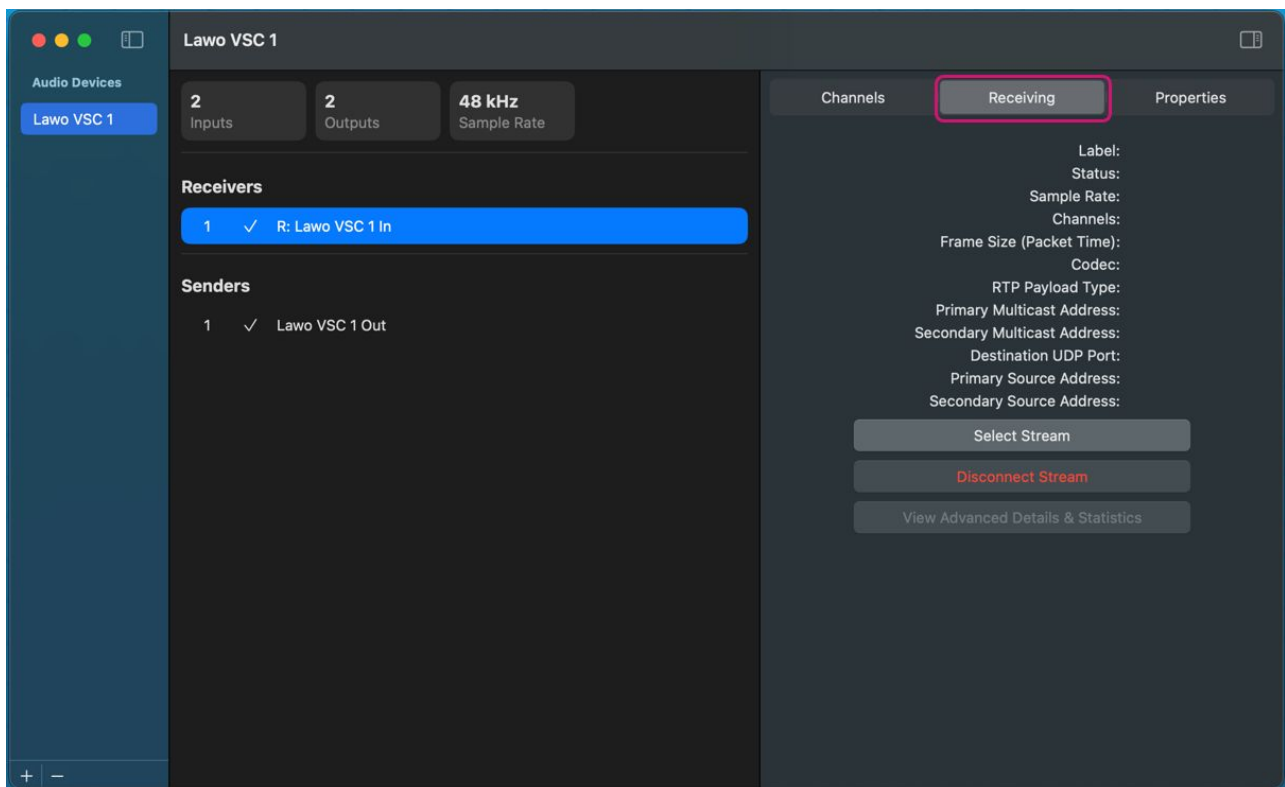
The **Listen** button can be used to check audio received from or sent to the network.

First, you must configure a local playback device using the **Play local audio through** and **Channels** options in the '[Settings](#) → [General](#)' dialog. You can choose any **Sound** device that is configured in your macOS system.

Then click on one of the **Listen** buttons (available for each channel). The audio is played out through the selected channels of the playback device.

Advanced Functions

The **Receiving** page shows information about the connected source such as its sample rate, number of channels, etc. If there is no stream connected, then the fields are empty.

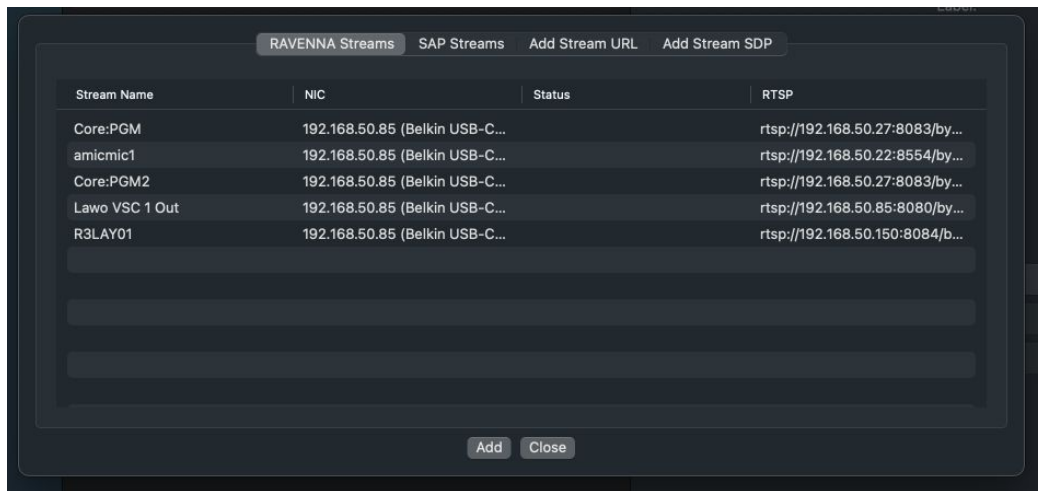


The three buttons, at the bottom of the page, can be used to setup a new streaming connection, disconnect an existing stream or view more information about the connected stream (for diagnostic purposes).

Select Stream

This option can be used to setup a new streaming connection. Streams can be selected by name if they are announced to the network. Or, you can enter a URL or SDP.

Start by clicking on **Select Stream**. A dialog opens with four pages/tabs.



To choose a stream by name:

1. Select either **RAVENNA Streams** or **SAP Streams**.
 - **RAVENNA Streams** lists all streams announced to the network via MDNS.
 - **SAP Streams** lists all streams announced to the network via SAP.
 - In each case, the list includes incoming streams from other devices plus local streams published from the Lawo VSC audio device.
2. Select a stream and then click on **Add**. The stream is connected to the receiver.
3. Click on **Close** (to close the dialog).

If a stream is not announced to the network, then there are two alternative methods: **Add Stream URL** or **Add Stream SDP**.

Add Stream URL can be used to add a stream with a specific URL. For example, if your network uses rtsp addresses.

1. Select the **Add Stream URL** tab.
2. Use the **NIC** drop-down menu to select the Network Interface Card which is receiving the stream.
3. Then enter the **URL** for the stream. The maximum length for the URL is 200 characters.
4. Click on **Add**. The stream is connected to the receiver.
5. Click on **Close** (to close the dialog).

Add Stream SDP can be used to add a stream by entering its session description (SDP). The SDP can be loaded from a file or entered manually into the 'Text' area.

1. Select the **Add Stream URL** tab.
2. Use the **NIC** drop-down menu to select the Network Interface Card which is receiving the stream.
3. If you have a copy of the SDP (as a file), then:
 - Click on the **Load..** button (beside the 'File' field).
 - Use the macOS Finder window to locate the SDP file.
 - Select the SDP file and click on **Open**. The SDP is displayed in the 'Text' area.
4. Alternatively, you can enter the SDP into the 'Text' area.
 - Either type in the SDP (as text).
 - Or, copy the SDP from the sending device and paste this into the 'Text' area.
 - The **Save..** button can be used to save the contents of the SDP 'Text' (for backup purposes or transfer to another device).
5. Click on **Add**. The stream is connected to the receiver.
6. Click on **Close** (to close the dialog).

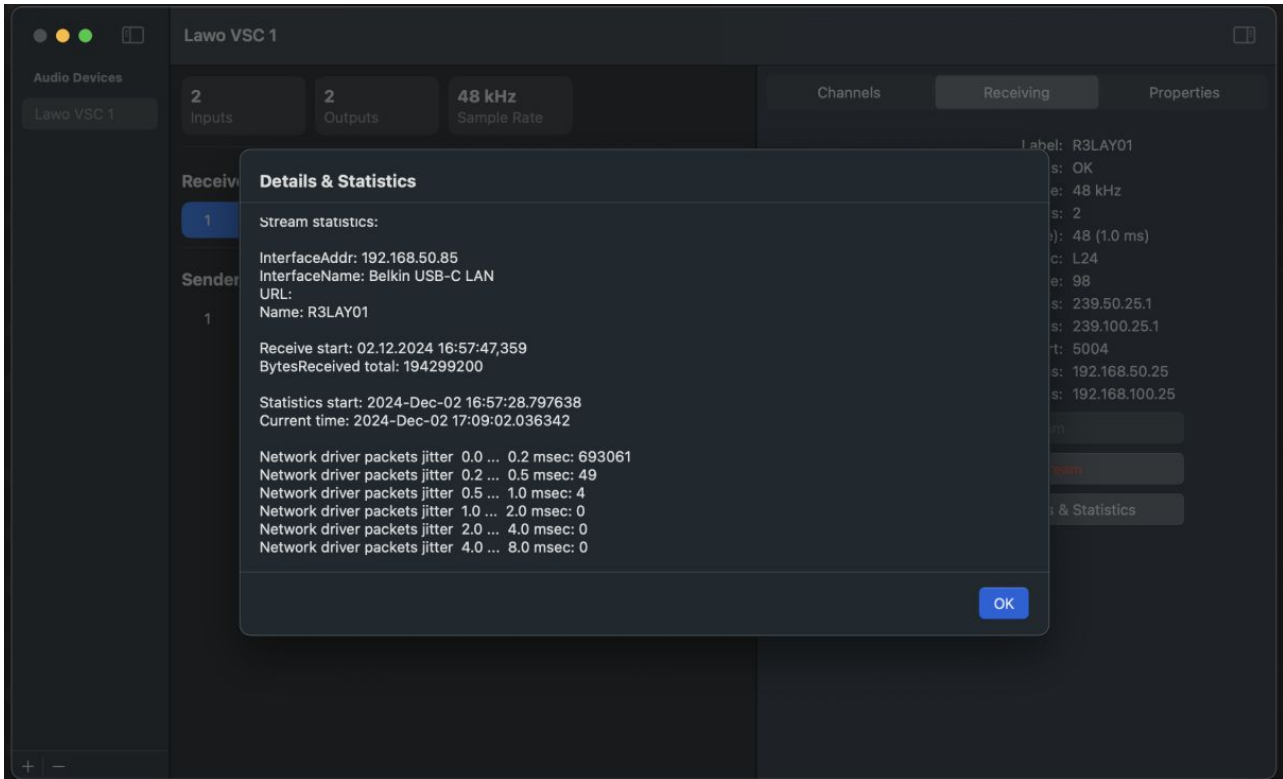
Disconnect Stream

Click on this option to disconnect the existing stream.

View Advanced Details & Statistics

Click on this option to open a dialog which shows more information and statistics about the connected stream. This can be useful for diagnostic purposes.

The information includes statistics about the network packets such as the amount of jitter.



Receiver Properties

In the current release, the **Properties** page is empty and has no function.

4.3 Lawo VSC - Sending Audio to the Network

To publish audio to the network, you must configure an audio device in Lawo VSC. Then assign the device to your local audio application.

The outgoing streams are available as soon as the audio device is configured. This means that they can be used by other receivers before a local application is connected. In this instance, the sender's audio channels are muted until the driver assignment is made.

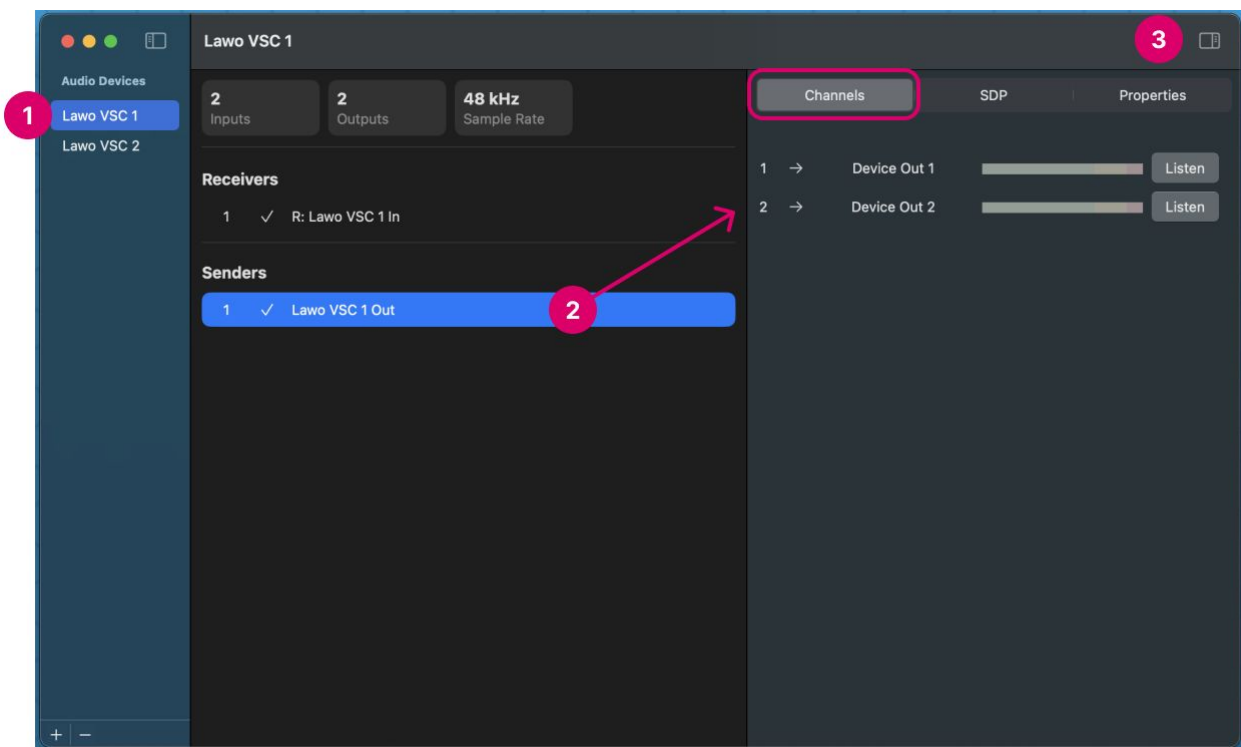
I/O Routing

There is no user-defined I/O routing in Lawo VSC and so the local audio application connects to the sender's audio channels on a 1:1 basis. If you wish to shuffle the audio channels, then this must be done in the external application.

Please note: Sample rate conversion (SRC) is applied automatically to the audio (as required). For example, if the sample rate of Lawo VSC is set to 48kHz and a 96kHz application is connected, then the audio from the application is down sampled and then encoded.

Checking the Audio Outputs

The Lawo VSC GUI can be used to check the audio carried by the outgoing streams on a channel-by-channel basis. This is done as follows.



1. Select the audio device in Lawo VSC (to reveal its **Receivers** and **Senders**).
 - The sender status should be ticked (to confirm that the stream setup is ok).
2. Select a sender (e.g. **Lawo VSC 1 Out**).
3. Click on the show side panel icon (to view the right-hand side panel) and select the **Channels** page.
 - If audio is present, then you will see the level on the meters.
 - Click on **Listen** to monitor a channel on the local playback device (defined in the '[Settings](#) → [General](#)' dialog).

If the audio device has multiple senders, then the number of the sender can be used to identify the channels. For example, if a 64 output device has 8 x 8-channel senders and you wish to check outputs 17-24, you will need to select sender 3.

Listen Function

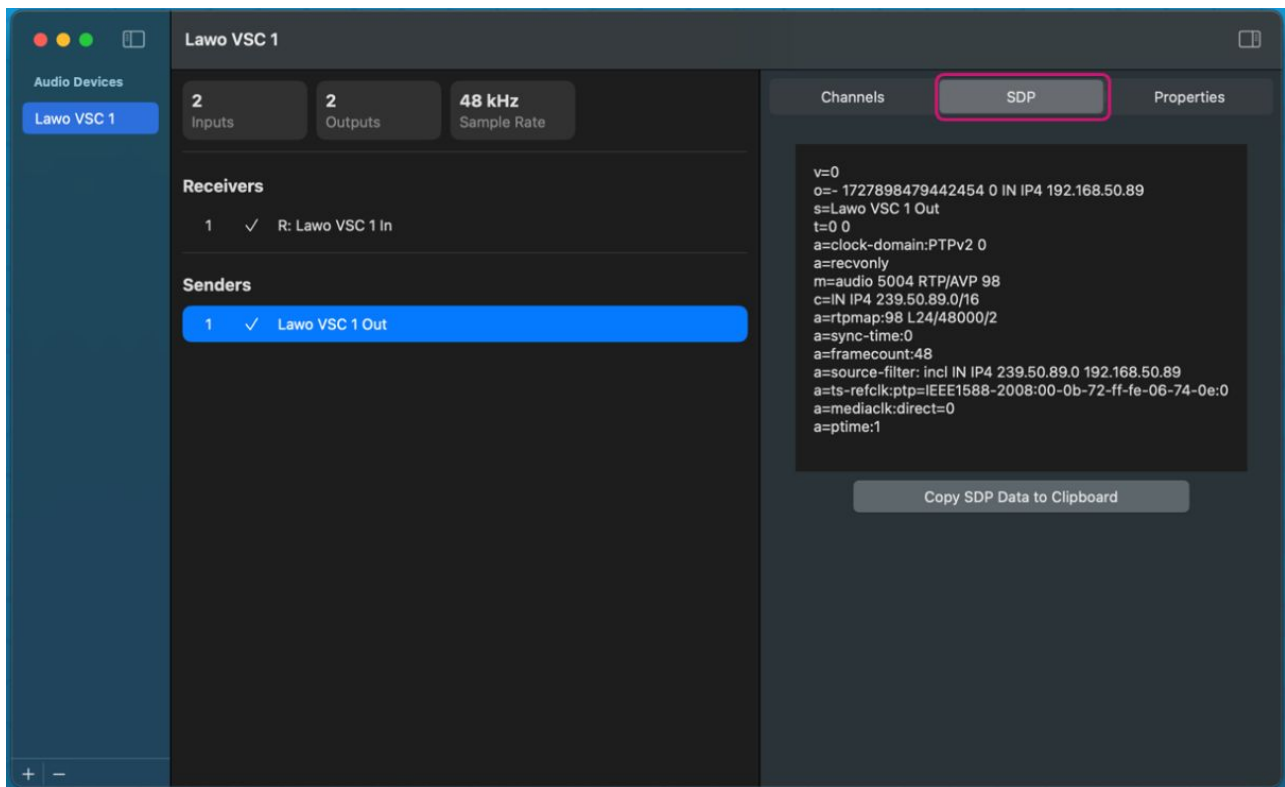
The **Listen** button can be used to check audio received from or sent to the network.

First, you must configure a local playback device using the **Play local audio through** and **Channels** options in the '[Settings](#) → [General](#)' dialog. You can choose any **Sound** device that is configured in your macOS system.

Then click on one of the **Listen** buttons (available for each channel). The audio is played out through the selected channels of the playback device.

SDP Functions

The **SDP** page shows the SDP data for the outgoing stream. This can be used to check the contents of the SDP data or copy the SDP to the clipboard (so that it can be used by another device/receiver).



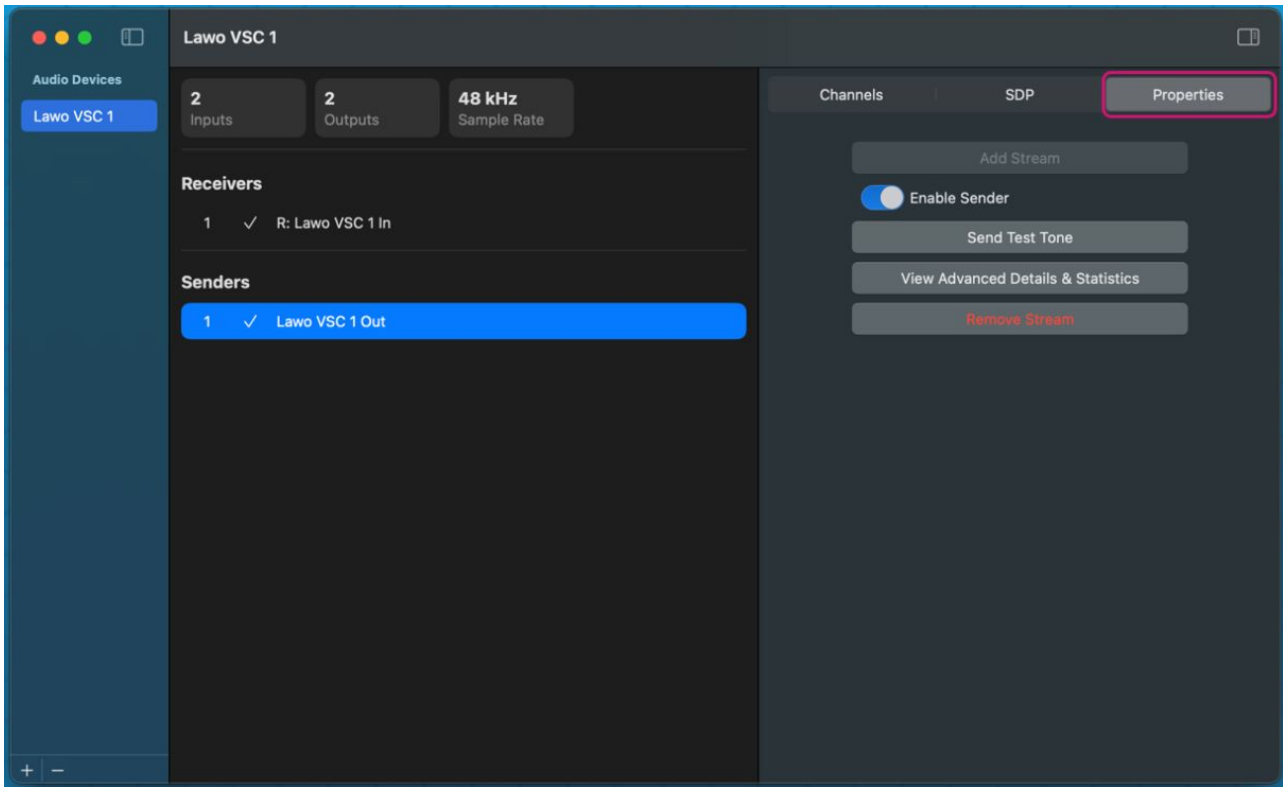
Copy SDP Data to Clipboard

Click on this button to copy the SDP data to the clipboard.

Once in the clipboard, the SDP can be saved as a text file (for backup purposes or transfer to another device). Or, pasted directly into a receiver (to setup a new streaming connection as described [earlier](#)).

Sender Properties

The **Properties** page can be used to access the sender properties. If an option is not supported, then it is greyed out.

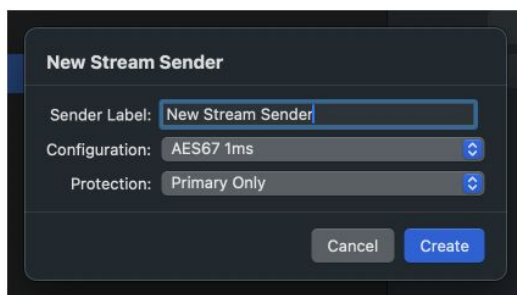


Add and Remove Stream

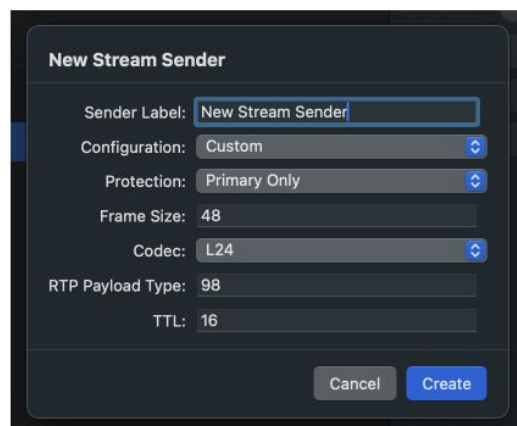
The **Remove Stream** option can be used to delete the selected sender. This can be useful if, for example, you want to change the configuration of the outgoing stream(s).

In this instance, click on **Remove Stream** to delete the existing sender. Once the sender is removed, it is possible to select the **Add Stream** option.

Click on **Add Stream** to open the 'New Stream Sender' dialog. Use the **Label**, **Configuration** and **Protection** fields to define the new sender. These options work in the same way as for a new audio device (as described in [Lawo VSC - Audio Device Configuration](#)).

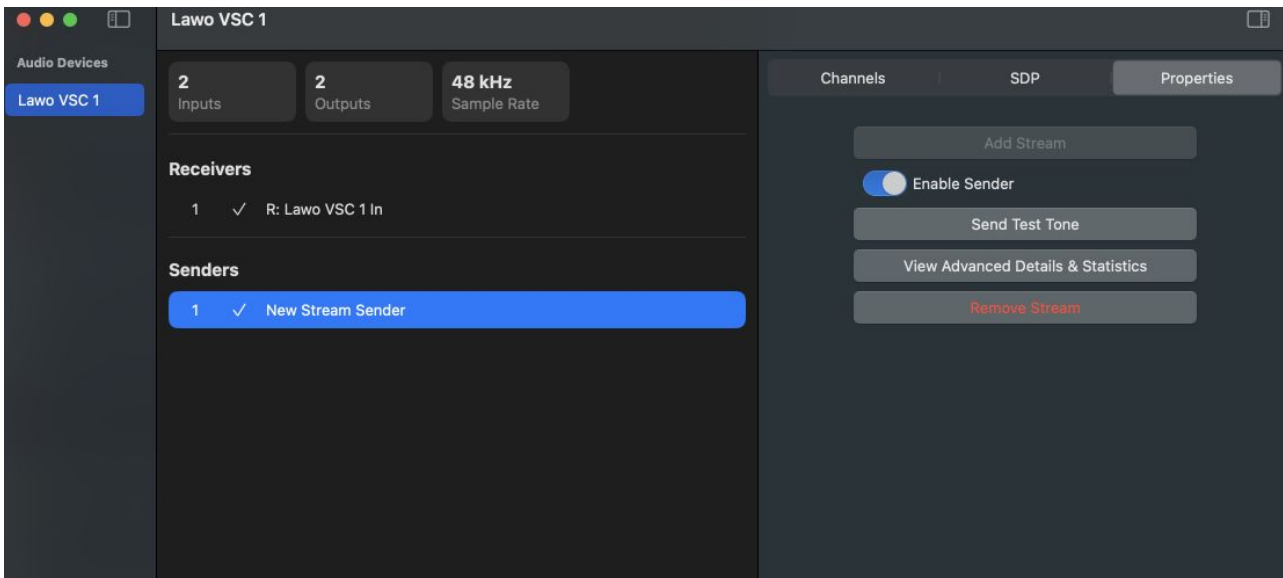


*Configuration = AES67 1ms
(advanced parameters are hidden)*



*Configuration = Custom
(advanced parameters are revealed)*

Once you are happy with the configuration, click on **Create** (to create the new sender). The stream is created and the list of **Senders** updates.



Enable Sender

Click on this option to enable or disable the outgoing stream. This can be used to remove the stream from the network on a temporary basis.

If you wish to remove the sender completely, then use **Remove Stream**.

Send Test Tone

The audio test tone generator can be used to line-check the audio path from a sender.

When enabled, the test tone is assigned to each channel of the stream in a cyclical manner - so tone appears on channel 1 for a few seconds, then on channel 2 and so on.

The generator produces a 1kHz sine wave test tone signal. The frequency is fixed and cannot be adjusted. The level is variable and can be adjusted in 1dB steps (from the '[Settings → General](#)' dialog). By default, the level is set to -18dBFS.

To use this function:

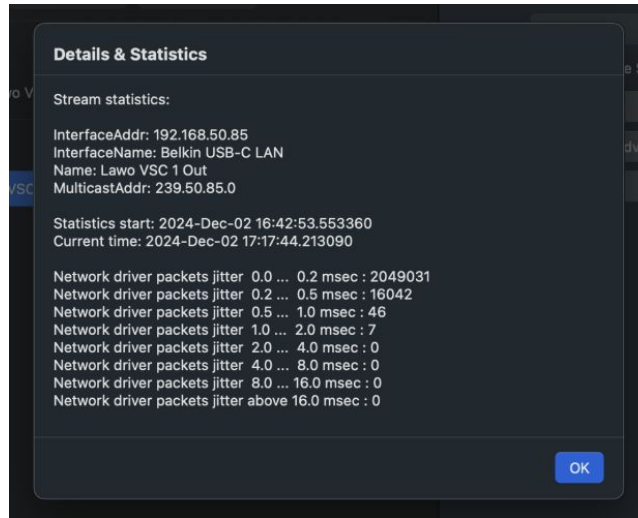
1. First, set the level of the test tone, using the **Test signal level** slider in the '[Settings → General](#)' dialog.
2. Select the audio device in Lawo VSC (to reveal its **Receivers** and **Senders**).
3. Select a sender (e.g. **Lawo VSC 1 Out**).
4. Click on the show side panel icon (to view the right-hand side panel) and select the **Properties** page
5. Click on the **Send Test Tone** button. The test tone is assigned to each channel of the selected sender in sequence. So, tone appears on channel 1 for a few seconds, then on channel 2 and so on until all channels are tested.
6. Remember to turn off the **Send Test Tone** button when the line check is complete.



View Advanced Details & Statistics

Click on this option to open a dialog which shows more information and statistics about the outgoing stream. This can be useful for diagnostic purposes.

The information includes the multicast IP address and statistics about the network packets such as the amount of jitter.

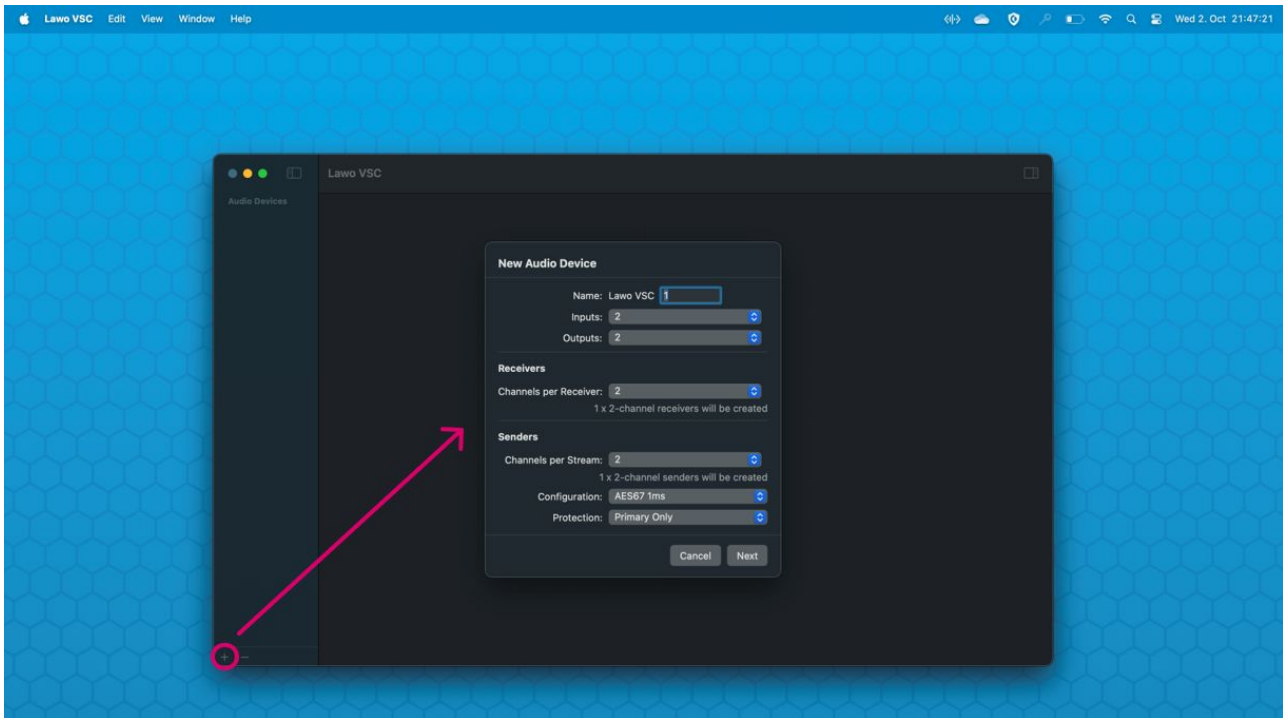


4.4 Lawo VSC - Audio Device Configuration

This topic provides more information about the audio devices in Lawo VSC.

New Audio Device - Configuration (Part 1)

The following fields are defined when you add a 'New Audio Device'.



Name

The **Name** identifies the audio device in Lawo VSC and in the macOS.

- The name always starts with "Lawo VSC"; this cannot be changed. The second part of the name can be edited.
- Although the name does not have to be unique, this is strongly recommended so that the device is easy to identify.

Inputs and Outputs

The **Inputs** and **Outputs** define how many mono inputs and outputs the device can handle. i.e. the I/O capacity of the audio driver.

- Please enter a value that meets the requirements of the local audio application/driver.
- In each case, the drop-down menu offers the following values: 0, 1, 2, 4, 8, 16, 32, 64 or 128.

Please note: To configure more than 2 inputs or outputs, you must be running the licenced version of Lawo VSC. If you are running the free version, then the '[Upgrade License](#)' dialog appears if you try to assign a higher value.

Channels per Receiver / Channels per Stream

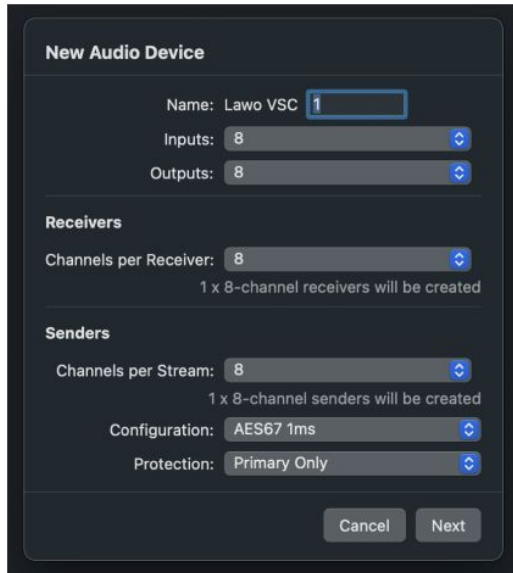
Once the **Inputs** and **Outputs** are defined, you can enter the number of **Channels per Receiver** and **Channels per Stream**.

- Once a value is selected, Lawo VSC calculates the number of senders (or receivers) and displays this below the corresponding field.
- In each case, the drop-down menu offers the following values: 0, 1, 2, 4, 8, 16, 32, 64 or 128.

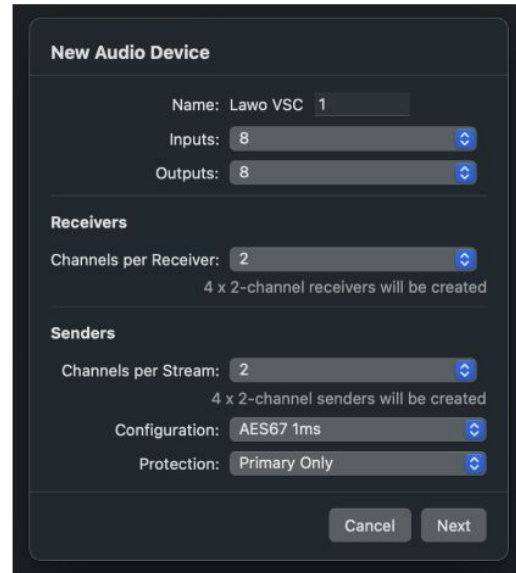
The **Channels per Receiver** sets the maximum number of channels that can be received. Once an incoming stream is connected, if there is a mismatch, then the incoming channels are received on a best-effort basis. For example:

- If a stereo stream is connected to an 8-channel receiver, then the two source channels are assigned to channels 1 and 2 of the receiver (and channels 3 to 8 of the receiver are unused).
- If a 64-channel stream is connected to an 8-channel receiver, then the first eight source channels are assigned to channels 1 to 8 of the receiver (and the remaining source channels from the incoming stream are unused).

The **Channels per Stream** defines the configuration of the outgoing stream(s). i.e. whether Lawo VSC creates a single multi-channel sender or splits the load into several smaller (2-channel) streams. The image below shows two possible configurations for an 8 in / 8 out device.



1 × 8-channel receiver & sender

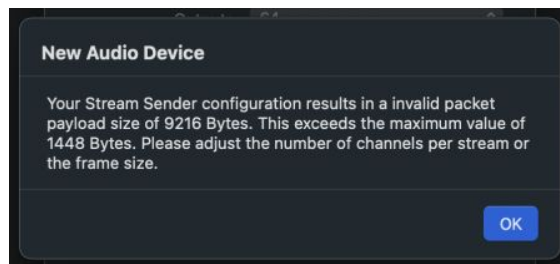


4 × 2-channel receivers & senders

When defining the **Channels per Stream**, it is important to consider the network bandwidth (of the NICs and media network).

i The resultant stream size is defined by the number of channels, codec type and frame size. This is important if network bandwidth is an issue. Thus, the network topology should be considered before defining the number of channels per stream.

If the value entered results in an invalid packet payload size, then the following message appears.



In this instance, select **OK** to clear the dialog. Then enter a different value for the **Channels per Stream** (or **Frame Size**). The **Frame Size** can be edited by defining a custom configuration (as described [later](#)).

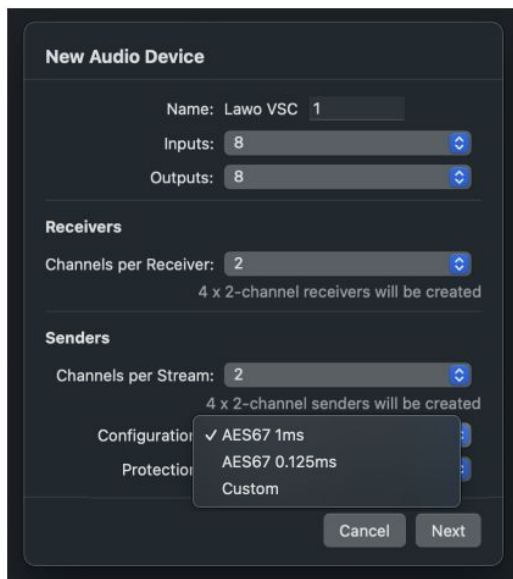
Configuration

The **Configuration** defines the advanced parameters for the outgoing stream(s). There are two ways to define the parameters: either automatically (by selecting an **AES67** preset) or manually (by selecting **Custom**).

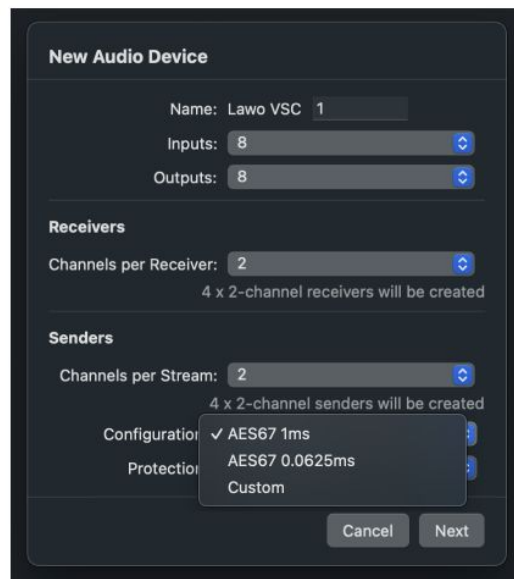
In most cases, it is recommended to accept the default preset (as this ensures that the streaming configuration is permitted, and that the streams are AES67-compliant). If you wish to change the streaming configuration, then choose an option from the drop-down menu (as shown below).

Please note:

- The available **AES67** presets are dependent on the number of **Channels per Stream** (to ensure that the resultant stream size is always permitted). For example, the **AES67 1ms** preset is not available for a 64-channel sender (as the stream size would be too large).
- The presets are named differently depending on the sample rate of the streams. In each case, the time specified refers to the packet time (per channel) of the resultant streams.
 - At 48kHz (or 44.1kHz), the options are: **AES67 1ms**, **AES67 0.125ms** or **Custom**.
 - At 96kHz, the second option changes to **AES67 0.0625ms**.



Configuration options (at 48kHz)



Configuration options (at 96kHz)

Using the Presets (for AES67 Compliance)

To ensure that all outgoing streams are AES67-compliant, it is recommended to set the **Configuration** to one of the **AES67** presets. The number of presets on offer are dependent on the number of channels per stream (to avoid an invalid packet payload size).

The packet time is included in the preset name to help you choose the correct option for your network. For example, the **AES67 1ms** preset delivers streams with a packet time of 1ms (per channel).

When operating at 48kHz, the packet time (and equivalent frame size) values are as follows:

- **AES67 1ms** = 48 samples (per channel).
- **AES67 0.125ms** = 6 samples (per channel).

At 96kHz, this changes to:

- **AES67 1ms** = 96 samples (per channel).
- **AES67 0.0625ms** = 6 samples (per channel).

If you choose a shorter packet time (smaller frame size), then the device transmits its packets more frequently. This results in a lower sending latency, but also a higher demand on the network's bandwidth.

In each case, the remaining parameters are set to the following values:

- **Codec** = L24
- **RTP Payload Type** = 98

- **TTL** = 16
- **Mode** = Multicast

The example below shows how the configuration looks if you choose the **AES67 1ms** preset and then switch to **Custom** mode.

The screenshot shows the 'New Audio Device' configuration window. The 'Name' is 'Lawo VSC 1', 'Inputs' is 8, and 'Outputs' is 8. Under 'Receivers', 'Channels per Receiver' is 2, with a note '4 x 2-channel receivers will be created'. Under 'Senders', 'Channels per Stream' is 2, with a note '4 x 2-channel senders will be created'. The 'Configuration' dropdown is set to 'AES67 1ms' and is highlighted with a red circle. 'Protection' is set to 'Primary Only'. 'Cancel' and 'Next' buttons are at the bottom.

*Configuration = AES67 1ms
(advanced parameters are hidden)*

The screenshot shows the 'New Audio Device' configuration window with 'Configuration' set to 'Custom'. The 'Configuration' dropdown is highlighted with a red circle. A larger red circle highlights the advanced parameters: 'Frame Size' (48), 'Codec' (L24), 'RTP Payload Type' (98), 'TTL' (16), and 'Mode' (Multicast). 'Protection' is still 'Primary Only'. 'Cancel' and 'Next' buttons are at the bottom.

*Configuration = Custom
(advanced parameters are revealed)*

Custom Configuration

When the **Configuration** is set to **Custom**, the advanced parameters are revealed: **Frame Size**, **Codec**, **RTP Payload Type**, **TTL** and **Mode** (Multicast or Unicast). This makes it possible to define the streaming configuration manually.

The advanced parameters can be edited in the same manner as for other Lawo streaming devices. For more information, please see [Lawo VSC - Sender Parameters](#).

For now, it is useful to know that:

- In **Custom** mode, each parameter can be set to any possible value. This means that the resultant streams may not be AES67-compliant.
- If an invalid combination of **Channels per Stream**, **Codec** and **Frame Size**, then the "invalid packet payload size" warning message appears (as described [earlier](#)).
- You can reset the parameter values by returning the **Configuration** to one of the **AES67** presets.

Protection

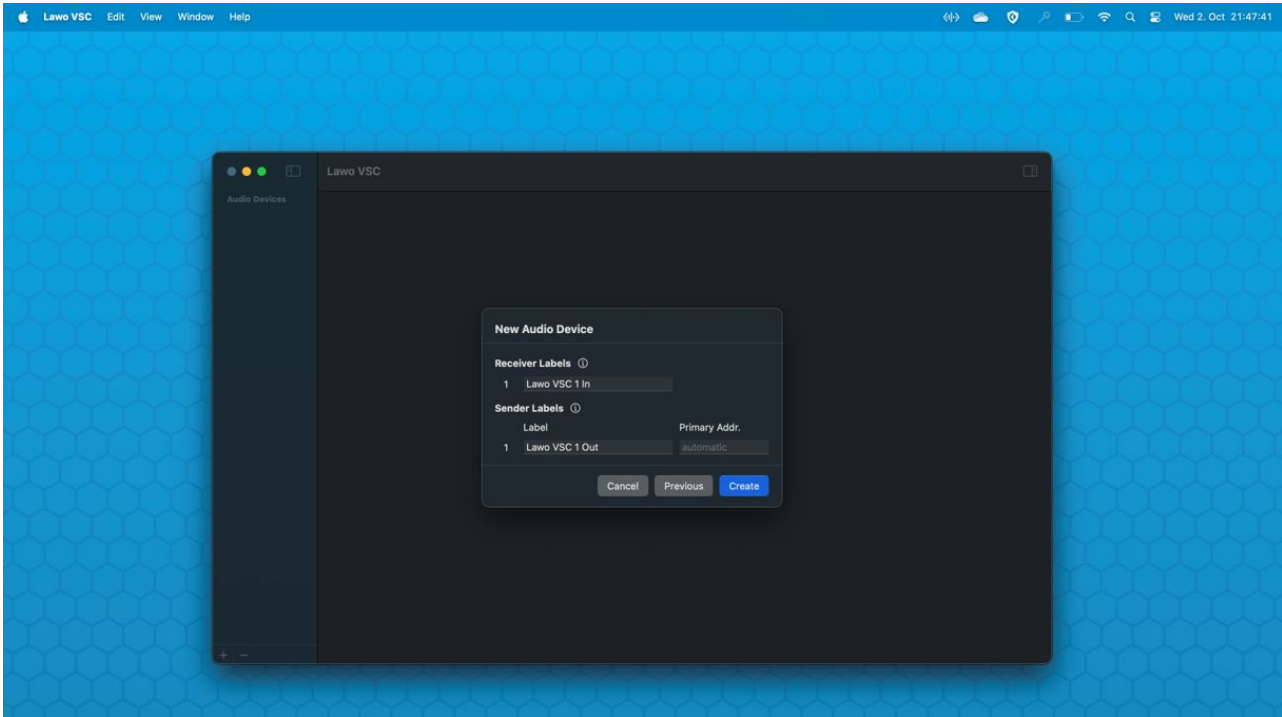
The **Protection** field defines the network interface(s) used to transmit the streams.

- By default, **Primary Only** is selected (to be compatible with the free version of Lawo VSC).
- To create redundant streams, compatible with SMPTE ST2022-7, you must change this option to **Dual Redundant**.

Please note: To support the **Dual Redundant** protection mode, you must [upgrade](#) to the licensed version of Lawo VSC. Then, assign a secondary streaming interface using the **NIC 2** field in the '[Settings](#) → [Streaming](#)' dialog.

New Audio Device - Configuration (Part 2)

At the next screen, you are asked to label the receivers and senders, and define a multicast IP address and port number for each of the outgoing streams.



Receiver and Sender Labels

The labels identify the receiver(s) and stream(s) to other network users. The label fields cannot be left blank, and cannot be edited once you have created the audio device.

To save time, it is recommended to use the default labels. These start with the device name (entered earlier).

If there is more than one receiver or sender, then the labels end in a number that increments automatically. Thus, the default labels are:

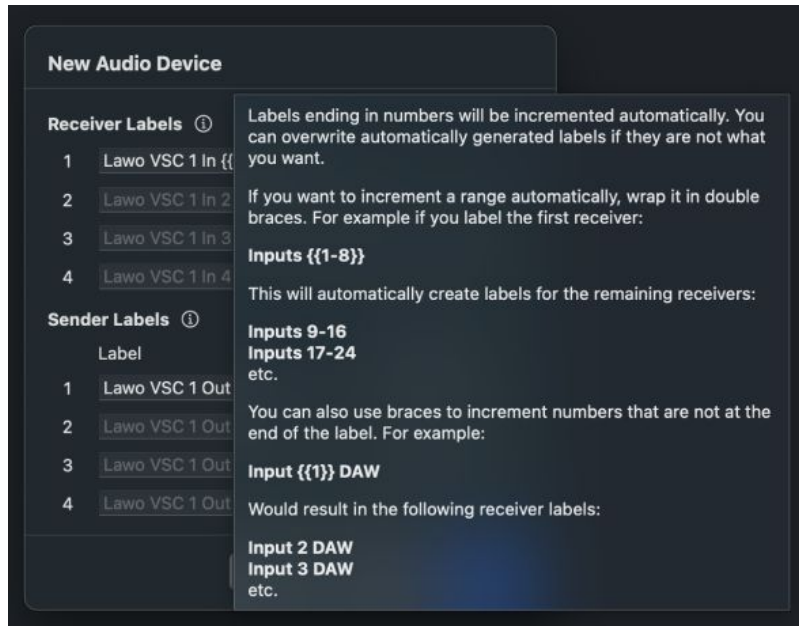
- **<device name> In n** - for receivers.
- **<device name> Out n** - for senders.

The default labels can be overwritten by typing into the fields.

i The identifier string must not contain the character "/" (ASCII/UTF-8: 47) and must begin with a letter or the lower line character "a"-"z", "A"-"Z", "_" (ASCII/UTF-8: 65-90, 97-122 ,95).

Each label must not exceed 28 characters.

To speed up the labelling for multiple receivers or senders, double braces can be used to automatically increment a number or range. Click on the **i** icon to open an "information" dialog that explains how to use this shortcut.



Sender Multicast IP Addresses & UDP Port Number

Beside the sender labels, the **Primary Addr.** field determines how the multicast IP addresses are created. There are two possibilities: either automatic or manual.

If you leave the field empty, then the stream will be allocated an automatic multicast IP address. In this instance:

- The pattern used to generate the multicast IP addresses can be edited from the 'Settings → Streaming' dialog.
- You can check the allocated address once the stream is created by opening the SDP data for the stream.

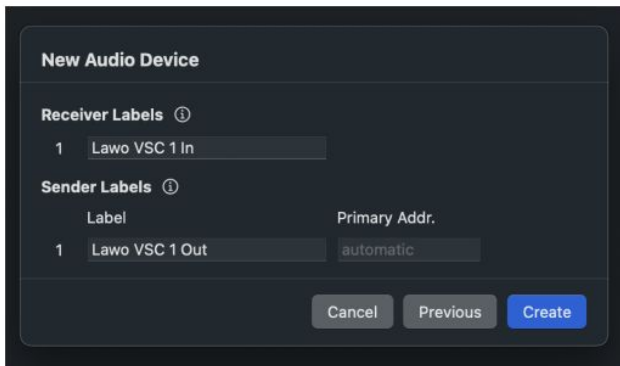
If your network supports a limited IP range, then you may wish to assign a multicast IP address manually. In this instance, type the required values into the corresponding fields.

Please note: The **Protection** option (defined earlier) determines how many address fields are visible. For example:

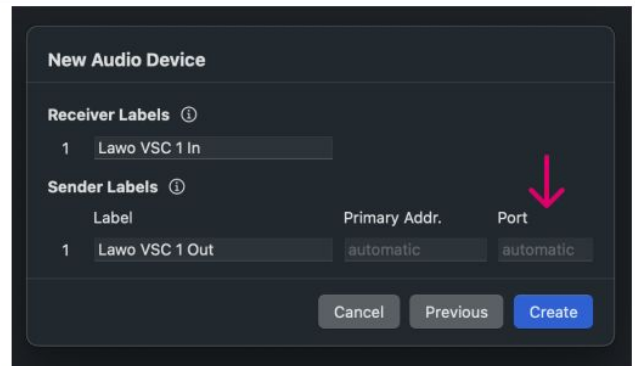
- If the **Protection** is set to **Dual Redundant**, then both the **Primary Addr.** and **Secondary Addr.** must be defined.
- If the **Protection** is set to **Primary Only** or **Secondary Only**, then only one address is required.

By default, the UDP port number for all streams is set to 5004. This can be edited on a per stream basis by turning on the **Enable definable port per stream** option (in the 'Settings → Advanced' dialog).

Once enabled, the **Port** field becomes visible (as shown below).



Definable port per stream (disabled)



Definable port per stream (enabled)

This can be used to enter a port number for each individual stream. If nothing is entered, then "automatic" is displayed and the default port number (5004) is used.

4.5 Lawo VSC - Sender Parameters

The following parameters are defined when you create a [new audio device](#) or a [new stream sender](#).

To make Lawo VSC easy to configure, most of the parameters are hidden from view unless you select **Custom** (in the **Configuration** field) to reveal the advanced parameters.

The parameters can also be viewed from HOME if [HOME integration](#) is configured.

i The "Label", "Media Interface" and "Protection" fields cannot be modified once a stream is created.

Label

The **Sender Label** identifies the stream to other network users. It cannot be left blank and cannot be edited once you have created the stream.

The identifier string must not contain the character "/" (ASCII/UTF-8: 47) and must begin with a letter or the lower line character "a"-"z", "A"-"Z", "_" (ASCII/UTF-8: 65-90, 97-122, 95).

Sender labels must not exceed 28 characters.

Media Interface & Protection

These fields determine which interface, or interfaces, will be used to transmit the stream to the network.

To create SMPTE ST2022-7 compatible streams, the "Protection" field must be set to **Dual Redundant** to activate both interfaces. If redundant streaming is not required, then you can choose to issue the stream from either the **Primary** or **Secondary** interface.

Channels

This value sets the number of audio channels to be encoded.

Sample Rate

This field is for information only. It describes the sample rate (fs).

Frame Size (Packet Time)

The frame size sets the number of samples per channel per network packet, and defines the packet time (in seconds). The default value = 6 samples (equivalent to 125 μ s when the sample rate is 48kHz).

The smaller the value, the more often the device transmits packets. This results in a lower sending latency, but also a higher demand on the network's bandwidth. In Lawo devices, the frame size limits the number of senders that can be created by each device.

Codec

This field selects the encoding method used for the digital audio. There are three possible options. The default value = L24.

- L16 = 16-bit Linear PCM
- L24 = 24-bit Linear PCM
- AM824 = 24-bit Linear PCM + 8-bit metadata, a non-standard format commonly used in AES/EBU.



TTL (Time to Live)

The TTL value can be used to prevent data packets from circulating indefinitely. The default value = 16.

You may need to increase the TTL value if your network includes several Layer 3 network switches (Gateways).

RTP Payload Type

This field describes the format of the transported content. The default value = 98.

Primary / Secondary Multicast Address & Destination UDP Port

These fields show the multicast IP addresses and UDP port assigned to the stream. By default, when you create a new stream, the multicast addresses are assigned automatically and the UDP port value is set to 5004.

If you wish to assign a multicast IP address and port manually, then type the required values into the corresponding fields.

Primary / Secondary Source Address

These fields are for information only. They show the IP address of the multicast address provider (used in auto mode).

4.6 Lawo VSC - Receiver Parameters

The following parameters are defined when you create a [new audio device](#).

To make Lawo VSC easy to configure, most of the parameters are hidden from view and calculated for you from the audio device configuration.

The parameters can be viewed from HOME if [HOME integration](#) is configured.

i The "Label", "Media Interface", "Protection" and "Max Receivable Channels" fields cannot be modified once a receiver is created.

Label

The **Receiver Label** identifies the receiver within the network. It cannot be left blank and cannot be edited once you have created the receiver.

The identifier string must not contain the character "/" (ASCII/UTF-8: 47) and must begin with a letter or the lower line character "a"-"z", "A"-"Z", "_" (ASCII/UTF-8: 65-90, 97-122, 95).

Receiver labels must not exceed 28 characters.

Media Interface & Protection

These fields determine which interface, or interfaces, will be used to receive the connected stream from the network.

By default, all new receivers are configured to use two network ports in **Dual Redundant** mode so that they can accept two SMPTE ST2022-7 compatible streams (for redundant streaming). You can choose to receive these streams non-redundantly by choosing either **Primary Only** or **Secondary Only**.

If the connected stream's SDP is not SMPTE ST2022-7 compatible, then the "Protection" field is set to **Primary Only** (by default). In this instance, you can change the receiver port to **Secondary Only** if needed.

Max Receivable Channels

This value sets the maximum number of channels that can be received. Once an incoming stream is connected, if there is a mismatch, then the incoming channels are received on a best-effort basis. For example:

- If a stereo stream is connected to an 8-channel receiver, then only the first two channels of the receiver are used.
- If a 64-channel stream is connected to an 8-channel receiver, then channels 1 to 8 are assigned to the receiver and channels 9 to 64 are unused.

Syntonized vs Synchronized Mode

In the current release, Lawo VSC always operates in syntonized mode.

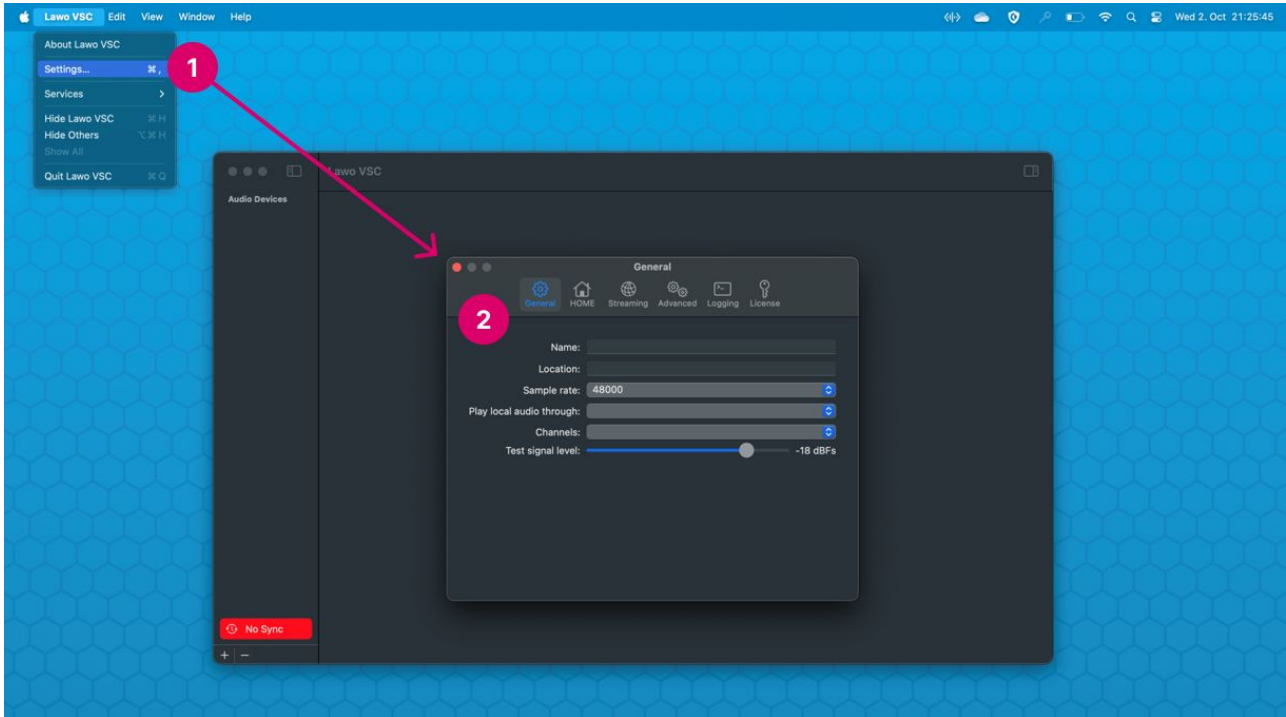
Please note: If you view the Lawo VSC receiver parameters in the HOME UI, then you will see two options for **Syntonized** and **Delay Relative to Source Timestamp**. In the current release, these fields have no meaning for Lawo VSC.

5 Lawo VSC - Settings

This chapter describes the application's global settings.

1. With Lawo VSC in focus, select **Settings** from the app menu.

The 'Settings' dialog opens to the **General** settings page.



2. Select a tab to change the page and edit the settings.

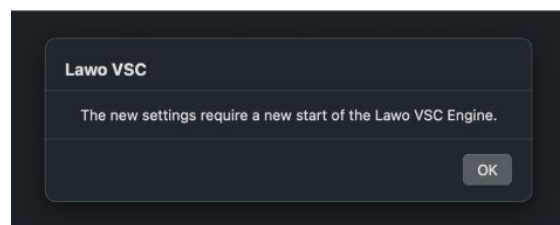
Please note: Changes are only applied once you close the 'Settings' dialog.

In the current release, there are six pages/tabs:

- **General** - general properties for Lawo VSC such as its network name and location, sample rate, local audio playback device and test tone level.
- **HOME** - defines the HOME network connection (if HOME integration is required).
- **Streaming** - global settings for streaming including the network interface(s) and sync mode.
- **Advanced** - advanced options for Lawo VSC.
- **Logging** - access to the software's logfiles (useful for diagnostics).
- **License** - can be used to switch between the free and licensed versions of Lawo VSC.

3. Once you are happy with the settings, click on the red circle (top left) to close the dialog (and save any changes).

If a restart of the Audio Engine is required, then the following message appears.



4. Select **OK** to confirm - the Lawo VSC Engine restarts and the new settings are applied.



All settings are stored with the rest of the configuration, see [Saving the Configuration](#).

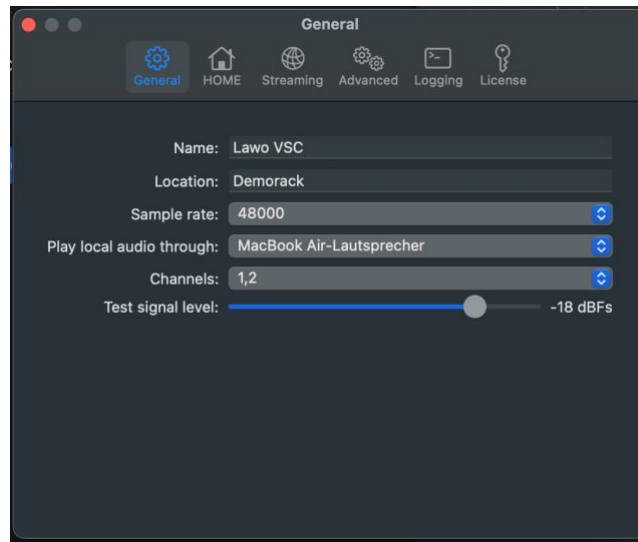


The rest of this chapter describes each page of settings.

- [Lawo VSC - General Settings](#)
- [Lawo VSC - HOME Settings](#)
- [Lawo VSC - Streaming Settings](#)
- [Lawo VSC - Advanced Settings](#)
- [Lawo VSC - Logging](#)
- [Lawo VSC - Use License](#)

5.1 Lawo VSC - General Settings

The **Settings** → **General** dialog defines the general properties for Lawo VSC such as its network name and location, sample rate, local audio playback device and test tone level.



Name and Location

These fields define a network name and location for Lawo VSC.

- They are used if Lawo VSC is connected to a HOME system (to identify the Lawo VSC instance in HOME's [Devices list](#)).
- They are also displayed in Lawo's VSC's Ember+ Tree.

If the fields are left blank, then the domain name of the computer is used.

For more information about using Lawo VSC with HOME, please see [Lawo VSC - Integration with HOME](#).

Sample Rate

This field defines the sample rate of Lawo VSC's Audio Engine which, in turn, determines the default sample rate used for the outgoing streams.

There are three possible options: **48000** (48kHz), **44100** (44.1kHz) or **96000** (96kHz).

Play Local audio through and Channels

These fields define the playback device used for the [prelisten](#) function.

- Start by selecting a device from the **Play local audio through** drop-down menu. You can choose any **Sound** device that is configured in your macOS system.
- Then use the **Channels** drop-down menu to define the channels used to output the audio. The options that appear here depend on the device selected in step 1.

To test the audio, select either a sender or receiver (from the main GUI); open the right-hand side panel and select the **Channels** tab; choose a channel where there is audio present on the meters and click on **Listen**.

Test signal level

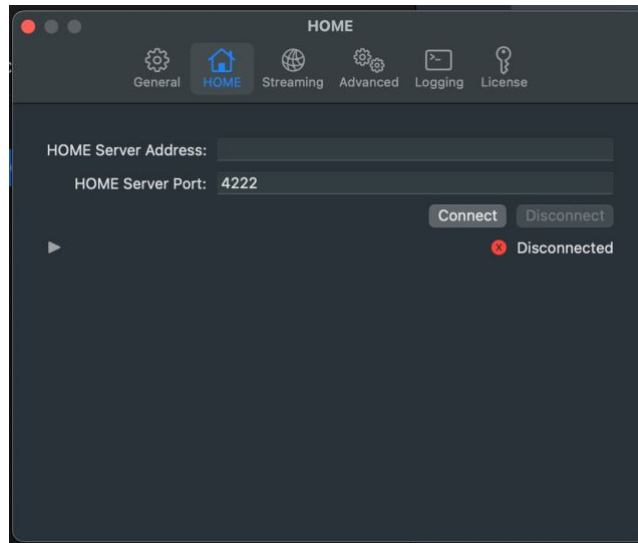
This field defines the level of the [test tone generator](#).

Click and drag on the slider to adjust the level. The level can be adjusted in 1dB steps. By default, the level is set to -18dBFS.

5.2 Lawo VSC - HOME Settings

The **Settings** → **HOME** dialog can be used to define a network connection to a HOME system.

There are two fields (to define the HOME server IP settings) and a button to **Connect** or **Disconnect** from HOME.



HOME Server Address

This field defines the IP address of the HOME system.

HOME Server Port

This field cannot be edited and is for information only. It shows the port number used by the HOME system server(s).

Connect (or Disconnect)

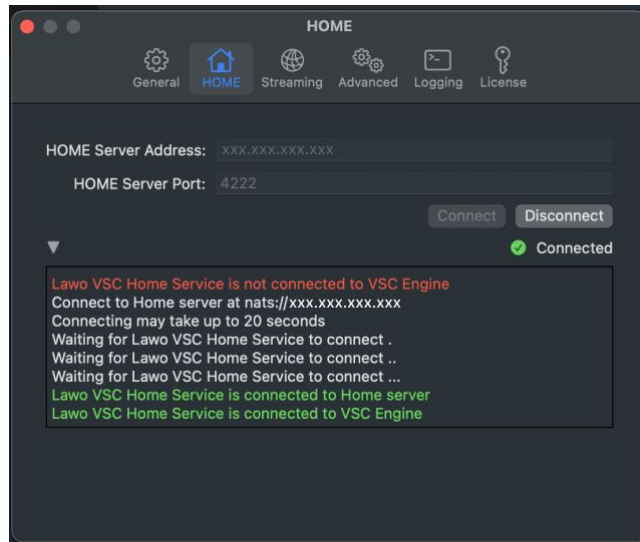
After an IP address has been entered, you can use this button to **Connect** (or **Disconnect**) Lawo VSC from the HOME system.

Connection Status & Diagnostics

The current status of the connection to HOME is displayed under the **Connect/Disconnect** buttons. There are two possible states: **Connected** or **Disconnected**.

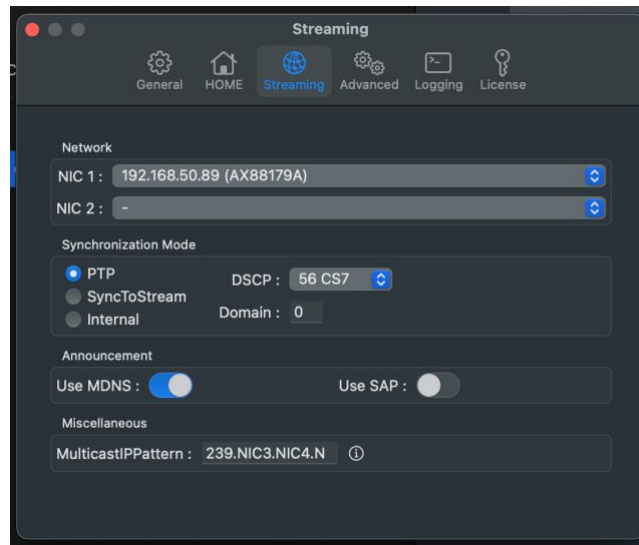
If you click on the triangle (reveal) icon, then additional information is displayed about the network connection to HOME. This can be useful for diagnostic purposes.

An example with a valid connection to HOME is shown below.



5.3 Lawo VSC - Streaming Settings

The **Settings** → **Streaming** dialog defines the global options for streaming.



NIC 1 and NIC 2

These fields define the network interface(s) for streaming: **NIC 1** = primary, **NIC 2** = secondary.

If a single interface is defined, then Lawo VSC can send and receive non-redundant streams only.

If you wish to support redundant streams, compatible with SMPTE ST2022-7, then both **NIC 1** and **NIC 2** must be defined.

Please note: To configure **NIC 2**, you must be running the licenced version of Lawo VSC. If you are running the free version, then the '[Upgrade License](#)' dialog appears if you try to assign **NIC 2**.

In each case, you can select any available network interface fitted to your macOS system. Choose the interface(s) that are connected to your media network.

Synchronization Mode

See [Lawo VSC - Synchronization](#).

Announcement

The next two options can be used to enable stream announcements.

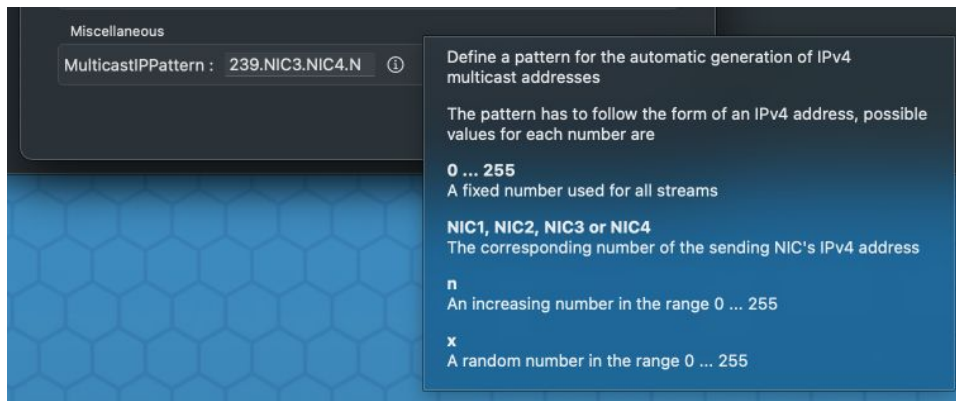
There are two possibilities: **Use MDNS** and/or **Use SAP**. The correct option(s) will depend on the requirements of your network.

Please note: The stream announcement settings are global. It is not possible to enable MDNS or SAP on a per stream basis.

MulticastIPPattern

This field defines the Multicast IP Pattern used during the creation of the streams. The pattern is used when the **Primary Addr** (and **Secondary Addr**) fields in the '[New Audio Device](#)' dialog are set to "automatic".

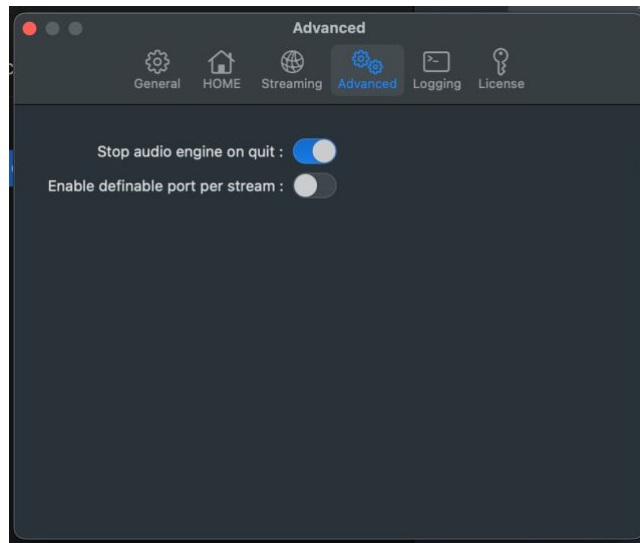
Click on the **i** icon to open an 'information' dialog that explains the format of the pattern.



To edit the pattern, type a valid IPv4 address into the field.

5.4 Lawo VSC - Advanced Settings

The **Settings** → **Advanced** dialog contains two advanced options.



Stop audio engine on quit

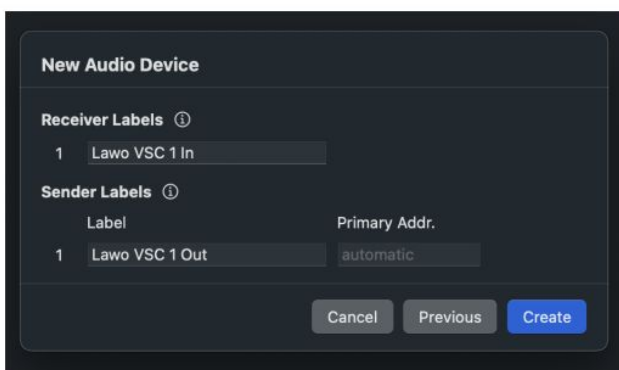
This option determines what happens to the streams and audio devices when you quit the application.

- When enabled, Lawo VSC stops streaming when the application quits (and will only start streaming again once the application restarts).
This is ideal if you wish to control whether the streams and sound devices are available by opening and closing the app. Note that connections can only be re-instated if the relevant streams are available on the network and Lawo VSC has valid sync.
- If the option is disabled, then the streams and audio devices remain available after the application quits.
This can be useful if you have a fixed configuration that you wish to remain in place (at all times). You can check the status of the background services from the [Status Menu](#). In this instance, to stop the Lawo VSC streams: either stop the Audio Engine manually or re-open the app, toggle the option back on and then quit.

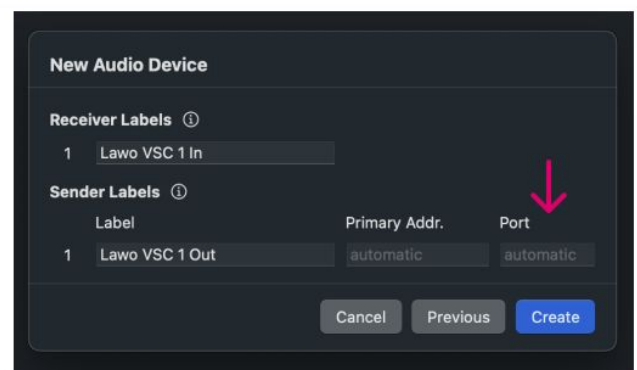
Enable definable Port per Stream

This option determines whether a UDP port number can be configured, individually, for each outgoing stream. It affects whether the **Port** field is visible in the '[New Audio Device](#)' dialog (as shown below).

- When disabled, all streams are set to the default port number (5004), and the **Port** field is hidden from view.
- If the option is enabled, then the **Port** field becomes visible. This can be used to enter a port number for each individual stream. If nothing is entered, then "automatic" is displayed and the default port number (5004) is used.



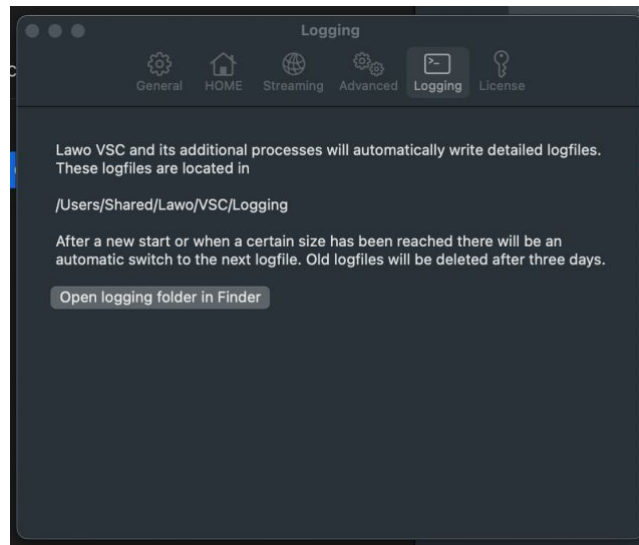
Definable port per stream (disabled)



Definable port per stream (enabled)

5.5 Lawo VSC - Logging

The **Settings** → **Logging** dialog provides access to the software's logfiles.



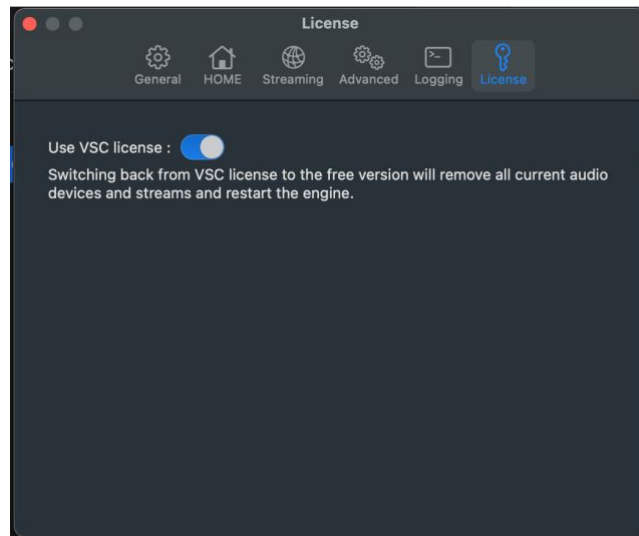
The text describes where to find the logfiles and how they are managed.

Open logging folder in Finder

This button can be used to open the logging folder in a macOS Finder window.

5.6 Lawo VSC - Use License

The **Settings** → **License** tab has a single option: **Use VSC license**.



Use VSC license

This option can be used to switch between the free and licensed versions of Lawo VSC.

- When **Use VSC License** is turned on, Lawo VSC switches to the licensed version. This unlocks the full functionality of the app and starts a new grace period.
- When **Use VSC License** is turned off, Lawo VSC switches back to the free version. If you have audio devices and streams configured, then these are removed.

Turning off the **Use VSC License** option can be useful to reset to an empty configuration (with no audio devices or streams).

For more information about the licensed versions, please see [Lawo VSC - License Activation](#).

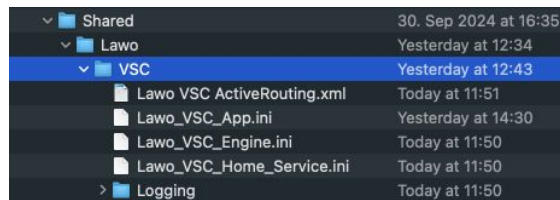
6 Lawo VSC - Saving the Configuration

The Lawo VSC configuration is stored locally on the host computer each time you quit the application or shut down the host computer.

6.1 What is Saved?

The complete configuration is saved, including all audio devices (and their stream setups) and all settings defined in the [Settings](#) dialog.

The data is stored in several files in the "/User/Shared/Lawo/VSC" folder.



If you wish to backup or transfer the configuration to a different computer, then please copy and paste the complete folder.

6.2 Restarting the App

When you quit the application, the behaviour of the streams and audio devices is dependent on the **Stop Audio Engine on Quit** option (in the [Settings](#) → [Advanced](#) tab).

- When enabled, Lawo VSC stops streaming when the application quits (and will only start streaming again once the application restarts).
This is ideal if you wish to control whether the streams and sound devices are available by opening and closing the app. Note that connections can only be re-instated if the relevant streams are available on the network and Lawo VSC has valid sync.
- If the option is disabled, then the streams and audio devices remain available after the application quits.
This can be useful if you have a fixed configuration that you wish to remain in place (at all times). You can check the status of the background services from the [Status Menu](#). In this instance, to stop the Lawo VSC streams: either stop the Audio Engine manually or re-open the app, toggle the option back on and then quit.



7 Lawo VSC - Integration with HOME

This chapter describes how to use Lawo VSC with a HOME system.

- [Lawo VSC - HOME Integration](#)
- [Lawo VSC - HOME Integration Setup](#)
- [Lawo VSC - Device Settings \(in HOME\)](#)

7.1 Lawo VSC - HOME Integration

Before setting up the integration, it is useful to understand how the Lawo VSC computer (and its receivers and senders) appear in the HOME UI.

Overview

Lawo VSC supports native integration with HOME, Lawo's management platform for IP-based media infrastructures.

If HOME integration is configured, then Lawo VSC appears as a device (in HOME's Devices list) and its streams can be patched to other hardware and software devices on the network (using HOME's Stream Routing page).

While Lawo VSC is fully integrated into HOME, it does not support all of the possibilities offered by HOME. The main points to note are:

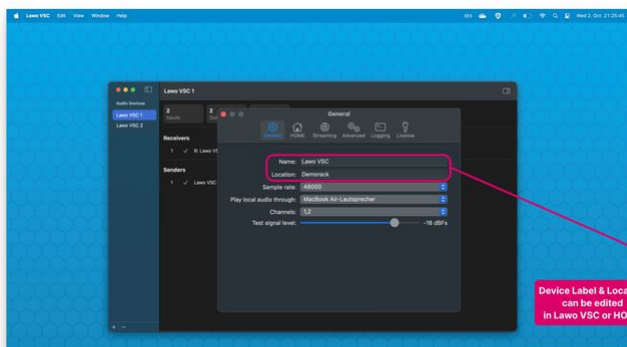
- The complete stream configuration is done within Lawo VSC and not in HOME. This means that, from HOME, you cannot add a new sender or receiver, or edit the stream parameters (and so these options are greyed out in the HOME UI).
- The same applies to the I/O Routing (as there is a fixed 1:1 assignment from the audio device to its local audio application).
- The Stream Routing works as expected.

For more information about the general operation of HOME, please see the "HOME User Manual" (available [here](#)).

The Devices List

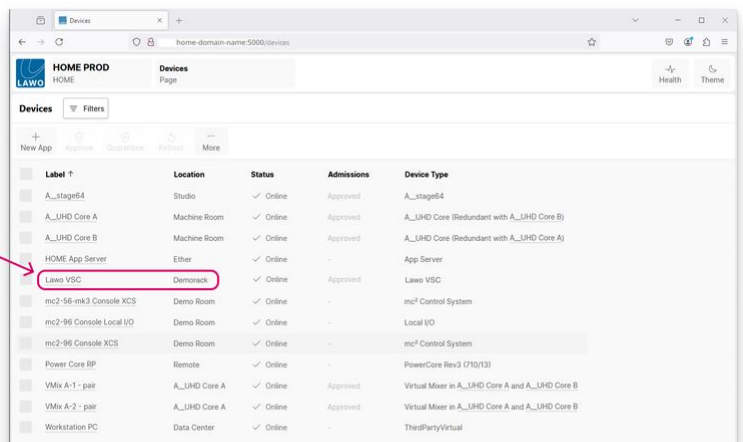
Firstly, each Lawo VSC computer is a streaming device that appears in HOME's 'Devices' list.

The device **Label** and **Location** (displayed in HOME) are taken from the **Name** and **Location** fields (defined in the 'Settings → General' dialog). Note that the label and location can be edited either from Lawo VSC or HOME.



Lawo VSC: Settings → General

Device Label & Location can be edited in Lawo VSC or HOME



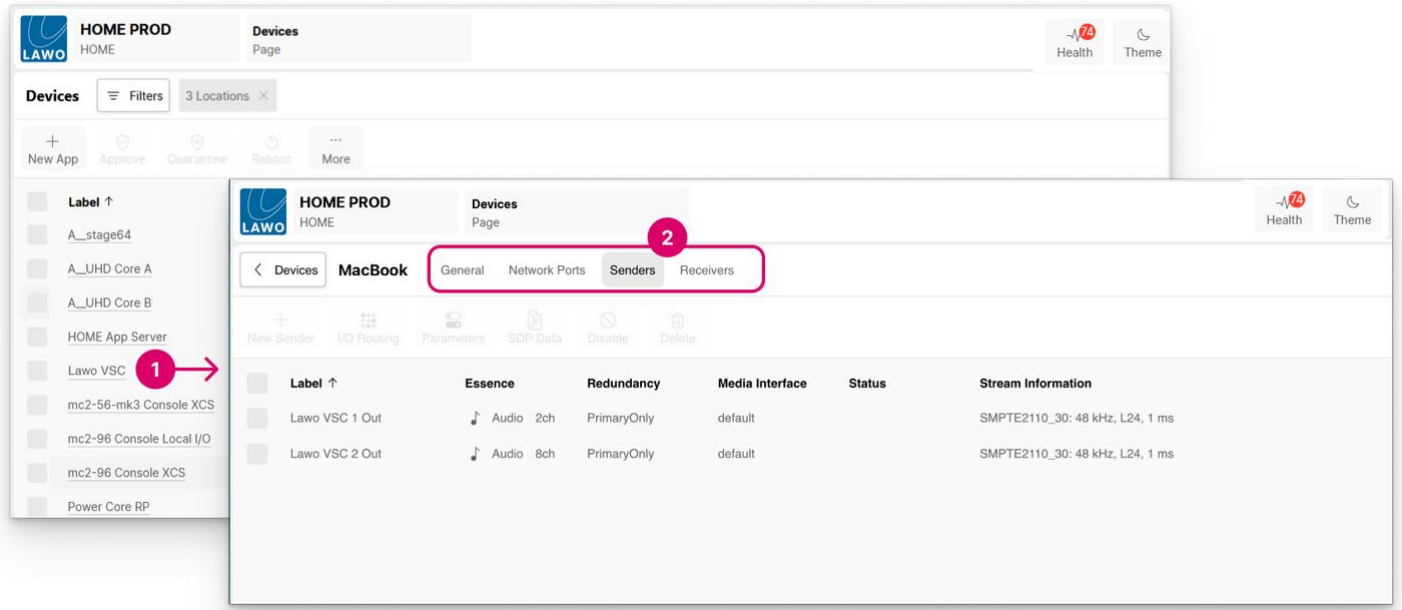
HOME: Devices list

IP Senders and Receivers

Secondly, each audio device configured in Lawo VSC has some senders and receivers. The number, and their configuration, is defined when you add a new audio device (in Lawo VSC).

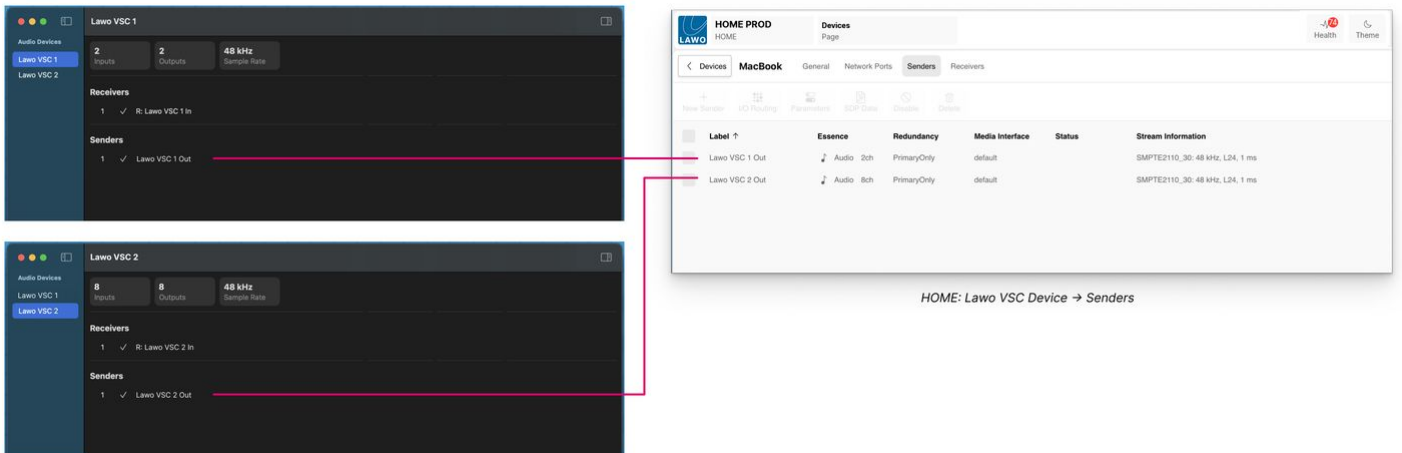
In HOME, you can view all of the available senders (or receivers) as follows:

1. Click on the Lawo VSC device label (to open the 'Device Details' pages).
2. Select the **Senders** (or **Receivers**) tab.
3. The page lists all of the senders (or receivers) that are configured in Lawo VSC.



In our example, there are two audio devices, each with a single sender. Thus, in HOME, there are two sending streams: **Lawo VSC 1 Out** and **Lawo VSC 2 Out**.

- The **Labels** come from the sender labels defined when you added the audio device or stream.
- The **Essence** column shows how many channels are carried by the stream (e.g. 2 or 8 channels).
- The other fields provide more information about the stream configuration (e.g. whether redundancy is supported).

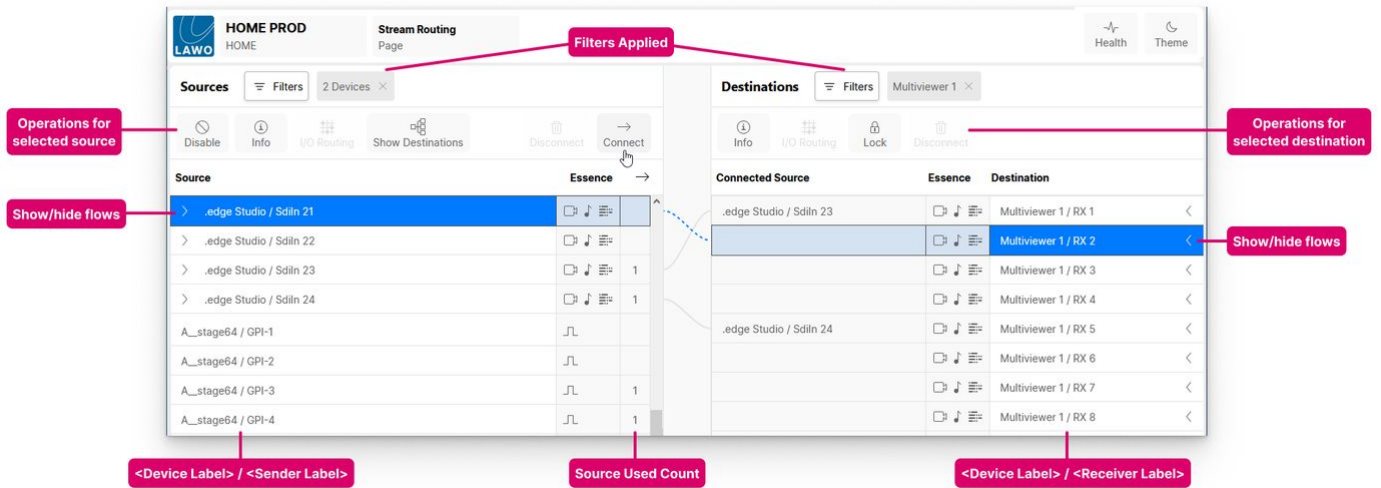


Please note: HOME can be used to check the details of the streams or receivers, but you cannot edit the parameters from here. Instead, this must be done from Lawo VSC, either by removing and adding a new audio device or using Remove and Add Stream.

Stream Routing

Once an audio device is configured (in Lawo VSC), its senders and receivers can be patched to other hardware and software devices on the network (using HOME's 'Stream Routing' page).

This is done in the same manner as for any other sender and receiver (as shown below).



The page lists all available senders (on the left) and receivers (on the right). In the example above, there are **Filters** applied to restrict the view.

- For each source and destination, there are two parts to the label: <device>/<sender> or <device>/<receiver>.
- The icons in the **Essence** column describe the type of flow: Video, Audio, Metadata and/or GPIO.
- If a source or destination handles more than one flow, then an arrow appears beside its label. Click on the arrow to show (or hide) the individual flows.
- Once a source is connected, a number appears in the "source used" column. This indicates the number of times the source is used. i.e. the number of connections made.
- Once a destination is connected, the "**Connected Source**" field shows the label of the connected stream.

To make a connection, select a source (on the left) and a destination (on the right); then click on **Connect**.

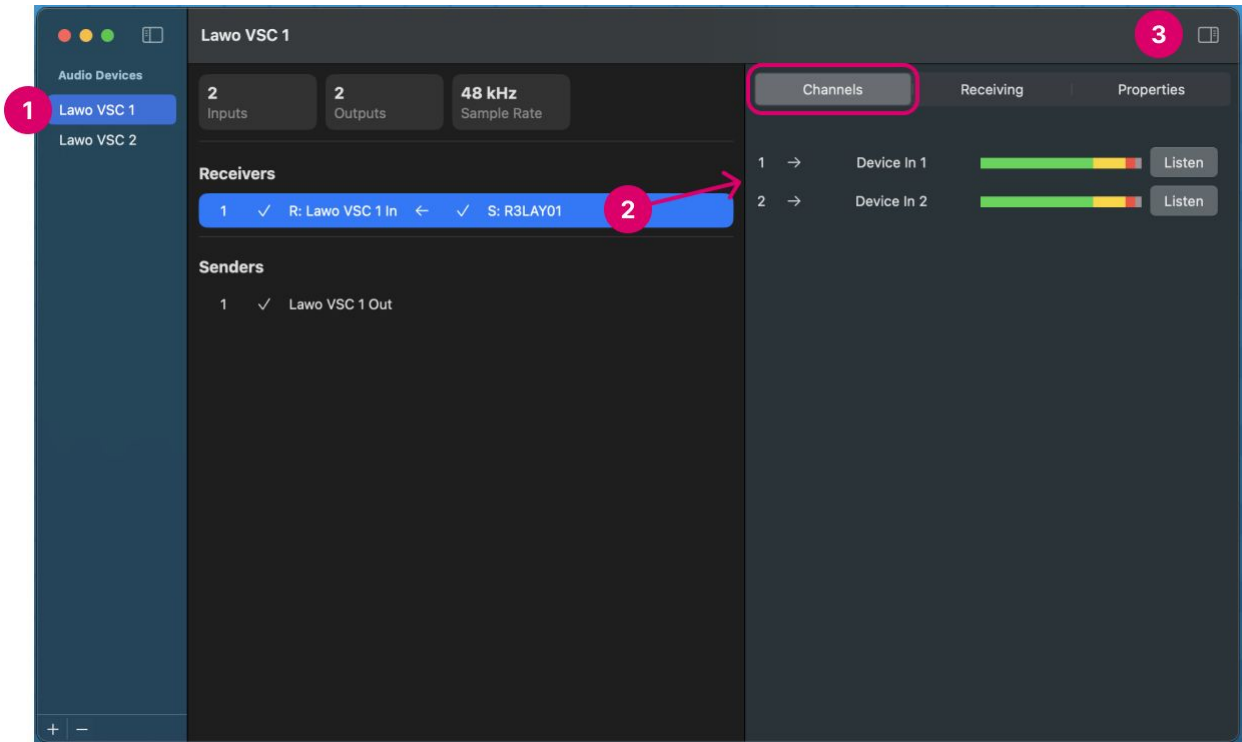
- A dotted (preview) line appears when a connection is prepared.
- This changes to a solid line once the source(s) and destination(s) are connected.

Connections can be made between individual or groups of flows, and for multiple sources and destinations.

For more information about how to use this page, please see [HOME - Stream Routing](#) (in the "HOME User Manual").



Once a sender is connected to a Lawo VSC receiver, the stream name appears in the "Connected Source" area (2) on the Lawo VSC GUI.



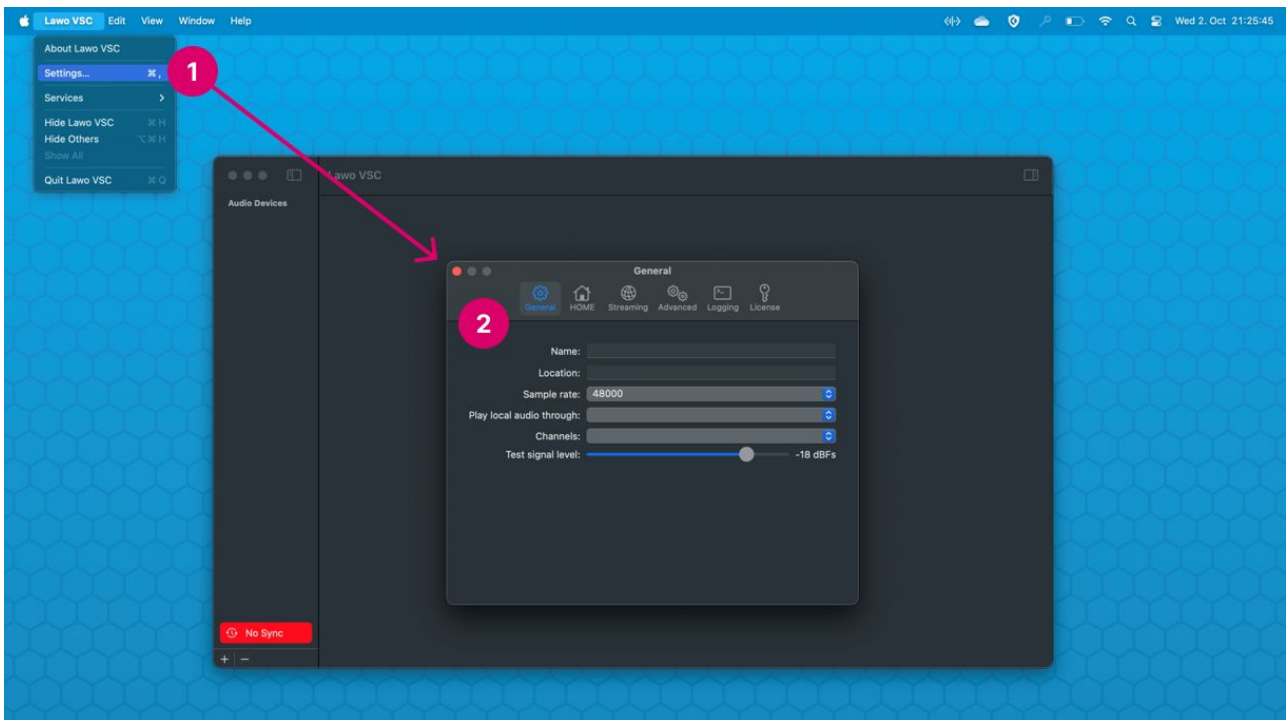
7.2 Lawo VSC - HOME Integration Setup

The steps below describe how to setup Lawo VSC to work with a HOME system.

Before you start, please check that:

- the Lawo VSC computer is connected to the same media network as the HOME server,
- the HOME server is configured,
- you know the IP address of the HOME system.

1. In Lawo VSC, open the 'Settings' dialog (as shown below).

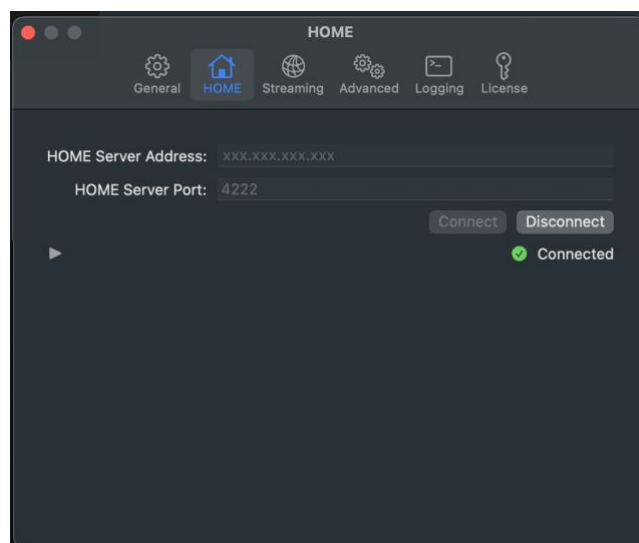


2. Select the **HOME** tab.

3. Enter the IP address of the HOME system into the **HOME Server Address** field.

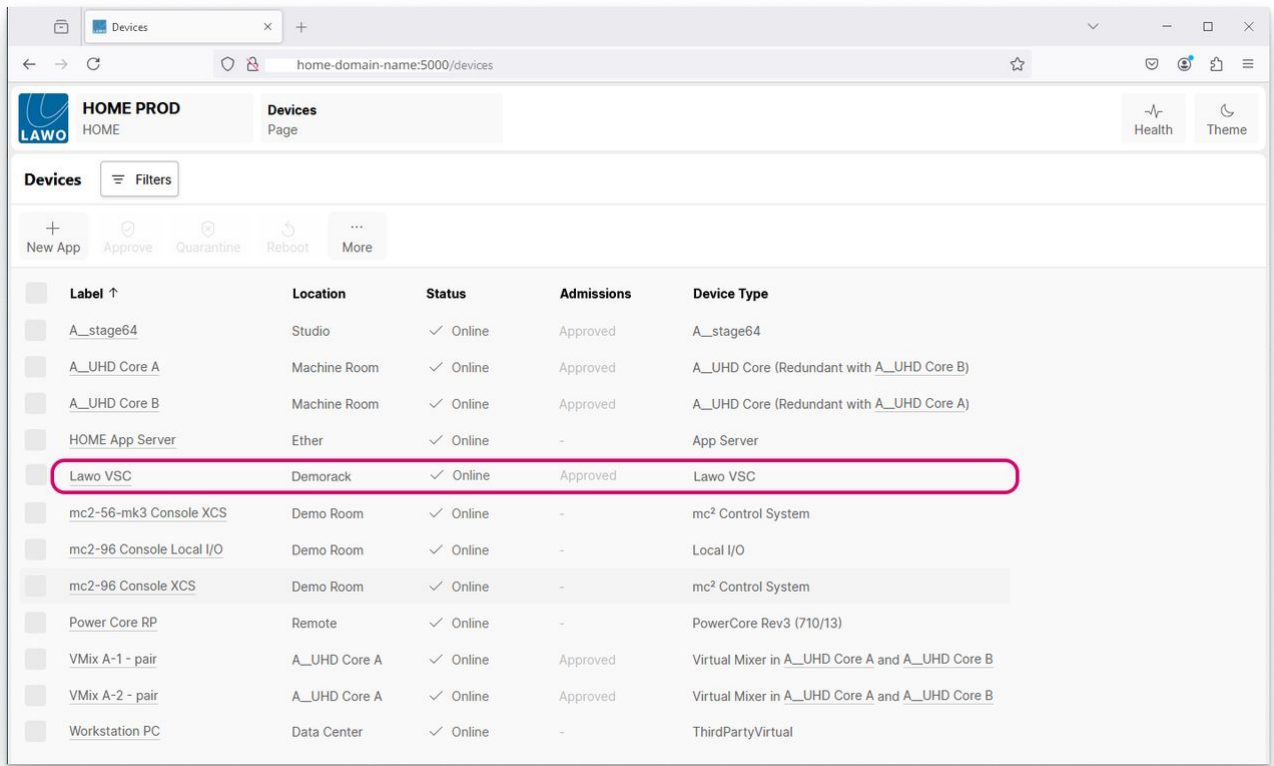
4. Click on **Connect** (to establish the connection).

Once the connection is made, the status (in Lawo VSC) updates to "Connected".





Then Lawo VSC appears in the HOME 'Devices' list. This takes a few seconds so please be patient for the list of the devices to update.

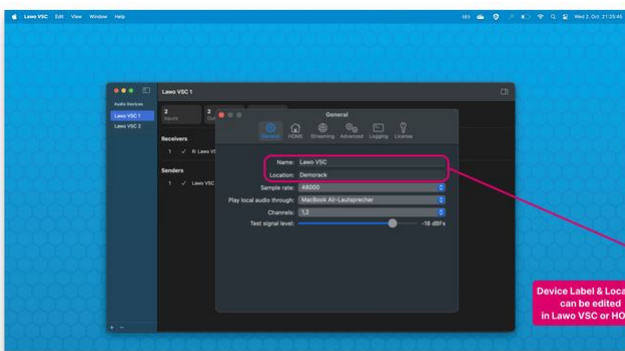


5. Once the Lawo VSC device appears in HOME, the setup is complete.

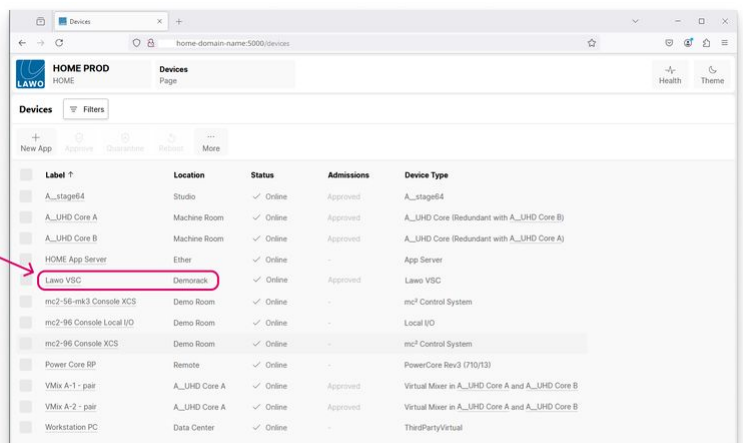
You can now use the 'Stream Routing' page to make connections to and from the Lawo VSC senders and receivers (as described earlier).

Editing the Label & Location

If you have more than one Lawo VSC computer connected to the network, then you will need to edit the **Label** and **Location** (displayed in HOME).



Device Label & Location can be edited in Lawo VSC or HOME.





Label

The **Label** identifies the device or app (in HOME) and to other network users (where applicable).

- A label must be entered. This field cannot be left blank.
- Each label must be unique (within the HOME system).
- The label can be edited without affecting the configuration.
- For all devices that are automatically detected by HOME, a default label is assigned.

Location

The **Location** is displayed in HOME and can be used to filter or sort a list by location.

- Entering a location is optional. This field can be left blank.
- The location can be edited without affecting the configuration.

Method

The two fields can be edited either from Lawo VSC or HOME.

To use Lawo VSC:

1. Open the "Settings" in the usual manner and select the **General** tab.
2. Type into the **Name** and **Location** fields (as shown above).
3. Close the dialog (to exit and save the changes).
4. Refresh the HOME 'Devices' list (to see the changes).

To use HOME:

1. Click on the Lawo VSC device label (to open the 'Device Details' pages).
2. Select the **General** tab.
3. Click on **Edit** (to open the 'Edit Device Info' dialog).
4. Type into the **Label** and **Location** fields.
5. Select **Done** (to exit and save the changes).

7.3 Lawo VSC - Device Settings (in HOME)

Once Lawo VSC is added as a device to the HOME system, its settings can be viewed from the "Device Details" tabs.

Unlike other Lawo streaming devices, most of the settings cannot be edited from HOME and are provided for information only. The exception are the **Label** and **Location** fields (in the **General** tab) which can be edited from HOME (as described [earlier](#)).

To access the settings:

1. Click on the device label (from the main 'Devices' list). The 'Device Details' page opens with the **General** tab selected.
2. Use the menu tabs (at the top of the page) to access settings for the **Network Ports**, **Senders** and **Receivers**.

Note that, unlike other Lawo streaming devices, there is no I/O Routing tab.

Label ↑	Essence	Redundancy	Media Interface	Status	Stream Information
Lawo VSC 1 Out	Audio 2ch	PrimaryOnly	default		SMPTE2110_30: 48 kHz, L24, 1 ms
Lawo VSC 2 Out	Audio 8ch	PrimaryOnly	default		SMPTE2110_30: 48 kHz, L24, 1 ms

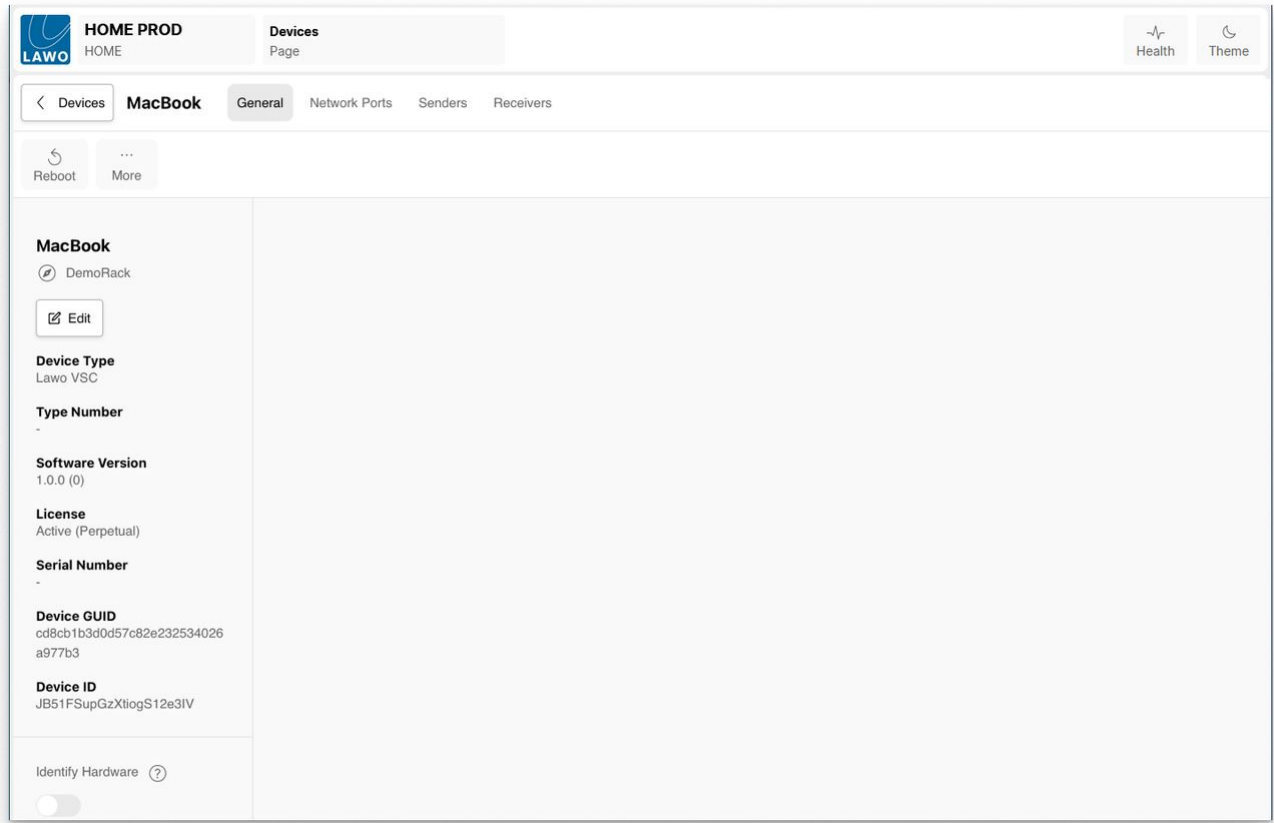
To return to the main 'Devices' list, click on the **< Devices** button (to the left of the device label).



General Settings

The **General** tab provides general information about the Lawo VSC computer.

The **Edit** button can be used to edit the device label and location. The remaining fields are for information only and include the **Software Version** and **License** type.





Network Ports

The **Network Ports** tab lists the device's active network ports.

There will be either one or two active ports depending on the NICs defined in the '[Settings → Streaming](#)' tab. The fields are for information only and include the **IP Mode** and **IP Address**.

	Label	Description	ID ↑	Media Stream	Link Speed	MAC Address	IP Mode	IP Address	Subnet Mask	Default
✓	Belkin USB-C LAN	Belkin USB-C LAN		default	-		Static	192.168.50.85	255.255.255.0	



Senders

The **Senders** tab lists all of the senders for every audio device defined in Lawo VSC. The number, and their configuration, is defined when you add a new audio device (in Lawo VSC).

In HOME, the fields are for information only.

- The **Labels** come from the sender labels defined when you added the audio device or stream.
- The **Essence** column shows how many channels are carried by the stream (e.g. 2 or 8 channels).
- The other fields provide more information about the stream configuration (e.g. whether redundancy is supported).

Label ↑	Essence	Redundancy	Media Interface	Status	Stream Information
Lawo VSC 1 Out	Audio 2ch	PrimaryOnly	default		SMPT2110_30: 48 kHz, L24, 1 ms
Lawo VSC 2 Out	Audio 8ch	PrimaryOnly	default		SMPT2110_30: 48 kHz, L24, 1 ms

Receivers

The **Receivers** tab lists all of the receivers for every audio device defined in Lawo VSC. The number, and their configuration, is defined when you add a new audio device (in Lawo VSC).

In HOME, the fields are for information only.

- The **Labels** come from the receiver labels defined when you added the audio device or stream.
- The **Essence** column shows the maximum number of channels that can be received (e.g. 2 or 8 channels).
- If a source is connected, then the stream name appears in the **Connected Source** column and its details are shown in the **Stream Information** field.
- The other fields provide more information about the receiver (e.g. whether redundancy is supported).

Label ↑	Essence	Redundancy	Media Interface	Status	Connected Source	Stream Information
Lawo VSC 1 In	Audio 2ch	PrimaryOnly			-	
Lawo VSC 2 In	Audio 8ch	PrimaryOnly			-	