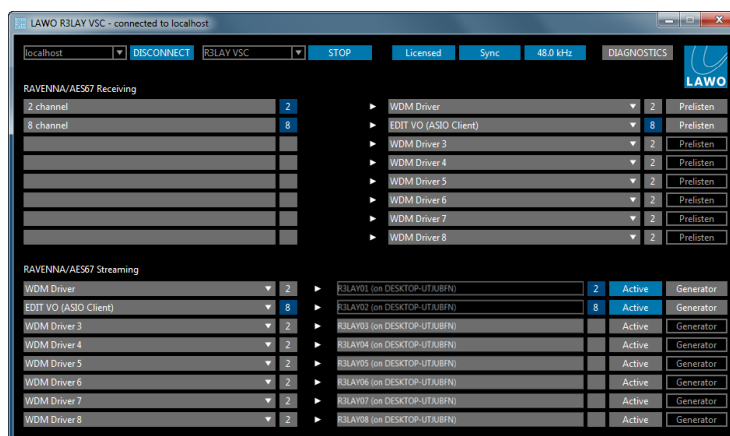# R3LAY

VSC Virtual Sound Card

User Guide

Version: 4.2.0/6

Edition: Thursday, August 4, 2022

To obtain the latest documentation and software downloads, please visit:

www.lawo.com/lawo-downloads

www.lawo.com/r3lay

Table of Contents

1.   Introduction

Welcome to **RƎLAY VSC**.

About this Manual

This document describes how to install, configure and operate the system.

Look out for the following which indicate:

> **Notes** - points of clarification.

> **Tips** - useful tips and short cuts.

> **Attention**: Alert you when an action should *always* be observed.

Software Updates

The latest User Guides and software are available from the **Downloads** area at www.lawo.com (after **Login**).

Lawo User Registration

For access to the **Downloads** area and to receive regular product updates, please register at:

www.lawo.com/registration.

2. Product Overview

R∃LAY VSC (Virtual Sound Card) is a tool for connecting RAVENNA audio streams to and from the software clients running on a PC.

The software must be installed on a Windows PC with all connections and settings controlled via the R∃LAY Service Manager GUI. The GUI can connect to either your local computer (localhost) or a remote PC on the network.

Up to eight incoming and eight outgoing connections are supported, to/from a RAVENNA stream (stereo or multi-channel) or virtual audio driver. The latter include WDM drivers 1 to 8 (always stereo) plus an ASIO client (configured for stereo, 8 or 64-channel). When connecting incoming streams, you can select which audio channels are used - for example, if an 8-channel RAVENNA stream connects to a stereo WDM driver client, you can choose whether the client receives channels 1+2, 3+4, 5+6 or 7+8. By assigning a different WDM driver to each software client, you will be able to connect RAVENNA streams to different applications independently.

The example below shows the GUI connected to the local R∃LAY VSC host. The upper half of the screen shows the incoming connections (RAVENNA streams to WDM Drivers/ASIO Clients). The lower half of the screen shows the outgoing RAVENNA streams which have been published. The numbers beside each slot indicate whether the stream or client is stereo (2) or multi-channel (8 or 64). The number's background indicates: grey = driver not assigned; dark blue = driver assigned or stream active (with no signal present); lighter blue = stream active (with signal present).
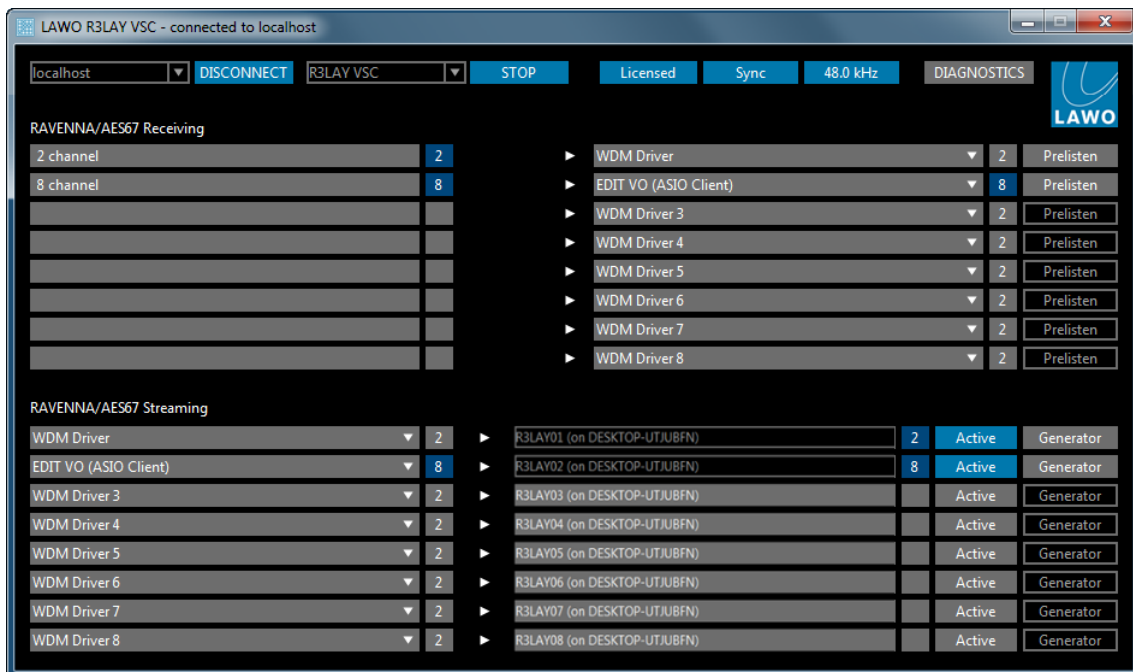
In addition to handling audio connections, R∃LAY VSC provides:

- **Prelisten Monitoring** – to check audio from an incoming RAVENNA stream.
- **Generator** (1kHz test tone) – to line check an outgoing RAVENNA stream.
- **Sample Rate Conversion** (for ASIO Clients).

> R∃LAY VSC handles the one-to-one connections of RAVENNA streams to software clients only; there is no in-built mixing or DSP capability as in R∃LAY Virtual PatchBay or R∃LAY VRX. If you wish to mix or process audio, then this should be handled prior to R∃LAY VSC within your software client.

3. Installation

This chapter describes how to install the software, assign the virtual audio drivers and activate the license.

3.1 Preparation

R∃LAY VSC is delivered as a software download only. You will need a customer login to download the installer, and a valid software license to activate the product.

To host the software, you will need a Windows PC which is not supplied.

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

1. Check that your host PC meets the system requirements.

2. Run the **R∃LAY VSC** installer.

3. Assign the virtual audio drivers for each software application you wish to connect.

4. Activate your software license.

3.1.1 Installing Multiple R∃LAY Products on a Single PC

The **R∃LAY** product family comprises several independent products: **VRX⁴** and **VRX⁸ (Virtual Radio Mixers)**, **VSC (Virtual Sound Card)** and **VPB (Virtual PatchBay)**. In addition, the **AoIP Stream Monitor** provides a tool for monitoring RAVENNA streaming connections. **VRX**, **VPB** and **Stream Monitor** can run either as an application (with full GUI control) or as a service (in the background) whenever you start the PC.

You can install multiple products on the same PC, but they cannot run at the same time. If more than one flavour of **R∃LAY** is installed, you can choose to stop and then start a different service or application from the **R∃LAY Service Manager**:
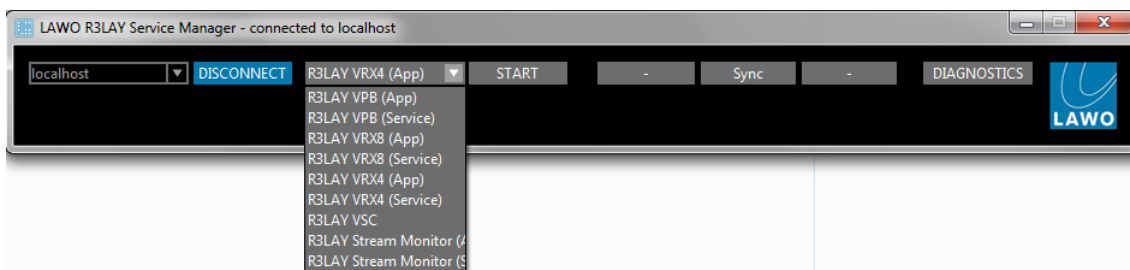
3.1.2 Controlling R∃LAY Services on a Remote PC

If multiple **R∃LAY** PCs are connected to the network, then you can use the **R∃LAY Service Manager** to connect to a remote PC, and then start or stop a **R∃LAY** application or service running on the remote host. See Connecting to a Local Host or Remote PC.

All settings are stored locally on the connected PC. If you wish to start **R∃LAY VRX**, **VPB** or **Stream Monitor** as an application, then a user must be logged in on the remote PC (in order to open the application GUI).

3.2 System Requirements

R∃LAY Virtual Radio Mixer applications are processor-intensive, and can be very demanding on a computer's resources, especially the CPU.

While it is virtually impossible to keep track of the ever-changing list of CPUs available, we do have some guidelines that can assist you in making your selection. These have been selected to help ensure that your R∃LAY software operates properly using any combination of included features.

Look for CPUs and PCs with the following characteristics:

- A multicore processor specified for desktop or server applications.

- Processor should have a CPU benchmark score of 8,000 points, minimum.

- System must have 8GB minimum RAM.

- Operating system should be Windows 7, 8, 8.1,10 (32 and 64 Bit), Server2012 R2 or Server2016.

- Dedicated graphics card recommended for improved performance.

- Gigabit Ethernet LAN connection. Better results are more likely to be achieved by using separate NICs for "normal" traffic and streaming.

To help you determine the best CPU for your R∃LAY system, we recommend PassMark's excellent website. You may be familiar with their benchmarking software; they also maintain a large list of CPUs with performance scores at https://www.cpubenchmark.net/cpu_list.php.

In general, you must select a CPU with 8,000 points or higher for optimal results. A score lower than 8,000 will likely result in performance problems. The more programs and tasks required to run while using R3LAY, and the more streams the computer has to work with, the higher the CPU benchmark should be.

Warning Notices

Operating systems not listed above have not been thoroughly tested by Lawo. Although you may be able to run R∃LAY on these untested operating systems, we cannot support such installations; neither can we support R∃LAY on any computers using pre-release or beta OS versions.

Athough R∃LAY may run on computers with CPUs which do not meet the benchmark requirements stated here, we cannot ensure that all software features will operate correctly unless that power requirement is met, and cannot support R∃LAY on any computers which do not meet the mimimum hardware requirements.

Additional Notes

As some audio devices and network interface cards behave in a different and unpredictable manner after recovering from a power-saving sleep state, it is recommended NOT to allow your computer to enter a sleep state while using such devices with R∃LAY. You can configure your power plan in Windows®, by selecting the "Control Panel -> Power Options" - choose a plan which does not put the computer to sleep.

3.2.1   Running R∃LAY in a Virtual Machine

Lawo is a VMWare Partner, and so to run R∃LAY in a Virtual Machine we recommend VMWare Server 6.5 and VSphere.

To familiarize yourself with the VMWare environment, please read the following Technical White Papers (from VMWare):

- Deploying Extremely Latency-Sensitive Applications in VMware vSphere 5.5

- Best Practices for Performance Tuning of Telco and NFV Workloads in VSphere

When configuring VMWare for use with R∃LAY, it is essential to use the latency sensitivity settings (mentioned in the white papers), and to follow the "100% reservation rule" for CPU and memory.

In addition to VMWare's recommendations, it is essential to configure a separate, standalone network for streaming, with additional NICs and an additional VSwitch.

3.3 Installing the Software

The latest **LawoR3LAYVSCSetup** installer can be downloaded from www.r3lay.com/pages/manuals-downloads.

1. Copy the installer onto your computer and double-click on its icon to start the setup wizard.

If an earlier version of **RƷLAY VSC**, or another **RƷLAY** flavour, is running on the computer, then it is best to stop and disconnect the current service, and then close the Service Manager GUI before continuing.

2. Select **Next** and follow the Wizard's instructions accepting the default options provided.

When the "Select Additional Tasks" screen appears, you may choose the following options. Note that the installer will detect which Virtual audio and RAVENNA Network drivers are currently installed; if there is a newer version, then the option is selected; if you already have the latest version, then the option is not ticked. If in doubt, leave the default options selected.

➢ **Virtual audio drivers**

These options determine which audio drivers will be installed:

- **ASIO** - installs a DLL which is loaded by devices using an ASIO driver. Most professional interfaces and applications use ASIO drivers (for lower latency).
- **WDM-Drivers** - installs 8 instances of the standard WDM driver. These are used by software applications such as chat software or media players.

➢ **RAVENNA**

- **Network Driver** - installs the RAVENNA network driver. The driver optimises network packet transmission for RAVENNA streaming.
- **Add firewall rules** - adds pre-determined firewall rules which may be required by the **Network Driver**.
- **Activate HPET (High Precision Event Timer)** - appears if you are running an OS prior to Windows 10. In this instance, HPET should be activated for proper RAVENNA timing.

Note that Windows 10 uses an improved internal clocking mechanism named "TSC_INVARIANT", which by default is active. Therefore, when running Windows 10, you will not see the **Activate HPET** option.

➢ **Licensing** - tick this option to install the **CodeMeter Runtime** software required for licensing. If the software is already installed, then selecting this option will update the CodeMeter release and configure a new Cm container.

➢ **Additional icons** - tick this option to create a desktop icon for the application.

4. Select **Next** followed by **Install** to proceed with the installation.

If an existing **RƷLAY** service is running, then the install may fail and an error dialog box will appear. Select the option to "automatically close the application(s)", **Abort** the install and then re-run the installer from step 1. Once the active **RƷLAY** service or application has been closed, the installer should run successfully.

5. After the **RƷLAY** installation, the **CodeMeter Runtime** Wizard appears (if **Licensing** has been selected during step 3). Select **Next** to install the licensing software. Or, **Cancel** to quit this part of the installation - for example, if the PC is already running the latest **CodeMeter Runtime** release.

6. After a successful install, a confirmation window appears - you will be prompted to restart the computer (if any of the "requires new start" options were selected during step 3). Select **Yes** (or **No**) and then click on **Finish**.

After the restart, you should see the **RƷLAY** Service Manager icon in the taskbar:

If you have any problems with the software installation, please contact your local Lawo representative or email support@lawo.com.

3.4   Uninstall & Updates

The software can be uninstalled in the usual Windows manner:

1. First, stop and disconnect the current application or service, and then close the Service Manager GUI.

2. Then open the "Uninstall or change a program" Control Panel, select the **RƎLAY VSC** program and click **Uninstall**.

To update to a new version, follow the installation procedure described earlier. There is no need to remove older versions of the application. The latest configuration is stored locally and is loaded automatically after the update, see Saving the Configuration.

3.5   Assigning the Virtual Audio Drivers

RƎLAY VSC supports 8 WDM drivers (stereo) plus an ASIO client (up to 256 channels). To use both driver types, they must have been selected during installation using the Virtual Audio Driver options.

The driver you choose depends on the software client and whether you wish to make connections independently:

- For the lowest latency, best audio performance or multi-channel operation, use **ASIO** (if supported by your software client).

- If ASIO is not supported, or to connect to applications independently, assign a different **WDM Driver** instance to each software client.

Note that not all software clients support the option to assign an audio driver, and may use only the Default Windows Sound Device.

If a single driver is used more than once, then audio to and from these software clients is presented to RƎLAY as a single audio stream.

Optionally, you can activate the Windows mixer volume for all **WDM driver** instances. This allows you to use the Windows volume control (shown below) to adjust the level to RƎLAY. By default, this option is turned off. It can be enabled by editing the advanced options (described later).
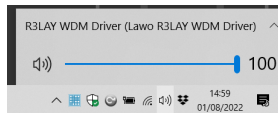
3.5.1   ASIO Software Clients

Most professional audio applications support ASIO. In order to connect audio to and from these clients using RƎLAY VSC, you will need to assign RƎLAY as the audio input and/or output device within the software application. The exact procedure depends on the application; an example using Lawo's **Edit VO** is shown below:
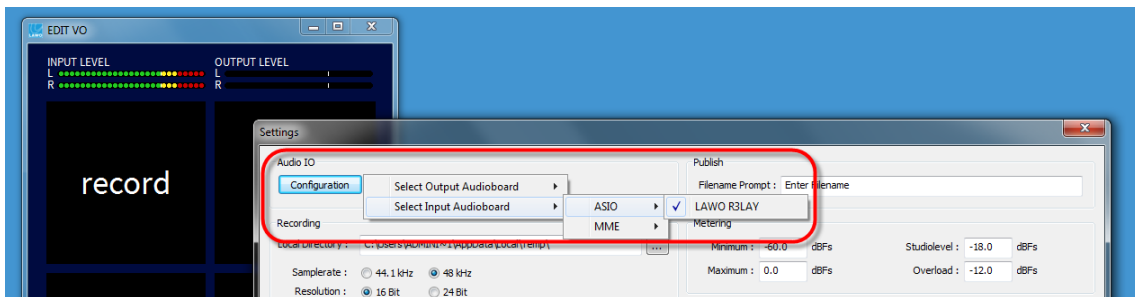
If you now open the RƎLAY VSC GUI, you will see the application's audio channels in the driver selection list:

You may configure and run multiple ASIO applications simultaneously.

Sample rate conversion is automatically applied to audio to and from ASIO clients. For example, if a 48kHz RAVENNA stream is connected to a 44.1kHz ASIO software client, sample rate conversion will be applied.

3.5.2 WDM Software Clients

Applications such as chat software or media players do not usually support ASIO, and therefore you should assign one of the R∃LAY WDM Driver instances. By assigning a different driver to each software client, you can connect RAVENNA streams to and from each program independently.

The exact procedure depends on the program. Below is an example of a common media player where the **Playback Output Device** has been assigned to the **R3LAY WDM Driver 2**:
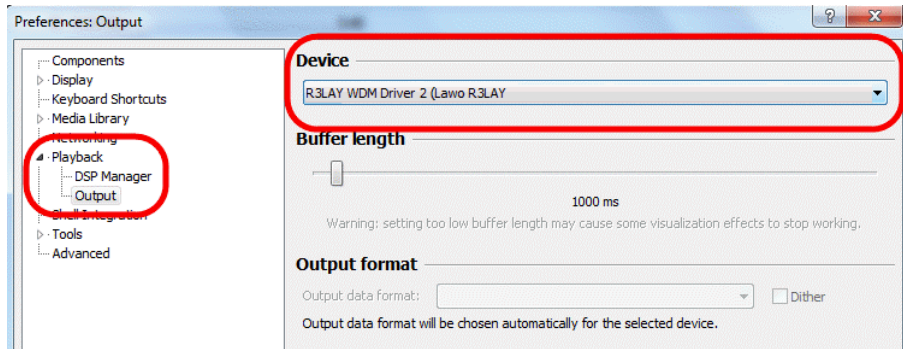

3.5.3 The Windows Default Sound Device

Some applications may not support the option to assign an audio driver and, instead, use only the default Windows Sound device. In order to connect audio to and from these clients using **R∃LAY VSC** you will need to assign one of the R∃LAY WDM Driver instances as the default Windows Sound device:

1. In Windows®, select **Control Panel** -> **Hardware and Sound** -> **Manage audio devices**, and assign one of the **R3LAY WDM Driver** instances as the default **Recording** and **Playback** device:

Windows OS: Default Playback Device
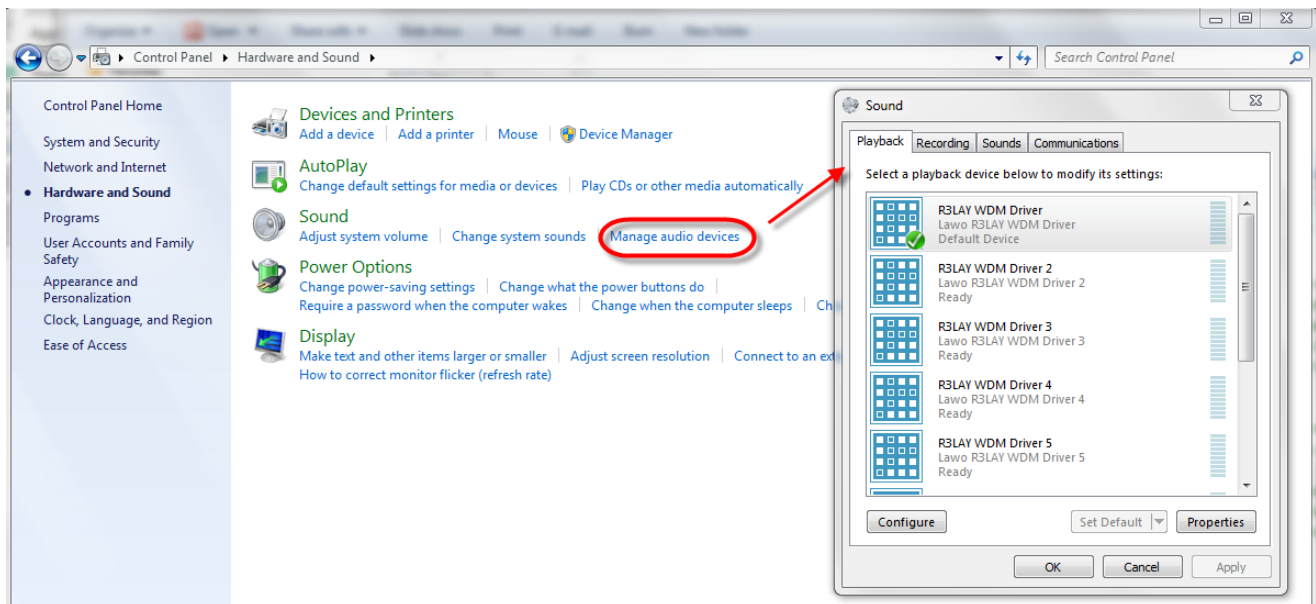
> If more than one software client uses the default Windows Sound device, then audio to and from these applications will be presented to **R∃LAY** as a single audio stream.

3.6   Licensing

Once the software has been started, the system checks periodically for an active software license. This can be installed into a local container (on your PC), a remote container (on a networked server), or onto a USB dongle (for portability). If you wish to use a dongle, then this must be ordered separately.

The license is activated and managed by the CodeMeter Runtime licensing system from WIBU systems. The license code can be found on the delivery note supplied with the software.

3.6.1   Checking the License Status

The current status of the license is indicated at the top of the GUI. If no license is found, then the software operates in demo mode, with all features enabled, for 15 minutes - during this time, the **Demo** field turns yellow and shows the 15 minute countdown:
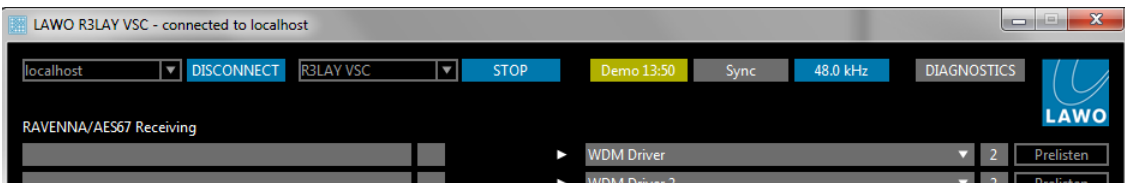
After 15 minutes, a five second burst of white noise (at a level of -30dBFS) is inserted every minute. This is indicated by the red **Demo** field:
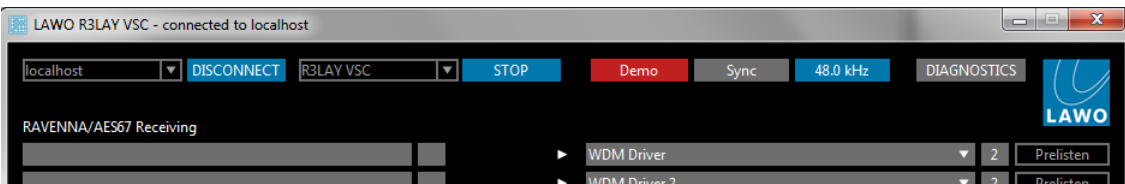
Once an active license is successfully located, the noise burst is removed and the field updates to **Licensed**:
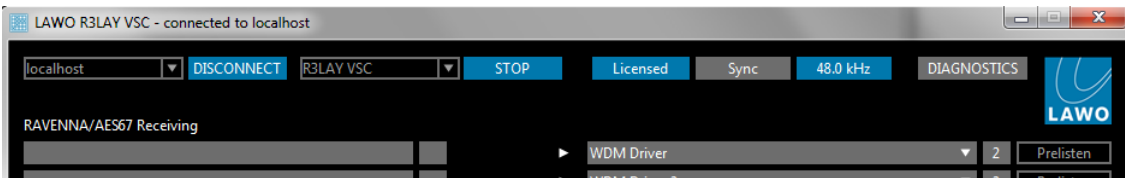
If the license is later removed, after being found at startup, there is a 12 hour grace period before the noise burst resumes. This is indicated by a yellow **Demo** license field (with a 12-hour countdown). If the license is not reinstated at the end of the countdown, then the **Demo** field turns red to indicate that the noise burst is active.

3.6.2   Using a Dongle

All dongles are specially-configured USB memory sticks which can be purchased from either Lawo or WIBU systems. The dongles supplied for software and hardware products ship with different file systems, so please take care not to mix up the different types. If you have purchased a dongle for R∃LAY VSC, then this will have a metal "LAWO logo" tag attached as shown below. Multiple R∃LAY products and other Lawo software can be licensed from a single dongle.

USB Dongle (for Lawo software)

3.6.3   Preparing for Activation

To activate a license, you will need:

- A PC with an internet connection (and USB port if using a dongle). If your PC does not have an internet connection, then the offline activation method can be used.

- The WIBU systems USB memory stick (if using a dongle).

- The license code. This can be found on the delivery note shipped with the system. It takes the form of a 25-digit ticket number such as the one shown below.

License Code Example

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

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

3.6.4   Installing CodeMeter Runtime

To activate a license, your PC must be installed with **CodeMeter Runtime** (from WIBU systems). The correct version is installed automatically with the setup software for your product.

You can check the installation by looking in the Windows taskbar where you should see the following icon.
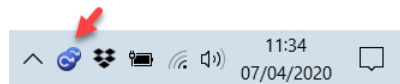
This shows that a Cm container (for local license storage) has been installed.

3.6.5   Activating a License Online

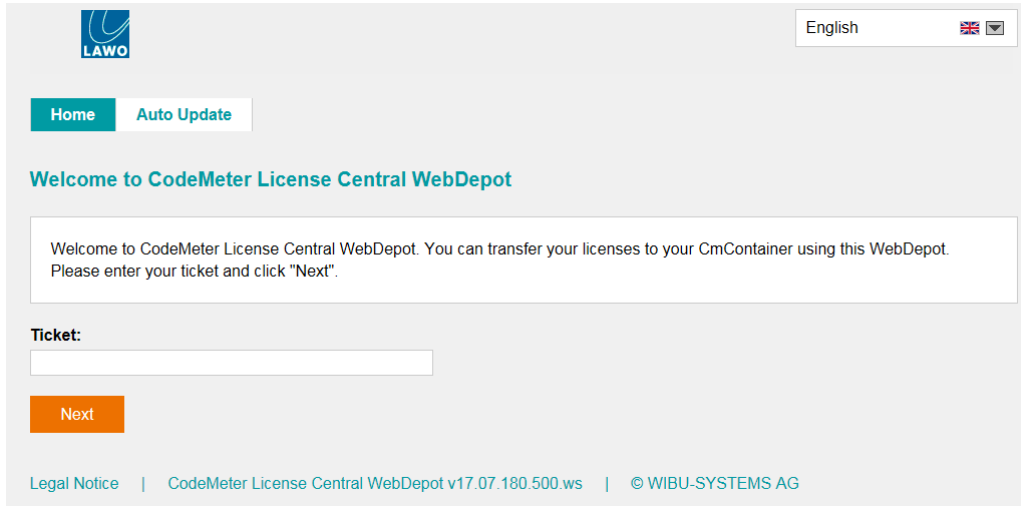To use this method, your PC must have an internet connection. If installing onto a dongle, then this should be connected to the PC's USB port.

1.   Open the Lawo licensing web page by copying the following URL into your web browser: https://licenseportal.lawo.com

If necessary you can choose a different language using the drop-down menu at the top right of the page.

2.   Copy your license ticket number - this is the 25-digit number code - into the **Ticket** field and select **Next**.

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 - note that this cannot be altered later.

Choose either **CmDongle** (to create a USB dongle) or **CmActLicense** (to bind the license to the local computer).
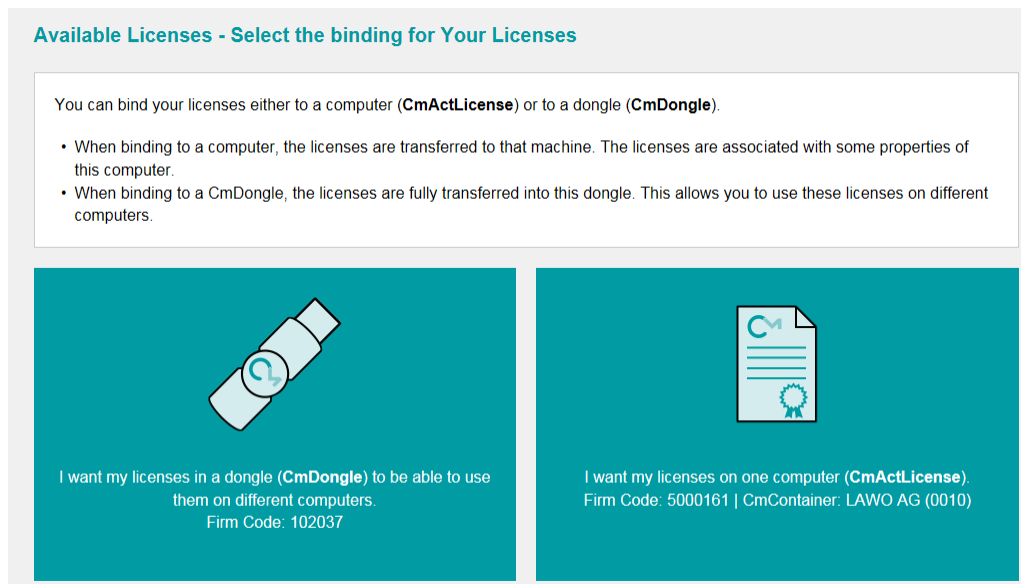
5. At the next page, select the licenses you wish to activate and the **CmContainer** to be used for the license storage.

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 pop-up 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.

For information on re-hosting a license, offline activation, backup/restore and using a license server, please see the Advanced Licensing Features appendix.

4. Operation

This chapter describes the operation of **RƎLAY VSC**.

4.1 Starting the Application

The simplest way to start **RƎLAY VSC** is by double-clicking on its desktop icon or selecting the program from the Windows START menu. **RƎLAY VSC** can also be started from the Service Manager GUI.

Only one instance of **RƎLAY** may be running at a time, and so if you see the message "This program is already started....", then check your taskbar icons and close the application, or use the **Service Manager** to stop the active service.

The first time you start the software, or connect to a **VSC** host, you are asked for the initial settings. These can be changed later, if required, from the RAVENNA and Host tabs in the "Settings" window.

Initial Settings
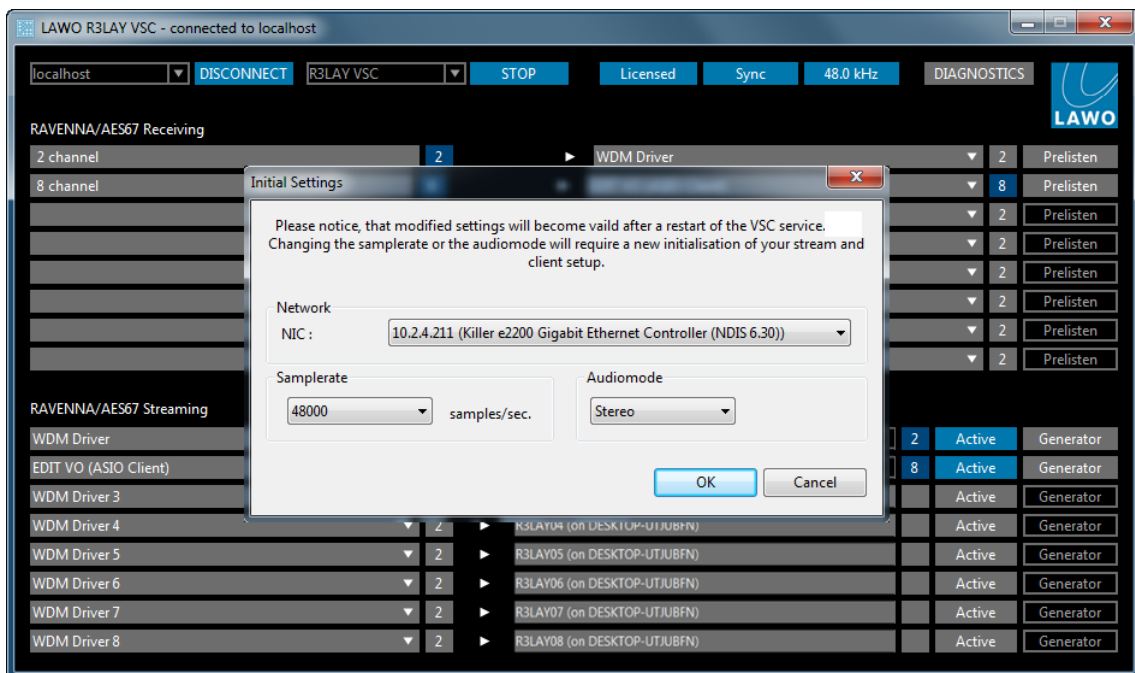
Complete the settings as follows and select **OK**.

- **Network** - select the Network Interface Card (**NIC**) to be used for RAVENNA streaming. The drop-down menus list all available network interface cards fitted to your computer.

- **Samplerate** - sets the default sample rate which will be used when creating RAVENNA streams.

- **Audiomode** - defines the number of channels for the **RƎLAY** ASIO client. Your selection affects the channel routing options available when assigning multi-channel streams to and from an ASIO client.

On all subsequent start-ups, the "Initial Settings" window is skipped, and the GUI opens with the latest configuration.

4.2 Closing the Application

To close **RƎLAY VSC**:

1. Right-click on the notification icon in the taskbar and select **Close**:
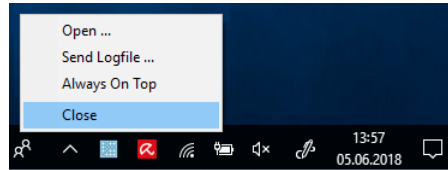
If you attempt to close **RƎLAY VSC** while one or more ASIO clients are running, then the following message appears:
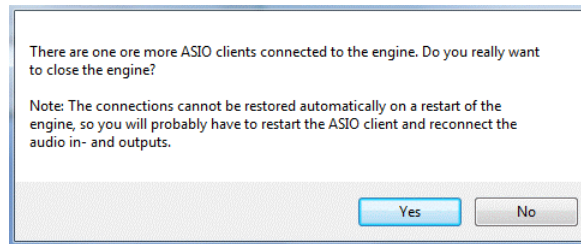
If you select **Yes** and then restart **RƎLAY VSC**, you may need to restart the ASIO software application, and reconnect its audio input and output devices.

> Closing **RƎLAY VSC** stops all audio passing through the application.

4.3 Function Buttons & Status Fields
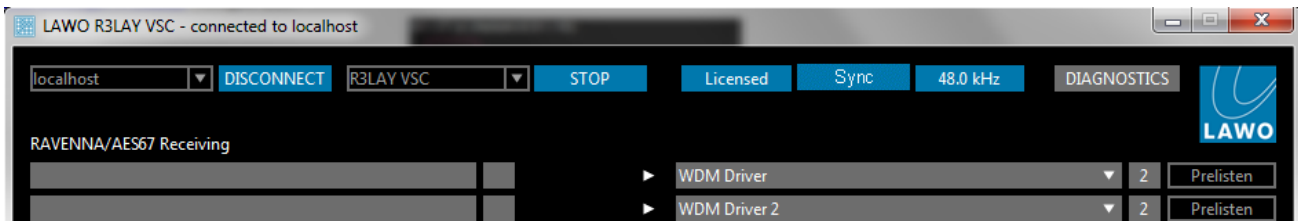
Running across the top of the GUI are the main function buttons and status fields:

- **Connected Host** (e.g. **localhost**) - shows the name or IP address of the connected host. It can be the local computer (localhost) or a remote PC.

- **CONNECT** (or **DISCONNECT**) - select this button to connect or disconnect the GUI from the **RƎLAY** service. See Connecting to a Local or Remote Host.

- **Service** (e.g. **RƎLAY VSC**) - shows the type of service which is active.

- **STOP** (or **START**) - select this button to stop or start the **RƎLAY** service. You would use this if you wish to restart the VSC (for example, if you have changed a setting in the Settings dialog box, or wish to run a different flavour of **RƎLAY** on the connected host). See Starting and Stopping the Service.

- **Licensed** (or **Demo**) - indicates the status of the software license.

- **Sync** - indicates the synchronisation status: blue = sync ok; flashing yellow = VSC is synchronising; grey = no valid sync signal.

- **48kHz** (or **44.1kHz**) - indicates the default sample rate which will be used for outgoing RAVENNA streams. It can be changed from the Settings -> Host dialog box.

- **Diagnostics** - select this button to open the Diagnostics dialog box.

- **Lawo Logo (Settings)** - click on the Lawo logo to open the Settings dialog box.

4.4   Interrogating the Connections

Below this, the GUI is divided into two halves:

- **RAVENNA/AES67 Receiving** - shows the eight incoming connections: RAVENNA/AES67 streams (on the left) to WDM Drivers/ASIO Clients (on the right).

- **RAVENNA/AES67 Streaming** - shows the eight outgoing connections: WDM Drivers/ASIO Clients (on the left) to RAVENNA/AES67 streams (on the right).
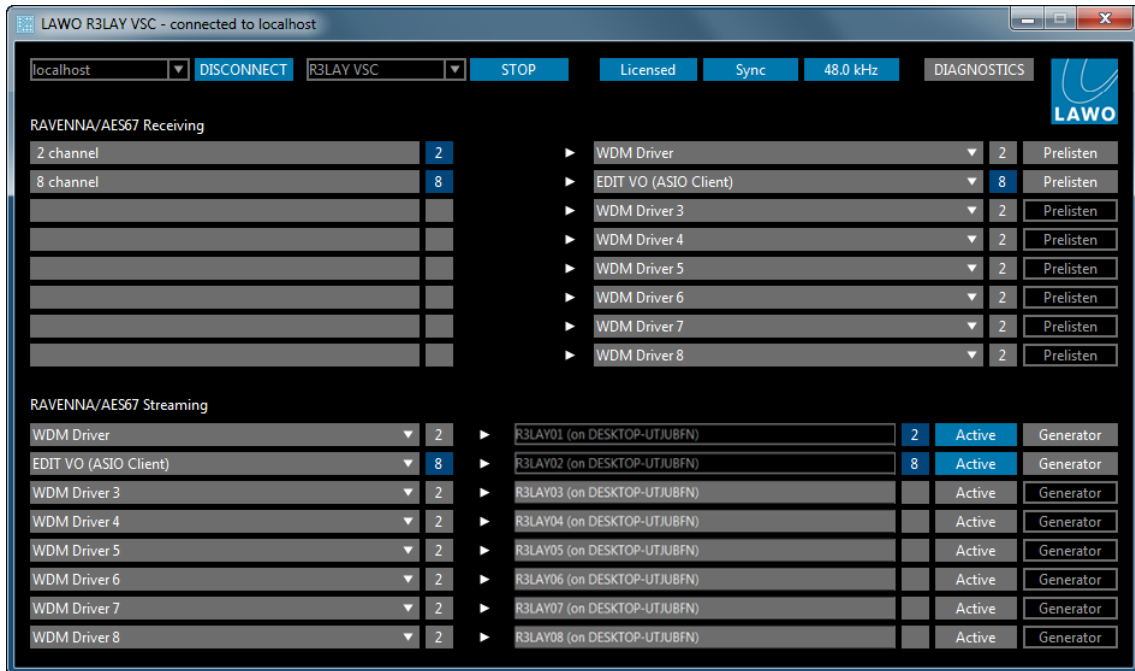
The numbers beside each slot indicate whether the RAVENNA stream or driver is stereo (**2**) or multi-channel (**8** or **64**).

The background color of these numbers indicates:

- **Grey** = driver not in use or not assigned; stream not active.

- **Dark Blue** = driver or stream active.

- **Light Blue** = stream active (with signal present).

In the example below, an outgoing RAVENNA stream named **R∃LAY02** has been assigned as the source for an incoming connection. When the **Generator** button is pressed beside the output stream, tone is sent to the RAVENNA streaming channels. This causes the incoming stream's channel count number (**8**) to turn a lighter blue, indicating that signal is present:
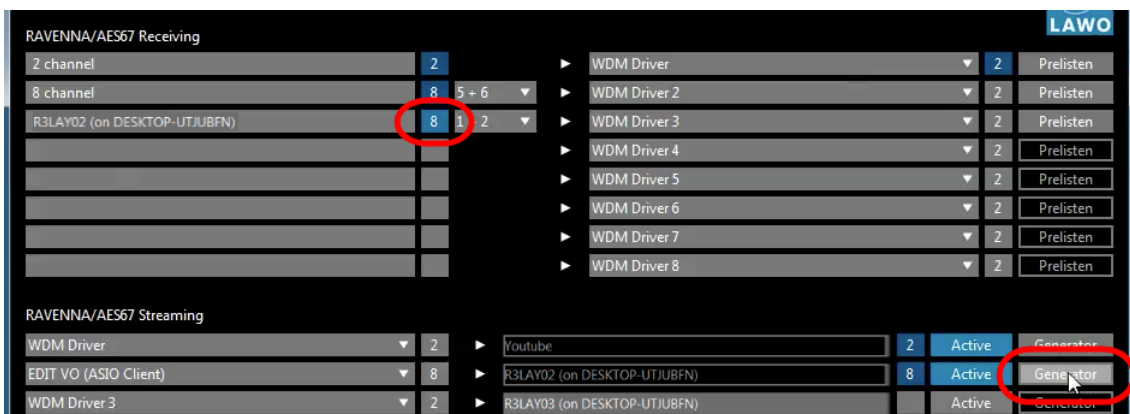
4.5   Using Audio from the Network

To use audio from the network, you must connect an incoming RAVENNA stream to a software client. Before making any connections, you should check the <u>assignment</u> of the RƎLAY virtual audio drivers, so that you know which driver is assigned to each client.

Up to eight incoming connections are supported, represented by the eight 'Receiving' slots in the upper half of the GUI screen. In each case, select a RAVENNA stream (on the left) for connection to the WDM Driver (on the right):
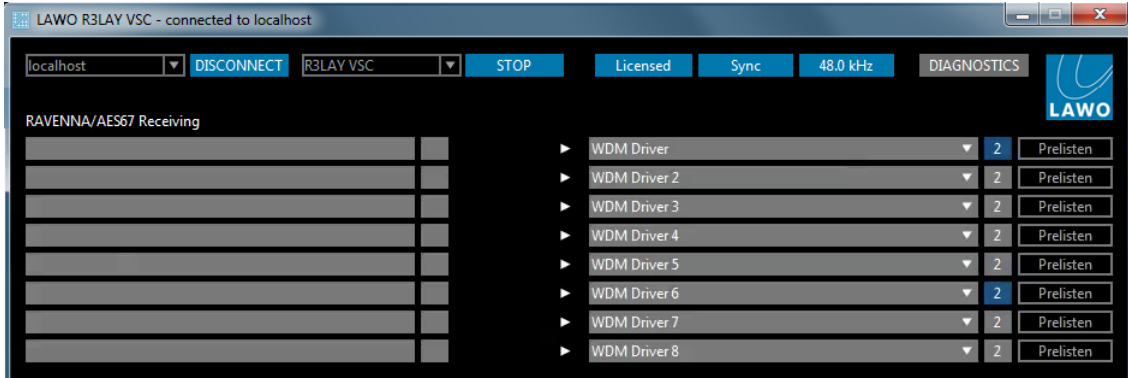
The eight destination slots (on the right) always connect to WDM Drivers 1 through 8. Any of the slots can be replaced by an ASIO client, providing that your ASIO client software is running. However, you cannot change the WDM Driver slots - for example, you cannot use slot one to connect to WDM Driver 8.

> The dark blue background of the channel count numbers, beside WDM drivers 1 and 6, indicates that the drivers are active (they are being used by a software client). The other destination drivers, with a grey channel count background, are either not in use or not assigned.

4.5.1   Making a Connection

1.   First, assign the destination driver by clicking on the right-hand slot. Each slot can be assigned to its corresponding WDM Driver number or an ASIO client (if your ASIO software is running):

2. Then click on the corresponding 'RAVENNA/AES67 Receiving' slot to open the 'Available Streams' dialog box - here you will see all the available **RAVENNA Streams** which have been announced to the network. The list includes any streams which you have already published from the connected host.
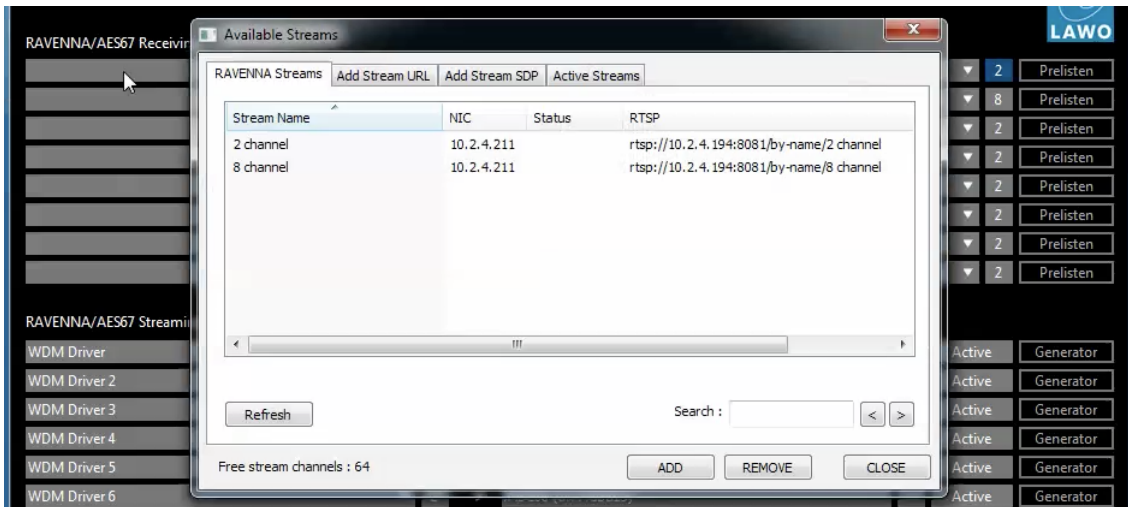
3. Select a stream and click on **ADD** - the name of the stream and its channel count appear in the receiving slot:
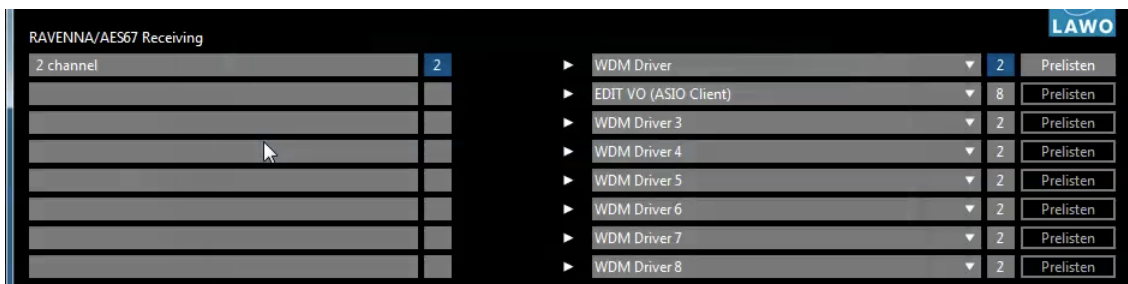
> A RAVENNA stream can also be added by using its URL or SDP. See the Available Streams dialog box.

In our example, we have connected a 2-channel stream to WDM Driver 1 (also 2-channel) and, therefore, there are no further options to configure.

> The dark blue background of the channel count number, beside the RAVENNA source stream, indicates that the stream is active but there is no signal present. The button will turn a lighter blue once signal level is detected.
> You can monitor audio from an incoming stream using the Prelisten function.

4.5.2 Multi-channel Connections

For multi-channel streams, follow the same connection process - click on the slot, select a stream and then select **ADD**:
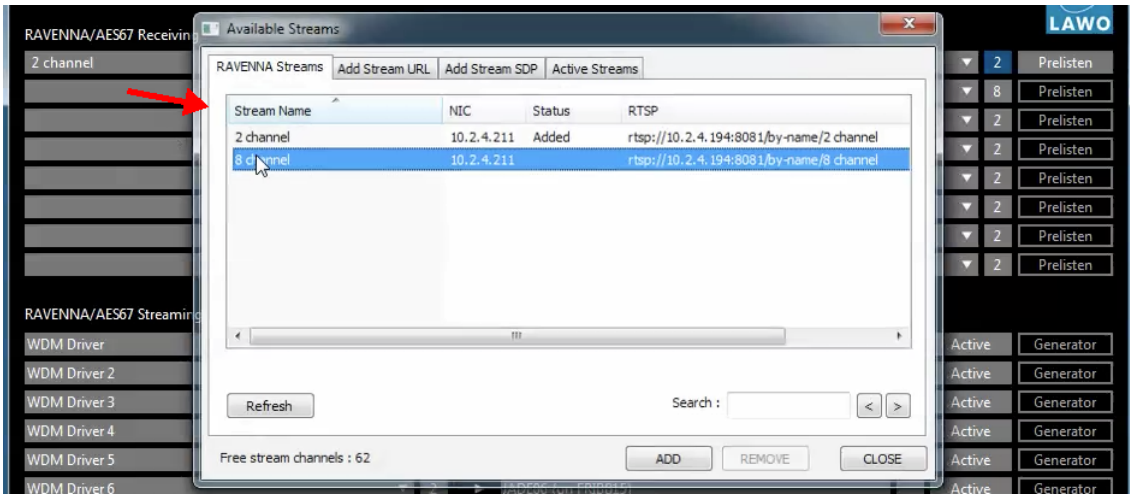
If the number of incoming channels matches that of the driver destination, then there are no further options to configure - for example, from an 8-channel stream to an 8-channel ASIO client:

If there is a channel mismatch - for example, a connection from an incoming 8-channel stream to a stereo WDM Driver - then a channel selection box appears. Use the drop-down menu to select which channels are connected - in our example, **1+2**, **3+4**, **5+6** or **7+8**:
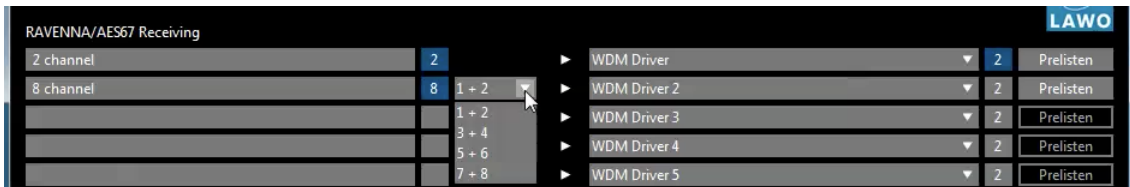
The selected channels appear beside the connection slot - in our example, channels **5+6**:

4.5.3 ASIO Client Connections

Providing your ASIO client software is running, you can replace any of the WDM Drivers by clicking on the driver's destination slot and selecting the ASIO Client:

The channel format is defined by the **Audiomode** option in the Settings -> Host dialog box:
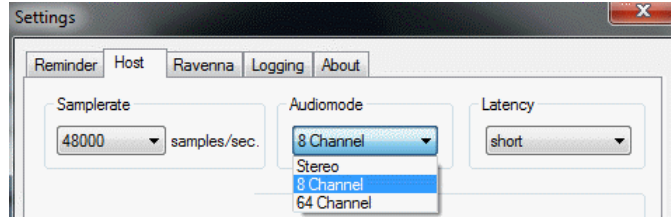
The example below shows from an incoming 8-channel stream connected to an 8-channel ASIO client:

If there are more channels available within the RAVENNA stream than configured for the ASIO client, you will see a channel selection box (as described earlier).

> Your ASIO client software must be running and have RƎLAY assigned as its audio i/o device, in order to see the client in the driver options list.

> You may configure and run multiple ASIO applications simultaneously.
>
> Sample rate conversion is automatically applied to audio to and from ASIO clients. For example, if a 48kHz RAVENNA stream is connected to a 44.1kHz ASIO software client, sample rate conversion will be applied.

4.5.4   Prelisten

This function can be used to check audio from an incoming RAVENNA stream.

1.   First, configure the listening device using the **Received streams** menu in the Settings -> Host dialog box. You can choose any stereo audio hardware interface installed on your PC - in our example, the computer speakers:
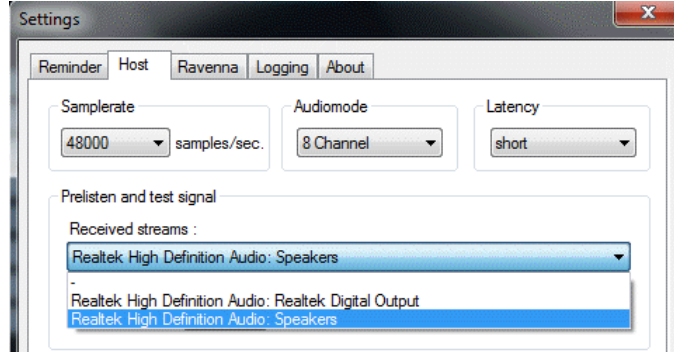
2.   Then click and hold one of the available **Prelisten** buttons (white text on grey background):

Prelisten is now active, and the GUI updates to show the channel numbers assigned to the listening device - in our example, **5+6**.

For an 8- or 64-channel stream, you can change the Prelisten channels by continuing to hold the left mouse button and pressing one of the following: the right mouse button; a keyboard cursor key (left/right or up/down); or the mouse wheel - any of these functions will scroll through the available channel pairs. In our example, to listen to channels **1+2**:

Note that this changes only the **Prelisten** channel routing, and not the channels connected to the software client driver.

4.6   'Available Streams'

When choosing a stream from the network, the 'Available Streams' dialog box appears:
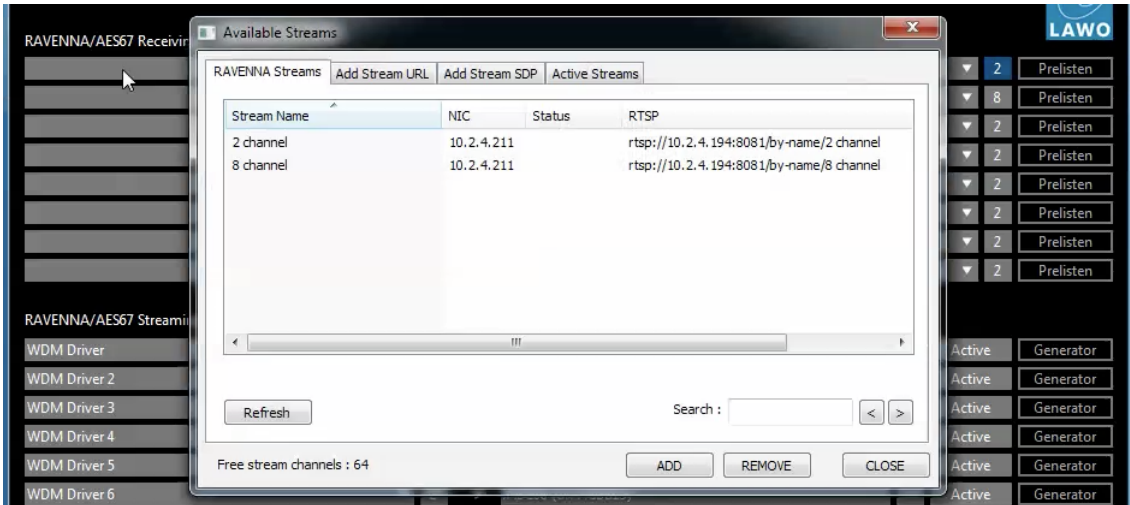
From here you can select a stream by name, URL or SDP, and also view all active streams.

4.6.1   RAVENNA Streams

1.   Select the **RAVENNA Streams** tab to see all of the streams announced by Bonjour to the network.

The list will include incoming streams from other devices plus local streams published from this device.

2.   Select a stream and then click on **ADD** - the stream is added to the connection slot, and its Status updates to **Added**.

Repeat to add more streams as you wish.

> Click on **Refresh** to update the list.
>
> You can search the Stream Names by entering a text string into the **Search** field and clicking on **Refresh**. Use the arrow keys to select the next or previous occurrence.
>
> The number of available channels is indicated by the **Free stream channels** counter - the total number of RAVENNA channels (used by sending + receiving streams) cannot exceed the maximum permitted by your license.

3.   To remove a stream, select an **Added** stream from the list followed by **REMOVE**.

4.   To close the dialog box, click on **CLOSE**.

The remaining tabs in the "Available Streams" dialog box work in a similar manner and are described over the next few pages.

4.6.2   Add Stream URL

Select this tab to add a RAVENNA stream with a specific URL - for example, if your network uses rtsp addresses.

1.   Select the Network Interface Card (NIC) which is receiving the stream from the drop-down menu.

2.   Enter the URL - the maximum length of an accepted URL is 200 characters.
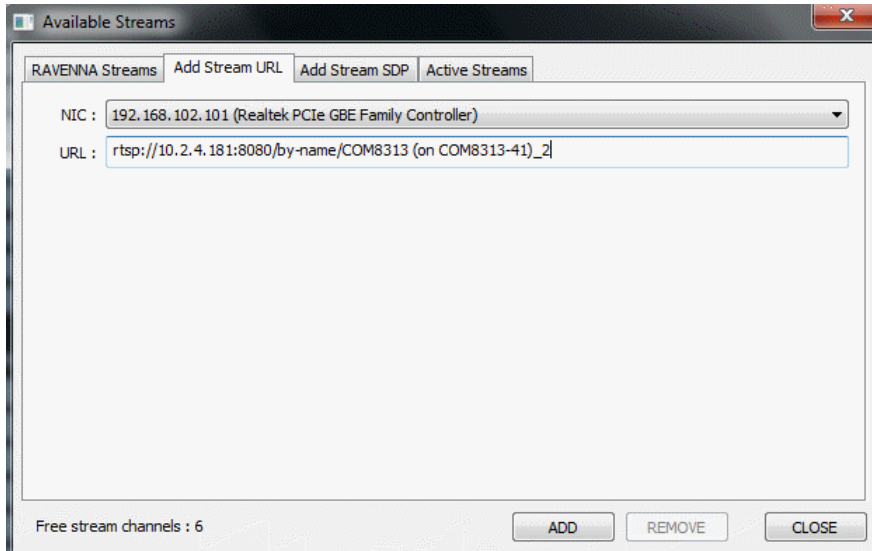
3.   Click on **ADD** to add the stream to the connection slot.

4.6.3   Add Stream SDP

Select this tab to add a RAVENNA stream identified by a stream description (SDP). The SDP can either be loaded (from a file) or entered manually (by typing in the text, or using copy/paste to paste the information from another location).

1.   Select the Network Interface Card (NIC) which is receiving the stream from the drop-down menu.

2.   To load an SDP, click on File **Load..** to select the file location:
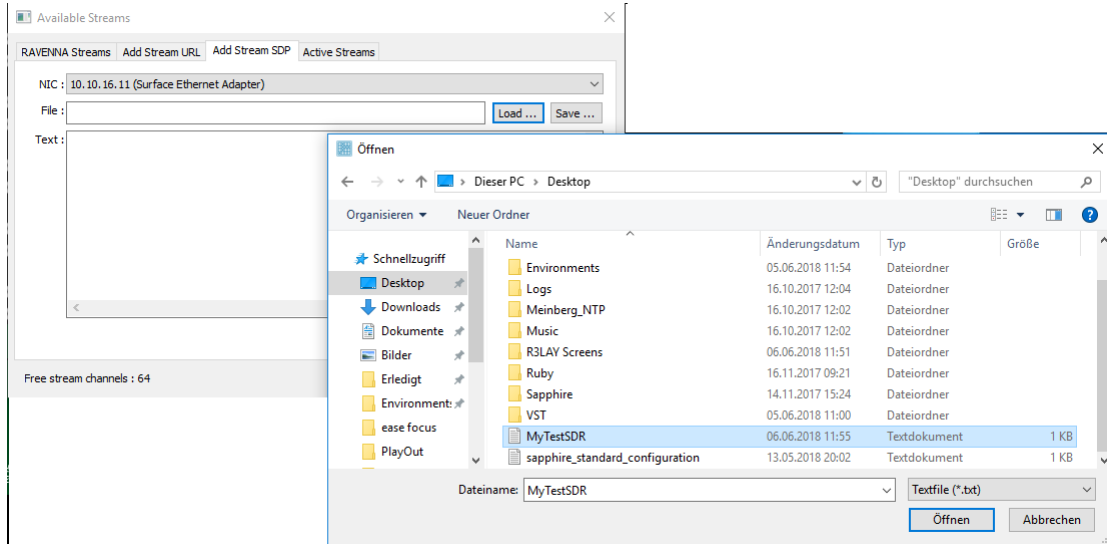
Then select **Open** - the file contents are displayed in the Text area:
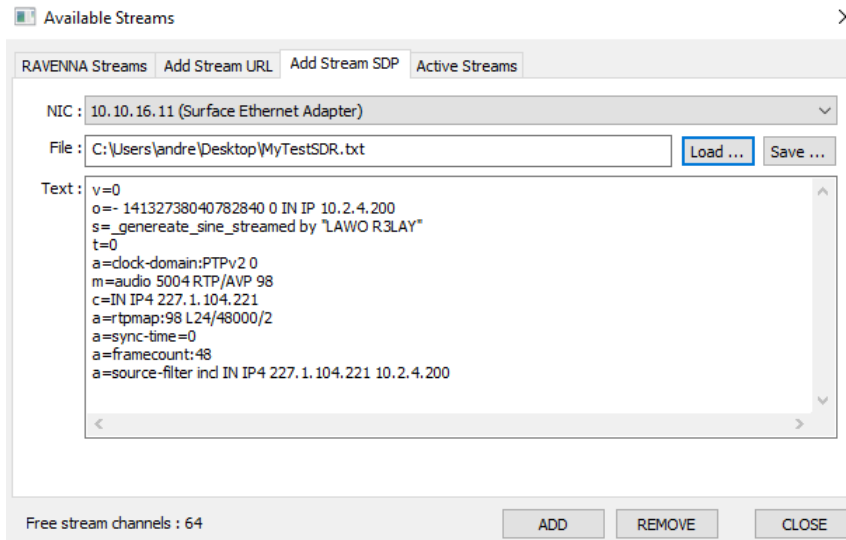
3.   Alternatively, type in the SDP information into the Text area (or use copy/paste to paste text from another location).

The **Save..** button can be used to save the SDP Text content (under a new filename).

4.   Click on **ADD** to add the stream to the connection slot.

4.6.4 Active Streams

Select this tab to display all active streams (those already added to an incoming connection slot, or published from the lower half of the GUI):
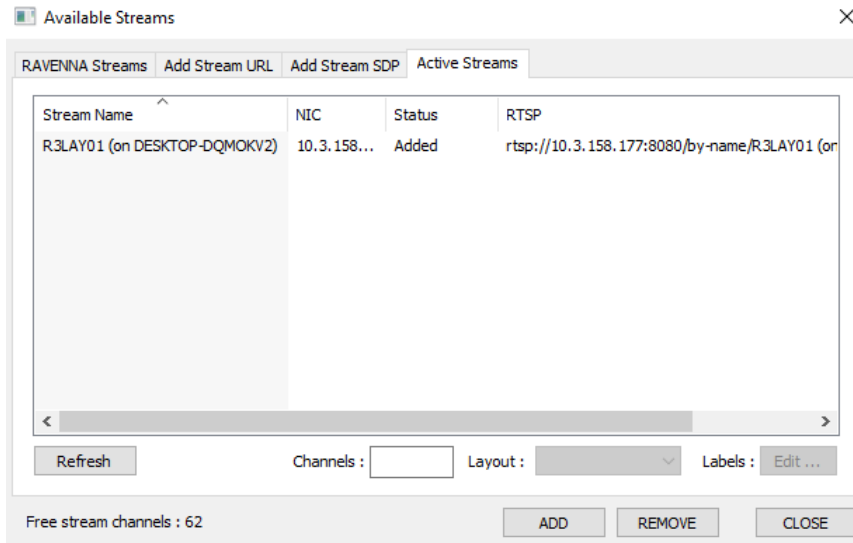
Click **Refresh** to update the list.

Note that the **Channels**, **Layout** and **Labels** fields are reserved for future implementation.

4.7 Publishing Audio to the Network

To publish audio from your computer to the network, you must create an outgoing RAVENNA stream. As before, you should check the assignment of the RƎLAY virtual audio drivers, so that you know which driver is assigned to each software client.

Up to eight outgoing streams are supported, represented by the eight 'Streaming' slots in the lower half of the GUI. In each case, a source driver is selected (on the left), and the stream is named and made **Active** (on the right):

Once a stream is **Active**, it can be used by any other RAVENNA compatible device connected to the streaming network.

The eight source slots (on the left) are always configured from WDM Drivers 1 through 8. Any of the slots can be replaced by an ASIO client, providing that your ASIO client software is running. However, you cannot change the WDM Driver slots - for example, you cannot use slot one to publish a stream from WDM Driver 8.

The channel format of output streams is defined automatically - for example, streams published from a stereo driver are always stereo; those published from an 8-channel ASIO client are always 8-channel; and so on. Therefore, there is no need for channel selection when defining an output stream.
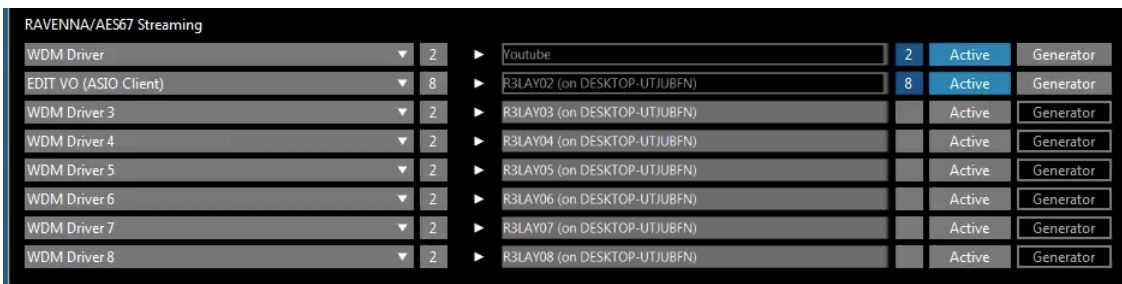
4.7.3 AES-67 Compliance

When a RAVENNA stream is published from **R∃LAY VSC**, the user can specify the stream name and number of channels. The remaining payload parameters are pre-defined as follows:

- **Bits per sample** = 24
- **Frame size** = 48 (for 2-channel and 8-channel streams).
- **Frame size** = 6 (for 64-channel streams).

This ensures that all streams published by **R∃LAY VSC** are AES67-compliant.

4.7.4 Using the Generator

This button sends a 1kHz test tone to each audio channel of the **Active** stream. The channel assignment is cyclical - so, tone appears on channel 1 for a few seconds, then on channel 2, then on channel 3 and so on until all channels have been tested.

1. First, set the level of the test tone, using the **Test signal level** menu in the Settings -> Host dialog box. You can choose one of the drop-down options:
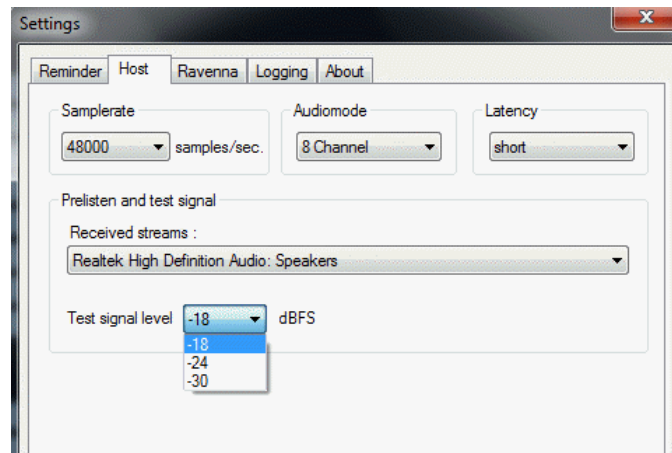
2. Then click and hold the **Generator** button beside the stream you wish to test - the button is highlighted (with a lighter grey background) when active:
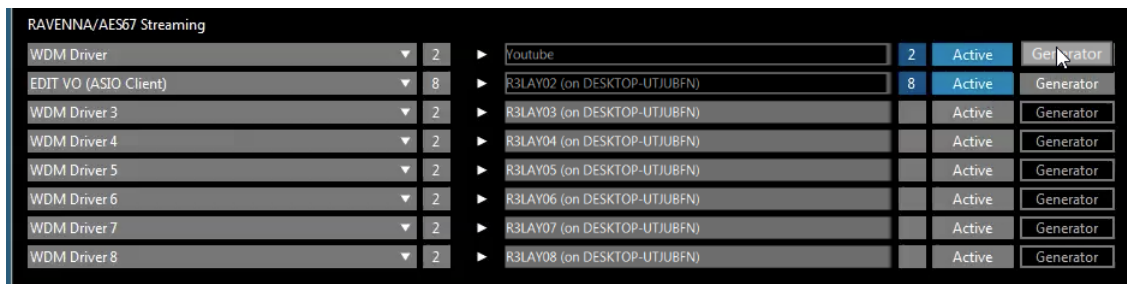
The test tone is now routed to each channel of the outgoing stream in sequence, so channel 1 for a few seconds, then channel 2 and so on.

3. Release the **Generator** button to cancel the test tone signal.

4.8 Diagnostics

This button provides further diagnostics:

1. Select **DIAGNOSTICS** to open the dialog box:
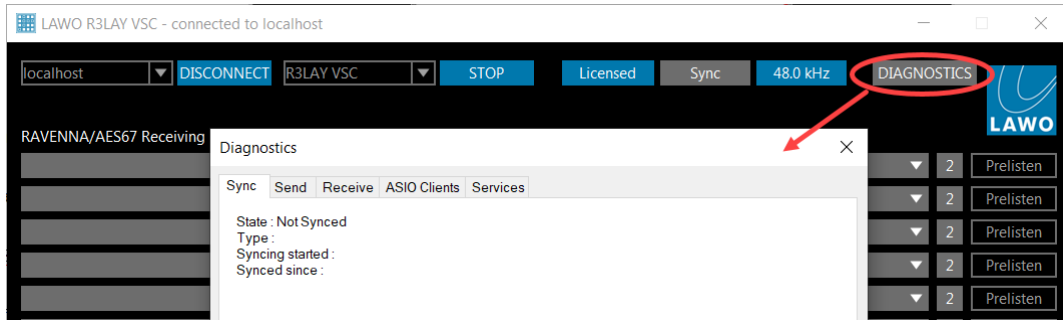
➢ **Sync**

This tab shows information about the sync source - see Synchronisation.

➢ **Send & Receive**

These tabs reveal more detailed information about the sending and receiving streams - select a stream from the drop-down menu. The information includes RTCP and SDP details, and internal statistics.

➢ **ASIO Clients**

This tab shows information about the ASIO clients - see ASIO Software Clients.

➢ **Services**

This tab shows information about the different RƎLAY services.

5. RAVENNA

This chapter describes the setup of RAVENNA streams for transferring audio-over-IP.

5.1 About RAVENNA

RAVENNA is an open technology which uses standardized networking protocols to stream audio, and other media content, across an IP network:
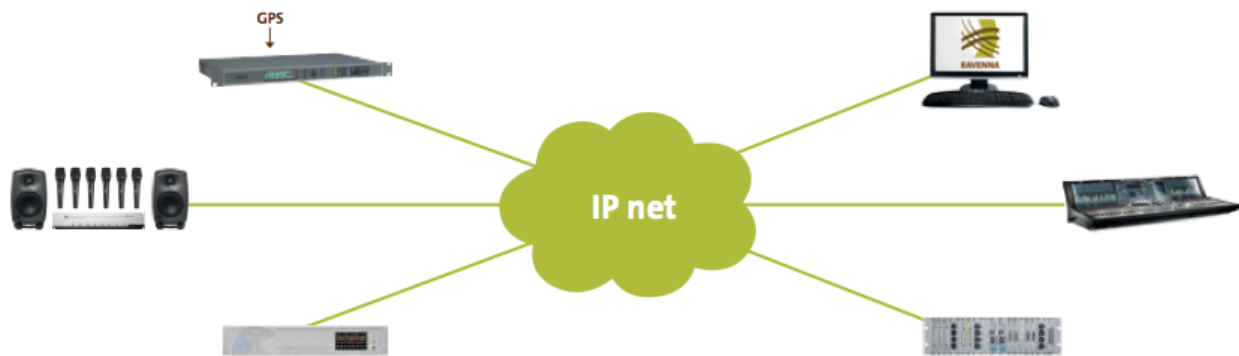
Each "node" on the network can be any RAVENNA compatible device (Lawo or third-party). RAVENNA nodes *MUST* be connected via a qualifying IP network - i.e. one that meets certain data network requirements. Audio streams can be published from each node to the network - for example, from a **RƎLAY** PC. Other nodes may then choose to start receiving the stream - for example, to play out the audio through one of the mixing consoles. Multiple streams can be published from a single node. In a multicast network, a published stream can be used by multiple receivers simultaneously. A major advantage of RAVENNA is that the network infrastructure can grow to meet the installation's requirements.

You can find more details about the data network requirements in the Lawo IP Networking Guide.

5.1.1 RAVENNA & RƎLAY VSC

RƎLAY VSC supports a native implementation of RAVENNA.

Up to eight incoming and eight outgoing connections are supported, where each one connects to a RAVENNA stream or virtual audio driver. Each stream can be either stereo or 8-channel.

Typical applications include receiving audio streams from a network playout server or other **RƎLAY** users, and publishing final mixes from your **RƎLAY VSC** computer onto the network.

> The maximum number of RAVENNA channels, used by any combination of streams, is 64 channels (receiving) + 64 channels (sending).

5.1.2 AoIP Stream Monitor

AoIP Stream Monitor can be used to check the status of RAVENNA streams on the network. It provides a useful diagnostics tool for master control and service technicians. It is available as a separate application (or service) and is described in the separate "AoIP Stream Monitor User Guide".

5.2 Configuring the Network Interface Card (TCP/IP Settings)

R∃LAY VSC connects to the RAVENNA network via the host PC's Network Interface Card (NIC). If the PC supports more than one NIC, then you can choose which interface will be used from the "Settings -> RAVENNA" menu.

To establish communication, you must first configure the TCP/IP settings of the NIC as follows. 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.

R∃LAY VSC supports both DHCP and static IP addresses. If you are using **R∃LAY VSC** with other Lawo RAVENNA hardware devices, then static IPs are recommended.

5.3 Defining the RAVENNA Settings

1. Open the Settings dialog box by clicking on the Lawo logo at the top right of the GUI.

2. Select the **Ravenna** tab:
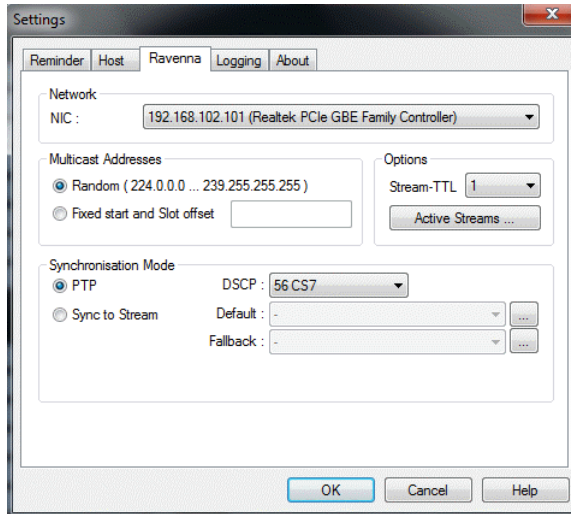
The RAVENNA settings configure the global streaming options used by **RƎLAY VSC**:

- **Network** - selects the Network Interface Card (**NIC**) to be used for RAVENNA streaming. The drop-down menus list all available network interface cards fitted to your computer.

- **Multicast Address Range** - these values define the multicast address range used for the eight outgoing RAVENNA streams. **Random** is the default setting. If you wish to limit the address range, select the **Fixed start and Slot Offset** radio button and enter the Multicast Address for the first stream - for example, 230.200.1.201. The eight streams are then automatically assigned to next eight addresses, so the second stream is addressed to 230.200.1.202; the third stream to 230.200.1.203; and so on.

- **Options: Stream-TTL** - defines the Time To Live for outgoing RAVENNA streams. TTL is used within computer networks to limit the lifespan of data packets so that they do not circulate indefinitely. For RAVENNA streaming, you may need to increase the TTL value if you wish to cross several subnets within your network - click in the **Stream-TTL** field and increase the value to something like **4**.

- **Options**: **Active Streams** - click on this button to open a further dialog box. Here you will see information about all the streams which **RƎLAY VSC** is sending and receiving:

You can copy and paste the details relating to any active stream - select a stream (or streams) from the list and press **CTRL** + **C** to copy the data to the clipboard. Then open a text editor and press **CTRL** + **V** to paste - the data appears in a .csv (comma separated values) format.

- **Synchronisation Mode**: see Synchronisation.

5.4   Synchronisation

RAVENNA streaming relies on accurate timing information and a valid sync source must be specified. This can be either PTP (Precision Time Protocol) from the network or an incoming RAVENNA stream.

5.4.1   Defining the Sync Mode

1.   Open the Settings dialog box by clicking on the Lawo logo at the top right of the GUI.

2.   Select the **Ravenna** tab, and under 'Synchronisation Mode' select either **PTP** (Precision Time Protocol) or **Sync to Stream**:
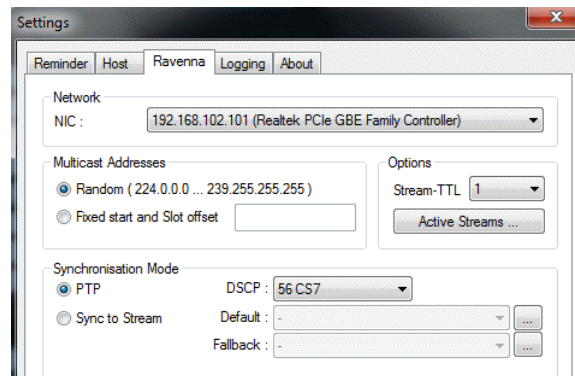
➢ **PTP**

The default mode is PTP (recommended for larger networks/multiple device streaming).

Note that R∃LAY VSC acts only as a PTP slave and, therefore, a master PTP clock generator must be installed somewhere within the network. The PTP clock source should arrive via the Network Interface Card (specified in the **NIC** field); the **Sync** status field flashes while synchronising, and lights once a valid PTP source is detected; this can take a few seconds.

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. DSCP values are used within computer networks to classify and manage different types of network traffic. For example, to provide low-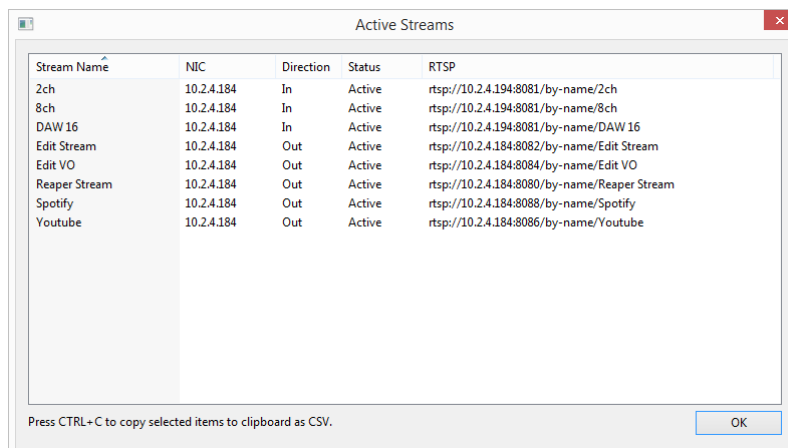latency for critical network traffic such as media streaming, while providing best-effort services to non-critical services such as web traffic or file transfers. If in doubt, please check the DSCP implementation with your network administrator.

➢ **Sync to Stream**

If your network has no PTP master, then R∃LAY VSC can sync to an incoming RAVENNA stream. This can be useful in a small network with say a single sending device. R∃LAY VSC will generate RAVENNA compatible streams locked to the incoming stream, allowing any outgoing streams to be received (by the sending device) without clock drift.

Select the **Sync to Stream** box, and then assign a **Default** (and **Fallback**) stream from the drop-down menus; the **Sync** status field flashes while synchronising, and lights once a valid PTP source is detected; this can take a few seconds. If the **Default** stream disappears, then the **Fallback** stream is used.

Note that the drop-down menus list all RAVENNA streams 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 box where you can enter the URL of the stream manually.

3.   Following a change, you will need to restart the R∃LAY VSC service before the changes take affect.

5.4.2 Checking the Sync Status

The sync status is indicated at the top of the GUI - the **Sync** field is blue if **RƎLAY VSC** is receiving a valid sync source:
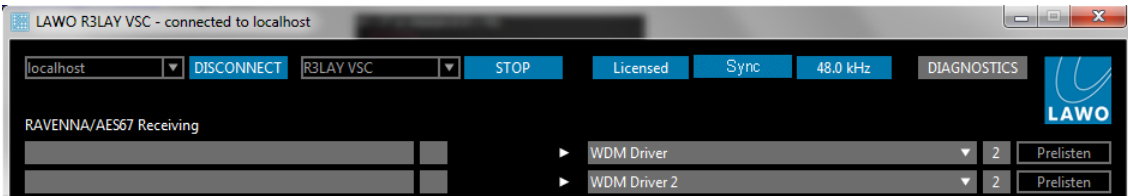
The field will flash yellow if the clock is synchronising - for example, after the **RƎLAY VSC** service is started. It is normal for the synchronisation process to take a few seconds:
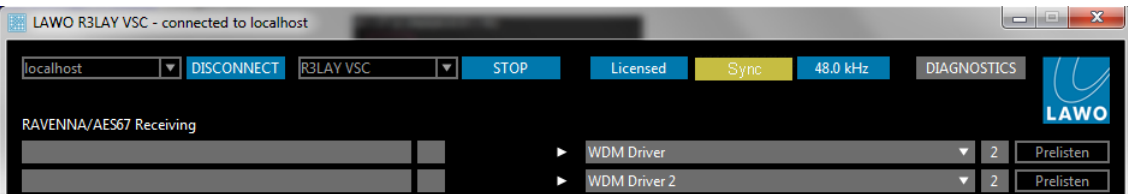
The field has a grey background if there is no valid sync signal detected:
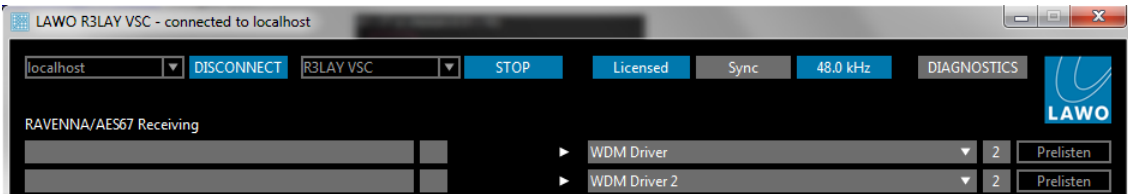
Synchronisation can also be checked from the Diagnostics dialog box:

1. Select **DIAGNOSTICS** and the **Sync** tab:
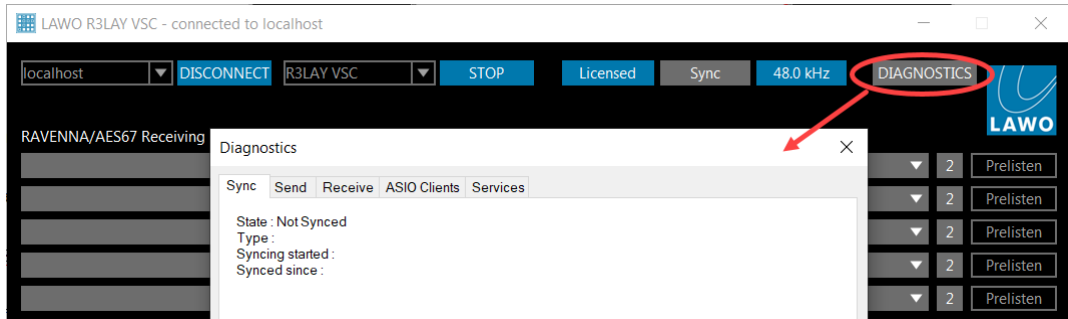
Information about the sync source and state will be specified - in our example above, we have no Sync source connected and, therefore, the state is 'Not Synced'.

Below is an example of a network configured with a PTP master:
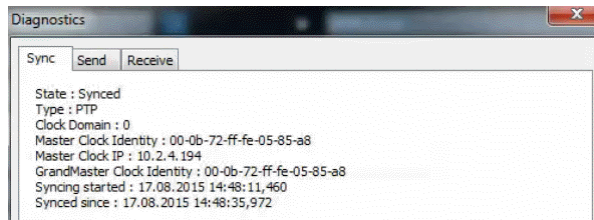
6.   Settings

This chapter describes the program's global settings.

1.   Open the "Settings" dialog box by clicking on the Lawo logo (top right):
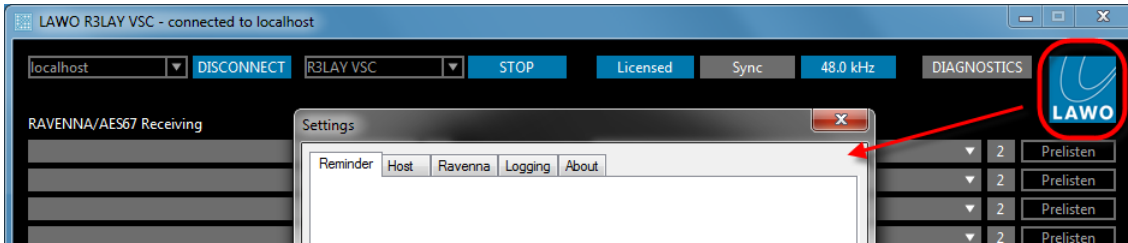
2.   Select a tab and edit the settings.

3.   Select **OK** to save any changes and close the dialog box.

If the following message appears, you will need to close and restart the application (as described earlier).
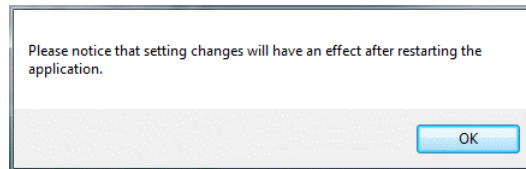
> All Settings are stored with the rest of the configuration, see Saving the Configuration.

6.1   Host
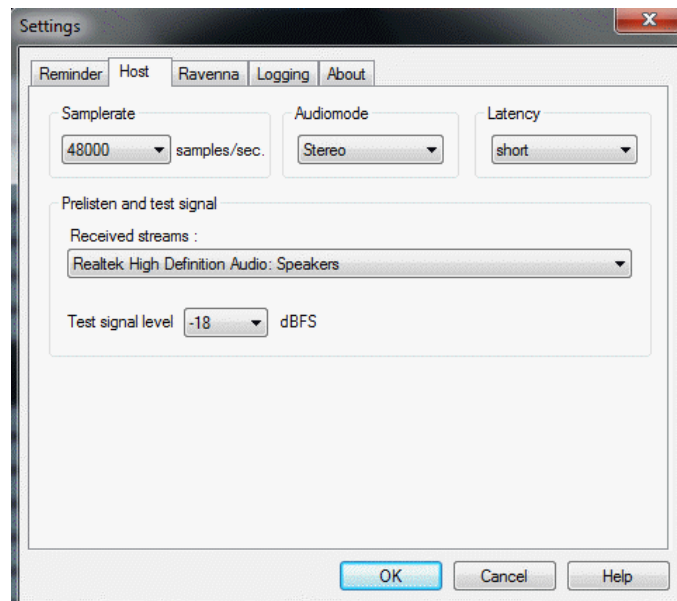
This tab configures options for the local host:

- **Samplerate -** sets the default sample rate which will be used for outgoing RAVENNA streams. You can choose **48000** (48kHz) or **44100** (44.1kHz).

- **Audiomode** - defines the number of channels for **RƎLAY** ASIO clients. You can choose **Stereo**, **8-channel** or **64-channel**. Your selection affects the channel routing options available when assigning multi-channel streams to and from an ASIO client.

- **Latency** - defines the preferred audio buffer size and, therefore, the latency. You can choose **Short**, **Medium** or **Long**. Note that the shorter the latency, the more susceptible the audio may be to drop-outs (depending on the performance of your computer). If you are experiencing problems with audio drop-outs, then you should increase the **Latency** option.

- **Prelisten and test signal**

  o   The **Received streams** drop-down menu selects the hardware interface which will be used as the Prelisten device. You can choose any stereo audio hardware interface installed on your PC.

  o   The **Test signal level** drop-down menu selects the level for the Generator signal. You can choose **-18**, **-24** or **-30** dBFS.

6.2   RAVENNA

These settings configure the global streaming options described earlier in the RAVENNA chapter.

6.3 Logging
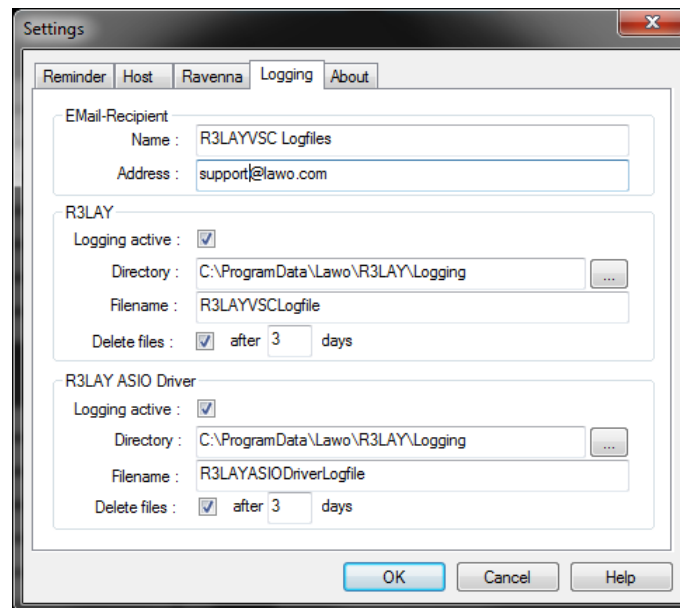
R∃LAY VSC produces a very detailed log of many events and statistics. These options define:

- **Email-Recipient** - enter the **Name** and **Address** of your chosen recipient - e.g. support@lawo.com.

- **Logging active** - saves a log file whenever there is a problem with the software.

- **Directory** and **Filename** - sets the filename and location for the log file(s) - each file is automatically suffixed with a different number to make it unique.

- **Delete Files** - select this option to delete the log files after **x** days.

Note that the same settings can be defined for the main **R∃LAY VSC** application and its ASIO Driver.

If you experience a problem with the software, please email the latest logfiles to support@lawo.com. Please add a description of what was happening, and the date and time when the problem occurred.

6.4 About

This page provides information about the **R∃LAY VSC** release and its drivers.

You can also display information about the third-party modules and/or Open Source libraries by selecting **Show Modules and Libs...**

The **Activate License** button opens the 'Lawo License' web browser page. If the button is greyed out, then a full license is already active.

7.   The Service Manager

This chapter describes the **RƎLAY Service Manager** which is included with **RƎLAY VSC**. It can be used to make changes to the current connections or settings, or start and stop a **RƎLAY** service or application (running on either the local or remote host).

7.1   Architecture

Once **RƎLAY VSC** is installed, the user sees only the GUI. However, there are three executables:

- **RƎLAY VSC** - this is the service which deals with all audio handling and RAVENNA streaming configuration. It runs automatically in the background whenever you start the PC. The default file path is: "C:\Program Files (x86)\Lawo\R3LAYVSC\R3LAYVSC.exe".

- **RƎLAY Service Manager** - this service is required to start and stop the application or service (described above). It runs automatically in the background whenever you start the PC. The default file path is: "C:\Program Files (x86)\Lawo\R3LAYServiceManager\R3LAYServiceManager.exe".

- **RƎLAY Service Manager GUI** - this is the GUI application which provides the front-end user interface. It controls the Service Manager, which in turn starts and stops the **RƎLAY** application or service. The GUI can connect to either the local host or a remote PC, and can start and stop any flavour of **RƎLAY**. The default file path is: "C:\Program Files (x86) \Lawo\R3LAYServiceManager\R3LAYServiceManagerGUI.exe".

7.2   Opening the Service Manager GUI

1.   To open the **RƎLAY Service Manager** GUI, either click on the taskbar icon or select the application from the Windows START menu.

The GUI opens with an automatic connection to the local host's active **RƎLAY** service - in our example, **RƎLAY VSC**. This is indicated by the '**Lawo RƎLAY VSC - connected to localhost**' text in the title bar, and the **localhost** and **RƎLAY VSC** fields at the top of the GUI:

> Only one **RƎLAY** application or service may be running at a time. To switch to another application or service, you will need to stop the current service and start a new one.

7.3 Connecting to a Local or Remote Host

If you see the following window, then the host has been disconnected:
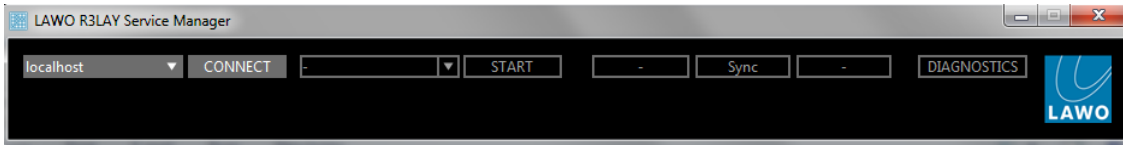
The connection status is also indicated by the taskbar icon - a green dot appears when the service is connected:

Service Connected   *Service Disconnected*

➢ **To connect to a Local Host:**

1. Select **localhost** from the drop-down menu (top left).

2. Click **CONNECT** - the GUI connects to the active **RƎLAY** service running locally on this computer, in our example to **RƎLAY VSC**:

➢ **To connect to a Remote Host:**

1. Select **DISCONNECT** - to disconnect the local host.

2. Type either the IP address or network name of the remote PC's Network Interface Card into the 'connected host' field - for example:

3. Click **CONNECT** - the GUI connects to the active **RƎLAY** service running on the remote PC.

The Standard Port Number

The standard port used for a **RƎLAY** connection = 9997. If you are not using the standard port, then you will need to add this number (after a colon) to the IP address or network name - for example, type "localhost:9997", "192.163.10.33:9997" or "MyPCName:9997" and then select **CONNECT**.

If you wish to use a different port number (other than 9997), then edit the number in the "C:\ProgramData\Lawo\R3LAY\R3LAYServiceManager.ini" file on the PC running the **RƎLAY** service. The line to edit is "EmberPort=9997".

7.4 Starting and Stopping the Service

Only one R∃LAY application or service may be running at a time. Therefore, if you have installed **R∃LAY VRX**, **VPB** or **Stream Monitor** (which can run as either an application or service), or have multiple flavours of R∃LAY installed on the same PC, you will need to stop the current service before starting a new one:

1. Select **STOP** to stop the active service:

If an ASIO client is running, then you will be asked for confirmation:
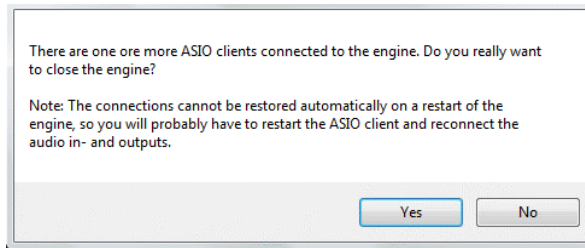
Select **Yes** to continue - the software saves the current configuration and stops the service. This may take a few seconds:

When the shutdown is complete, you will see a reduced GUI:
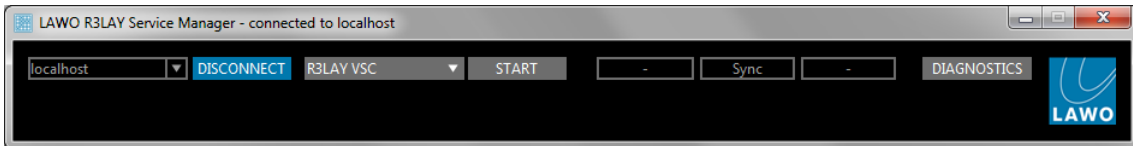
2. Select the new application or service from the drop-down service field - note that you will only see the options installed on the connected host:
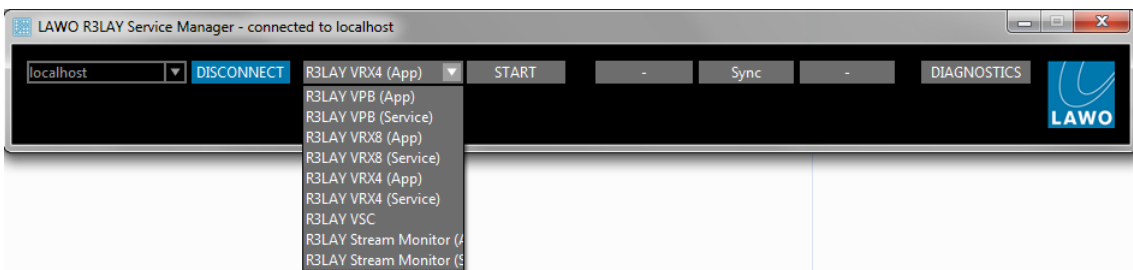
3. Select **START** - a pop-up appears showing the progress; it may take a few seconds to start a new service. At the end of the start-up, the software loads the latest configuration file:

- For **R∃LAY VRX**, **VPB** or **Stream Monitor** applications, the application GUI opens in a separate window.

- For **R∃LAY VRX**, **VPB** or **Stream Monitor** services, you will see a reduced Service Manager GUI (as shown above) - the service is now running in the background.

- For **R∃LAY VSC**, the Service Manager expands to reveal the full VSC GUI.

You need to restart your ASIO clients and reconnect their audio input/output devices following a service restart.

If the connection is to a remote PC, and you start a **R∃LAY VRX**, **VPB** or **Stream Monitor** application, then a user must be logged in on the remote PC (in order to open the application GUI). To start **R∃LAY** services on a remote PC, no user login is required.

7.5   Closing the GUI

The **RƎLAY Service Manager** GUI can be minimised or closed in the usual windows manner (from the top right of the window):
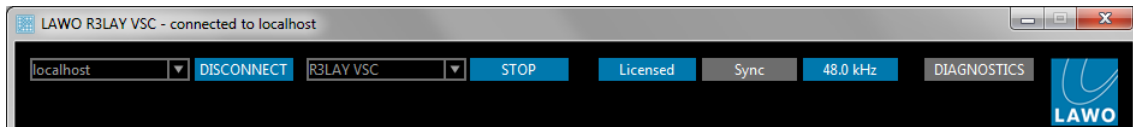
Alternatively, right-click on the taskbar icon and select **Close**:
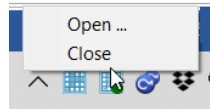
Note that closing the GUI only closes the Service Manager GUI - all **RƎLAY** services continue to run in the background, meaning that any audio connections and RAVENNA streams remain active. If you wish to stop the active service, then use the **STOP** button. See <u>Starting and Stopping the Service</u>.

To reopen the GUI, click on the taskbar icon.

8. Saving the Configuration

The **RƎLAY VSC** configuration is stored locally on the connected host, each time you stop the **RƎLAY VSC** service or shut down the **RƎLAY VSC** PC.

What is Saved?

The complete configuration is saved, including all settings (defined in the Settings dialog) and all connections (between the RAVENNA streams and software clients, and their corresponding stream setups). The data is stored in the "R3LAYVSC.ini" file in the "c:\ProgramData\Lawo\R3LAY" folder for all users. It is important that Windows Administrator rights grant full access to the ".ini" file for every user.

Restarting

All background services start automatically whenever you restart the **RƎLAY VSC** PC. This means that any connections and streams which were active at the last shutdown will be reinstated after a restart. Note that connections can only be re-instated if the relevant client drivers and RAVENNA streams are available, and you have a valid sync signal.

9.   Appendices

This chapter includes further information which you may find useful.

9.1   Third-Party Modules & Open-Source Libraries

RƎLAY VSC uses the following third-party modules and/or Open Source libraries. Please click on the links below for more information about the code and license.

_____

Live555

http://www.live555.com/liveMedia

http://www.live555.com/liveMedia/#license

_____

Portaudio V19

http://www.portaudio.com/

http://www.portaudio.com/license.html

_____

Rapidxml

http://rapidxml.sourceforge.net/

http://rapidxml.sourceforge.net/license.txt

_____

reSIProcate

https://www.resiprocate.org/

https://www.resiprocate.org/License

_____

Steinberg ASIO & VST

https://www.steinberg.net/de/company/developer.html

This program uses ASIO Technology by Steinberg Media Technologies GmbH. VST is a trademark of Steinberg Media Technologies GmbH.

_____

Info-Zip

ftp://ftp.info-zip.org/pub/infozip/license.html

_____

9.2   Advanced Options

R∃LAY supports a number of options which can be enabled (or disabled) by editing the "R∃LAYxxx.ini" file, where xxx is the application name: VSC, VRX4, VRX8, VirtualPatchBay or StreamMonitor.

The file can be found in the "C:\ProgramData\Lawo\R3LAY\" folder on the PC running the R∃LAY service. If more than one R∃LAY product is installed, then you will see a separate ".ini" file for each application.

In each case, use the following steps to update the file:

1.   Using a plain text editor, add the correct syntax to the ".ini" file.

2.   Save the file, taking care to retain the same file name and folder location.

3.   Stop and then restart the R∃LAY application - the software will read the ".ini" file contents and update its feature set accordingly.

An ".ini" file template can be used to distribute parameters across several workstations or R∃LAY applications.

9.2.1 Using an "*.ini" File Template

A separate *.ini" file can be used to distribute parameters across several workstations or **RƎLAY** applications. The template can be stored locally or on a centralized file server.

This feature works as follows. On start up, **RƎLAY** always reads its local "RƎLAYxxx.ini" file. If a template is specified using the syntax given below, then the template is also read and its entries appended or overwritten to the local file.

Syntax

To enable this feature, add the following syntax to the local "RƎLAYxxx.ini" files:

```
[IniTemplates]

PathLocalTemplate=\\fileserver\Lawo\R3lay\R3layTemplate.ini
```

The file name used can be any, providing it matches the name and path defined above.

Implementation

Then edit the template "*.ini" file and move it to the specified folder location.

When you next stop and start the **RƎLAY** application on each workstation, the software will update the local ".ini" file contents as described above.

The examples below demonstrate some of the ways you can use this feature.

Example 1: Adding Workstation Names to Stream Names

If the following syntax is added to the "R3layTemplate.ini" file, then the result will be that Bonjour is switched off, and the workstation name will be automatically added to the stream names on all connected workstations:

```
[Debug]

UseBonjour=0

StreamNameAddComputerName=0
```

Example 2: Automatic Editing of Stream Parameters

Similarly, you can use variables to define certain stream parameters. So, if the following syntax is added to the "R3layTemplate.ini" file, the first stream can have a different Name and Multicast Address:

```
[R3layVRX8\RTSPSource\0]

Instance=1

Name=R3LAY%REGISTRY:HKCU:SOFTWARE\DSA\VisTool:StationID:String%_sla

MulticastAddr=230.155.139. %REGISTRY:HKCU:SOFTWARE\Lawo\R3layVRX8:MulticastStream0:DWORD%
```

Example 3: Using Different Templates for Different Workstations and Users

It is also possible to use variables within the template name. Thus you can specify a different template for each workstation or user.

For example, if the following syntax is added to the local "RƎLAYxxx.ini" files, then each workstation will read its own "*.ini" template from a centralized server:

```
[IniTemplates]

PathLocalTemplate=\\fileserver\Lawo\R3lay\R3layTemplate%REGISTRY:HKCU:SOFTWARE\DSA\VisTool:StationID:String%.ini
```

Similarly, the variable can be based on the environment variable username:

```
[IniTemplates]

PathLocalTemplate=\\fileserver\Lawo\R3lay\R3layTemplate%USERNAME%.ini
```

9.2.2 ".ini" File Options

Stream Setup

Name	Syntax & Description	Values

Setup SPS Connections	`[Debug]`
	`StreamingUseHitlessMerge=0`
	This option enables SMPTE ST2022-7 compatible streaming, otherwise known as Seamless Protection Switching (SPS) or Hitless Merge. Once enabled, you can transmit and receive streams using two NICs: default (NIC 1) and alternate (NIC 2).
	Note that SPS is NOT supported by RƎLAY VSC.
		0 or 1, default is 0

Setup Automatic Multicast Address Generator	`[Streaming]`
	`MulticastIPv4Pattern=239.NIC3.NIC4.n`
	This option allows you to set your own default pattern for the multicast address generator. The value is an IPv4 pattern, where:
	• the number is a fixed value in the range 0 to 255.
	• NIC3 / NIC 4 is the corresponding number of the NIC sending the stream (NIC1 to NIC4 are permitted).
	• n is an increasing number in the range 0 to 255.
	• x is a random number in the range 0 to 255.
		as per description

Define Offset for Second Multicast Address	`[Streaming]`
	`SecondMulticastIPv4Offset=0.0.0.1`
	When sending Hitless Merge streams, you can add an offset to the mulitcast address for the second stream. The value is an IPv4 pattern which defines the offset for each digit.
		as per description

Add Support for Source Specific Multicast (SSM)	`[Streaming]`
	`UseStreamSinkSSM=0`
	This option adds support for Source Specific Multicast (SSM) to the network driver. The driver version must be >= 1.4.0.11
	For SSM to work, the value must be set to 1 on all IGMPv3 members.
	SSM is a method of delivering multicast packets in which the only packets delivered to a receiver originate from a specific source address. Thus, SSM reduces demands on the network and improves security.
		0 or 1, default is 0

Define Default RTP Media Payload	`[Ravenna]`
	`StreamPayloadType=`
	This option defines the default RTP media payload type if it is not specified elsewhere (i.e. via Ember+).
		leave empty or enter value (95 to 255), default is empty

Direct Audio Switching	`[Debug]`
	`UseStreamReceiverDirectConnection=0`
	This option activates direct audio routing for streams switched to stream receivers. Once enabled, the connections from the receiver itself are used as a template for how to connect the stream.
		0 or 1, default is 0

Define WAN Connections (in addition to LAN Connections)	`[Debug]`
	`WanNICDefault=`
	`WanNICAlternate=`
	This option supports two additional WAN NICs to support stream translations between LAN and WAN. In this instance, you may have up to two NICs for WAN and two NICs for LAN.
		leave empty or enter NIC name

Setup Additional Values	`[Debug]`
	`DialogAddStreamSourceNbChannels=1,2,4,8,12,16,24,32,48,64`
	`DialogAddStreamSourceSamplesPerFrame=4,8,12,16,24,32,48,64,96,128,192,240,256,480,512`
	`DialogSettingsHostSamplerates=32000,44100,48000,88200,96000`
	This option defines the values that appear in the drop-down menus when you add a stream: Channels, Frame Size (samples per packet) and Sample Rate.
	Any value is permitted, so please take care to enter only reasonable values. For the number of channels, any value can be added from 1 to 64. For sample rates, note that WDM drivers support only 44.1kHz and 48kHz, while ASIO clients and streaming support other options. A typical example is shown above.
		as per description

Define New Stream Delay Time	`[Debug]`
	`NewStreamInfoDelayMilliSec=5000`
	This option defines the time (in ms) between the arrival of a stream announcement and the stream being made available inside RƎLAY.
		enter value in ms (0 to 30000), default is 5000

Stream Announcement

Name	Syntax & Description	Values

Setup Bonjour	`[Debug]`
	`UseBonjour=INT`
	This option defines the type of Bonjour implementation or deactivates Bonjour. The default value (INT) uses the internal C++ flavour. All other values result in Apple's mDNSResponder. (From Version 3.0.0.181, the value DSA is not supported.)
		0, 1, TRUE, APPLE or INT, default is INT

Define Node Names	`[Debug]`
	`BonjourNodeNameDefault=`
	`BonjourNodeNameAlternate=`
	This option defines the node names published to the network via Bonjour for your computer's NICs. The alternate name applies if SPS / Hitless Merge is enabled.
		leave empty or enter node name

Define Stream Name	`[Debug]`
	`StreamNameAddComputerName=1`
	This option adds the computer name to all stream names, resulting in names like "stream01 (on xxxx)". This makes it easy to identify streams on the network.
		0 or 1, default is 1

Setup mDNS Announcement Rings	`[Debug]`
	`UseBonjour=INT`
	`UseBonjourAddress1=224.0.0.251`
	`UseBonjourPort1=5353`
	`UseBonjourAddressName1=Ring 1`
	`UseBonjourAddress2=224.0.0.252`
	`UseBonjourPort2=5353`
	`UseBonjourAddressName2=Ring 2`
	`UseBonjourAddress3=224.0.0.253`
	`UseBonjourPort3=5353`
	`UseBonjourAddressName3=Ring 3`
	`UseBonjourAddress4=224.0.0.254`
	`UseBonjourPort4=5353`
	`UseBonjourAddressName4=Ring 4`
	This option allows you to define up to four separate mDNS announcement rings. The system listens on all of the defined rings for stream announcements, and allows you to select an individual ring or rings when you add a stream.
	The "UseBonjourAddressName" values name the rings in the GUI.
		leave empty or set (as shown)

Setup SAP Support	`[Debug]`
	`UseSAP=1 (default 0)`
	`UseSAPDoSDPSort=1 (default 1)`
	`UseSAPAddress1=239.255.255.255`
	`UseSAPPort1=9875`
	`UseSAPAddress2=`
	`UseSAPPort2=9875`
	`UseSAPAddress3=`
	`UseSAPPort3=9875`
	`UseSAPAddress4=`
	`UseSAPPort4=9875`
	If this option is enabled, the software listens for SAP announcements, and announce streams to the network via SAP. This provides an alternative method of stream detection to the usual mDNS/Bonjour. Up to four SAP announcement rings can be specified.
	The "UseSAPDoSDPSort" value affects the ordering of SDP lines within the SAP message.
		0 or 1, default is 0

Define TTL for mDNS Packets	`[Debug]`
	`UseBonjourTTL=0`
	This option defines a TTL for outgoing mDNS UDP packets.
		0 to 255, default is 0 (which results in OS default TTL=1)

Define TTL for SAP Packets	`[Debug]`
	`UseSAPTTL=0`
	This option defines a TTL for outgoing SAP UDP packets.
		0 to 255, default is 0 (which results in OS default TTL=1)

Setup UniCast without RTSP	`[Debug]`
	`StreamingUseDirectUnicast=0`
	This option can be used to do unicast without RTSP communication. When the option is enabled, you can enter stream destination IPs which are not multicast. Any IP address can be entered in the Multicast Address field, and there will be no test to check if the value is a valid multicast address.
		0 or 1, default is 0

Name	Syntax & Description	Values

Define Send Multicast Join/Leave	`[Debug]`
	`StreamSenderJoinMulticast=0`
	When this option is enabled, the stream senders issue a multicast join/leave. This can be used to avoid UDP packet flooding on certain types of network switch.
		0 or 1, default is 0

Send Stream SDPs as mDNS Packet	`[Debug]`
	`UseBonjourSDPExtension=0`
	This option supports an mDNS extension to send stream SDPs directly in a mDNS packet.
		0 or 1, default is 0

Define the Media Index inside SDP	`[Ravenna]`
	`NICDefaultSDPMediaSelection=MediaIndex:0`
	`NICDefaultSDPMediaSelection=MediaID:primary`
	This option is needed only in routed networks, such as a Nevion network. It defines the part of the SDP which should be used for the default NIC. The syntax is shown below. For the MediaIndex, enter either an index number (starting from 0) or id (defined in the SDP line "a=mid:...").
		as per description

Support Static SDP Stream List	`[SDPStreams]`
	`NbStreams=1`
	`[SDPStream_1]`
	`Interface=Default`
	`Name="Rav.Out8"`
	`SDP="v\=0\r\no\=- 06904238260008 0 IN IP4`
	`10.2.20.90\r\ns\=Rav.Out8\r\nt\=0 0\r\na\=clock-domain\:PTPv2`
	`0\r\na\=ts-refclk\:ptp\=IEEE1588-2008\:00-0B-72-FF-FE-05-85-`
	`A8\:0\r\na\=mediaclk\:direct\=0\r\nm\=audio 5004 RTP/AVP`
	`98\r\nc\=IN IP4 239.20.90.8/5\r\na\=source-filter\: incl IN IP4`
	`239.20.90.8 10.2.20.90\r\na\=rtpmap\:98`
	`L24/48000/2\r\na\=framecount\:32\r\na\=recvonly\r\na\=ptime\:0.66`
	`6\r\na\=sync-ime\:0\r\na\=mediaclk\:direct\=0\r\n"`
	This option supports a static SDP stream list. A typical example is shown above. Please note the SDP escapement.
		as per description

Setup Search Text	`[Debug]`
	`DialogAddStreamSinkUseSearchAsFilter=0`
	When this option is enabled, the "Search" field in the 'Available Streams' dialog box can be used to filter the list of streams.
	Enter your filter text into the "Search" field and press **Refresh** - all streams which match the filter are shown. Clear the "Search" field and press **Refresh** again to see the complete list. Note that the search text is case sensitive.
		0 or 1, default is 0

Synchronization

Name	Syntax & Description	Values

Set WDM Clock to PTP	`[Debug]`
	`UsePTPToWDMClockSyncFactor=0`
	This option sets the WDM clock to PTP by transmitting the PTP clock factor from the application to the WDM driver. This options requires a WDM driver version >= 1.6. You can check the WDM driver version from the About menu (click on the Lawo logo and then select "About").
		0 or 1, default is 0

Setup PTP Delay Request	`[Debug]`
	`PTPUseSyncOnly=1`
	This option deactivates PTP Delay Request messages. This can slightly improve the precision of PTP. Under normal circumstances, it is not needed.
		0 or 1, default is 1

Define PTP "Not Valid" Delay Message	`[Debug]`
	`PTPMaxValidMessageTimeoutMilliSec=5000`
	This option defines the time in milliseconds without receiving PTP before the software reports the sync signal as lost.
		enter value in ms (1000 to 300000), default is 5000

Define Minimum Number of Valid PTP Sync Signals	`[Debug]`
	`PTPMinSyncs=50`
	This option defines the minimum number of valid PTP syncs received before the software switches the sync to active.
	ATTENTION! It is recommended to leave this option unchanged, as setting the value too low can result in sync issues.
		enter value (5 to 100), default is 50

Name	Syntax & Description	Values

Define Valid Number of PTP Delay Requests	`[Debug]`
	`PTPMinDelayRequests=5`
	This option defines the minimum number of valid PTP delay request responses received before the software switches the sync to active.
		enter value (1 to 20), default is 5

Setup Seamless PTP Switching	`[Debug]`
	`UseSeamlessPTPSwitching=1`
	When this option is enabled and the PTP master is lost, the software uses the latest computed values until a new valid PTP master is available. Thus, the system switches seamlessly between PTP masters.
		0 or 1, default is 1

Setup Internal Streams without PTP	`[Debug]`
	`UseInternalSyncedStreams=0`
	This option adds an additional sync mode to send streams based on the internal clock. The option must be enabled in both the sender and receiver. In the receiver, the streams are called "R3lay" streams and are displayed in a separate tab from the Ravenna tab.
		0 or 1, default is 0

Define Internal Streams without PTP as Ravenna Streams	`[Debug]`
	`AnnounceNonPTPStreamsAsRavenna=0`
	This option announces the internal streams as Ravenna streams even though they are not synchronized to PTP.
		0 or 1, default is 0

RTSP

Name	Syntax & Description	Values

Define RTSP URL Escape Characters	`[Debug]`
	`RtspUrlEscapeCharacters=":/?#[]@!$&'()*+,;= % "`
	This option defines the list of characters to be used for RTSP URL escapement. Please include the reserved characters like ":" and "?". If the list is left empty, then the internal escape characters are used.
		leave empty or set (as shown)

Define First RTSP Server Port	`[Streaming]`
	`InitialRTSPSourcePort=8000`
	This option defines the port number of the first RTSP server.
		enter port number

Setup RTSP Ping Timeout	`[Streaming]`
	`RTSPPingTimeoutSecs=0`
	This option defines the RTSP behaviour if the ICMP ping to Unicast receiver fails. The value sets the number of seconds after which the stream is stopped. If the value is 0, then no ICMP ping check is done.
		0 to 14400, default is 0

Define RTSP Behaviour for 0 Bytes	`[Streaming]`
	`RTSPCloseSessionOnEmptyNewBytes=0`
	This option defines the RTSP behaviour if a remote socket dies and a 0 bytes reading is reported. In this instance, the unicast stream is stopped.
		0 or 1, default is 0

Setup RTSP Timeout for 0 Bytes	`[Streaming]`
	`RTSPLivenessTimeoutSecs=0`
	This option defines the RTSP behaviour if the connection breaks and there is no further RTSP communication. The value sets the number of seconds after which the unicast stream is stopped. Note that the receiver must send periodic dummy RTSP commands to use this feature.
		0 to 14400, default is 0

Network Compensation

Name	Syntax & Description	Values

Setup Wait Time Before Processing Buffer	`[Debug]`
	`SampleDataBufferTimeout=15`
	This option sets the wait timeout in milliseconds for data buffers before the buffer is processed.
		1 to 1000, default is 15

Setup Wait Time Before Processing Connection	`[Debug]`
	`SampleDataConnectionTimeout=15`
	This option sets the wait timeout in milliseconds for data buffers before a connection is processed.
		1 to 1000, default is 15

Name	Syntax & Description	Values

Setup Wait Time Before Processing WDM Driver	`[Debug]`
	`WDMDriverTimeout=5`
	This option sets the wait timeout in milliseconds for WDM drivers before the buffer is processed.
		1 to 50, default is 5

Setup Window Resend Size if Packets are too late	`[Debug]`
	`StreamDiscardPacketsTooLateMilliSecs=0`
	Packets which are too late by this amount of time are discarded and not sent. The option can be used to avoid heavy packet bursts. A value of 0 means no discarding of packets even if they are late. The time is set in milliseconds.
		1 to 100000, default is 15

Define What To Do in Case Of Drifting Streams	`[Debug]`
	`ClockDriftCompensation=NONE`
	This option defines what happens if a connection needs to be corrected due to under or overruns (caused by drifting clocks or performance jitter). The possible values are "NONE", "CROSSFADE", "CHECKPHASE" or "CHECKCLOCK". The default is "NONE".
	• CROSSFADE - a small crossfade is added to smooth the audio correction.
	• CROSSFADE|CHECKPHASE - the software performs a phase check to find an appropriate sample position and then adds a small crossfade.
	• CHECKCLOCK - the software attempts to compensate for the different sample clocks by adding or dropping random samples.
		as per description

Setup Cross Fade Behaviour in Case of Drifting Streams	`[Debug]`
	`DropoutCrossfadeSamples=64`
	In the case where a crossfade is applied, this option sets the crossfade duration (in samples).
		0 to 512, default is 64

Define Search Area for Phase Auto Correction in Case Of Drifting Streams	`[Debug]`
	`DropoutPhaseSearchSamples=0`
	In the case where a phase check is performed, this option defines the range of samples searched to find the best match for the audio correction.
		0 to 512, default is 0

Define Audio Buffer Size	`[Debug]`
	`SampleDataBufferSizeMilliSec=-1`
	This option sets the buffer size for each audio object inside RƎLAY. Defining a large buffer size can be used to compensate for high jitter values in the incoming or outgoing audio signals.
		500 to 30000, or -1 for default

Ember+

Name	Description	Values

Setup Stream Switching via Ember+	`[Streaming]`
	`UseEmber=0`
	This option allows stream parameters to be read and controlled via Ember+. For example, to switch streams to and from RƎLAY.
		0 or 1, default is 0

Define EmBER+ Stream Interval	`[Interfaces]`
	`EmberStreamInterval=50`
	This option sets the number of milliseconds until a new value is sent for Ember+ streams (i.e. peakmeter values).
		10 to 5000, default is 50

Improved Performance for Large Matrix	`[Debug]`
	`UseSinkSourceEmberMatrix=0`
	This option switches the SourceToSink matrix to an Ember+ matrix for each streaming connection. It can be used to improve the performance of a large matrix.
		0 or 1, default is 0

VRX: Setup Extended EmBER+ Tree for GUI	`[Debug]`
	`UseJadeStudioFullEmber=0`
	This option applies to RƎLAY VRX4 and VRX8. When enabled, the Ember+ tree is extended to allow control of the complete GUI.
		0 or 1, default is 0

VPB: Define Additional EmBER+ Matrix View	`[GUI]`
	`EmberMenuCommands=0`
	This option applies to RƎLAY VirtualPatchBay. It allows you to add individual inputs, outputs and summing points to the Ember+ tree (via the context menu in the VPB routing matrix).
		0 or 1, default is 0

Diagnostics

Name	Syntax & Description	Values

Setup Alert Manager	`[Debug]`
	`UseAlertManager=0`
	This option activates the Alert Manager to monitor events that are not obvious to the user. Once enabled, a dialog box appears if an alert is detected. The Alert Manager detects the following situations:
	• NICs using more than one IP address.
	• Suddenly missing UDP stream packets.
	• Duplicated multicast addresses.
		0 or 1, default is 0

Setup AlarmLog and Matrix Server Connections	`[Interfaces]`
	`AlarmLogActive=1`
	`AlarmLogNIC1=`
	`AlarmLogIPAddress1=x.y.z.t`
	`AlarmLogPort1=18200`
	`AlarmLogNIC2=`
	`AlarmLogIPAddress2=x.y.z.t`
	`AlarmLogPort2=18200`
	`AlarmLogMatrixServerActive=0`
	`AlarmLogMatrixServerIDOffset=0`
	This option supports connections to a DSA Alarmlog PC and/or Matrix Server.
	The "AlarmLogActive" and "AlarmLogMatrixServerActive" values can be set to either 0 or 1, the default is 0.
	The "AlarmLogIPAddress1" and "AlarmLogIPAddress2" values define the IP address of the main and redundant Alarmlog PC. In each case, enter either an IP address or name.
	The "AlarmLogMatrixServerIDOffset" sets a general offset for all IDs from 0 to 65535.
		as per description

Setup Latency Measuring	`[Debug]`
	`UseLatencyMeasuring=0`
	This option should only be used by an administrator in the case of latency issues. It can be used to measure and define the total latency of samples received in a stream and sent to a stream.
		0 or 1, default is 0

SysLog

Name	Syntax & Description	Values

Setup SysLog	`[Interfaces]`
	`SysLogActive=0`
	Activates the sending of some syslog messages.
		0 or 1, default is 0

Define SysLog IP	`[Interfaces]`
	`SysLogIPAddress=127.0.0.1`
	Defines the IPv4 address of the syslog server.
		enter IP address

Define SysLog Port	`[Interfaces]`
	`SysLogPort=514`
	Defines the port number of the syslog server.
		enter port number

Virtual Machine (VM)

Name	Syntax & Description	Values

Setup VM Mode	`[Debug]`
	`UseVMWareAPI=0`
	When this option is enabled, the software tries to load a vmware dll to detect whether it is running on a Virtual Machine and improve migration.
		0 or 1, default is 0

Fallback Monitor Rate in VM	`[Debug]`
	`UseMonitorRefreshRateFallback=0`
	This option may be needed if the software is running on a Virtual Machine and the monitor refresh rate cannot be detected. If the VM shows an error message such as "The monitor refresh rate could not be detected…", then the option should be set to 1.
		0 or 1, default is 0

General

Name	Syntax & Description	Values

Setup Defaults for Silence Detection	`[Debug]`
	`SilenceDetectionThresholdHigh=-20`
	`SilenceDetectionTimeoutHigh=0`
	`SilenceDetectionThresholdLow=-50`
	`SilenceDetectionTimeoutLow=5`
	This option sets the default values for silence detection.
	
	This feature can be used to indicate when the signal on a channel falls below a certain level. The silence detection Active state is published to the network via Ember+ (if Ember+ is enabled), and be used by an Ember+ consuming device.
		enter threshold in dBFs (-90 to 0), enter timeouts in seconds (0 to 60), default values are as shown.

Setup Audio Plug-in	`[Debug]`
	`UseAudioFilterFileSource=0`
	Adds the possibility to add a plug-in that can playback linear PCM wave files and be controlled via Ember+ (if Ember+ is enabled).
		0 or 1, default is 0

Setup Double Touch Event Delay	`[GUI]`
	`SuppressDoubleTouchMilliSecs=100`
	This option determines what happens when the user presses the same button in quick succession. If the time between presses is less than, or equal to, the value, then the software responds only to the first press. If the time between presses is greater than the value, then the software responds to the second press and actions another event. The time is set in milliseconds.
		50 to 2000, default is 100

Setup Process Priority	`[Host]`
	`ProcessPriority=REALTIME`
	This option defines the processing priority of RƎLAY. You can use this to increase the CPU resources allocated to RƎLAY compared to other PC tasks. The possible values are "NORMAL", "ABOVENORMAL", "HIGH", "REALTIME". The default is "REALTIME".
		as per description

Define SRC for ASIO (CPU Load)	`[Debug]`
	`ASIOClientSRC=BEST_QUALITY`
	This option defines the quality of Sample Rate Conversion (SRC) for ASIO clients running at a different sample rate. Note that a higher quality results in a higher CPU load. The possible values are "BEST_QUALITY", "MEDIUM_QUALITY", "FASTEST", "ZERO_ORDER_HOLD" and "LINEAR". The default is "BEST_QUALITY".
		as per description

Setup WLAN NICs	`[Debug]`
	`UseNIC=ALL`
	Enables the use of WLAN NICs.
	ATTENTION! Only for testing purposes as Admin.
		leave empty or set (as shown)

Setup Custom AutoMix Parameters	`[Debug]`
	`AutoMixAttackMilliSecs=5`
	`AutoMixReleaseMilliSecs=250`
	`AutoMixFloorDb=-45`
	This option can be used to define custom parameters for the AutoMix function:
	• Attack Time in ms, from 1 to 1000 (default is 5)
	• Release Time in ms, from 1 to 2000 (default is 250)
	• Floor Level in dB, from -100 to 0 (default is -45)
	Note that AutoMix is NOT supported by RƎLAY VSC.
		as per description

Activate Windows Mixer Volume	`[Debug]`
	`WDMDriverUseMixerVolume=0`
	This option activates the Windows mixer volume for all WDM driver instances. It allows you to use the Windows volume control to adjust the level to RƎLAY.
	The WDM driver version must be 1.8.0.5 or later.
		0 or 1, default is 0

RƎLAY VSC

Name	Syntax & Description	Values

Maximum Connection Latency	`[VSC]`
	`MaxConnectionLatencyWDMToStream=1024`
	`MaxConnectionLatencyASIOToStream=1024`
	`MaxConnectionLatencyStreamToWDM=1024`
	`MaxConnectionLatencyStreamToASIO=1024`
	This option applies to RƎLAY VSC. It defines the maximum latency for each type of connection. If a value is entered, then this overrides the settings-defined value: "short", "medium" or "long".
		leave empty or enter value (64 to 16384), default is empty

Define Fixed RTSP Ports	`[Streaming]`
	`VSCUseFixedRTSPPortPerSlot=0`
	This option applies to RƎLAY VSC. It assigns a fixed RTSP port for each connection slot.
		0 or 1, default is 0

RƎLAY VRX

Name	Syntax & Description	Values

Define Preset Workflow with Open Faders	`[Debug]`
	`MuteChannelOnPresetSwitch=0`
	This option applies to RƎLAY VRX. When enabled, a channel with an open fader mutes when the user changes the signal processing preset.
		0 or 1, default is 0

Define User Keys for Stream Connects	`[Debug]`
	`UseJadeStudioStreamReceiveConnect=0`
	This option applies to RƎLAY VRX. When enabled, VRX user keys can be defined to connect an incoming stream to a stream receiver.
		0 or 1, default is 0

Define User Keys to Open Sources	`[Debug]`
	`UseJadeStudioOpenSource=0`
	This option applies to RƎLAY VRX. When enabled, VRX user keys can be defined to open and close source channels. On opening, the fader returns to its last known position.
		0 or 1, default is 0

Define User Keys to Talk	`[Debug]`
	`UseJadeStudioTalkDirect=0`
	This option applies to RƎLAY VRX. When enabled, VRX user keys can be defined to talk to the direct out.
		0 or 1, default is 0

Define PPM	`[Debug]`
	`PeakmeterType=PPM10`
	This option applies to RƎLAY VRX and affects the PPM metering in the Taskbar. It sets the peak meter characteristics to match those used in Lawo's mc² Audio Production Consoles. The possible values are "PPM0", "PPM1", "PPM10" and "VU". The default is "PPM10".
		as per description

Setup PPM Level for Red Marker	`[Debug]`
	`StudioRedLevel=-6`
	This option applies to RƎLAY VRX and affects the PPM metering in the Taskbar. It sets the level at which the meter color turns red. The value is set in dBFS from -32 to 0. In VRX8, the defaul is -6. In VRX4, the defaul is -3.
		as per description

Define Range for Pop-up Arrows	`[R3LAYVRX8\Settings\Global\GUI]`
	`ButtonUnfoldHeightPercent=50`
	This option applies to RƎLAY VRX. It applies to the four User Keys in the headline of the GUI which support a second function via the pop-up arrow. It defines how much of the button is used for the arrow and how much is left for the main function. When the value is set to 50%, the button is split equally. i.e. users must click on the upper half of the button to action the User Key function, and click on the lower half to open the drop-down menu. If you wish to make it easier to operate the User Key functions, then reduce the value to make the arrows smaller.
		enter value (10 to 90), default is 50

Enable switching Fullscreen / WindowMode	`[Debug]`
	`R3LAYVRXnUseWindow=0 (n = 4 or 8)`
	This option applies to RƎLAY VRX. It is a special option which prevents the application switching into full screen view. To activate, click on the TASKBAR icon while pressing left SHIFT + CTRL + ALT.
		0 or 1, default is 0

Name	Syntax & Description	Values

Setup Extended EmBER+ Tree for GUI	`[Debug]`
	`UseJadeStudioFullEmber=0`
	This option applies to RƎLAY VRX. When enabled, the Ember+ tree is extended to allow control of the complete GUI.
		0 or 1, default is 0

VRX4: Define Default Support Channel in Taskbar	`[R3LAYVRX4\Settings\Global\General]`
	`StartupAppBarChannel=PHONES`
	This option applies to RƎLAY VRX4. It defines the default channel assigned to the "Channel Selection" box in Taskbar View.
		"Phones", "Speaker" or leave empty, default is empty

VRX8: Setup Processing for PGM and REC Bus	`[Debug]`
	`UseVRX8OutputProcessing=0`
	This option applies to RƎLAY VRX8. It allows you to assign signal processing presets to the PGM and Record busses (in Admin Mode).
		0 or 1, default is 0

VRX8: Show Options: Copy RTSP Link & Copy SDP	`[Debug]`
	`UseStreamClipboardCopy=0`
	This option applies to RƎLAY VRX8 and VPB. By default, the option is disabled. When enabled, it reveals two additional buttons when you add streams to VRX8: Copy RTSP Link and Copy SDP. These options copy the selected information to the clipboard, so that it can be used to setup a new stream. For example, via the Add Stream URL or Add Stream SDP windows in RƎLAY VRX8.
		0 or 1, default is 0

VRX8: Setup Additional Values for Number of Channels to/from ASIO Client	`[Debug]`
	`DialogSettingsNbAsioChannels=1,2,4,8,12,16,24,32,48,64`
	This option applies to RƎLAY VRX8. It defines the values that appear in the Number of Inputs and Number of Outputs menus for the RƎLAY ASIO Driver (in the Global Settings -> Audio tab).
	Any value from 1 to 256 is permitted, so please take care to enter only reasonable values. A typical example is shown above.
		as per description

RƎLAY VPB

Name	Syntax & Description	Values

Define Loop Visibility	`[GUI]`
	`PreventClientLoops=1`
	This option applies to RƎLAY VPB. When enabled, any connections in the routing matrix that could result in loops are hidden from view.
		0 or 1, default is 1

Setup AutoMix Context Menu	`[Debug]`
	`UseAutoMix=0`
	This option applies to RƎLAY VPB. It adds the AutoMix function to the context menu for summing points, in the routing matrix, so that users can apply automatic level adjustment.
		0 or 1, default is 0

Setup Stream Statistics	`[Debug]`
	`UseShowStatisticsInContextMenu=0`
	This option applies to RƎLAY VPB. It activates a context menu option to open a stream statistics window for the selected stream.
	To open the statistics window, right-click on a stream and select "Show Statistics...".
		0 or 1, default is 0

Show Options: Copy RTSP Link & Copy SDP	`[Debug]`
	`UseStreamClipboardCopy=0`
	This option applies to RƎLAY VRX8 and VPB. By default, the option is disabled. When enabled, it reveals two additional context menu options in the VPB "Routing" view when you right-click on a stream: Copy RTSP Link and Copy SDP. These options copy the selected information to the clipboard, so that it can be used to setup a new stream. For example, via the Add Stream URL or Add Stream SDP windows in RƎLAY VPB.
		0 or 1, default is 0

RƎLAY Stream Monitor

Name	Syntax & Description	Values

Open App as Window	`[Debug]`
	`R3LAYStreamMonitorUseWindow=0`
	This option applies to RƎLAY Stream Monitor. When enabled, the application opens as a window that can be resized, minimized, etc. By default the option is disabled so that the application opens in full screen.
		0 or 1, default is 0

Name	Syntax & Description	Values

Disable Loudness Measurement	`[Debug]`
	`UseStreamMonitorLUFS=1`
	This option applies to RƎLAY Stream Monitor. It can be used to switch off the loudness measurement to reduce the demand on the computer's CPU. In this instance, the stream monitoring window shows only the peak level metering (in dBFS). By default, the loudness measurement is turned on and so both dbFS and LUFS are shown.
		0 or 1, default is 1

OnAir4

Name	Syntax & Description	Values

Setup OnAir4	`[Interfaces]`
	`OnAir4Active=0`
	`OnAir4UseFixedIPAddress=1`
	`OnAir4FixedIPAddress=a.b.c.d`
	This option activates the connection to an OnAir4 (supported by RƎLAY VRX4, VRX8 and VPB).
		0 or 1, default is 1

VRX8: Setup All Headphones for OnAir4	`[Interfaces]`
	`OnAir4UseMultiHeadphone=1`
	This option applies to RƎLAY VRX8. It activates all four headphone outputs on the OnAir4 with independent level control from the GUI, and via Ember, for each output.
		0 or 1, default is 0 for existing and 1 for new installations

Setup Image Check on OnAir4	`[Interfaces]`
	`OnAir4CheckImageVersion=1`
	This option suppresses the image check of the OnAir4 (when the value = 0).
	ATTENTION! Only for testing purposes as Admin.
		0 or 1, default is 1
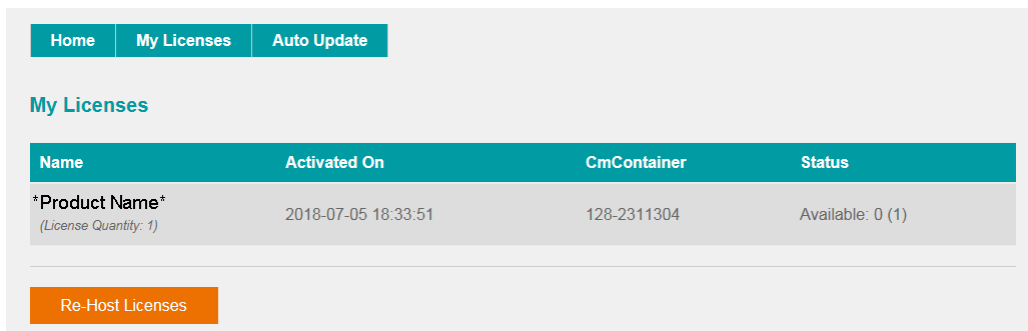
9.3   Advanced Licensing Features

This appendix describes the more advanced features of the CodeMeter Runtime licensing system.

9.3.1   Re-Hosting a License
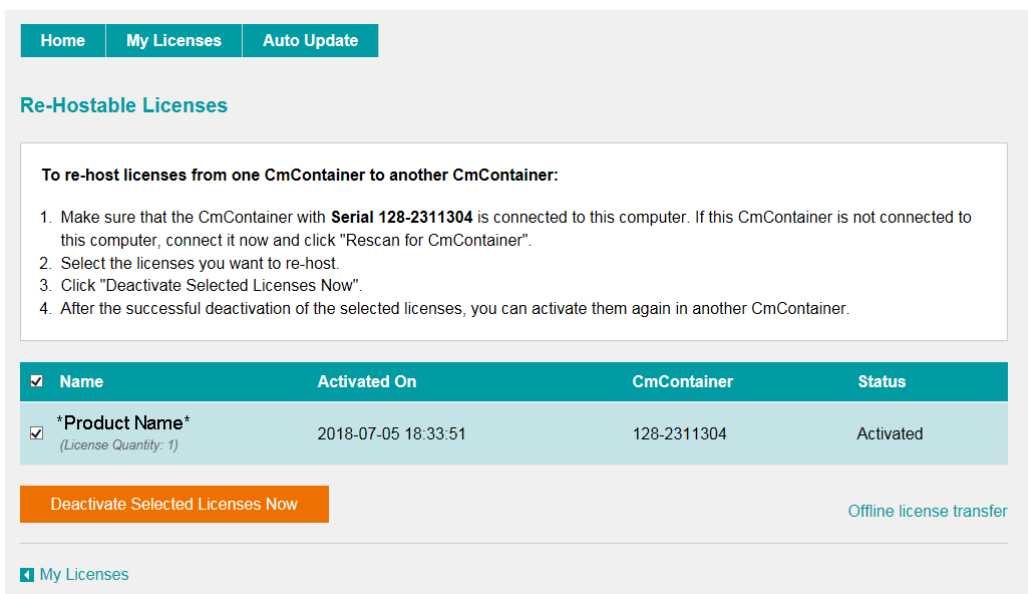
To move a license from one Cm container to another, you will need to re-host the license as follows. This requires you to first de-activate the license from its existing Cm container, and then choose the new storage container.

1.   Follow the first two steps from the online activation method:

- Open the 'Lawo License' web browser page at https://licenseportal.lawo.com.

- Copy your license ticket number - this is the 25 number code - into the **Ticket** field and select **Next**.

2.   At the "My Licenses" summary window, select **Re-Host Licenses**:

3.   Make sure that the Cm container is connected to the computer, select the licenses you wish to re-host and select **Deactivate Selected Licenses Now**.

Wait for a few seconds - a confirmation pop-up appears once the de-activation is successful.

You can follow steps 3 to 7 from the online activation method, or perform an offline license transfer, to activate the license using a new storage container.

9.3.2 Activating a License Offline

If your PC has no internet access, then you can activate a software license offline. This method involves three stages:

- **Create a license request file -** for the Cm storage container. Then copy the file onto a computer with internet access.
- **Activate the license** - using the 'Lawo License' web portal, copy the license update file back to the original computer.
- **Import the license update file** - to the Cm storage container.

Creating the License Request File

On the computer you wish to license:

1. Open the 'CodeMeter Control Center' (by clicking on the Cm taskbar icon), and select the container you wish to use for the license storage.

2. If the container is empty, select **Activate License**. Or, if the container already holds an active license, select **License Update**. This starts the 'CodeMeter Field Activation Service (CmFAS) assistant':
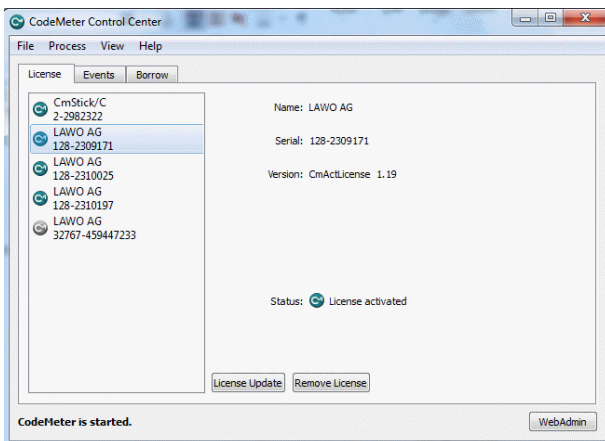
3. Select **Next**: and then **Create license request**:
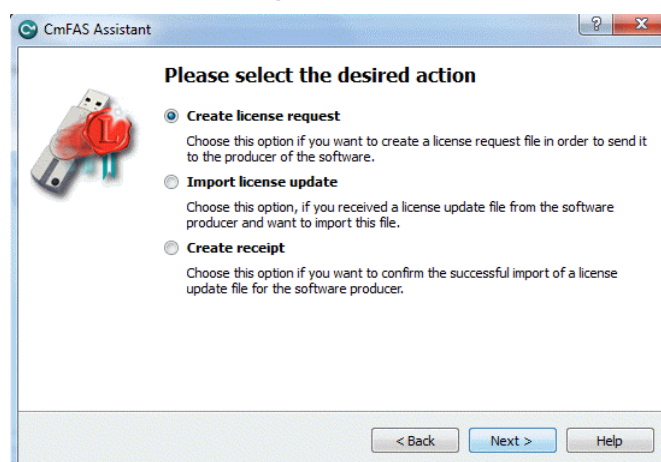
At this stage, there are two additional steps (to add the correct firmcode) if you have selected a **CmStick** container. Enter the following Lawo FirmCode to create the license request file:

Select Add license of a new producer   *Enter the Lawo FirmCode = 102037*
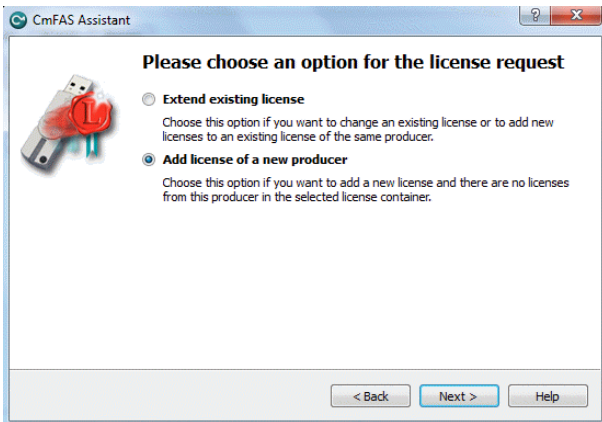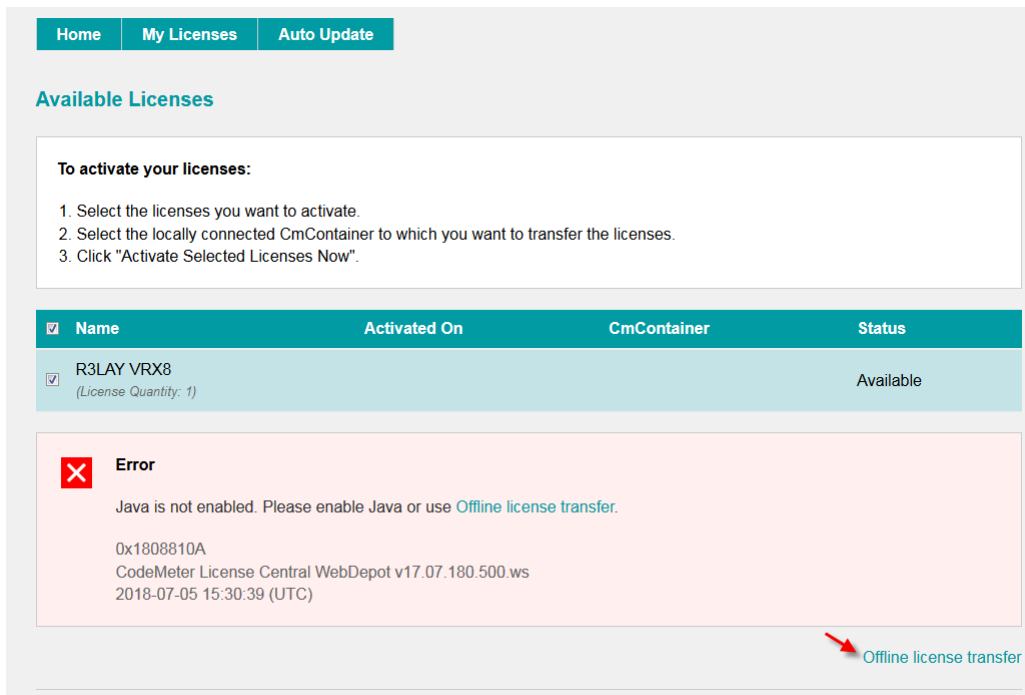
4.   Select **Next**, and using Windows Explorer, enter a file path for the license request file. Choose somewhere easy to find, such as the Desktop. Then select **Commit** to create the request file:
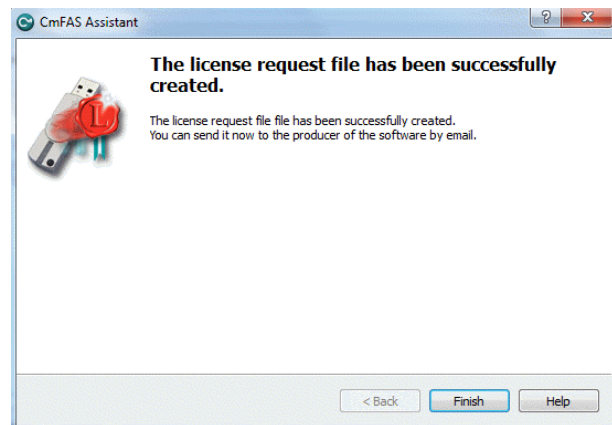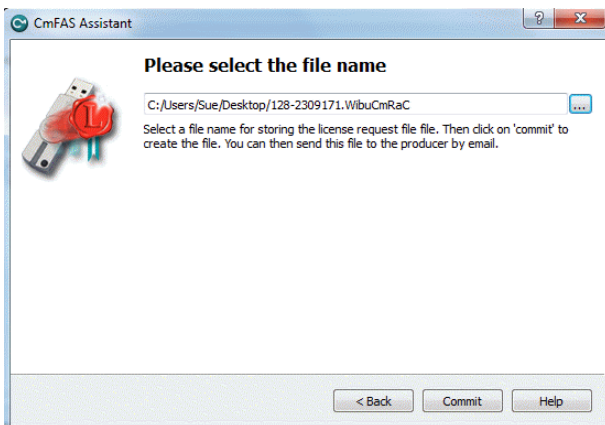
5.   Select **Finish** and copy the request file onto a computer with internet access. You will need both the license request file and the 25-digit ticket number (received with your license purchase).

Activating the License

1.   On a computer with internet access, follow the first four steps from the online activation method:

- Open the 'Lawo License' web browser page at https://licenseportal.lawo.com.

- Copy your license ticket number - this is the 25 number code - into the **Ticket** field and select **Next**.

- When your license is displayed, select **Activate Licenses** to continue.

- Select the storage method for your license - either USB dongle or single computer.

2.   At the **Available Licenses** page, select **Offline license transfer** to continue:
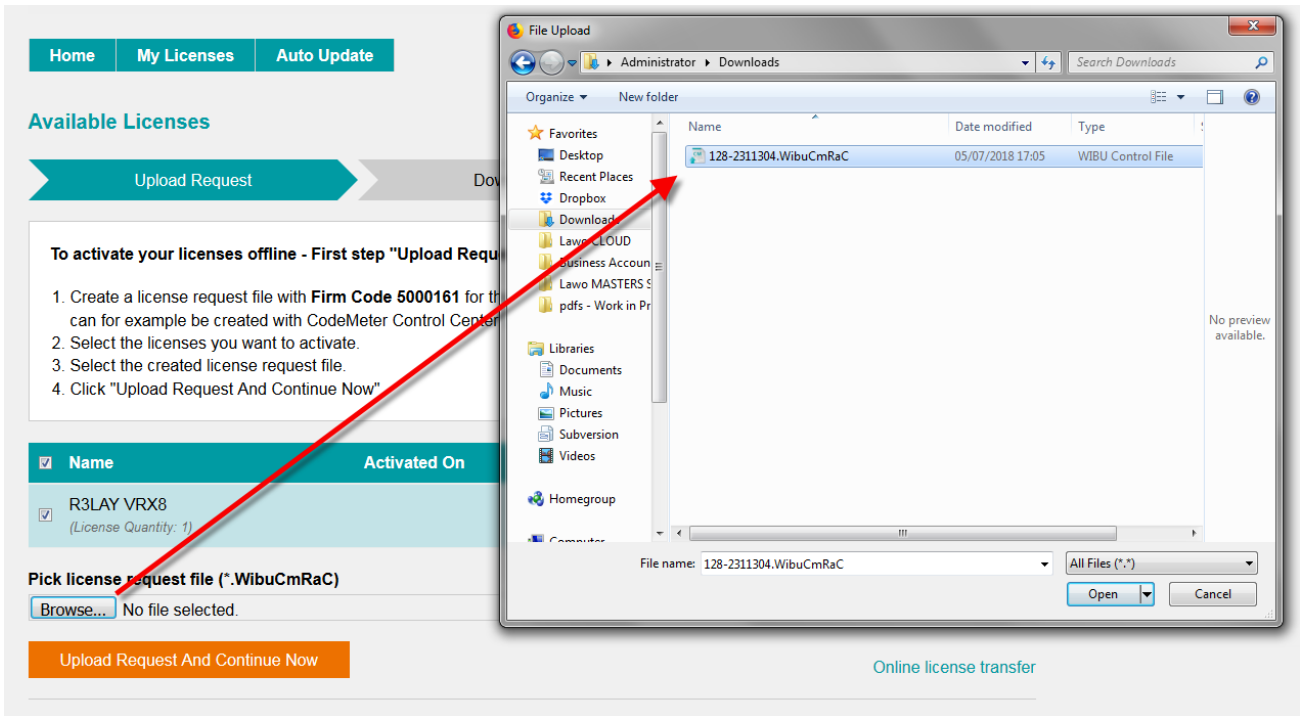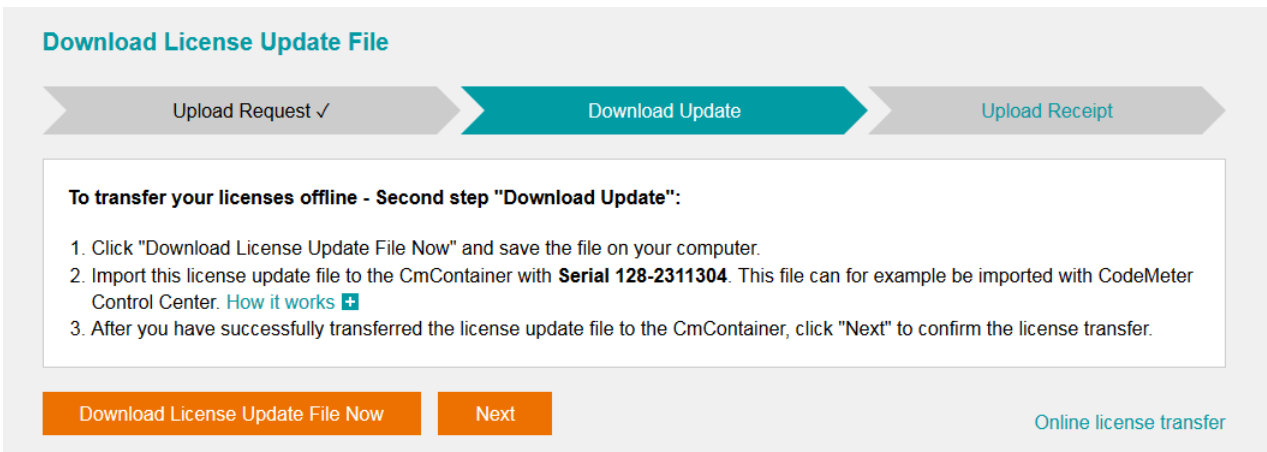
3. On the next page, select the license(s) you wish to activate, select **Browse...** and, using Windows Explorer, choose the request file (created earlier):

4. Then select **Upload Request And Continue Now** - the license request is processed and, if successful, you will have the option to Download the update:


5. Select **Download License Update File Now** and, when prompted, choose the **Save** file option - the file is downloaded.

**6.** Copy the License Update file back to the original PC.

Importing the License Update

1.   On the original computer re-open the 'CodeMeter Control Center' and select the Cm container for the license update. Note that this must be the same container as the one selected earlier (during the License Request).
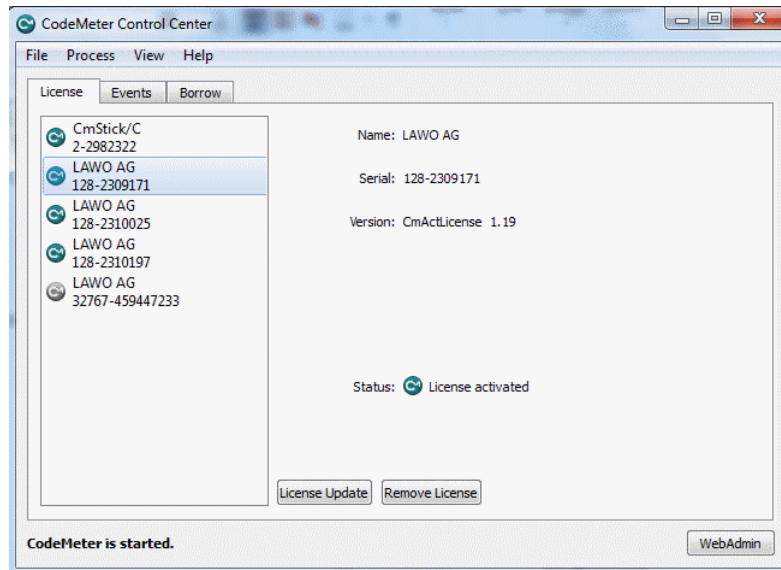
2.   Select **License Update** and follow the instructions given by the 'CmFAS Assistant' - when prompted, select Import License update and choose the update file (downloaded from the License portal):
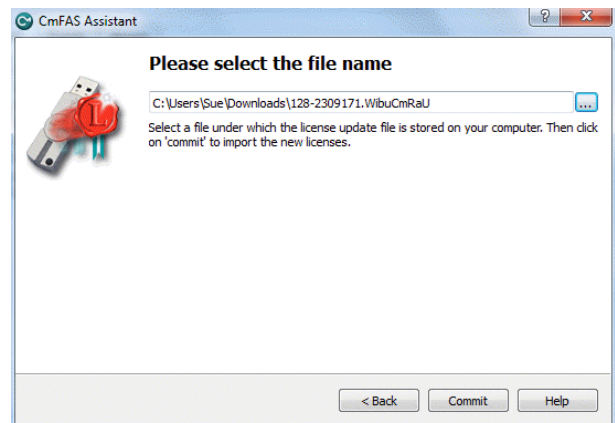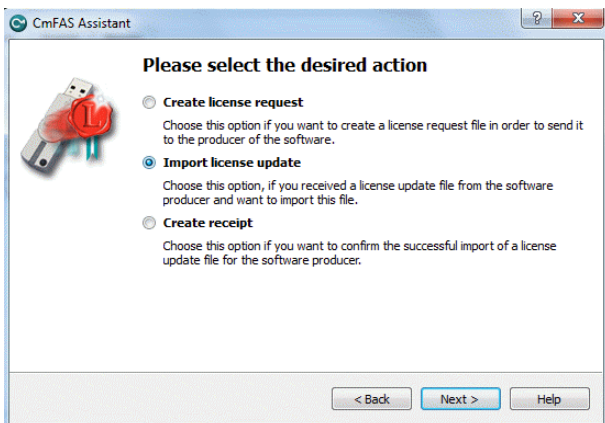

3.   Select **Commit** to action the update - the license is activated and you can close the 'CodeMeter Control Center'.

4.   You can now return to your Lawo application or install your USB license dongle - all licensed features should be available.

9.3.3 The CodeMeter Control Center

The 'CodeMeter Control Center' is used to manage the license containers and perform a backup or restore.
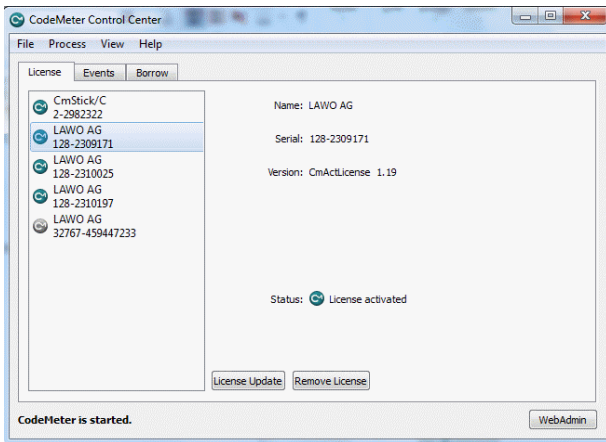
1. Click on the Windows taskbar Cm icon to open the 'CodeMeter Control Center' - the icon may be hidden from view or vary in color (depending on your taskbar configuration).
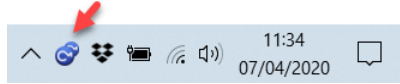

The 'CodeMeter Control Center' shows all the Cm containers which can be used for license storage.

A new local computer container is created each time you run the **CodeMeter Runtime** install wizard. Therefore, if you have installed multiple Lawo products or software versions, you will see several **LAWO AG** containers. If a USB dongle is connected, you will see a container labelled **CmStick**.

Local Computer Container (LAWO AG)   *USB Dongle Container (CmStick)*
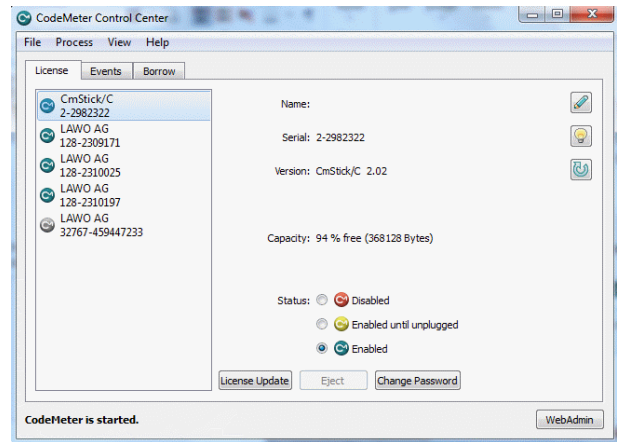
The **Serial** numbers identify each container. The icon colours indicate: green = license activated; grey = container is empty; red = license deactivated.

> A single Cm container can contain multiple licenses - simply select the same container during the activation process.

2. Select **WebAdmin** (bottom right) to open the WebAdmin portal in your default browser. The portal has many functions including license interrogation, and backup/restore functions for licenses stored on a **CmStick** (USB Dongle):

WebAdmin Content Cm Container   *WebAdmin Backup/Restore*
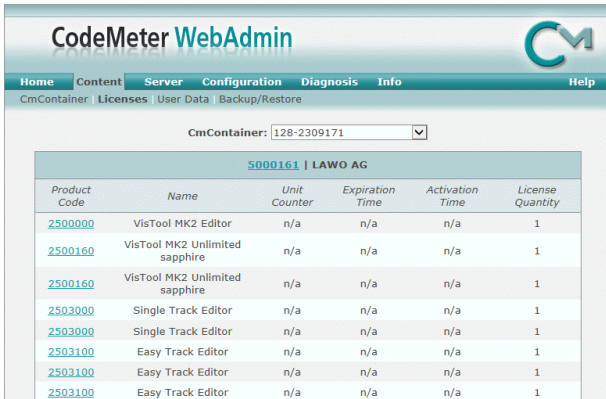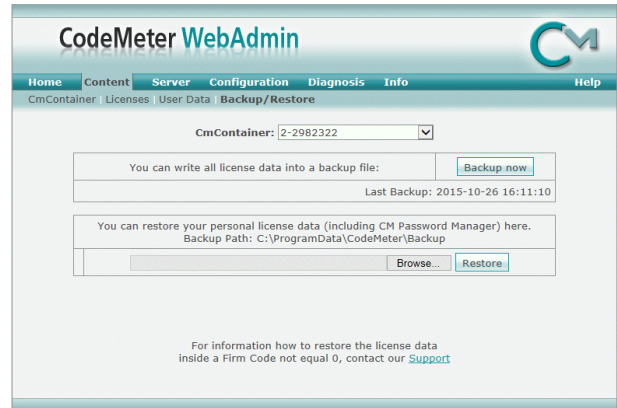
For further information, please refer to the **CodeMeter Runtime** documentation at wibu.com.

9.3.4   License Configuration via a Server

This license storage method can be used to administrate licenses centrally within a local network. For example, when starting a Lawo application such as **VisTool**, the local computer asks the server to borrow the relevant license. The license is then used by the **VisTool** client until the application is closed. On closing, the license is handed back to the server where it may then be used by a different **VisTool** client.
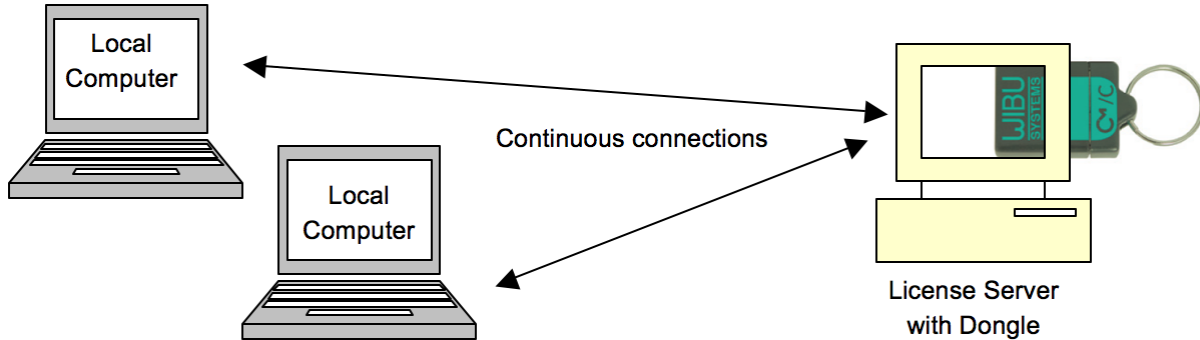

Preparing the Server

1.   First, install the **Codemeter Runtime** software (Version 5.10 or above) on the central server. (Or, on a virtual machine on the server).

The latest release of CodeMeter Runtime can be downloaded from WIBU systems at wibu.com.

2.   Activate all licenses in the usual manner.

If a virtual machine is being used, set up a connection between the virtual machine and USB dongle.

3.   Open the CodeMeter Control Center and select **WebAdmin**.

4.   Under **Configuration** -> **Server**, select the **Run Network Server** checkbox:
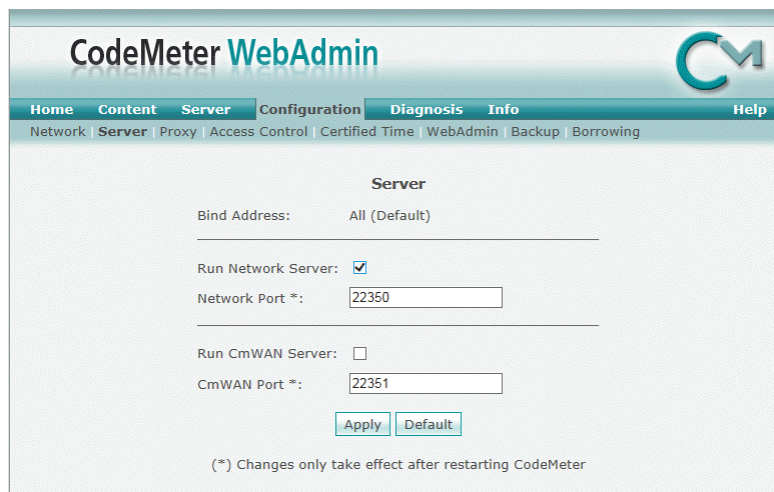
5.   Click **Apply** and restart the **CodeMeter Runtime** software.

Preparing the Clients

1.   Install the **Codemeter Runtime** software (Version 5.10 or above) on each of the client computers.

2.   Connect the clients (and server) to the network - on startup, the **CodeMeter Runtime** software sends a broadcast message across the network to find all license servers.

3.   On each client computer, open the <u>Codemeter Control Center</u> and select **WebAdmin**.

4.   From the **Home** page, select the name of the computer - a dialogue box should appear listing all the available license servers:
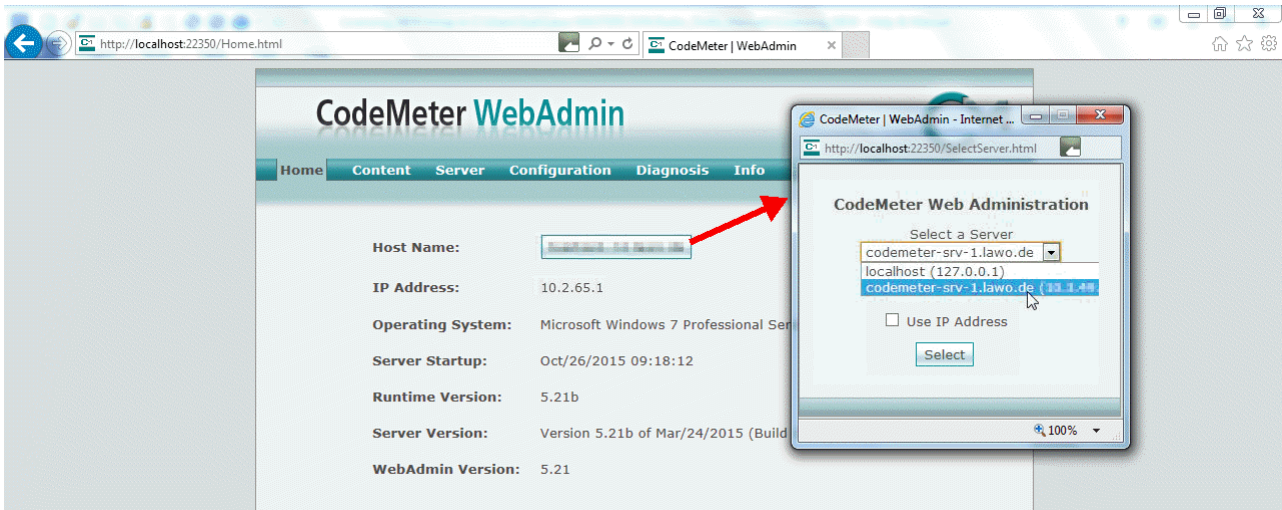
5.   Choose the correct server from the drop-down list and click on **Select**.

If the license server is not found, then your firewall or network policy may not allow messages to be broadcast. In this case, you will need to add the server's IP settings to the search list, manually, as follows:

Under **Configuration** -> **Network**, add the correct IP settings into the **Server Search** list:
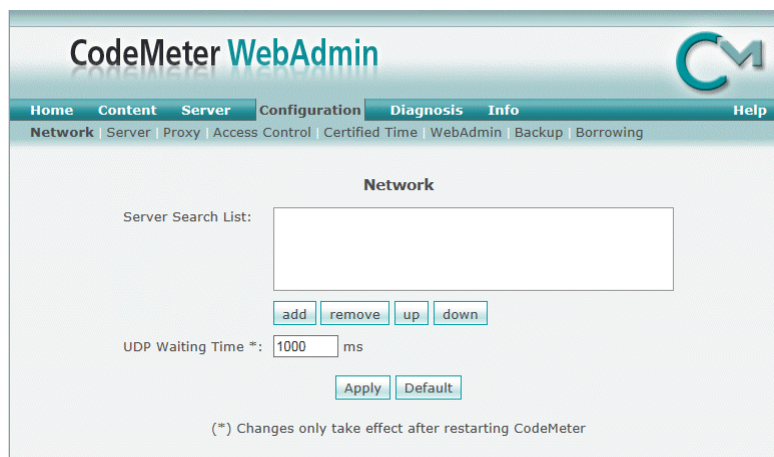
Click **Apply** and restart the **CodeMeter Runtime** software.

Note that once the **Server Search list** has an entry, all other license servers (announced automatically to the network) will be ignored.

Choosing a License

Once a connection to the license server is established, you can borrow one of the server licenses as follows:

1. On the client computer, open the Codemeter Control Center and select **WebAdmin**.

2. Under **Content** -> **Licenses**, choose the **CmContainer** (holding the server licenses) and select the desired license file:
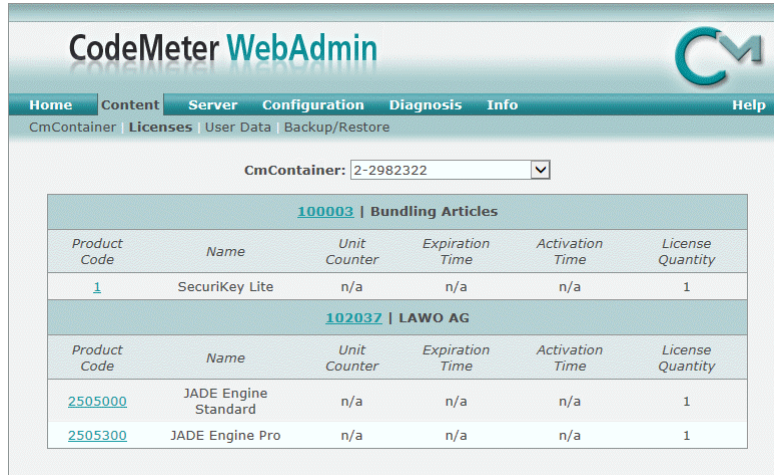
If the licenses is in use, then a warning message appears.

You can check which licenses are available (free) by selecting **Server** and **Cluster**:

10.   Glossary

48kHz or 44.1kHz	See Sample Rate.
ASIO	Audio Stream Input/Output
	A computer sound card driver protocol for digital audio. Most professional interfaces and applications use ASIO drivers to achieve low latency.
Audio Buffer Size	The buffer size sets the amount of data stored (in memory) before each data packet is transmitted or played out. In an audio system, the smaller the buffer size, the lower the latency, but the more susceptible to drop-outs.
Bargraph	An optical display instrument in the shape of a LED bar for displaying signal level.
dB	deciBel
	A unit of transmission giving the ratio of two powers.
	The number of bels is the logarithm to the base 10 of the ratio of the two powers. One decibel equals one tenth of a bel.
dBu	dBu is used to describe levels within the analogue domain, and is a measure of absolute voltage level based on 0dBu = 0.775 Volts (RMS). dBu is often used to indicate nominal broadcast operating levels. For example, in the EBU normal broadcasting level = +6dBu.
dBFS	dB Full Scale
	dBFS is used to describe levels within the digital domain. 0dBFS describes the system's internal clipping point; this is the maximum level which may be handled by the system without signal distortion. For example, your system may be set for +18dBu = 0dBFS. If your normal broadcast level is +6dBu then this leaves an operating headroom of 12dB.
DSCP	Differentiated Services Code Point
	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.
DLL	Dynamic Link Library
	An alternative file type to .exe, used in computing to run installer applications in Windows®. In R∃LAY, DLLs are used to support the ASIO and MME driver types.
Ember+	A non-proprietary TCP/IP interface protocol. In R∃LAY, parameters can be "published" in Ember+, enabling control from a remote device such as a mixing console.
Fader	A potentiometer used to adjust the gain of a signal.
Gain	Adjusting the gain of a signal results in a change in the perceived level or amplitude. An increase in gain (positive values) results in amplification and a reduction in gain (negative values) in attenuation.
GPI	General Purpose Interface (IEEE488) is a standardised platform independent short-range digital interface, to allow switching connections between broadcast equipment from different manufacturers.
Headroom	The amount of operating level which is in reserve between normal operating level and 0dBFS.
HPET	High Precision Event Timer
	A high precision clock reference provided by your PC.
HTTP	Hypertext Transfer Protocol
	A networking protocol/URL address, commonly used to exchange or transfer web pages, email, etc.
Insert Point	A connection point which interrupts the signal flow and routes signal to and from the inserted device.

Latency	The amount of time delay between an audio signal entering and emerging from a system.
MME-Interface	Multimedia Extensions Interface (also known as WaveIn/WaveOut) A Windows® driver for digital audio.
Monitor	Term used to describe the outputs and functionality of feeds to loudspeakers or headphones for the purpose of listening to a mix.
ms	milliseconds Unit of time measurement.
NIC	Network Interface Card A computer interface that connects to external network devices.
Nova73	A stand alone routing matrix with networking capabilities; this is a large matrix related to the mc^2 series of Lawo consoles.
Overload	Occurs when the signal level is too large for the system, resulting in signal distortion.
PTP	Precision Time Protocol. An ultra-precise, synchronisation method used in data networks. The protocol can be used as the sync reference for all RAVENNA devices in a network.
QoS	Quality of Service The QoS defines the overall performance of a computer network. Several factors are considered: error rates, bandwidth, throughput, transmission delay, availability, jitter, etc.
RAS	Radio Automation System control protocol is Lawo's universal protocol for communication between a mixing console (MIXER) and a radio automation system (RAS).
RAVENNA	A real-time, network-synchronised Audio over IP protocol. RAVENNA offers real-time distribution of audio and other media content within IP-based network environments.
Remote MNOPL	The remote control protocol RemoteMNOPL is a LAN based client-server network byte order protocol to enable third party systems to control Lawo's digital mixing consoles or standalone routers.
Routing	Signal Routing Term used to describe the connection made between an input and output.
RTSP	Real Time Streaming Protocol A networking protocol/URL address, commonly used in establishing point-to-point media sessions.
Sample Rate	The speed at which the Processing of the system takes samples respective to values from a continuous, analogue audio signal to make a discrete, digital one. For example, when running at 48kHz, incoming analogue audio is sampled at a rate of 48000 values per second.
SDP	Session Description Protocol A format for describing streaming media communications parameters.
SIP	Session Initiation Protocol A networking protocol/URL address, commonly used within Voice-over-IP systems.
SOAP	Simple Object Access Protocol. A non-proprietary protocol for XML information exchange. R∃LAY environments use SOAP scripts to trigger external actions.
TCP	Transmission Control Protocol A protocol that provides reliable, ordered, and error-checked delivery of a stream of octets (bytes) between applications running on hosts communicating via an IP network.

TCP/IP   The Internet protocol suite - Transmission Control Protocol (TCP) and the Internet Protocol (IP) - provides end-to-end data communication specifying how data should be packetized, addressed, transmitted, routed, and received.

TDM   Time-Division Multiplexing

A common method of transporting signals via a point-to-point connection. In Lawo devices, TDM is used internally to transport audio along the backplane - e.g. from an IO to DSP card, or vice versa.

TTL   Time to Live

A mechanism that limits the lifespan of data within a computer network, in order to prevent data packets from circulating indefinitely.

UDP   User Datagram Protocol

A simple connection-less networking protocol which is often used in real-time applications due to its low latency. UDP is suitable for purposes where error checking and correction are either not necessary or performed in the application.

URL   Uniform Resource Locator

A networking term for specifying the location of a resource on a computer network. URL types include http, rtsp and sip.

WDM   Windows Driver Model

The standard Windows® driver for digital audio. Devices using this driver are presented to R∃LAY as a single mixed audio stream and pass through the Windows® audio mixer.

WASAPI   Windows Audio Session API (Application Programming Interface)

A Windows® driver for digital audio, introduced in Windows Vista.