colorfront

Streaming Server 2025

User Guide

2025-10-28

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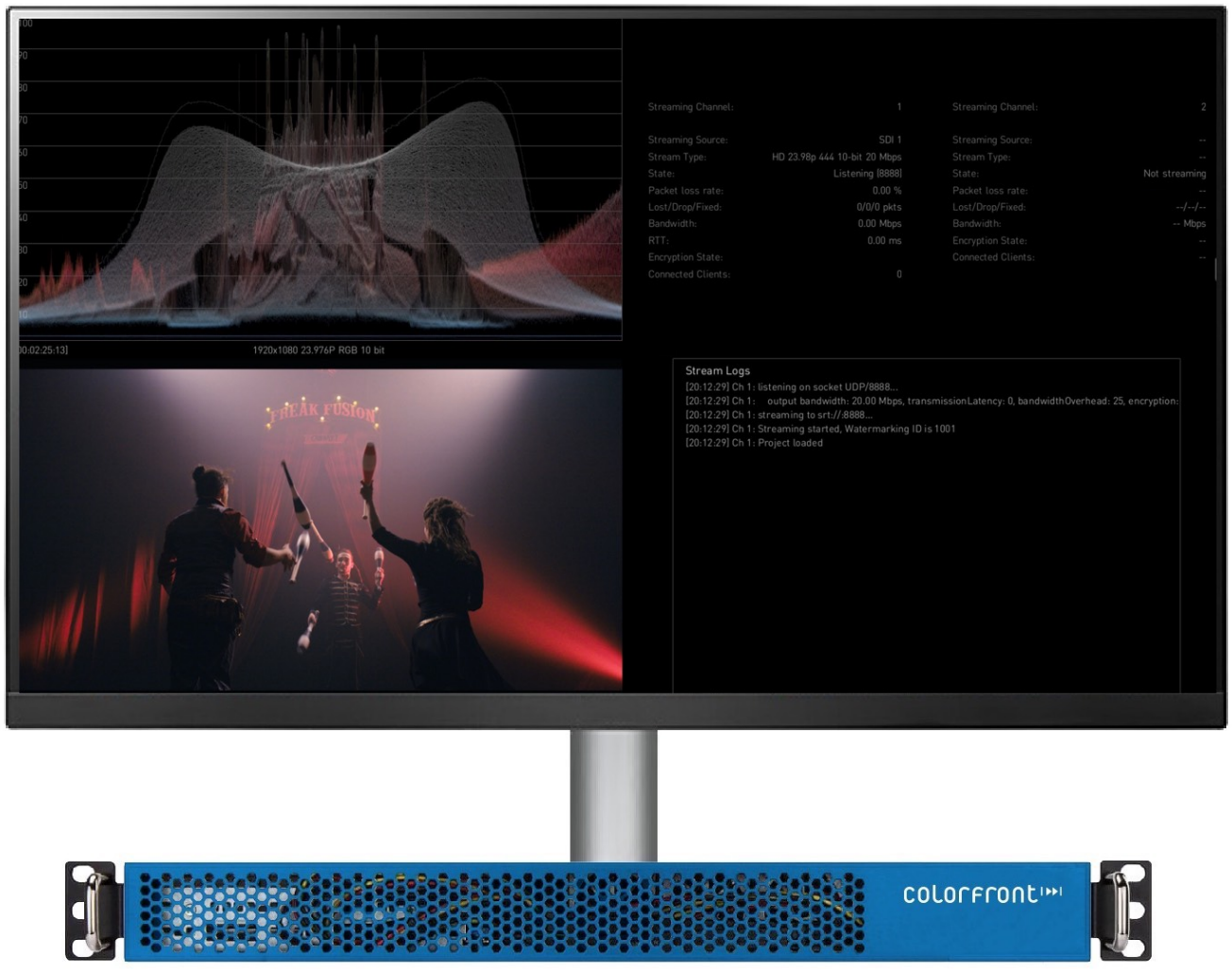
Streaming Server 2025 Introduction

About Streaming Server

Looking at video content remotely at reference quality, from as early as initial camera and make-up tests all the way up to final localized deliverables, has become exceptionally important.

Colorfront's advanced Streaming Server appliance offers a solution for professional remote video and audio monitoring with secure, reference-quality and low latency viewing experience that is suitable for critical QC or client approval, and supports a range of display options including: Apple's XDR display, OLED TVs, professional HDR reference monitors or even emissive cinema walls.



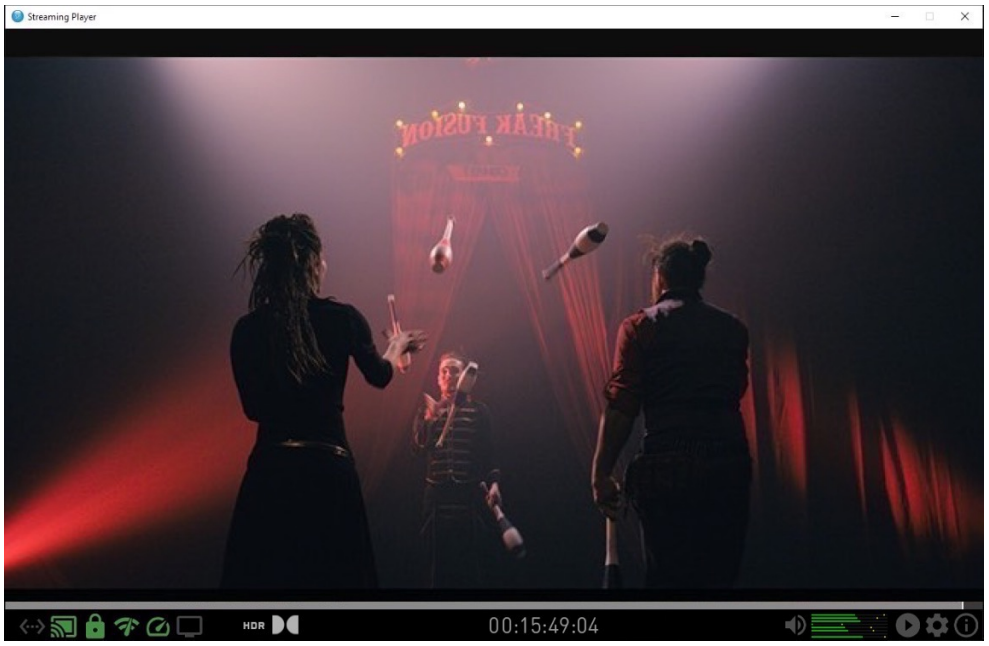
The Streaming Server appliance

Key Features of Streaming Server

- Reference quality 10-bit 444 HEVC video stream
- Sub-second latency for truly interactive sessions
- Secure transport with 128/256-bit AES encryption
- Optional forensic and visible watermaking
- Flexible data rates from below 10 up to multiple hundreds of Mbps
- Rec.709 and PQ color space support
- Dolby Vision tunneling

- UI and web control
- Multi audio channels up to 16 channels
- Secondary stream via WebRTC or external gateway

To view the stream generated by the server, Colorfront provides a simple, easy-to-use, thin Client Application, the ***Streaming Player*** that supports both Windows and macOS platforms. For the best quality, it is recommended that you use a professional video output device connected to the client computer to interface with the monitor.



The Streaming Player application

Contact Customer Support

All information with regard to COLORFRONT's Streaming Server software application can be found on the COLORFRONT website. Should any issues or questions arise, please contact Customer Support so that we can assist you as efficiently as possible. Our contact information:

Web:	http://www.colorfront.com
Help Center:	http://support.colorfront.com
Email:	support@colorfront.com
Discord:	https://discord.gg/cfsupport

To help us support you as efficiently as possible, please read chapter Troubleshooting.

About COLORFRONT

COLORFRONT, based in Budapest, Hungary, is one of Europe's leading post-production facilities. The company was founded by brothers Mark and Aron Jaszberenyi, who together played a pivotal role in the emergence of non-linear digital intermediate. The company's R&D team earned an Academy Award for the development of Lustre, Autodesk's DI grading system, and a Primetime Engineering Emmy for COLORFRONT On-Set Dailies. Combining this in-depth expertise with a pedigree in the development of additional cutting-edge software, COLORFRONT offers today's most advanced technologies for scanning and recording, DI grading, conforming, digital dailies, VFX, online and offline editing, cinema sound mixing, mastering and deliverables. For more information, please visit https://docs.colorfront.cloud.

1. Getting Started

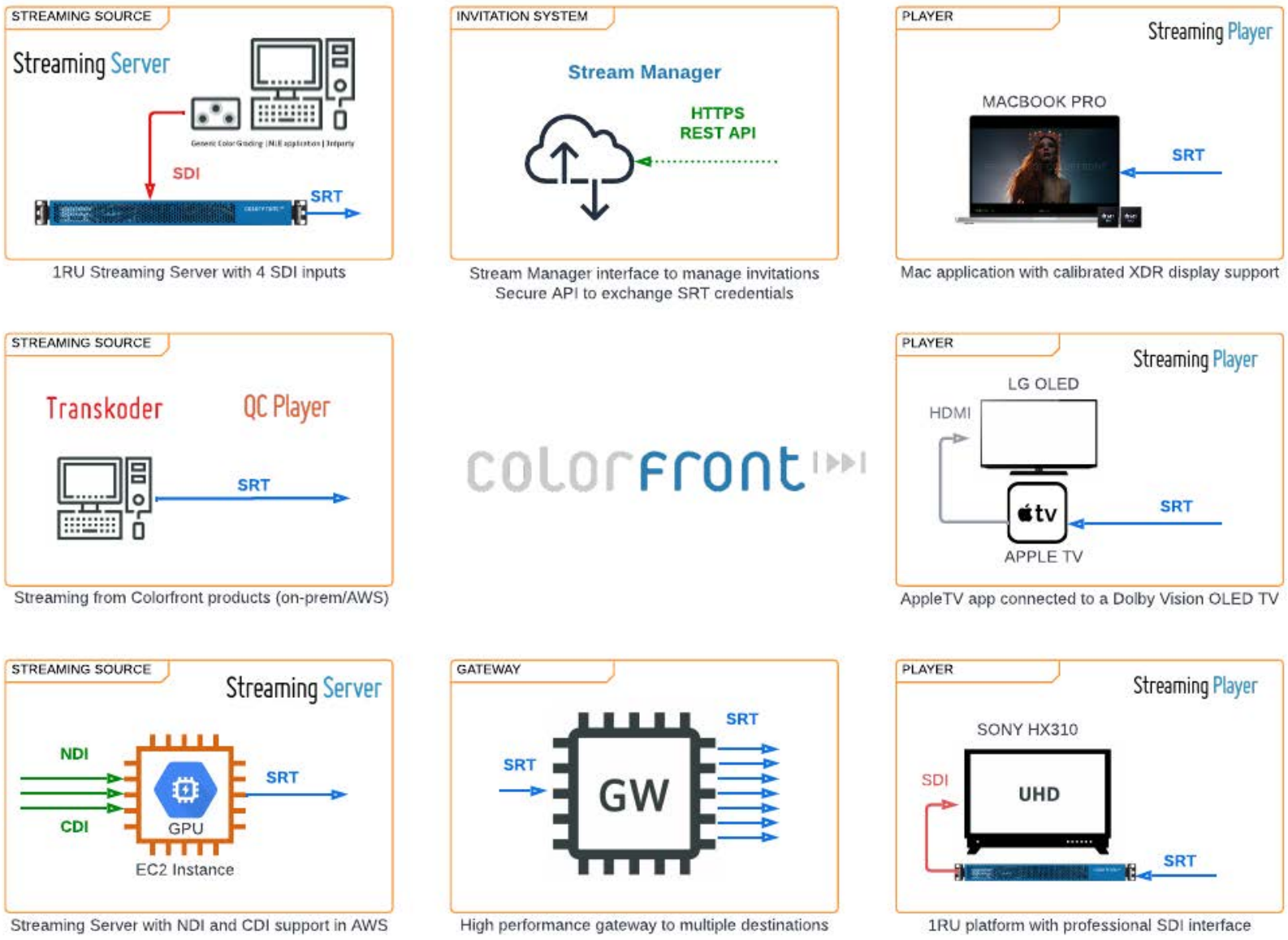
Please take the following steps upon receiving the Colorfront Streaming Server hardware unit:

1. Rack mount the unit wherever it is ideally suited for your facility/testing.
2. Connect the power supply.
3. Run 4xSDI cables into the video i/o card.
4. Run 1xEthernet cable to the bottom left port on the back of the chassis.
5. Connect a DisplayPort-capable display (only needed for original setup) so you can get the TeamViewer details as well as the IP address.
6. Power up the system. It will automatically log in the user and launch the software.

2. Streaming Network Architectures

The remote streaming technology relies on various components that facilitate the deployment of a wide range of workflows and configurations. These key building blocks include:

- **Streaming sources**, such as the Streaming Server (StS) SDI appliance, the Colorfront Streamer application, the StS software within Amazon AWS, or other Colorfront dailies or mastering products.
- The **Stream Manager**, which offers a user-friendly interface for session management and invitations.
- **Streaming Player** applications, designed to view the reference-quality output.
- A **gateway**, which transmits SRT streams to multiple destinations. Users can leverage Colorfront's high-security, high-performance Gateway or opt for direct streaming through a P2P setup.



Various components of streaming configurations

Many configurations can be built from these components. For illustration, we present the following examples for streaming with the Streaming Server:

- Streaming via Colorfront's Stream Manager interface
- Direct (P2P) streaming between the server and the player components, without using an external gateway

Learn how to configure the different settings for each type in the Network Configuration section.

2.1. Streaming Sources

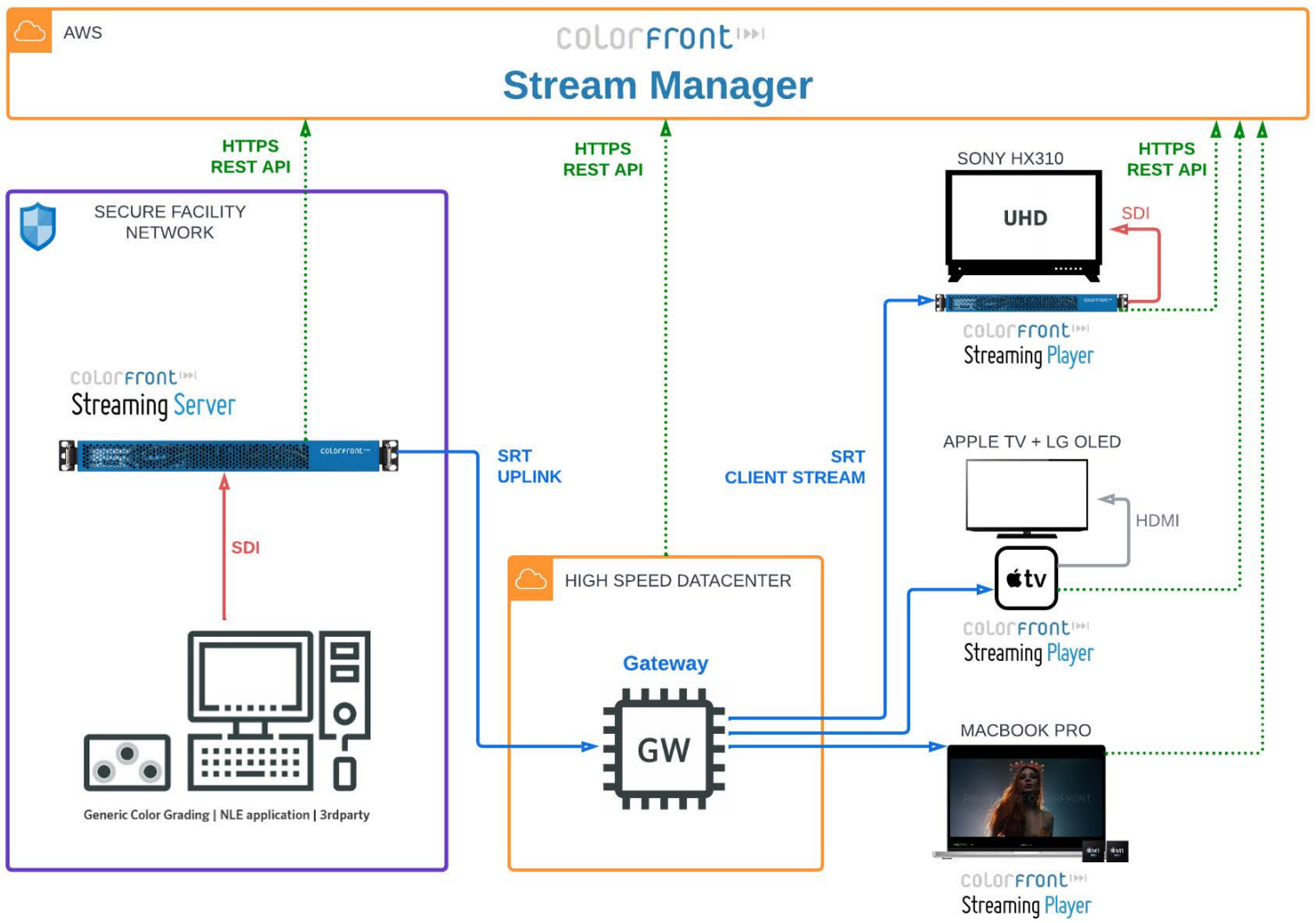
Streaming sources are essential elements of remote streaming technology, serving as the foundation for various workflows and configurations. These sources encompass a diverse range of components designed to facilitate seamless deployment. Key streaming sources include:

Streaming Server appliance	This dedicated hardware SDI appliance offers robust streaming capabilities, ensuring reliable performance and seamless integration with existing infrastructure. It enables direct streaming of high-quality content, making it ideal for demanding production environments.
Streaming via Colorfront products	Colorfront's mastering and dailies products, such as Transkoder or On-Set Dailies, feature built-in streaming functionality. This enables seamless streaming to Streaming Player applications, with operators configuring the stream within the software settings, similar to configuring local video output.
Streaming Server in AWS	The Streaming Server within Amazon AWS provides scalable and flexible streaming solutions. This cloud-based solution offers remote access to EC2 instances within the AWS infrastructure, functioning as a virtual streaming source with the same high-quality capabilities as the StS appliance.

2.2. Streaming via Stream Manager

For SRT streaming, Streaming Server uses Colorfront's proprietary **Stream Manager**, which acts as an intermediary between the streaming source and the client. Its advantages are:

- simpler firewall configuration; generally does not require open ports (See Security Hardening for more details.)
- scales with demand without additional bandwidth pressure on the local network
- studio-level security with individual email invites that cannot be shared
- session management and real-time monitoring of connected clients



Streaming workflow via Colorfront's Stream Manager

See Stream Manager for more details.

2.3. Direct Streaming

Direct, or **point-to-point (P2P)** streaming allows multiple clients to connect directly to a single server concurrently through a point-to-multipoint connection, keeping the video stream within a private network and avoiding transmission over the public internet. This method is particularly relevant in scenarios where a company or studio's security policy requires that all streaming data remains within a closed network or when working offline is necessary.

In any streaming setup, Streaming Server accesses the source digital media directly, whether stored on-premise or in the cloud, while the client Streaming Player applications run locally on users' computers. What distinguishes P2P streaming from the traditional streaming setup is that it avoids external gateways, transmitting video content directly between the server and clients, ensuring the stream remains within the private network.

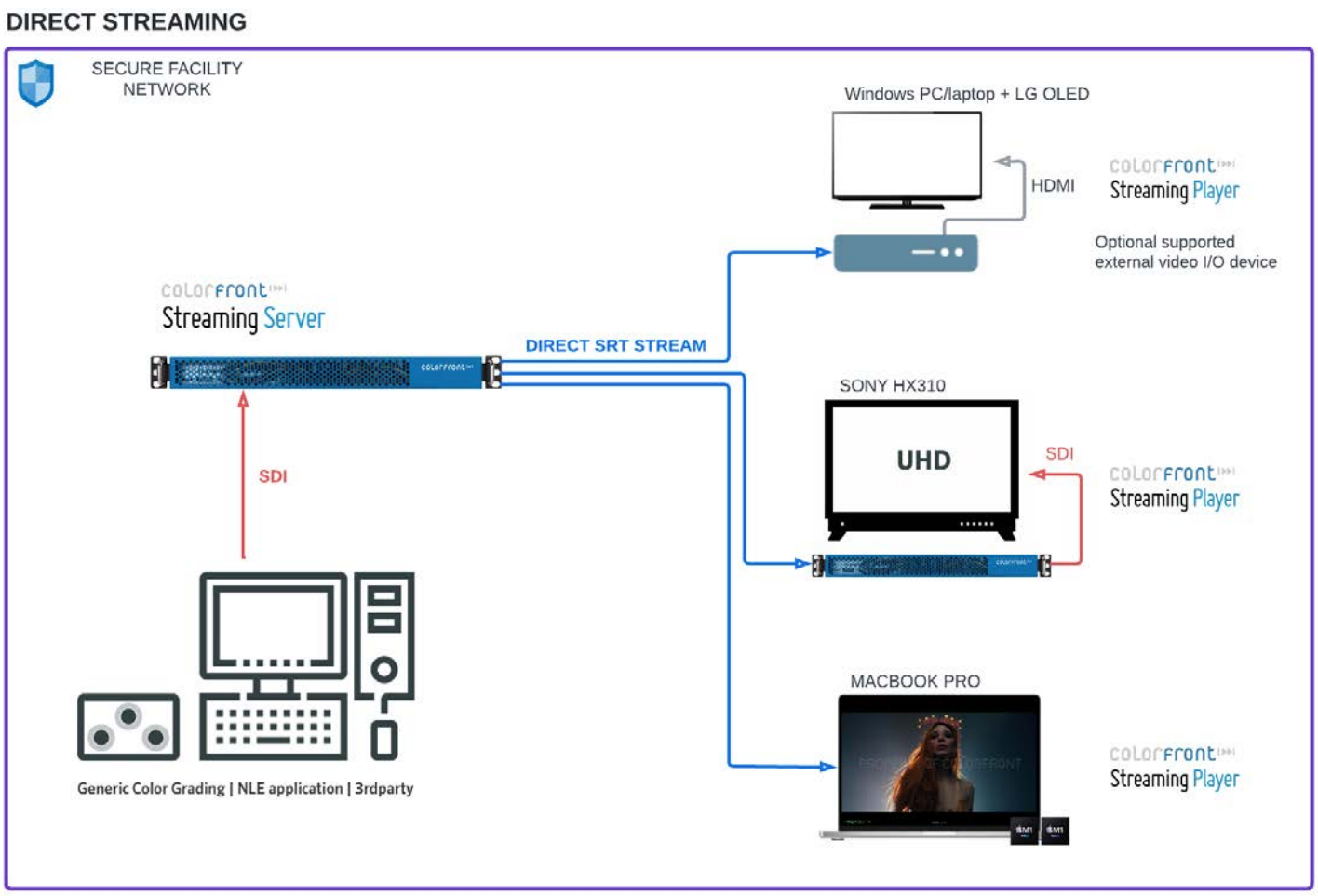
While P2P streaming operates independently, a Stream Manager can be used to facilitate session management and connection setup between the server and clients.

It is important to note that the Stream Manager acts solely as a facilitator for connection setup and session management; it does not handle or route the actual video stream.

Point-to-point streaming uses bi-directional UDP communication, where the server connects directly to a client's listening socket over a private network or, if necessary, the public internet. The content is transmitted as an encrypted MPEG-TS stream within the SRT (Secure Reliable Transport) protocol,

enhancing reliability and security against network fluctuations. For this configuration, you may need to set up a VPN or similar secure connection, and ensure that the necessary ports are open on the firewall.

Refer to P2P Streaming Configuration for instructions on configuring P2P streaming for the Streaming Server.

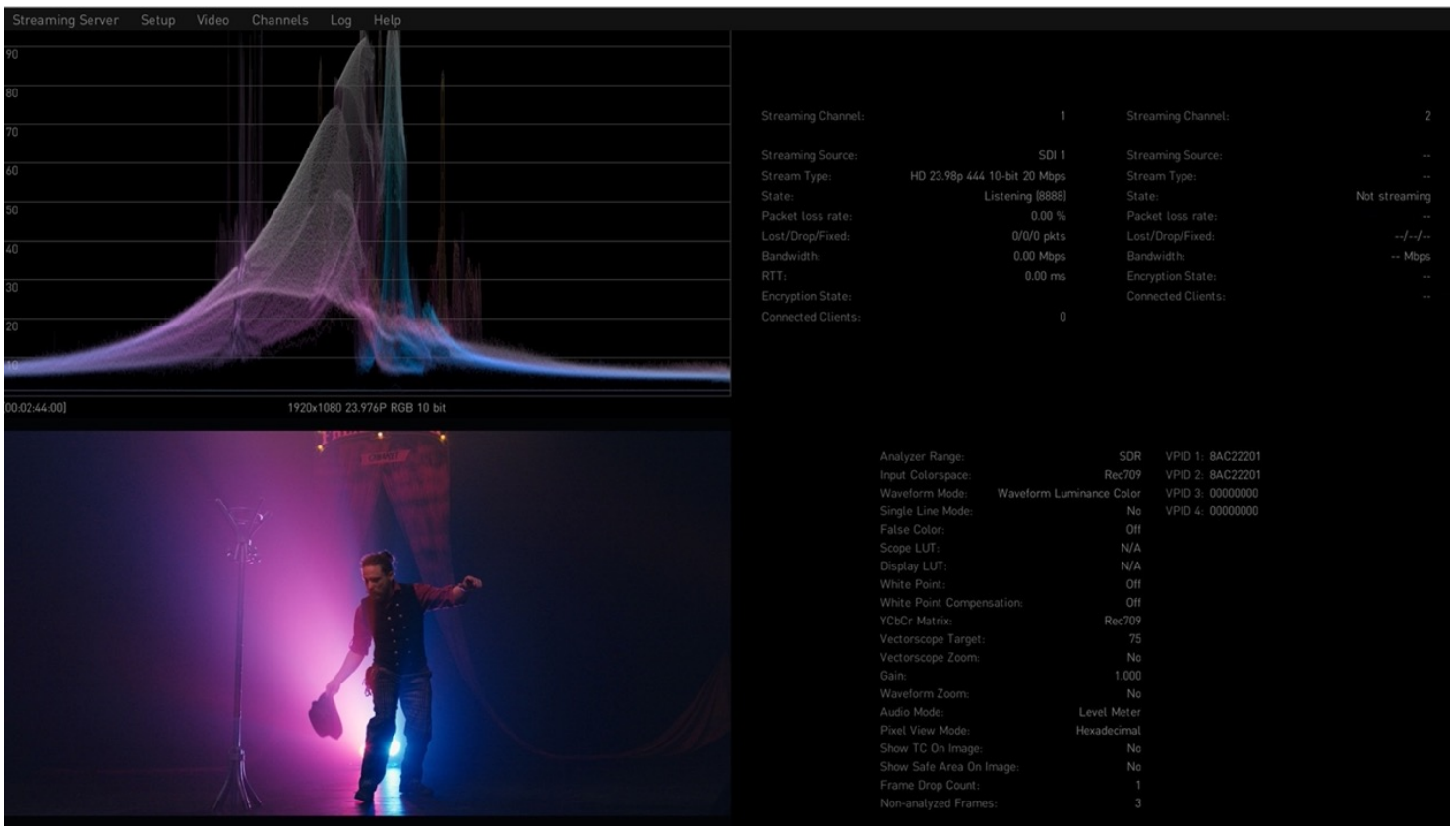


Direct streaming configuration

3. GUI Overview

Streaming Server has a four-quadrant configurable layout that allows the operator to check relevant information about the input and the stream status simultaneously. Alternatively, you can switch to Four-Channel View.

The system can also be controlled via a Web Control Interface.



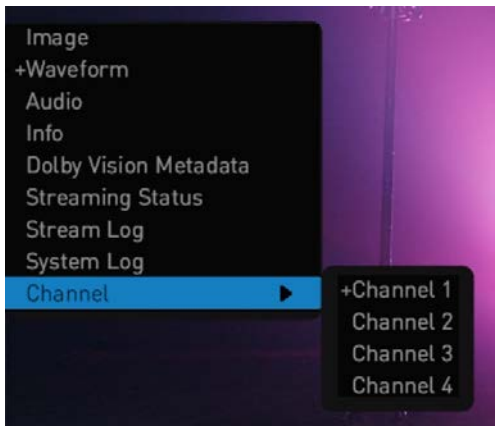
Four-quadrant layout of the Streaming Server

3.1. Quadrant Views

As a default, the initial four quadrants in the GUI are:

- Q1 - **Waveform**
- Q2 - **Streaming Status**
- Q3 - **Video Image**
- Q4 - **Info**

Right-click on any quadrant of the screen and switch to another view from the pop-up menu.



Selecting various quadrant views from the context menu

The available quadrant views are:

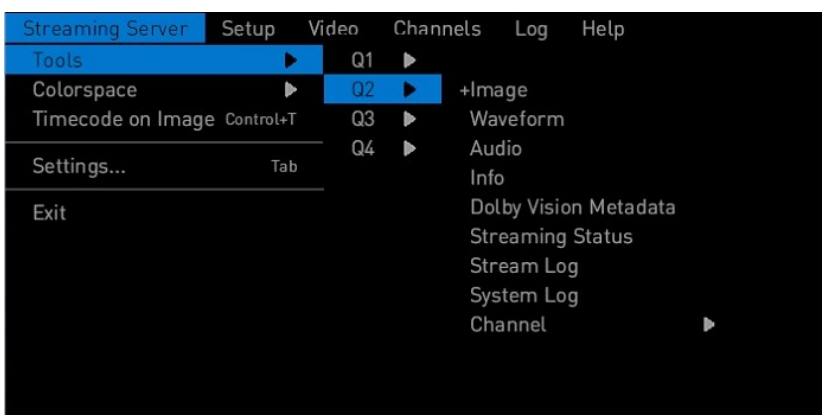
Image	shows the video image with applicable LUTs
Waveform	illustrates both luminance and color information in a basic lumi color waveform graph
Audio	small volume meter to monitor playback volume levels up to 16 channels
Info	displays video characteristics such as input color space, dynamic range or frame drop count
Dolby Vision Metadata	presents Dolby Vision metadata if detected
Streaming Status	various status information indicating the stream's health

> By default, the Streaming Status view shows the status of the first two streaming channels if *Channel* (see below) is set to Channel 1 or 2.
> To view the streaming status of the third and fourth channels, set the channel to either 3 or 4.

Stream Log	monitors the streaming and provides basic stream information for each channel
System Log	general system log for tracking and alerting to potential system issues and problems
Channel	defines which channel's attributes are displayed when any view option is selected for the specific quadrant

For multiple input channels, for example, a layout of two video streams and two stream logs, or even four different video images can be configured for the four quadrants.

The quadrant layout can also be controlled from the top menu. Use the **Streaming Server › Tools › Q1/Q2/Q3/Q4** menu options to select the view for each quadrant and to specify the appropriate channel.



Selecting various quadrant views from the top menu

3.1.1. Keyboard Shortcuts for Quadrants

Various keyboard shortcuts are available to switch between channels assigned to a given quadrant (Q1, Q2, etc.), or to toggle between different quadrant views, as shown in the table below.

GUI shortcuts for quadrants

Shortcut	Operation
F5	Toggles between quadrant views for Q1
F6	Toggles between quadrant views for Q2
F7	Toggles between quadrant views for Q3
F8	Toggles between quadrant views for Q4
F9	Toggles between channels 1-4 for Q1
F10	Toggles between channels 1-4 for Q2
F11	Toggles between channels 1-4 for Q3
F12	Toggles between channels 1-4 for Q4

See more in Keyboard Shortcuts.

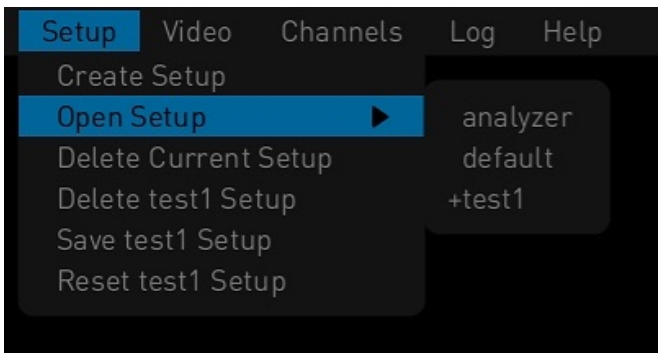
3.2. Four-Channel View

The four-channel view mode is a valuable tool for simultaneously monitoring all four streaming channels side by side. You can easily toggle this view by using the *Shift*+*Enter* keyboard combination, and see the streaming status, audio volume meters, and video images for each of the available streams. Alternatively, you can access this feature via the **Streaming Server › Tools › Four Channel View** menu option.

Four-channel view mode

3.3. Create Custom Layouts

Streaming Server's **Setup ›** menu allows you to create different layouts of the four quadrants.



Setup menu for creating, selecting or deleting layout setups

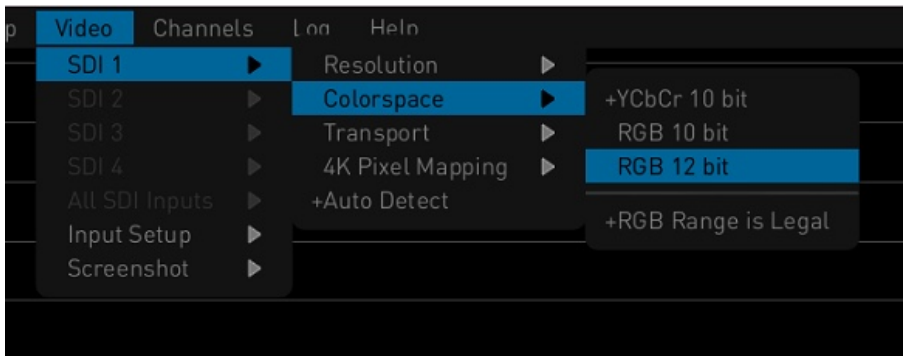
Create Setup	Set each of the four quadrants to the appropriate view, and then use this menu option to save it as a new layout.
Open Setup	After creating a custom layout/setup, switch between the available setups listed.
Delete Current Setup	Deletes the currently selected setup.
Delete 'custom' Setup	Deletes the indicated setup.
Reset 'custom' Setup	Resets the indicated setup to the default view, which is the following:

- **Q1** - Waveform
- **Q2** - Streaming Status
- **Q3** - Video Image
- **Q4** - Info

4. Input Configurations

4.1. Video Input

Individual video inputs may have different resolution or color space parameters, which can be configured independently. The *Video* menu is used for specifying the characteristics of the video signal coming from an SDI link. You can also configure the characteristics of all SDI inputs at once by using the **Video › All SDI Inputs** menu option that has the same sub-menus.



Specifying characteristics for SDI video inputs

Use the **Video › SDI 1/2/3/4** menu options to configure the following parameters:

Resolution — Match the input signal resolution to the source from [720p] up to [8K].

Color Space — Select from [YCbCr 10-bit], [RGB 10-bit] or [RGB 12-bit] color space options. There is also a [RGB Range is Legal] option for RGB 444 mode.

Transport — Apply [Single-link], [Dual-link] or [Quad-link] transport.

> When using quad-wire SDI setup for UHD/4K signals, the quad-link transport mode will be set for the first input channel.
>
> For dual-link setup, the first or the third input channel will be set, as the signal will be transported via either channels 1 and 2, or channels 3 and 4.

4K Pixel Mapping — For UHD/4K source, select [Square Division] or [Two-Sample Interleave] pixel mapping.

Auto Detect — Choose this option to follow the source video parameters.

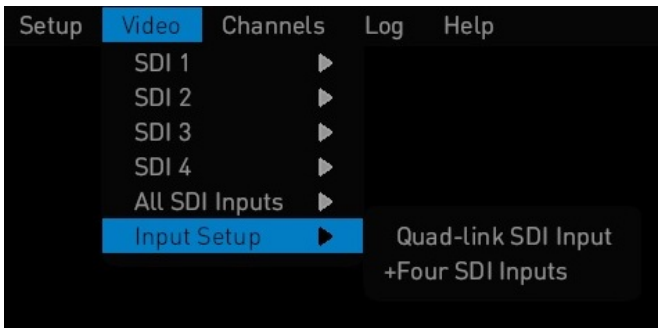
4.1.1. SDI Input Modes

Streaming Server is capable of simultaneously capturing, encoding and streaming four HD or UHD signals.

Using the **Video › Input Setup** menu option, you can specify whether to use quad-link SDI or four separate SDI input modes, as per the following:

Quad-link SDI Input — The four SDI signals are combined to result in full UHD/4K/8K resolution video.

Four SDI Input — Four independent input signals result in four separate video image. Use this setting to display four separate HD or UHD video.



Selecting quad-link or four SDI input modes

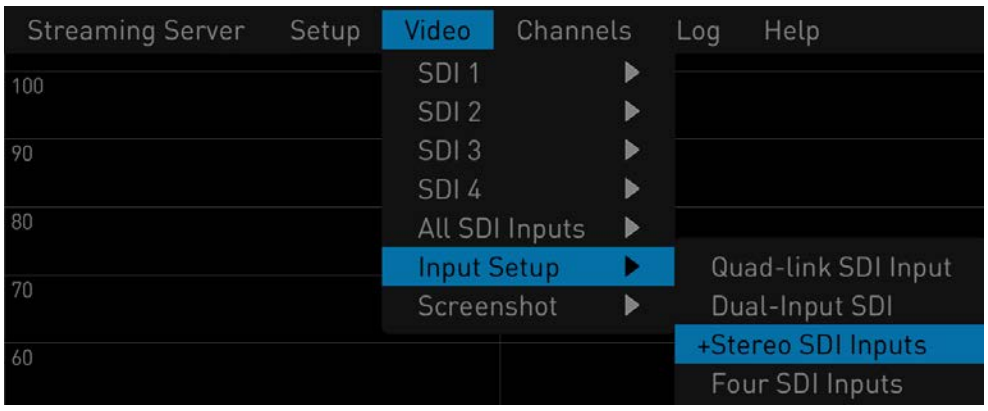
4.1.2. Stereo Streaming

Streaming Server supports the streaming of stereo 3D content, which is served by two input options:

Stereo SDI inputs — It captures and directly streams Colorfront's Transkoder's stereo SDI output, where both SDI 1,2 and SDI 3,4 will be stereo.

Dual Input from Davinci Resolve — 3D stereo images are captured from the DaVinci Resolve system. See Setting up Resolve for Stereo Output.

> Make sure that SDIs 1 and 2 from Resolve are routed to SDI ports 3 and 4 on the *Blackmagic Design Decklink 8K Pro* card of the Streaming Server.



Setting up stereo 3D streaming in Streaming Server

Limitations

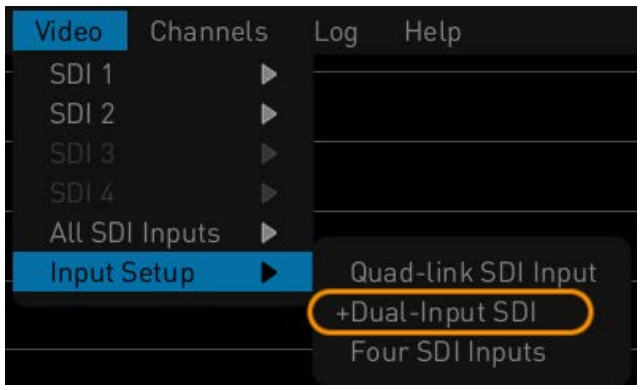
The limitations to stereo 3D streaming are the following:

- Stereo capture in Streaming Server only works with the Blackmagic 8K Pro video card.
- Stereo playback with the Streaming Player is AJA only. See details in View Stereo Stream with the Streaming Player.
- Stereo capture and playback is HD/2K only.
- Both the left and right eyes must be assigned to a channel in the Streaming Server. The right eye's channel will show *'no input'* on the GUI as it will be used by the left eye's channel.
- Before switching between the **Video › Input Setup** options, the stream must be manually stopped.

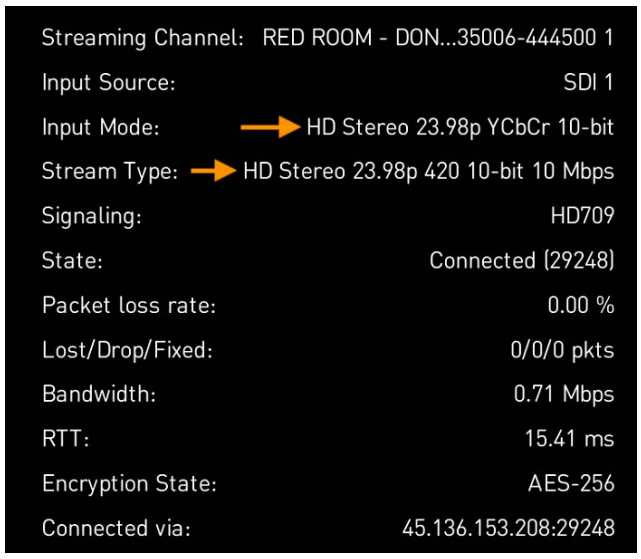
Stereo Configuration

To configure stereo streaming with the Streaming Server:

1. Open Streaming Server with the supported build version.
2. Select the appropriate input configuration using the **Video › Input Setup › Stereo SDI Inputs** or **› Dual-Input SDI** menu option.



3. Click the [START STREAM] button. When the connection is established, the *Streaming Status* shows that the input and the stream are stereo.



4. After the stereo input is configured in the Streaming Server, view the stereo stream using the Streaming Player. See the next section.

View Stereo Stream with the Streaming Player

The stereo stream can be viewed using the **Streaming Player**. For stereo video output, the Streaming Player must be equipped with *AJA Kona 5* video device *with 4K firmware*.

To switch between left and right eye views, use the *Ctrl+F2* and *Ctrl+F3* key combinations.

> Monitoring a stereo data stream with the Streaming Player is currently only available on Windows systems.

Setting up Resolve for Stereo Output

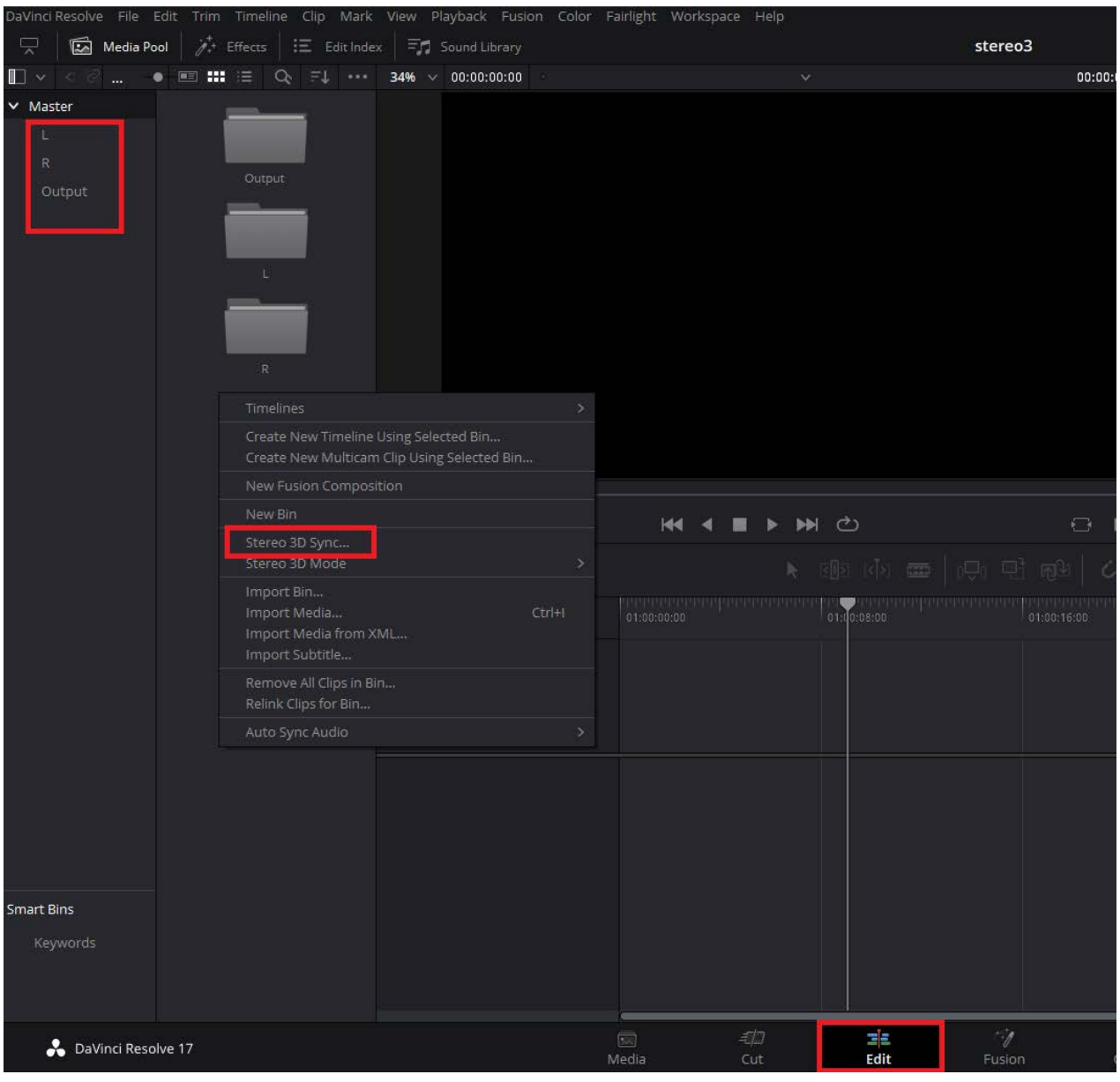
Stereo streaming is also supported using a special configuration that involves sending stereo streams from a DaVinci Resolve Studio system to the Streaming Server, and then transferring the 3D images to the Streaming Player for viewing.

First, set up DaVinci Resolve Studio to output stereo 3D images as follows:

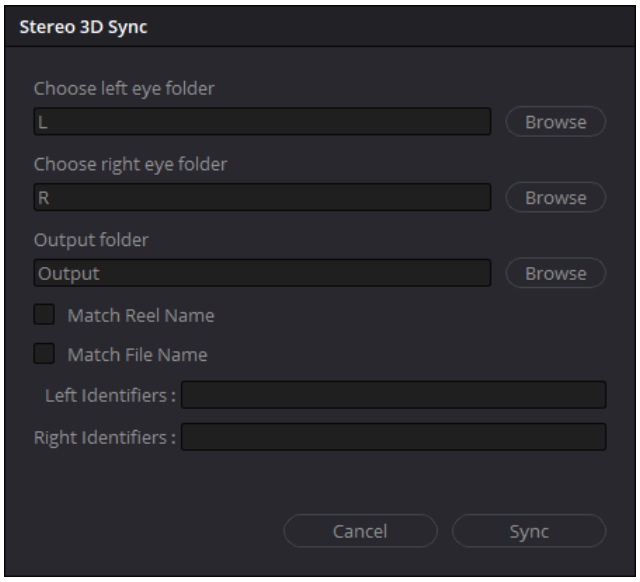
1. On the computer running DaVinci Resolve, connect the SDI cables to the Streaming Server's Blackmagic Design Decklink 8K Pro device:
    - Route SDI 1 and 2 to SDI ports 3 and 4 on the Streaming Server's Blackmagic Design card.

> Currently, for 3D stereo streaming, both the video card of the computer with DaVinci Resolve and the Streaming Server video card must be *Blackmagic Design Decklink 8K Pro* devices.

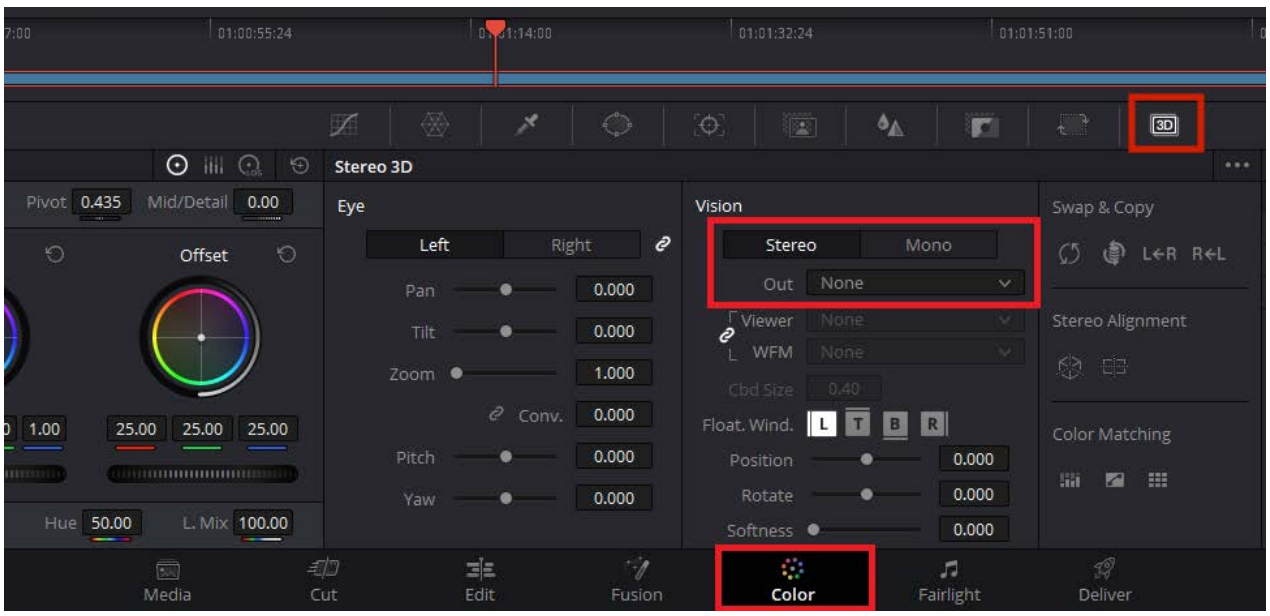
2. In Resolve Studio, create a new project.
3. Select the **Edit** page at the bottom and create three new bins named L, R, Output (Left, Right, Stereo).
4. Drag and drop each media to the relevant Left and Right bins.
5. Then right-click in the area where the large folder icons are and select **Stereo 3D Sync...**



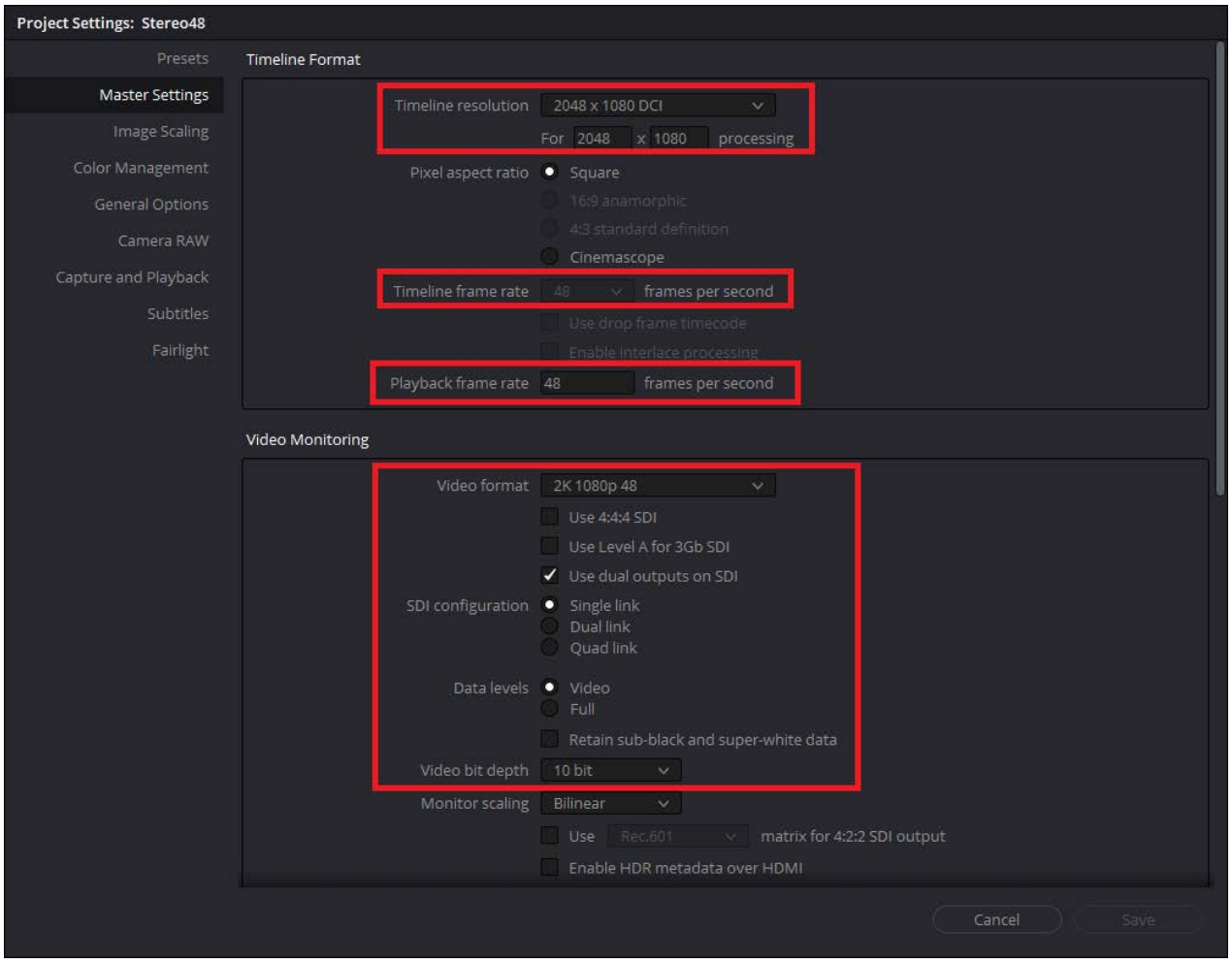
6. In the pop-up window, click the [Browse] buttons to select the left and right eye and stereo output folders, and then press [Sync].



7. Open the **Output** bin right click on the media.
8. Select **Create New Timeline Using Selected Clips**.
9. At the bottom of the screen, switch to the **Color** page.
10. Select **3D** and set **Vision** to [Stereo]. In addition, make sure that **Out** is set to [None].



11. Go to the **Project Settings**, and set the **Video format** to [2K 1080p 48]. Select the **Use dual outputs on SDI** and **Single link** options. Also, make sure the timeline resolution and the frame rates match.



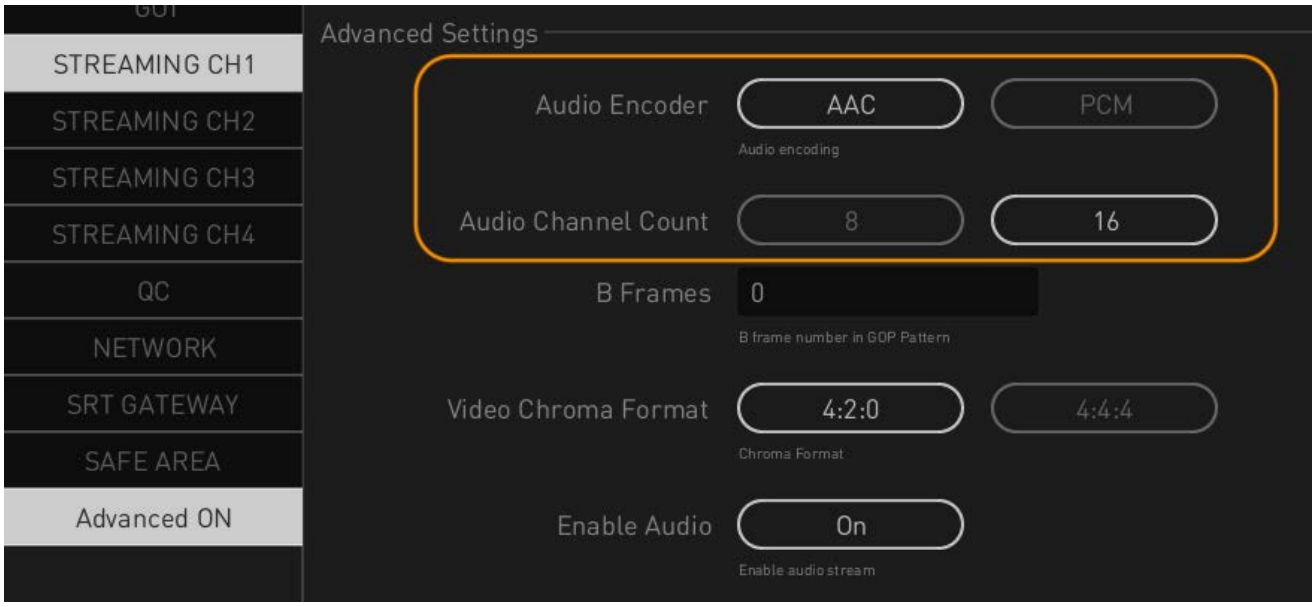
4.2. Audio Input

Streaming Server supports multichannel configurations up to 16 audio data channels. Both *AAC* and *PCM* audio outputs are supported for streaming.

> **PCM** (Pulse Code Modulation) is an uncompressed and *lossless* audio format where the raw analog audio signals are sampled and recorded at certain intervals (or pulses). The PCM audio codec does not include audio compression, which provides very high fidelity to the original audio, although streaming these large audio files requires a lot of extra bandwidth.
>
> **AAC**, on the other hand, stands for Advanced Audio Coding and is a *lossy* digital audio encoding standard. This compression codec is newer and more advanced format than MP3 and provides better sound quality.

For streaming via the Streaming Server, you can configure the following audio parameters in the Advanced Streaming Channel 1-4 Settings:

Audio Encoder	Set to [AAC] or [PCM] format
Audio Channel Count	Set to [8] or [16] audio channels



Audio streaming settings on the Settings Page

4.3. Supported Hardware and Configuration

Streaming Server supports a variety of video devices, including Blackmagic Design *Decklink SDI 4K* and *Decklink 8K Pro*, which can be used alternately in the same system.

Supported AJA and Blackmagic Design video cards are:

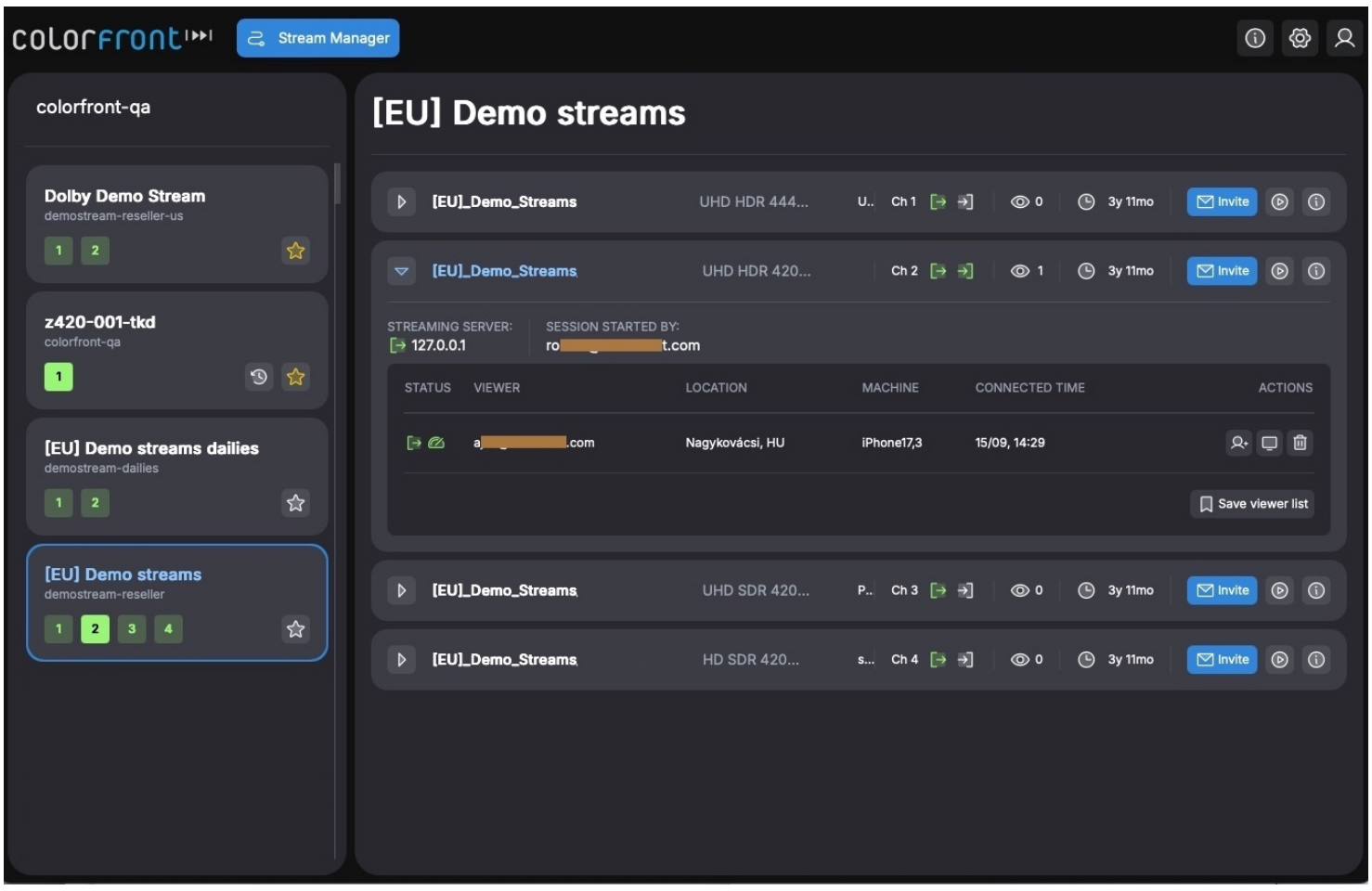
- AJA KONA 4
- AJA KONA 5
- AJA Corvid 44/88
- AJA T-Tap Pro (AJA Peek only)
- AJA Io 4K
- AJA Io 4K Plus
- AJA Kona IP (AJA Peek only)
- BMD DeckLink 8K Pro
- BMD DeckLink Quad HDMI
- BMD Decklink Mini Recorder 4K
- BMD Decklink Mini Recorder HD
- BMD DeckLink Duo 2
- BMD DeckLink Duo 2 Mini
- BMD DeckLink 4K Extreme 12G
- BMD SDI 4K
- BMD Studio 4K
- BMD Ultrastudio 4K Mini
- BMD UltraStudio Recorder 3G
- BMD UltraStudio 4K Extreme 3
- BMD UltraStudio HD Mini

5. Stream Manager

The Stream Manager is accessible via any web browser at: `https://stream.colorfront.cloud`

To get started, log in with your username and password.

For regular users, the Stream Manager provides access to the Streams Page, which lists all available stream sessions for the user's team(s) with detailed information on the selected session, stream parameters, active and inactive viewers, invitation options, and related metadata.



Stream Manager main view

When accessed with Team Manager Privileges, the Stream Manager interface offers additional management options. **Team Managers** can configure team preferences, manage members, and administer streaming servers.

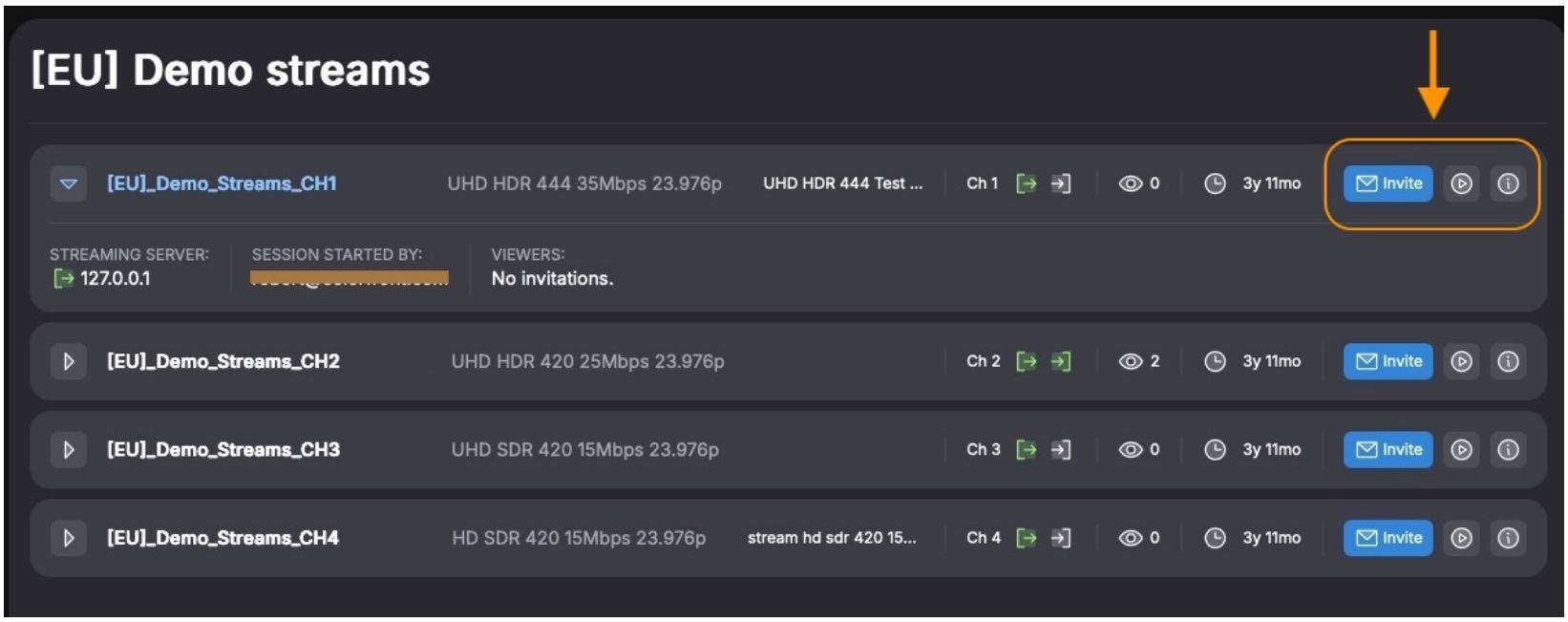
See the following chapters for additional details:

- Streams Page
- Starting Streams From Stream Manager
- Inviting Viewers
- Managing Viewers
- Monitoring Streams
- Team Manager Privileges

5.1. Streams Page

The Stream Manager's main view displays all configured stream sessions for the user's team(s) in the left panel, with the associated session details in the right panel. You can mark your favorite streams by selecting the star icon, which will position them at the top of the list.

On the right, you can see the available streaming channels for the selected stream, up to four channels. The channel header shows the channel name, stream specs, two arrow icons indicating connection status (green when connected), the number of active viewers, and more.



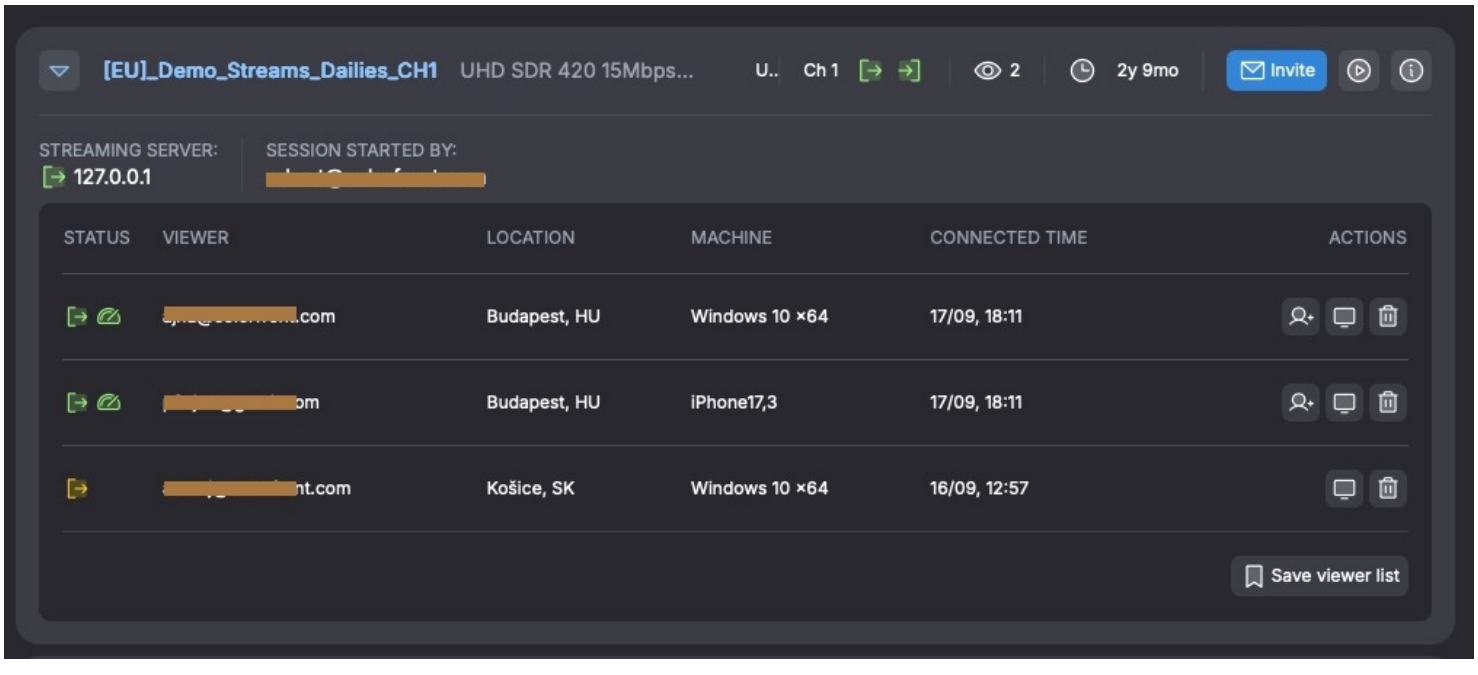
Stream channel details in the Stream Manager

At the end of each channel entry, three buttons are available:

- [Invite] – Send invitations to the session. For details, see Inviting Viewers.
- *Play* button – Join the session using the Streaming Player or a connected device. Refer to Joining Session via URL.
- *Info* button – Display channel details for the stream and its viewers, along with selectable graphs. For more information, see Monitoring Streams.

When viewers are connected to the stream, the right arrow turns green, and active viewers are listed for the channel.

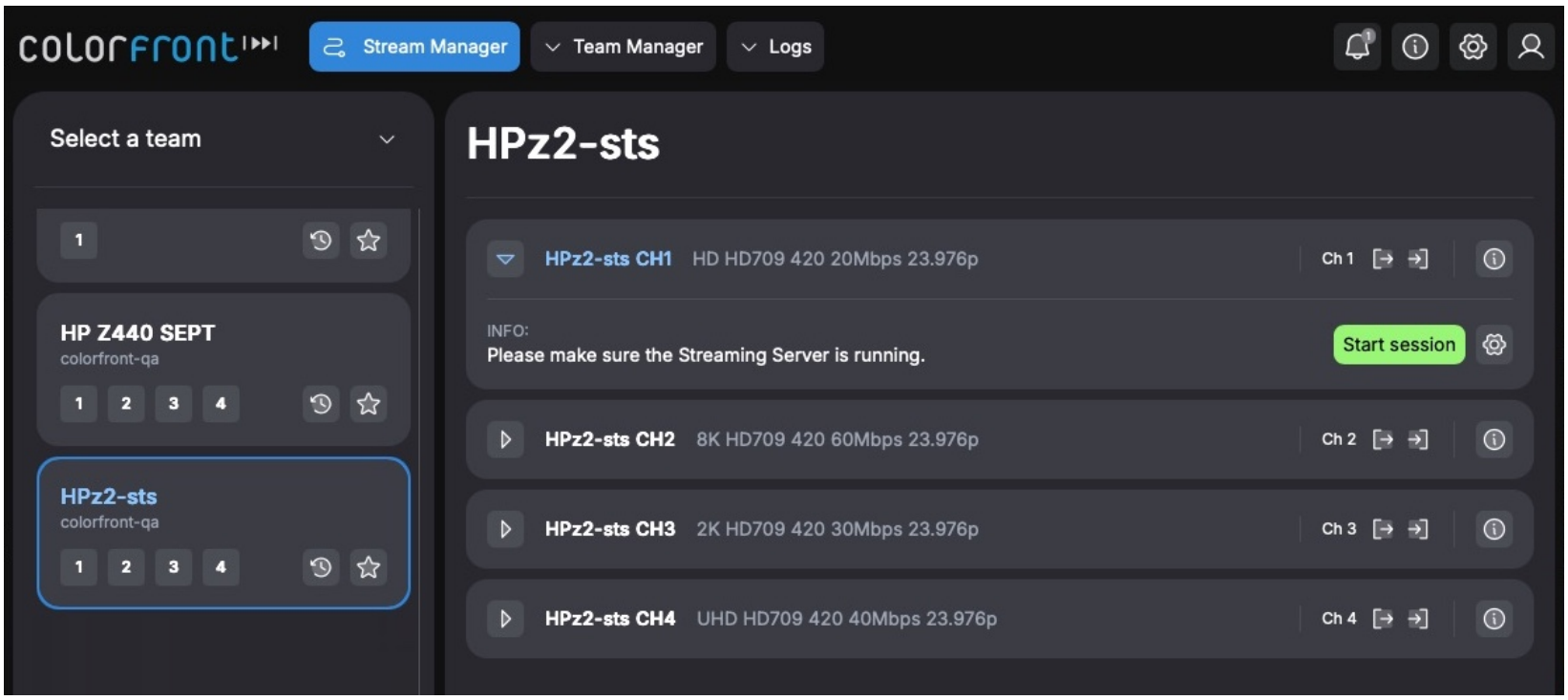
When viewers are connected, you can track their status, device information, and activity directly in the Stream Manager. For details on how to monitor and manage connected viewers, see Managing Viewers.



Stream viewers list

5.2. Starting Streams From Stream Manager

Apart from initiating streaming via the Streaming Server or from Colorfront products such as Transkoder or QC Player, you can also start streaming sessions directly from the Stream Manager.

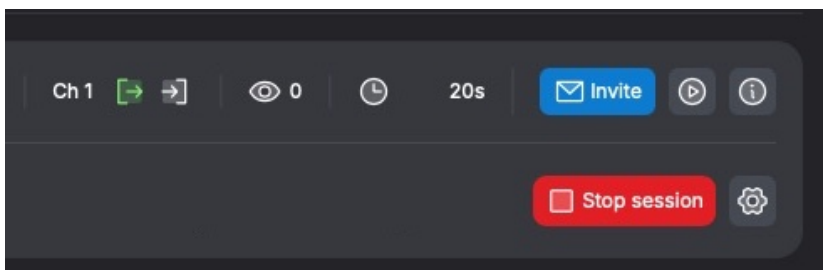


Start a streaming session in Stream Manager

To start a streaming session:

1. Open the Stream Manager to display the Streams Page.
2. Select the stream source from the left panel, then click the preferred stream channel on the right to reveal detailed information.
3. If the input stream is available (the Streaming Server or Streamer is not offline) and no session is active, you can start it as follows:
   - Click the cogwheel button to configure stream parameters. For details, see Configuring Streams.
   - After configuration, either start the session from that panel or click [Save settings] and then [Start session] on the Streams Page.
   - Invite viewers as described in Inviting Viewers.
4. To stop the stream, click the red [Stop session] button.

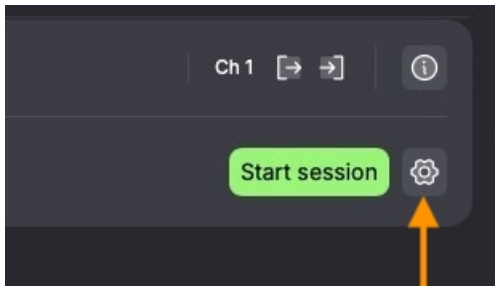
> Stopping the stream immediately disconnects all viewers. This action cannot be undone.



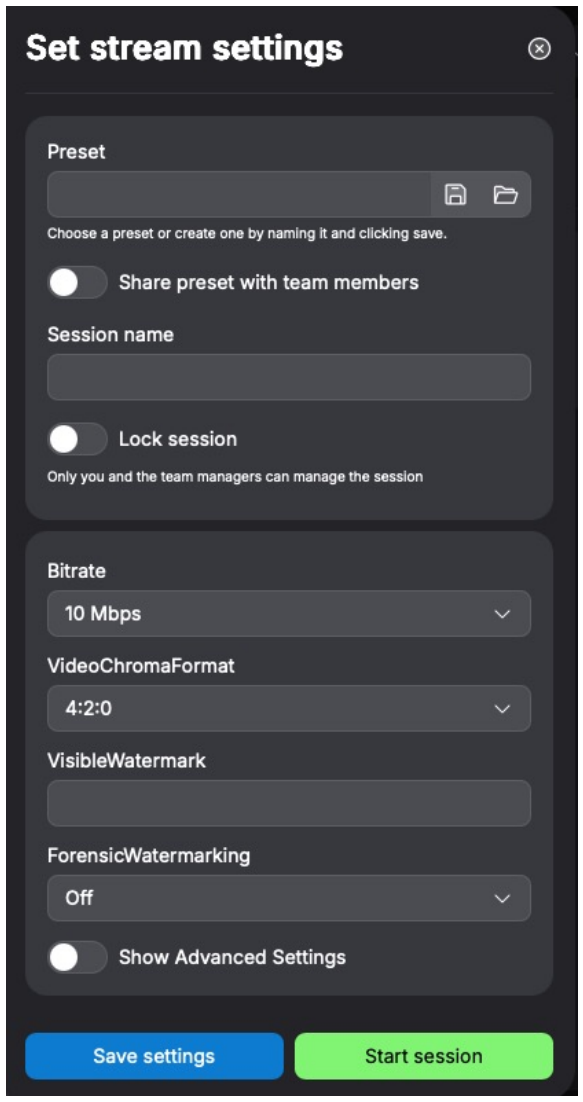
Stopping a streaming session

5.2.1. Configuring Streams

To configure a stream in the Stream Manager, click the cogwheel next to the [Start session] button.



Configuring a stream in Stream Manager

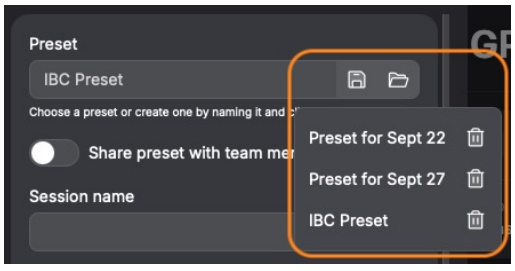


Stream settings panel

Configurable parameters include:

Preset

Save the current configuration as a named preset using the Save icon. Click the Load preset button to recall a preset from the list. To delete a preset, click the Delete icon.



Selecting a saved preset

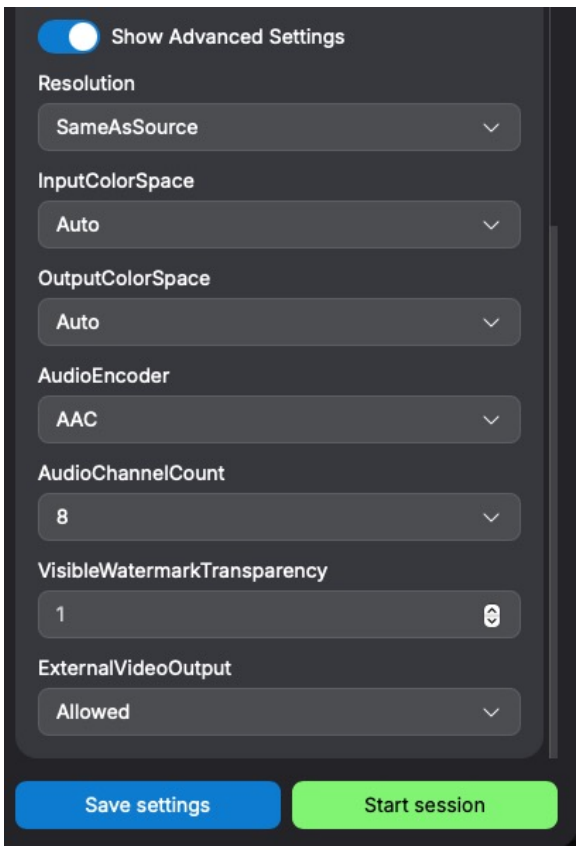
Share preset with team members

Enable to share the preset with team members (if available).

Session name

Add a custom session name.

Lock session	Restrict management of the session to yourself and Team Managers.
Bitrate	Select from available presets (5–35 Mbps) or enter a custom value up to 200 Mbps.
Video Chroma Format	Choose [4:2:0] or [4:4:4].
Visible Watermark	Apply a visible watermark burned into the image for content protection.
Forensic Watermarking	Toggle [On] / [Off] to enable or disable forensic watermarking.
Show Advanced Settings	Toggle to display additional options.



Advanced stream settings

Advanced settings:

Resolution	Set to [HD] , [2K], [UHD], [4K], or [SameAsSource].
Input Color Space	Options include [Auto], [HD709], [HDR10], [P3D65PQ], [HLG], [P3DCIGamma26], [XYZGamma26], [P3D65Gamma26], and [Bypass].
Output Color Space	Same options as above plus [Dolby Vision]
Audio Encoder	[AAC] or [PCM]
Audio Channel Count	[8] or [16]

Visible Watermark Transparency	Adjust the opacity of the visible watermark (0–100%).
External Video Output	[Allowed] or [Prohibited]

Once configuration is complete, click [Save settings] and then [Start session].

5.3. Inviting Viewers

The Stream Manager provides several ways to invite viewers to a streaming session. You can invite any number of viewers to a channel. The available methods are:

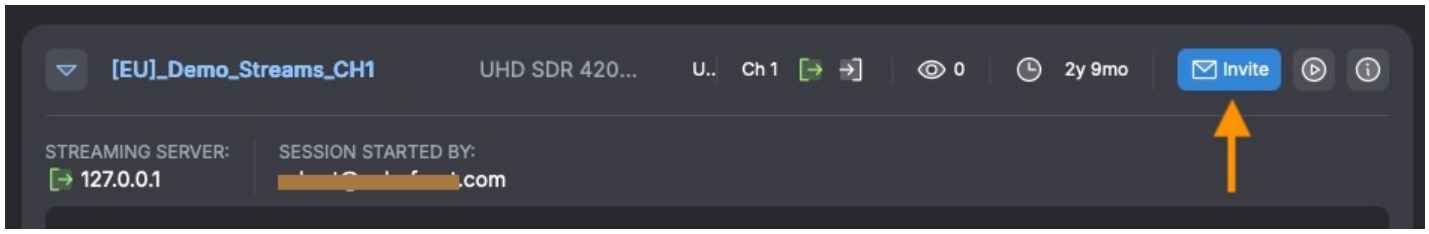
- Email Invites
- Joining Session via URL
- Easy Join

For details on viewer monitoring and management, see Managing Viewers.

5.3.1. Email Invites

To invite viewers to a stream session from the Stream Manager, follow these steps:

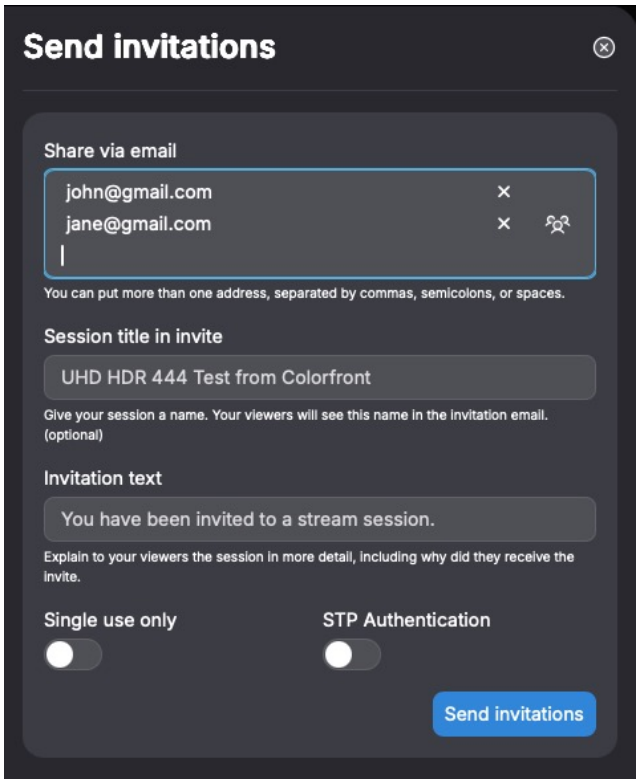
1. On the Streams Page, click the blue [Invite] button next to the selected channel. This opens a panel on the left where you can add viewers.



Inviting viewers

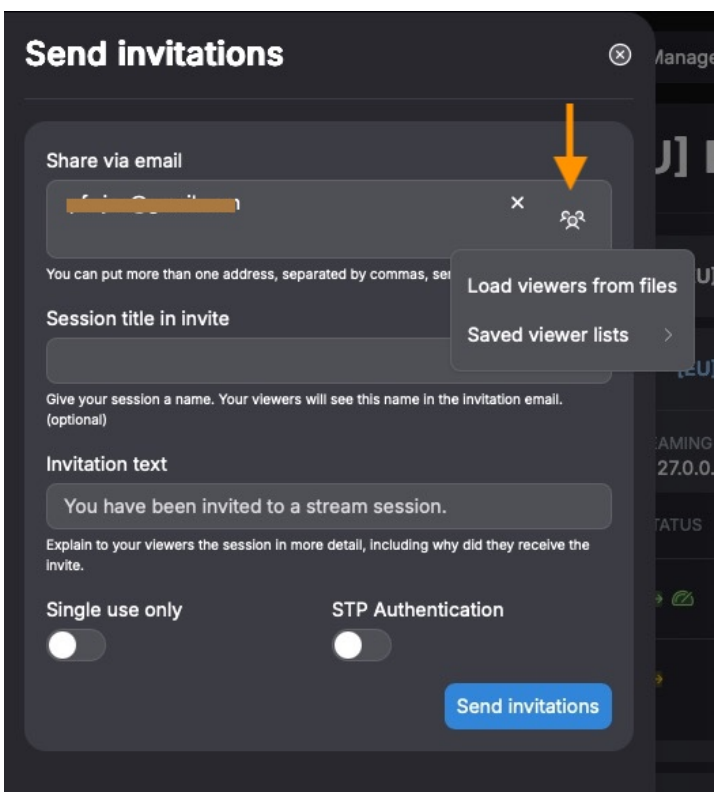
2. In the panel, enter one or more email addresses as recipients. You can also add a *session title* and *invitation text* for the email.

	Ensure that all email addresses are entered correctly.



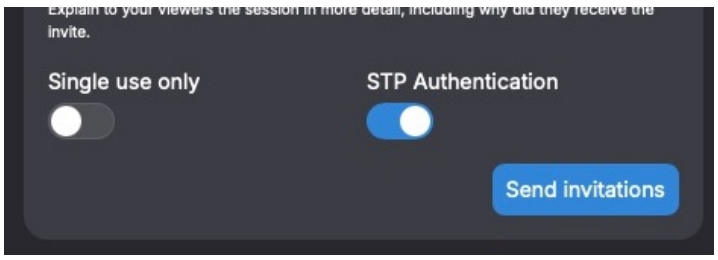
Sending email invites

3. To simplify the process, you can load saved viewer lists in the *Send Invitations* panel by clicking the group icon. In the pop-up panel, click [Load viewers from files] to import a list in .txt or .csc format, or select a list from [Saved viewer lists].



Load viewers from saved list

4. Enable **Single use only** to restrict viewers to a single device (computer, iPad, etc.). In this mode, viewers are limited to a single device. By default, multiple devices can be used simultaneously.
5. Enable **StP Authentication** to add an extra layer of security and verify the viewer's identity. When enabled, invited viewers must complete a *two-factor authentication* process:

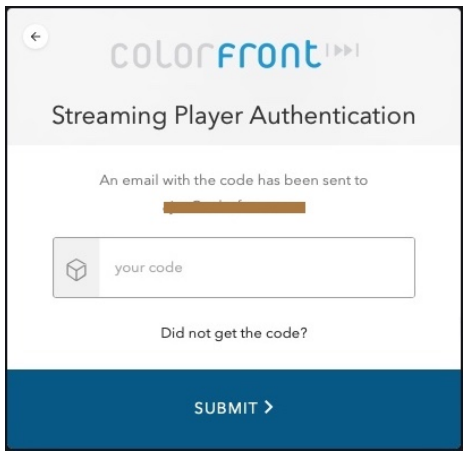


a. After receiving the email invites, the viewer clicks [Join Session] to open the Streaming Player application.

b. A pop-up window appears with the viewer's email address pre-filled.

c. The viewer clicks [Submit], and a verification email is sent containing a one-time code.

d. The viewer enters this code into the authentication pop-up and clicks [Submit] again. The stream begins once the code is verified.

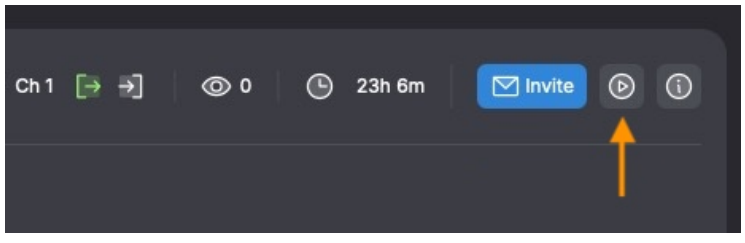


6. When all recipients and options are set, click [Send invitations]. Each recipient will automatically receive an email notification with a link to join the stream.

Invite via email

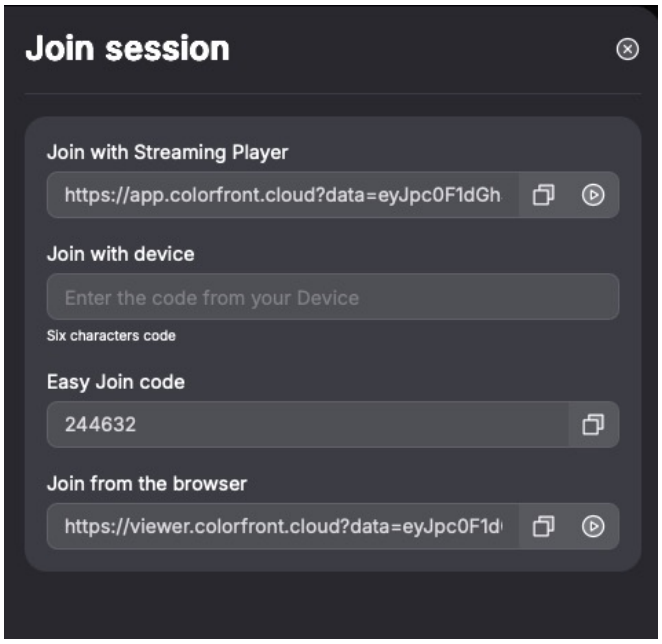
5.3.2. Joining Session via URL

You can also join a streaming session using invite URLs generated on the Streams Page of the Stream Manager. Click the *Play* button next to the name of the selected streaming channel.



Joining a session via URL

A panel appears on the left, where you have the following options to join the stream:



Join session options

Join with Streaming Player

- Click the *Copy to clipboard* icon to copy the URL and paste it into a web browser. The browser will open the Streaming Player.
- Click the *Play* button to launch the Streaming Player directly and start viewing the stream on your current computer.

Join with device

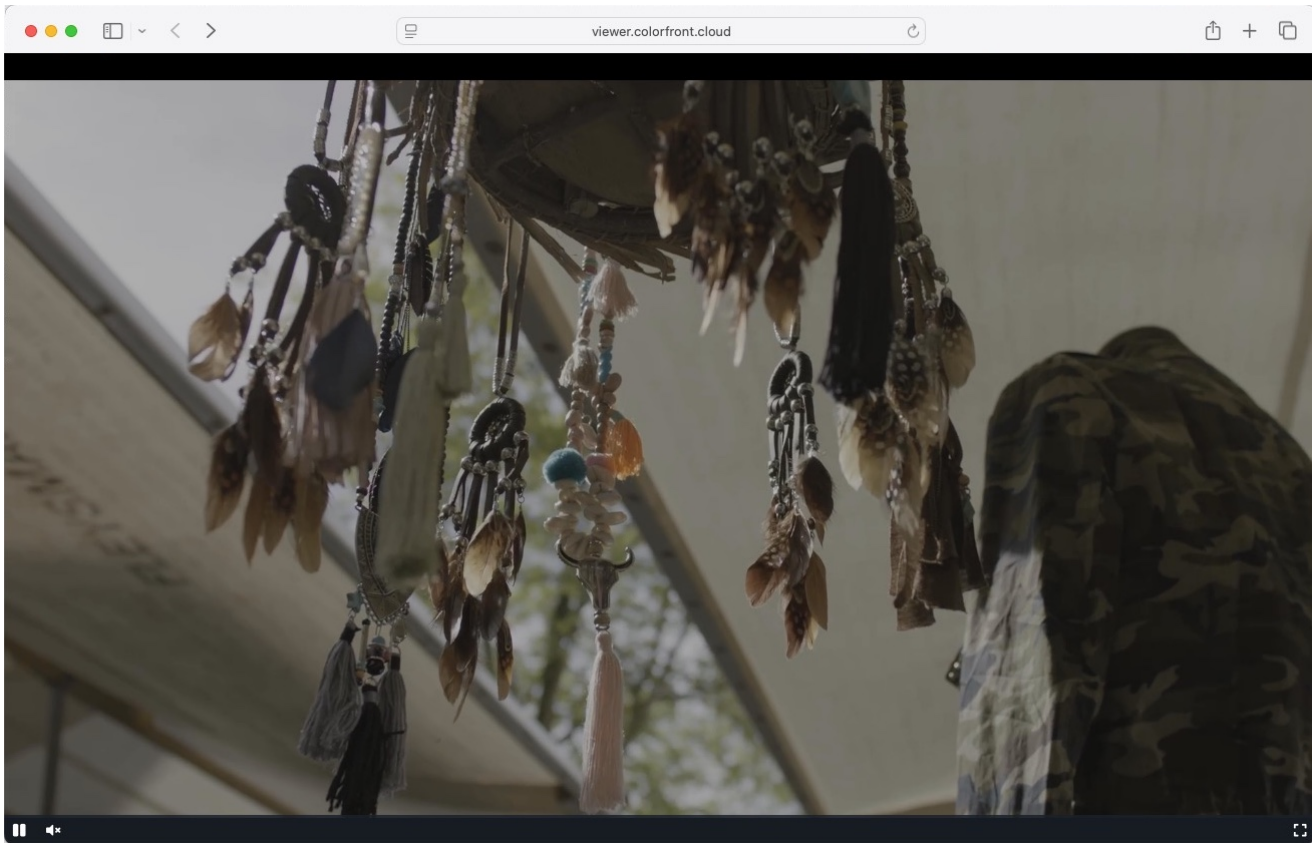
Click to Play button in the Streaming Player app on your device, and enter here the six-character authentication code provided to join the

Easy Join code

Copy and share the code for Easy Join.

Join from the browser

- Click the *Copy to clipboard* icon to copy the URL and paste it into a web browser. The Colorfront Viewer loads in the page and plays the stream.
- Click the *Play* button to launch the Colorfront Viewer directly in your current browser.



Colorfront Web Viewer for stream sessions

5.3.3. Easy Join

As an alternative to connecting to a stream via Email Invites or invite URLs, **Easy Join** provides a simplified way to joining sessions. Instead of logging in or entering an email, viewers use a short numeric code included in their session invitation. This reduces the number of steps required to access a stream, particularly on mobile devices, but it is less secure than the standard authentication method.

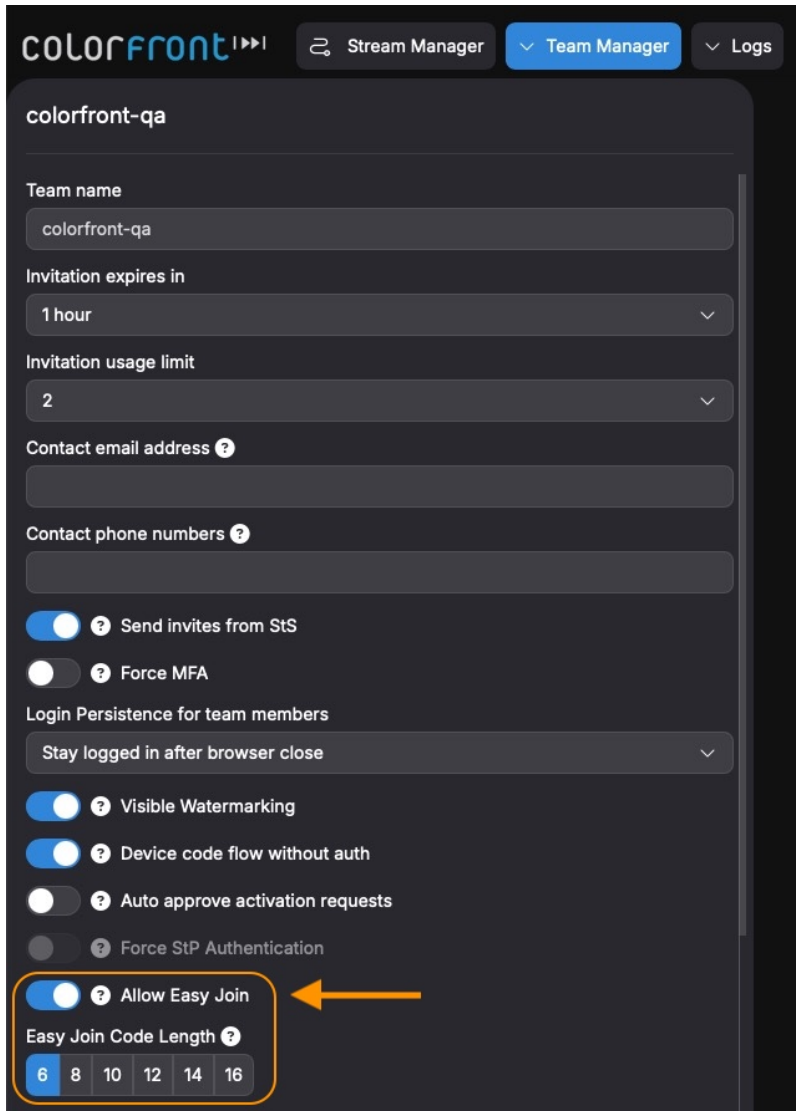
	Easy Join bypasses default security features that protect streamed content. It should only be enabled with a clear understanding of the associated risks.

Easy Join codes are numeric only. Their length can be set in Team Preferences with the ***Easy Join code length*** option. Available lengths are: [6], [8], [10], [12], [14], and [16].

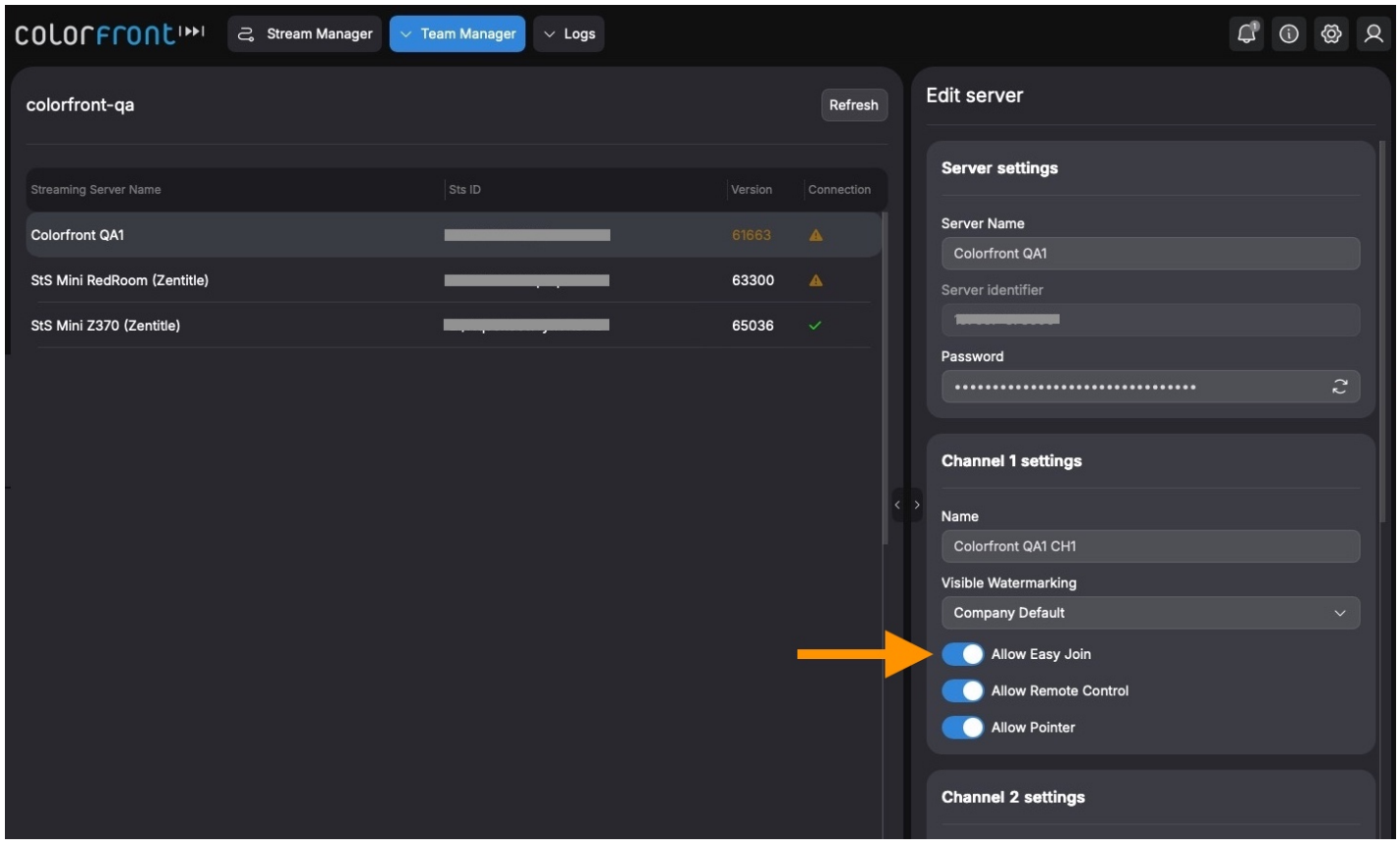
Codes are generated automatically in the Stream Manager when a session starts, provided that Easy Join has been enabled at the team or route level. The host can then share the code with viewers directly.

Team Managers control Easy Join settings in the Team Manager Menu:

- In Team Preferences view, Easy Join can be enabled for all team members. When activated, team members receive an email notification. For sessions where Easy Join is available, invitations also include an option for the host to disable it. If a host wishes to restore default security protections, they can do so by following the link in the notification email.



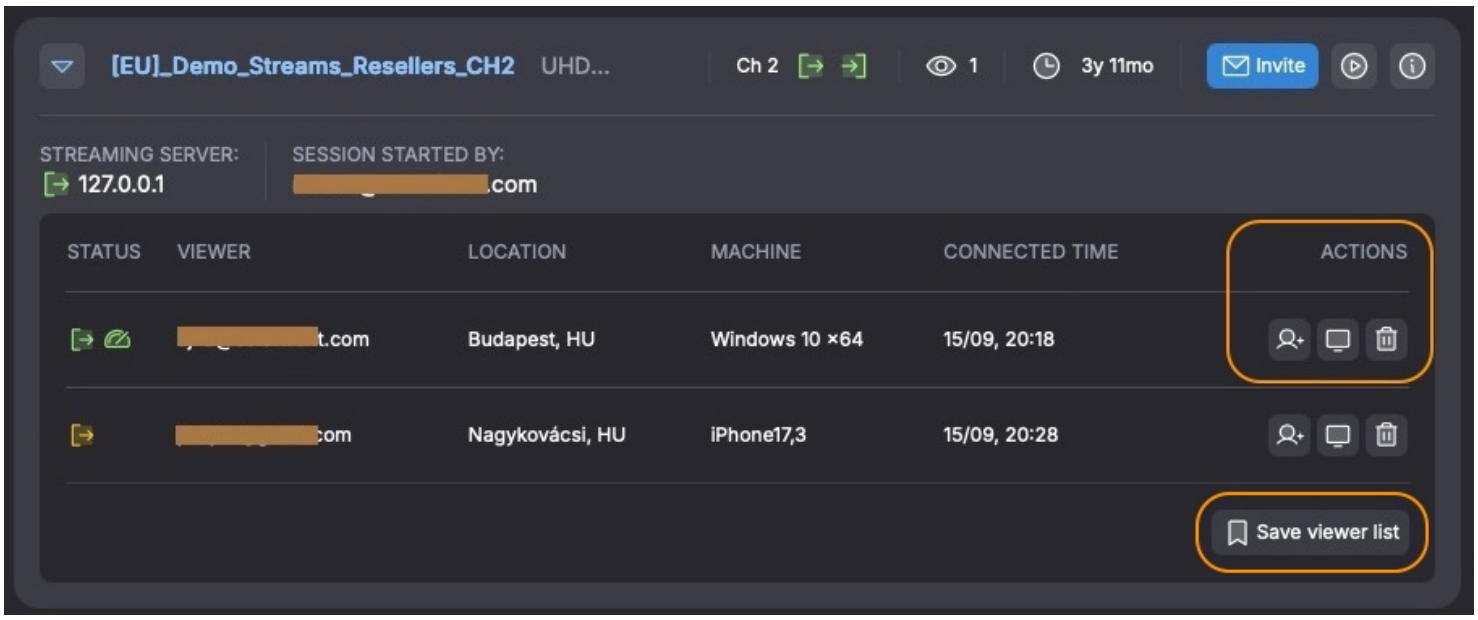
- In Streaming Servers view, Easy Join can be enabled for all users of a given Streaming Server.



5.4. Managing Viewers

When a user connects to the stream, a green icon appears next to the viewer's name. Used invitations are marked with a yellow checkbox. Each viewer entry also shows stream quality (green icon), location, connected device(s), and date and time of connection.

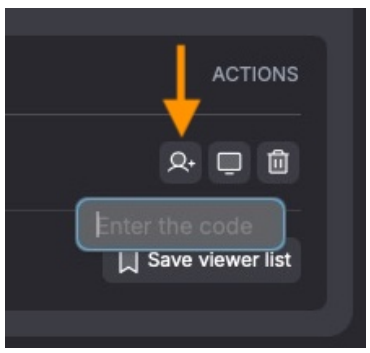
Click [Save viewer list] to store the current session's viewers for later use. See Email Invites for details.



Stream viewers list

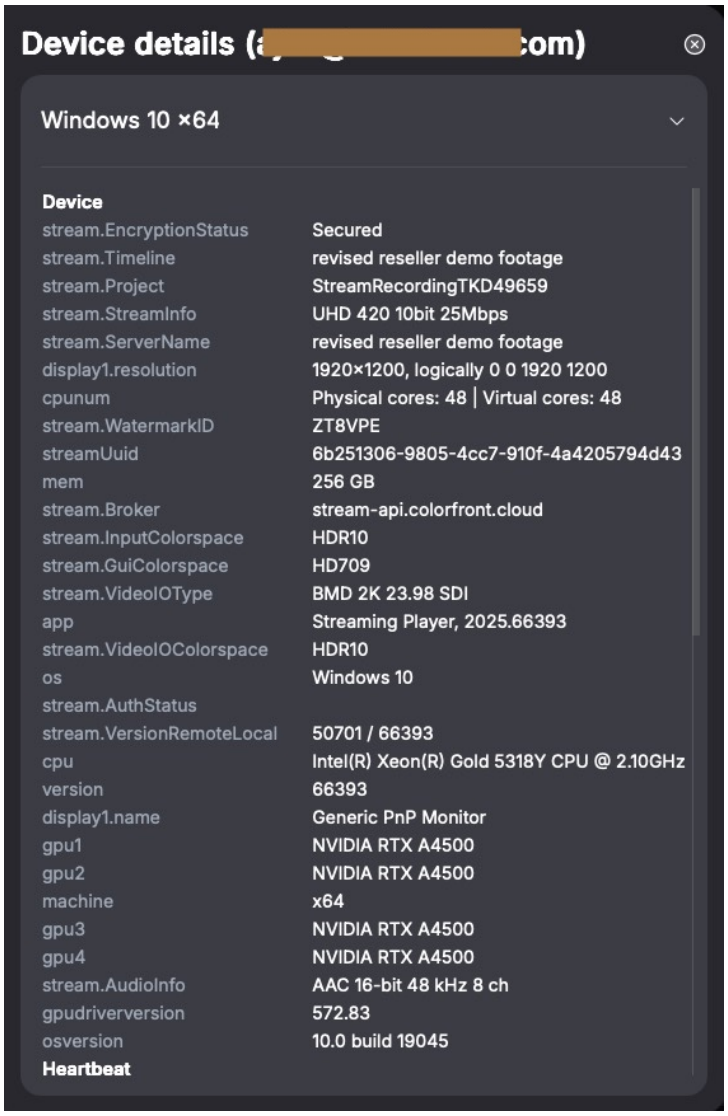
At the end of each viewer entry, three action buttons are available:

Add viewer with code Enter the six-character access code from another of your devices to join the stream. The code is generated by clicking the *Play* button in the Streaming Player app on an Apple device (iPad, iPhone, Apple TV) or on the desktop application for macOS or Windows.



Device info

Click to display details about the user's active device(s). The metadata shown is provided to the Stream Manager by the Streaming Player application. This panel also includes heartbeat data with real-time updates on the device's connectivity and operational status.



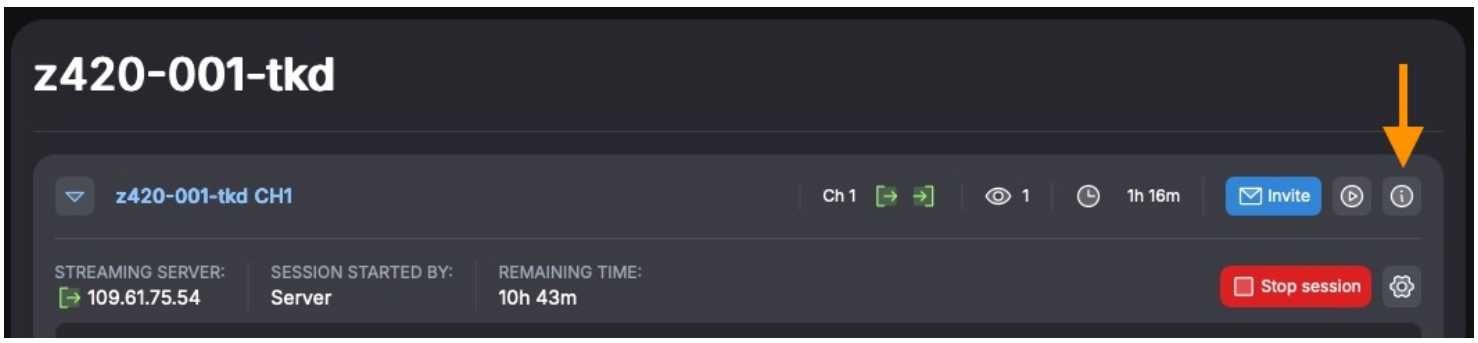
Remove viewer

Click to remove the viewer from the list of active viewers.

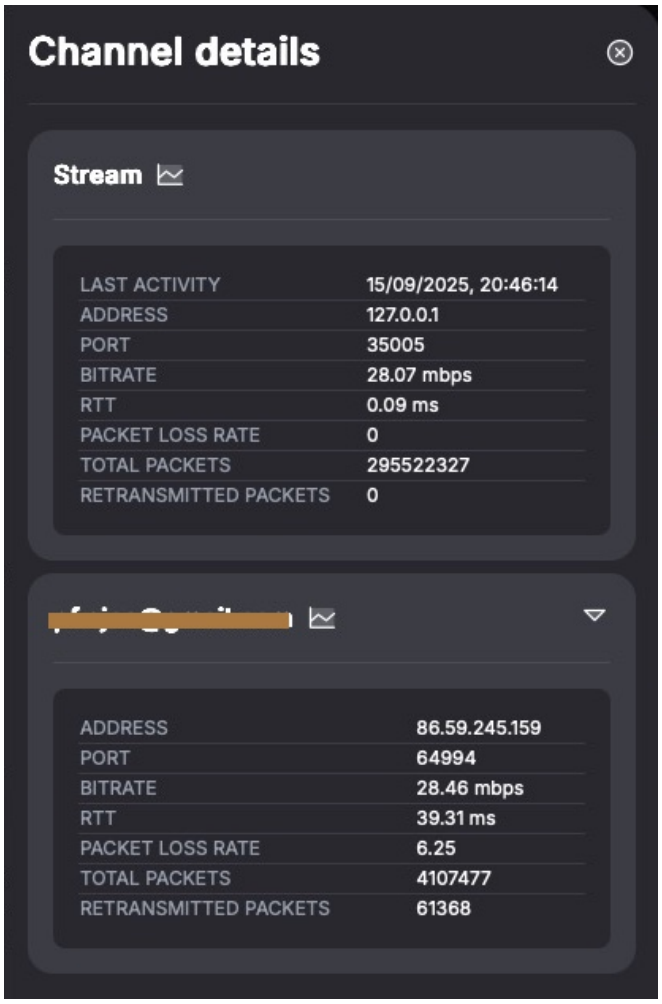
5.5. Monitoring Streams

The Stream Manager is not only a powerful interface for managing stream sessions, it also provides real-time monitoring of stream parameters for connected clients.

The stream's health can be checked by clicking the info button, which opens the Channel Details panel. Here you can view live stream parameters such as address, port, bitrate, and packet loss rate for both the streaming source and the selected viewer. If multiple viewers are connected, you can switch between them using the small arrow.



Info button to open channel details



Channel details panel

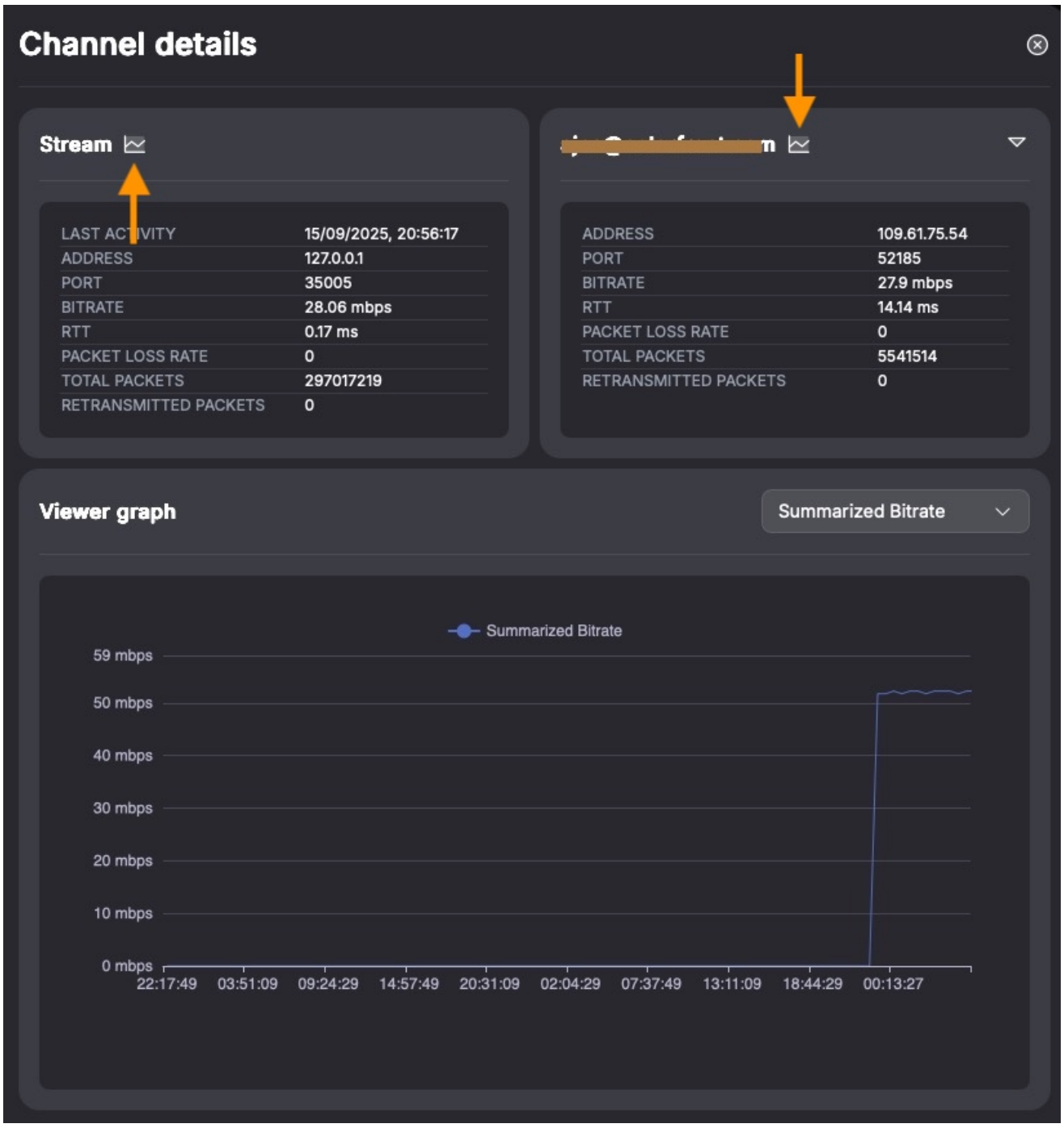
The source panel and the viewer panel each include one graph icon. Clicking the icon opens a statistics view with selectable graphs.

In the graph panel, a drop-down menu allows you to select from the following metrics:

- Bitrate
- RRT
- Packet Loss Rate
- Retransmitted Packets

For viewer panels, an additional option is available:

- Summarized Bitrate



Streaming channel details with graphs

5.6. Team Manager Privileges

Team Managers (TMs) are users with higher privileges than regular Stream Manager users. In addition to the Streams Page, Team Managers have access to two further menu options in the top navigation:

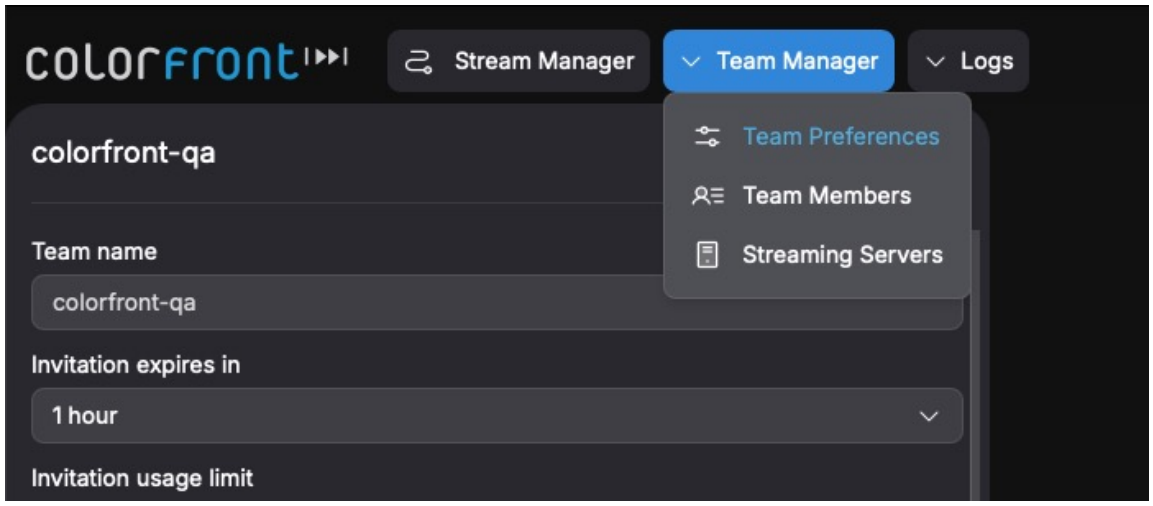
- Team Manager Menu for managing team preferences, members, and streaming servers.
- Logs Menu for logging and monitoring user activity and connection characteristics

5.6.1. Team Manager Menu

The Team Manager menu provides access to configuration and management options that are not available to regular users. In addition to being able to send invitations, Team Managers (TMs) have elevated permissions in three areas, accessible from the drop-down menu:

- Team Preferences: Configure team-wide settings such as invitation expiry, email template branding, login persistence, and watermarking options.
- Team Members: Manage team membership by adding or removing users, resetting passwords, and editing member details.
- Streaming Servers: View and manage registered streaming servers, including version information,

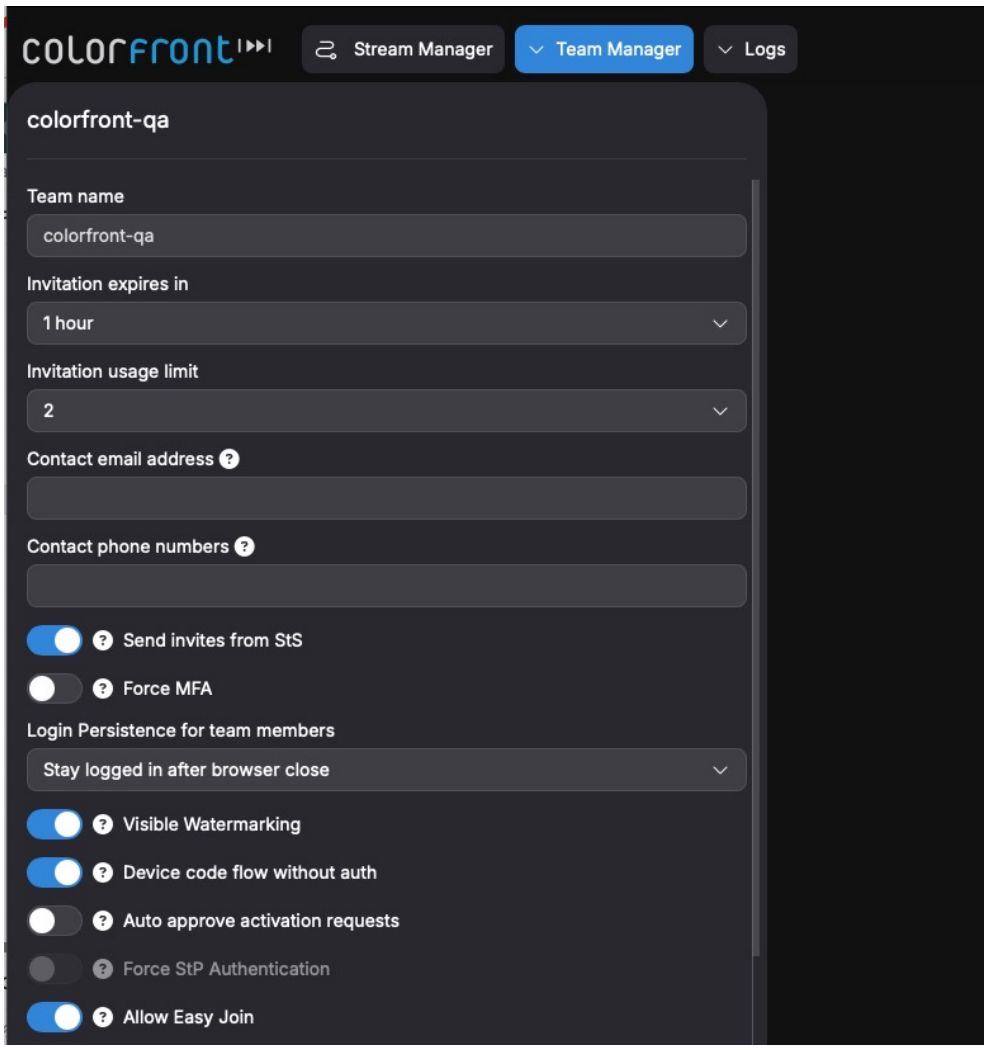
configuration, and connection status.



Team Manager menu

Team Preferences

In the Team Preferences view, Team Managers can configure various team settings. Configurable parameters are:



Team Preferences view

Team name	Define or update the team's display name.
Invitation expires in	Set the validity period for invitation links. Options: [5m], [10m], [30m], [1h], [No expire].
Invitation usage limit	Limit how many times an invitation link can be used. Options: [2], [5], [10], [50], [100], [Infinity].

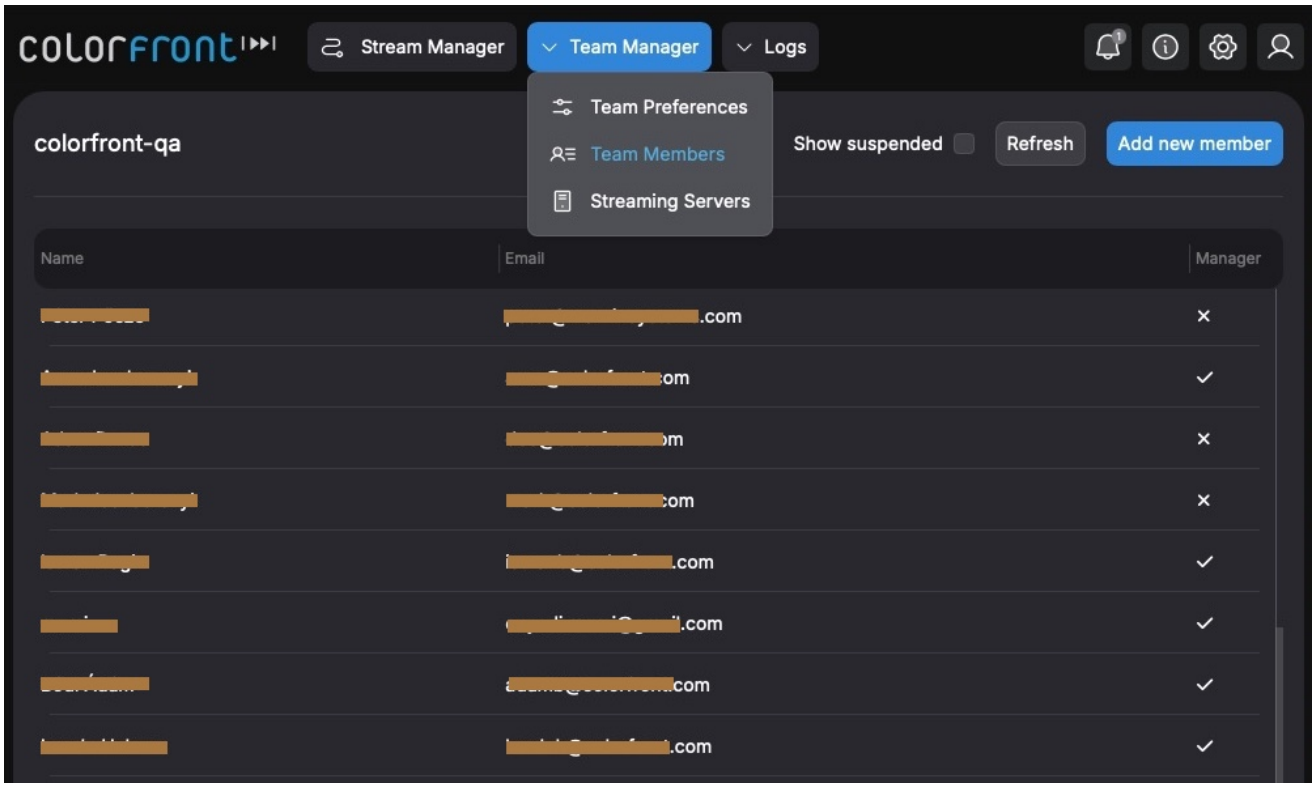
Contact email address	Example: `user@domain.com`, `Support <support@domain.com>`.
Contact phone numbers	Example: `1-541-754-3010`, `Support <+1-541-754-3010>`.
Send invites from StS	When enabled, streaming servers are allowed to send invitations. If disabled, streaming servers will not be permitted to send invitations.
Force MFA	Require all team members to enable multi-factor authentication. Enabling this will also enforce MFA on your own account.
Login persistence	Choose whether members stay logged in or are logged out after closing the browser.
Visible watermarking	Enable or disable visible watermarks on streams.
Device code flow without auth	Allow device code–based login without authentication. If disabled, streaming players must authenticate (using default passwordless login) before they can use the device code flow.
Auto approve activation requests	When enabled, all activation requests are automatically approved. If disabled, requests must be approved manually.
Force StP Authentication	All viewers must log in and authenticate before joining a session. If a custom identity provider is configured, viewers authenticate through that provider. Cannot be used together with Easy Join.
Allow Easy Join	Allow users to join sessions without authentication using an Easy Join code. Security implications should be considered. For more information, see Easy Join. • *Disabled*: Easy Join is disabled for all team channels. • *Enabled*: Easy Join is enabled for all channels, though individual channels can be opted out. Cannot be used while Force StP Authentication is enabled.
Easy Join code length	Define the number of characters in Easy Join codes. Options: [6], [8], [10], [12], [14], [16].
Identity provider	Select authentication provider. Options: [Custom], [Passwordless], [Team Member].

Custom Identity Provider	• **Issuer URL**: URL of the OpenID Connect discovery document.
	• **Client ID**: Value obtained from the OIDC provider. Consult your provider's documentation.
	• **Callback URL**: Must be registered with the OIDC Issuer. Use the following callback URLs:
	`https://device.colorfront.cloud.com.colorfront.StreamingPlayer`
	`https://colorfront.auth0.com/macos/com.colorfront.StreamingPlayer/callback`

Realtime pointer	Allow viewers to interact with pointers in their Streaming Players. By default, all channels are enabled unless specific channels are disabled. • [Enabled]: Pointers active on all team channels. • [Disabled]: Pointers are disabled for all team channels. • [Per Channel setting]: Pointers can be enabled or disabled for each channel separately.
Remote control	Allow viewers to remote-control the server via their Streaming Players. By default, all channels are enabled unless specific channels are disabled. • [Enabled]: Remote control active on all channels. • [Disabled]: Remote control disabled for all team channels. • [Per Channel setting]: Remote control can be enabled or disabled for each channel separately.
Voice conference	Allow viewers to communicate through voice conferencing in their Streaming Players. By default, all channels are enabled unless specific channels are disabled. • [Enabled]: Voice conference active on all channels. • [Disabled]: Voice conference disabled for all team channels. • [Per Channel setting]: Conferences can be enabled or disabled for each channel separately.
Email template logo	Upload or delete the logo displayed in invitation emails.

Team Members

The Team Members page lists all users in the team, showing their email address and whether they are Team Managers (TMs).

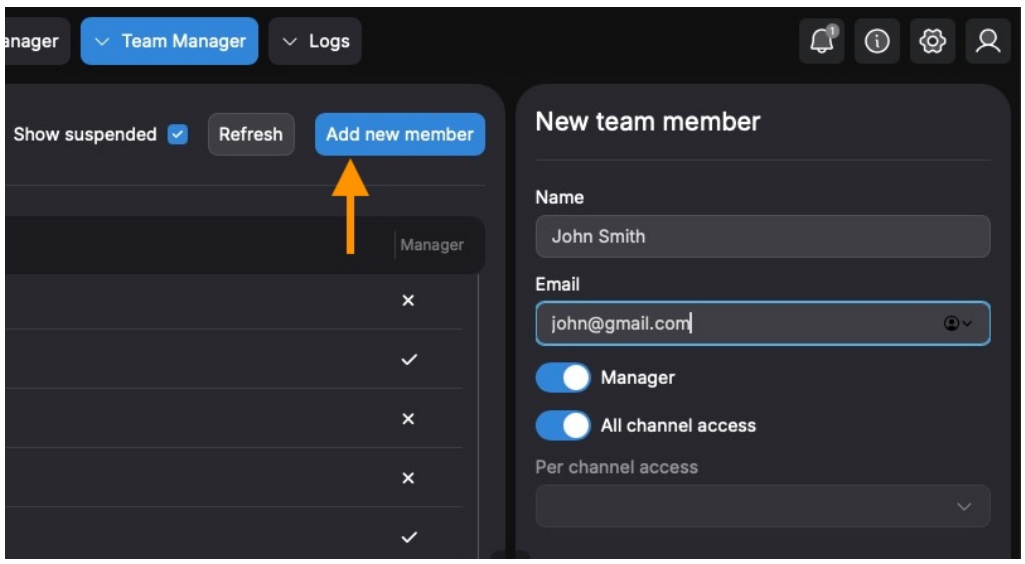


Team Members page in Stream Manager

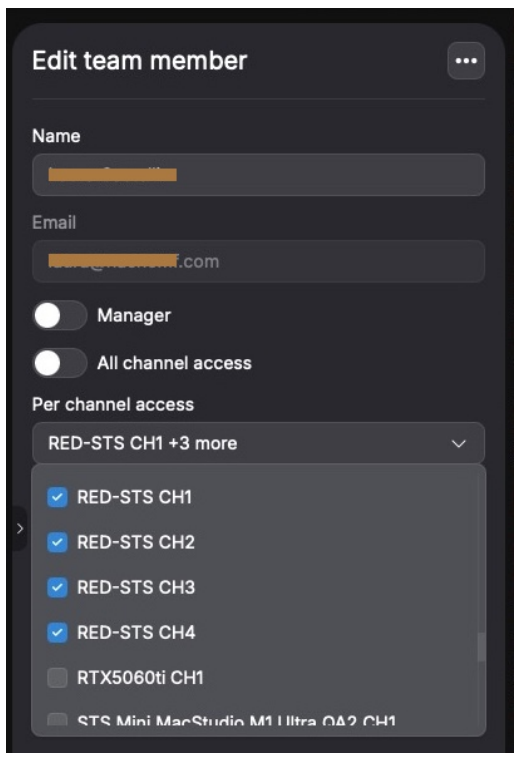
You can perform the following actions here:

Add new members

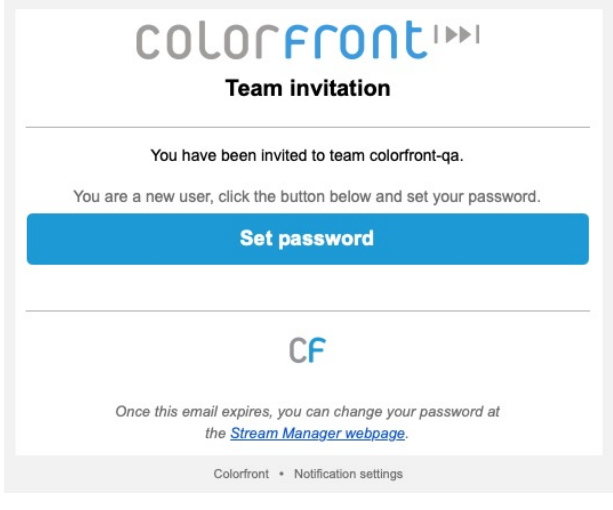
1. Click [Add new member] to open the panel on the right.
2. Enter the user's name and email address, and configure their Manager role and channel access.



3. Choose between *All channel access* or *Per-channel access* by selecting specific channels from the menu.

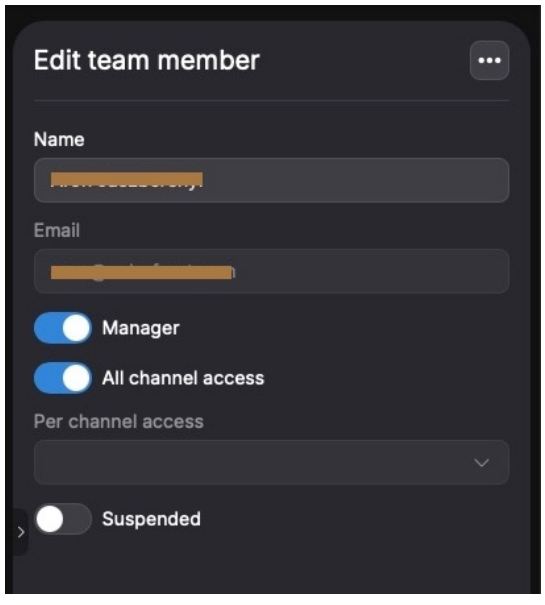


4. When finished, click [Create].
5. The new user will receive an email invitation to join the team and set their password.



Edit team members

Click a user entry to open the edit panel on the right. Here you can rename the user, enable or disable the Manager role, and set channel access.



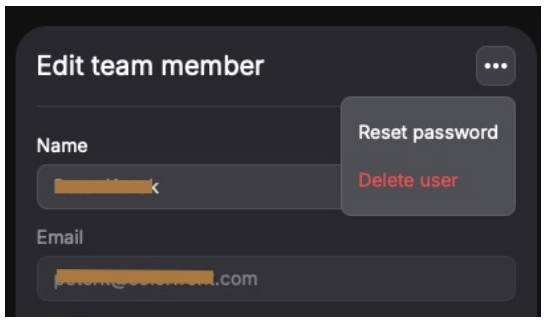
Editing team members

- To **rename** a user, edit the displayed name. The change is applied immediately.
- To **grant or revoke TM rights**, toggle the *Manager* checkbox.
- To **suspend** a member, enable *Suspended* in their edit panel. Suspended users lose all permissions and are hidden from the list by default. To re-activate, enable *Show suspended* in the top bar, select the user, and clear the *Suspended* option in the edit panel.

	Team Managers cannot be suspended directly. Their Manager role must be revoked first.

Reset password / Delete user

In the user's edit panel, open the three-dot menu in the top-right corner to reset the user's password or delete the user from the team.



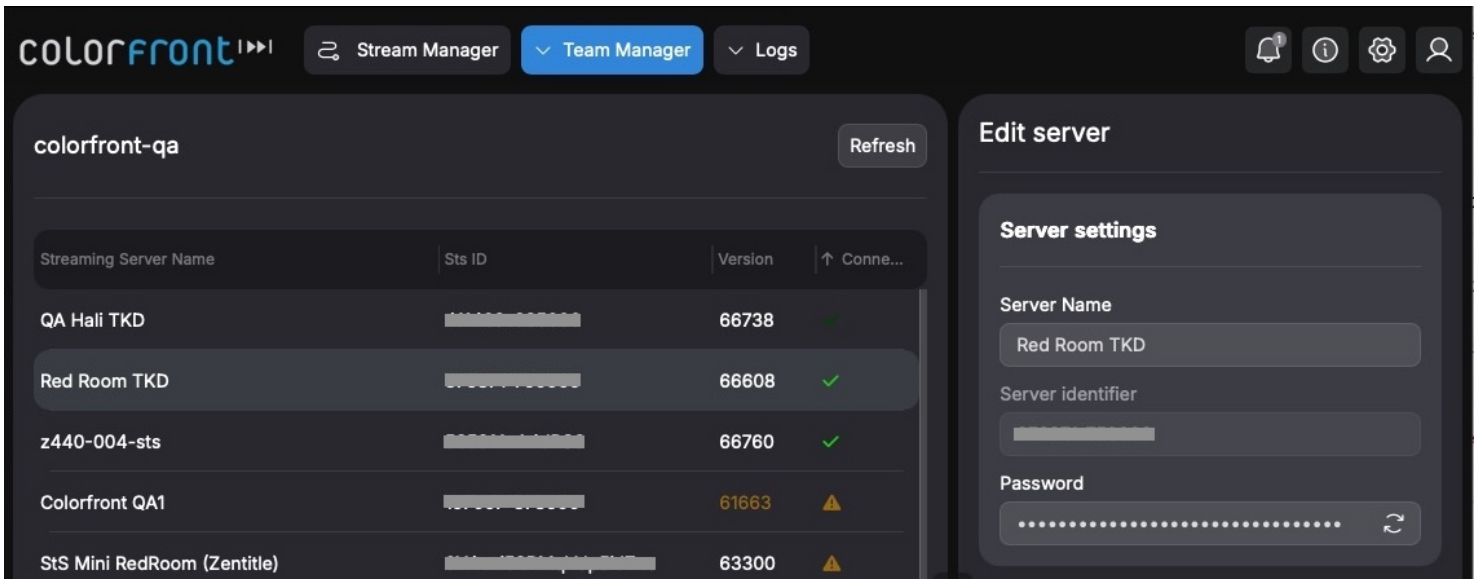
Streaming Servers

The Streaming Servers page lists registered servers by ID and name. Connection status is shown with colored icons, such as a green checkmark for connected status or a dark yellow triangle for servers that have not logged into the Stream Manager in the last 24 hours.

	Hover over the icons to see the tooltip.

Each entry also displays the server's application version. Orange indicates a version below the recommended level, and red indicates a version below the minimum requirement.

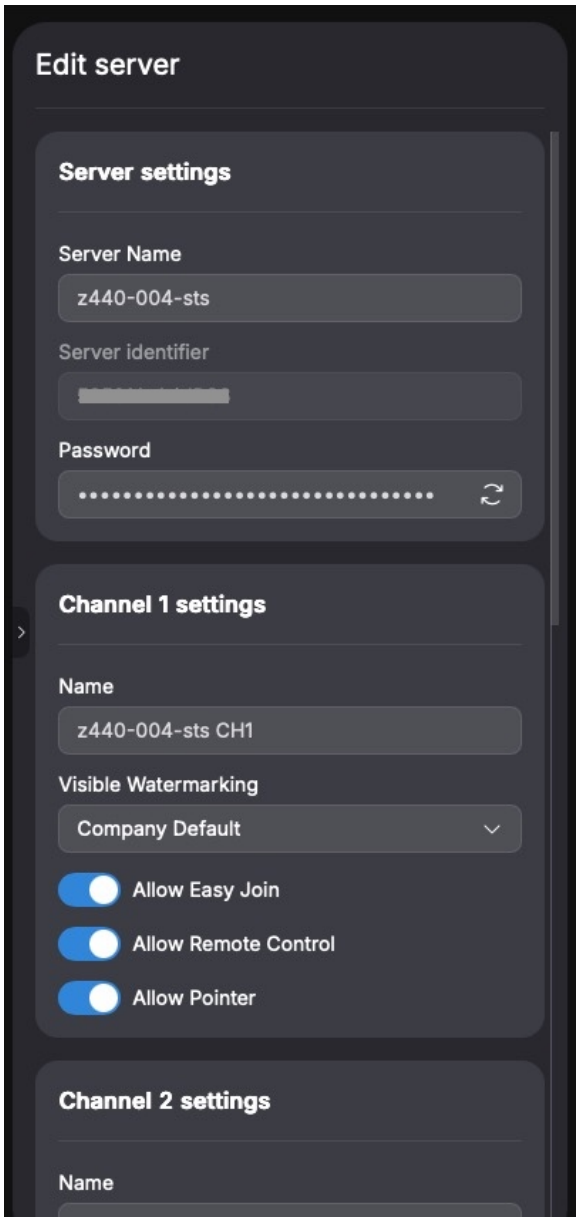
Click a server entry to open the *Edit* panel on the right. Here you can rename the streaming server or its channels individually, and generate a passkey.



Streaming Servers page

Additionally, the following options are available:

Visible Watermarking	Enable, disable, or set *Company default* to display a watermark in players per channel. Users joining the team session for that channel will see watermarked text if enabled. The watermark contains the invited user's email address and a random string that identifies the user (searchable in activity logs).
Allow Easy Join	Enable this option for all users of the selected streaming server. See Easy Join for details.
Allow Remote Control	Allow remote control of the streaming server via connected Streaming Player applications.
Allow Pointer	Enable pointer sharing between viewers in a session. Each viewer is assigned a distinct color, making it easy to reference areas of the footage on screen.

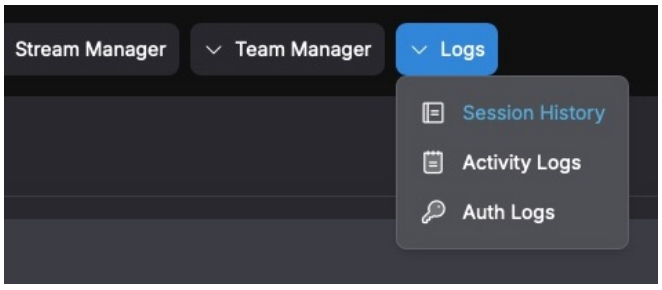


Edit panel for a streaming server

5.6.2. Logs Menu

The Logs menu provides access to detailed histories of sessions, activity events, and authentication records for the team. Use the drop-down menu at the top to switch between:

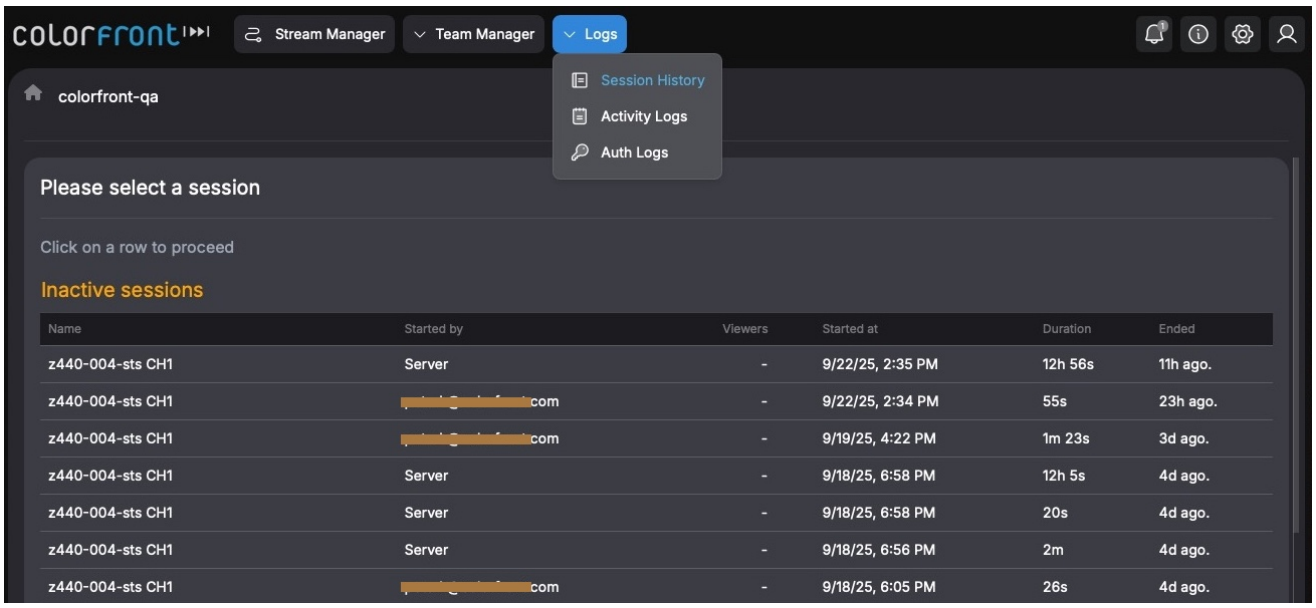
- Session History
- Activity Logs
- Auth Logs



Logs menu in Stream Manager

Session History

The Session History view (default) lists both active and expired sessions for the selected team. Each entry shows key information, including number of viewers, session start date and time, and total duration.



Session history log

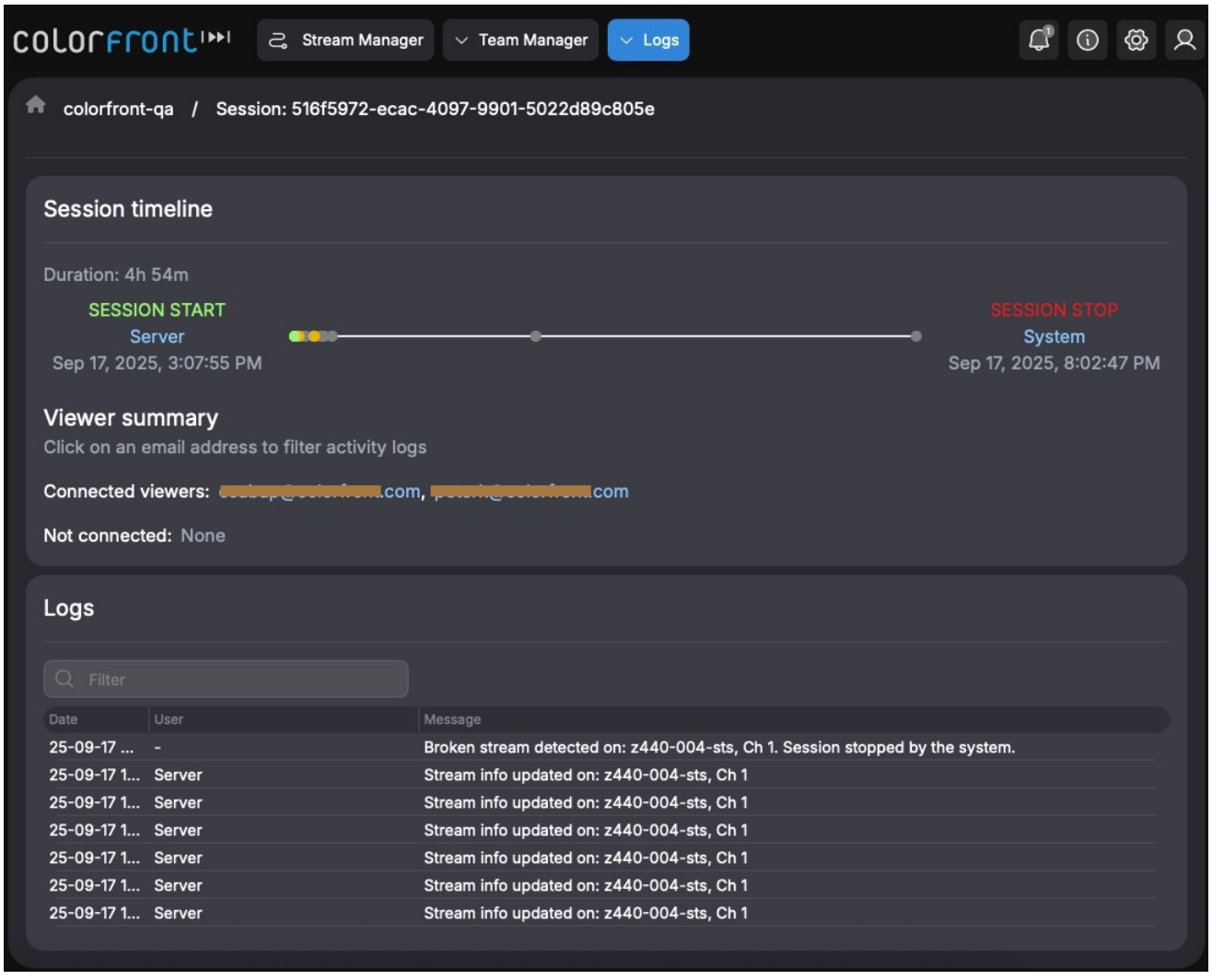
Clicking a session opens a detailed view with the following sections:

Session timeline — A chronological list of events from session start to end. Each entry is clickable and opens the related activity log.

Viewer summary — Lists the email addresses of connected viewers and highlights invitees who did not connect.

Logs — Displays all activity logs generated during the session. Clicking a row opens a details panel on the right.

Log entries can be filtered by viewer email, date, IP address, or message. Start typing in a field to apply filters.

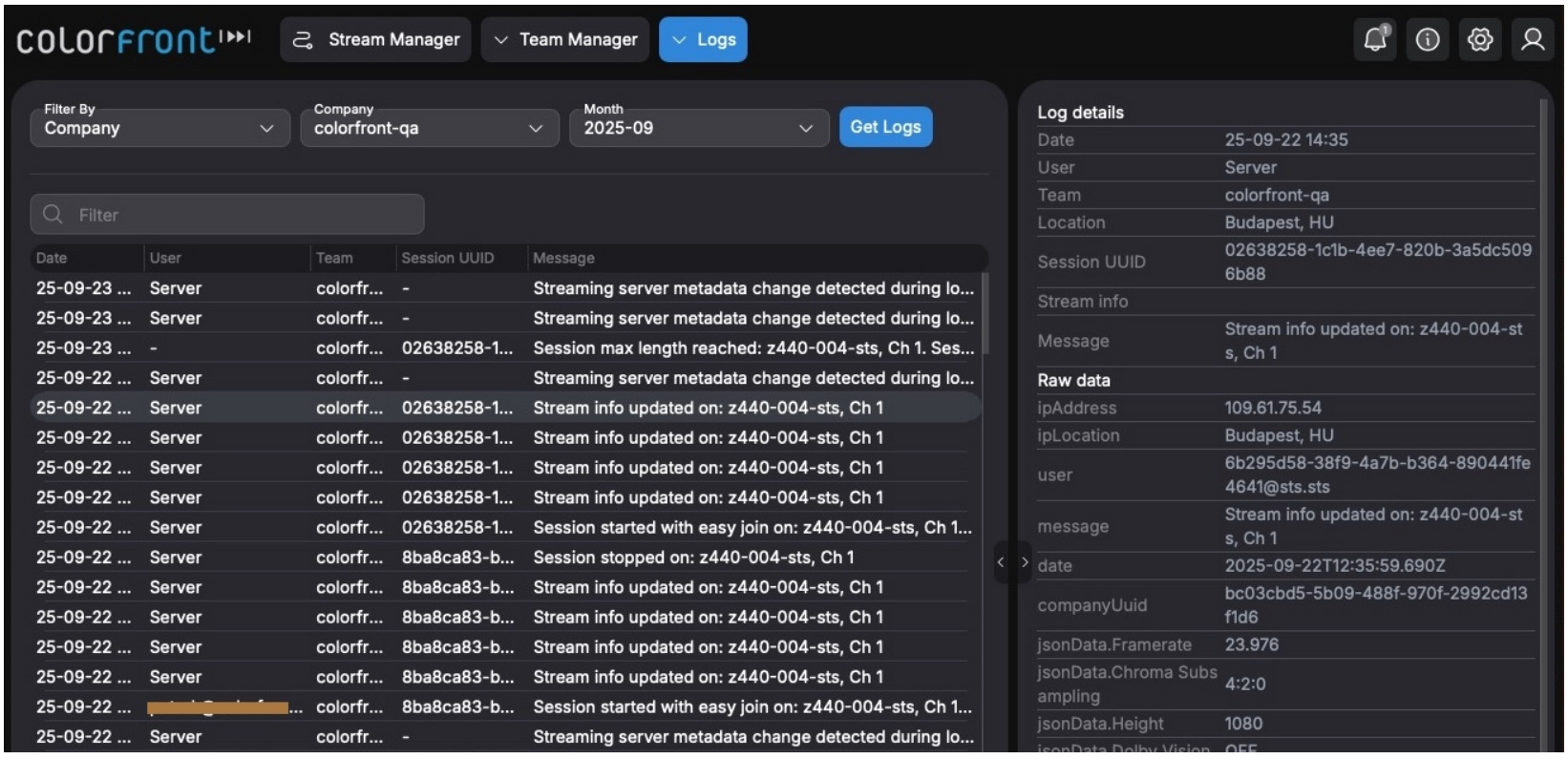


Session detailed history

Activity Logs

The Activity Logs view lists all log entries for the current session. You can filter entries by parameters such as Company, Session UUID, watermarking ID, team, or date. After setting filters, click [Get logs] to display the results.

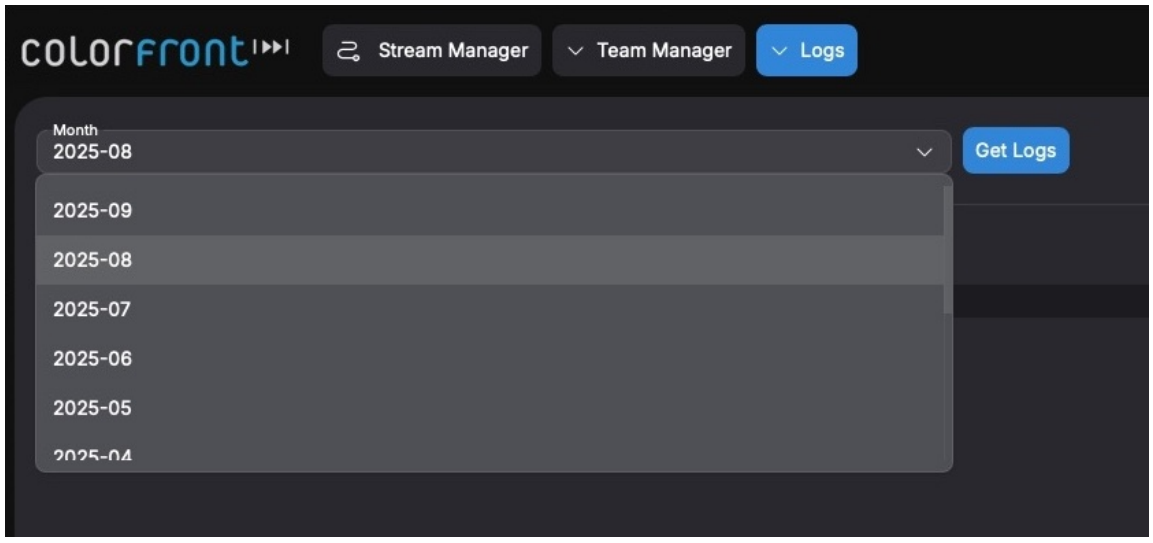
Double-clicking an entry opens a panel on the right with detailed information for that log.



Activity logs

Auth Logs

The Auth Logs view displays records of all login attempts to the Stream Manager. Entries can be filtered by month or other parameters using the Filter field. After setting filters, click [Get logs] to display the results.



Auth Log view

6. Stream Setup

When using the standalone Streaming Server appliance, the operator can stream from the video output of any third-party editing, grading or finishing system. Color metadata, including Dolby Vision metadata, is automatically extracted from the input signal and channeled to the client application. The powerful Colorfront engine of the Streaming Server unit can handle four independent sources and the corresponding stream targets.

6.1. Source Channel Configuration

The *Channels* menu is used for mapping SDI, NDI and CDI input sources to the four streaming channels.

With the **Channels › Channel 1/2/3/4 › Input › SDI 1/2/3/4** menu items you can connect any **SDI** input source to any channel.

The *same* input source can be connected to *multiple* channels in order to generate simultaneous streams with different resolution, quality or color settings.

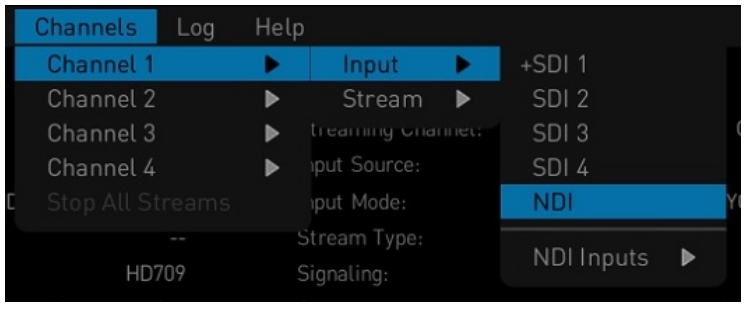
NDI (Network Device Interface) is a standard protocol for ultra-low latency, premium quality video encoding and video transmission over the IP network. Streaming Server allows you to connect multiple channels of NDI sources to the streaming channels over your local area (LAN) network.

AVID Media Composer's NDI audio uses 20 dB of headroom by default. Since no related metadata travels in the NDI signal, Streaming Server will automatically compensate for this if the NDI feed's name ends with `.AVID`.

Alternatively, you can configure all NDI inputs for a specific reference level using the following Startup.xml key:

```
<NDIInputReferenceLevel type="int">20</NDIInputReferenceLevel>
```

Use the **Channels › Channel 1/2/3/4 › Input › NDI** menu option to select NDI as the source for the streaming channel. NDI feeds can be changed dynamically by using the **Channels › Channel 1/2/3/4 › Input › NDI Inputs** options for available NDI sources.



Assigning input source to channel

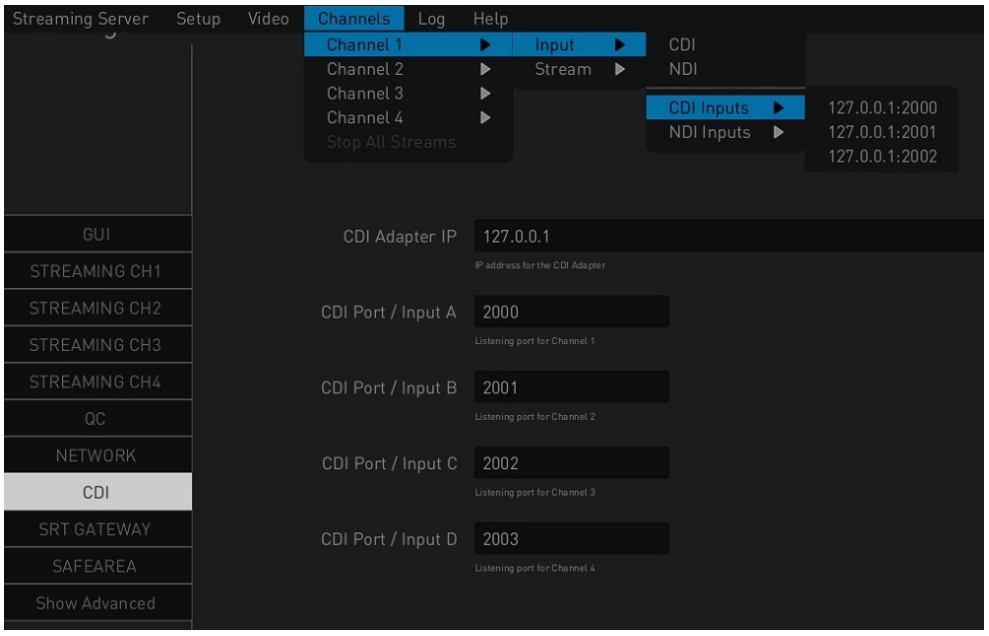
AWS's **CDI** (Cloud Digital Interface) is a reliable low-latency networking technology that allows transporting uncompressed video in real time between applications and services inside the AWS cloud, using EFA (Elastic Fabric Adapter) enabled Amazon EC2 instances.

To set up a CDI input, follow these steps:

1. First, switch to the CDI Settings and verify that the ***CDI Adapter IP*** of the EFA adapter is `127.0.0.1`

If you have multiple EFAs in the system, you must specify the exact IP address of the EFA adapter you want to use.

2. In the ***CDI Port / Input A/B/C/D*** settings, enter the port numbers you are using for the CDI sources coming into the Streaming Server. Default port numbers are: `2000`, `2001`, `2002` and `2003`
3. Finally, select the appropriate CDI source using the **Channels › Channel 1/2/3/4 › Input › CDI Inputs** menu items.

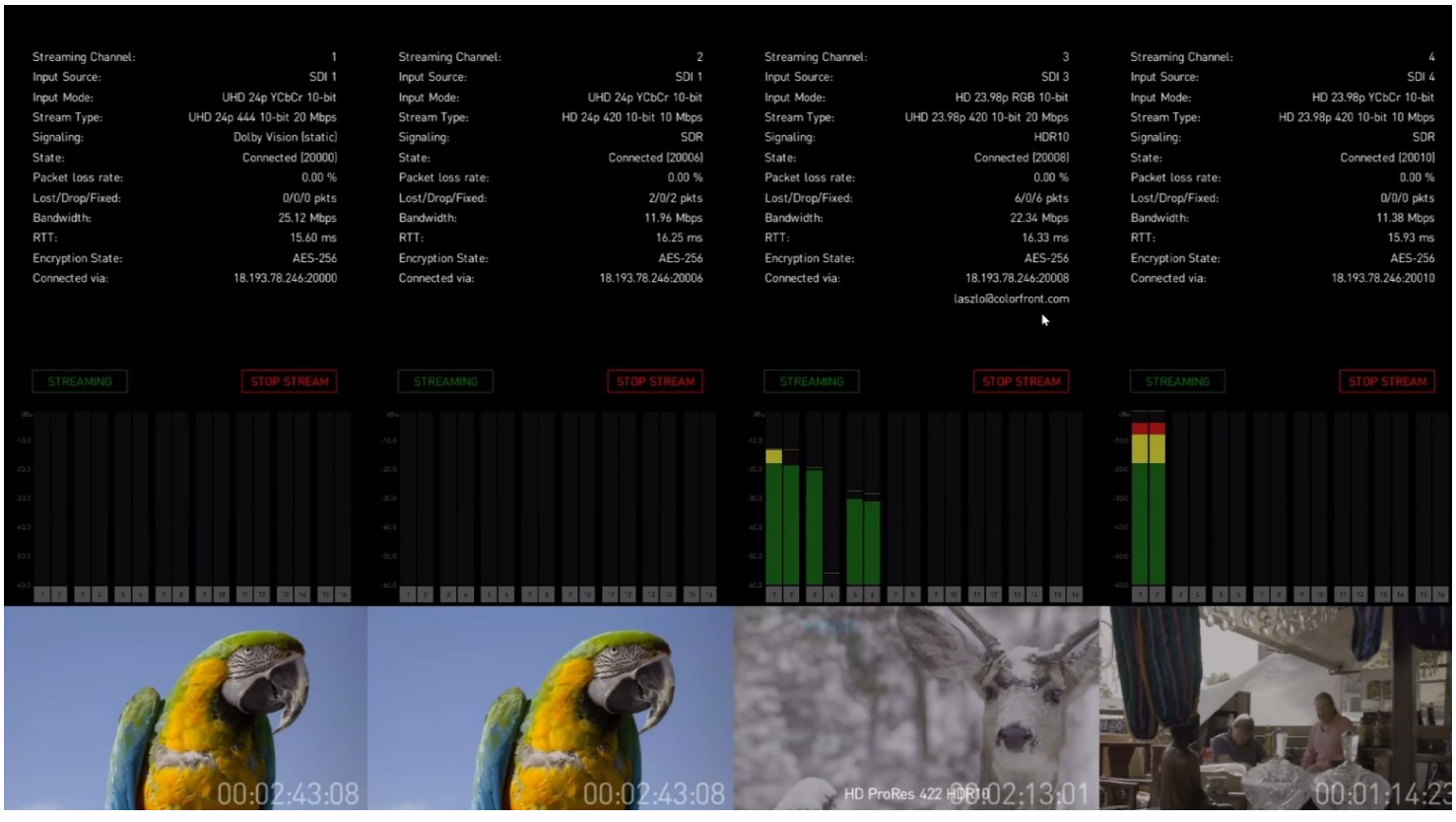


Setting CDI inputs

The **Channels › Channel 1/2/3/4 › Stream › Start/Stop** menu options are for initiating/stopping the stream of the selected channel.

6.2. Stream Channel Configuration

Streaming Server is a **four-channel** device where each streaming channel can be configured independently. The operator can configure the input source, stream quality, resolution and color conversion parameters.



Simultaneous streams in the Streaming Server

To configure streaming in Streaming Server through an output channel, hit the [Tab] button to get to the Settings Page. There are separate sections for each streaming channels such as *STREAMING CH1* or *STREAMING CH3*:

- ***Resolution***: Select from various resolutions for the stream, such as HD, UHD or 4K. The system will resize the video stream on the fly. Streaming Server also supports streaming 720p resolution video or transmitting it to the video output.

> In case of 720p video source, set the *Resolution* to [SameAsSource].

- ***Bitrate***: Enter low bitrate (5 Mbit) for lower resolution SDR output, e.g. for streaming on iPhone, or higher bitrate (20 Mbit) for UHD HDR streams, e.g. for the grading room.

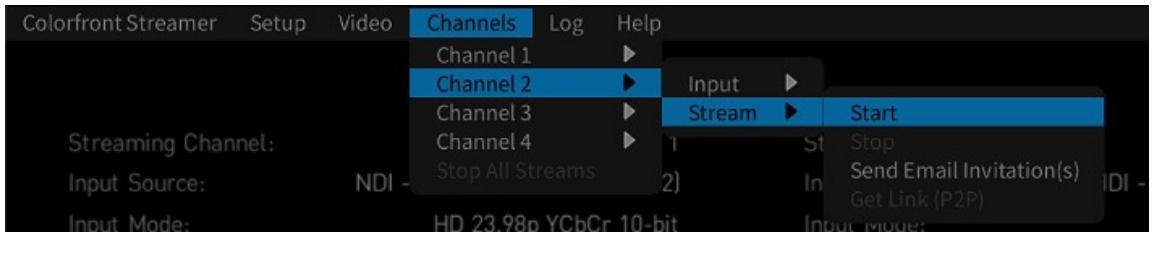
> When using the Stream Manager, the maximum bitrate is limited by default to keep data traffic at a reasonable rate. If you set a bitrate exceeding this limit, a warning message will be displayed. (If this limit is not sufficient and you would like to stream at higher bitrates, please Contact Customer Support.)

- **Input/Output Color Space**: Set the color space of the input or output signal, such as [HD709], [HDR10] or [P3DCIGamma26]. For *Input*, [Auto] means that the color space follows the source metadata. In case of *Output*, [Auto] follows the current setting of the input color space.

- ***Video Chroma Format***: In the Advanced Streaming Channel 1-4 Settings, configure the chroma sampling of the video transmission . [4:2:0] will be more optimal for low or moderate data rates, while [4:4:4] is to be used for premium quality.

Depending on the current network architecture (Stream Manager/direct streaming), the operator may also set connection parameters such as the passphrase. This is not necessary when streaming using Colorfront's Stream Manager. See Network Configuration for more information.

After setting the most important parameters on the Settings Page, go back to the main view, and start the streaming of any input channel by using the **Channels › Channel 1/2/3/4 › Stream › Start** menu option. To stop the stream, use the **... › Stop** option.



In quadrant view, the Streaming Status *Connected Clients* parameter will show how many clients are currently connected to the stream via Colorfront's Streaming Player application. Both the number of clients and their IP address will be displayed.

Streaming Server supports streaming **embedded Dolby Vision metadata** over SDI.

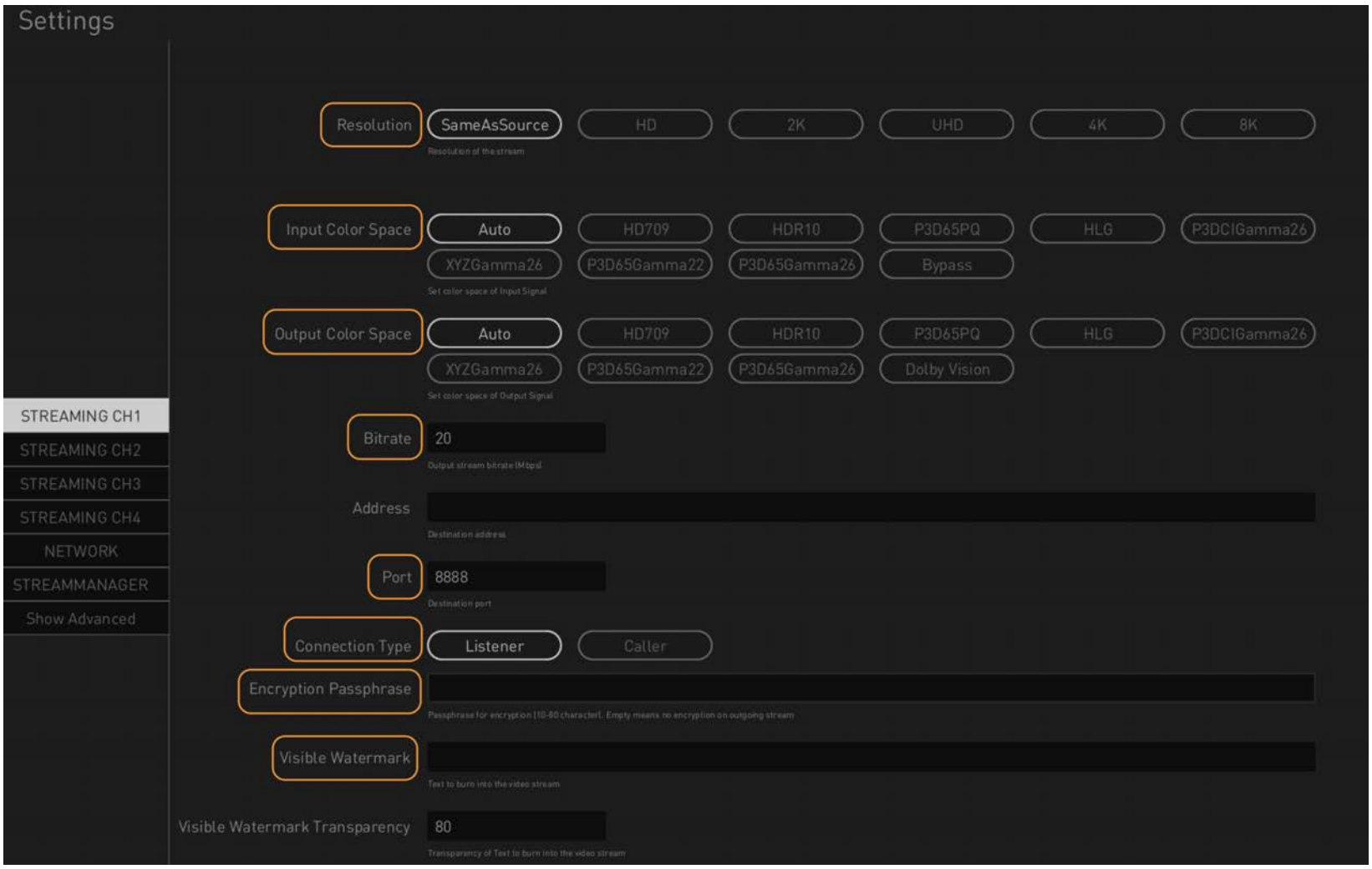
6.2.1. P2P Streaming Configuration

When streaming directly, whether with or without the Stream Manager, the remote stream may not use the correct IP address when generating the client invitation link. This issue can occur if the server has multiple network interface cards or the stream passes through a network device, causing the server's local IP address to change. In such cases, navigate to the Network Settings and manually enter your public IP address in the ***Shared IP for Direct Stream*** setting. This ensures that the generated invitation link contains the correct IP address, allowing the viewer to access the stream effectively.

To configure your Streaming Server for P2P streaming, follow these steps:

1. **Access settings.** Press *Tab* to enter the Settings Page, and then select the desired Stream Channel (1-4) that you want to configure for P2P streaming.
2. **Set your preferred *Resolution* , *Color Space*, and *Bitrate*.** We recommend the following configurations based on your resolution:
   - [HD]: 5-10Mbps
   - [2K]: 10-20Mbps
   - [UHD] or [4K]: 20-40Mbps
3. **Configure *Port*.** The default UDP ports are as follows; however, you may customize these ports based on your network requirements.
   - Stream Channel #1: `8888`
   - Stream Channel #2: `8889`
   - Stream Channel #3: `8890`
   - Stream Channel #4: `8891`
4. **Select *Connection Type*.** Set this to [Listener] mode for P2P streaming. This configuration allows Streaming Server to listen for incoming connections from the Streaming Player application.
5. **Set encryption passphrase (Optional).** If you want to secure your stream, manually enter an ***Encryption Passphrase***. We recommend a minimum of 10 characters for AES-256 encryption. If encryption is not needed, leave this field blank. The Streaming Player will not require a passphrase to connect.
6. **Configure watermarking (Optional).** If you wish to include a ***Visible Watermark*** on your stream, set the desired transparency level. A lower transparency value will make the watermark more prominent. If no watermark is needed, leave this field blank.
7. **Finalize configuration.** Press *Tab* to exit the settings and save your configurations.

Refer to the Streaming Player manual to complete the connection to your stream.



P2P streaming configuration

P2P Streaming via the Stream Manager

The most secure and convenient way of direct streaming (P2P) is through the Stream Manager. In this setup, the stream is locally available, and invitations to streaming sessions are sent through the Stream Manager. If you prefer this option, follow these steps:

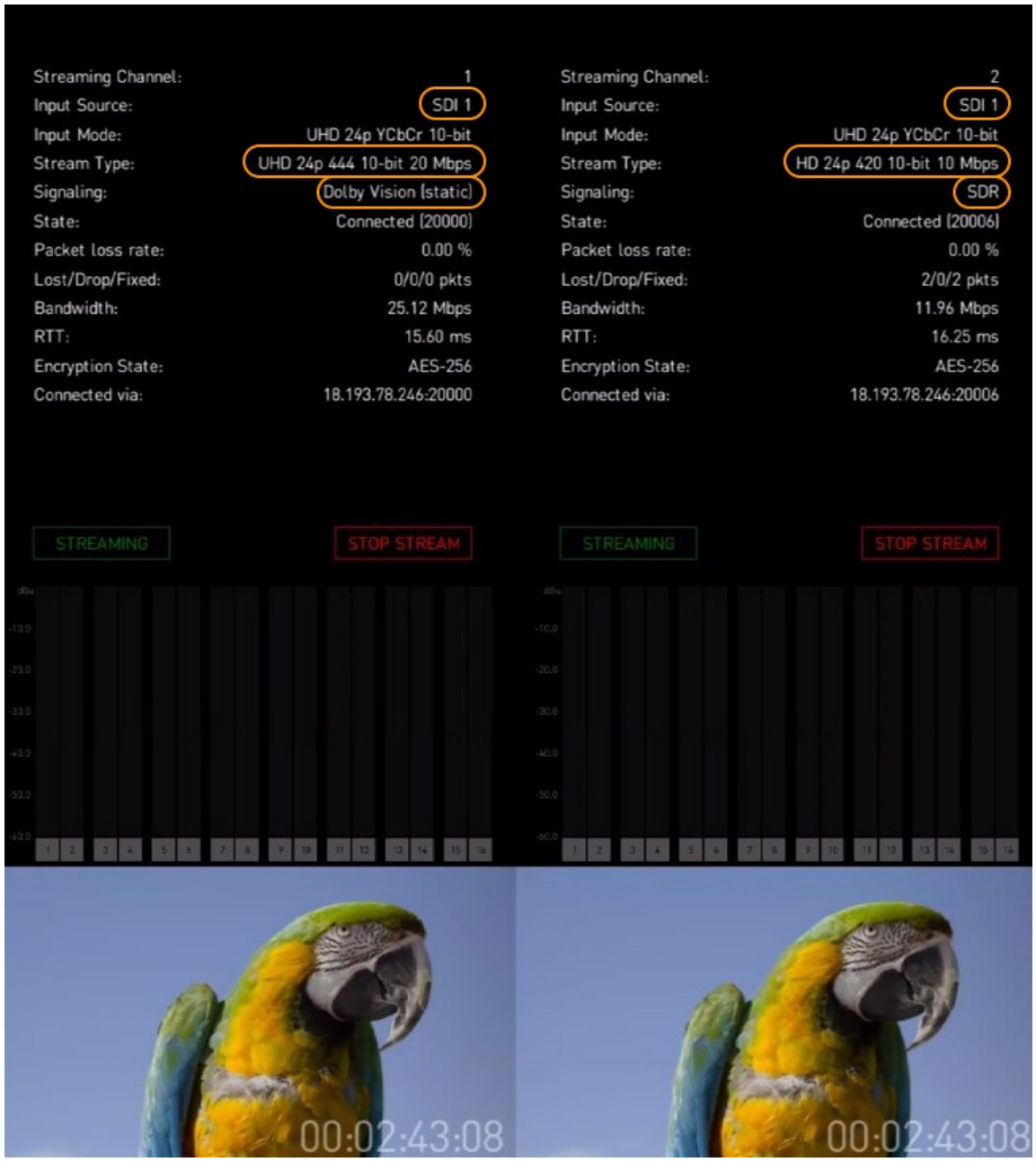
1. Navigate to the Stream Manager Settings and activate the following settings:
    - ***Use Stream Manager***
    - ***Manage SRT Gateway***
    - ***P2P Streaming With Manager***
2. Next, follow the steps in P2P Streaming Configuration.

6.2.2. Different Streams From Same Input Signal

Streaming Server has the ability to generate different types of streams from the same input video signal. This powerful feature makes it possible to adapt to various bandwidth, quality, color space or security requirements at the same time from the same Streaming Server system.

One possible use case for transferring different quality streams concurrently is sending:

- a high-quality UHD HDR 4:4:4, 10-bit, 30 Mbit stream to a high-end grading monitor for critical review, and
- an HD SDR 4:2:0, 5 Mbit low bitrate stream to the producer’s iPhone.



Simultaneous stream of UHD Dolby Vision HDR and HD SDR footage

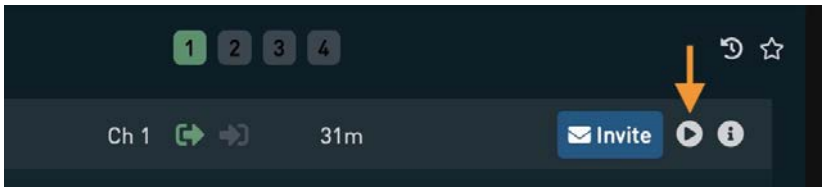
Additionally, the ***Stream Waveform*** parameter within the Advanced Streaming Channel 1-4 Settings allows for further customization. When enabled, you can send the waveform of the image in the stream instead of the actual image, making it useful for technical reviews.

6.3. Secondary Stream

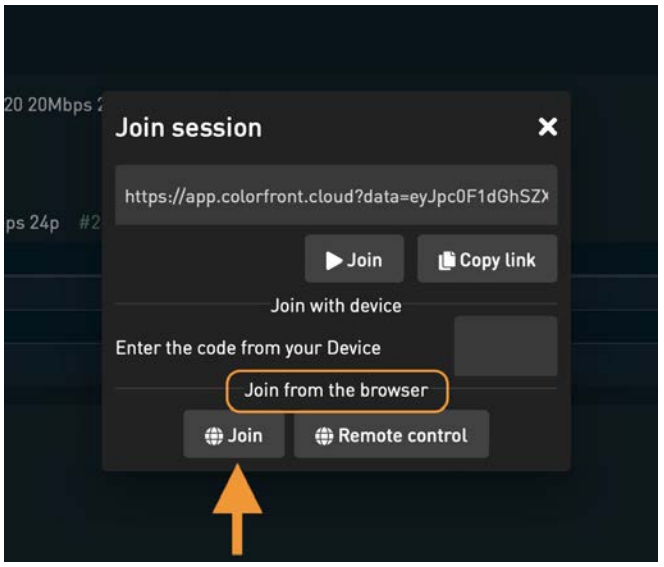
The Streaming Server supports secondary streaming using either WebRTC, an open-source video transport protocol designed for low-latency, real-time video, audio and data transmission, or an external gateway. This feature complements the primary stream by offering an alternative viewing option with potentially lower latency, ideal for real-time applications.

To enable this feature, navigate to Advanced Settings and activate the ***Secondary Stream*** parameter. Select either [WebRTC](default) or [Gateway] as the ***Secondary Stream Target***.

After enabling the secondary stream and initiating it via the Streaming Server, you can launch the stream through the Stream Manager. Simply click the "*Join session*" icon next to the Invite button. In the subsequent window, select the [Join] button to view the stream in a web browser. This will open a separate window where the video, streamed as H.264 8-bit HD 4.2.0 format SDR, begins playing.

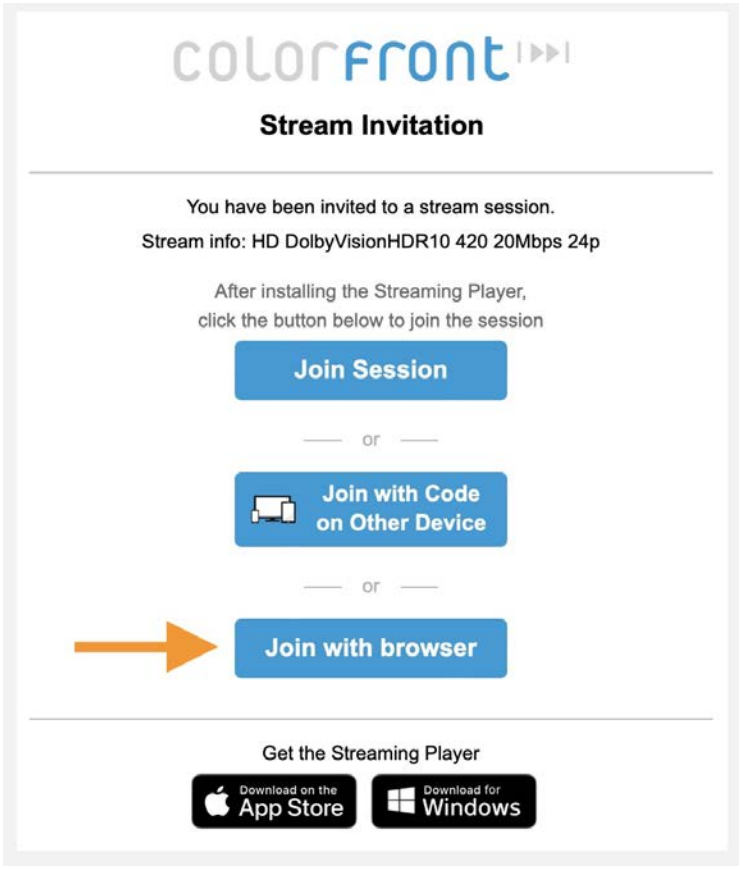


Join session icon in the Stream Manager



Click to join the WebRTC stream

Alternatively, you can connect to the stream through an email invitation. Click the [Join with browser] button in the email to view the law-latency stream in a separate browser window.



Click to join the WebRTC stream

If you have the **Streaming Player** application installed, you can click [Join Session] to access a high-quality version of the stream via the software.

6.4. Network Configuration

You can initiate streaming with Streaming Server as follows:

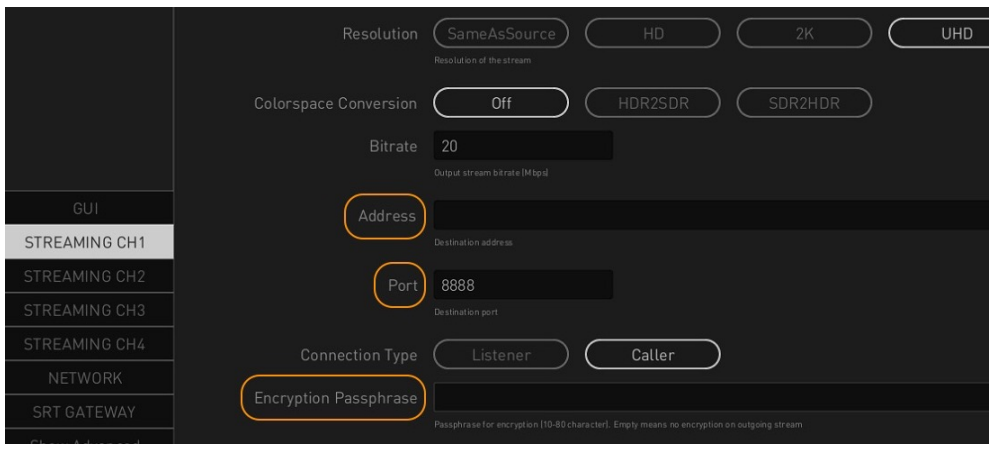
Streaming via Stream Manager

After you specify the parameters in the Stream Manager Settings for the Stream Manager, the system automatically populates the stream parameters, such as *Address*, *Port* and *Passphrase* of the available streaming channels. See the Stream Manager Configuration section on how to set up Colorfront' Stream Manager.

Streaming directly (P2P)

For point-to-point streaming, set the necessary settings such as ***Address***, ***Port*** and ***Encryption Passphrase*** of each streaming channel. The default port numbers are:

- `8888` for channel 1
- `8889` for channel 2
- `8890` for channel 3
- `8891` for channel 4



Essential settings for P2P streaming

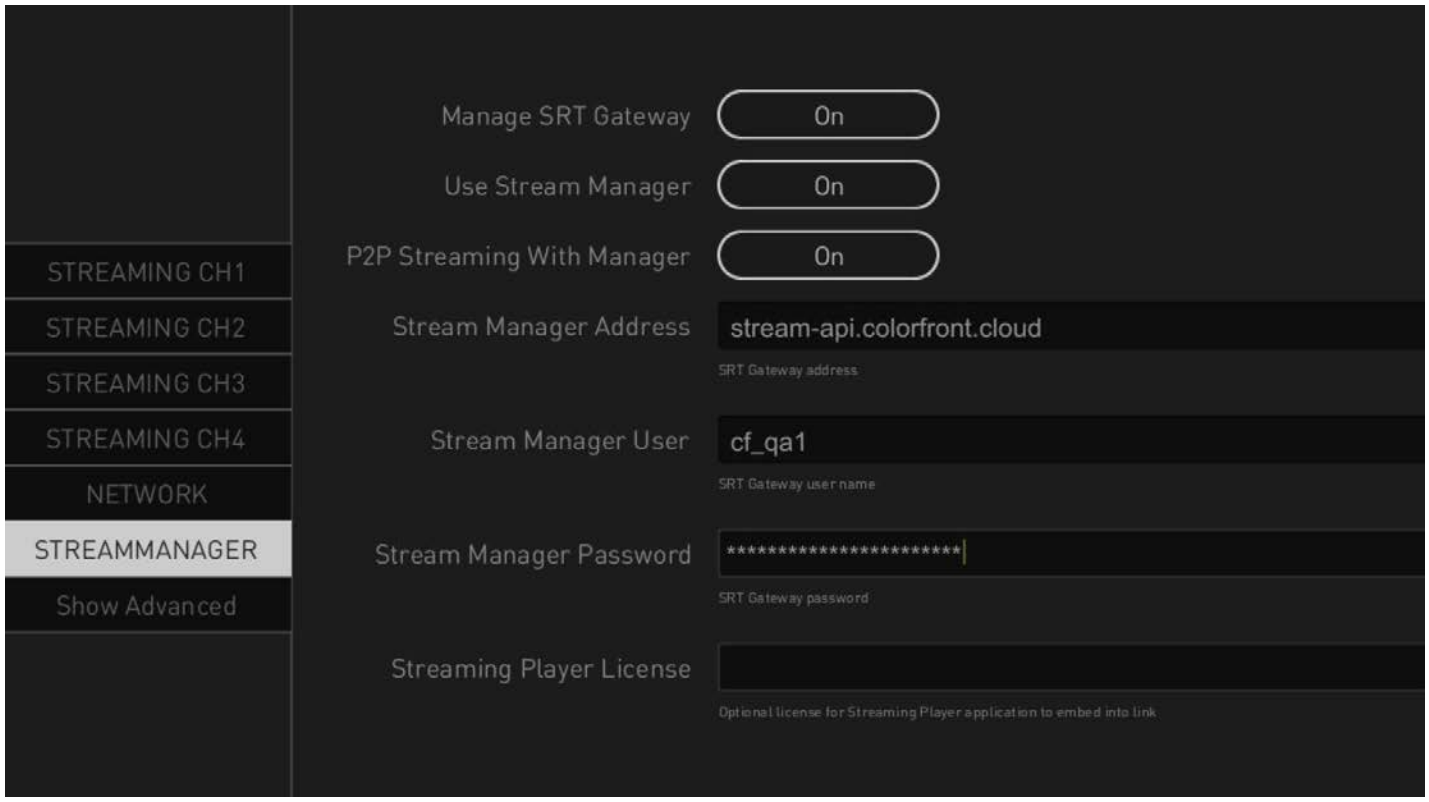
For information on the different components of each streaming modes, see Streaming Network Architectures.

6.4.1. Stream Manager Configuration

To access the Stream Manager for the Streaming Server, simply navigate to it from the menu by selecting **Stream › Go to Stream Manager**.

To initiate streaming with the Streaming Server, please follow the steps below:

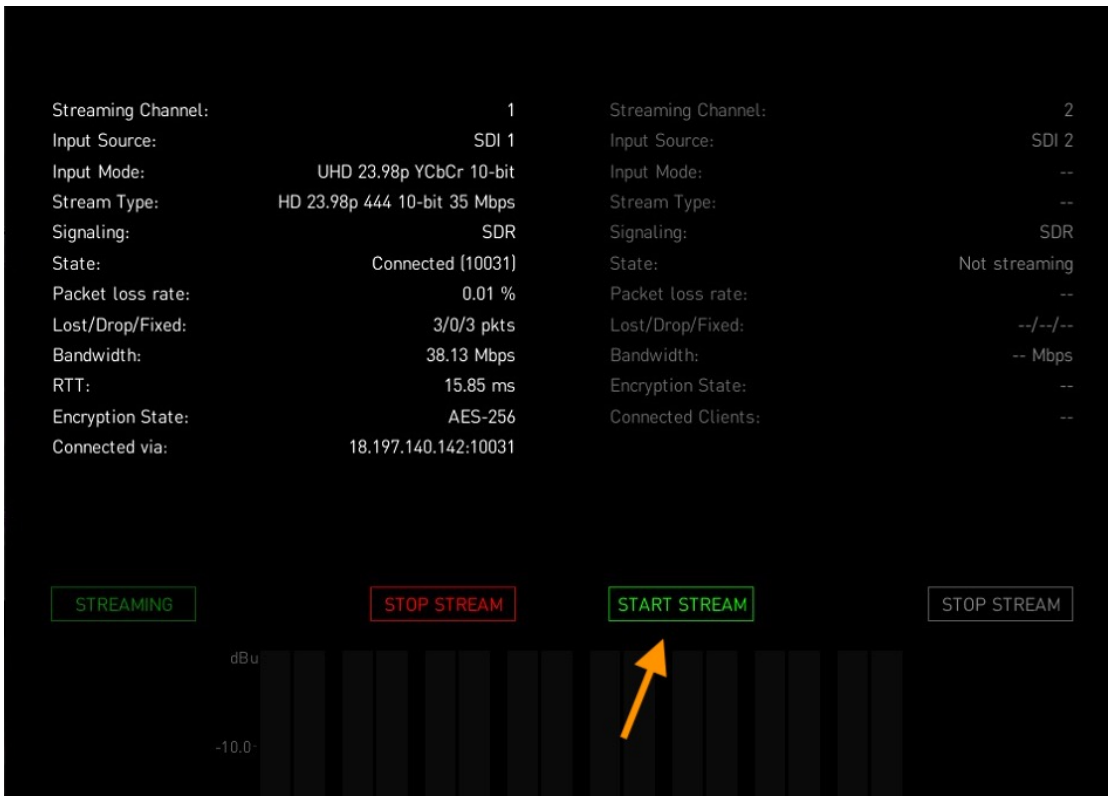
1. Go to the Stream Manager Settings, and enable the ***Manage SRT Gateway*** and the ***Use Stream Manager*** options.
2. Enter `stream-api.colorfront.cloud` as the ***Stream Manager Address***.
3. Add your login information to the ***SRT Gateway User*** and ***Stream Manager Password*** fields.
4. Optionally, specify a temporary license for the Streaming Player in the ***Streaming Player License*** field for the stream viewers if they do not have one. In this case, the stream recipients need to have the Streaming Player application installed on their computer to see the stream.



Configuring Stream Manager parameters in the Stream Manager settings

5. After defining the above parameters, Streaming Server and the Stream Manager API create a handshake, and the streaming parameters for available streaming channels in the Streaming Channel 1-4 Settings are automatically populated, such as ***Address***, ***Port*** and ***Encryption Passphrase***.
6. Make sure that the ***Connection Type*** is set on [Caller] for each streaming channel.
7. You can configure additional parameters such as ***Resolution*** or ***Bitrate*** in the Advanced Streaming Channel 1-4 Settings.
8. Go back to the main view and start the stream session either using the **Channels › Channel 1/2/3/4 › Stream › Start** menu option, or clicking the [START STREAM]button.

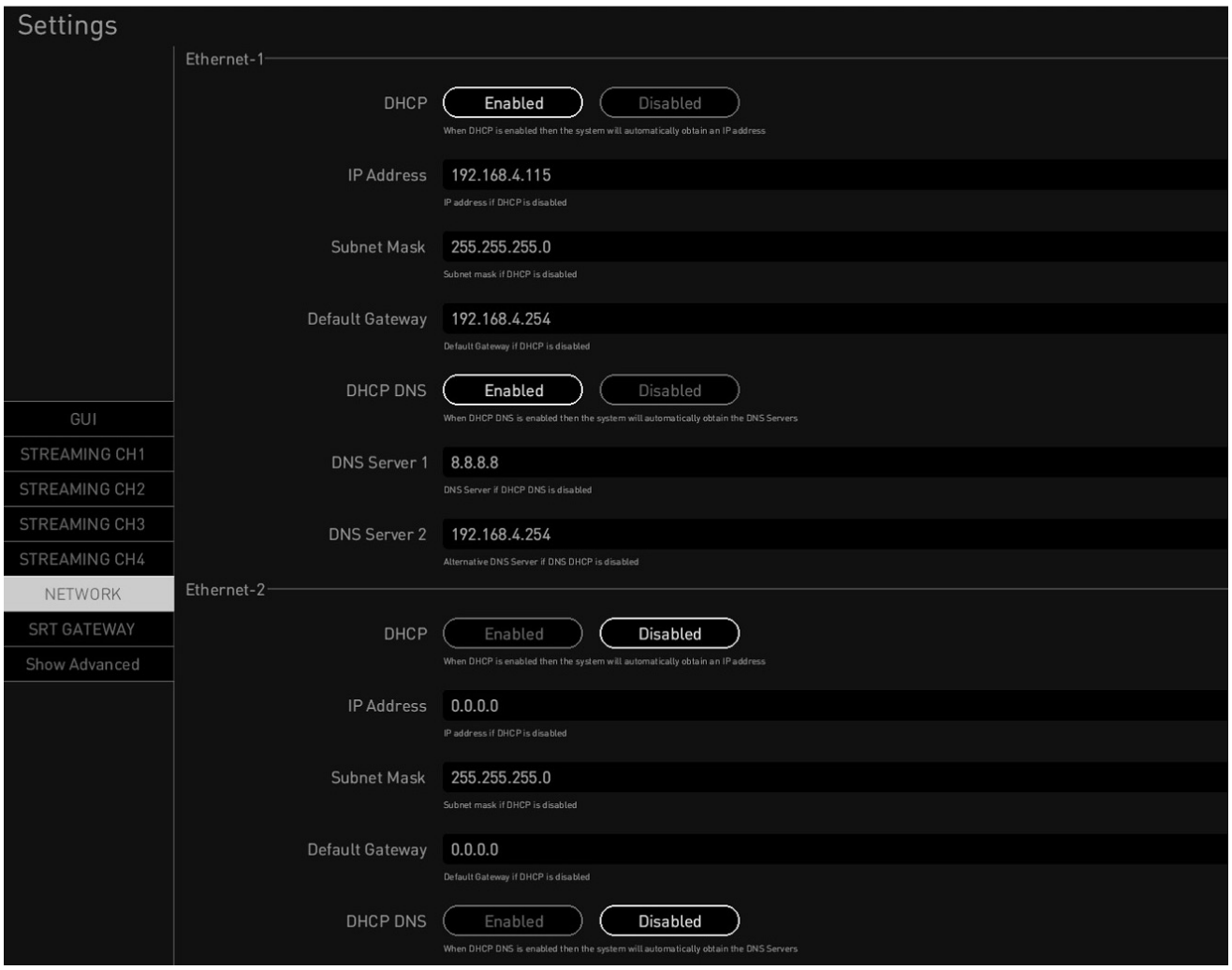
   The Start/Stop Stream buttons are only available in *Streaming Status* view. See Quadrant Views for details.



Starting the stream for Channel 2; Channel 1 is already streaming

6.4.2. Network Setup

The *NETWORK* section on the Settings Page offers a convenient interface to review and, if needed, adjust the network configuration of the system. The same network adapter parameters are also available through the standard Windows OS Control Panel. In this page, you can view and change the IP address of the unit in particular. By default, the DHCP is enabled, so you should see a relevant IP address.



Network settings on the Settings Page

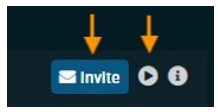
6.5. Custom LUT on Stream

Color conversion for the stream is possible without using the Streaming Server's own color space conversion, only using custom LUTs. To apply a custom LUT for color conversion on the streamed image, please follow these steps:

1. Name your custom LUTs as follows: `STREAMLUT1.3dmesh`, `STREAMLUT2.3dmesh`, etc.
2. Save your custom LUTs in the \Program Files\ColorfrontPlatform\lut folder.
3. Go to the Advanced Streaming Channel 1-4 Settings and enable the ***Custom Input LUT*** parameter.
4. The LUTs will be applied on the displayed and streamed image. You can either [Bypass] the Streaming Server's ***Input Color Space*** conversion in the Streaming Channel 1-4 Settings, or optionally set it to any conversion option, which will be implemented after the custom LUT is applied.

6.6. URL Links for Streaming Player

There are several ways to watch the stream via the Streaming Player application:

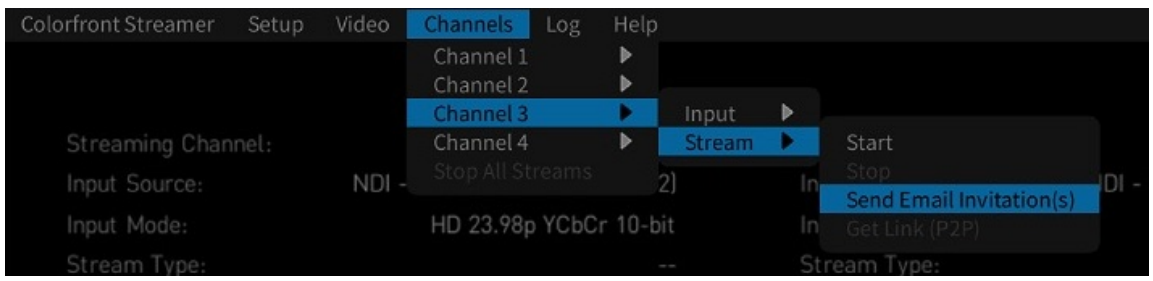
Send email invites from Stream Manager	On the Routes page of the Stream Manager, the *Invite* button allows you to add email addresses to invite potential viewers to the selected streaming channel.
Create invite URLs in Stream Manager	You can use the *play* button next to the name of the selected streaming channel to generate invite URLs from the Stream Manager's Routes page.  See Inviting Viewers to learn how to invite people via the Stream Manager to view the stream.
Send invites from the Streaming Server menu	See Sending Stream Invitations From Menu for details.
Generate URLs directly from the menu	See the next section for details on creating invite URLs directly from the Streaming Server's menu.

To be able to view the stream, the Streaming Player must be installed on the viewer's computer.

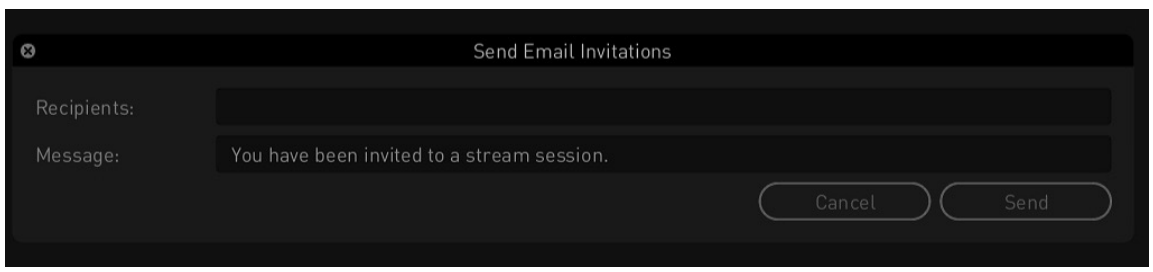
6.6.1. Sending Stream Invitations From Menu

The Streaming Server allows you to send invitations to stream sessions directly from the menu. Simply select the **Channels › Channel 1/2/3/4 › Stream › Send Email Invitation(s)** and enter the recipient email address(es) in the pop-up window.

To invite multiple viewers, separate email addresses using commas (`,`) or semicolons (`;`), with or without spaces.



Inviting stream viewers from the Streaming Server's menu

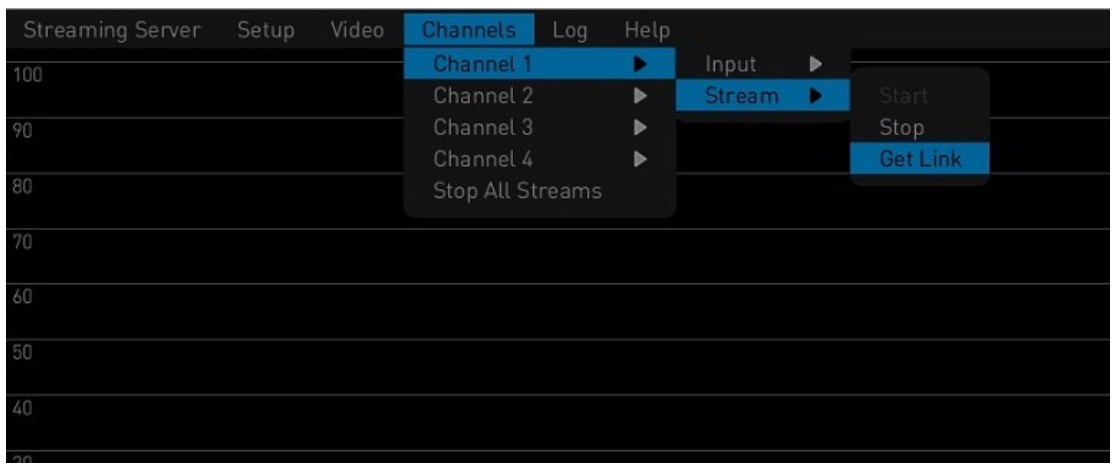


Adding email addresses in the pop-up window

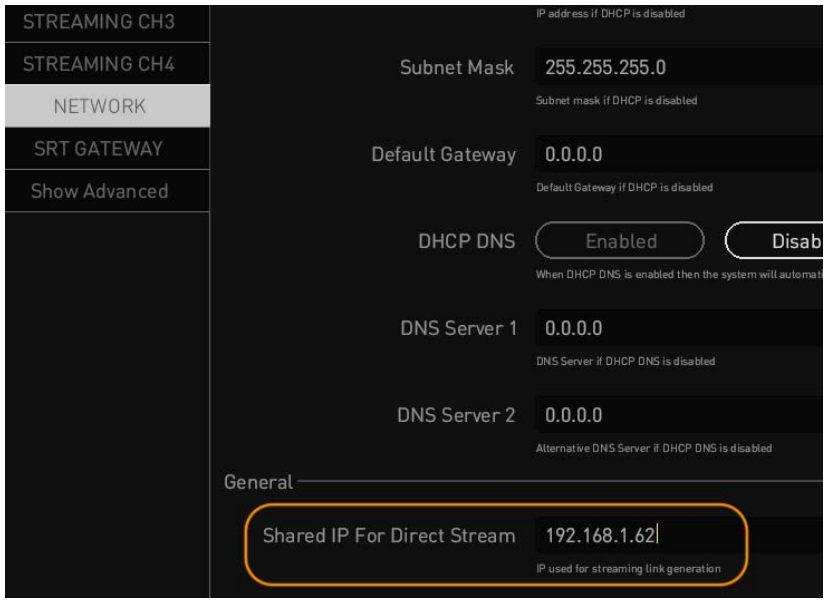
6.6.2. Invite Links From Menu

The Streaming Server has the ability to publish invite links, which are clickable URLs that automatically open the Streaming Player application and launch streaming. To generate invite URL links from the Streaming Server's menu, please follow the steps below:

1. Go to the **Channels › Channel 1/2/3/4 › Stream** menu option, and Start the stream if it is not running yet.
2. Use the **Channels › Channel 1/2/3/4 › Stream › Get Link (P2P)** menu command to copy the URL to a clipboard.



3. Paste the URL into an email or any communication message. When the recipient of the message clicks on the URL, the Streaming Player, if installed, will open automatically and the stream will start (output stream).
4. Alternatively, if the Streaming Player is installed on your computer, enter the link to the address bar of your browser and start watching the stream.

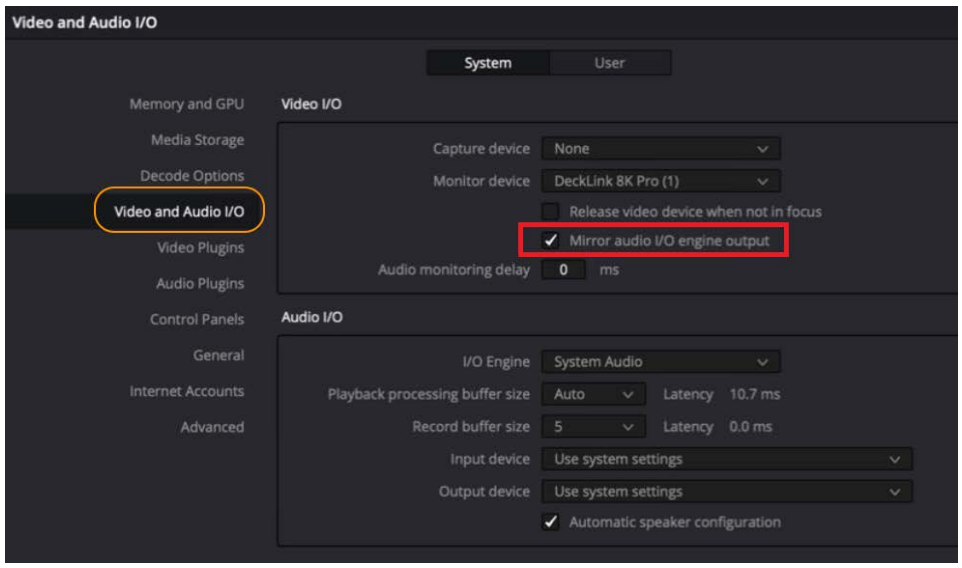


6.7. Third-Party Configuration for SDI Audio Streaming

For proper audio playback when streaming via SDI with Streaming Server, the following configurations must be applied in the settings of third-party applications.

Streaming From DaVinci Resolve

In order for Streaming Server to properly receive the audio stream via SDI from the *DaVinci Resolve* application, open Preferences, and enable the ***Mirror audio I/O engine output*** option on the *Video and Audio I/O* tab.

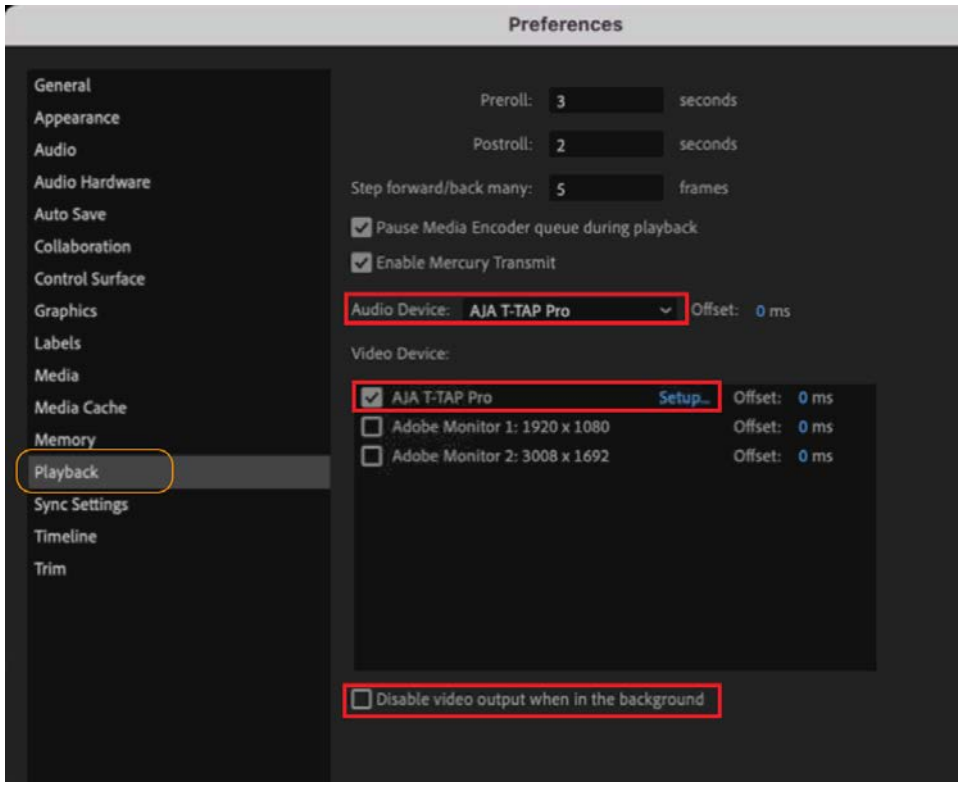


Configuring DaVinci Resolve preferences for streaming via Streaming Server

Streaming From Adobe Premiere

First check if the AJA/Blackmagic Design card is visible on the *Playback* tab of Preferences. If not, uninstall the AJA/Blackmagic Design device using the device's uninstaller in the Applications, and then install it again.

Next, make sure that the AJA/Blackmagic Design card is set for both *Audio Device* and *Video Device*, and uncheck this option: ***Disable video output when in the background***.



Configuring Premiere Preferences

7. Web Control Interface

For easy configuration without having to access the physical unit, the Streaming Server can also be controlled via Colorfront's Web Control interface in a web browser at the following address:
`<IP address>/cf-web-control` or `localhost/cf-web-control`

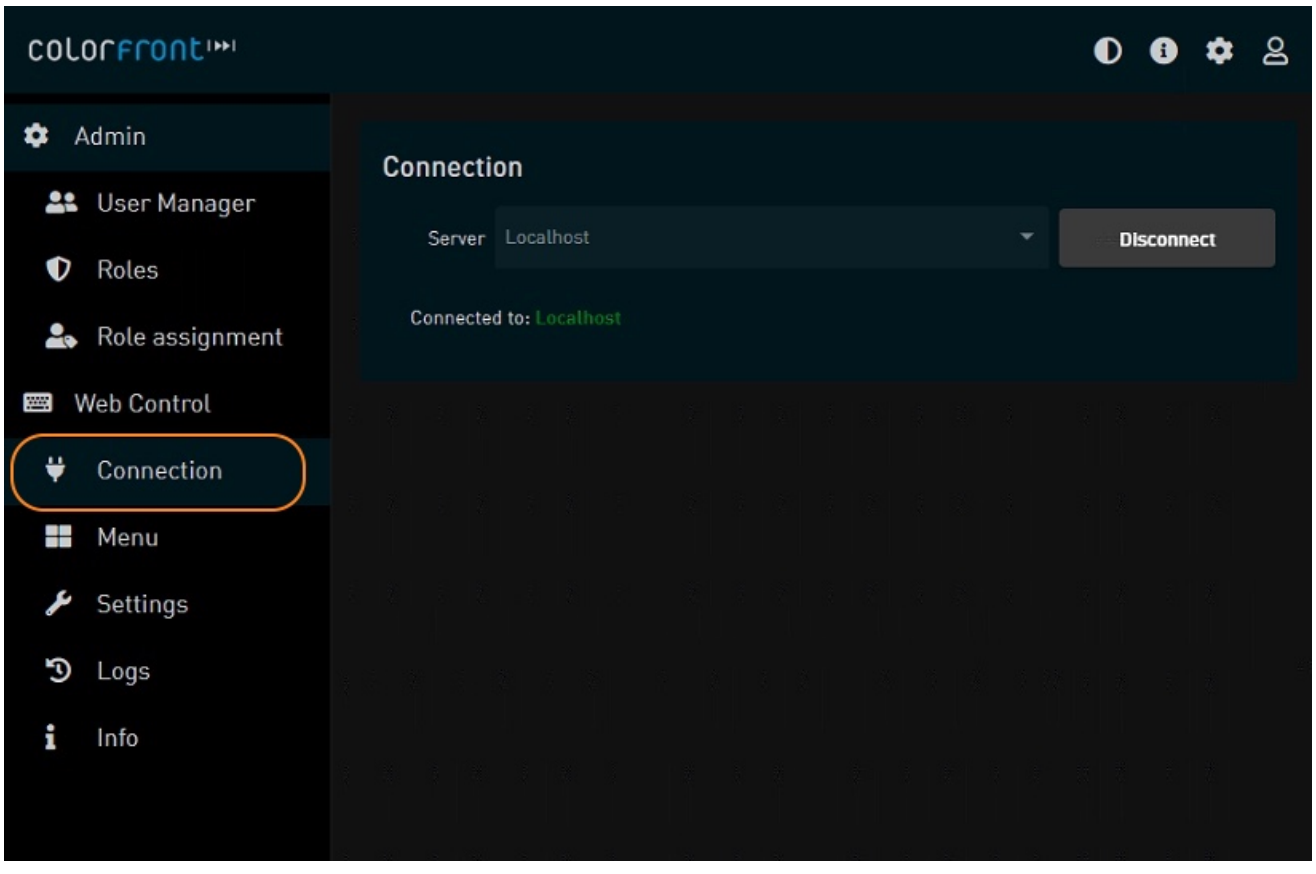
This interface includes the complete set of controls, including user management, role assignment, input selection, stream configuration and real-time status information.

You can enter the Web Control site with a default admin user with the following credentials:

- username: `admin`
- password: `Admin123`

> For security reasons, please immediately change the default password after the first login.

First, go to the **Connection** page, and connect to the selected server.

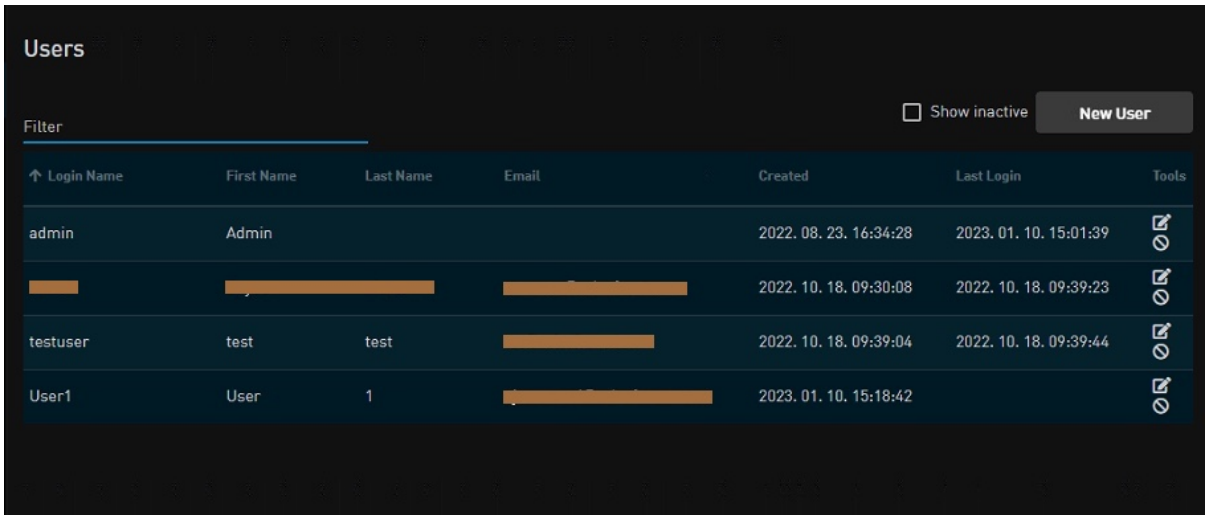


Connecting to the Web Control Interface

The Colorfront Web Control consists of the following pages:

Admin

- **User Manager**: Create new users, edit user profiles or assign admin or other roles to users.



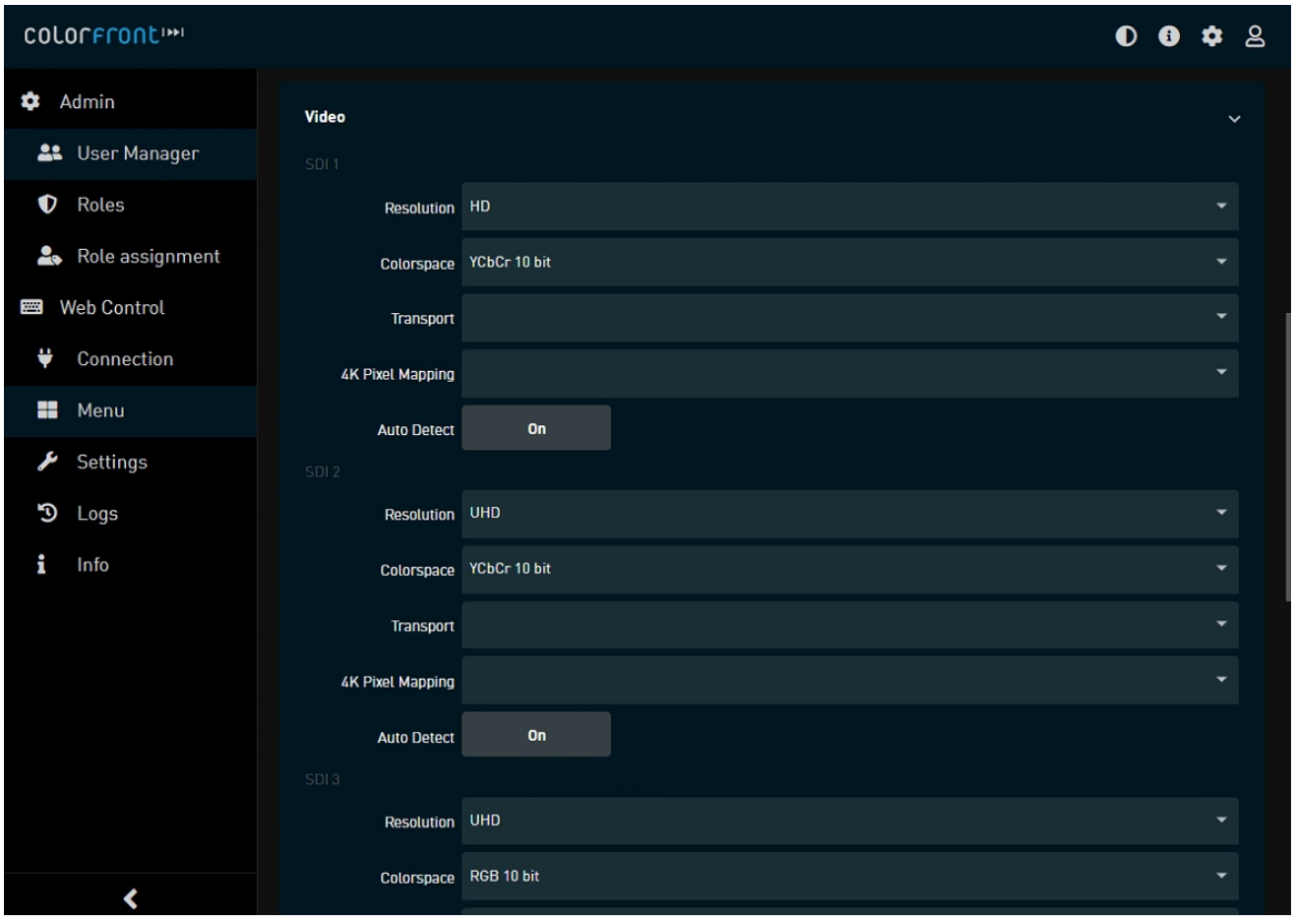
- **Roles**: View details for each role type, delete or modify roles, or set up new roles. You can add authentication to system configuration and list or edit roles and user profiles.

> Only admin users are authorized to add or configure roles.

- **Roles assignment**: View the list of roles and use filters to search between them.

Web Control

- **Connection**: Select the server and establish a connection to use the Web Control functions.
- **Menu**: Configure input channels and start/stop streaming. You can also configure each video input with different resolution, color space, transport mode or pixel mapping parameters.
  [Start Stream Logging] here if needed.
- **Settings**: Configure streaming channels individually with different resolution, bitrate, input/output color space and other parameters.
  Click *Show advanced* to view additional configurable options.
- **Logs**: Monitor streaming and view basic stream information for each channel.
- **Info**: Check the status of your the streaming channel, including information such as packet loss rate, bandwidth, encryption state or connected clients, as well as frame drop count and Dolby Vision metadata.



Colorfront Web Control interface for Streaming Server

8. Streaming Server Within AWS

To set up the Streaming Server with CDI/NDI support within the AWS infrastructure, please provide the following information to Colorfront:

- AWS 12-digit account ID
- AWS region in which you want to deploy the AMI

Do not use the AWS account root user for any deployment or operations of the Streaming Server in the Cloud.

Once Colorfront receives this information, we will share the AMI in the requested region and email you the AMI ID number for configuration.

8.1. Requirements for AWS Deployment

Before configuring Streaming Server within AWS, make sure you have the necessary resources and configurations in place:

8.1.1. Deployment Time

The deployment time may vary based on your team's familiarity with AWS and the complexity of your infrastructure. Ideally, the system can be deployed and tested in optimal environments within 24-48 hours.

8.1.2. Region Support

The virtual Streaming Server is supported in any region that supports the required instance type. It can be deployed in Single or Multiple Availability Zones.

8.1.3. Instance Type

- Supported instance types include *g4dn-8x-large*, *g5-8x-large* or *g6-8x-large*.
- Elastic Fabric Adapter (EFA) is required for CDI.
- Windows 2019/2022 Server OS is required.

8.1.4. Disk Requirement

If not using Colorfront-provided AMI, a *64 GB* system disk is required.

8.1.5. IAM Role

The end user's security team can set up the necessary permissions for managing the system.

8.1.6. IMDSv2 Support

IMDSv2 is supported for enhanced security measures within the setup. You have the option to disable Instance Metadata Services Version 1 for improved security and protection against potential vulnerabilities.

8.1.7. Security Groups

Security groups must allow all traffic on the same subnet as the streaming server and source of the CDI. This is a requirement for CDI and NDI.

8.1.8. Elastic IP

Assigning an Elastic IP address to the system is optional.

8.1.9. Licensing

POC license Contact support@colorfront.com or your Colorfront representative to obtain a POC License.

Yearly license Purchase a Colorfront Streaming Server subscription from your authorized Colorfront Reseller. For the worldwide network of resellers, refer to the Colorfront Resellers website.

License server Once the license is obtained, the system initiates an activation process when the software launches by contacting the license server hosted at My.nalpeiron.com. The following ports are utilized for communication:

- Port 80 TCP (HTTP): 184.106.60.185 and 20.237.110.18
- Port 443 TCP (HTTPS): 184.106.60.185 and 20.237.110.18

The IP address for licensing has not changed in the past nor do we expect it to change in the future. However, unexpected situations do occur. If at all possible, it is recommended that you use the domain name (my.nalpeiron.com) rather than the IP address. This will ensure that licensing will connect to the Nalpeiron server even if the IP address is changed.

8.1.10. Colorfront Stream Manager

Refer to the Stream Manager section for detailed requirements and setup instructions.

8.1.11. Latest Software Builds

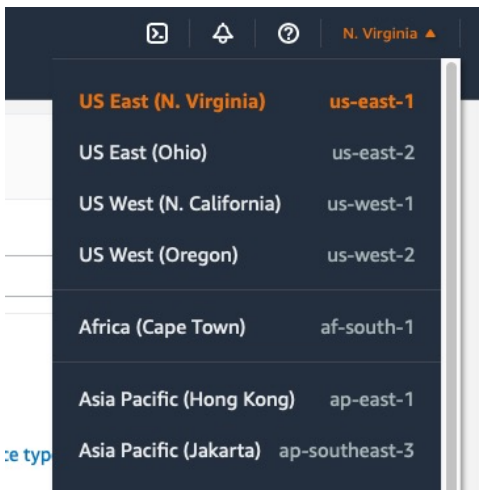
Sign up here for the Colorfront Newsletter and notifications at Colorfront's Support page to receive automated notifications when new builds are released.

8.2. Create EC2 Instance in AWS

An EC2 (Elastic Compute Cloud) instance is a virtual server in Amazon AWS. To set up an EC2 instance with the **Amazon Machine Image (AMI)** you have received from Colorfront, please follow these steps:

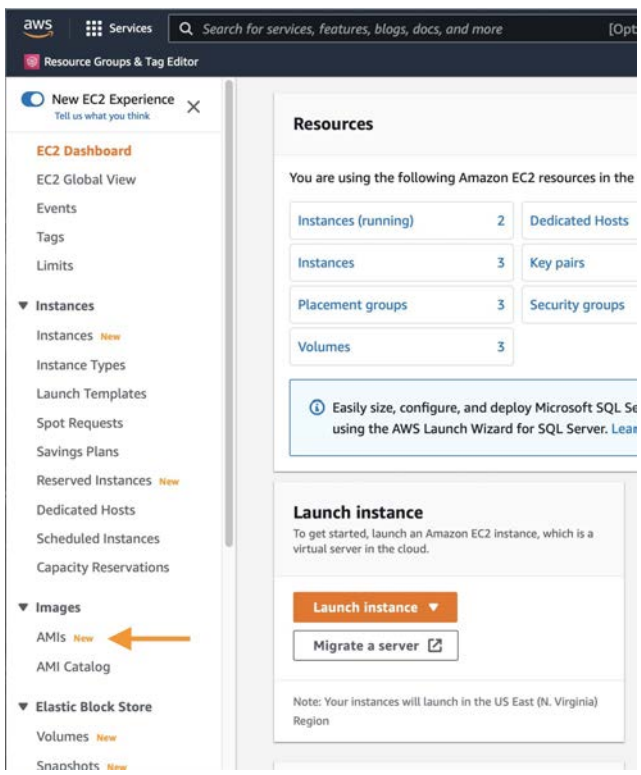
1. Log into the Amazon AWS console at https://aws.amazon.com/ and open the **EC2** (Elastic Compute Cloud) dashboard.
2. Make sure the appropriate **region** and **availability zone** is selected at the top right corner of the page, such as the *us-east-1* availability zone for the US East North Virginia region.

	Opt for the AWS region that is closest to the location of your customer base to reduce network latency for users.



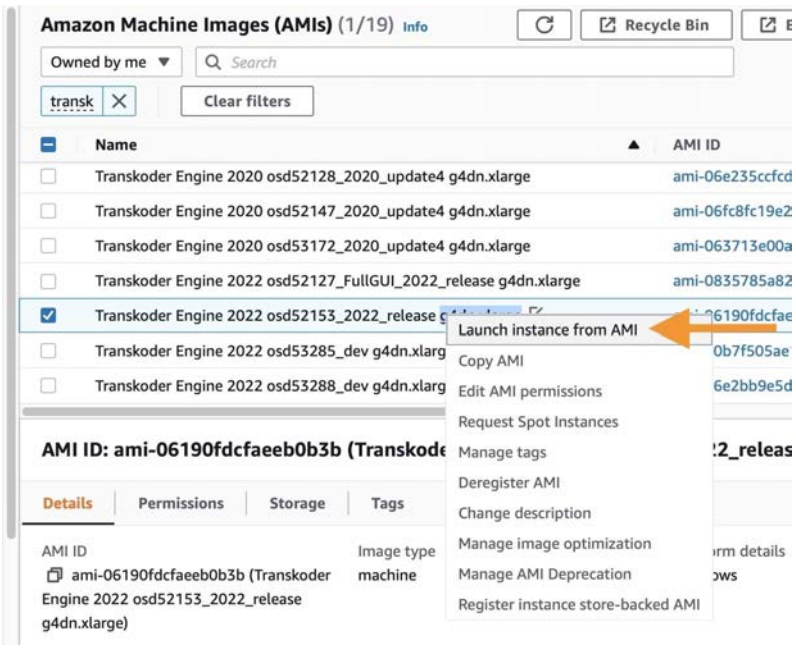
Selecting the adequate availability zone

3. In the left navigation pane, choose **AMIs**.

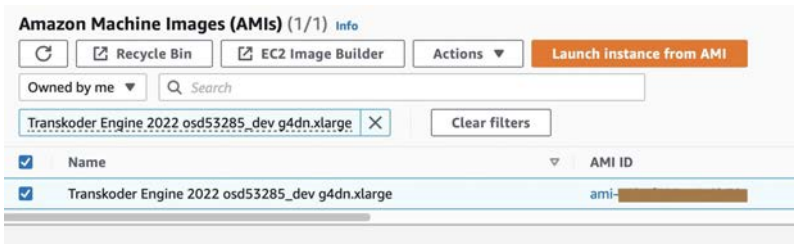


Go to AMIs on EC2 Dashboard

4. In the Search bar, type the first few letters of the AMI name you received from Colorfront.
5. Select your AMI from the list and right-click on it.
6. In the popup menu, select **Launch Instance from AMI**. You can also initiate this using the top orange button.

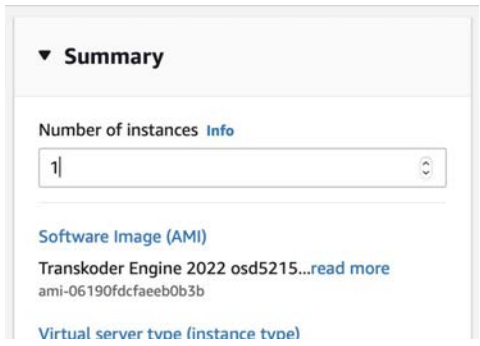


Launching instance from AMI with right-click



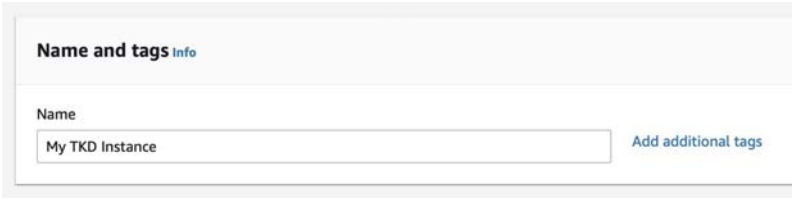
Launching instance from AMI with button

7. Next, the *launch instance wizard* will open, where you can enter all necessary configurations. First, in the **Summary** panel on the right, add the **number of instances** you want to launch.



Entering number of instances to launch

8. Under **Name and tags**, enter a **Name** for your instance.

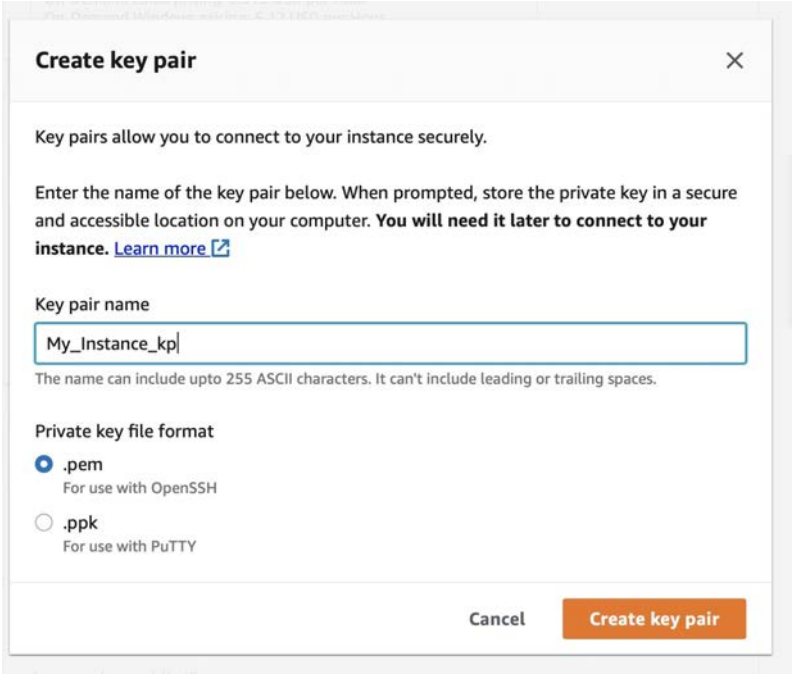


Adding name of instance

9. Under **Application and OS Images (Amazon Machine Image)**, the Colorfront AMI has already been selected from the catalog for your instance, but you can also *Browse more AMIs*.
10. Under **Instance type**, select a **G5** instance suitable for your environment. The recommended configuration is *g5.12xlarge* with four NVIDIA A10G Tensor Core GPUs. If no G5 instances are available, select *g4dn.12xlarge* with four NVIDIA T4 GPUs.
11. Under **Key pair (login)**, select your already existing keys, or click **Create new key pair** to generate a .pem file on your local computer. This public-private key pair allows you to securely connect to your instance. While the public key is stored by AWS, you should store the private key in a secure directory

on your computer.

> Your private key should be kept safe and secure. Make a note of where it has been downloaded to your computer.



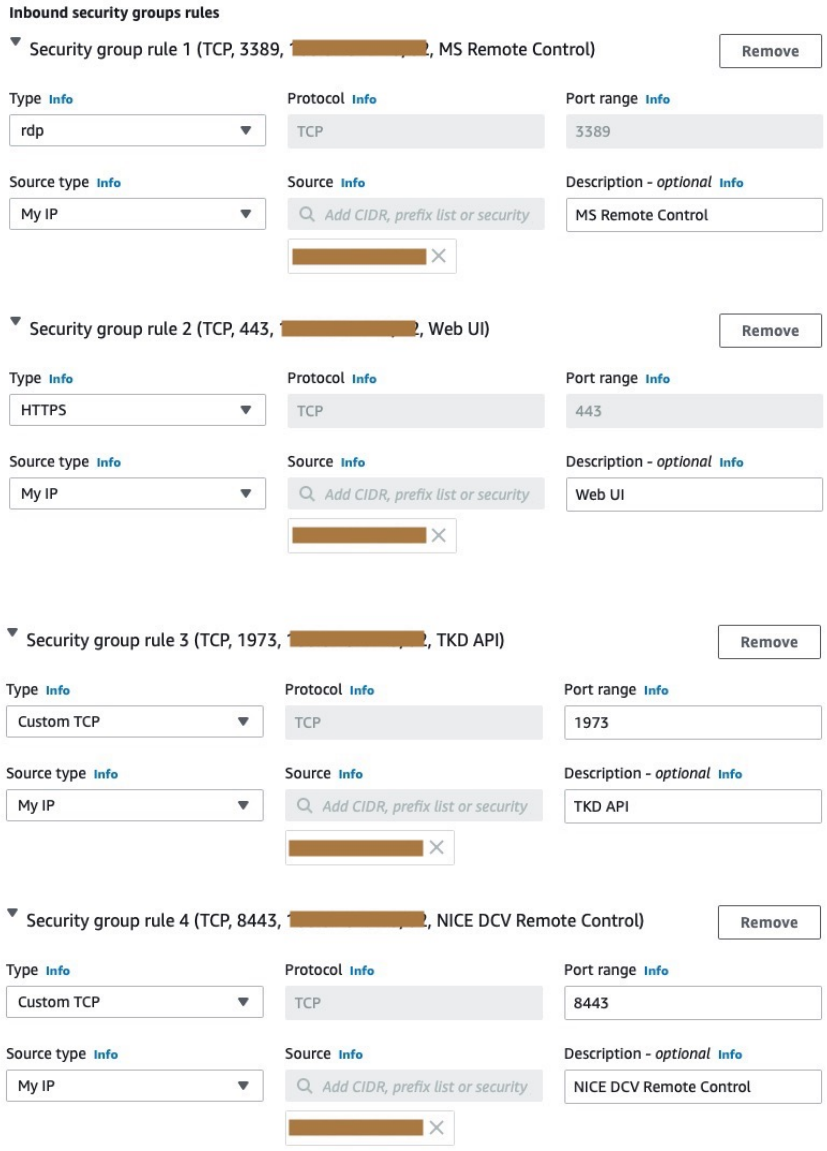
Creating key pair

12. Set the **password for the instance** to ColorfrontStreamCDI2023
13. Under **Network settings**, select the desired VPC and subnet with the appropriate Availability Zone. Click [Edit] to make changes.
    a. Make sure that the instance is in the same VPC/AZ and Subnet as the CDI Source System.
    b. Additionally, enable **Auto-assign public IP** so that AWS can assign a public IP address to your instance. You can also assign an elastic IP address for easy configuration.
14. For **Security Group**, use an already existing group or create one by adding a name and description.
    a. For the **source type** of the below security group rules, select either:
        i. *Anywhere* - Your instance is accessible from any location.
        ii. *My IP* - Specify your current IP address.
        iii. *Custom* - Enter any CIDR blocks (separated by commas) or block range(s).
    b. Specify the following **inbound security group rules**:

rdp	The default rdp type TCP protocol at port 3389 is for the **Microsoft Remote Desktop**.
HTTPs	Specify a HTTPS type TCP protocol on port 443 for secure internet traffic to access the Colorfront Web Control interface of the Streaming Server.
custom TCP 1	Define a custom TCP protocol for port 1973 so that you can remote control your instance with the **REST API** interface.
custom TCP 2	Specify another TCP protocol for port 8443 for remote controlling your instance through Amazon's **NICE DVC** client application.

Custom UDP This should be updated once you have assigned the UDP port on which the streaming traffic will flow between Streaming Server and the Colorfront Stream Manager system.

ALL Traffic Must allow all *inbound* and *outbound* subnet traffic for CDI traffic to flow between machines.



Inbound security group rules

c. **License Requirements** - need *Inbound/Outbound* to the following:

   i. my.nalpeiron.com

   ii. port 80 TCP (HTTP) 184.106.60.185

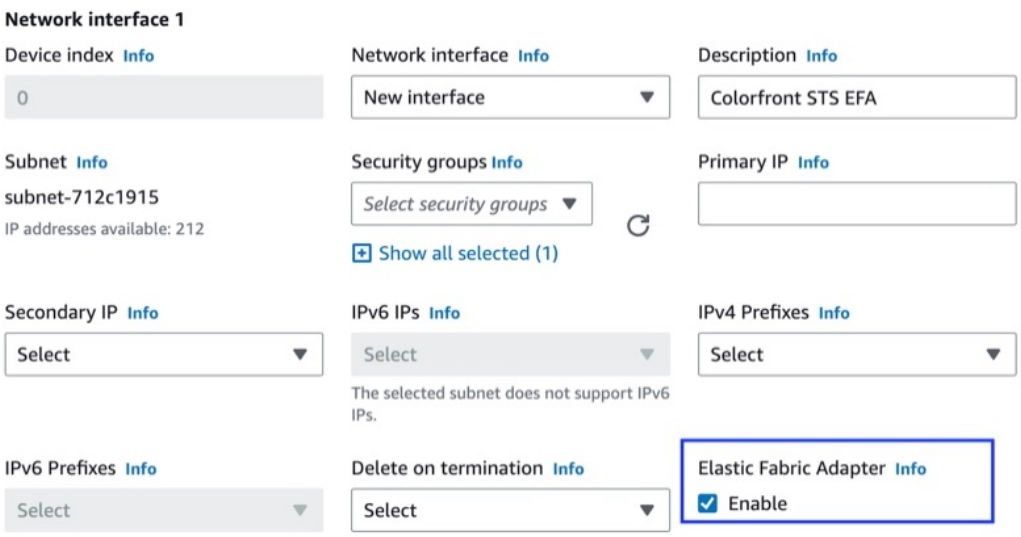
   iii. port 443 TCP (HTTPS) 184.106.60.185

> The IP address for licensing has not changed in the past nor do we expect it to change in the future. However, unexpected situations do occur. If possible, it is recommended that you use the domain name (my.nalpeiron.com) rather than the IP address to ensure that licensing will connect to the Nalpeiron server even if the IP address changes.

15. For **Advanced Network Configuration**, under **Network Interface 1**:

    a. for **Description** add a name such as Colorfront STS EFA.

    b. Additionally, make sure **Elastic Fabric Adapter** is enabled.



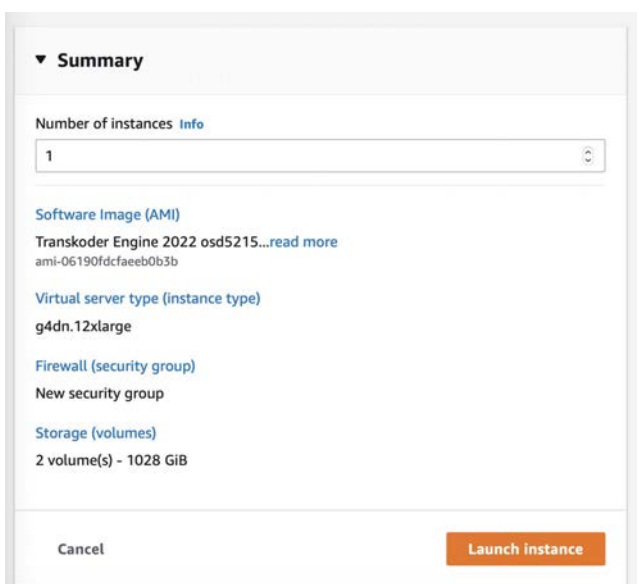
16. Under **Configure storage**, increase the **gp3** root volume to **128 GiB** to provide adequate storage space. You can add additional volumes later if needed.

> Make sure you select an SSD type for the root volume.

Increase root volume to 128 GiB

17. In the **Advanced details** section, the following configurations may be required:
    - **IAM instance profile** - In addition to traffic control by security groups, additional limitations can be defined here that control access to the instance in terms of users or services. For example, you can assign an *S3-full-access* permission policy role to the instance through an additional profile.
    - It is important to enable **Termination protection** so that you do not accidentally delete your instance.

    - Optionally, you can enable **Detailed CloudWatch monitoring** to be able to monitor, collect and analyze metrics about your instance.
18. Click [Launch instance] to launch your Amazon EC2 instance.



- Once it is launched, the default password is: ColorfrontStreamCDI2023
- You can log in with RDP or NiceDCV.

19. Once you are launched and have Streaming Server running:
    - ***Please send Colorfront*** the ***instance ID***. We use this to add the system to the Colorfront Stream Manager.
    - If you currently do not have access to the Stream Manager interface, we will create a team and user profile for you, providing the required permissions.

8.3. Setting Up the System

When using the Streaming Server software, operators can stream from the video output of any third-party editing, grading, or finishing system that supports CDI or NDI. Color metadata, including Dolby Vision metadata, is automatically extracted from the input signal and transmitted to the client application.

8.3.1. Licensing the Colorfront Streaming Server

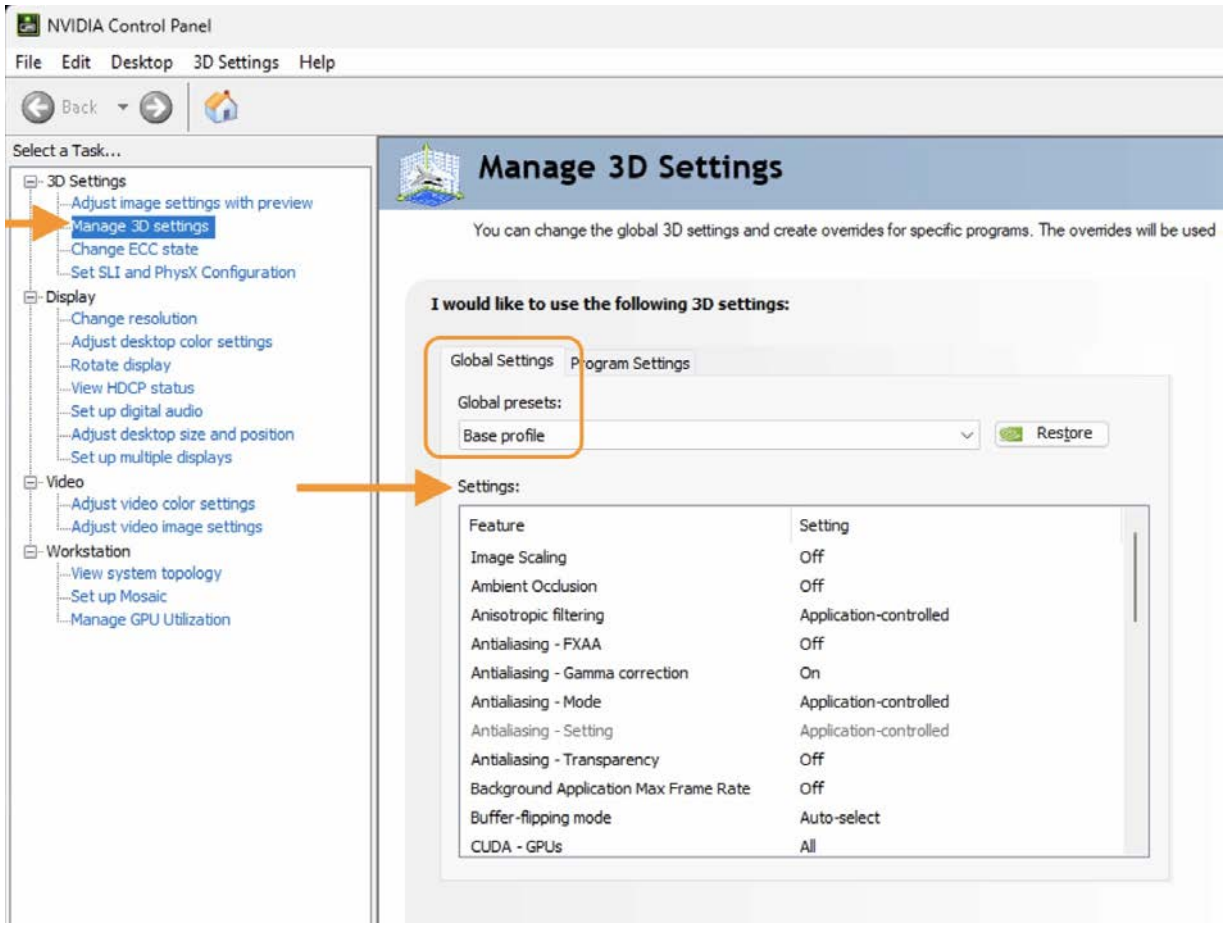
Once the system is launched and the Instance ID is added to the Colorfront Stream Manager:

1. You will receive a license file for the system named sts.txt.
2. Save this license file in the directory C:\ProgramFiles\ColorfrontPlatform\License.
3. Proceed to launch the Streaming Server.

8.3.2. Configuring Nvidia Driver Settings

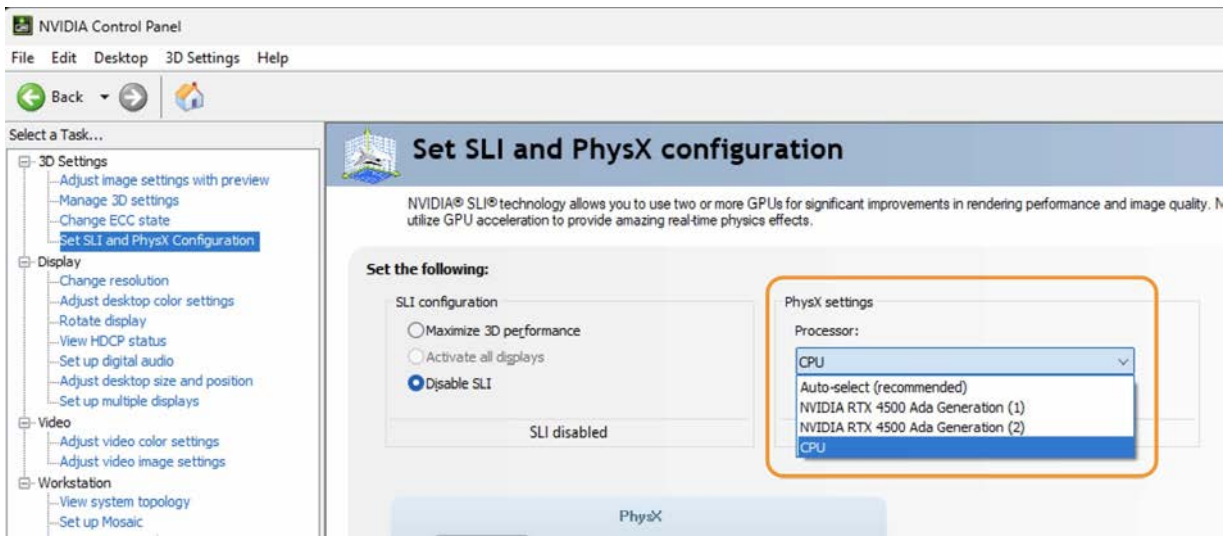
To optimize performance and ensure compatibility with your system, adjust the following settings within the Nvidia Control Panel:

1. Open the Nvidia Control Panel app.
2. Under ***3D Settings***, click **Manage 3D settings**.
    - In the *Global Settings* tab, for Global presets, select [Base profile].



- Then, within the Settings list, set **CUDA - GPUs** to [All].
- Optionally, set the **Multi-display/mixed-GPU acceleration** to [Single display performance mode].
- Set the **OpenGL rendering GPU** to one of the NVIDIA cards to which the display monitor is connected.
- For **Power management mode**, make sure [Prefer maximum performance] is selected.
- Set **Vertical Sync**, select [Use the 3D application setting].

3. Under ***3D Settings***, click **Set PhysX Configuration**.
   - Under **PhysX settings**, set the Processor to [CPU].

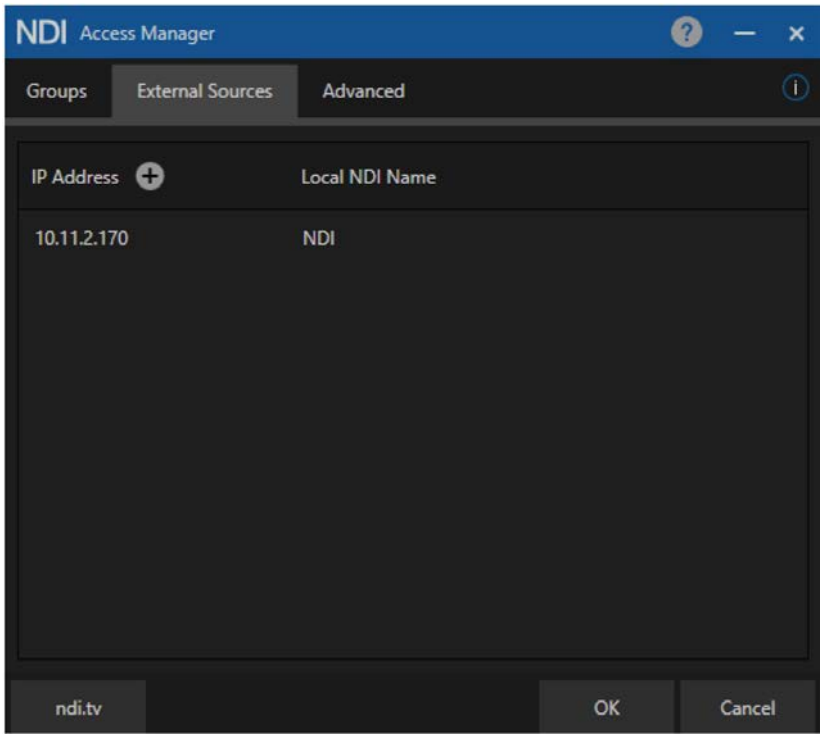


8.3.3. XAMPP Configuration

Make sure that Apache and MySQL are running as services and started.

8.3.4. NDI Access Manager

In the NDI Access Manager, configure the internal **IP Address** of the NDI input that serves as the source.



Setting the IP address in NDI Access Manager

8.3.5. Streaming Server Configuration

After launching the Streaming Server software, the first step is to configure the SRT Gateway settings to authenticate your Streaming Server to the Colorfront Stream Manager system.

Press the [Tab] key on your keyboard to bring up the Settings Page, and then navigate to the Stream Manager Settings section.

Stream Manager Setup

Please confirm the following steps are completed:

Manage SRT Gateway	Make that this option is toggled [On].
Use Stream Manager	Verify that this option is also enabled.
Stream Manager User	Leave this field blank as it is not required.
Stream Manager Address	Set it to stream.colorfront.cloud.

Stream Manager Password

Follow the steps below to set the password:

- Go to the Stream Manager website.
- Log in using your username and password.
- Navigate to the **Team Manager** page.
- Select the **Streaming Servers** tab.
- Click on the small edit button at the end of the server row.
- Hit the [Generate password] button.
- Copy the generated code.
- Return to the Streaming Server's Settings Page, to the Stream Manager Settings, and paste the code into the ***Stream Manager Password*** field.

> You only need to complete this process once, and the system you are streaming from will be authenticated to the Stream Manager.

CDI Section

1. Switch to the CDI Settings section of the Streaming Server's Settings.
2. Verify that the ***CDI Adapter IP*** for the EFA adapter is set to 127.0.0.1.

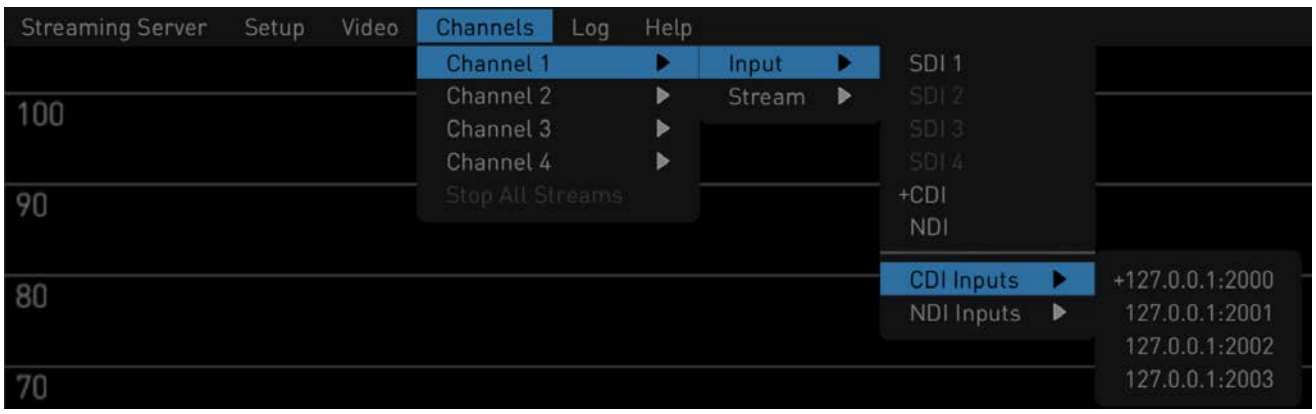
> If multiple EFAs are present in the system, specify the exact IP address of the EFA adapter you intend to use.

3. For the ***CDI Port/Input A/B/C/D*** parameter, enter the port numbers corresponding to the CDI sources incoming into the Streaming Server.

   Default port numbers are: `2000`, `2001`, `2002`, `2003`

Selecting Streaming Server Input Channel

Finally, you need to select the **CDI input** of the streaming channel you want to use within the **Channels › Channel 1/2/3/4 › Input › CDI Inputs** menu items.



Setting the CDI input

8.3.6. Streaming Gateway Access

Here, you will find all the necessary information to access Colorfront Streaming Services. It is essential to note that all required connections are outbound. By default, there is no need to enable inbound connections unless specifically required by your networking team.

Streaming Gateway Access [US]

Only an outbound UDP connection is required. The ports may vary between StS instances but remain constant even if the gateway changes. For US customers, the possible host/IP addresses are as follows:

sakura-la1.colorfront.cloud	UDP (84.17.45.139)
sakura-la2.colorfront.cloud	UDP (84.17.45.155)
sakura-lax.colorfront.cloud	UDP (52.53.48.52)

In the event that both DP servers are unavailable, the sakura-lax host serves as the final solution. This address is a preallocated elastic IP. Additionally, in the event of a disaster, we have the capability to set up an ad-hoc gateway in EC2.

Streaming Gateway Access [EU]

sakura-frankfurt1.colorfront.cloud	UDP (45.136.153.208)
sakura-frankfurtx.colorfront.cloud	UDP (Not allocated yet)

Streaming gateway access [AU]

sakura-alpha-apau.colorfront.cloud	UDP (EC2 auto assigned IP address)

Streaming gateway access [JP]

sakura-jpn1.colorfront.cloud	UDP (EC2 auto assigned IP address)

Stream Manager API access [All region]

brokerapi-test.colorfront.cloud	443/TCP (the IP address could be any of AWS's CloudFront address space)
stream-api.colorfront.cloud	443/TCP (the IP address could be any of AWS's CloudFront address space)

Stream Manager Web Access [All region]

broker-test.colorfront.cloud	443/TCP (the IP address could be any of AWS's CloudFront address space)

stream.colorfront.cloud	443/TCP (the IP address could be any of AWS's CloudFront address space)

The second hosts (stream-api/stream/stream-eval) will be utilized as soon as all users are migrated to the production instance.

To obtain the actual AWS CloudFront address space, you can use the following command:

```
$ curl -s https://ip-ranges.amazonaws.com/ip-ranges.json | jq
-r '.prefixes[] | select (.service=="CLOUDFRONT") | .ip_prefix'
| sort -V
```

WebRTC Streaming Server Side (From StS/TKD/QCP/OSD/EXD) [All region]

srt-auto.millicast.com	UDP/10000 [outbound] Based on DNS records, the current IP addresses for srt-auto.millicast.com could be any of the following: • 129.153.125.139 • 158.101.22.33 • 144.24.0.201 • 129.146.113.97 • 132.226.147.204 • 141.148.142.156

These addresses are managed by a third party and may be subject to change without our control or knowledge.

WebRTC Streaming Viewer Side [All region]

https://viewer.colorfront.cloud	443/TCP (the IP address could be any of AWS's CloudFront address space)

8.4. Security Best Practice

8.4.1. Implementing the Principle of Least Privilege

For the most secure deployment of your Colorfront Streaming Server in the cloud, it is imperative to adopt the Principle of Least Privilege (PoLP). This foundational security guideline ensures that each component of your deployment operates with the minimum levels of access and permissions necessary to perform its functions. By strictly applying PoLP, you significantly mitigate the risk of unauthorized access and potential security breaches.

Here are the key steps to implement PoLP:

Role Analysis	Carefully evaluate the roles within your deployment environment. Identify specific tasks and determine the minimum level of access required for each role to perform its functions effectively.
Access Control	Assign permissions based on the roles identified. Ensure that each user, application, and system component has access only to the resources that are essential for their tasks.
Regular Audits	Conduct regular audits of permissions and roles. This helps in identifying and correcting any deviations from the least privilege principle over time.
Security Training	Educate all users on the importance of PoLP and the specific practices in place within your deployment. Awareness is key to maintaining a secure environment.
Incident Response Plan	Have a robust incident response plan in place. In the event of a security breach, this plan will guide your team in quickly and effectively mitigating any damage.

By implementing the Principle of Least Privilege, you ensure a secure and efficient environment for your Colorfront Streaming Server in the cloud. This approach safeguards your data and systems while boosting customer confidence in the reliability and safety of your services.

8.4.2. EC2 Backup and Recovery

To access the best policy for EC2 backups, please refer to this link.

8.4.3. Billable and Required Services

- **EC2 Services (Mandatory)**: You will be billed for all usage of the EC2 instance while it is running.
- **Egress (Mandatory)**: Egress fees apply to all data exiting your AWS deployment.
- **Service Limits**: For best practice, refer to this link.

9. Client Application

9.1. Getting Started

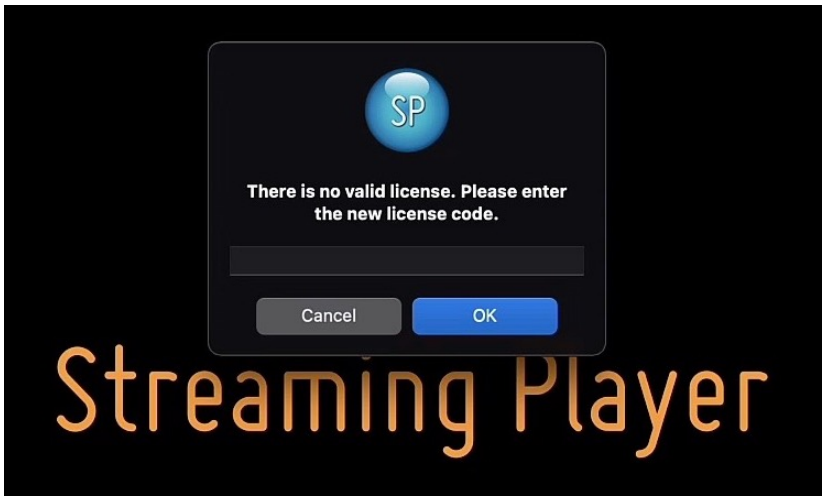
Colorfront will provide you with the **Streaming Player** application software that is available for both Windows and macOS systems. The app should be installed by double-clicking the relevant .msi (on Windows) or .pkg (on macOS) file and following the prompts. The installer will create a Streaming Player icon on the desktop.

Streaming Player icon

If you are using either a AJA or BlackMagic SDI device, you will need to download and install the necessary drivers/software on the system for them to be usable.

Most of the time, the *stream invitation link*, which is sent via email, contains the license information that allows Streaming Server to be launched, and the viewer does not need to take any action. If you get a license string, please start the application and enter the received license key into the license entry window. This is a 18-character numeric string.

!	For the first validation of the received license key, an active Internet connection is required.



License entry window for the Streaming Player

9.2. Stream Connection

Colorfront offers a variety of configuration solutions for remote streaming to meet different individual customer needs and security requirements.

You can connect to a stream in the following ways:

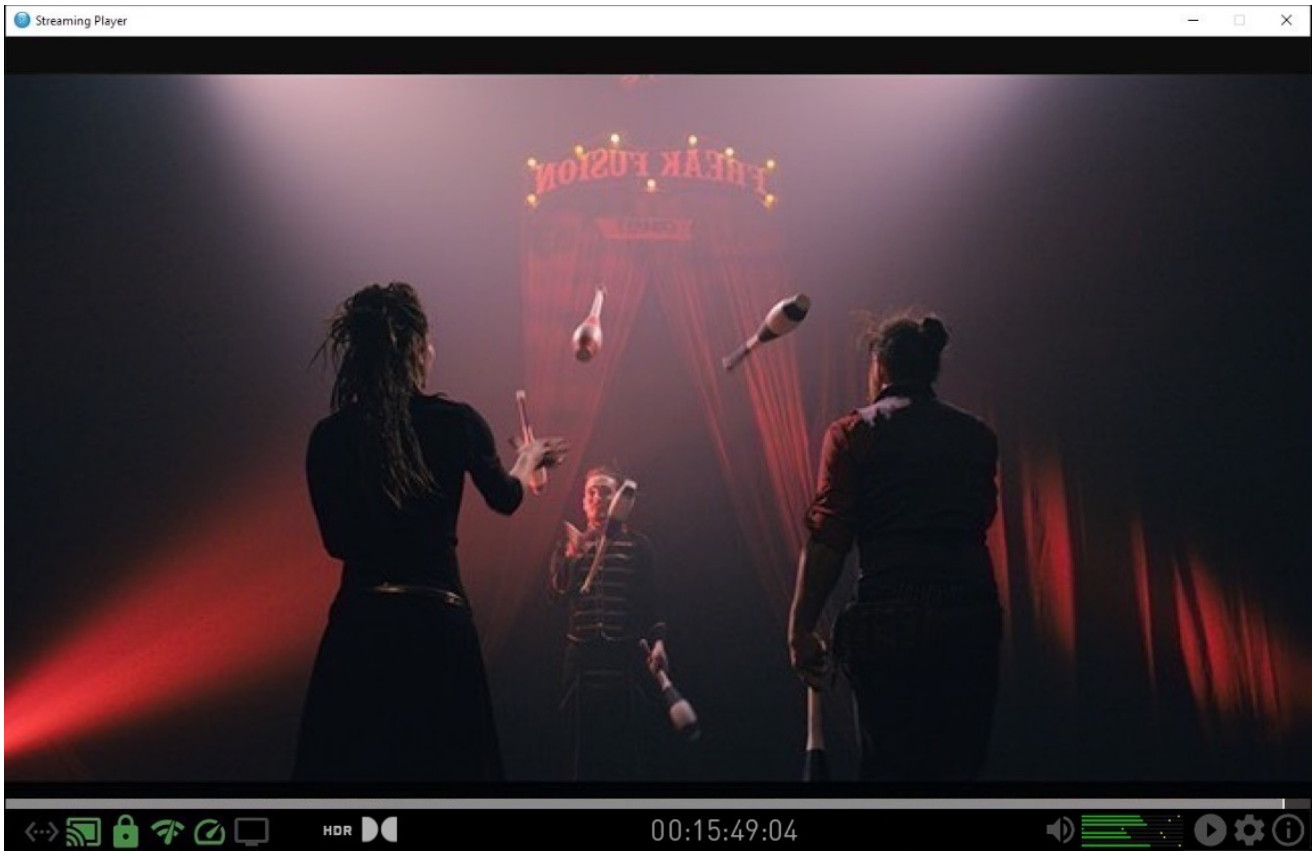
Invite URL	The easiest way to connect to a stream from the Streaming Player is to simply click on a custom URL sent by the partner. Colorfront's proprietary **Stream Manager** is the most convenient intermediary between the streaming source and the client and can also be used for generating URL invite links. The Stream Manager can be flexibly customized and allows parallel streaming to a vast number of clients that have the Streaming Player application installed on their computer or other devices. It also ensures high quality color encoding and robust, low latency viewing experience. Stream invitations can be sent from the Stream Manager to multiple users at once. The generated URL links will be automatically sent to the recipients via email. You can also join the stream session through direct invite URL links, generated from various Colorfront systems.
Via Apple device	Use a code generated from an Apple device such as an iPad, iPhone, or Apple TV to join the stream.
Direct connection	Connect directly to the streaming source by manually configuring all connection parameters.

See URL Links for Streaming Player for how to set up an invite link for the Streaming Player.

9.3. UI and Navigation

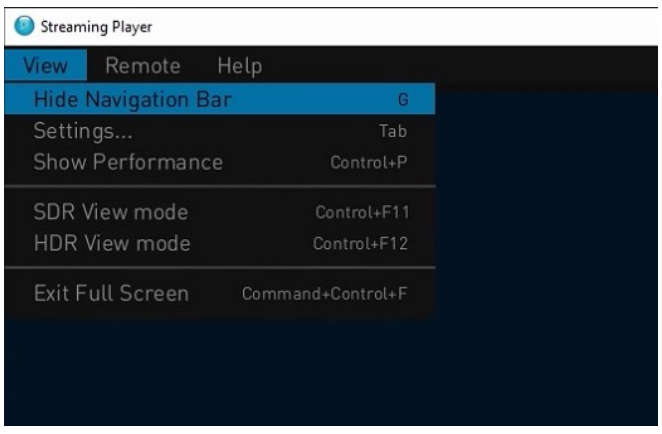
The Streaming Player has a simple user interface with a **navigation bar** at the bottom. It consists of:

- timeline showing the current frame position
- status icons
- timecode display
- mute button and audio bar
- various configuration and information buttons



Streaming Player

The bar can be displayed or hidden by the **View › Show/Hide Navigation Bar** menu option, or using the *G* shortcut.



View menu options of the Streaming Player

9.3.1. Status Icons

The status icons on the left side of the navigation bar indicate the stream's health.

As for color coding, the icons turn *green* in case of connection or availability, while *yellow/red* icons indicate performance issues. See Troubleshooting for Streaming Player for details on color coding and what to do if an icon is not green.

The status icons are the following:

Remote control status	green when remote controlling is established
Stream connection status	green when connected
Encryption status	green for encrypted and gray for unencrypted streaming

 *Stream quality*	green when streaming is realtime
 *Performance*	green when hardware decoding is seamless
 *Video I/O*	green when video output is established and gray when there is no video IO
 *HDR mode*	white text for HDR content; icon is crossed-out and gray when stream is not HDR

	HDR signaling is enabled in any of the HDR modes via SDI or HDMI of AJA boards, such as *KONA 4* or *KONA 5*, and a number of Blackmagic Design devices, such as *DeckLink 8K Pro*, *DeckLink Mini Monitor 4K*, *DeckLink Duo 2* or *DeckLink 4K Extreme 12G*.

 *Dolby Vision*	Dolby Vision logo only when relevant metadata is available

	For Dolby Vision tunneling, the HDMI link uses Dolby's proprietary *IPT* color space.

	Status icons are currently not available in the main screen on the Mac platform, only on the Performance page. Double-click to view them.

9.3.2. Center Displays and Buttons

In the center of the navigation bar, there is a **timecode** display of the incoming footage.

	The *timecode* is the eight-digit numeric representation of a particular frame of the video, as follows: `Hours:Minutes:Seconds:Frames` For example, `00:17:22:07` refers to the seventh frame of the video at 17 minutes and 22 seconds.

You can monitor audio levels with the small **audio level indicator**. Click the **mute** button to mute the sound.

	The mute button behavior depends on the Mute Scope parameter in the [Advanced Settings]. It defines whether muting affects [Video Out], [System Audio], or [Both] (default). Adjust this setting to control which outputs are silenced when mute is enabled.

Mute button, timecode and audio indicator in the navigation bar

By default, the Streaming Player is in view-only mode, meaning playback controls are hidden and remote controlling is disabled. To see the basic navigation controls on the right side of the bottom bar, such as the ***Play/Pause***, ***Previous Frame*** and ***Next Frame*** buttons, enable *full* remote control REST API access in the server application.

9.3.3. Information and Configuration Buttons

The *play* button on the right side of the navigation bar is used to **generate access codes** for the stream.

Information and configuration buttons on the navigation bar

The **Settings** page can be accessed by clicking on the cogwheel icon or by hitting [Tab].

Next to it is an information icon that opens the **Performance** page, which is also accessible by double-clicking anywhere on the screen.

Performance Page of the Streaming Player

9.3.4. Navigation on Apple Devices

Touch and swipe interaction is supported on both iOS devices and Apple TV. See the following table for navigation details.

Navigation	**Action**
On all Apple devices*	
Swipe up	Switching between Performance Page and image
Swipe down	Enabling the bottom navigation bar while switching between Performance Page and image

Navigation	Action
Swipe left/right	Switching between image / image+navigation bar / Performance Page+navigation bar
Only iPad and iPhone	
Single tap	On *mute* button to mute the audio
Double tap	Resizing of the main image as *Fit* (fit to screen) or *FitAll* (original scale)
Three-finger touch and hold	Code generation to log in to the stream
Only Apple TV	
Mute button on the remote	Mutes the audio
Play button on the remote	Code generation to log in to the stream

* Swiping on the touch surface of the remote (Apple TV) or on the screen of the device (iPad/iPhone)

To prevent any interference with the stream, it is possible to disable user interactions for viewing the metrics. To deactivate all user interaction, follow these steps:

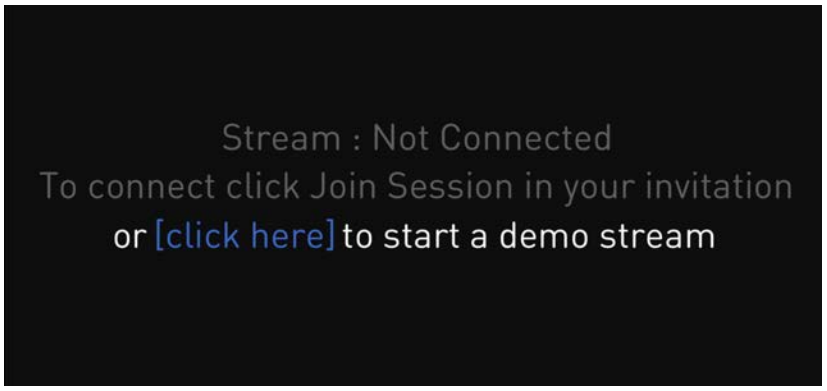
1. Go to Settings.
2. Access Application Preferences.
3. Click ***Disable User Interaction***.

9.4. Viewing the Stream

There are several ways to look at the video content when using the Streaming Player application. Most importantly, you can use

- a directly connected GUI monitor, including the XDR display on the Mac, or
- a professional AJA or Blackmagic Video Output Device and connect to an external HDMI or SDI monitor.
- You can also use the Streaming Player App on Apple TV and iOS Devices. See the step-by-step installation guide.

When you first open the Streaming Player, a screen message will invite you to connect to a **demo stream**.



Start demo stream

Click the link and enter your email address in the pop-up window. You will receive a code via email to verify your identity in the Streaming Player to start the demo stream. You can interrupt and rejoin the stream multiple times, or join from another device with a code.

The demo stream contains watermarks including your IP and email address.

Watermarked demo stream

9.4.1. Performance and Quality

Streaming technology encompasses a wide range of resolutions and formats, including HD, UHD, or 8K, with color encodings such as RGB 444 or YUV 420, alongside variable bitrates that can range from low to very high. These critical settings determine the stream's overall quality and require precise adjustment on the server side. It is important to note that compatibility with these settings varies across playback devices; for instance, AppleTV may not support UHD with RGB 444 encoding.

Adjustments on the Streaming Player side, particularly in terms of network buffering, can directly impact latency, ensuring a smoother viewer experience.

	For optimal performance with the ***Network Buffering*** parameter set to [Ultra Low Latency] in the Advanced Settings of the Streaming Player, it is recommended to switch the streaming server to PCM audio. Unlike the default AAC option, which delivers compressed audio, PCM offers lossless quality. Despite the higher data rate, PCM provides superior quality and reduced latency.

When using PCM audio, Streaming Server also supports multichannel 5.1 and 7.1 output on Mac and iPad devices if compatible hardware is available. This enables full-quality multichannel playback without

compression, ideal for QC and professional review workflows.

The quality and performance of the streaming content can be adversely affected by the network environment. WiFi and VPN connections, in particular, often lead to notable slowdowns, potentially compromising stream quality.

9.4.2. Directly Connected Displays

You can connect HDR-capable displays directly to the Streaming Player on both macOS and Windows. Refer to the following sections for platform-specific instructions on configuring HDR display output.

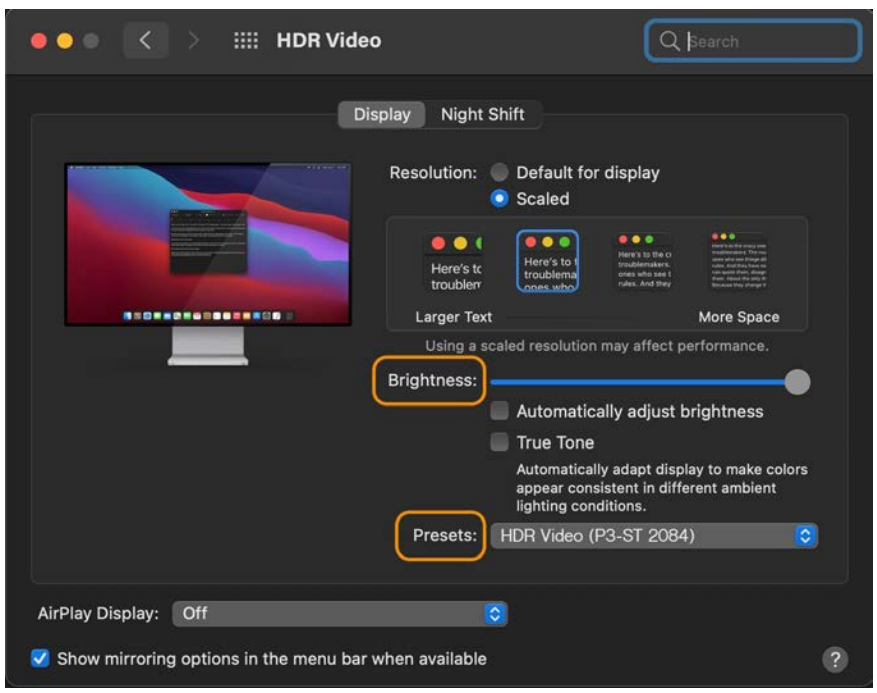
To toggle full-screen mode in the Streaming Player, use the `Alt+Enter` keyboard shortcut.

On macOS, full-screen mode can also be activated by clicking the green button in the top-left corner of the application window. In this mode, video content fills the screen and audio is played through the system's default output.

Directly Connected Displays via DisplayPort on macOS

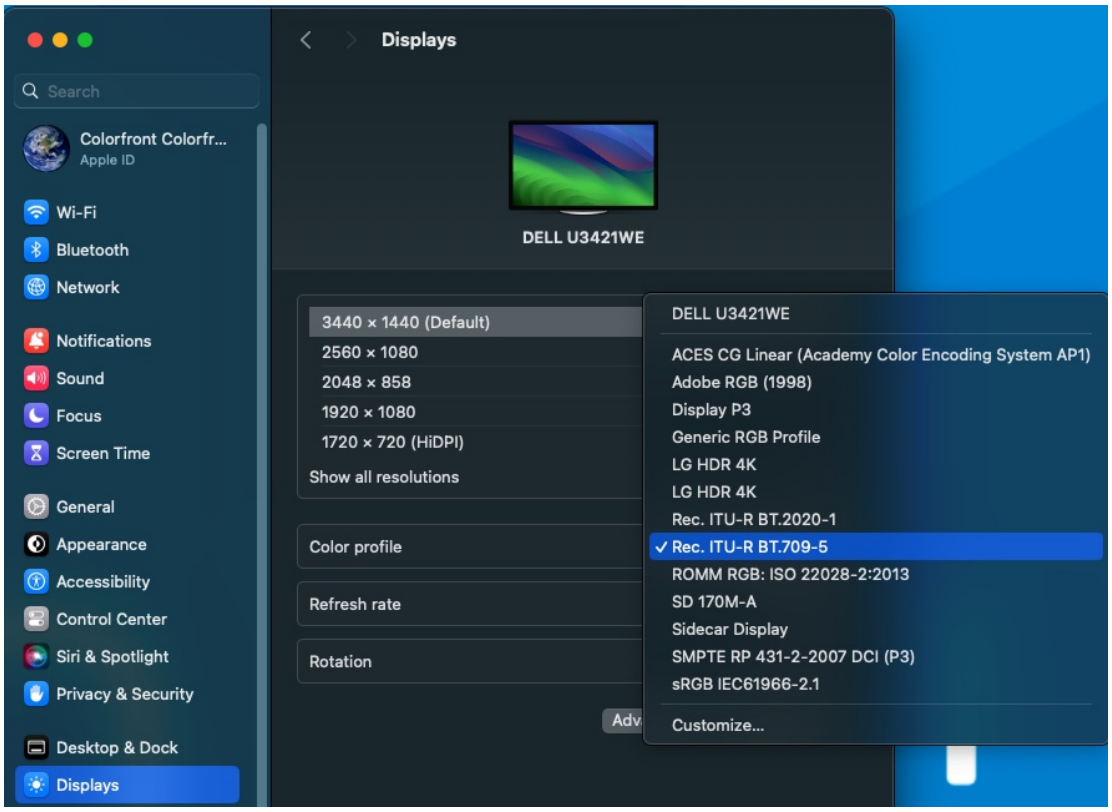
To use a graphics monitor directly, take the following steps:

1. Connect the display through the DisplayPort of your Mac workstation.
2. Go to the display settings of your Mac and set the *Brightness* slider to its maximum value. The *Preset* selector should be set to **[HDR Video (P3-ST 2084)]** for HDR displays.



Selecting the P3-ST 2084 preset for HDR video display

3. For non-HDR content, select the **[Rec. ITU-R BT.709-5]** (Rec. 709) setting as your default *Colour Profile*. When viewing HDR video on a non-XDR display, choose the **[Rec. ITU-R BY.2020-1]**(Rec. 2020) color profile for an optimal viewing experience.



Selecting proper display profile

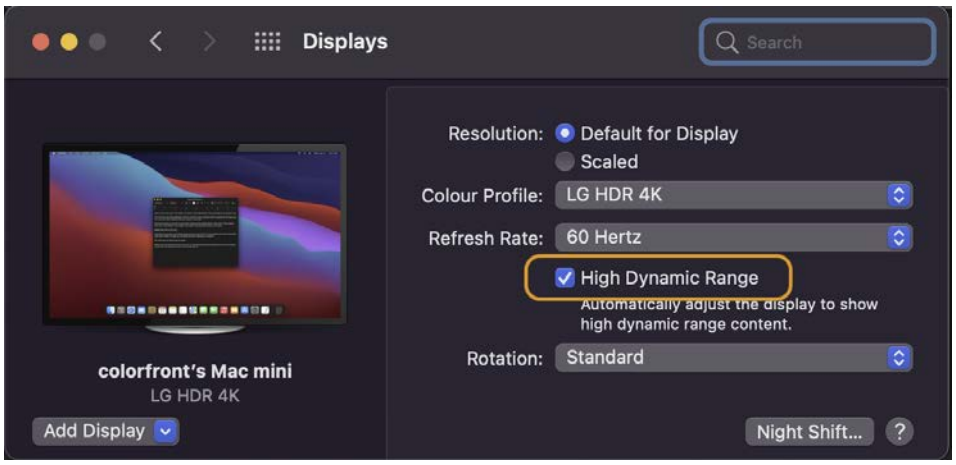
4. Start the Streaming Player.
5. For HDR, navigate to the Advanced Settings and set the ***Gui HDR Mode*** from [SDR] to [HDR10] to trigger the HDR mode on the display.

Selecting HDR display mode on the Settings Page

Directly Connected Displays via HDMI on macOS

Another option to view the Streaming Server's streamed HDR content through a direct display is to connect an LG OLED TV to the supported Mac configuration (such as Mac Pro) via the HDMI port, as per the following:

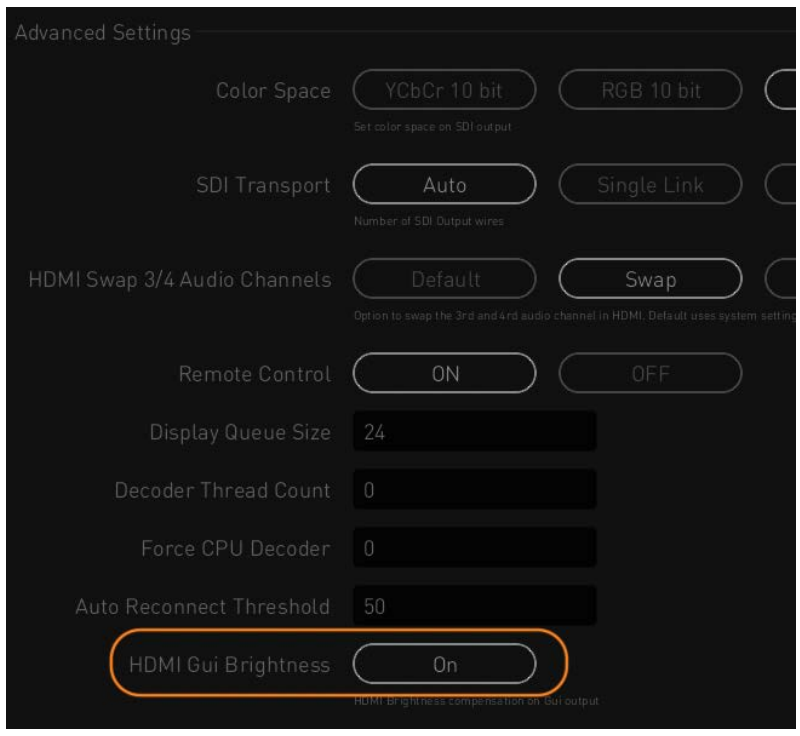
1. Connect the television through the HDMI port of your Mac workstation.
2. Go to the display settings of your Mac, and enable the ***High Dinamic Range*** option so that the display shows HDR content. Make sure that the *Colour Profile* is also set to the appropriate option.



Enabling HDR mode in the display settings on the Mac

3. Start the Streaming Player and go to the Settings Page.
4. For color-accurate monitoring, go the Advanced Settings and enable the ***HDMI Gui Brightness*** to compensate HDMI brightness on the GUI output.

	The *HDMI Gui Brightness* setting is only available on macOS.

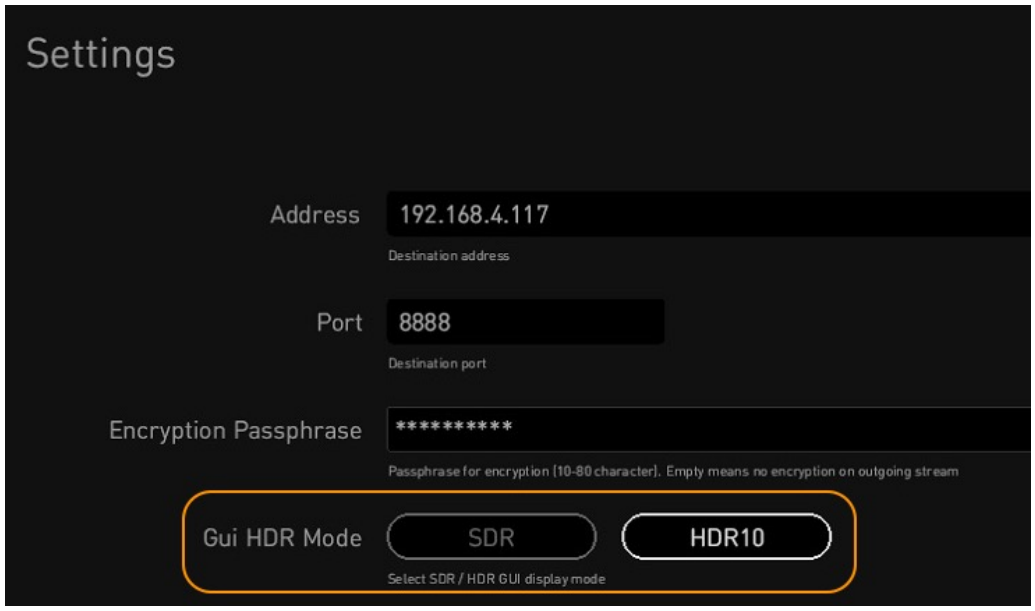


Selecting GUI brightness compensation for the GUI

Directly Connected Displays on Windows

When using the Streaming Player on a Windows workstation, please do the following:

1. Connect the display, GUI monitor or TV, through the appropriate port of the workstation. The monitor should be HDR10 capable. For HDR televisions, use the HDMI port of the computer.
2. Go to the displays settings of the Windows operating system, and switch to HDR mode.
3. Start the Streaming Player and go to the Settings Page.
4. Set the ***Gui HDR Mode*** to [HDR10] display mode for all direct connections, including HDMI.



Selecting HDR GUI display mode on the Settings Page on Windows

9.4.3. Video Output Device

If an AJA or Blackmagic Design device is installed in the system, you can customize the video output on the Settings Page as follows:

Video Out	Set it to [HDMI], [SDI] or [Off].
Video Resolution	It should match the server's video setting. To send HD 720p resolution video to the video output, set this to [Auto].
Color Space	Set the SDI output color space to [YCbCr 10 bit], [RGB 10 bit] or [RGB 12 bit].
SDI Transport	Set to [Auto] or to the appropriate SDI configuration.
Dual Video Out	Enable a secondary video output by choosing a color space for the output. Select either [SDR] or [HDR].

The transmission also consists of the audio stream. The audio is transmitted to the video card, and may be output to a monitor or television over SDI or HDMI interface.

9.4.4. Disabled Screen Capturing

To protect sensitive content, all forms of screen capturing is blocked in the Streaming Player, such as taking screenshots or recording screen content.

Viewing streamed video content of the Streaming Player through any remote desktop application is also disabled. While the audio signal is transmitted to the remote party, no image is visible from remote access. For support purposes, you can allow limited access to the application's settings by enabling the Support Mode.

9.4.5. Advanced Configurations

Custom GUI Color Space

The Streaming Server supports defining a custom GUI color space through the Startup.xml file. This advanced configuration affects only the GUI display and does not alter the streamed or video output

signal. It allows GUI color management customization for specific display workflows, such as Apple P3 monitors or SDR/HDR mixed environments.

> This feature is available only through the Startup.xml file and is not accessible from the user interface.

Add the following entry to the Startup.xml:

```
<CustomGUIColorspace type="string">P3D65_SRGB</CustomGUIColorspace>
```

The value follows the `Primary_Curve` format:

- The part *before* the underscore defines the **color primaries**.
- The part *after* the underscore defines the **gamma** or **transfer curve**.

Examples:

- `P3D65_SRGB` (Apple Display P3)
- `BT709_Gamma24`
- `BT2020_PQ`

Available options:

Primaries	`BT709`, `Rec709`, `BT2020`, `Rec2020`, `P3DCI`, `P3D65`, `XYZ`, `AP0`, `AP1`, `ARRIWideGamut`, `CanonCinemaGamut`, `RedWideGamutRGB`, `Sgamut3Cine`, `VGamut`
Curves	`SRGB`, `Gamma22`, `Gamma24`, `Gamma26`, `BT1886`, `HLG`, `PQ`, `ACEScct`, `LogC`, `Slog3`

9.5. Streaming Player App

You can watch media content on **Apple TV** and **iOS devices** such as iPad or iPhone through the **Streaming Player app**.

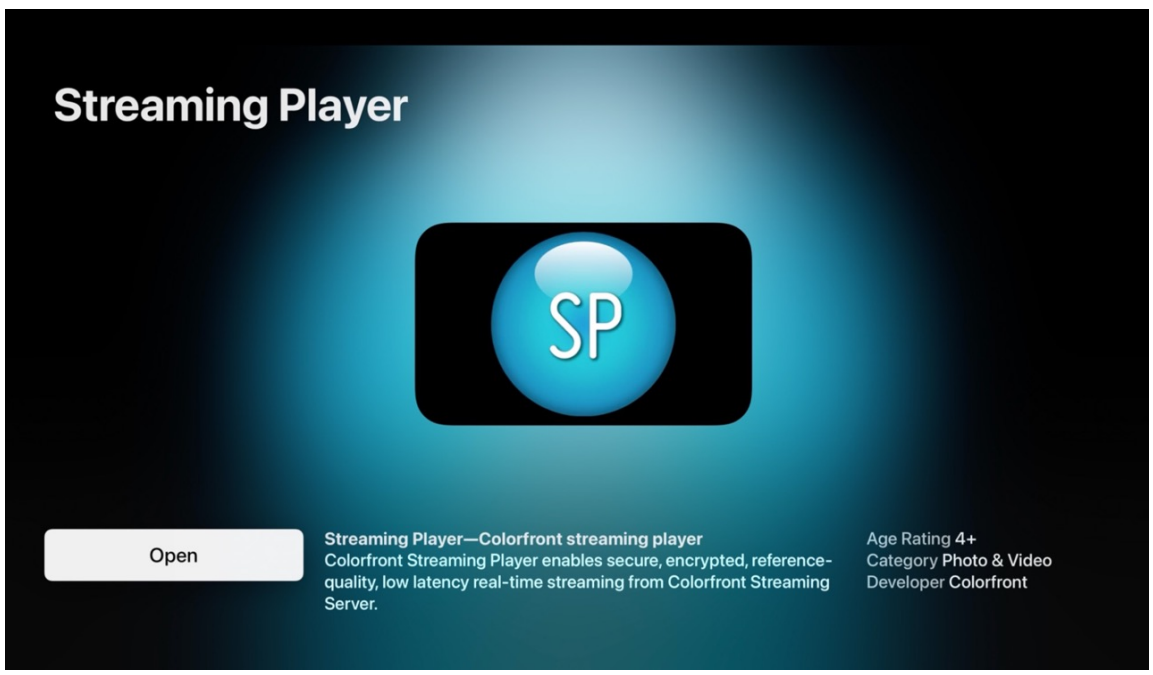
Apple TV device

Please see the Streaming Player manual on how to join a streaming session by clicking on the URL sent to you in email.

> Currently, the Streaming Player does not open on iPhone from email when the default browser is Microsoft Edge.

Key Features of Streaming Player App

- Reference-quality 10-bit 420 HEVC video stream
- Sub-second latency for truly interactive sessions
- Secure transport with 128/256-bit AES encryption and optional visible and forensic watermarking
- Flexible data rates from below 10 up to multiple hundreds of Mbps
- Rec.709 and PQ color space support
- Dolby Vision
- Disabled screen capturing to ensure content security



Streaming Player App on the GUI of Apple TV

9.5.1. Prerequisites

Supported hardware platforms, setups and formats are the following:

System	Supported Versions
Apple TV model	• 4K (2nd generation) - recommended • 4K (1st generation) - with limited functions Currently, AppleTV HD is not supported.
tvOS	tvOS 15.0 and above - 15.5 recommended
iPad model	iPad Pro 4th Generation 12.9" or later
iPadOS	iPadOS 14.5 and above
iPhone model	iPhone 12 and 13 Pro/Pro Max or later
iOS device	Devices equipped with Apple A12 Bionic 6-core processor or above

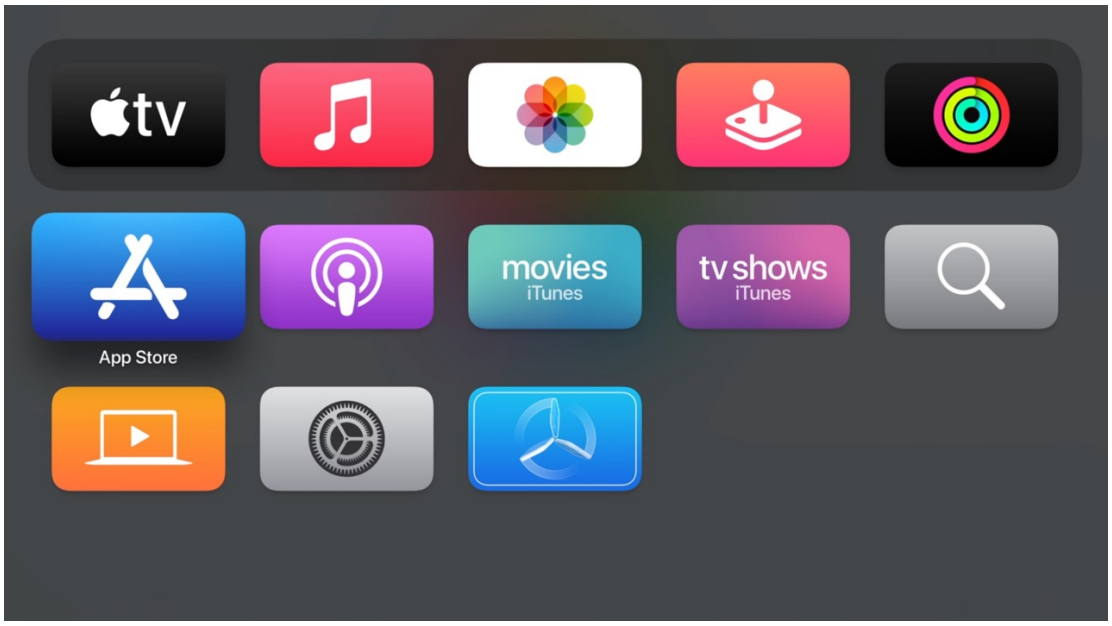
System	Supported Versions
Web browser	Safari, Chrome and Firefox Currently, Streaming Player does not open on iPhone from email when the default browser is Microsoft Edge.
Stream format	10-bit 420 HEVC video stream Currently, 10-bit 444 HEVC video stream is not supported on Apple TV.
UHD HDR 420/444 support	• iPhone 12 Mini and up, with reduced stream quality for iPhone SE (3rd generation) • iPad Air (3rd generation) and up • iPad Pro 12.9-in. (3rd generation) and up
8K support	iPad Pro 12.9-in. (5th generation) and up
Internet connection	For best performance, we strongly recommend using hard-wired Ethernet cable for your system. If hard-wired connection is not possible, you can also use Wifi for streaming.
HDMI connection	The Apple TV is HDMI 2.0a capable, which can be connected to any input of the Television.
Picture Mode settings	Although many manufacturers/televisions differ, it is generally recommended to disable features such as motion compensation (e.g. LG TruMotion) or dynamic contrast options that may interfere with the original creative intent. However, picture settings such as Filmmaker Mode are recommended. Filmmaker Mode automatically disables any picture processing settings that can often distort the natural look of movies, ensuring they are displayed as intended by their directors by preserving the film's original aspect ratio, colors, and frame rate, and delivering a more authentic and true-to-source viewing experience.

9.5.2. Apple TV

Installation on Apple TV

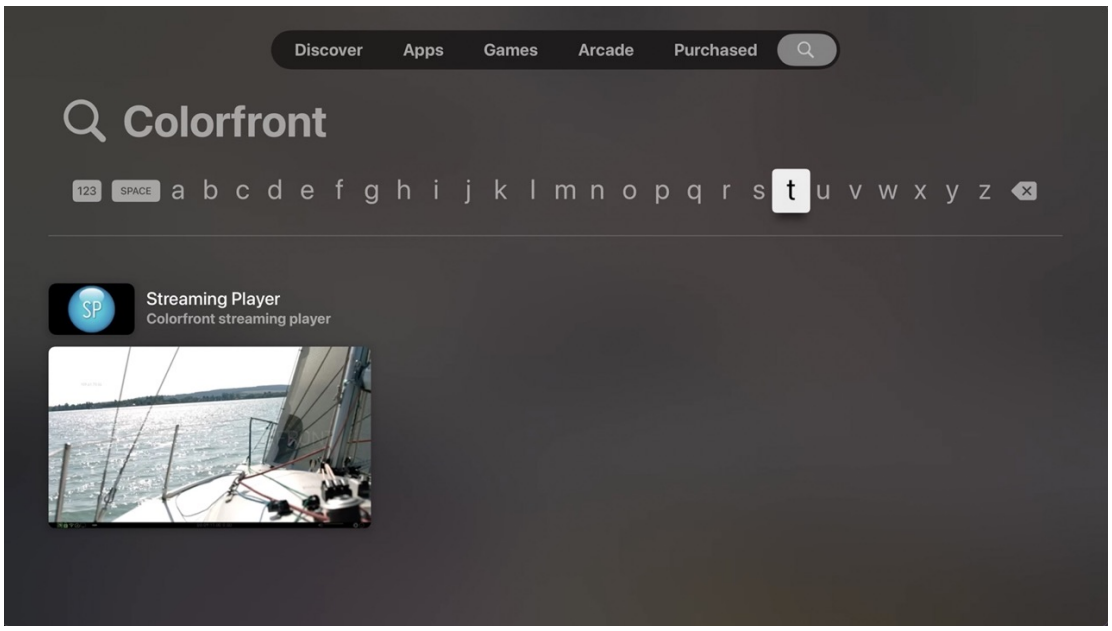
To install the Streaming Player App on Apple TV, please follow these steps:

1. On your Apple TV, go to the App Store.

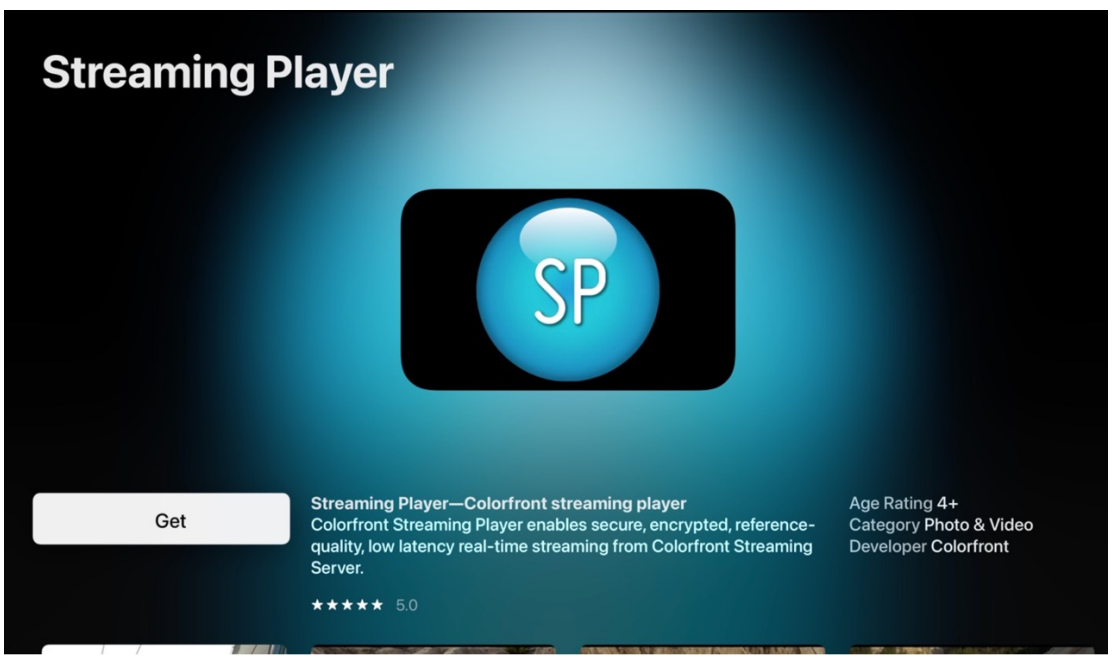


Apple TV App Store

2. Search or type in ‘Colorfront’.



3. Select the Streaming Player application icon and click [Get].



4. Once the download is complete, return to the main screen and tap the Streaming Player App icon to open it.
5. Before connecting to a stream using the Streaming Player App, you need to verify your identity. For detailed instructions, please refer to the Email Verification for Stream Access section.

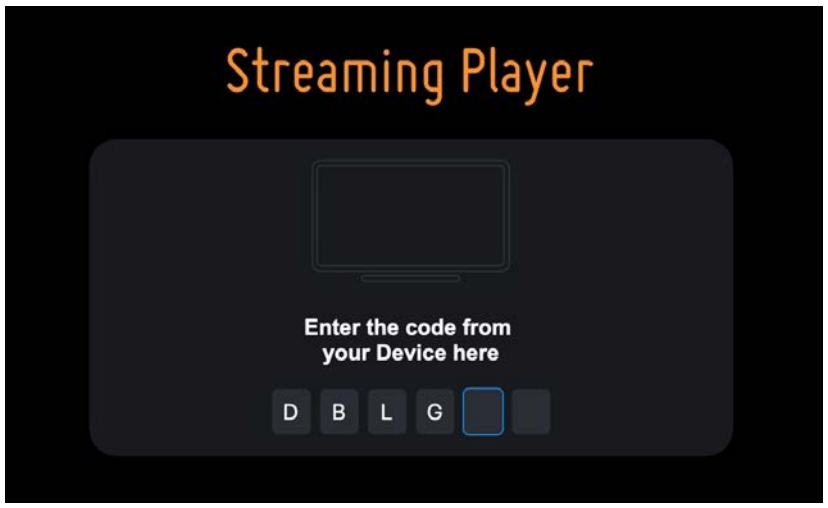
Code Generation on Apple TV

To generate a code from the Streaming Player App installed on your Apple TV to access the video stream, follow these steps:

1. Open the stream invitation email. The message will include a [Join with Code on Other Device] button that will take you to the Device Login Page. Here you will need to enter a six-digit invitation code generated by your Streaming Player App within the Apple TV.
2. Go the GUI of the Apple TV.
3. On the Apple TV home screen, open the Streaming Server App.
4. On the Siri Remote controller, press the Play/Pause button.

5. A 6-digit alphanumeric code will appear on the screen.

6. Go back to the Device Login Page on the device that you used to open the stream invitation email (such as your mobile phone or computer) and enter the code.
7. Once the code is validated, the stream will start automatically on Apple TV.
8. Closing the application will stop streaming data with the Streaming Player App, but as long as the streaming session is live, you can rejoin the stream by reopening the application.



Entering code on Device Login Page

Siri Remote Controller

Touch and swipe interaction is supported on Apple TV using the Siri Remote controller, where you can swipe by touching across the touch surface of the remote with a sliding gesture. See the following table for navigation details.

Touch surface of Siri Remote controller

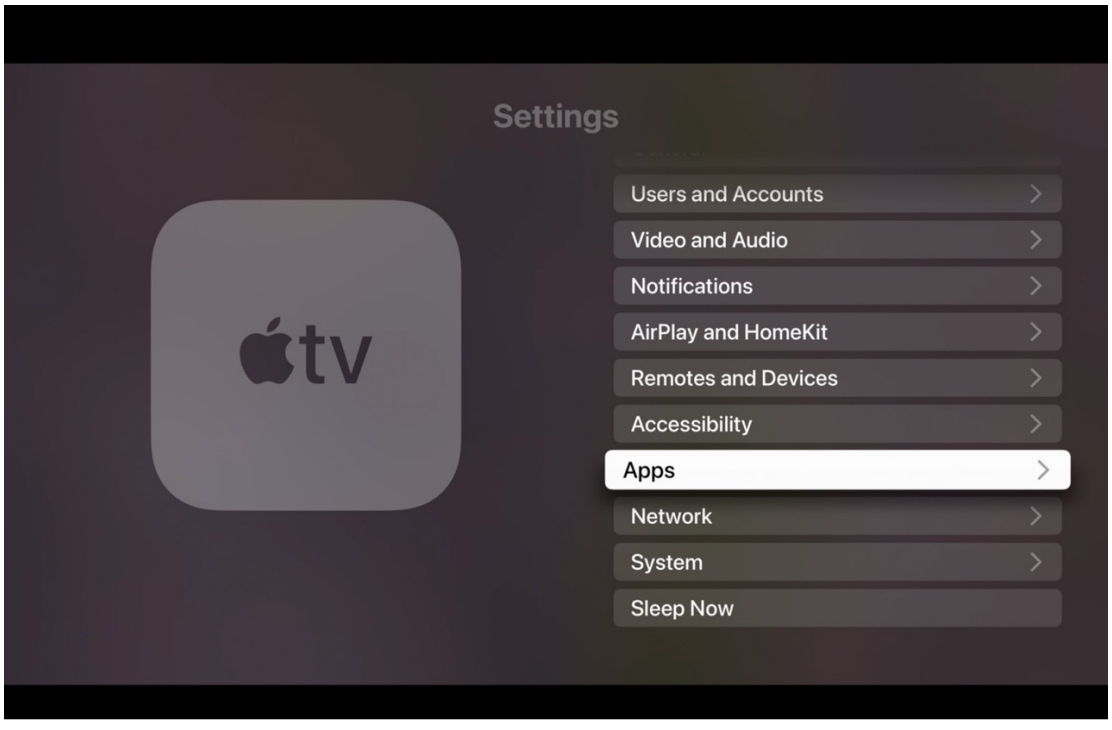
Navigation	**Action**
Swipe up	Switching between Performance Page and image
Swipe down	Enabling the bottom navigation bar while switching between Performance Page and image
Swipe left/right	Switching between image / image+navigation bar / Performance Page+navigation bar
Mute button on the remote	Mutes the audio
Play button on the remote	Code generation to log in to the stream

Streaming Player Performance Page with navigation bar

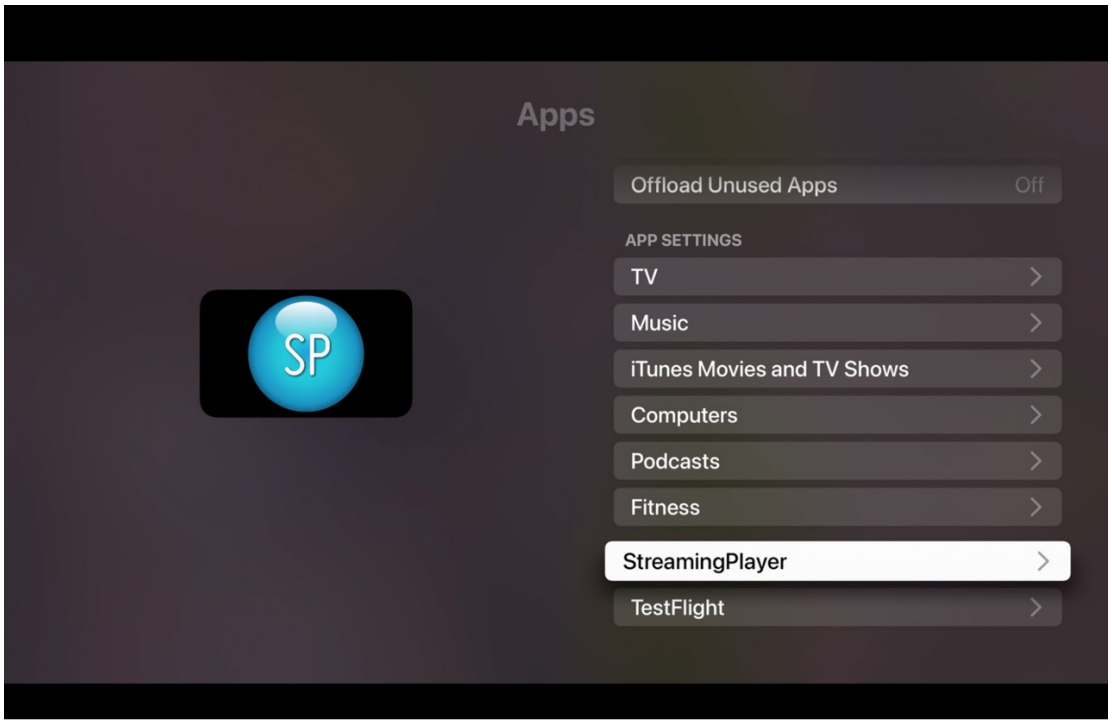
StP App Settings

1. Access **Settings** from the Apple TV Home Screen.

2. Select **Apps**.



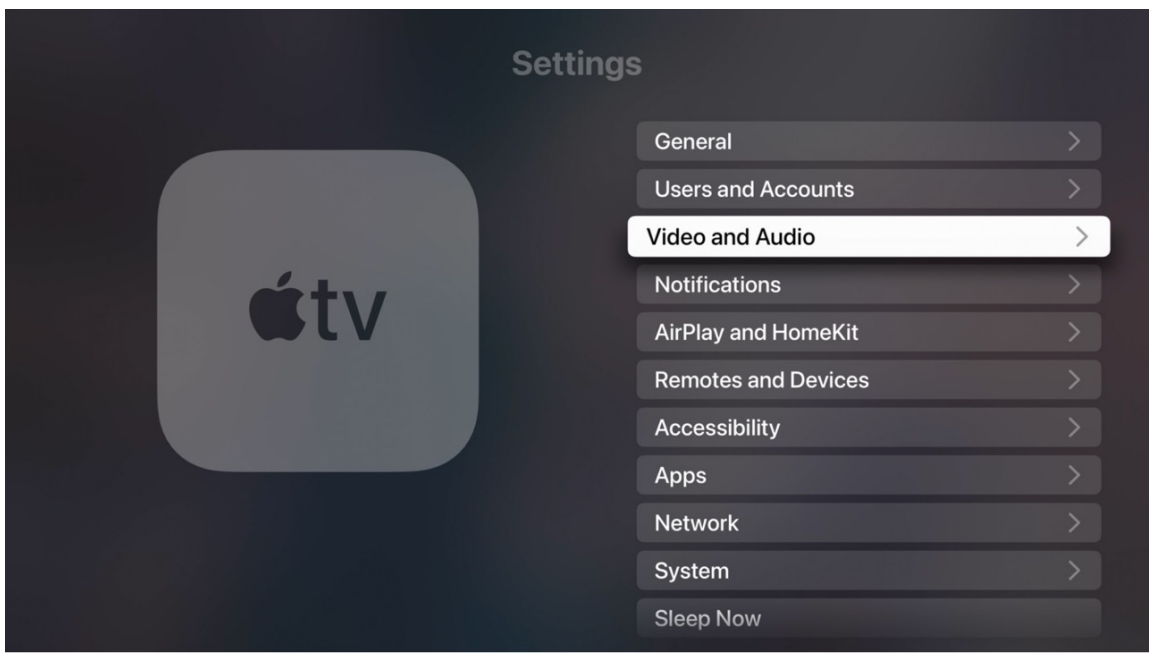
3. Select **Streaming Player**.

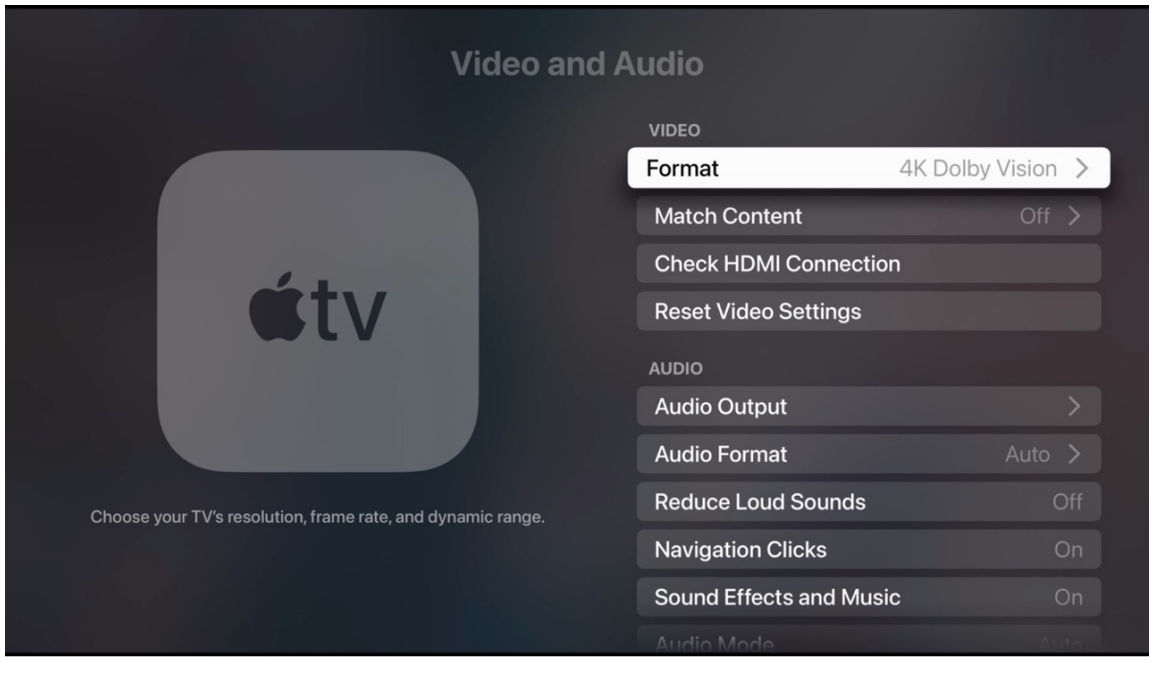


To see how to configure streaming source parameters, see Application Settings.

Apple TV Video Settings

In the **Settings**, open **Video and Audio** where you can configure the **Format** of the video stream.





For an optimal review experience, please choose a 4K video format. 4K options include [4K HDR], [4K

SDR] and [4K Dolby Vision] in 50/60 Hz formats.

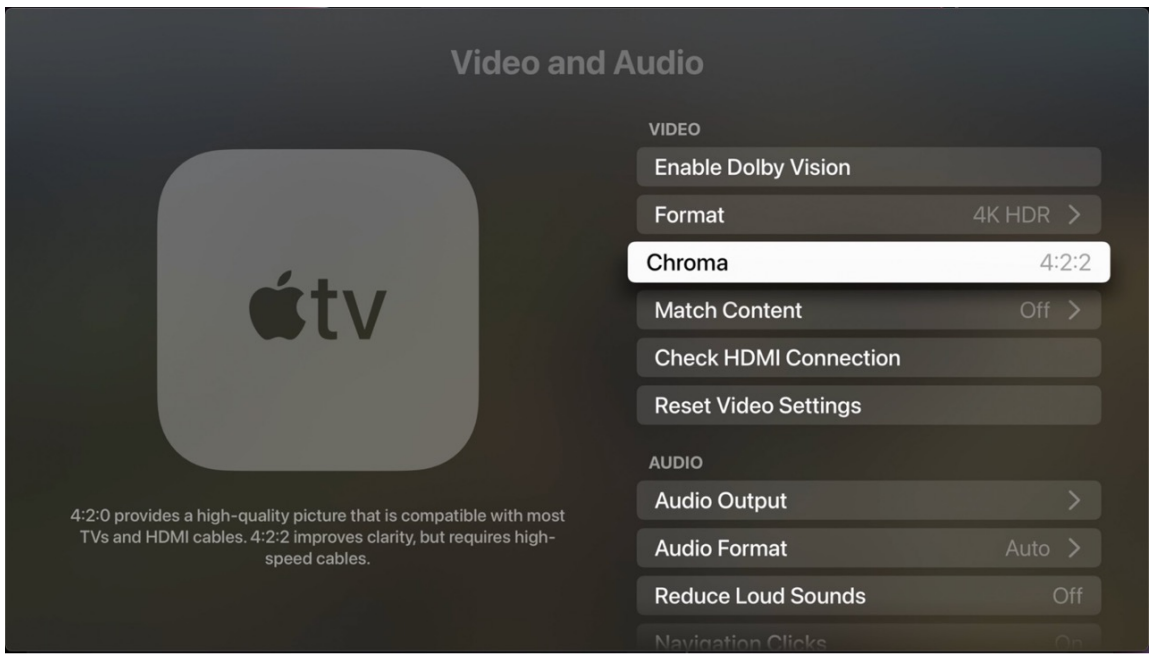
If you have a **Dolby Vision** compatible television (such as LG or Sony), for the best quality and experience, please set your Apple TV to [4K Dolby Vision] video format. This is especially important if you want to review HDR materials. However, even for SDR videos, we encourage you to set your Apple TV device and television to Dolby Vision format.

Selecting 4K Dolby Vision video format

If Dolby Vision is not available but you have a HDR-compatible TV (such as Samsung), please select an HDR format option.

Please note that the HDR-compatible TV should immediately display an HDR or HDR10 logo if any of the [4K HDR] format options is selected on the Apple TV.

As for **Chroma** settings, for HDR10 content, it is best to set the hue subsampling to the maximum value. The choices on Apple TV are [4:2:0] or [4:2:2]. Please set to the latter.



Setting Chroma to 4:2:2

Other Stream Parameters

Color Conversion

Either your Apple TV is configured for SDR (Rec.709, Gamma 2.4 at 100 nits) or HDR (with HDR10 or Dolby

Vision), the Streaming Player will handle the color conversion as needed.

As an example, you can send a 48 nits, Gamma 2.6 video with P3 DCI primary to the Apple TV Streaming Player, and the application will receive the signal “as is” and perform the appropriate color conversion to make the images look as good as possible on your television screen. This color conversion is based on Colorfront’s advanced *Perceptual Processing Engine* (PPE), aka the **Colorfront Engine**, which is a complex color processing model based on human visual perception to ensure a perceived match between SDR and HDR outputs while preserving the artistic intent of the original source material.

Finally, if the incoming stream or signal is the same color as the destination (Apple TV Streaming Player), no conversion is applied. A visual indication of the incoming signal as *Input Color* and of the destination color as *GUI Color* is shown on the Streaming Player’s Performance Page.

Force SDR Display Mode

In some workflows, especially when connecting Apple TV to professional SDR monitors or converting HDMI to SDI signals, it is necessary to disable automatic color space conversion and HDR tunneling. This ensures the preservation of exact Rec.709 color characteristics without unintended HDR processing.

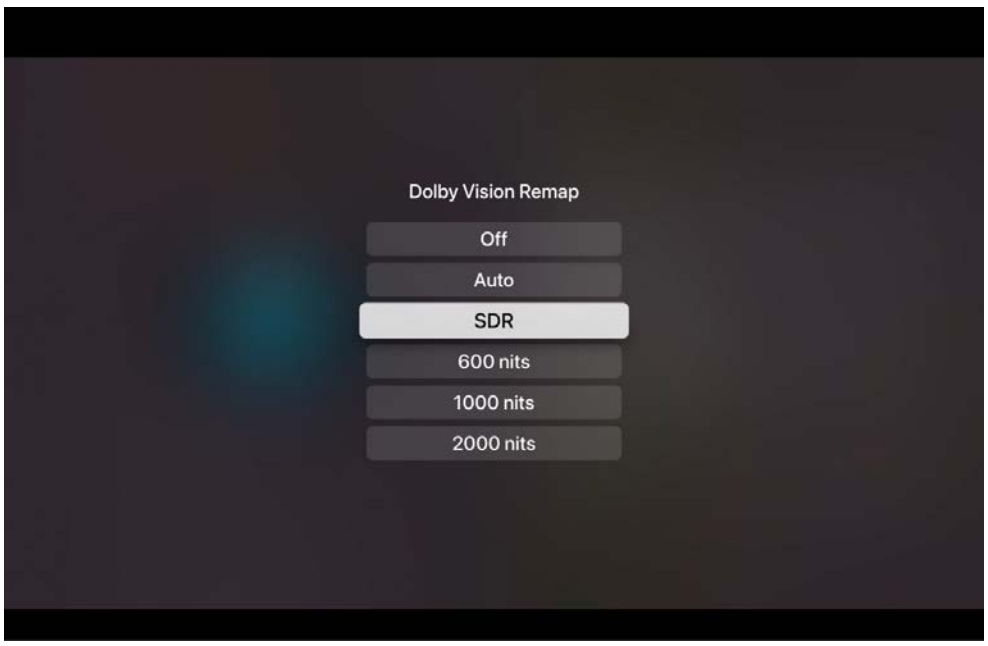
The Streaming Player app on Apple TV includes a ***Force SDR Display Mode*** setting, available in the App preferences. When enabled, this option forces the Apple TV’s HDMI output to behave as a true Rec.709 SDR signal, bypassing any internal HDR signaling or color conversions. This ensures that the HDMI output matches the original stream characteristics as closely as possible (except for legal/full range adjustments if necessary), without altering gamut, gamma, white point, or dynamic range.

After enabling the *Force SDR Display Mode* setting, you must restart the Streaming Player app for the changes to take full effect.

Dolby Vision Remap

If the stream contains Dolby Vision metadata, a Dolby Vision logo will appear in the navigation bar of the GUI. In the Streaming Player App preferences, you can select **Dolby Vision Remap** and choose one of the Dolby Vision target options that you want to see, such as [Auto], [SDR], [600 nits], [1000 nits] and [2000 nits].

This setting controls the content mapping in the Streaming Player App itself. It allows previewing any target via the application, such as SDR, and not just a "fixed" remap performed on your television.



Selecting Dolby Vision target remap options

Audio Stream on Apple TV

The Apple TV Streaming Player application supports stereo only (2-channel) audio output over HDMI. However, the audio stream can be configured with up to 8 separate audio channels. The application will display all eight audio channels in the GUI and will mix them down to stereo configuration for monitoring, e.g. mixing down 5.1 (L, R, C, LFE, Ls, Rs) to stereo.

Screen Capture

In order to protect sensitive content, all forms of screen capturing is blocked in Streaming Player, such as taking screenshots or recording screen content.

9.5.3. iOS Devices

Installation on iPad/iPhone

To install the Streaming Player App on your iOS device, such as an iPad or iPhone, please follow these steps:

1. On your iOS device, open the App Store.

2. In the App Store app, search for ‘colorfront’ or 'streaming player'.

3. Locate the Streaming Player app and tap [Get] to download it.
4. Once the download is complete, return to the main screen and tap the Streaming Player App icon to open it.

5. Before connecting to a stream using the Streaming Player App, you need to verify your identity. For detailed instructions, please refer to the Email Verification for Stream Access section.

Code Generation on iOS Device

To generate a code from the Streaming Player App installed on your iPhone or iPad to access the video stream, follow these steps:

1. Open the stream invitation email. In the message click the [Join with Code on Other Device] button that will take you to the Device Login Page.
2. Open the Streaming Server application on your iPhone/iPad.
3. Place three fingers on the screen and hold it for a few seconds.
4. A 6-digit alphanumeric code will appear on the screen.

5. Go back to the Device Login Page and enter the code.

> You may use a separate device (such as your mobile phone or computer) to read the stream invitation email and then open the Device Login Page, and another device (such as an iPad) to view the stream through Streaming Player, or use the same device for both.

6. Once the code is validated, the stream will automatically start on your iPad/iPhone.
7. Closing the application will stop streaming data on the iOS device, but as long as the streaming session is live, you can rejoin the stream by reopening the Streaming Server app.

Brightness Configuration

Image brightness must be set up in different ways for proper viewing depending on whether the goal is to critically review the content with an iOS device, such as an iPad Pro. In addition, brightness configuration depends not only on the dynamic range of the footage (SDR or HDR), but also on the display used for

viewing it.

There are two use cases when adjusting the image brightness on iOS devices:

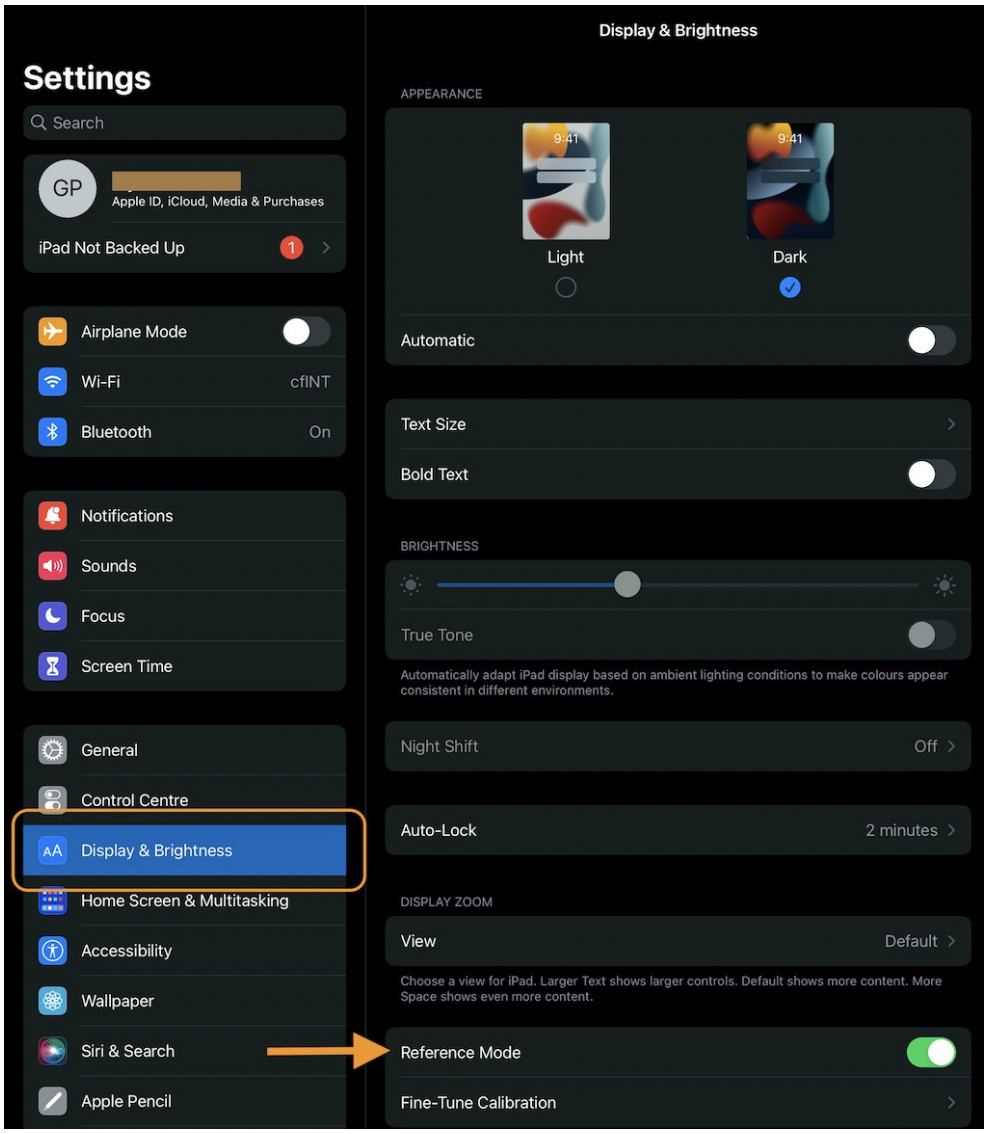
Reference mode	It is used for performing critical QC and making informed color decisions in a dark environment. When this mode is enabled, content colors and image brightness are accurate as seen on a calibrated, professional reference monitor. However, it is highly recommended using a device with an XDR display.
Non-reference mode	It is used to view technically correct image using the Streaming Player with factory default settings, in various lighting conditions, adapted to the viewing environment.

For devices with **advanced XDR display and iOS 16** (and above), use the ***Reference Mode*** in the iOS *Display & Brightness* settings. While the Streaming Player app also has an optional Reference Mode parameter, it will automatically follow this system setting.

	iOS-level reference mode requires 12.9-inch iPad Pro (5th generation or later) and iPadOS 16 or later.

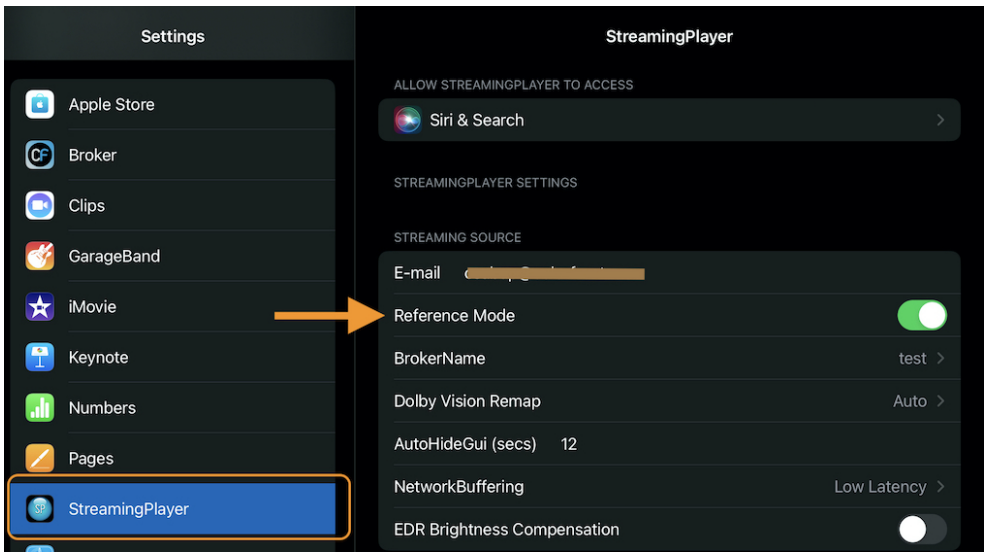
For HDR content, the Reference Mode adjusts brightness to the PQ value of the footage, while SDR images are limited to 100 nits.

	When iOS-level Reference Mode is on, the brightness slider is disabled, and true tone, auto brightness and night shift are not available.



Reference Mode in the Display & Brightness system settings

On **all other iOS devices**, enable Reference Mode in the Streaming Player app settings to see color- and brightness-accurate images as seen on a professional reference monitor.

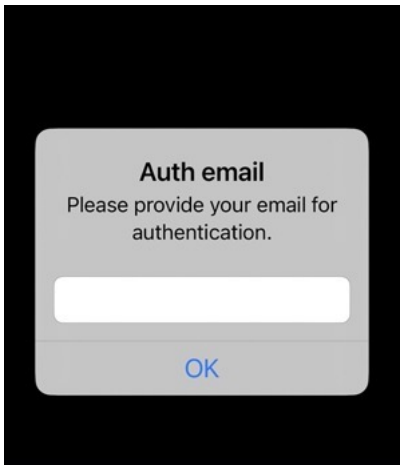


Reference Mode in the Streaming Player app settings

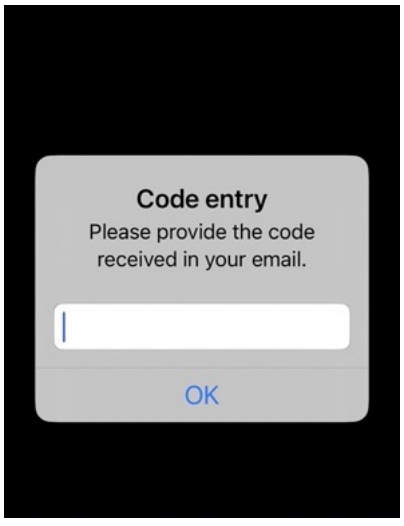
9.5.4. Email Verification for Stream Access

In order to ensure a secure and reliable experience for users of the Streaming Player App, a one-time email verification process is essential. This verification step is designed to confirm the user's identity and grant access to the app's streaming functionality. By validating the provided email address, we ensure that only authorized individuals can access the app's features. Please follow this steps:

1. Launch the Streaming Player App.
2. In the pop-up window, enter your email for one-time authentication and press [OK].

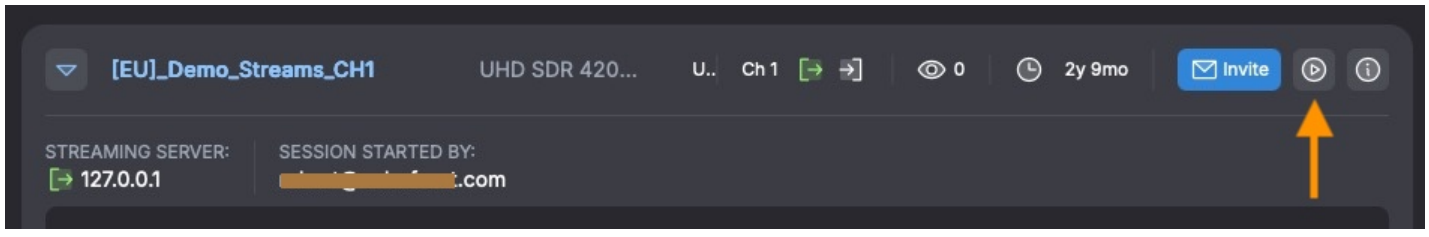


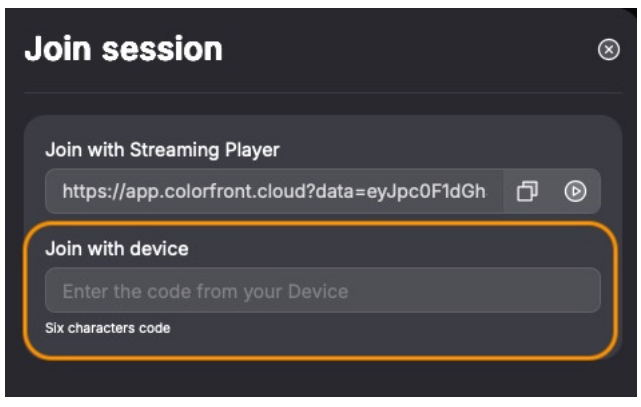
3. You will receive an email containing a verification code. Enter this code in the next pop-up window in the Streaming Player App.



4. Upon successful verification, a six-character alphanumeric access code will be displayed.

5. Enter this access code in the Stream Manager for the selected stream. On the Streams Page, click the Play button next to the streaming channel name. In the panel that opens on the left, paste the code into the *Join with device* field.



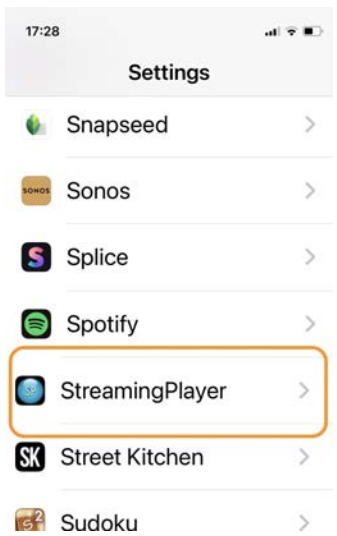


	If needed, contact your TM for assistance with the Stream Manager interface, or refer to the Streaming Server manual.

6. After entering and confirming the access code, the stream starts automatically on your iOS device or Apple TV.

9.5.5. Application Settings

Open Settings on your Apple TV or iOS device, then the Streaming Player app settings. Here you can modify the following parameters.



Selecting StP settings on iOS device

E-mail	Email identification to communicate with Colorfront's Stream Manager.
Reference Mode	For *Apple TV*, leave this setting disabled for SDR content, i.e. at 200 nits. When enabled, the brightness value is at maximum 100 nits on the HDMI HDR output, as seen on a calibrated, professional reference monitor. For *iOS devices*, see Brightness Configuration for details.
	Check the *GUI Color* parameter on the Performance page to see the maximum dynamic range (in nits) of the video output.
Dolby Vision Remap	For Dolby Vision High Dynamic Range streams, enable and set to any available target nit level options or SDR preview. Options are: [Off], [Auto], [SDR], [600 nits], [1000 nits] and [2000 nits].
Auto Hide GUI	Enter any value that specifies the number of seconds after which the bottom navigation bar automatically disappears from the GUI. Default is 12 seconds.
Network Buffering	Specifies how much error correction the streaming application should perform in terms of latency. Options are: [Ultra Low Latency], [Low Latency], [Balanced] (default) and [Reliable].
Disable User Interaction	Deactivate all user interaction to prevent any interference with the stream.

Version	Displays the build version of the installed Streaming Player application.

9.6. Hardware Configurations

9.6.1. Minimum Hardware Requirement

The minimum hardware requirement for the Streaming Player application is as follows:

Minimum **Windows** *hardware requirement*

CPU	i5-8400 or faster for desktop, i5-8300H or faster for mobile
Memory	16+ GB dual channel DDR4-2400 or faster
GPU	RTX4000 or faster for desktop, T1000 or faster for mobile (minimum PCIe x16 Gen3 slot)
Display	HD resolution or above

On client-side systems, 444 hardware decoding is only supported by NVIDIA **Turing** GPUs, such as T1000, T2000 and RTX4000.

Pascal GPUs are also supported, but their decoding capability is limited to 420. If you use a Pascal GPU for 444 formats, decoding will be performed on the CPU of the system, which can affect performance.

Supported **Mac** *hardware*

Memory	8+ GB

- **Intel MacBook Pros** 2019 or later with AMD GPU
- **MacBook Pro with Apple Silicon**
- **Mac mini with Apple Silicon**
- **iMac with Apple Silicon**
- **Mac Pro** 2019 or later with AMD GPU

9.6.2. Recommended Configurations

Recommended hardware configurations for the Streaming Player are the following:

Mac mini configuration

Workstation	Apple Mac mini. See here.
CPU	Apple Silicon
Memory	16 GB unified memory
Storage	256GB SSD

Display	SDI/HDMI monitor connected to the AJA T-Tap Pro or Black Magic Design UltraStudio 4K Mini, or a directly connected XDR display

Example Windows PC configuration

Workstation	HP Z2 Tower. See here.
CPU	Intel® Core™ i9-9900 processor. See here.
Memory	Minimum of 2x8GB. Recommended: 2x16GB
Storage	256GB SSD
GPU	NVIDIA Quadro RTX 4000, driver version 442.50
SDI/HDMI	AJA KONA 5 or Blackmagic Design DeckLink Mini Monitor 4K
Monitor	A screen resolution of at least 1920x1080 is required. A resolution of 2560 or 3840 is recommended.

Example 1RU Rack Mount Chassis Configuration

Workstation	SuperChassis 514-R407W. See here.
Motherboard	X11SPW-TF. See here.
CPU	Intel® Xeon® Silver 4210R processor. See here.
Memory	Minimum of 2x8GB. Recommended: 2x16GB
GPU	NVIDIA Quadro RTX4000, driver version 442.50
SDI	AJA KONA 5 and BMD DeckLink Mini Monitor 4K

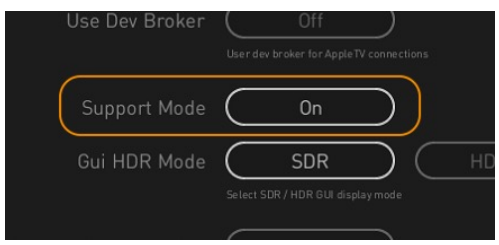
Example Laptop Configuration

Laptop	HP ZBook 15 G6 Mobile Workstation with Windows 10 Pro or Windows 11. See here.
CPU	Intel® Core™ i9-9880H vPro™ processor (2.3 GHz, up to 4.8 GHz with Turbo Boost, 16 MB cache, 8 core). See here.
Memory	32 GB (4x8 GB) DDR4 2666
GPU	NVIDIA® Quadro® T1000 (4 GB GDDR5 dedicated)
SDI	AJA Io4K+ or Blackmagic UltraStudio 4K Mini
Display	15.6" diagonal UHD B-LED UWVA Anti-Glare DreamColor slim (3840x2160) (600 nits)

9.7. Troubleshooting for Streaming Player

9.7.1. Support Mode

If you need remote assistance from our Support Team regarding the Streaming Player, please switch the software to ***Support Mode*** in the Advanced Settings.



In this mode, although the default Disabled Screen Capturing is still on, the GUI will only appear with the Settings Page on the computer screen. While streaming continues, the streamed image will still be blocked and not appear on the GUI, or on any remote screen connected via remote desktop software, such as *TeamViewer*. This mode allows our Support Team to configure settings to resolve any issues with the Streaming Player.

9.7.2. Color Coding for Status Icons

By examining the status icons and their color code, you can easily determine whether the streaming is working properly or not. The color coding is as follows:

Green icons signify normal operation.

Yellow indicates borderline performance values.

Red signifies an error in the stream.

Gray represents that the corresponding element of the streaming pipeline is disabled.

Remote Control Status

Status	**Remote Control Status**
Icon	
Green	The ***Remote Control Mode*** setting from the remote machine is enabled and the streaming server's API is accessible.
Red	The above setting is enabled, but there is an error connecting to the streaming server's API.
Gray	The above setting is disabled.
Troubleshooting	There is a possible firewall issue on the streaming server's side. The remote control API is only available when streaming straight from a Colorfront product such as Transkoder, QC Player, OSD or ExD. Remote controlling cannot be enabled if the server is a Colorfront Streaming Server or an SRT gateway/HUB.

Stream Connection Status

Status	**Stream Connection Status**
Icon	
Green	The Streaming Player is able to receive/decode the stream.
Red	The incoming, configured stream is not accessible.
Troubleshooting	Please check the configured IP address and port number settings on the Settings Page. Please check if the server is running on the correct port and is in listening mode. If all these settings are correct, there is probably a firewall or network configuration issue. Please contact your IT administrator.

Encryption Status

Status	**Encryption Status**
Icon	
Green	The passphrase is correct on both sides. Thus, the stream is encrypted and can be decrypted properly by the client.
Red	There is no passphrase specified on the client side, or it is incorrect.
Gray	No passphrase is set on the server side, so the stream content is not encrypted.
Troubleshooting	Please check that you entered the passphrase correctly.  If no passphrase is specified on the server side, the stream will not be encrypted. In this case, the client does not need to add a passphrase either. However, if a passphrase is specified on the server side, the stream will be encrypted, but will only work if the same passphrase is entered on the client side.

Stream Quality Status

Status	**Stream Quality Status**
Icon	
Green	Smooth operation. The stream arrives properly and is played back in real time.

Status	Stream Quality Status
Yellow	The stream arrives, but packet recovery is reaching its upper limit. If this state persists, operational issues may arise.
Red	Packet loss exceeds 30%.
Gray	No stream available.
Troubleshooting	Please check the values for *Packet loss rate* and *Lost/Drop/Fixed* on the Performance page. • If the packet loss rate is above 25%, the bitrate is too high for the current network connection. Please decrease the bitrate. • If the Drop value is greater than 0, there is a possible network quality and/or connection issue. Please decrease the bitrate or check your network connection.

Performance Status

Status	Performance Status
Icon	
Green	Smooth performance. The hardware is capable of decoding the arriving stream in real time.
Yellow	"Local performance" issue: Frame processing takes longer than real-time periodically. "Remote performance" issue: The server side cannot render the stream in real time.
Red	Frame processing takes longer than real-time permanently. As a result, latency is constantly increasing.

Status	Performance Status
Troubleshooting	If indicates yellow "Local performance" issue: Set the ***Network Buffering*** parameter from [Ultra Low Latency] to [Low Latency], or from [Balanced] to [Reliable] in the Advanced Settings so that the system can compensate for periodical delays without dropped frames. If indicates yellow "Remote performance" issue: Check what is causing the performance problem on the server side. Server hardware capacity may be insufficient. If red: The hardware is incapable of rendering the stream. You can either: • use the recommended configurations, • decrease stream resolution, and/or • switch to 4:2:0 video chroma format. To achieve optimal performance with [Ultra Low Latency], it is recommended to switch the streaming server to PCM audio. Unlike the default AAC option, which delivers compressed audio, PCM offers lossless quality. Despite the higher data rate, PCM provides superior quality and reduced latency.

Video IO Status

Status	Video IO Status
Icon	
Green	Video IO output is enabled and working properly.
Yellow	There has been a frame drop within one minute but not within 10 seconds.
Red	There has been a frame drop within 10 seconds. Alternatively, there is a possible conflict between the video IO settings and the stream format. In this case, more information is available on the Performance page.
Gray	Video IO output is either unavailable or turned off.
Troubleshooting	Other issues may have been culminated here. Please check if there are any other status icons that indicate an error, and if so, refer to the corresponding troubleshooting descriptions above. If red permanently, and no other icons indicate an error, please check the video IO board drivers and their configurations.

10. Security Hardening

Colorfront offers a safe and secure remote streaming solution using the SRT (Secure Reliable Transport) Protocol and 256-bit AES encryption, which ensures that content is protected even when transmitted over the public internet.

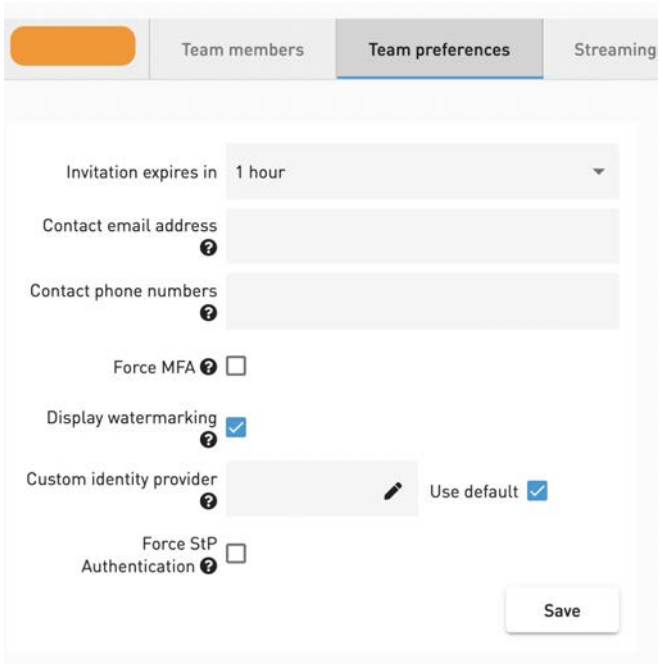
To further enhance system safety and ensure studio-level security, you can take the following measures:

- **Forensic and Visible Watermarking**: NexGuard forensic watermarking and visible watermark burnt into the pixels provide additional protection. Enable these features in the Streaming Channel 1-4 in the Advanced settings.
- **Force Disable SDI Output**: You can set the *External Video Output* setting from the default to [Prohibited] to disable the external SDI video output on the Streaming Player.
- **Remote Control REST API Considerations**: For added security, you can either restrict or deny the remote control access to your system. To do this, the following line needs to be set in the Startup XML: `<RemoteControlRESTmode type="string" enum="off,playback,full">off</RemoteControlRESTmode>`
  - To *limit* remote control access, set this parameter to `playback` mode, which only allows playback controls.
  - The `off` option *disables* the remote control REST API on port 1973 to prevent anyone from accessing sensitive data over the local network. While this will deactivate the remote control option and the use of the Colorfront Web UI, it provides a more secure system.
  - *Only if* you need web control access, set it to `full` and run the Apache components on your system.
- **10-Character Long Passphrase**: For best security, use a randomized password of at least 10 characters in case of *direct streaming*. When using Colorfront's Stream Manager, however, the system automatically populates the stream parameters, such as the passphrases for the available streaming channels.
- **Firewall Setup Considerations**: If you are working in a high-security corporate network environment, and your outgoing traffic is restricted or filtered, you must open the required ports on the UDP protocol to allow outgoing streams. A separate open port is required for each streaming channel.

10.1. Hardening in the Stream Manager

Colorfront's proprietary cloud-based Stream Manager provides a strong and secure streaming session management interface with additional features to enhance protection, such as forced studio-grade security with individual email invites that cannot be shared. It is always advisable to use the Stream Manager for streaming, as all connection information remain hidden in the system, ensuring that unauthorized persons cannot access the stream.

Team Managers of the Stream Manager can enforce a range of security features globally in their organization, making sure these security measures are applied to all streams within the group:



Hardening in the Stream Manager

- **Invitation Expiration**: Default value is 1 hour.
- **Force Multi-Factor Authentication for Team Members**: Users on your team will be forced to set up MFA and secure their accounts. Enabling this setting will force you to secure your account as well.
- **Display Watermarking in Players**: This setting forces all channels to be using the watermarking. You can also set the watermarking option per-channel in the Streaming Servers view. Users joining the team's sessions will see a watermarking text burned into the display when this option is turned on. This watermarking is the email address of the invited user and a random string that identifies the user (can be searched in activity logs).
- **Custom Identity Provider**: It allows members of an enterprise team to authenticate through the company's identity provider.
- **Force Streaming Player Authentication for All Viewers**: Viewers receiving invitation from your team can only join the session after logging in and verifying their account. If you specify a custom identity provider, viewers must authenticate through the identity provider you defined.

10.2. Restricting Network Communication

If you are using the Stream Manager, open port 443 to allow communication between Streaming Server and the Stream Manager on TCP protocol. Regarding the necessary port numbers to open, please contact your Stream Manager administrator.

Using Gateway: If you use your own Gateway service, enable inbound traffic for the ports that you have configured in AWS.

Direct Streaming: For direct streaming, you must also set a NAT (Network Address Translation) service on the firewall to allow secure direct access. Please contact your network administrator.

See the following table for details on the protocol and port settings required for the various streaming setups.

	Direction	Protocol	Port	Destination
Using Stream Manager				

	Direction	Protocol	Port	Destination
Stream Manager API	Out	TCP	443	stream.colorfront.cloud
Streaming channels	Out	UDP	Colorfront provides information per channel after provisioning	
Using Streaming Gateway service				
Gateway API	Out	TCP	443	your gateway address
Streaming channel in [Listener] mode	In	UDP	Streaming channel settings/Port	
Streaming channel in [Caller] mode	Out	UDP	Listener port configured at your gateway's route	your gateway address
Direct streaming				
Streaming channel in [Listener] mode	In	UDP	Streaming channel settings/Port	
Streaming channel in [Caller] mode	Out	UDP	Listener port configured at your streaming destination	your destination address

Appendix A: Settings Page

Pressing *Tab* or selecting the corresponding menu item from the drop-down menu opens the Settings Page, where you can adjust the project settings.

Hold the right mouse button to scroll up and down the page.

Press the *A* key while on the Settings Page to view Advanced settings.

Settings Page	Description
Streaming Channel 1-4	Settings for streaming channel 1/2/3/4 with separate Advanced section for each
Network	Network settings
CDI	CDI settings
Stream Manager	Stream Manager settings

A.1. Streaming Channel 1-4 Settings

Setting	Description	Note
Resolution	Resolution of the stream	Options: [SameAsSource], [HD], [2K], [UHD], [4K] , [8K]
Input Color Space	Set the color space of the input signal [Auto] means that the color space follows the source metadata	Options: [Auto], [HD709], [HDR10], [P3D65PQ], [HLG], [P3DCIGamma26], [XYZGamma26], [P3D65Gamma22], [P3D65Gamma26], [Bypass]
Output Color Space	Set the color space of the output signal [Auto] follows the current setting of the **Input Color Space**	Options: [Auto], [HD709], [HDR10], [P3D65PQ], [HLG], [P3DCIGamma26], [XYZGamma26], [P3D65Gamma22], [P3D65Gamma26], [Dolby Vision]
Bitrate	Output stream bitrate in Mbps	
Address	Destination address	
Port	Destination port number	
Connection Type	Selects the connection mode for streaming via an SRT gateway	Options: [Listener], [Caller]
Encryption Passphrase	10-80 characters passphrase for encryption, where empty means no encryption on outgoing stream	For P2P configuration only!

Setting	Description	Note
Visible Watermark	Add text to burn into the video stream	
Visible Watermark Transparency	Transparency of text to burn into the video stream	

A.1.1. Advanced Streaming Channel 1-4 Settings

Setting	Description	Note
Audio Encoder	Audio encoding format	Options are [AAC] or [PCM]
Audio Channel Count	Number of audio channels	Options are [8] or [16]
B Frames	B frame number in GOP pattern	
Video Chroma Format	Video chroma format of the stream	Options: [4:2:0] or [4:4:4]
Enable Audio	Enable audio stream	
Stream Waveform	Enable to send the waveform of the image in the stream (instead of the image itself)	
Streaming Output Format	Stream output format	Options: [RTP] or [SRT]
Connection Timeout	Connection timeout in Msec	
Watermarking	Enable forensic watermarking	
Watermarking ID	Payload ID for forensic watermarking	
External Video Output	Allow external video output on Streaming Player	Options: [Allowed], [Prohibited]
Streaming Log Database	Target path for the streaming log database	
Halved HFR Stream	Enable it to halve frame rate in HFR modes by dropping every second frame	
Custom Input LUT	Enable to apply custom input LUT to the stream	
Secondary Stream	Enable an alternative lower latency viewing option	
Secondary Stream Target	Use [WebRTC](default) or [Gateway] for the secondary stream	

A.2. Network Settings

Ethernet-1 and Ethernet-2

Setting	Description	Note
DHCP	When DHCP is enabled, the system will automatically obtain an IP address	
IP Address	IP address if DHCP is disabled	
Subnet Mask	Subnet mask if DHCP is disabled	
Default Gateway	Default Gateway if DHCP is disabled	
DHCP DNS	When DHCP DNS is enabled, the system will automatically obtain the DNS servers	
DNS Server 1	DNS Server if DHCP DNS is disabled	
DNS Server 2	Alternative DNS Server if DNS DHCP is disabled	

General

Setting	Description	Note
Shared IP for Direct Stream	Enter the IP address to be used for invite link generation	If empty, the invite link will use the local IP address

A.3. CDI Settings

Setting	Description	Note
CDI Adapter IP	IP address for the CDI EFA Adapter	Default is: `127.0.0.1`
CDI Port / Input A	Listening port for Input A	Default is: `2000`
CDI Port / Input B	Listening port for Input B	Default is: `2001`
CDI Port / Input C	Listening port for Input C	Default is: `2002`
CDI Port / Input D	Listening port for Input D	Default is: `2003`

A.4. Stream Manager Settings

Setting	Description	Note
Manage SRT Gateway	Manage the SRT gateway destinations	
Use Stream Manager	Enable Stream Manager for stream configuration	
P2P Streaming with Manager	Manager direct stream sessions via the Stream Manager	Further configuration is required. Please contact your Super Admin.
Stream Manager Address	IP address or host name of the SRT gateway	
Stream Manager User	SRT Gateway username	
Stream Manager Password	Password for Stream Manager/SRT Gateway username	
Streaming Player License	Optional license for Streaming Player application to embed into invite link	

Appendix B: Keyboard Shortcuts

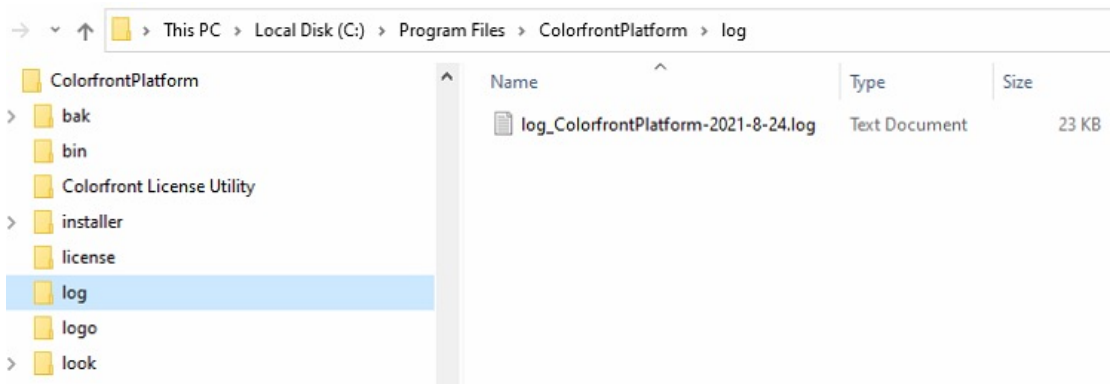
Shortcuts used in Streaming Server are listed below.

Keyboard Shortcut	**Command**
Ctrl+*T*	Timecode on Image
Tab	Settings
A (while on Settings Page)	View Advanced settings
Shift+*Enter*	Four-channel view
F9	Cycles through channels 1-4 for quadrant 1
F10	Cycles through channels 1-4 for quadrant 2
F11	Cycles through channels 1-4 for quadrant 3
F12	Cycles through channels 1-4 for quadrant 4
F5	Toggles image/waveform view for quadrant 1
F6	Toggles image/waveform view for quadrant 2
F7	Toggles image/waveform view for quadrant 3
F8	Toggles image/waveform view for quadrant 4
Alt+*/*	About

Appendix C: Troubleshooting

Should any issues or questions arise, please Contact Customer Support. In order to provide you with support as efficiently as possible, please collect the following files and attach them to your support request:

- **Log file** for Streaming Server - saved immediately after the problem occurred. Log files are stored in the \Program Files\ColorfrontPlatform\log folder.



- **Crash dump files** - Crash dump files are saved in the \Program Files\ColorfrontPlatform\bin folder.
- **Any** possibly **related** non-sensitive **metadata or sample file**.

C.1. Log Viewer

The Log Viewer is available in the Streaming Player App for both AppleTV and iOS devices. It provides the capability to inspect application logs, assisting in debugging and issue resolution.

Apple TV

To activate the Log Viewer on AppleTV, follow the swipe sequence on the remote control: left, right, right, left, left.

To exit the viewer, simply use the back button.

iOS Devices

On iPad and iPhone devices, the Log Viewer can be activated with the sequence: tap, double tap, double tap, tap.

To exit on iOS, you can use the dedicated exit button or swipe in any direction.

Appendix D: Copyright, License and Trademark Notices

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Freetype 2.3.9, 2.3.5
FreeType License (FTL)
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http://www.freetype.org/FTL.TXT

FTGL 2.1.3
GNU LESSER GENERAL PUBLIC LICENSE
Version 2.1, February 1999

FTGL - OpenGL font library
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Copyright © 2008 Sam Hocevar <sam@zoy.org>
Copyright © 2008 Sean Morrison <learner@brlcad.org>
http://ftgl.sourceforge.net/docs/html/index.html

Inconsolata font
SIL OPEN FONT LICENSE
Version 1.1 - 26 February 2007

Created by Raph Levien using his own tools and FontForge. Copyright 2006 Raph Levien. Released under the SIL Open Font License, http://scripts.sil.org/OFL.

Python 2.5.4 , 2.6, 2.7.4
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LIBXML2 and LIBXSLT2

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Chromium Embedded Framework

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