BRIDGE LIVE

Video I/O and Streaming Appliance

Installation and Operation Guide

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AJA VIDEO SYSTEMS

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Contents

Chapter 1 – Introduction

Overview

BRIDGE LIVE is a broadcast quality, low latency turnkey system for REMI, Synchronous Multi-Channel Video Contribution, Remote Collaboration, Direct to Audience Streaming, and Multi Bit Rate/Format Delivery.

NOTE: REMI is an acronym used in the broadcast industry for Remote Model Integration and is sometimes called "at home" production with a broadcast workflow where content is captured live at a remote location while production is performed at a main studio.

Equipped with 12G-SDI I/O plus the power and flexibility to enable real time bidirectional encoding, decoding, and transcoding for critical UltraHD and HD workflows, BRIDGE LIVE is an essential part of any modern live video production toolkit. A compact and robust 1RU form factor with redundant power supplies and a 3 year warranty means peace of mind even when dealing with the most demanding applications.

Whether facilitating remote production, two-way interviews, live event streaming, synchronous multi-cam backhaul with HDR, cloud contribution, program return, confidence monitoring, collaborative production, or ABR ladder profiles to hand-off for OTT packaging, BRIDGE LIVE ensures simultaneous, secure, and stable workflows whether over private lines or the public internet.

AJA and Comprimato

BRIDGE LIVE represents an exciting partnership between AJA and Comprimato, both long standing industry innovators. The merging of AJA's hardware development and video I/O expertise with Comprimato's transcoding and internet transport know-how means customers can expect the versatility, speed, and quality needed for that competitive edge. The unique fusion of company talent between AJA and Comprimato ensures that BRIDGE LIVE delivers the performance, reliability, and ease of use needed for critical live encode, decode, or transcode needs.

Features

- 12G-SDI/3G-SDI I/O supports Multi-Channel HD or UltraHD as standard
- Bidirectional Encode/Decode/Transcode; NDI, H.265 (HEVC), H.264 (AVC, MPEG-4), H.262 (MPEG-2), and with optional licenses JPEG 2000 (TR-01), and JPEG XS (TR-07)
- Synchronous Multi-Channel / Multi-System Transport for SDI backhaul or Cloud Delivery
- Protocols; SRT, UDP, HLS, RTP, RTMP/S (output), MPTS (input)
- Transports; MPEG-TS, NDI, AVC-TS, Fragmented MP4 (input)
- SRT Bonding for Redundancy
- Multiple NDI Discovery Server support
- Supports NDI Groups
- Multi bit rate/format distribution, ABR Ladder Profiles for OTT hand-off.
- Selectable profiles for 10-bit and 8-bit, 4:2:2 and 4:2:0

- Unmatched Metadata capabilities including MPEG-2 ANC, SMPTE 2038, Ad insertion markers (SCTE-35/SCTE-104), CC/Subtitles (EIA-608/708, Line 21, H.264 SEI)
- HDR/SDR from SDI source to SDI destination in BRIDGE LIVE end-to-end configurations
- Remote WebUI or local GUI for easy administration, control, and operation
- Monitoring, Control, and Automation supported via REST API or SNMP
- Turnkey 1RU rack-mountable, enterprise-class form factor
- Dual 10GbE interface for control and transport
- Dual power supplies for critical application redundancy
- Three year warranty

Metadata

BRIDGE LIVE allows the pass through of metadata, and supports various codecs, protocols,and transports:

- Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC)
- Closed Captioning (EIA-608/708 including conversion)
- CC/Subtitles embedding into H.264 SEI messages
- SDR/HDR Transfer Characteristics, Colorimetry + Luminance
- Timecode
- Ad insertion markers (SCTE-35/SCTE-104) pass through
- Line 21 captions
- Electronic program guide (EPG) on input

NOTE: "End-to-End SDI Transport" refers specifically to workflows where the first BRIDGE LIVE is receiving SDI and sending IP video to a second BRIDGE LIVE, which is receiving IP video and outputting SDI.

NOTE: End-to-End SDI workflows support HDR transport (SDI to IP to SDI), but this is only possible when the IP Video format supports 4:2:2, 10-bit and as such, is a function of using either H.264 (AVC) 4:2:2, 10-bit (HQ), JPEG 2000 TR-01 4:2:2, or JPEG XS TR-07, 10-bit.

Encoding and Decoding Protocols Supported

BRIDGE LIVE supports encoding from SDI to Stream, and decoding from Stream to SDI. Encoding and decoding between SDI, JPEG 2000 and JPEG XS streams is also fully supported (watermark removed), with installation of optional licenses. Transcoding between any Stream input and Stream output is also supported.

See *Table 1 "SDI to Stream Encoding" on page 10, Table 2 "Stream to SDI Decoding" on page 11* and *Table 3 "JPEG XS (TR-07) Encoding Efficiency Mbps" on page 12* for detailed signal specifications. The table values are recommendations only. Bit rate value settings should consider available network throughput for each channel.

Table 1. SDI to Stream Encoding

Codec/Quality	HD (1080p)	UltraHD	Protocol	Transport	Metadata
NDI UYVY 4:2:2, 8-bit P216 4:2:2, 16-bit	4x up to 60p 105-165 Mbps	3x up to 60p 4x up to 30p 150-312 Mbps	NDI	NDI	
H.265 (HEVC) 4:2:0, 8/10-bit	4x up to 60p 5-12 Mbps	1x up to 60p 2x up to 30p 35-110 Mbps	HLS RTP SRT UDP	AVC-TS MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC) Encoding: SCTE-104 to SCTE-35 conversion
H.264 (AVC) 4:2:0, 8-bit	4x up to 60p 8-15 Mbps	1x up to 60p 2x up to 30p 40-75 Mbps	HLS RTP RTMP/S SRT UDP	AVC-TS MPEG-TS MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC) Encoding: SCTE-104 to SCTE-35 conversion Subtitles embedded within H.264 SEI messages
H.264 (AVC) 4:2:2, 10-bit (HQ)	4x up to 30p 2x up to 60p 50-75 Mbps	1x up to 30p 80-120 Mbps	HLS RTP RTMP/S SRT UDP	AVC-TS MPEG-TS MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC). Supporting SDR/HDR Transfer Characteristics, Colorimetry and Luminance Encoding: SCTE-104 to SCTE-35 conversion Subtitles embedded within H.264 SEI messages
H.262 (MPEG2) 4:2:0, 8-bit	4x up to 30p/60i 8-15 Mbps		RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC) Encoding: SCTE-104 to SCTE-35 conversion
H.262 (MPEG2) 4:2:2, 8-bit (HQ)	4x up to 30p/60i 10-20 Mbps		RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC) Encoding: SCTE-104 to SCTE-35 conversion
JPEG 2000 TR-01 4:2:2, 10-bit	4x up to 60p 80-220 Mbps	1x up to 60p 2x up to 30p 200-800 Mbps	RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC). Supporting SDR/HDR Transfer Characteristics, Colorimetry and Luminance Encoding: SCTE-104 to SCTE-35 conversion
JPEG XS 4:2:2 10-bit	4x up to 60p. Possible to increase count, depending on remaining resources 180-400Mbps	1x up to 60p 2x up to 30p 360-1600 Mbps	RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG2 ANC). Supporting SDR/HDR Transfer Characteristics, Colorimetry and Luminance Encoding: SCTE-104 to SCTE-35 conversion

Table 2. Stream to SDI Decoding

Codec/Quality	HD (1080p)	UltraHD	Protocol	Transport	Metadata
NDI UYVY 4:2:2, 8-bit P216 4:2:2, 16-bit	4x up to 60p 105-165 Mbps	3x up to 60p 3x up to 30p 150-312 Mbps	NDI	NDI	
NDI HX (1, 2, 3) 4:2:0, 8-bit	4x up to 60p 9-16 Mbps	1x up to 60p 2x up to 30p 19-30 Mbps	NDI HX	NDI	
H.265 (HEVC) 4:2:0, 8/10-bit	4x up to 60p 5-12 Mbps	1x up to 60p 2x up to 30p 35-110 Mbps	HLS RTP SRT UDP	Fragmented MP4, AVC-TS MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC)
H.264 (AVC) 4:2:0, 8-bit	4x up to 60p 8-15 Mbps	1x up to 60p 2x up to 30p 40-75 Mbps	HLS RTP SRT UDP	Fragmented MP4, AVC-TS MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC)
H.264 (AVC) 4:2:2, 10-bit (HQ)	4x up to 30p 2x up to 60p 50-75 Mbps	1x up to 30p 80-120 Mbps	HLS RTP SRT UDP	Fragmented MP4, AVC-TS MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC), supporting SDR/HDR Transfer Characteristics, Colorimetry and Luminance
H.262 (MPEG2) 4:2:0, 8-bit	4x up to 30p/60i 8-15 Mbps		RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC)
H.262 (MPEG2) 4:2:2, 8-bit (HQ)	4x up to 30p/60i 10-20 Mbps		RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC)
JPEG 2000 TR-01 4:2:2, 10-bit	4x up to 60p 80-220 Mbps	1x up to 60p 2x up to 30p 200-800 Mbps	RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG-2 ANC), supporting SDR/HDR Transfer Characteristics, Colorimetry and Luminance
JPEG XS 4:2:2 10-bit	4x up to 60p. Possible to increase count, depending on remaining resources 180-400Mbps	1x up to 60p 2x up to 30p 360-1600 Mbps	RTP SRT UDP	MPEG-TS MPEG-TS MPEG-TS	End-to-End: Generic SDI VANC metadata via SMPTE 2038 ANC (MPEG2 ANC). Supporting SDR/HDR Transfer Characteristics, Colorimetry and Luminance

Table 3. JPEG XS (TR-07) Encoding Efficiency Mbps

Format	Minimum	Maximum
720p 59.94	92	221
720p 50	77	184
1080i 29.97	104	249
1080i 25	86	207
1080p 59.94	207	497
1080p 50	173	415
2160p 59.94	829	1989
2160p 50	691	1659

Hardware Description

Chassis Front

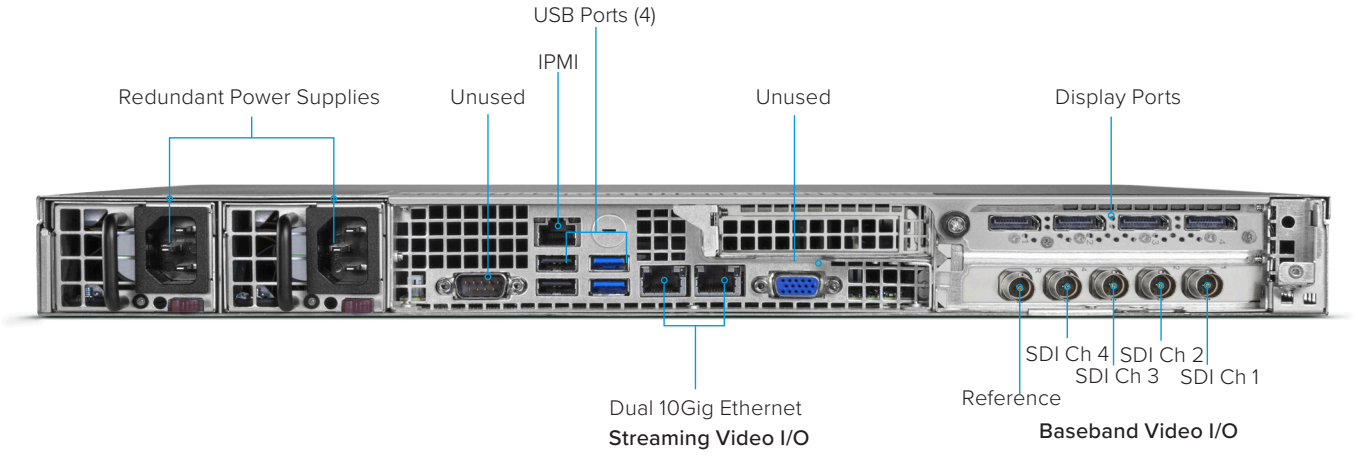
Figure 1. BRIDGE LIVE Chassis Front View

Chassis Power Button

The main power switch is used to apply or remove power from the power supply to the system. Turning off system power with this button removes the main power but keeps standby power supplied to the system. Therefore, you must unplug all system power cords before servicing.

Chassis Rear

Figure 2. BRIDGE LIVE Chassis Rear View



BRIDGE LIVE is equipped with:

- Two Redundant Power Supplies (IEC connectors)
- Two USB 3.0 (blue) connectors
- Two USB 2.0 (black) connectors
- Two 10Gb RJ-45 Ethernet connectors
- Three Display Ports for use with monitors
- One IPMI (Intelligent Platform Management Interface) RJ-45 connector
- Four bidirectional 12G-SDI connectors
- One Video Reference input port

Rear Panel Power Supply LEDs

On the rear of each power supply module an LED indicates its status as follows.

- Solid Green: When illuminated, indicates that the power supply is on
- Solid Amber: When illuminated, indicates the power supply is plugged in and turned off, or the system is off but in an abnormal state
- Blinking Amber: When blinking, this system power supply temperature has reached 63°C. The system will automatically power-down when the power supply temperature reaches 70°C and restarts when the power supply temperature goes below 60°C

Workflow Examples

REMI (Remote Production)

Since BRIDGE LIVE can be used as an encoder, decoder and transcoder, there are many advantages to its use in REMI workflows.

Additionally, BRIDGE LIVE can take independent SDI source inputs, and maintain their synchronous relationship while transporting the content to end-point destinations.

This functionality can take place between a pair of BRIDGE LIVE units for a synchronous end-to-end SDI workflow, often referred to as SDI backhaul, or site-to-site SDI workflows.

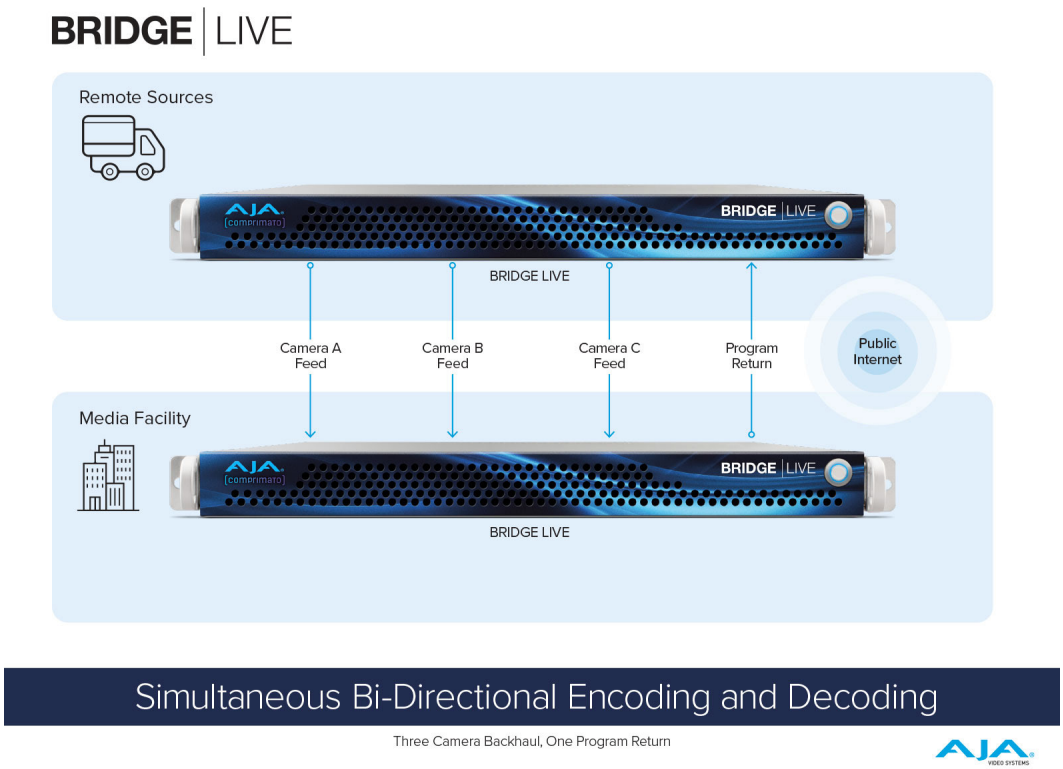
BRIDGE LIVE's synchronous multi-channel capability is also supported for cloud contribution, whereby a BRIDGE LIVE system can send to a cloud instance of Comprimato Live Transcoder software, for delivery to various platforms / cloud services as IP video.

Simultaneous Bidirectional Encoding and Decoding

BRIDGE LIVE supports simultaneous bidirectional encoding and decoding with UltraHD, HD, and SD sources.

For example, with a pair of BRIDGE LIVE systems, a broadcast facility can receive three incoming encoded HD camera sources from a remote location and decode them back into SDI for editing and production while simultaneously providing an HD program return to the remote location.

Figure 3. Multi-Channel Synchronous Transport for Backhaul



Synchronous Multi-Channel Transport for Backhaul

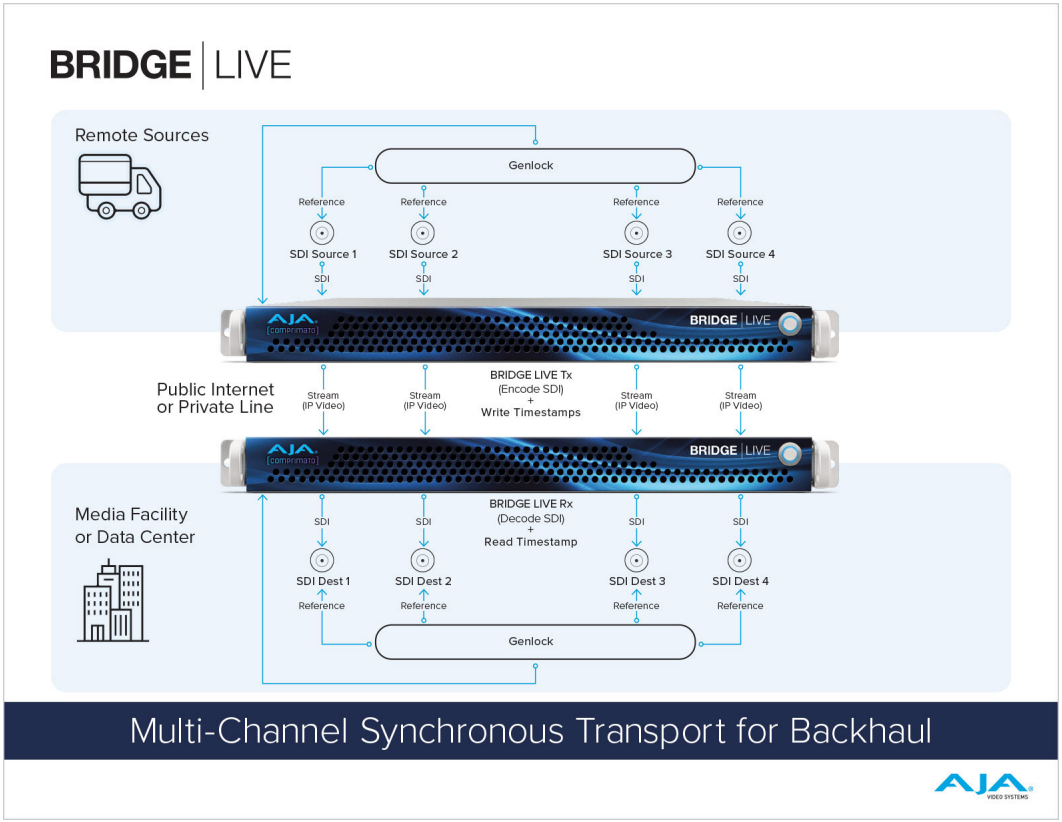
For SDI backhaul or other site-to-site SDI workflows, BRIDGE LIVE's bidirectional functionality means BRIDGE LIVE can act as an encoder or a decoder, and do so simultaneously. As such, references to BRIDGE LIVE Tx or BRIDGE LIVE Rx are only descriptions of how the unit is currently configured. A single BRIDGE LIVE unit can be configured for encode only, decode only, or a combination of both.

BRIDGE LIVE Synchronous Multi-Channel Transport functionality provides an easy and repeatable way to ensure synchronous SDI video sources can be fed to an encoding BRIDGE LIVE (Tx), then be timestamped, transported, and ultimately output from the decoding BRIDGE LIVE (Rx) with each SDI signal in lock step with each other.

Furthermore, Synchronous Multi-Channel Transport can be scaled up from a single BRIDGE LIVE pair to additional BRIDGE LIVE pairs, to enable workflows where multiple BRIDGE LIVE systems can be receiving SDI and sending to multiple BRIDGE LIVE systems outputting SDI, all in synchronicity.

For end-to-end SDI workflows, HDR is also supported.

Figure 4. Multi-Channel Synchronous Transport for Backhaul

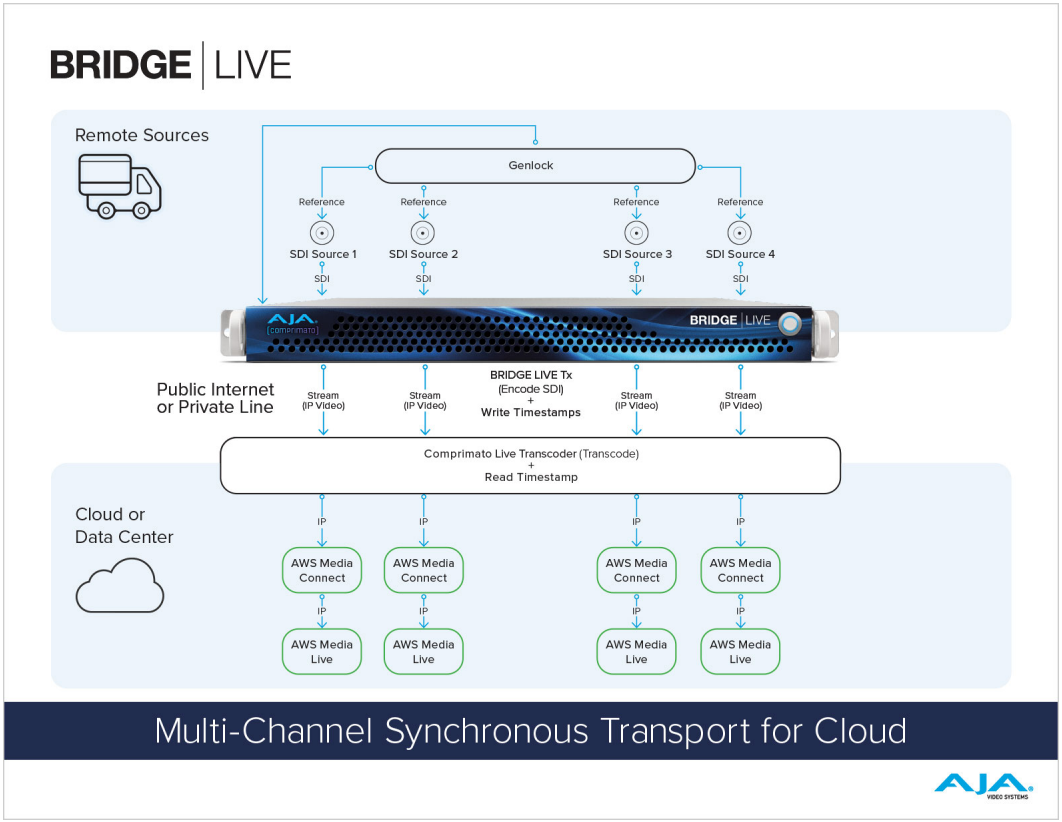


Synchronous Multi-Channel Transport for Cloud Contribution

When using individual or multiple BRIDGE LIVE systems for contribution to cloud platforms/services such as AWS (Amazon Web Services), the receiving side is supported by single or multiple instances of Comprimato Live Transcoder software. From Comprimato Live Transcoder, Synchronous Multi Channel IP Video can be handed off to 3rd party services.

NOTE: AWS references are examples. Comprimato Live Transcoder can be used as the receiver with other cloud providers/services.

Figure 5. Multi-Channel Synchronous Transport for Cloud

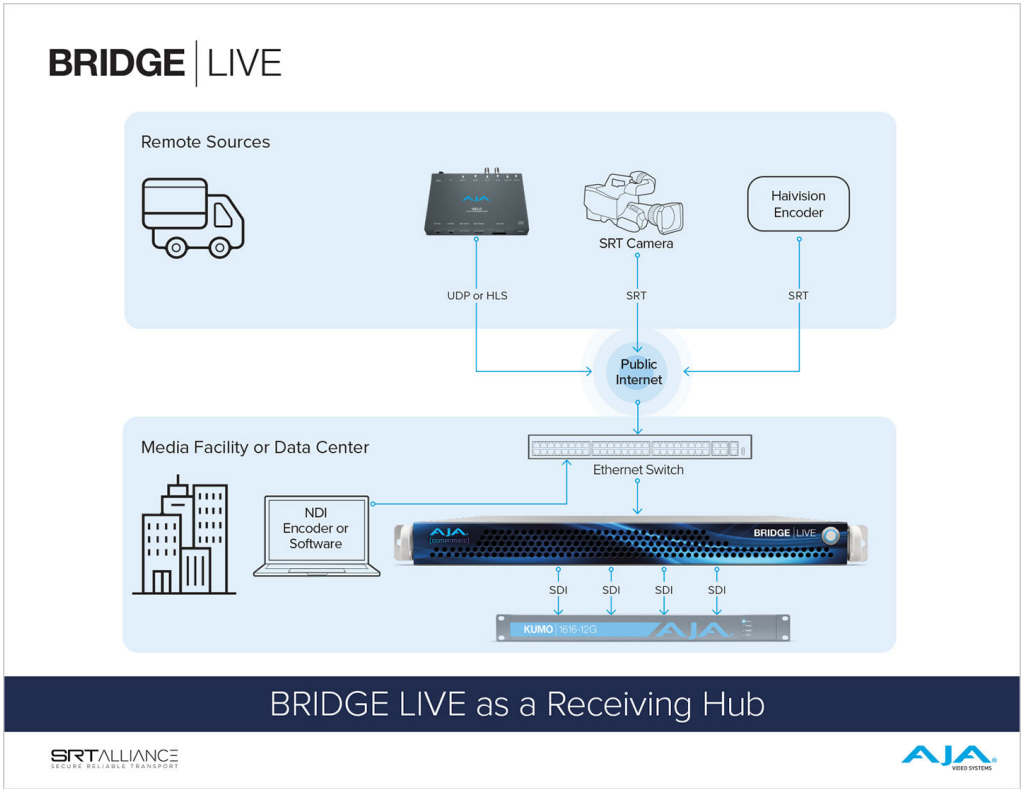


BRIDGE LIVE as a Receiving Hub

BRIDGE LIVE supports workflows where it is necessary to receive contribution streams coming from various 3rd party encoders, IP cameras, or AJA products such as HELO Plus, for conversion back/to SDI at a production facility.

For example, BRIDGE LIVE could be receiving UDP or HLS from HELO Plus, SRT from a Panasonic camera (e.g. AW-UE150, AW-UE100, AG-CX350, AJ-CX4000), SRT from a Haivision encoder (e.g. Makito X4), and NDI from AJA Bridge NDI, software such as NLE or Gaming PC, NDI cameras, or hardware based encoders such as BirdDog (e.g. Studio NDI) and Magewell (e.g. Pro Convert).

Figure 6. BRIDGE LIVE as a Receiving Hub



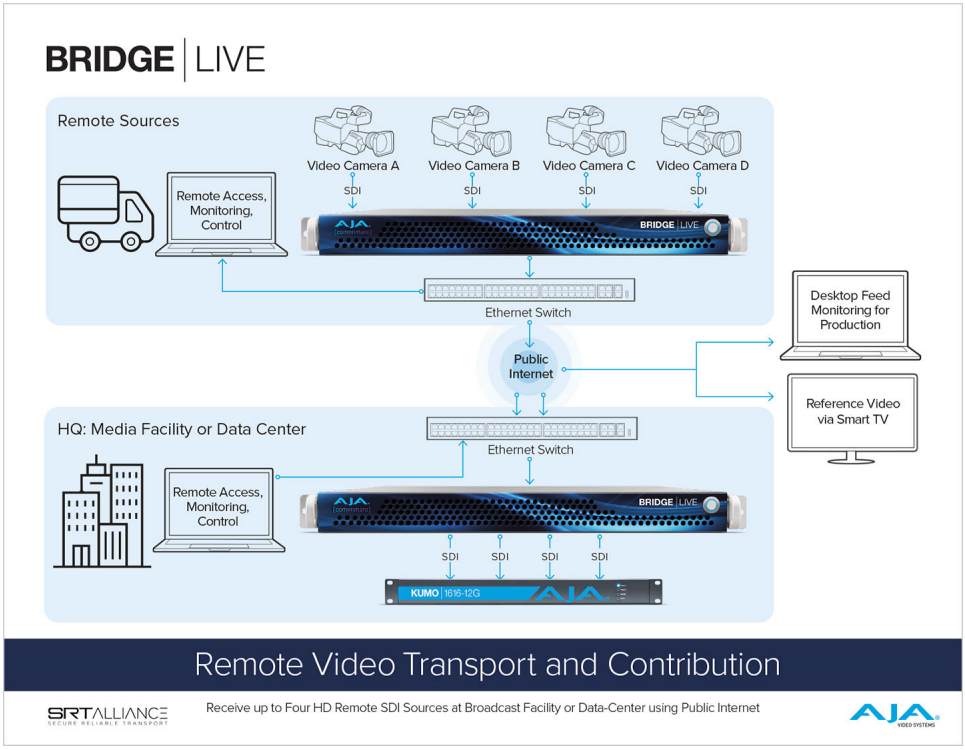
Contribution

Remote Video Transport

For Broadcast, BRIDGE LIVE provides an efficient mechanism for backhauling remote live SDI camera sources to the media production facility, in order to be converted back to SDI and made available on the internal facility SDI router for ongoing production/transmission.

Traditional secure lines for remote production can be very expensive, with additional fees being levied for time before and after a production starts and ends. BRIDGE LIVE allows source cameras and local program out to be transported using publicly available Internet, with no penalty for early or extended use during a production. BRIDGE LIVE also offers lower latency than traditional secure lines for time critical productions.

Figure 7. Remote Video Transport and Contribution



Collaboration

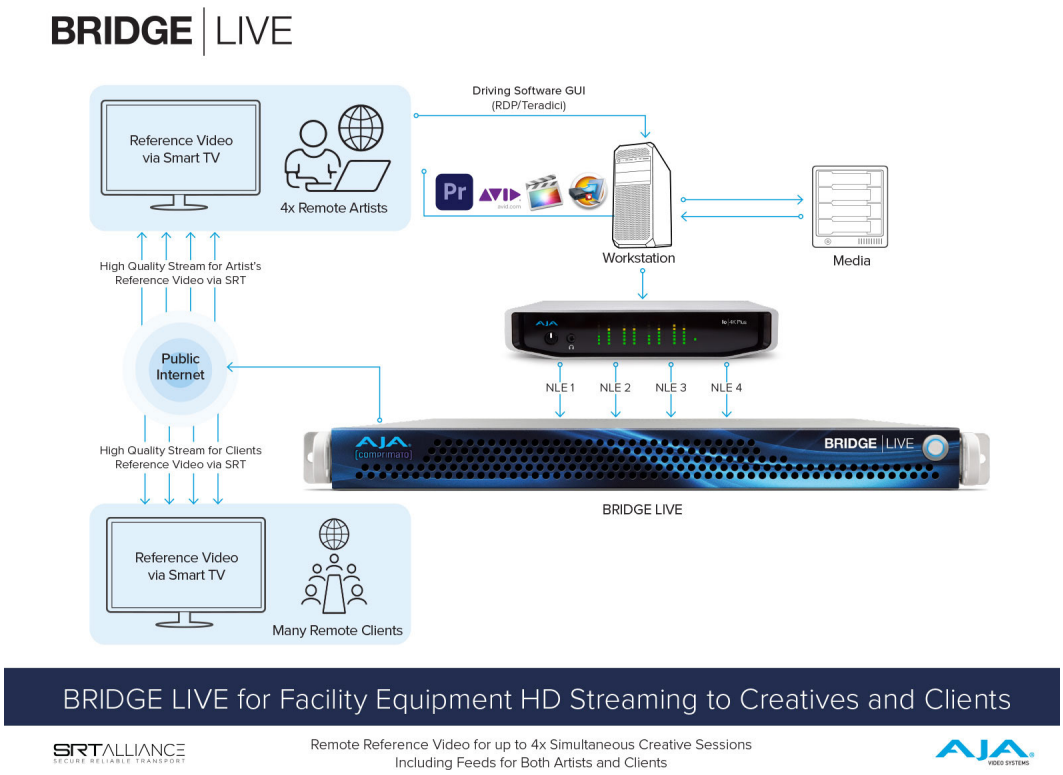
Reference Video for Remote Creatives

Production and Post: Connecting remote artists and clients using reference quality video, or providing a high quality window into production for those who cannot be on-set.

BRIDGE LIVE means the flexibility to leave media and equipment at the secure, managed facility, and have creative talent work together remotely with reference quality video.

BRIDGE LIVE compliments existing GUI driving technologies (e.g. RDP, Teradici) by layering on the reference quality video needed for creative confidence and client/executive sign-off. Choices between H.265 (4:2:0, 10-bit), H.264 (4:2:2, 10-bit) with turnkey BRIDGE LIVE, or via optional license JPEG 2000 (4:2:2, 10-bit), mean there is choice and flexibility in how to approach your needs in terms of quality and latency.

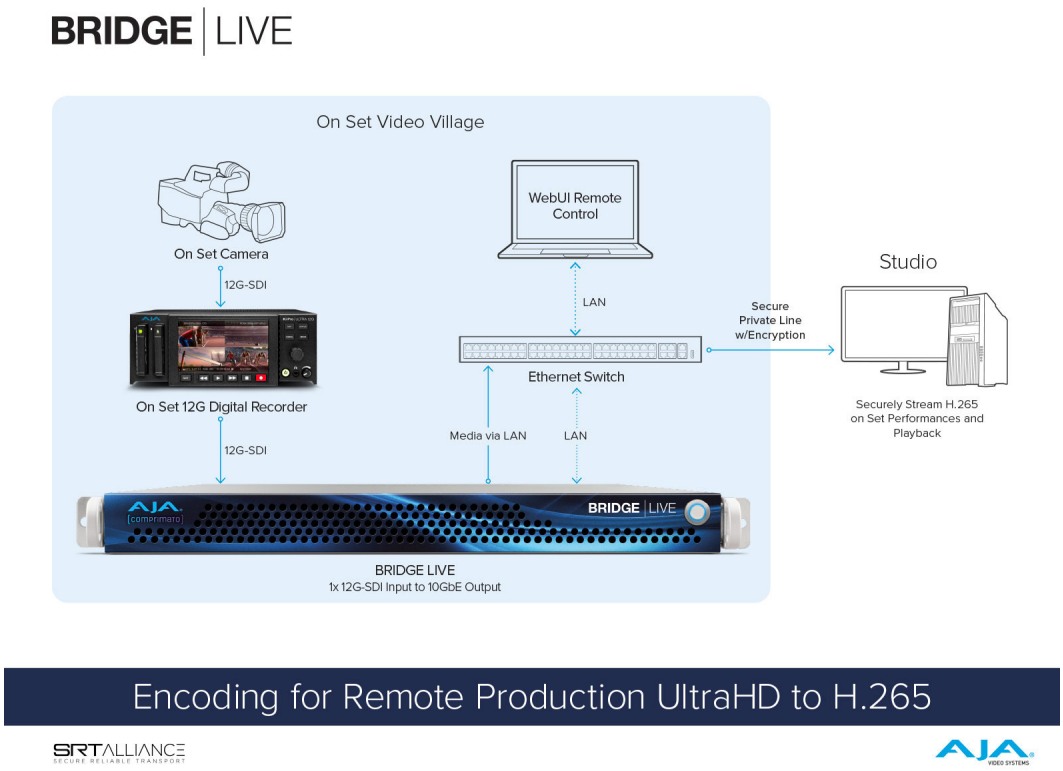
Figure 8. BRIDGE LIVE for Facility HD Streaming to Creatives and Clients



Secure Window into the Remote Set or Studio

BRIDGE LIVE also offers the flexibility to tap video from on-set recording devices and stream the output of cameras (over a secure private line with encryption) providing a high quality window into production for those who cannot be on-set.

Figure 9. Encoding for Remote Production UltraHD to H.265

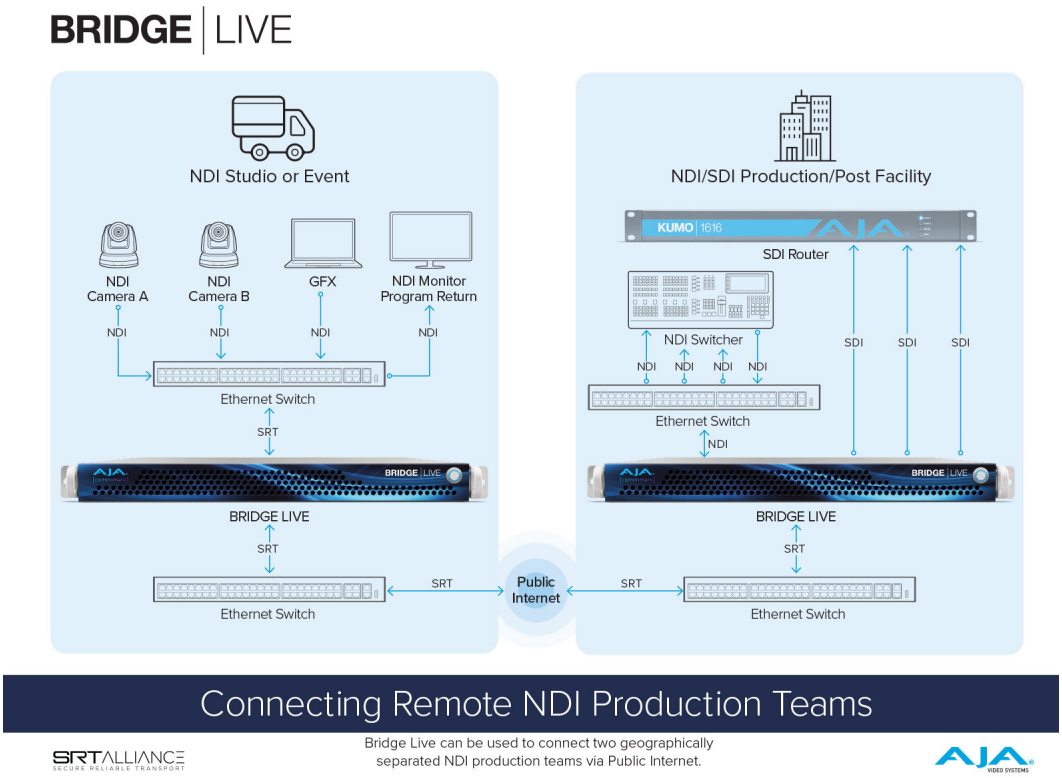


Connecting Remote NDI Production Teams

BRIDGE LIVE can be used to connect two geographically separated NDI production teams via Public Internet.

For example, a studio or event location could be sending the feeds from 3 NDI cameras to an NDI production or post facility, which can distribute those sources as both NDI and SDI, while also returning a program feed back to the studio location.

Figure 10. Connecting Remote NDI Production Teams



Streaming

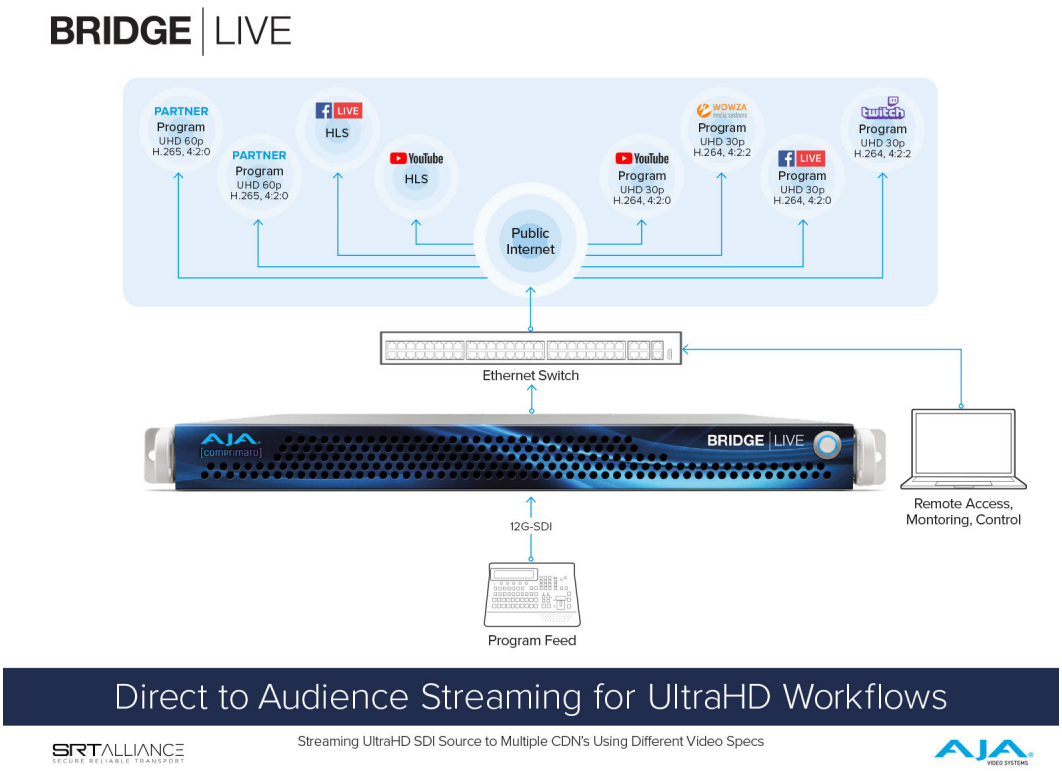
Direct-to-Audience Streaming

BRIDGE LIVE offers a comprehensive platform for live video streaming. Streaming support includes SRT, HLS, RTMP/S, RTP, UDP, and MPEG-TS. Using these standard protocols provides wide support for streaming services such as Twitch, YouTube Live and Facebook Live.

BRIDGE LIVE builds upon the tried and tested approach of AJA's HELO Plus streaming device, while including flexibility for multiple bidirectional transport, broad format and bit rate support, as well as metadata and redundancy.

And, while streaming to CDNs for a direct-to-audience delivery, BRIDGE LIVE can simultaneously deliver different stream types to partners to re-transmit, transcode, or store.

Figure 11. Direct to Audience Streaming for UltraHD Workflows



Delivery

Encoding For Content Distribution

For Studios and Broadcast applications BRIDGE LIVE facilitates primary distribution of finished and mastered content to partners for subsequent streaming to audiences.

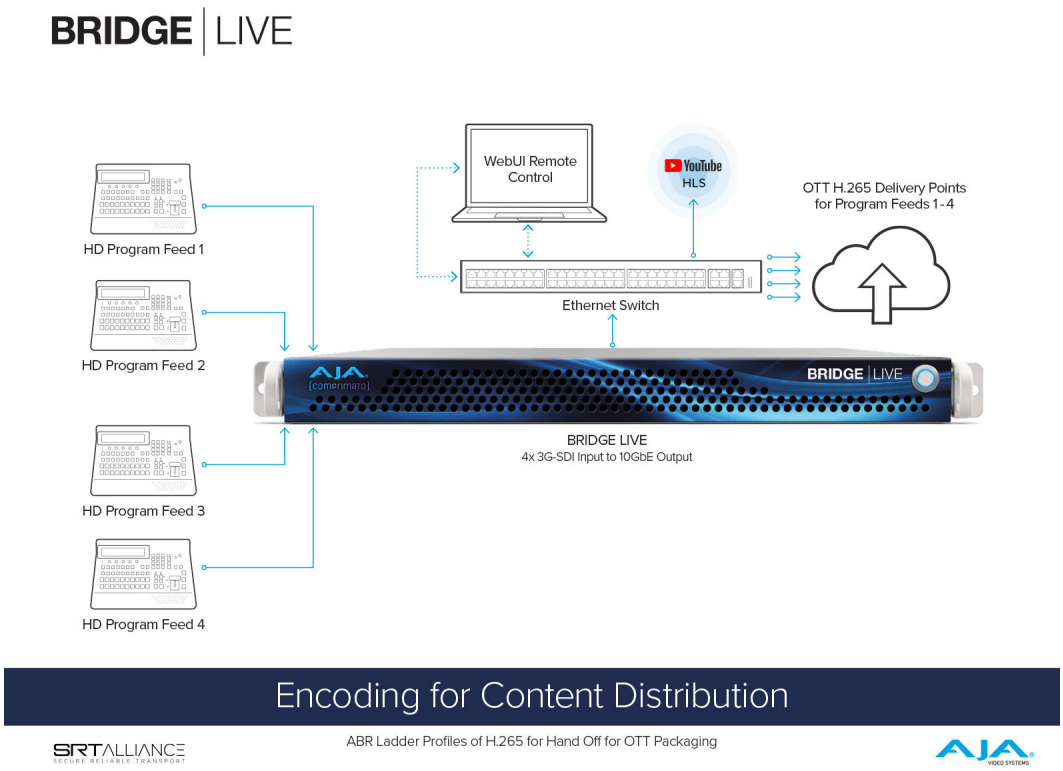
BRIDGE LIVE can provide ABR ladder profiles or hand-off for OTT packaging. For example, encoding to H.264 or H.265 for hand-off with ABR ladder profiles, including pointing the ladder profile directly to a local packager or CDN.

BRIDGE LIVE can also provide multi-format/rate/bit rate material via HLS. The combined outputs within the HLS stream are presented as a "playlist", meaning that devices (e.g. phones or tablet) or software (e.g. web browser) can pull a particular format, frame rate and bit rate based on the device characteristics and the current connectivity. Note that this is not a Push model. If conditions change (e.g. available bit rate) then the receiving device can elect to consume a different format / frame rate / bit rate. However, multi variants are chunked, so if a player switches to a different resolution, it must start downloading a new chunk and this can result in impacts to video stream continuity – since chunks are 10 seconds in length.

The best way to deliver HLS with BRIDGE LIVE is to provide the pre-packed video to a CDN. This means many end-point-devices can utilize the content simultaneously.

HLS could be sent to a local network in a studio or on set, to enable iPad and iPhone to receive and monitor (provided the devices have network access to BRIDGE LIVE). However, in this situation the number of simultaneous consumers will need to be kept low (under 10) to avoid over-taxing BRIDGE LIVE.

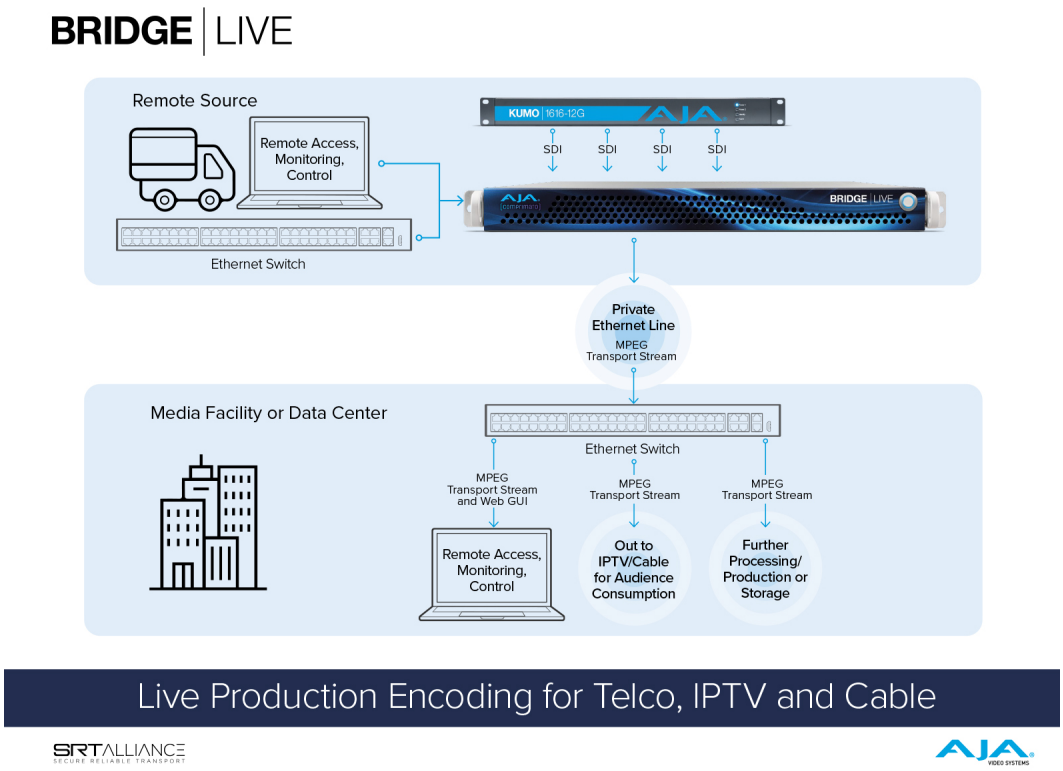
Figure 12. Encoding for Content Distribution



Live Production Encoding

Telcos, IPTV and cable operators are often presented with an SDI source or a live event or live production, which is needed as a simple MPEG-Transport Stream with H.264/H.262 encode. The delivered stream may be required for further processing (storage, production), or else be streamed directly to an IPTV/Cable network.

Figure 13. Live Production Encoding for Telco, IPTV and Cable



Synchronous Multi-Channel Transport

NOTE: Bidirectional functionality means that BRIDGE LIVE can act as an encoder or a decoder, and can do so simultaneously. As such, references to BRIDGE LIVE Tx or BRIDGE LIVE Rx are only descriptions of what the unit is currently deployed to do, rather than references to an encode-only or decode-only model of the product.

BRIDGE LIVE can take independent SDI source inputs and maintain their synchronous relationship while transporting the content to end-point destinations.

This functionality can take place between a pair of BRIDGE LIVE units for a synchronous end-to-end SDI workflow, often referred to as SDI backhaul, REMI, or site-to-site SDI workflows.

BRIDGE LIVE's synchronous multi-channel capability is also supported for cloud contribution, whereby a BRIDGE LIVE system can send to a cloud instance of Comprimato Live Transcoder software for delivery to various platforms or cloud services as IP video.

Synchronous Multi-Channel Transport for Backhaul

BRIDGE LIVE Synchronous Multi-Channel Transport functionality provides an easy and repeatable way to ensure synchronous SDI video sources can be fed to an encoding BRIDGE LIVE (Tx), then be timestamped, transported, and ultimately output from the decoding BRIDGE LIVE (Rx) with each SDI signal in lock step with each other.

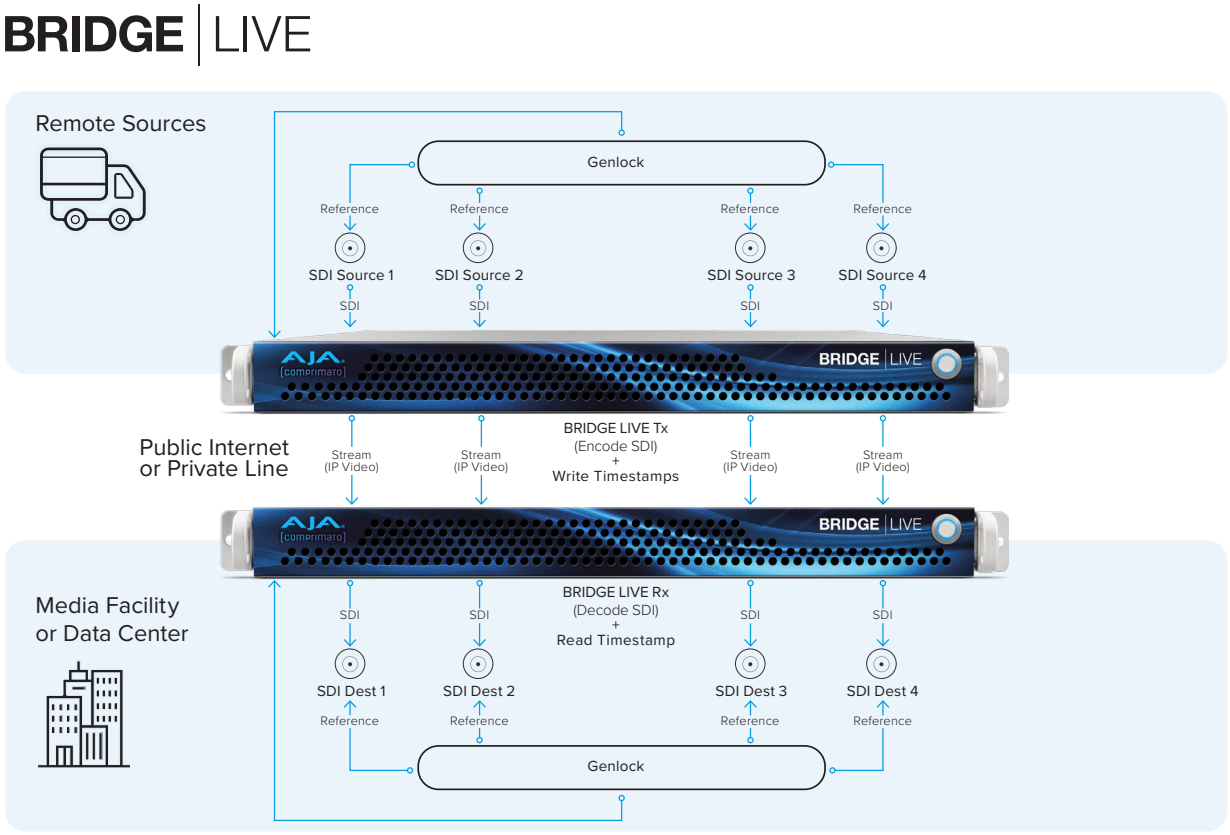
Furthermore, Synchronous Multi-Channel Transport can be scaled up from a single BRIDGE LIVE pair to additional BRIDGE LIVE pairs, to enable workflows where multiple BRIDGE LIVE systems can be receiving SDI and sending to multiple BRIDGE LIVE systems outputting SDI, all in synchronicity.

Synchronous multi-channel transport is necessary when the SDI sources being decoded by the BRIDGE LIVE Rx are required for uses such as live production switching, multicam recording or other live multichannel workflows.

NOTE: For end-to-end SDI workflows, HDR is also supported.

In most situations BRIDGE LIVE will yield perfect sync between sources. In some cases a transport may occasionally drift by a maximum of 1 frame.

Figure 14. Multi-Channel Synchronous Transport for Backhaul



Multi-Channel Synchronous Transport for Backhaul

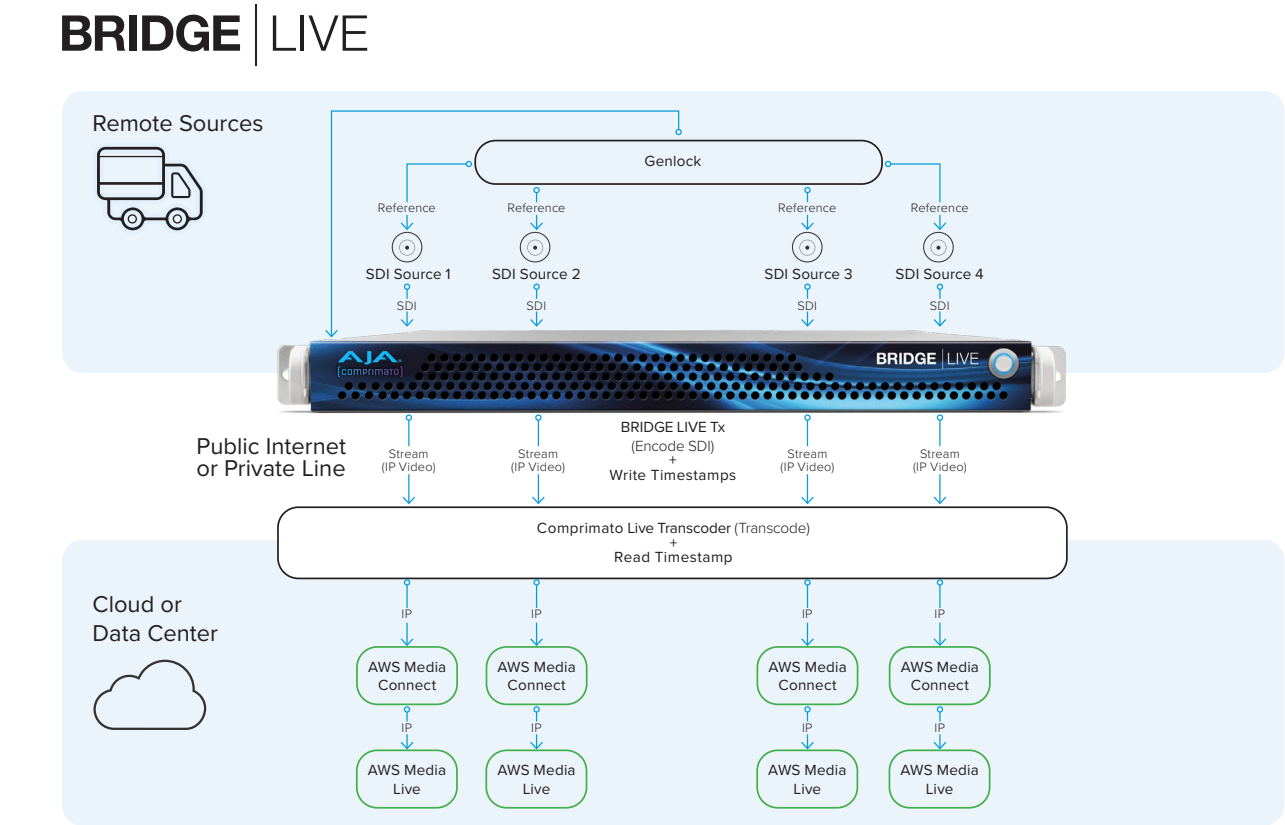
Synchronous Multi-Channel Transport for Cloud Contribution

When using individual or multiple BRIDGE LIVE systems for contribution to cloud platforms/services, the receiving side is supported by single or multiple instances of Comprimato Live encoder software.

From Comprimato Live Encoder, Synchronous Multi Channel IP Video can be handed off to 3rd party services.

NOTE: AWS references are examples. Comprimato Live Encoder can be used as the receiver with other cloud providers/services.

Figure 15. Multi-Channel Synchronous Transport for Cloud



Multi-Channel Synchronous Transport for Cloud

Configuration Requirements

The default encoding configurations should be suitable for most use cases. However, when configuring synchronous multi-channel transport, the following four key areas warrant careful consideration:

- Genlocking
- Encoding Guidelines
- Decoding Guidelines
- Audio Best Practices

Genlocking

Genlock on the SDI source side should be provided to the BRIDGE LIVE Tx system and upstream SDI source devices, such as cameras.

Genlock on the SDI destination side should be provided to the BRIDGE LIVE Rx system and downstream SDI devices, such as switchers.

Genlocking on both the source and destination sides should be of the same frequency.

If delivering to Comprimato Live Transcoder, genlock on the destination side is not required.

Encoding Guidelines

Encode the SDI inputs using MPEG-TS.

Use equal parameters for all SDI inputs. Do not modify any video parameters such as scan type, resolution, or frame rate.

To simplify this process of using equal parameters, you can use the “Clone” button to replicate the configuration on a single encoder. Use the “Download” and “Upload a preset” buttons to replicate the configuration over multiple encoders.

Use the RTP network protocol for transport on reliable networks such as within a single facility. Use the SRT network protocol for transport over less reliable networks when possible packet losses may be expected.

The output of every encoding pipeline must be routed to a unique address and port destination.

You can tune the encoding configuration to achieve your desired quality. For example, you could choose to encode using the visually lossless codec JPEG 2000.

Decoding Guidelines

Decoders are configured to receive traffic originating from encoders and to straightforwardly decode it to your SDI feed without modifying any video parameters such as scan type, resolution, or frame rate.

When decoding using the SRT network protocol, you may need to tune SRT latency to meet the requirements of the network unreliability.

Configure all decoding pipelines to equal SRT latency. This field is present in the BRIDGE LIVE User Interface on the main page. If you see packet drops, there could be an issue with SRT. Increasing the latency should help. Be careful to set up the same latency in each pipeline. Refer to the pipeline configuration on the Source side.

Audio Best Practices

For Audio, best practice is to add primary audio via a single pipeline (up to 16 channels). This may require some routing or premixing upstream of BRIDGE LIVE (Tx).

Audio can be carried via all pipelines. However, in some circumstances, it is possible for one or more pipelines to get up to 1 frame late. In this scenario, the audio transported across each pipeline remains good; however, if switching live between the SDI outputs from the BRIDGE LIVE (Rx), then some audio clicks and pops may occur.

Chapter 2 – Installation

Overview

BRIDGE LIVE ships from the factory with the latest version of software installed.

What's In the Box?

- BRIDGE LIVE Quick Start Guide
- BRIDGE LIVE appliance, including:
  - pre-installed rack-ears
  - rack rails
  - two power cables

Quick Start Guide Login Credentials

BRIDGE LIVE ships with a Quick Start Guide when it comes from the factory. This physical document contains the login information for accessing BRIDGE LIVE for the first time. Do not discard the unique Quick Start Guide, as these credentials will be required following any future Factory Reset. If you do not have this Quick Start Guide, you will need to contact AJA tech support.

If you are receiving a system that has been used elsewhere and you do not have the password that may have been applied, you can perform a Factory Reset and then use the factory supplied password from the Quick Start Guide to regain access to the system for set up.

Installation Summary

First time BRIDGE LIVE configuration involves the following steps.

- Unpack the shipping box, retaining the printed BRIDGE LIVE Quick Start Guide.
- Mount the BRIDGE LIVE chassis into a standard 19-inch wide equipment rack, allowing space for cooling airflow. The chassis occupies only one vertical rack unit.
- Connect the two BRIDGE LIVE power cords to AC mains.
- Perform initial network configuration. This is accomplished via the Kiosk interface, using a customer supplied Display Port monitor, keyboard, and mouse.
- Access the BRIDGE LIVE UI over your network, using the unique User and Password information for your unit, included in the printed BRIDGE LIVE Quick Start Guide provided.
- Connect your SDI sources and/or destinations to your BRIDGE LIVE. Which SDI connectors you use depends on your intended workflow.
- Create an initial BRIDGE LIVE workflow by creating the necessary BRIDGE LIVE Pipelines, to ether encode SDI signals to the network, decode from the network to SDI, or for encode/decode bidirectional operation.

Initial Hardware Installation

Unpacking

As you unpack the shipping box, carefully examine the contents. Retain the Quick Start Guide, which has important information for that individual BRIDGE LIVE unit. Make sure you received everything and that nothing was damaged during shipment. If you find any damage, immediately notify the shipping service and supply them with a description of the damage.

If you find shipping damage, contact your AJA dealer or distributor for details on how to have your BRIDGE LIVE repaired or replaced.

NOTE: Save packing materials and the shipping box. If your BRIDGE LIVE ever requires service or you move your system, use the packaging materials and box for safe shipment.

Mounting the Chassis

Mount the BRIDGE LIVE chassis as desired into a standard 19-inch wide equipment rack, using the provided sliding rails. The chassis occupies only one vertical rack unit.

NOTE: Cooling airflow enters the chassis from the front, and exits from the rear and top panels. Do not obstruct these air vents.

Two rack rail assemblies are included in the rack mounting kit. Each assembly consists of two sections: an inner fixed chassis rail that secures directly to the server chassis and an outer fixed rack rail that secures directly to the rack itself.

The rail assemblies are shipped with rack adapters installed for use with IT (square hole) style rack frames. For IT racks, simply slide the unit into place, as the rails will lock automatically. For use with a standard round hole rack frame, you will need to remove the adapters using a small Phillips head screwdriver.

Connect AC Power

Connect the two BRIDGE LIVE power cords to AC mains. For redundancy, use both power supplies and connect them to separate branch circuits. Then the BRIDGE LIVE will continue to operate even if a circuit breaker opens on one branch. For even greater reliability, connect one BRIDGE LIVE power supply to a UPS, and leave the other connected directly to a live circuit (not through that same UPS). This covers the situation where the UPS itself fails. For the highest level of protection use two UPS units connected to two different branch circuits.

You will power up the unit later, depending on which initial network configuration procedure you decide to use.

Initial System Access via Local Kiosk Interface

1. Connect a computer monitor (user supplied) to one of the rear Display Port connectors.
2. Connect a keyboard and mouse (user supplied) to available rear USB connectors.
3. Power up the chassis. The system will boot up to the BRIDGE LIVE and display a login splash screen. The same screen will appear when connecting using a remote network connected computer's web interface.

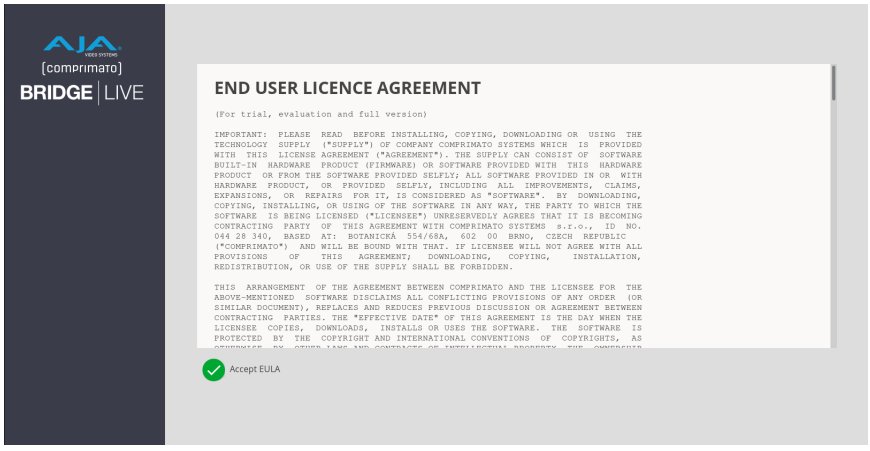
Figure 16. BRIDGE LIVE Kiosk View Login Splash Screen

4. At the login screen, enter the system's specific Admin credentials as shown below:
   - Username: admin
   - Password: See the BRIDGE LIVE Quick Start Guide for the unit's unique default password.

EULA

When you login to the BRIDGE LIVE UI for the first time, you will be prompted to read and accept the EULA. If you change the BRIDGE LIVE version using the Version manager, you will be required to accept it again.

Figure 17. EULA



Initial System Setup Process

BRIDGE LIVE has a menu driven initial setup process available for first time installation. This allows you to easily set basic system operation parameters.

For an initial system setup, you can simply click on the Setup (wrench) icon on top line of the screen. This action takes you directly to the first step of the setup process.

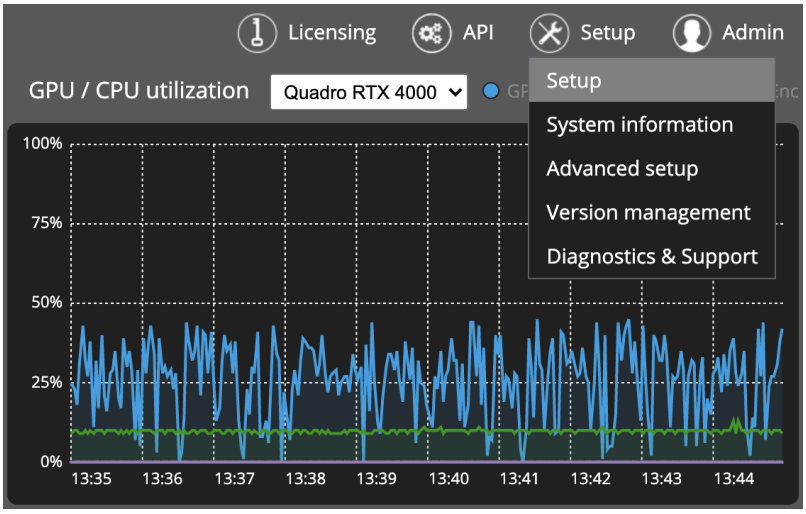
Figure 18. Top Line with Setup Icon

NOTE: The Licensing and API top line icons can also can be clicked on to activate them. However, there is no need to access these functions during an initial system setup.

Alternatively you can hover your cursor over the top line Setup Icon, and then click on the Setup item in the opened Setup Menu dropdown. This is the method used to access all the items in this dropdown menu.

NOTE: This cursor hover technique is also used with the Admin top line Icon. However, there is no need to access the Admin functions during initial system setup.

Figure 19. Accessing the Setup menu



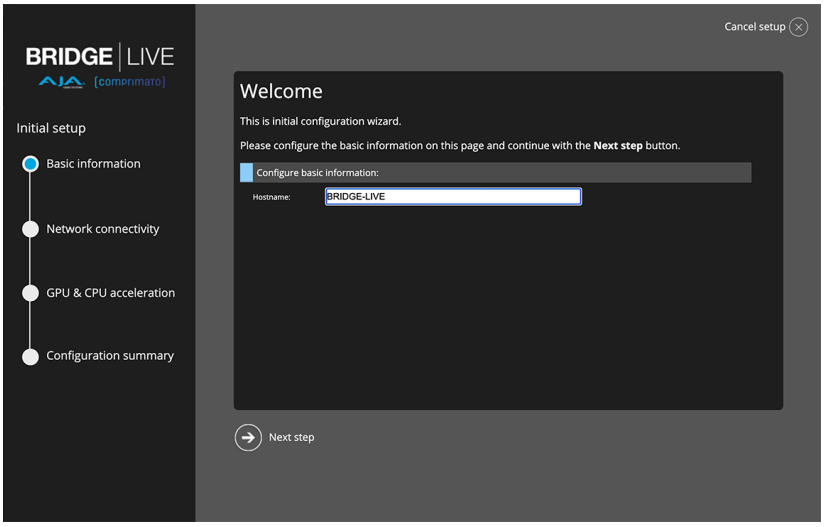
NOTE: GPU model displayed in GPU/CPU Utilization selector and UI screens may vary depending on your system configuration.

After selecting Setup, a series of screens will be displayed from which you can select or enter the necessary information. Four screens will be opened in sequence:

- Basic Information
- Network Connectivity
- GPU & CPU Acceleration
- Configuration Summary

Basic Information

Figure 20. Setting the System Hostname



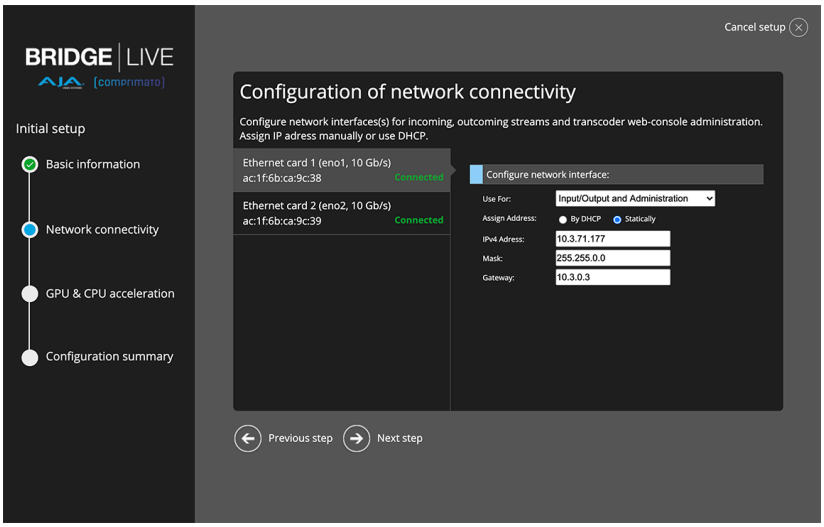
A Welcome screen is displayed first, allowing you to identify that specific BRIDGE LIVE system with a unique Hostname.

HostName

Enter a name in the Hostname field, then click **Next step**.

Network Connectivity

Figure 21. Configuring network connectivity



The Network Connectivity screen appears. Here you configure each of the two 10GbE interfaces.

Use For

Select one of the following from the pull-down menu:

- Don't Use
- Administration

- Input/Output
- Input/Output and Administration

NOTE: Typically Administration is applied to only one port. If applied to more than one port, you will see a warning message (but not an error).

NOTE: With a dual NIC setup, you cannot have both NICs connected to the same network.

Assign Address

Configure the following as appropriate for your network:

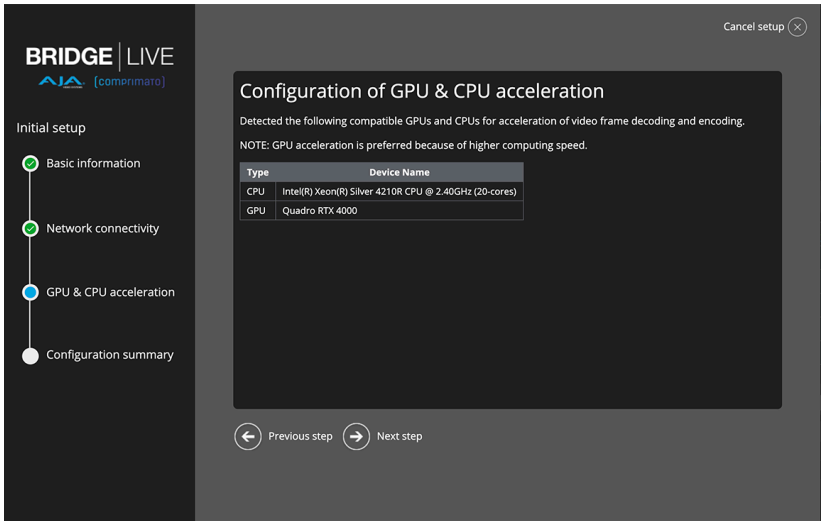
- By DHCP
- Statically
  - IPv4 Address
  - Mask
  - Gateway

After entering all the information, click **Next step**.

GPU and CPU Acceleration

This screen is informational only. It reports detected GPUs and CPUs for acceleration of video frame decoding and encoding.

Figure 22. Informational only – Configuration of GPU & CPU acceleration



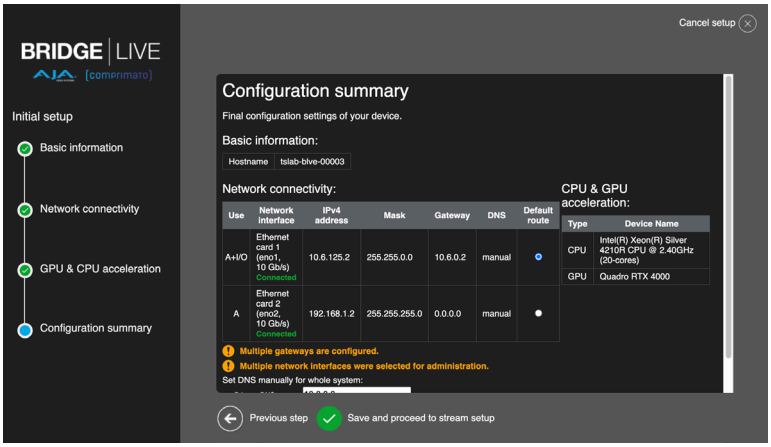
NOTE: GPU model displayed in setup or UI screens may vary depending on your system configuration.

Click **Next step** to continue.

Configuration Summary

A summary of the final configuration settings of your device, including hostname, network connectivity, CPU and GPU acceleration, and DNS settings.

Figure 23. Configuration summary



Default Route

This is used for setting up the BRIDGE LIVE system so that it communicates correctly within your network. The default route determines which interface is used by BRIDGE LIVE for outbound communication.

The Default route is also used for internal communication. It is typically the address of another router, which treats the packet the same way: if a route matches, the packet is forwarded accordingly, otherwise the packet is forwarded to the default route of that router.

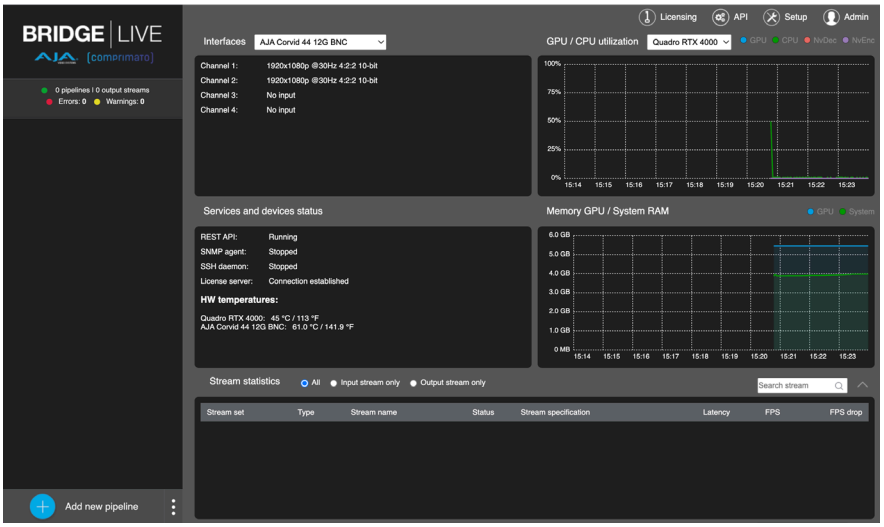
Click on the Default route circle of the desired NIC.

Set DNS Manually for Whole System

You can manually set which DNS server should be used for your BRIDGE LIVE system. The BRIDGE LIVE server will send DNS requests to either the primary or secondary DNS server. DNS is a protocol which allows you to translate domain names (www.domainname.com) into IP addresses

Enter any desired Primary and Secondary DNS IP addresses, and then click on the **Save and proceed to stream setup** button to complete your initial system setup. After a short time you are returned to the BRIDGE LIVE Dashboard UI (figure).

Figure 24. BRIDGE LIVE Dashboard After System Setup



Once your BRIDGE LIVE has completed its initial setup, you will be able to make it fully operational by configuring pipelines that meet your requirements. See *"Pipeline Configuration" on page 68*.

BRIDGE LIVE System Administration

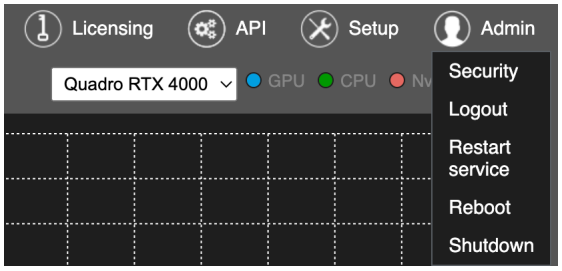
Once a BRIDGE LIVE system has been setup with properly configured pipelines, the unit can be routinely reconfigured by an end user to select different signal Inputs and Outputs and adjust other pipeline features, using the Dashboard UI.

Other more complicated system updates and re-configurations are generally performed by a BRIDGE LIVE system administrator using other UI menus.

Admin Menu

Some basic functions can be performed via the Admin Menu. Hover your cursor over the Admin icon and click on the desired function.

Figure 25. Open Admin Menu



Security

Used to manage password security. See *"Password Administration" on page 37*

Logout

Logs you out of that BRIDGE LIVE's web interface. This will not affect any currently running pipelines. You will need the user name and password for that BRIDGE LIVE unit to log back in.

Restart Service

This function assists with restarting the BRIDGE LIVE software, useful if unexpected transport problems are encountered.

A "Do you really want to restart...?" prompt appears. After answering **Yes**, all currently running pipelines will be halted and will then restart. You will also be logged out. You will need the user name and password for that BRIDGE LIVE unit to log back in.

Reboot

This function performs a complete reboot of the hardware, useful if serious unexplainable problems with signals or OS occur.

A "Do you really want to reboot...?" prompt appears. After answering **Yes**, all currently running pipelines will be halted, the BRIDGE LIVE chassis will power cycle, the BRIDGE LIVE application will reload, and all the previously active pipelines will be restarted. You will also be logged out. You will need the user name and password for that BRIDGE LIVE unit to log back in after the unit has completed its reboot.

Shutdown

A "Do you really want to shutdown...?" prompt appears. After answering **Yes**, all currently running pipelines will be halted and the BRIDGE LIVE chassis will power down. To regain operation, the front panel Power button will need to be pressed, and you will need the user name and password for that BRIDGE LIVE unit to log back in after the unit has completed its bootup.

Factory Reset

NOTE: BRIDGE LIVE factory reset can only be performed locally using the Kiosk UI, not with a web interface.

Performing a factory reset will restore BRIDGE LIVE to its factory settings. All pipelines and settings, including network setup and passwords, will revert to default factory settings. Only your current licenses will be preserved. Once changes are applied, the server will restart itself and boot into the factory state. The process takes approximately one minute.

WARNING: ***Before performing a factory reset, be sure to backup your pipeline configurations. See*** *"Verifying Pipeline Configurations" on page 99* ***for more information.***

CAUTION: *A factory reset will revert the login credentials back to how they were set at the time of shipment from the factory. You will need to reference your Quick Start Guide for these original login credentials; otherwise you will need to contact AJA Tech Support.*

Different methods exist for performing a Factory Reset to BRIDGE LIVE.

- One method is to continuously press and hold any key on the keyboard while booting or rebooting the device, then selecting from a list of menu options.
- Another method is to use a command line interface (CLI).

Keyboard Method

To perform a factory reset using the keyboard:

1. While booting or rebooting the BRIDGE LIVE device, continuously press and hold any key on the local keyboard that is connected to the unit. The following list of menu options displays:
   - Continue booting with the existing version
   - Boot using previous software version
   - Perform a factory reset
2. Select "Perform a factory reset."
3. You will need the original Admin credentials indicated in the Quick Start Guide in order to login following the factory reset.

Command Line Interface Method

NOTE: SSH needs to be enabled under the Admin>Security menu before you can perform any function via the command line.

To perform a Factory Reset Locally Using the Command Line Interface

1. Press CTL+ALT+T to switch to the terminal application so that you can use a command prompt.
2. From the command line interface, enter the following command:

   ```
   sudo ostree-factory-reset
   ```

3. You will need the original Admin credentials indicated in the Quick Start Guide in order to login following the factory reset.

To Perform a Factory Reset Remotely Using the Command Line Interface

1. Launch a command prompt for Mac or Windows.
   - Terminal application on a Mac
   - Command Prompt on Windows
2. Login to your BRIDGE LIVE device as a transcoder user (See *"User Types" on page 37*).

WARNING: ***When using SSH to access the BRIDGE LIVE system and run commands as a root (sudo) user, please exercise caution. It is possible to severely or irreparably damage the system if you are not clear on what you are doing. Please seek appropriate guidance if you are uncertain about how to proceed.***

3. From the command line interface, enter the following command:

   ```
   sudo ostree-factory-reset
   ```

4. You will need the original Admin credentials indicated in the Quick Start Guide in order to login following the factory reset.

Password Administration

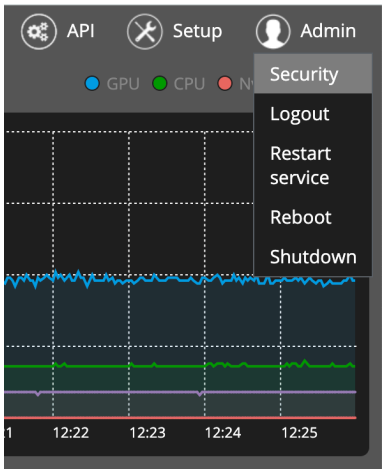
User Types

Two user types exist for a BRIDGE LIVE System:

- Admin Username (“admin”) is used for local login, browser login and REST API access. This is the user type we are going to be using in the examples below.
- Transcoder Username (“transcoder”) is used for CLI/SSH (CLI stands for Command Line Interface, SSH for Secure Shell).

Changing passwords for the two user types is done through the Password management page, accessed through the Admin > Security menu.

Figure 26. Accessing Password Management



Setting Remote Shell Access

From the Password management page, you can enable or disable SSH access to BRIDGE LIVE altogether by clicking the Enable button (if currently disabled) or the Disable button (if currently enabled) underneath the Secure Shell (SSH) heading. Remote secure shell (SSH) access is intended only for the transcoder user (console user).

Password Management

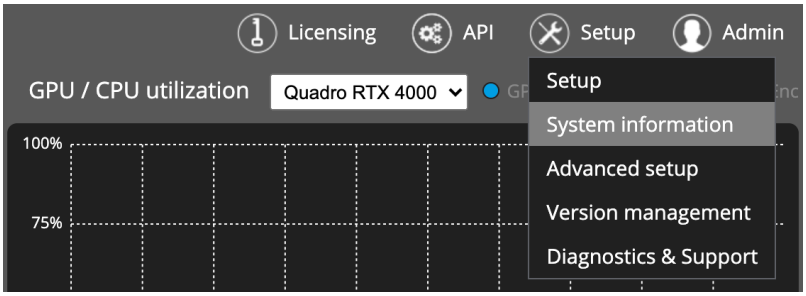
Manage passwords for the admin user (web application user) and the transcoder user (console user) by entering the current password, then setting the new password.

Licensing

Licenses that are ordered at the time of purchasing the BRIDGE LIVE unit are pre-installed prior to shipment. At a later date, if you want to order an additional license, you will need to get the unique Installation ID number, found on the System Information page, and contact your AJA Distributor or Regional Sales representative. If you do not know who that is, you can contact AJA Sales directly.

To access the System Information page, select **System Information** from the Setup menu in the upper right area of Dashboard. The System Information page displays.

Figure 27. Accessing the System Information page from the Setup menu



From the System Information page, the Installation ID is found a few lines below

Installing a New License Package

Typically, new BRIDGE LIVE License Packages are delivered as a zip file. If zipped, please unzip the delivered package.

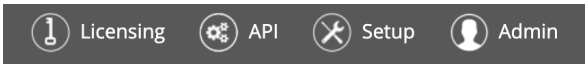
Remote Installation

Accessing BRIDGE LIVE through a browser requires that you are using a machine that has network connectivity to the BRIDGE LIVE device.

Steps for Installing a New License

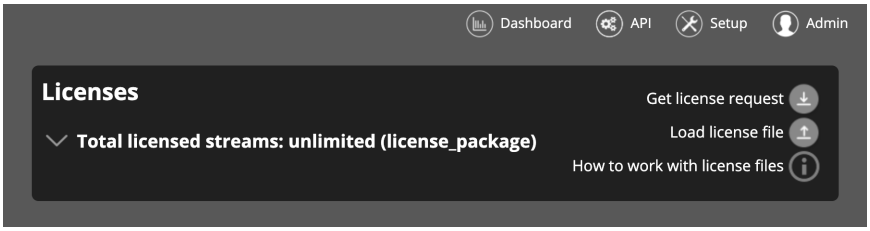
1. From the BRIDGE LIVE interface, select the Licensing menu in the upper right area.

Figure 28. The Licensing menu



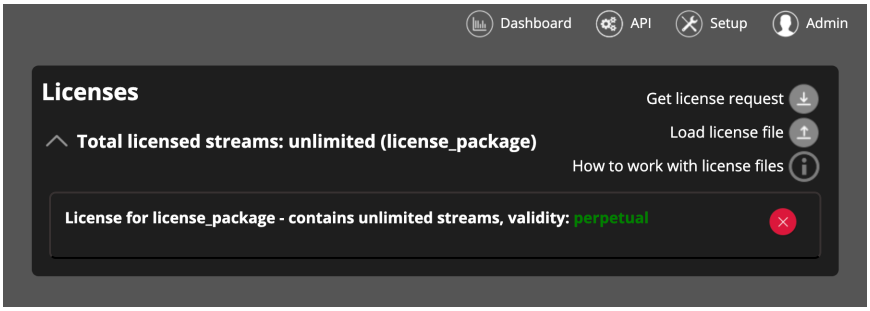
The Licenses page displays.

Figure 29. The Licenses page



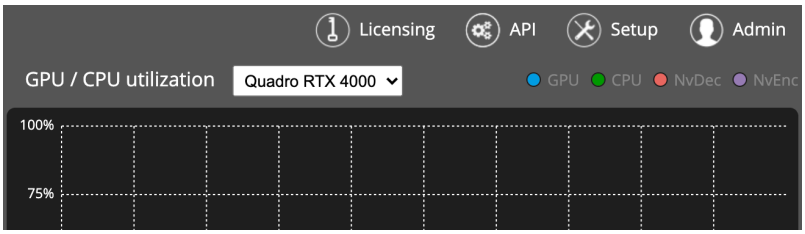
2. Click the downward pointing disclosure triangle to display your License Package details for your previously installed License Package.

Figure 30. The Licenses page displaying previously installed License Package



3. Click the red "X" icon to the right of the currently installed License Package to remove it.
4. Next, with no License Package present, click **Load license file**. A navigation window opens.
5. Navigate to your new License Package location, choose the file, and select **Open**. The new License Package will install.
6. Next, navigate to the License page by clicking **Licensing** in the upper right area of Dashboard.

Figure 31. Accessing the Licenses page



7. From the Licenses page, select **Load license file**. Navigate to the license file, select it, then click **Upload**.

Upon completion of the license upload, the license will immediately be available for use.

License Status

If a license is granted, the status shows "Unlimited time" or the time for which the stream is allowed to produce an output, according to loaded license files. The status will be, for example:

- License: Unlimited time – a stream may produce an output for an unlimited period of time
- License: Till 2021-02-21 23:59:59 – a stream will produce an output until the displayed time point is passed.

NOTE: For your convenience, the status shows the time and date according to your computer's time setting, not the BRIDGE LIVE system time, which may be different. For example, during installation, the automatic installer sets the time-zone to America/Los Angeles, but you may be located in a different time zone. Also, you might have offices in different time-zones and would prefer the servers to have the same system time, potentially for monitoring purposes.

If a stream is not allowed to produce an output, the license status reads "Blocked" or "Unavailable" and is shown red. BRIDGE LIVE will process the stream as usual, the only difference is that the output will not be sent to defined output destinations. This feature will help you verify your environment abilities, such as system load limits, input stream compliance, and other factors, even if you don't have enough licenses yet. For that reason, the input and output stream status indicator may be green even if the license status is not valid.

Possible invalid license statuses are:

- License: Blocked – there are licenses for the stream loaded in the system, but the count of streams exceed the licensed number (other streams have exhausted the available licenses)
- License: Unavailable – the stream needs a license which is not loaded (the stream contains a feature of newer version of BRIDGE LIVE which isn't included in any loaded license)

BRIDGE LIVE Software Update

To check for updates for BRIDGE LIVE software:

1. Go to the AJA website and view/download the package for your particular BRIDGE model:

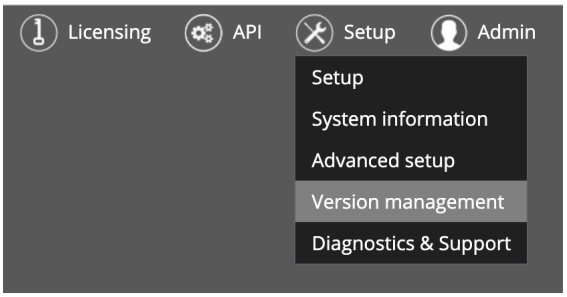
   https://www.aja.com/products/bridge-live#support

After unzipping the file, the download will be a .tgz file.

NOTE: MacOS with Safari has a setting that can cause the browser to incorrectly unzip the .tgz file into it's elementary components, making it unusable. To prevent this turn off "Open safe files after downloading" via Safari>Preferences>General.

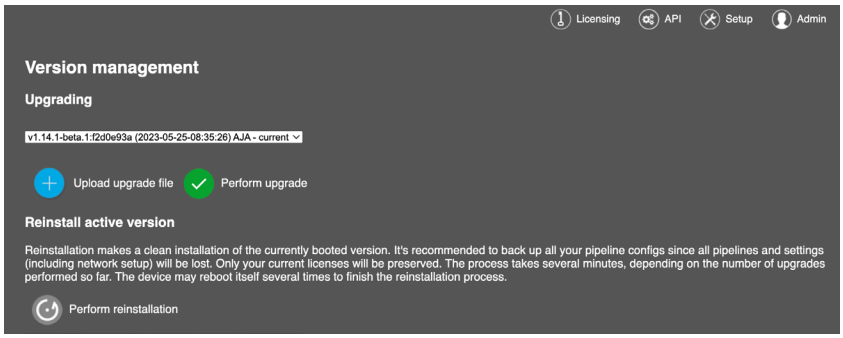
2. Stage the downloaded update on an accessible network location.
3. From within BRIDGE LIVE, navigate to **Setup > Version management**.

Figure 32. Accessing the Version management page from the Setup menu



The Version Management Upgrading page displays.

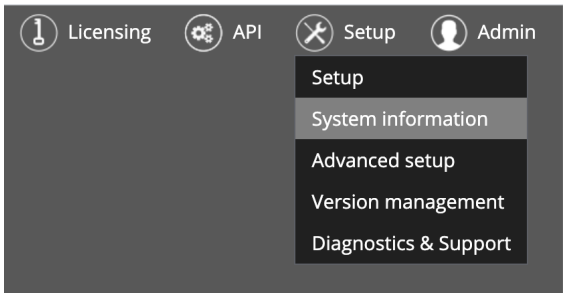
Figure 33. Version management Upgrading page



4. Select **Upload upgrade file** and browse to the downloaded update.
5. Select **Perform upgrade**. BRIDGE LIVE will upload and install the update. You will need to reboot the system via the dialog after the update completes.

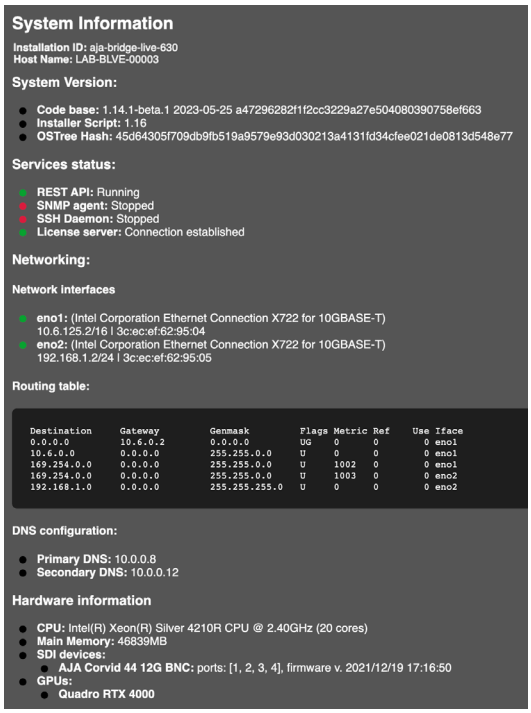
Following the upgrade, you can verify the version installed if you like by navigating to **Setup** > **System information**.

Figure 34. Accessing the System information page from the Setup menu



The System Information page displays, indicating the version number currently installed and running.

Figure 35. System Information page indicating the version number



In the event that there is an issue or failure during the update process, BRIDGE LIVE will automatically retry the upgrade process and reboot up to three times.

If the upgrade is unsuccessful, even after the automatic retries, the UI shows a warning statement at the top of the page with a link to the Version Management page. From the Version Management page, you can retry the upgrade process manually.

Upgrading BRIDGE LIVE from USB Flash Drive

If your work environment is such that you cannot access your BRIDGE LIVE remotely through a browser interface, you can upgrade firmware or load a license file from a USB flash drive connected directly to one of the USB ports on the rear panel of the BRIDGE LIVE device.

To Upgrade Remotely from a USB Flash Drive Attached Locally

1. Place a copy of the upgrade package onto a USB flash drive.
2. Insert the USB flash drive into one of the USB ports on the rear panel of your BRIDGE LIVE device.
3. Mount the USB flash drive using the following steps and commands:
   A. Launch a terminal application so that you can use a command prompt.
   B. Login to your BRIDGE LIVE device as a transcoder user. For more information about logging in as a transcoder user, please see:
      - *"User Types" on page 37*
      - *"Default Accounts" on page 52*
      - *"Setting Remote Shell Access" on page 38*

WARNING: ***When using SSH to access the BRIDGE LIVE system and run commands as a root (sudo) user, please exercise caution. It is possible to severely or irreparably damage the system if you are not clear on what you are doing. Please seek appropriate guidance if you are uncertain about how to proceed.***

   C. From the command prompt, enter the command: **`lsblk`**

   This command returns a list of all connected drives. The output in a terminal window will display something like the following: **`sda, sda1, sdb, sdb1`**

   D. Identify the correct USB flash drive by checking that its storage capacity matches the one you have inserted. For example, let's assume that the USB flash drive is **`sdb1`**.

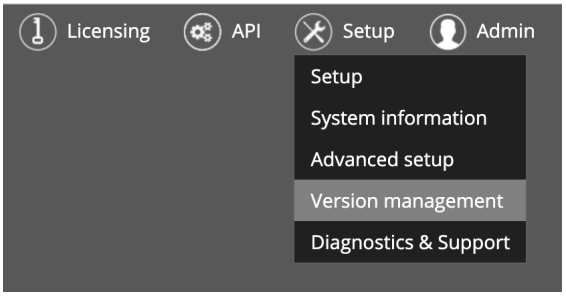
   E. For this example, you would enter the following command:

```
sudo mount /dev/sdb1 /mnt/
```

NOTE: If the output from the `lsblk` command shows that your USB flash drive has a different name, use that instead. Please be careful to use the correct name for your USB flash drive.

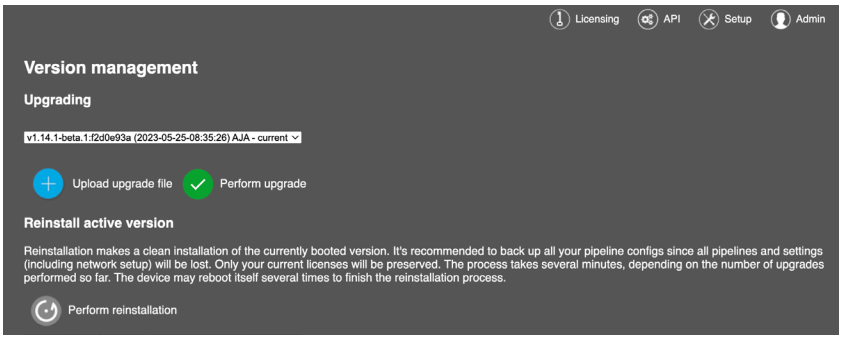
   F. Close the terminal application.
4. From within BRIDGE LIVE, navigate to **Setup** > **Version management**.

Figure 36. Accessing the Version management page from the Setup menu



The Version Management Upgrading page displays.

Figure 37. Version management Upgrading page

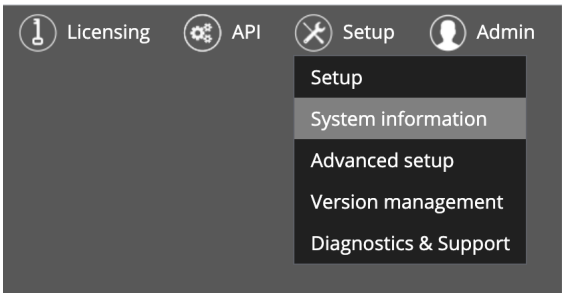


5. Select **Upload upgrade file** and navigate to the **`/mnt`** folder where the upgrade file is located.
6. Select the upgrade file, then click **Perform upgrade**. BRIDGE LIVE will upload and install the update. This may take several minutes.

Your BRIDGE LIVE unit will be upgraded to the version that you just uploaded.

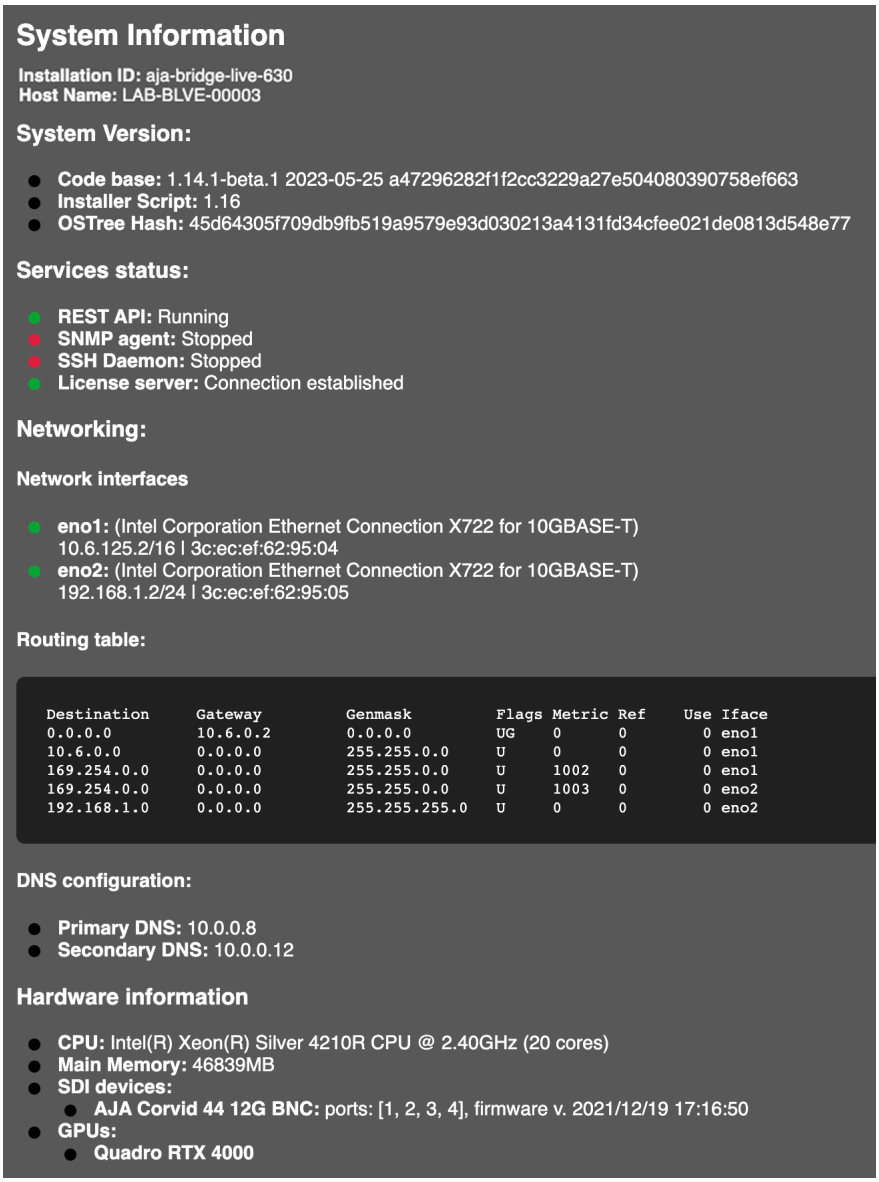
Following the upgrade, you can verify the version installed if you like by navigating to **Setup** > **System information**.

Figure 38. Accessing the System information page from the Setup menu



The System Information page displays, indicating the version number currently installed and running (see *Figure 39 on page 44*).

Figure 39. System Information page indicating the version number



To Upgrade Locally from a USB Flash Drive

This scenario is for upgrading locally, using a keyboard and monitor attached directly to the BRIDGE LIVE device.

1. Place a copy of the upgrade package onto a USB flash drive.
2. Insert the USB flash drive into one of the USB ports on the rear panel of your BRIDGE LIVE device.
3. Log in as "admin" on BRIDGE LIVE.
4. Mount the USB flash drive using the following steps and commands:
   A. Press CTL+ALT+T to switch to the terminal application so that you can use a command prompt.
   B. Login to your BRIDGE LIVE device as a transcoder user. For more information about logging in as a transcoder user, please see:
      - *"User Types" on page 37*
      - *"Setting Remote Shell Access" on page 38*

WARNING: ***When using SSH to access the BRIDGE LIVE system and run commands as a root (sudo) user, please exercise caution. It is possible to severely or irreparably damage the system if you are not clear on what you are doing. Please seek appropriate guidance if you are uncertain about how to proceed.***

C. From the command prompt, enter the command: **`lsblk`**.
This command returns a list of all connected drives. The output in a terminal window will display something like the following:

```
sda, sda1, sdb, sdb1
```

D. Identify the correct USB flash drive by checking that its storage capacity matches the one you have inserted. For example, let's assume that the USB flash drive is **`sdb1`**.

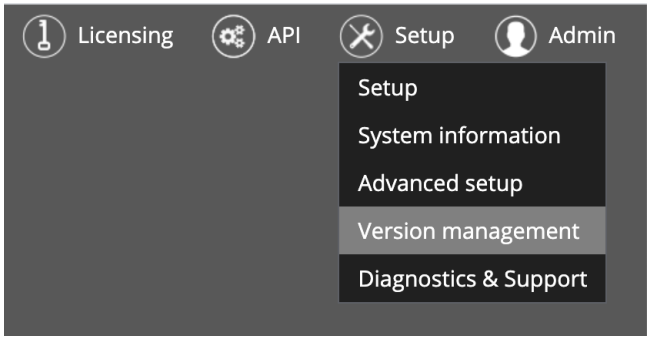
E. For this example, you would enter the following command:

```
sudo mount /dev/sdb1 /mnt/
```

NOTE: If the output from the `lsblk` command shows that your USB flash drive has a different name, use that instead. Please be careful to use the correct name for your USB flash drive.

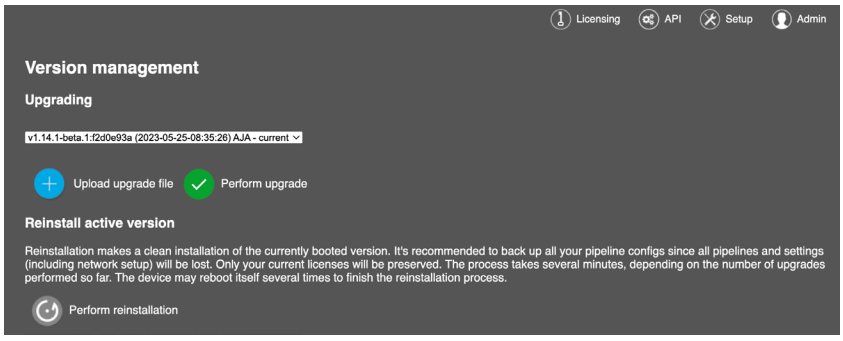
5. Press ALT+F4 to toggle out of terminal mode and back to the BRIDGE LIVE UI.
6. From within BRIDGE LIVE, navigate to **Setup** > **Version management**.

Figure 40. Accessing the Version management page from the Setup menu



The Version Management Upgrading page displays.

Figure 41. Version management Upgrading page

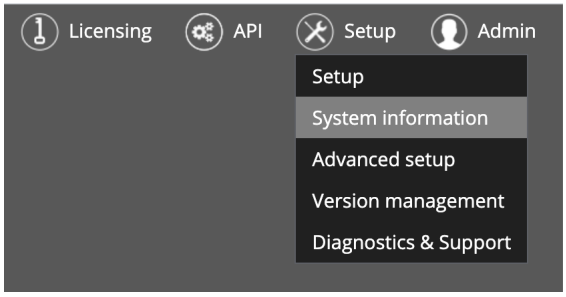


7. Select **Upload upgrade file** and navigate to the **`/mnt`** folder on the USB stick where the upgrade file is located.
8. Select the upgrade file, then click **Perform upgrade**. BRIDGE LIVE will upload and install the update. This may take several minutes.

Your BRIDGE LIVE unit will be upgraded to the version that you just uploaded.

Following the upgrade, you can verify the version installed if you like by navigating to **Setup** > **System information**.

Figure 42. Accessing the System information page from the Setup menu



The System Information page displays, indicating the version number currently installed and running.

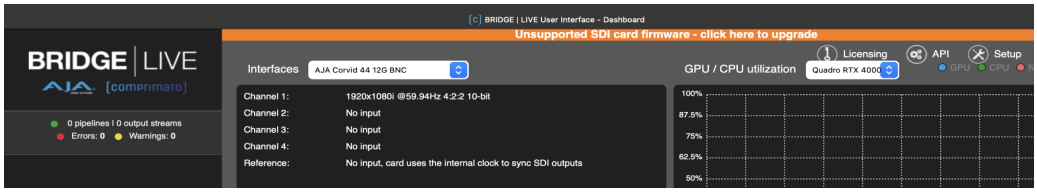
9. You will also be prompted to select which network interface's default gateway will be used as a default route (likewise for every interface).

Corvid 44 12G Firmware Update

When BRIDGE LIVE is updated to v1.16.2, an AJA Corvid card firmware update may be required. If it is required, you will be prompted to do so in the UI.

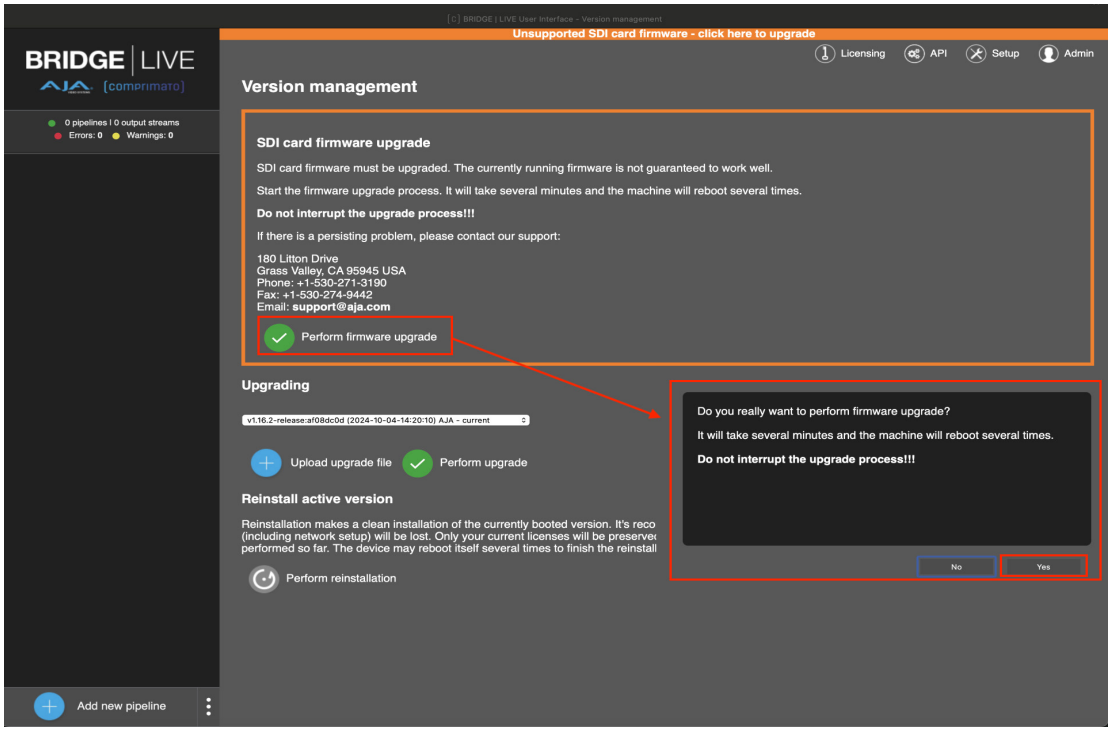
1. Update to latest BRIDGE LIVE version, as outlined in the preceding installer sections.
2. Once upgrade is complete, login to BRIDGE LIVE. If the AJA Corvid card firmware is out of date, an orange dialog box will appear at the top of the screen with the following prompt: "Unsupported SDI card firmware – click here to upgrade."

Figure 43. Firmware Upgrade Prompt



3. Click on the orange dialog box to start the upgrade procedure. This will take you to the 'Version Management' page.
4. In the orange 'SDI card firmware upgrade' dialog box, select 'Perform firmware upgrade'. Press 'Yes' when prompted.

Figure 44. Perform Firmware Upgrade



5. After clicking 'Yes', machine will reboot the BIOS screen twice before showing an OS selection screen.
6. After loading the OS, machine will reboot again to a black screen for approximately 1-2 minutes before restarting.
7. After this reboot, the OS will load and proceed to the login screen as the update is complete.

Low Latency Operation

Introduction

The best practice to achieve the lowest BRIDGE LIVE processing latency is to configure the low latency preset once all the BRIDGE LIVE pipelines have been set up.

If all the formats, rates and settings are the same across all pipelines, then the **`low _ latency.ini`** file can be used (variable bit rate (VBR) mode) for low latency operation. This is the default setting. If different settings are used across pipelines, then a constant bit rate (CBR) **`*.ini`** file can be adjusted manually to achieve the desired results.

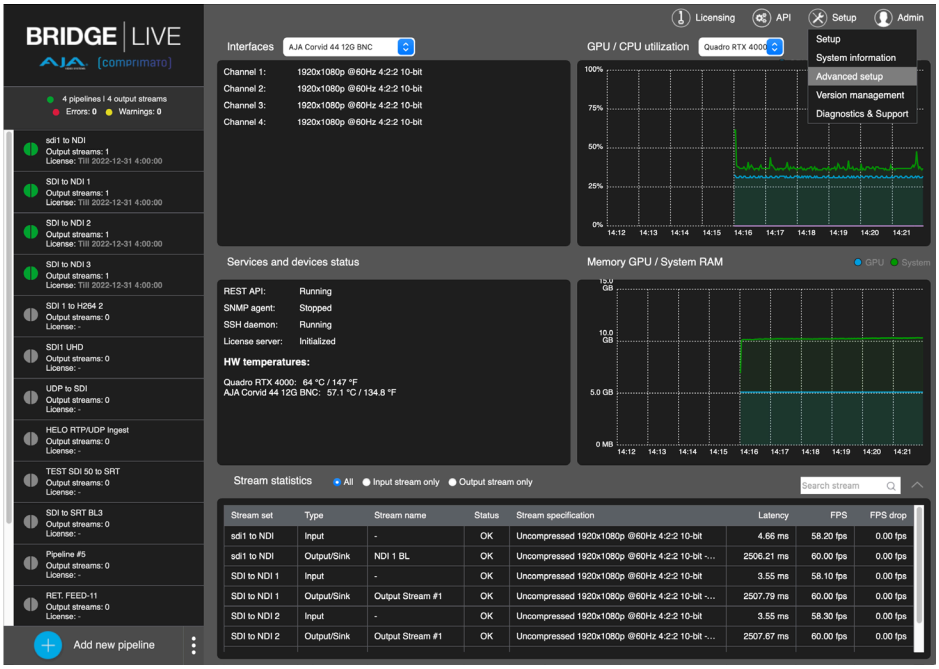
Please follow the appropriate procedure below for your workflow.

Low Latency Using VBR

If all the formats, rates and settings are the same across all pipelines, then the **`low _ latency.ini`** file can be used.

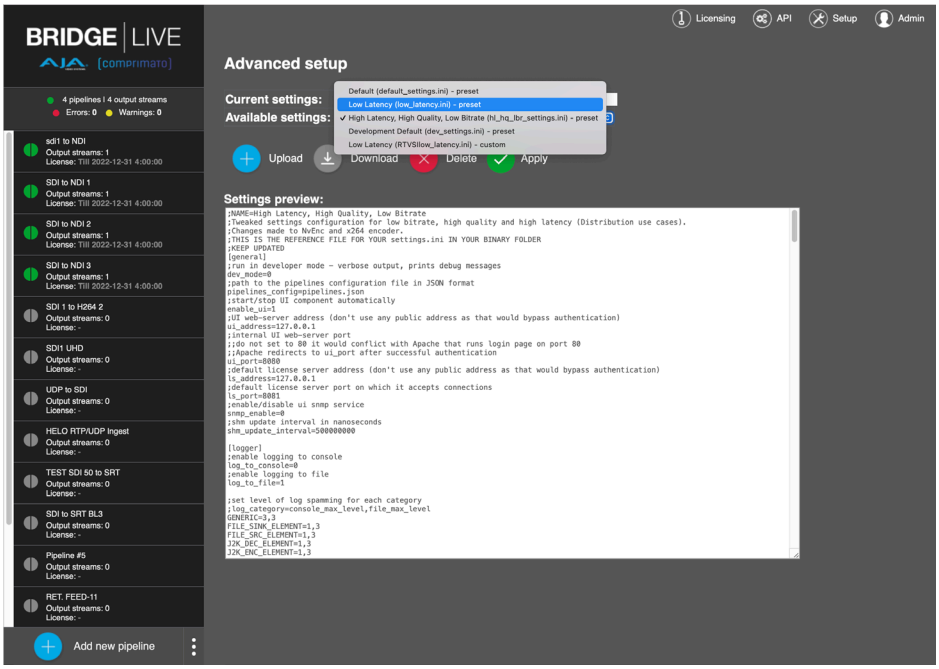
1. In the BRIDGE LIVE Dashboard screen, hover your cursor over the Setup item at the top right and click on "Advanced setup".

Figure 45. BRIDGE LIVE Dashboard



2. Inside the Advanced setup window that opens, open the drop-down menu of "Available Settings" and choose "Low Latency."

Figure 46. Selecting Low Latency from Available Settings



3. You will be prompted with a verifying message asking if you want the Low Latency settings file to be used. Click "Next."
4. In the additional pop-up that appears, click "Restart now!"
5. BRIDGE LIVE will restart and activate the Low Latency Preset.

Low Latency Using CBR

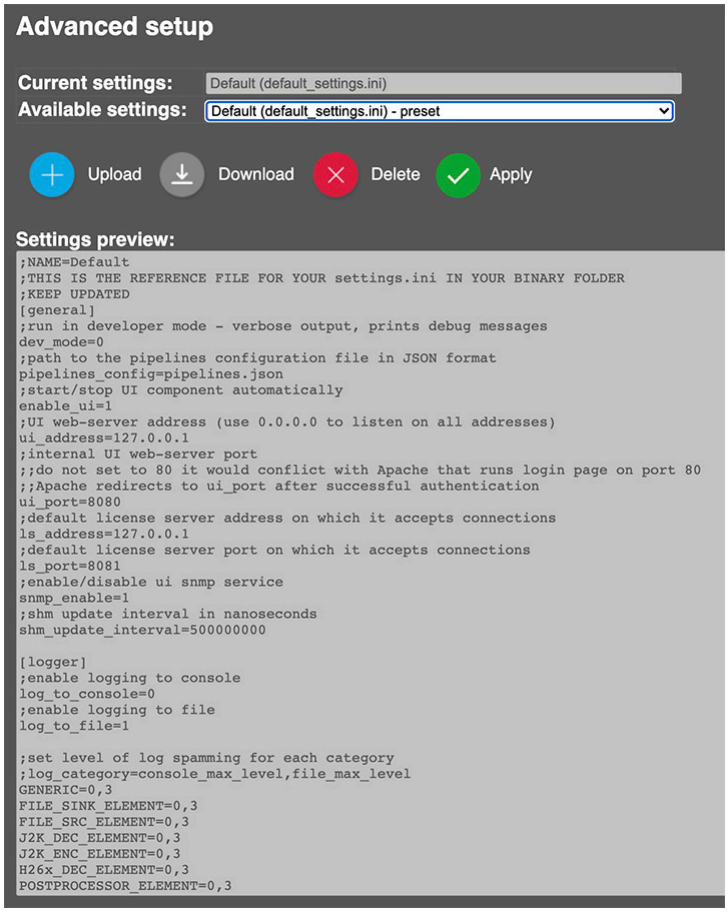
If the formats, rates, and settings are the same across all pipelines, a constant bit rate (CBR) **`*.ini`** file can be adjusted manually to achieve the desired results.

Within the CBR **`*.ini`** file (**`default _ settings.ini`**), there are two attributes that need to be edited manually. They are:

- LATENCY_ADDITION (value in milliseconds). The default value is "2000". This attribute can be a common cause for synchronization to fail. Every pipeline has a different latency. If you don't want latency to be dynamic, use "0" (or a different specific value) in milliseconds.
- FULLSPEED_MUXING. Indicates either CBR (value of "0") or VBR (value of "1").

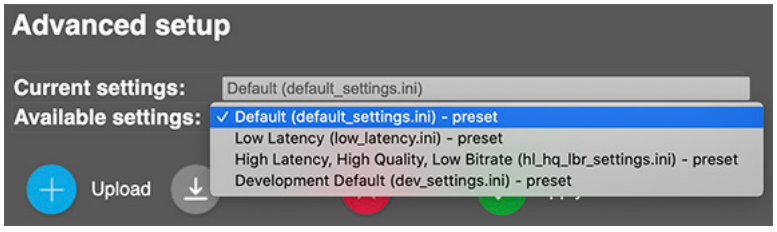
1. From the **Setup** menu, select **Advanced Setup**. The Advanced Setup page displays.

Figure 47. The Advanced Setup page displaying the default_settings.ini file



2. Select the file you want to edit from the **Available Settings** drop-down list.

Figure 48. Selecting latency .ini file presets



3. Click **Download**. The file you selected downloads to your computer.
4. Make any needed edits to the file using your preferred text editor.

5. Once finished, select **Upload**. Navigate to the file you want to upload, select it, then click **Open**. The file will upload and it will display in the **Settings Preview** area.
6. Click **Apply**. A confirmation message displays. Click **Next**. Another confirmation displays. Select **Restart later** or **Restart now**.

The currently selected **`*.ini`** file is indicated in the **Current settings** field. You can select a different **`*.ini`** file from the **Available settings** drop-down menu.

NDI Discovery Servers

NDI Discovery servers can act as central resources which detect the presence of all the NDI streams on the network. The NDI discovery service is designed to allow you to replace the automatic discovery NDI uses with one or two servers which operate as a centralized registry of NDI sources.

This can be very helpful for installations where you wish to avoid having significant mDNS (Multicast DNS) traffic for a large number of sources. It can also be useful in situation where multicast is not possible or desirable; it is very common for cloud computing services not to allow multicast traffic.

When using the discovery service, NDI can operate entirely in unicast mode and thus in almost any installation. The discovery servers support all NDI functionality including NDI groups.

Starting in v1.16 BRIDGE LIVE supports multiple NDI Discovery servers.

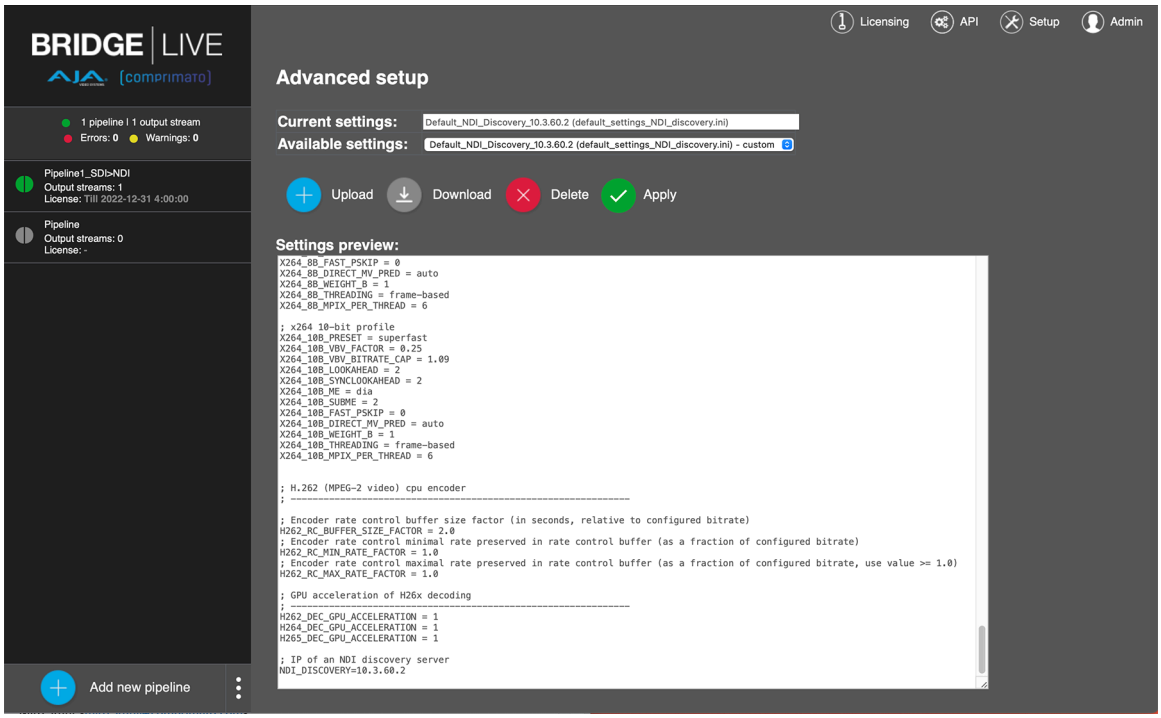
Using NDI Discovery with BRIDGE LIVE

In order to utilize NDI Discovery servers, it is necessary to change parameters in the active .ini settings file. See *"Advanced Setup" on page 66*.

Configure as follows:

- Download the active .ini settings file
- Open the downloaded .ini settings file and locate the line which contains “NDI_DISCOVERY=” and add the IP address of your discovery server to that line (ex. NDI_DISCOVERY=10.3.60.2)
  - If your file doesn't contain a "NDI_DISCOVERY=" line, simply add it to the .ini file (along with the required IP address). While that new line can be located anywhere, appending it to the end of the file makes it easy to find should it require a change (*Figure 49 on page 51*)
- To add a second NDI Discovery server, add a comma followed by the NDI Discovery server IP address (ex. NDI_DISCOVERY=10.3.60.2, 10.3.60.3)
- Save your changes, then Upload the updated .ini settings file. Select the file, click Apply, then follow directions to activate

Figure 49. Advanced Setup, NDI Discovery



Timecode Insertion in SEI

BRIDGE LIVE supports inserting Timecode into SEI (Supplemental Enhancement Information) for encoding into HEVC or H.264 streams. The timecode inserted can be set to lock to NTP (Network Time Protocol), which must be configured on the sending BRIDGE LIVE.

To configure Timecode Insertion in SEI, it is necessary to change parameters in the active .ini settings file. See *"Advanced Setup" on page 66*.

HEVC Activation

Download the active .ini settings file and remove the semi-colon on two lines:

- ; NVENC_HEVC_ADD_TIMESTAMPS = 1
  - NVENC_HEVC_ADD_TIMESTAMPS = 1
- ; NVENC_HEVC_TIMESTAMPS_IDENTIFIER = cf848278-ee23-306c-9265-e8fef22fb8b8
  - NVENC_HEVC_TIMESTAMPS_IDENTIFIER = cf848278-ee23-306c-9265-e8fef22fb8b8

Figure 50. HEVC Activation

```
; timestamp SEI messages (MISB ST 0604)
; ------------------------------------------------------------------

; enable/disable adding timecode SEI messages for H.264 nvenc (default: disabled)
; NVENC_H264_ADD_TIMESTAMPS = 1
; enable/disable adding timecode SEI messages for H.264 cpu encoder (default: disabled)
; X264_ADD_TIMESTAMPS = 1

; enable/disable adding timecode SEI messages for H.265 nvenc (default: disabled)
; NVENC_HEVC_ADD_TIMESTAMPS = 1
; timestamp identifier to be used as the uuid_iso_iec_11578 of the user data SEI message
; ommit to use the standard one specified in MISB ST 0604 (works for H.265 nvenc only!)
; NVENC_HEVC_TIMESTAMPS_IDENTIFIER = cf848278-ee23-306c-9265-e8fef22fb8b8
```

Save your changes, then Upload the updated settings file. Select the file, click Apply, then follow directions to activate

H264 Activation

Download the active .ini settings file and remove the semi-colon on two lines:

- ; NVENC_H264_ADD_TIMESTAMPS = 1
  - NVENC_H264_ADD_TIMESTAMPS = 1
- ; X264_ADD_TIMESTAMPS = 1
  - X264_ADD_TIMESTAMPS = 1

Figure 51. X264 Activation

```
; timestamp SEI messages (MISB ST 0604)
; ------------------------------------------------------------

; enable/disable adding timecode SEI messages for H.264 nvenc (default: disabled)
; NVENC_H264_ADD_TIMESTAMPS = 1
; enable/disable adding timecode SEI messages for H.264 cpu encoder (default: disabled)
; X264_ADD_TIMESTAMPS = 1

; enable/disable adding timecode SEI messages for H.265 nvenc (default: disabled)
; NVENC_HEVC_ADD_TIMESTAMPS = 1
; timestamp identifier to be used as the uuid_iso_iec_11578 of the user data SEI message
; ommit to use the standard one specified in MISB ST 0604 (works for H.265 nvenc only!)
; NVENC_HEVC_TIMESTAMPS_IDENTIFIER = cf848278-ee23-306c-9265-e8fef22fb8b8
```

Save your changes, then Upload the updated settings file. Select the file, click Apply, then follow directions to activate.

OS and Network Administration

Console Administration

NOTE: Starting with v1.16, BRIDGE LIVE has moved to the Rocky Linux 9 Operating System (previously CentOS7). If you need to roll back to an older BRIDGE LIVE firmware release, please use the appropriate manual, to ensure accurate representation of configuration options.

If you want to administer the BRIDGE LIVE locally, it is highly recommended that you boot it with the monitor already connected. You can unplug the monitor later, but if you want to use it again, you should re-connect it to the previously used port.

The default user environment is the aforementioned web-based console. However, for advanced administrative tasks, it is possible to switch to the system console. The background OS is Rocky Linux 9. The standard shortcut Ctrl+Alt+T will take you to the graphical terminal application (not meant for long-term use, only for a quick configuration or diagnostic).

Default Accounts

Admin User

Admin Username: admin

- Used for local login, browser login and REST API

Admin Password:

- See the Quick Start Guide that was originally delivered with your unit for your factory-provided unique password.

Transcoder User

Transcoder Username: transcoder

- Used for CLI/SSH

Transcoder Password:

- See the Quick Start Guide that was originally delivered with your unit for your factory-provided unique password.

NOTE: Due to security reasons, it is not possible to connect using SSH as a root user.

BRIDGE LIVE Files Location

Most of the important files are located in /opt/transcoder/ folder including the binaries and configuration files.

System Services

All BRIDGE LIVE components run as a system service. You can use the standard OS's interface systemctl to manage those services.

transcoder-base

Starts the BRIDGE LIVE and the web server with web UI at system start.

transcoder-x

Starts graphical window system with lightweight desktop manager OpenBox.

transcoder-browser

Starts Chromium browser in kiosk mode and restarts it in case it detects that Chromium stops running.

transcoder license

Starts the license server with its web UI at system start.

System Security

The security of the system is provided by a built-in firewall. The setup is available in the UI's setup wizard.

Each network interface needs to be marked with an attribute whether its intent is to be used for:

- Administration – SSH, HTTP(S), SNMP protocols ports allowed
- Incoming/outgoing streams – 1024-65535 ports allowed
- Both
- Unused

All of the remaining ports are blocked.

In a situation when an interface is marked either Administration or Unused, it will not show in the stream configuration dialogue; therefore, it cannot be selected there.

Manual Network Interface Configuration

BRIDGE LIVE UI offers a somewhat limited set of possibilities to configure the network interface. In the event that you need to set it more precisely, Rocky Linux 9 has three main options for how to configure network interfaces.

- ifcfg files – It uses ifcfg network configuration script files placed in '/etc/sysconfig/network-scripts'. It is used internally in BRIDGE LIVE. You can manually adjust some parameters when needed. Preferred and the only supported way of manual network setup in BRIDGE LIVE OS.
- NetworkManager – NM uses its nm* commands to configure network interfaces.
- ip command – some changes made by ip commands are only temporal and are not guaranteed to survive system restarts. We recommend exercising caution if using this functionality.

Virtual Interfaces

BRIDGE LIVE currently doesn't support creating new virtual interfaces in the web UI. These interfaces need to be added using system console using ifcfg scripts. Currently BRIDGE LIVE recognizes bond, bridge and vlan interfaces.

Adding New Virtual Interface

For example, to add vlan 100 to existing Ethernet interface enp4s0:

With sudo add new file ifcfg-enp4s0.100 to directory /etc/sysconfig/network-scripts/ (for example with nano or vim) cd /etc/sysconfig/network-scripts/ sudo vim ifcfg-enp4s0.100

DEVICE=enp4s0.100

TYPE=Vlan

VLAN=yes

VLAN_ID=100

ONBOOT=yes

BOOTPROTO=none

NM_CONTROLLED=no

IPV6INIT=no

ZONE=trc-admin-data

Next start the interface

sudo ifdown ifcfg-enp4s0.100

sudo ifup ifcfg-enp4s0.100

Restart BRIDGE LIVE service

sudo systemctl restart transcoder-base

Wait until BRIDGE LIVE starts and in BRIDGE LIVE Dashboard run Setup where you can find your new vlan interface. Configure usage and complete setup.

IPMI

You can use IPMI to remotely reboot or shutdown BRIDGE LIVE.

CAUTION: *Use of IPMI can introduce possible security implications for your network. AJA can not be responsible for issues that arise from making use of the IPMI functionality.*

To access the IPMI of a Supermicro server, you need to know the IP address to which you want to connect. With BRIDGE LIVE, you do not need to have the dedicated IPMI interface plugged in, since IPMI shares an interface with the OS while having its own IP address.

You can find the IP address using an app on your phone (Android/iOS), PC (IPMIView), or you can memorize the IP address that you can see during the boot process as "BMC IP:".

If IPMI has no IP address assigned (for example, if there is no DHCP server in the subnet), you can configure it in BIOS. When you start the server, press the DEL key repeatedly until you are in BIOS. From there, navigate to the IPMI tab. Select BMC network config and fill in the parameters you require.

The current list of IPMI features can be found here. As of now, we do not support out of the box the following items:

- Keyboard, Video & Mouse (KVM) Console Redirection with multi-language support,
- HTML5 web Console Redirection,
- Serial over LAN (SOL) - this can be enabled from the OS.

You can find the complete Supermicro IPMI user guide here.

Chapter 3 – Operation

Overview

BRIDGE LIVE is designed as a network appliance, such that once configured it will transport signals across the network without requiring direct user interaction. After initial configuration of the unit for network operation, most of BRIDGE LIVE end-user operating procedures involve creating or modifying pipelines, which can be as simple as selecting different available input or output signals.

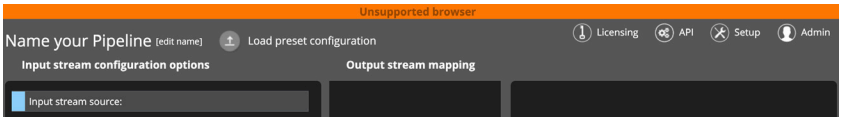
Browser Types

Once BRIDGE LIVE has been configured, it can be accessed with a network connected computer running a supported browser (Chrome, Firefox, Edge, Safari).

Unsupported Browsers

Browsers change over time as new functionality is added. In some cases, using an older browser may cause some issues. If that happens, you will be notified that you are using an old or unsupported browser, as pictured in *Figure 52*.

Figure 52. Example of an Unsupported Browser Message

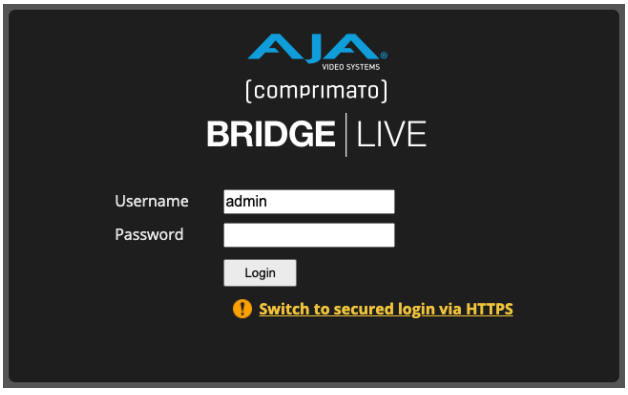


Logging in Remotely with a Browser

Once BRIDGE LIVE has been configured, it can be accessed with a network connected computer running a browser.

You login by entering the IP address of that BRIDGE LIVE into the browser. The following login prompt appears:

Figure 53. BRIDGE LIVE Initial Login Prompt via Browser



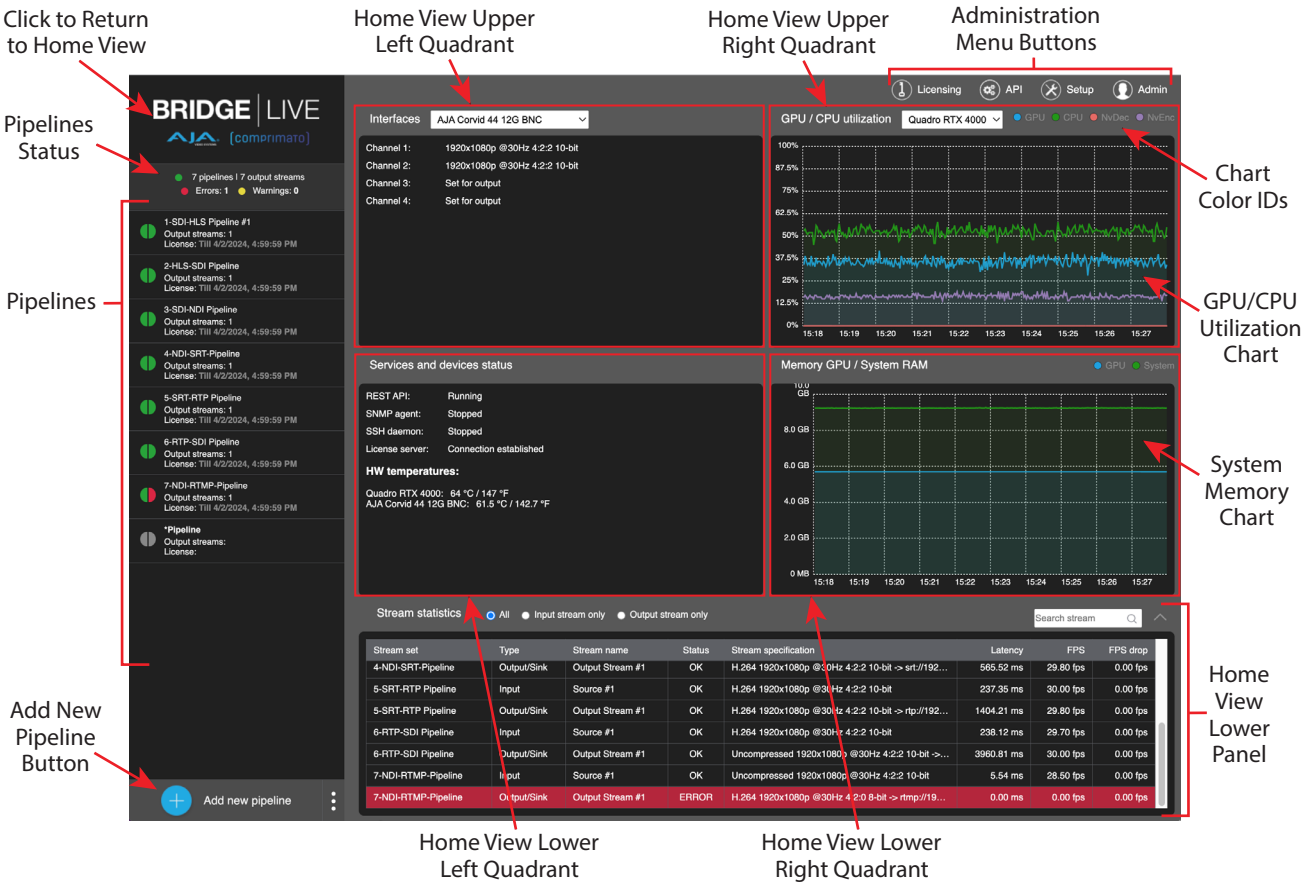
The Username is "admin", and the default password that is unique to that BRIDGE LIVE unit is included in the Quick Start Guide provided with shipment. If the password has been changed, contact your system administrator for the new password.

After entering the username and password, click **Login**. You will go to the BRIDGE LIVE Dashboard displays showing the general user interface (see *"BRIDGE LIVE Dashboard Home View" on page 57*).

BRIDGE LIVE User Interface Description

Dashboard Interface Basics

Figure 54. BRIDGE LIVE Dashboard Home View



The BRIDGE LIVE UI has two basic layouts, Home View and Pipeline View. Both views share the same left column, which displays system status and is also used for pipeline operation and selecting a pipeline for configuration.

Home view is the default display when the BRIDGE LIVE application is first launched (*Figure 54*). You can return to Home view at any time by clicking on the BRIDGE LIVE logo at the upper left corner of the screen.

Clicking on a pipeline in the left column displays the Pipeline view, showing video configuration information for that pipeline on the right side of the screen (*Figure 55*).

Home View

Home View provides an overview of system status. It also shows an overview of performance and of the utilization of the system through the following interface elements:

Left Column - Shared with Pipeline View. Pipeline status, pipeline selection for configuration, and controls for starting, stopping, and deleting pipelines.

Upper Left Quadrant - Reports the data throughput transmitted (Tx) and received (Rx) for the selected interface. For SDI, it reports what is detected and if it is used for output streaming.

Upper Right Quadrant - GPU utilization/CPU utilization

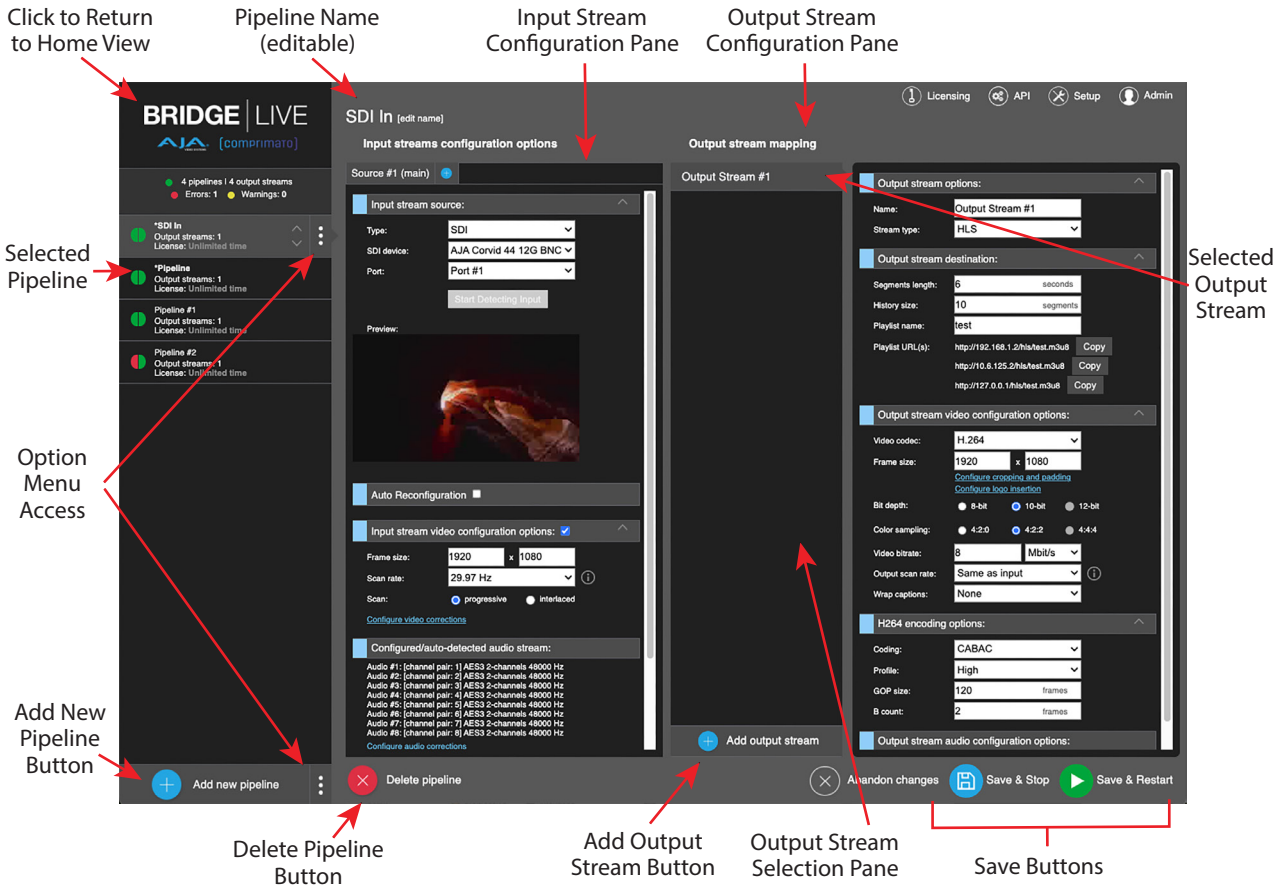
Lower Left Quadrant - Services and devices status

Lower Right Quadrant - Memory GPU/System RAM

Lower Panel - Stream statistics including stream latency, FPS and FPS drops

Pipeline View

Figure 55. BRIDGE LIVE Dashboard Pipeline View



Left Column - Shared with Home View. Pipeline status, pipeline selection for configuration, and controls for starting, stopping, and deleting pipelines.

Input Stream Configuration Pane - Input stream configuration parameters, which will vary depending on type of input stream.

Output Stream Selection Pane - Output stream addition and selection, used for pipelines that support multiple output streams.

Output Stream Configuration Pane - Output stream configuration parameters, which will vary depending on type of input stream.

Pipeline Control Buttons - Located at the bottom of the screen, these buttons affect the currently selected pipeline or output stream, allowing you to Delete and Save pipelines. Different button functions are displayed, depending on the current pipeline configuration step.

The Left Column (Pipelines)

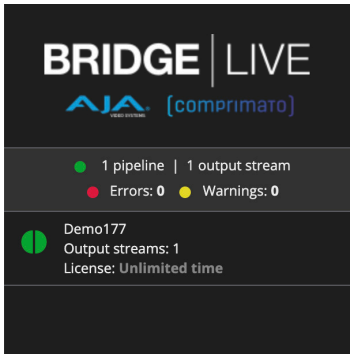
Beneath the AJA and Comprimato logos, in the top left of the interface, is a summary of the number of running pipelines, beneath which are flags for Errors (Red) or Warnings (Yellow).

Flags, Warnings and Errors

The Pipeline status indicators shown in *Figure 56* below show the number and types of errors, along with indicators for configured and applied Pipelines.

Hover the mouse over a half circle to see specific error messages for a Pipeline.

Figure 56. Pipeline status indicators



Pipelines

Below the errors and warning flags the currently configured pipelines are displayed. Clicking on a pipeline displays information for that selected pipeline.

On the left side, each pipeline has a circular status icon. The left half of the colored circle provides feedback on the incoming part of the pipeline, while the right side indicates the status of the outgoing part of the pipeline.

Immediately to the right of the circular icon is the name of the pipeline. An asterisk (*) in front of the name indicates changes have been made to that pipeline's configuration that have not been saved.

Further to the right, when hovering the mouse over the pipeline, there is also a toggle pipeline stop and start button.

Figure 57. Pipeline Stop Button

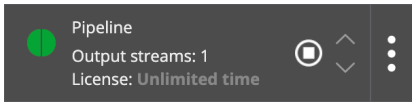
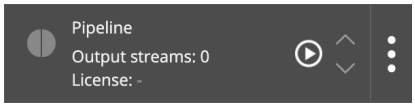
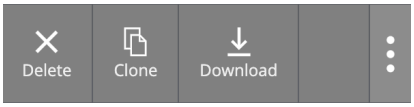


Figure 58. Pipeline Play Button



When hovering the mouse, along the right edge of each pipeline is a vertical ellipsis. Clicking on the ellipsis will toggle the button to display the following three options:

Figure 59. Pipeline Delete, Clone, Download Buttons

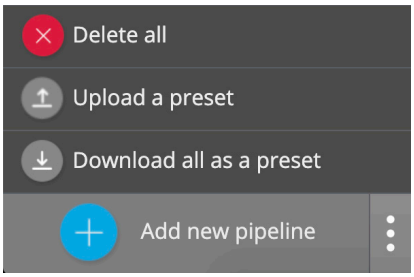


Use these buttons to delete, clone or download a pipeline.

Backing Up Pipelines

Once you have created all the pipelines you need, you can create a backup of them. From the lower left corner, click the vertical ellipsis next to "Add new pipeline" to open the Pipelines Management pop-up menu.

Figure 60. Pipelines Management Menu



Select "Download all as a preset." All of your pipeline configuration settings will download as a "pipelines.json" file.

You can upload this file in the future to upload your pipeline preset using the "Upload a preset" menu. If the name of an uploaded pipeline is identical to an existing pipeline, the name will be appended with #1, #2, etc.

Additionally, you can delete all pipelines by selecting the "Delete all" menu.

Output Streams and Licenses

Beneath the name of the pipeline is an indication of the number of output streams associated with the pipeline. For every stream, there is also information on license status. Streams need to be licensed in order to run. For H.265, H.264 and H.262, BRIDGE LIVE will come with perpetual licenses.

Meaning of Color Statuses

	**Both sides Grey** - No pipeline has been created (new system or all pipelines deleted). The pipeline has been stopped. **Right side Grey** - The output is not configured
	Red - There is an error causing the pipeline not to work correctly. Left side for input, right side for output.
	**Yellow** - Standby mode. This can occur, for example, when a pipeline is in SRT mode and the stream does not have a subscriber. In that case, the stream is not being sunk. In this case when a subscriber is actively receiving the stream, the signal turns green. Another example is HLS buffering.
	**Green** - The stream is working correctly (and in the case of SRT, is being subscribed to).

Add New Pipeline Button

The bottom left corner of the Dashboard has an **Add new pipeline** button for adding a new pipeline. Selecting it directs you to the pipeline window. This is the same window accessed when you want to change the configuration of an existing pipeline.

Returning to Dashboard Home View

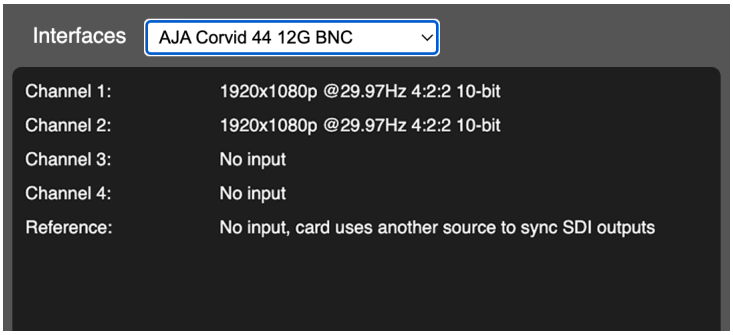
At any time, to return to the main Dashboard home view, click the AJA/ Comprimato logos in the top left area of the Dashboard interface.

Upper Left Quadrant – Interfaces

The first quadrant (upper left) displays information for the BRIDGE LIVE's I/O signals. When the AJA Corvid is selected, the configuration status and format of that incoming signals are displayed (*Figure 61*).

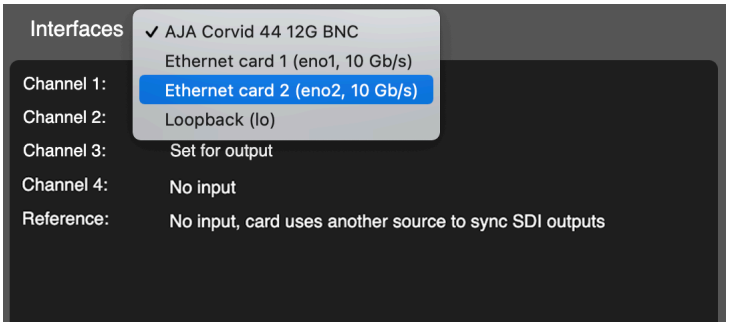
The Interfaces panel also allows you to easily monitor reference signals. See *"Reference Monitoring" on page 62*

Figure 61. Interfaces Panel of Dashboard, Corvid 44 Selection



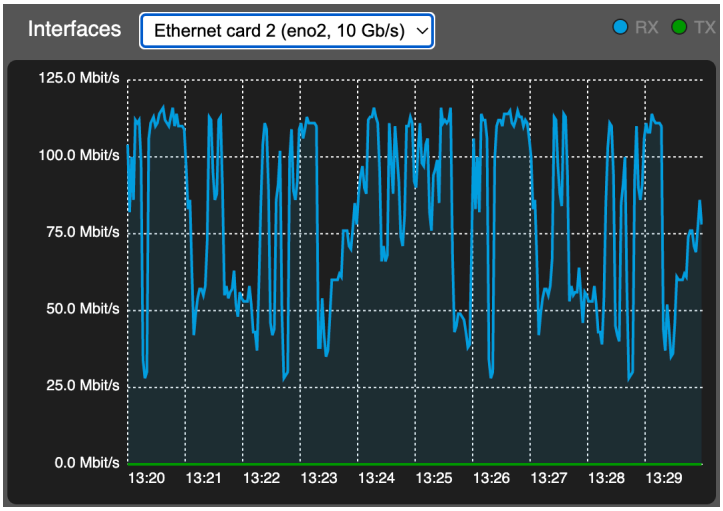
Clicking on the Interfaces box presents a dropdown menu (*Figure 62*).

Figure 62. Interfaces Panel Drop-down Menu



Selecting an Ethernet Card displays a chart over time of data transfer (*Figure 63*). The Loopback setting is used for system testing purposes.

Figure 63. Interfaces panel Ethernet Selection



Reference Monitoring

The Interfaces panel displays reference detection and provides SDI output genlock status.

Figure 64. No Reference Detected

Channel 1:	1920x1080p @59.94Hz 4:2:2 10-bit
Channel 2:	1920x1080p @59.94Hz 4:2:2 10-bit
Channel 3:	Set for output
Channel 4:	Set for output
Reference:	No input, card uses the internal clock to sync SDI outputs

Figure 65. Reference Detected and Used for Genlock

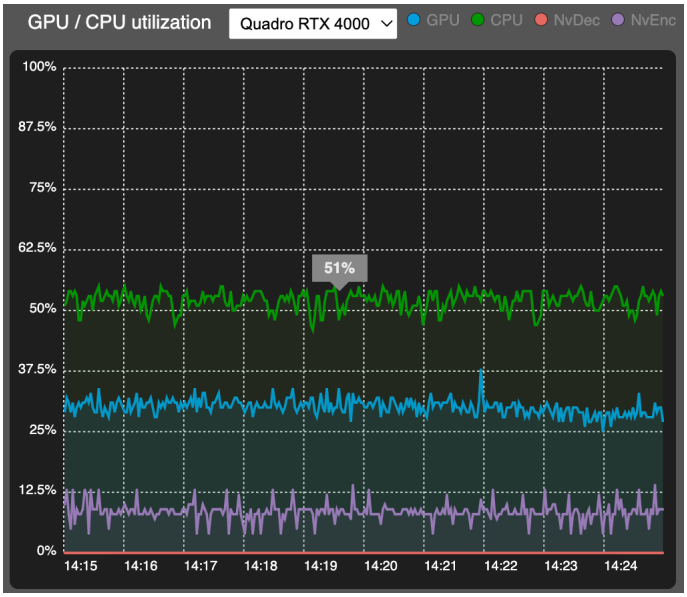
Channel 1:	1920x1080p @59.94Hz 4:2:2 10-bit
Channel 2:	1920x1080p @59.94Hz 4:2:2 10-bit
Channel 3:	Set for output
Channel 4:	Set for output
Reference:	1920x1080i @59.94Hz (used to sync SDI outputs)

Upper Right Quadrant – GPU/CPU Utilization

The second quadrant (upper right) shows GPU/CPU utilization hardware components. The GPU has three statistics. The blue line shows the level of GPU utilization. NvEnc and NvDec represents the workload of the NVIDIA hardware encoder decoder respectively.

Hover the mouse over a line to see the percentage of utilization of that component at that point in time on the graph.

Figure 66. GPU utilization/CPU utilization panel of Dashboard

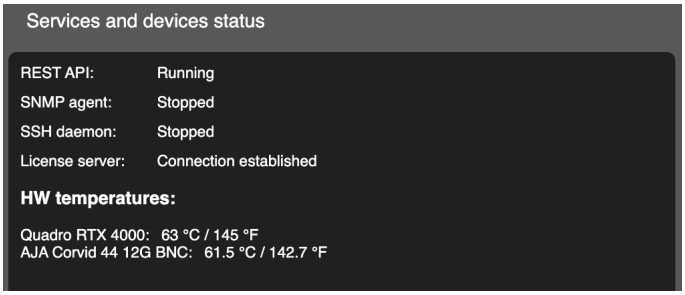


NOTE: When working with JPEG 2000, the CPU chart may go to 100% utilization. Generally, however, the CPU is not expected to go over 65%.

Lower Left Quadrant – Services and Devices Status

The lower left quadrant, Services and devices status, reports statistics for services that are running. It reports what is running, and it also displays the status of the License server. In the example shown below, the License server is initialized. Hardware temperatures are also reported.

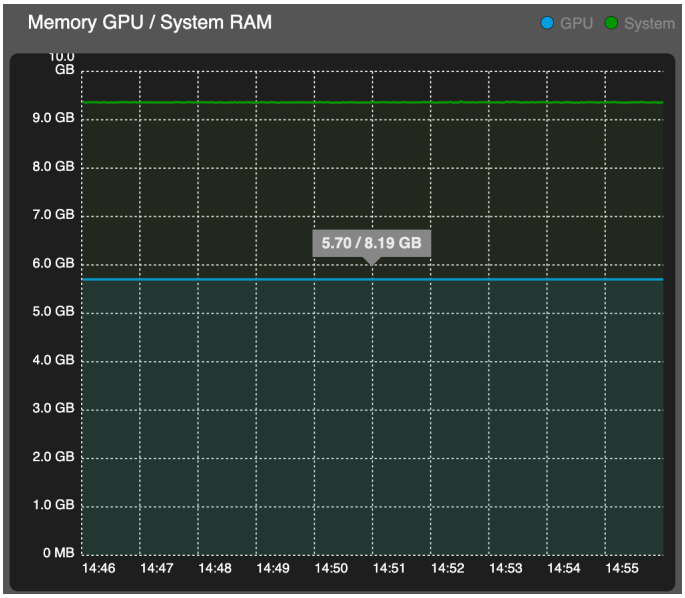
Figure 67. Services and devices status panel of Dashboard



Lower Right Quadrant – Memory GPU/System RAM

The lower right quadrant, Memory GPU/System RAM, reports memory consumption. When you hover the mouse over the line in the graph, a mouse-over message reports the amount of memory used at that point in time, followed by the amount of memory that was available.

Figure 68. Memory GPU/System RAM panel of Dashboard

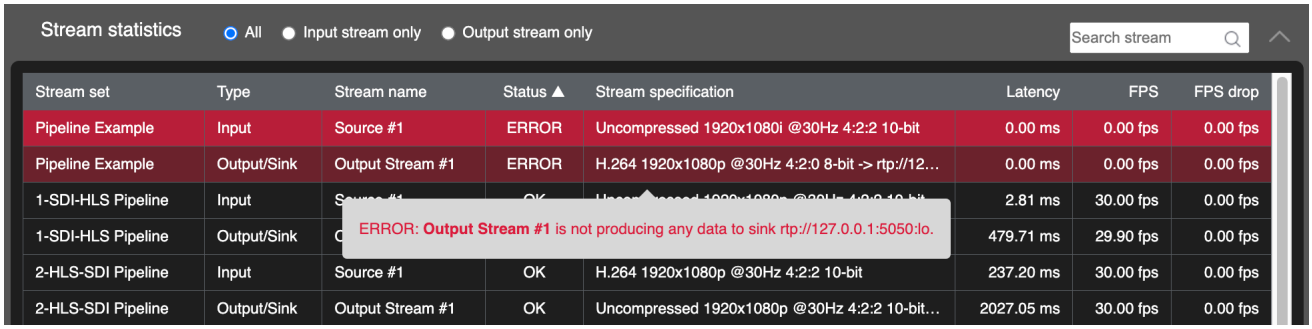


Lower Panel

In the lower panel of Dashboard, you can see a list of all currently running streams, both input and output. Use the Stream statistics radio buttons to filter by All, Input stream only, or Output stream only. Clicking on a column name on the top gray line sorts the list by that category. You can also search for a particular stream using the search tab in the upper right section of the panel.

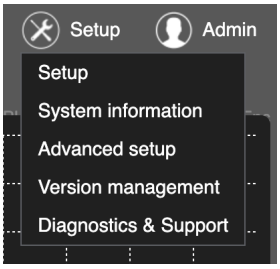
If an error occurs, the relevant lines will turn red. When you hover the cursor over a red line, a brief description of that error will be displayed.

Figure 69. Dashboard Stream Statistics



NOTE: Inactive pipelines still being configured will not be displayed on the stream statistics list.

Setup Menu



Additional setup and information screens can be accessed by hovering your cursor over the Setup top menu button, and then clicking on the desired menu item.

Setup

Initiates an initial system setup procedure (see *"Initial System Setup Process" on page 31*). If you do not want to run this procedure, click on **Cancel Setup**.

System Information

To view system information, click System information. System information reports various aspects of the system including software version, OS version, Installation ID, Host Name, Memory statistics, drivers, hardware and network information.

Figure 70. Selecting System information from the Setup menu

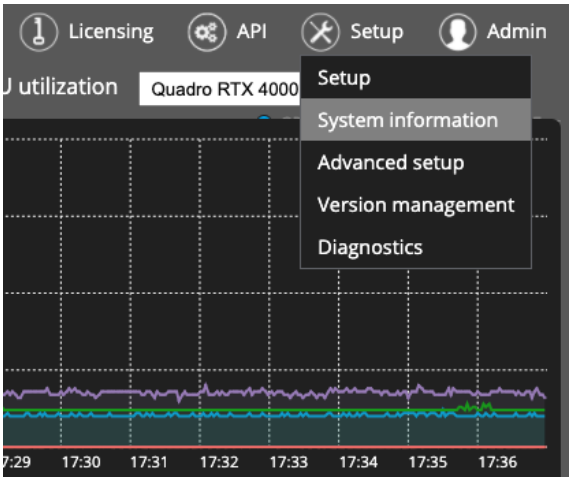
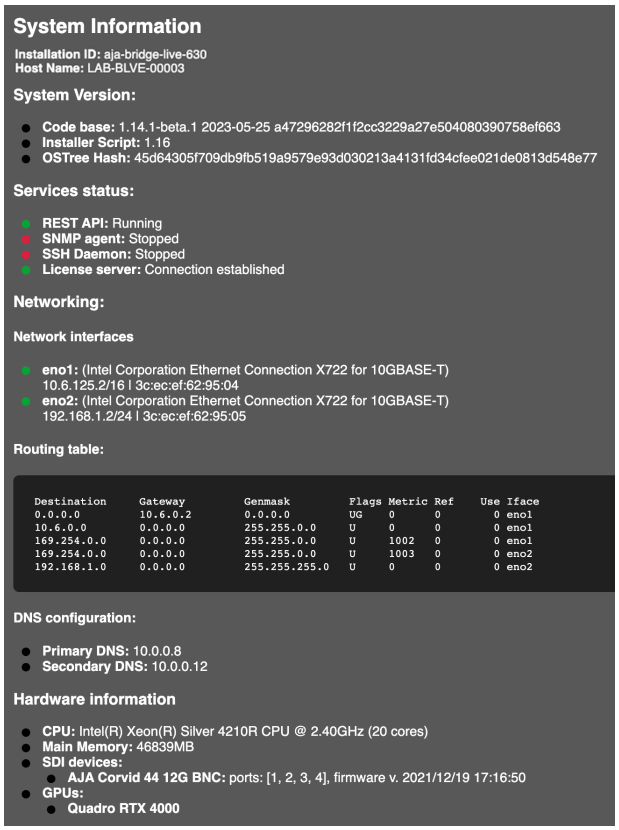
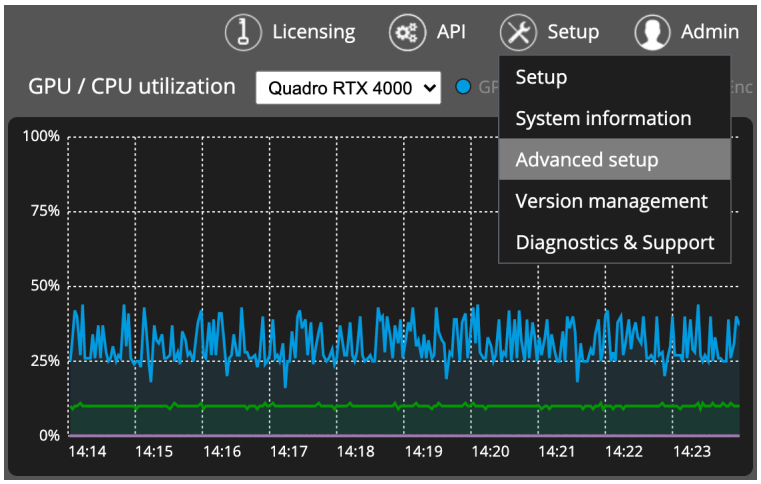


Figure 71. System Information



Advanced Setup

Figure 72. Setup Mouse-over

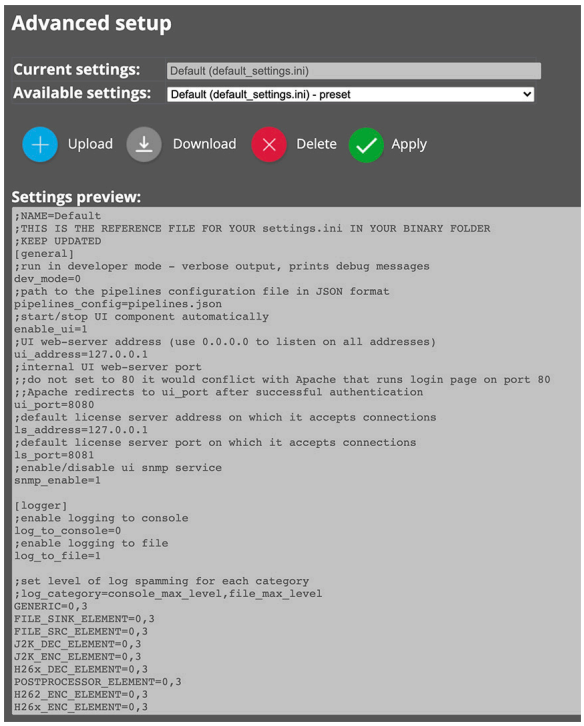


Access Advanced setup by clicking the Advanced setup option under the Setup mouse-over. You can select among saved configurations under Available settings drop-down menu. Configurations are stored in BRIDGE LIVE using .ini files. Users can download, edit, upload, and activate various settings and features via these files.

Click the Apply button in order to set the chosen settings configuration. After that, you will be prompted to restart the BRIDGE LIVE service in order to apply changes. This configuration allows you to edit parameters, which adjust the transcoding process, such as GPU memory distribution, encoding presets, and other settings.

The suffix “preset” means that the file is the pre-configured one, which in general should work best with a particular use case. The suffix “custom” points out the fact that this settings file was uploaded to BRIDGE LIVE by the end user. It is advised to consult the configuration adjustments with your support team.

Figure 73. Advanced Settings Management



See *"Low Latency Operation" on page 47* for an example using Advanced Setup.

Version Management

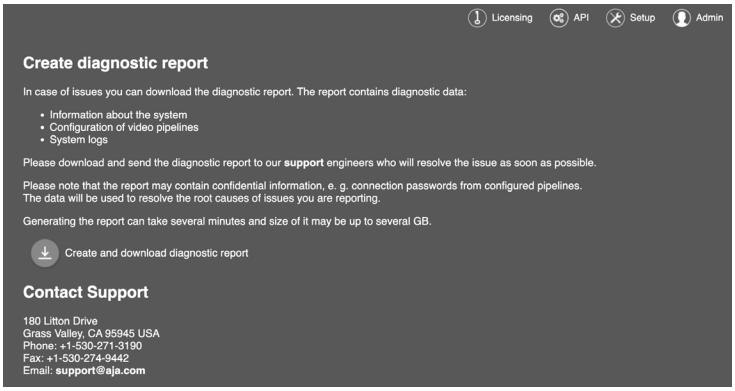
See *"BRIDGE LIVE Software Update" on page 40* for information.

Diagnostics & Support

The Diagnostics and Support page lets you create a BRIDGE LIVE log file, which can be useful for troubleshooting by AJA support staff. The report contains system information, pipeline configuration information, pipeline error messages, and system logs.

To access the page, select **Diagnostics & Support** from the Setup menu in the upper right area of Dashboard. An informational screen will be displayed.

Figure 74. Diagnostics and Support Screen



To create a log file, Click **Create and download diagnostic report**. The diagnostic report will download to your computer. You can see logs in the folder:

/opt/transcoder/transcoder/logs/

If you need to send logs to AJA Support, please copy the contents of the folder, archive them and share.

Admin Menu

Functions available in the Admin Menu can be used for system management functions, including restarting all pipelines, and rebooting or shutting down the BRIDGE LIVE unit. See *"Admin Menu" on page 35* for more information.

Pipeline Configuration

About Pipelines

A pipeline is a configured network communications path defining necessary signal stream information. Each pipeline has an Input Stream and at least one Output Stream, which specify various parameters that are configured to define the functionality of that pipeline. Each Output Stream also has an Output Stream Destination, which further defines that Output Stream target and capabilities. Each Pipeline also employs a Codec, used to encode and decode the data sent over the network.

Various parameters are available, depending on the choice of Input Stream, Output Stream, Destination, and Codec. During the pipeline configuration process the BRIDGE LIVE UI displays only the parameters applicable to the options that you have selected.

Because of the progressive definition of a pipeline, the order of the configuration steps you perform is important. For example, some pipeline settings can be set automatically when a pipeline is first created, but only if an active source is already present and detected. If that source is not available, additional manual configuration settings, subject to human error, will be required. Following the general procedure described here can help you efficiently and successfully configure your BRIDGE LIVE with the pipelines needed for your workflows.

Saving, Starting, and Stopping Pipelines

Once created, each pipeline must be saved before it can be used. When a pipeline is started, it activates that network signal path, transporting video from the selected source to the desired destination. Pipelines continue to operate as long as the input source and output destination(s) are present and valid.

Currently active pipelines will be automatically restored to operation when the BRIDGE LIVE unit is reset, rebooted, or power cycled. All pipeline configurations are also retained, but inactive pipelines are not automatically re-activated under those circumstances.

General Procedure for Creating a Pipeline

Overview

The following procedures describe the basic steps required to create an entirely new pipeline. You will make choices regarding transport streams, protocols, and codecs to meet your encoding requirements. These choices dynamically affect which sets of configuration options become available as you build your pipeline.

NOTE: Because different parameter settings are required depending on the type of pipeline being created, cross references are provide to manual locations explaining specific settings.

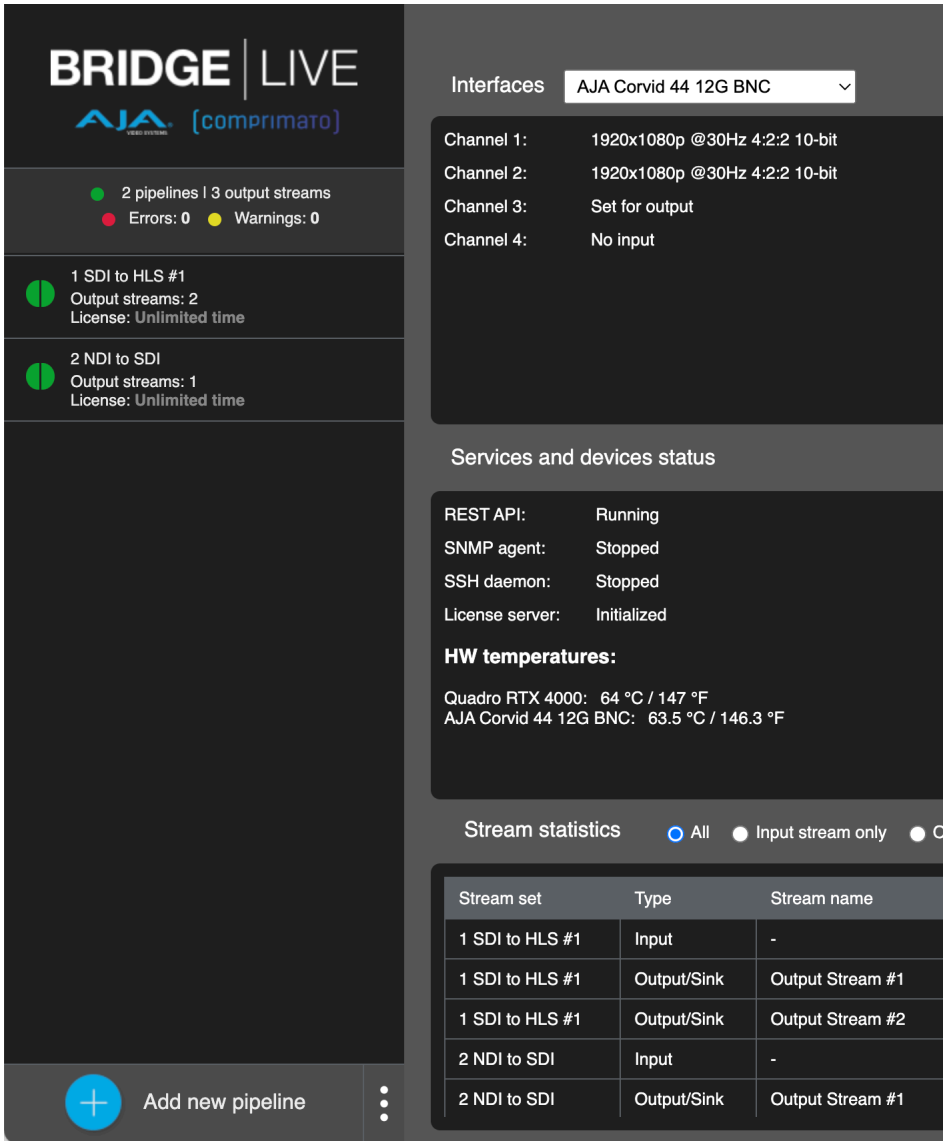
Identifying Your Encoding Requirements

Before you begin, consider which of the following components match your requirements. See *"SDI to Stream Encoding" on page 10* and *"Stream to SDI Decoding" on page 11* for available options.

Add New Pipeline

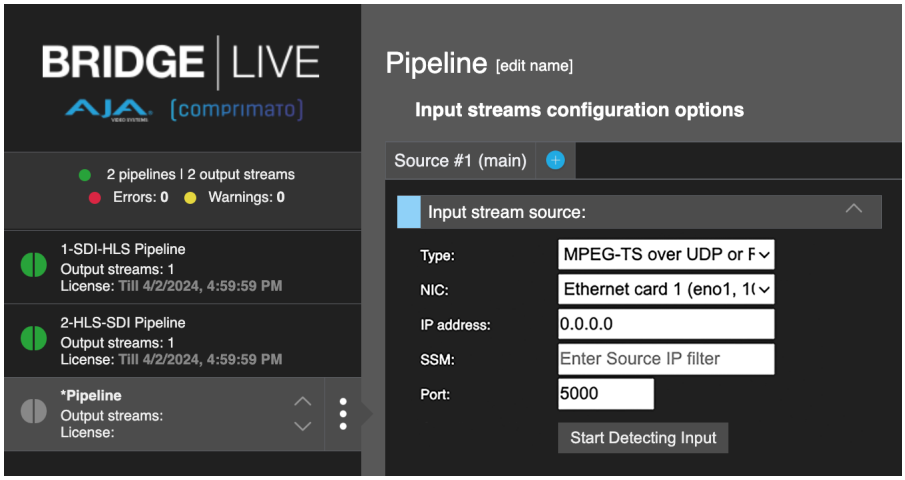
1. From the BRIDGE LIVE Dashboard, click **Add new pipeline** at the bottom of the Pipeline pane in the lower left corner.

Figure 75. Add New Pipeline Button



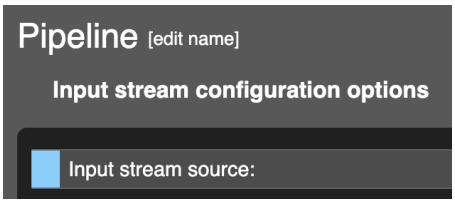
2. Dashboard will display a page with Input stream configuration options.

Figure 76. Input Stream Options



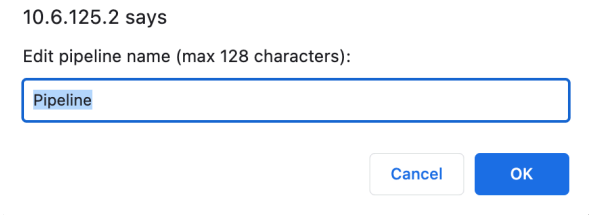
3. From the top of the **Input stream configuration options** column, click **[edit name]**, found immediately to the right of the text "Name your pipeline."

Figure 77. Edit Name Button



4. The Edit Pipeline Name pop-up window displays. The default name is "Pipeline".

Figure 78. Edit Pipeline Name Pop-up Window

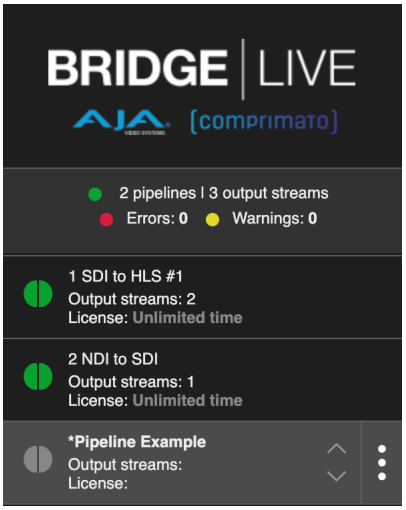


5. Click in the box and enter a name for your new pipeline. Use a simple name that will be easy to understand.

NOTE: *Pipeline names are limited to 128 characters. An error message is displayed If you try to enter too many characters, and you will not be able to save the name.*

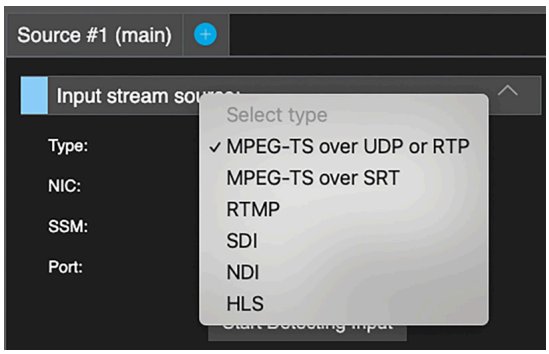
6. After clicking OK, the new pipeline will be shown in the left column of Dashboard. Both half circles are gray indicating that the pipeline is not configured or active yet.

Figure 79. Newly Named Pipeline



Selecting Input Stream Type

Figure 80. Input Stream Type Selection



The rest of the configuration procedure depends on the Type of Input stream you select. Click on the Type box, and select your desired Input stream type. Example procedures are included for the following types:

- SDI (see *"Configuring an SDI Input Stream" on page 72*)
- NDI (see *"Configuring an NDI Input Stream" on page 75*)
- RTMP (see *"Configuring an RTMP Input Stream" on page 77*)
- MPEG TS (see *"Configuring an MPEG TS Input Stream" on page 80*)

NOTE: The Input Stream IP address field will autopopulate with the first IP of the selected NIC. You may also specify a different valid IP address.

Configure Input Stream Options

BRIDGE LIVE now supports automatic population of the input codec and signal format when receiving MPEG-TS streams. Once the Input Stream Source is configured, select 'Start Detecting Input'. Once the signal is detected, the 'Auto Detected Video streams' section will show a summary of the incoming signal. Select 'Set as Input'. The detected input will now automatically populate the codec and all associated formats. There should be no need to further configure the incoming signal. The manual steps to configure MPEG-TS Input streams are still included in the manual. Consult the Reference section for configuration and feature details.

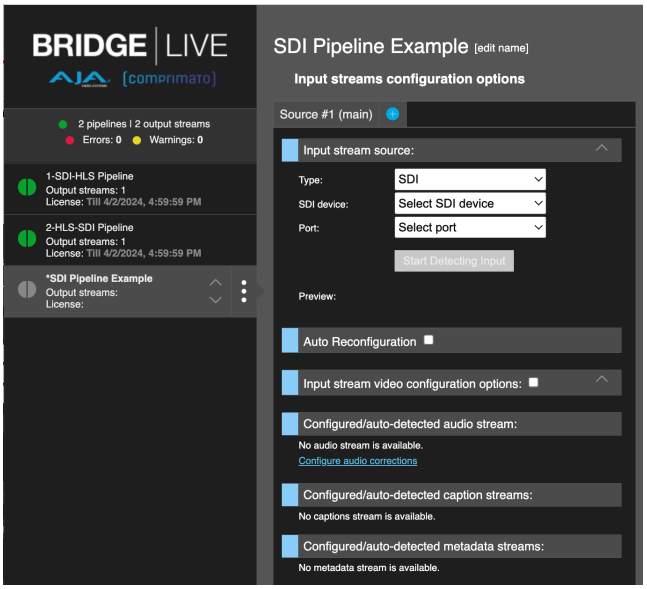
Configuring an SDI Input Stream

NOTE: Procedure continued from the conclusion of "Selecting Input Stream Type" on page 72.

After selecting the SDI Input stream type, you need to configure the input stream's parameters.

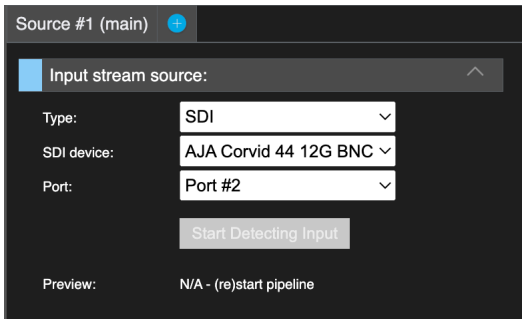
NOTE: The SDI CORVID card installed in the BRIDGE LIVE unit will need to have an active input SDI signal connected to the desired BNC port to continue with this procedure.

Figure 81. SDI Input Stream Example



1. Click on **Select SDI device**. Select the only choice, which is the AJA Corvid card installed in your BRIDGE LIVE chassis.
2. Select the input SDI port with the desired SDI input signal.

Figure 82. SDI Input Stream, Device and Port Selected

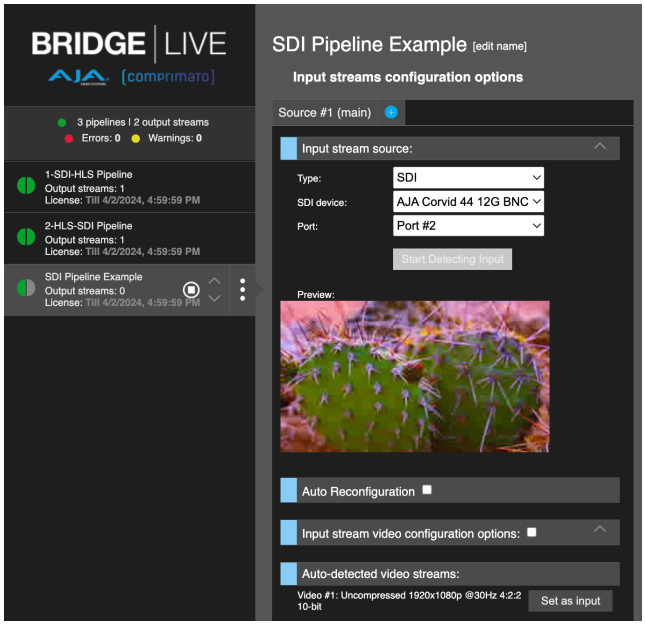


Start Detecting Video Input Properties

3. To prompt BRIDGE LIVE to detect the incoming SDI signal, click **Start Detecting Input** located above the video preview window. A preview image of the input will be displayed, with the left half circle colored green, indicating an input source is present. A new heading called "Auto-detected video streams is also displayed.

NOTE: If no image displays, check that an SDI signal is actively being output from that device's selected port.

Figure 83. SDI Input Stream, Detected Input with Preview

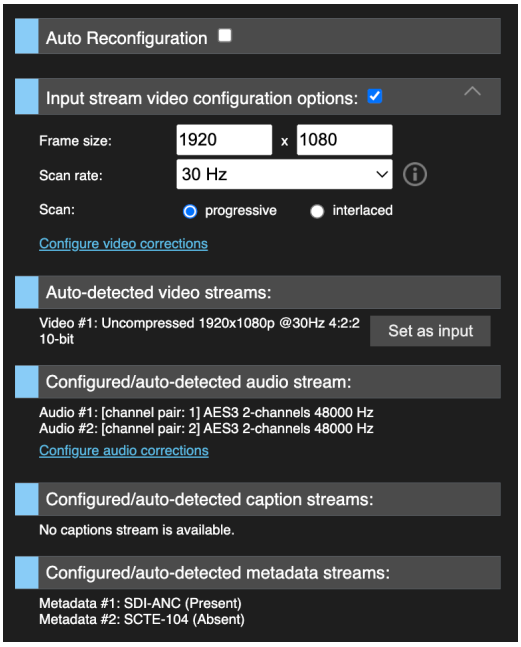


NOTE: If you require reference-quality video image monitoring, we recommend that you use either an SDI monitor and/or a receiving client (host system) with a high-quality GPU and Monitor.

4. Under the "Auto-detected video streams" heading, click on **Set as input** (*Figure 84*). The heading immediately above expands and displays auto-populated characteristics of the detected video signal.

IMPORTANT: Both the **Start Detecting Input** *and* **Set As Input** *buttons need to be clicked if you want to use the automatically detected source video format for the output stream.*

Figure 84. Auto-populated Characteristics of the SDI Input signal



5. This completes the pipeline's Input stream configuration.

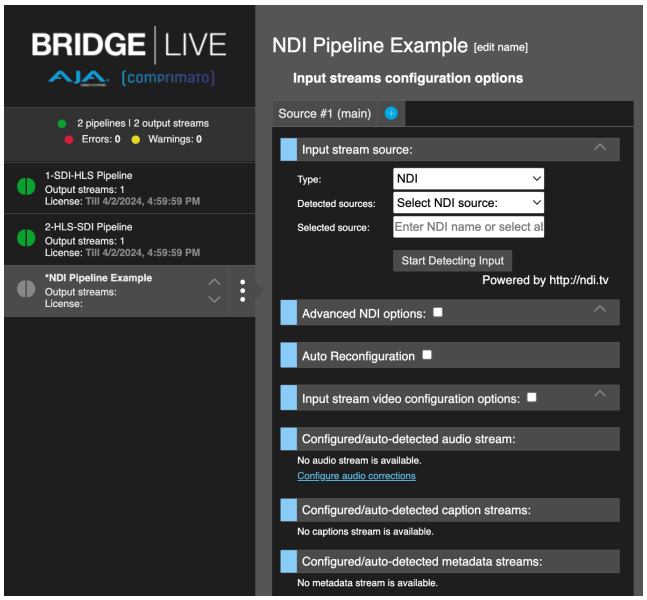
   Go to *"Add New Output Stream to Pipeline" on page 80* to continue this procedure.

NOTE: Procedure continued from the conclusion of "Selecting Input Stream Type" on page 72.

NOTE: This procedure assumes an NDI system is already present and operating on the network, using standard NDI auto-discovery. See "NDI Discovery Servers" on page 50 for information about using an NDI Discovery server instead.

After selecting the NDI Input stream type, you need to configure the input stream's parameters.

Figure 85. NDI Input Stream Example

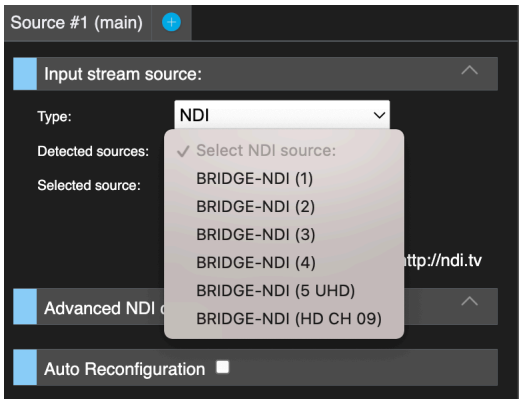


1. Click on **Select NDI Source** in the "Detected sources" box. A list of the discovered NDI sources will be displayed.

NOTE: Only the names of currently active NDI sources will be available for selection.

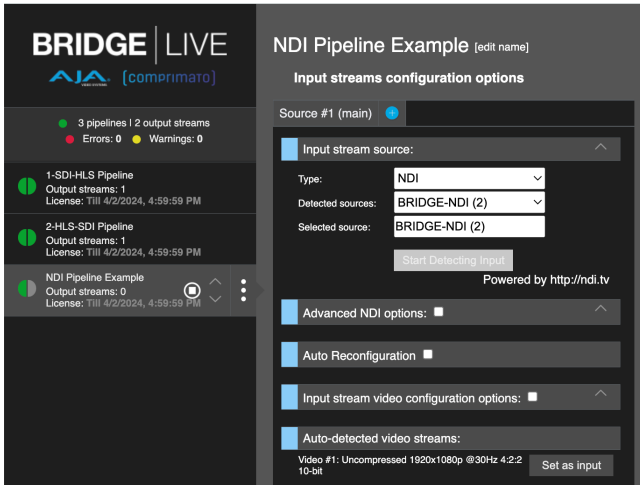
NOTE: The NDI source can also be entered manually. The name entered must exactly match the actual NDI source.

Figure 86. NDI Detected Sources



2. Click on the desired NDI source. That source name will be displayed in the "Detected sources" and "Selected source" boxes.
3. Click on the **Start Detecting Input** button. An "Auto-detected video streams" heading appears displaying the detected NDI video format. The left half of that pipeline's status will also be colored green.

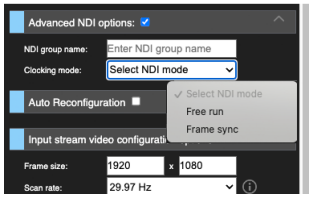
Figure 87. NDI Detected Video Format



4. Click on the **Set As Input** button. Additional information about that NDI source will be displayed in the "Input stream video configuration options" pane.

IMPORTANT: Both the **Start Detecting Input** *and* **Set As Input** *buttons need to be clicked if you want to use the automatically detected source video format for the output stream.*

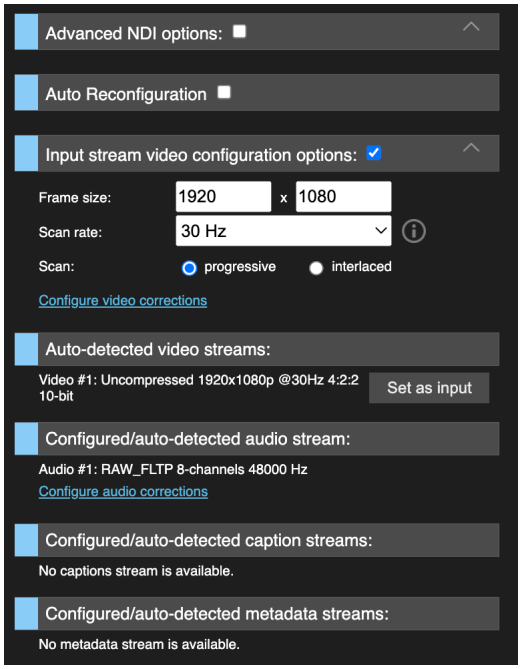
Figure 88. Advanced NDI Options



5. You may select the sync mode for NDI input:

- Frame Sync (default). Synchronises both video and audio using the local clock. Audio is re-sampled and video is duplicated/dropped if needed.
- Free-Run. Synchronises video to the audio. This may drop video frames in order to resync

Figure 89. Auto-populated Characteristics of the NDI Input signal



6. This completes the pipeline's Input stream configuration.

   Go to *"Add New Output Stream to Pipeline" on page 80* to continue this procedure.

Configuring an RTMP Input Stream

NOTE: Procedure continued from the conclusion of "Selecting Input Stream Type" on page 72.

IMPORTANT: RTMP source clients must be configured with a video format compatible with BRIDGE LIVE. For example, 720p 30 is not a SMPTE standard and is not supported by BRIDGE LIVE. See "Appendix A Specifications" for a listing of supported video formats.

About RTMP Streaming

Configuring an RTMP input on BRIDGE LIVE differs somewhat from configuring other IP video stream inputs because RTMP requires a stream key. Typically the stream key follows the / after the IP address:

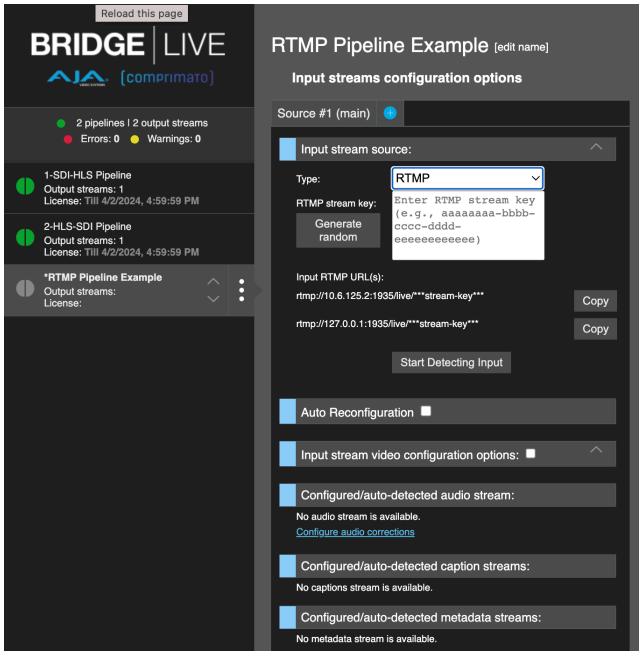
rtmp://<IP Address>/live/<Stream Key>

The BRIDGE LIVE pipeline's RTMP input must be configured with a stream key, and also be running, before the external RTMP client (source) that has been configured with that same stream key is started. When that source stream starts, it finds the matching key for that BRIDGE LIVE's running RTMP pipeline's input stream, and can then complete the streaming connection. With that connection established, you can then set the video settings for that BRIDGE LIVE pipeline, and continue configuring that pipeline's output stream(s). BRIDGE LIVE actually provides three methods of stream key configuration (see *"RTMP (Input and Output)" on page 103*).

This example procedure assumes an external RTMP source device is available on the network, you can change the configuration settings for that RTMP source, and you can turn that external source stream off and on.

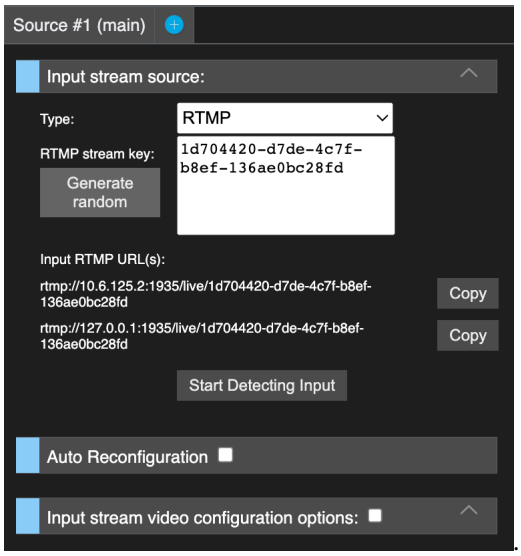
1. After selecting the pipeline's input stream type, you now need to configure the input stream's parameters.

Figure 90. RTMP Input Stream Example



2. Click on the Generate Random button to create a unique stream key.

Figure 91. RTMP Input Stream Key Generated

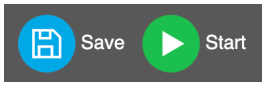


3. Click on the **Copy** button of the RTMP stream URL you wish to use.
4. Go to the RTMP source stream configuration application and paste in that URL and stream key, as required for that application.

NOTE: Do not turn on the external RTMP source stream yet.

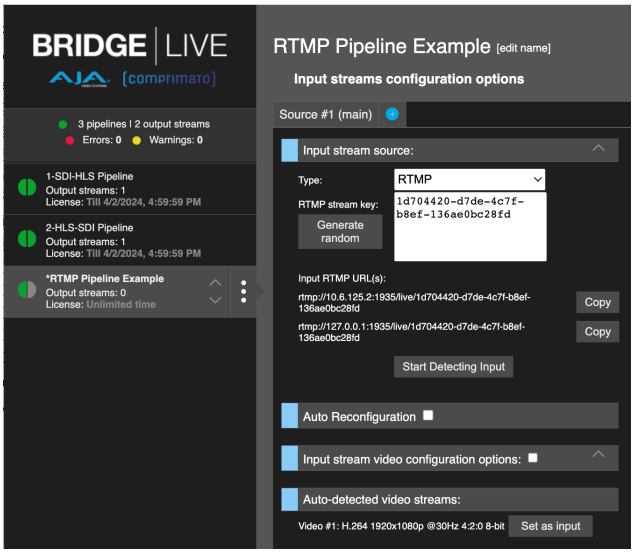
5. Click on the **Start** button at the bottom left of the BRIDGE LIVE UI.

Figure 92.



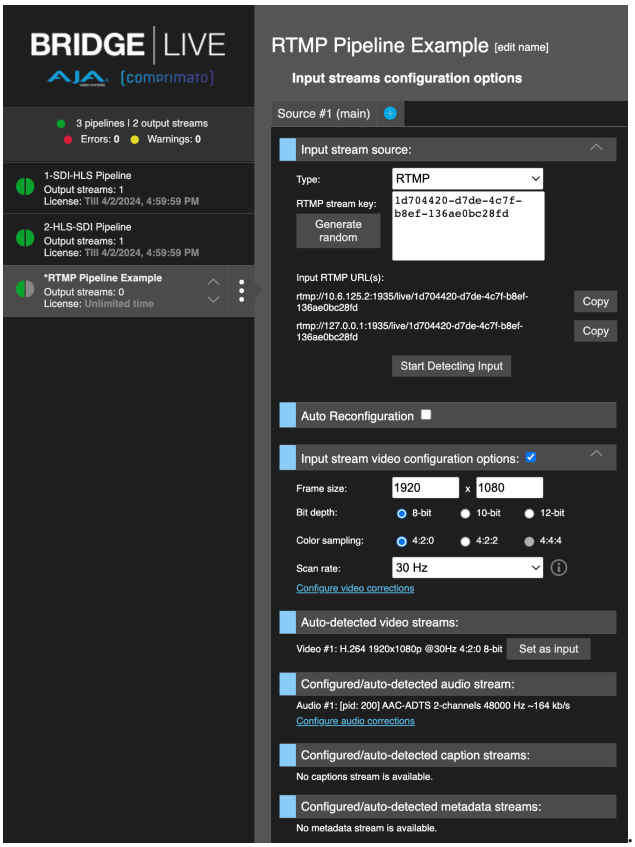
6. Now start the external RTMP source stream. The left side of the status circle for that pipeline will be colored green.

Figure 93. RTMP Stream Connection Initiated



7. Click on the **Start Detecting Input** button. An "Auto-detected video streams" heading appears displaying the detected video format. The left half of that pipeline's status will remain colored green.
8. Click on the **Set As Input** button. Additional information about that source will be displayed in the "Input stream video configuration options" pane.

Figure 94. RTMP Input Stream Key Generated



IMPORTANT: Both the **Start Detecting Input** *and* **Set As Input** *buttons need to be clicked if you want to use the automatically detected source video format for the output stream.*

9. This completes the pipeline's Input stream configuration.

   Go to *"Add New Output Stream to Pipeline" on page 80* to continue this procedure.

Configuring an MPEG TS Input Stream

NOTE: Procedure continued from the conclusion of "Selecting Input Stream Type" on page 72.

The Input Stream IP address field will autopopulate with the first IP of the selected NIC. You may also specify a different valid IP address.

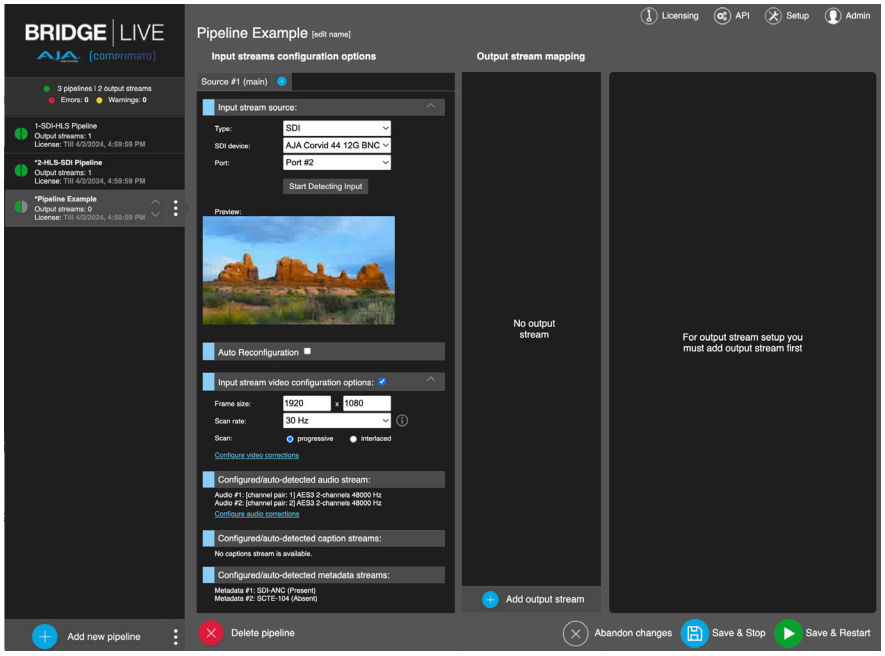
Add New Output Stream to Pipeline

NOTE: Procedure continued from the conclusion of "Configure Input Stream Options" on page 72 for your selected Input Stream Type.

After you have configured your pipeline's Input stream, and a valid signal has been detected, you now can now easily configure your pipeline's Output stream(s).

During initial pipeline configuration the Dashboard will indicate that the currently selected pipeline lacks any output streams.

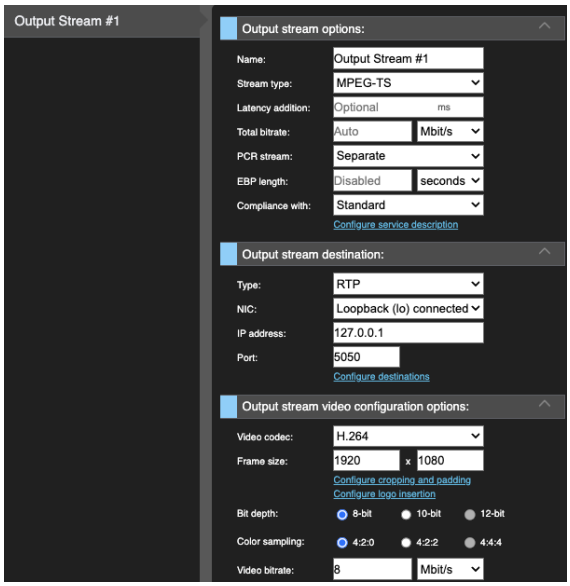
Figure 95. Pipeline Without Output Stream



Adding an Output Stream

1. Click on **Add output stream** at the bottom of the Output Stream Mapping pane. New fields display in the Output stream column on the right side of Dashboard for naming and configuring your new output stream. Some of the fields of the Output stream column are auto-populated, matching the detected Input stream

Figure 96. Output Stream Added with an Input Stream Source Detected

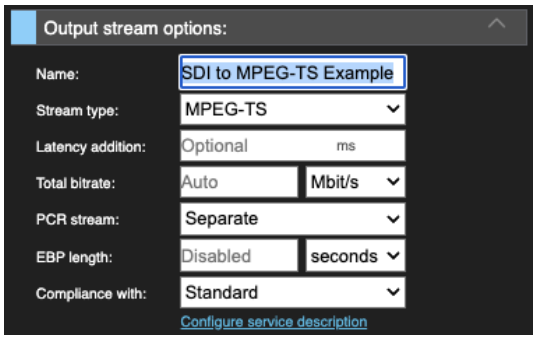


NOTE: If no valid Input stream is detected, you can manually enter data into empty fields, but will need to know exactly what that pipeline's input values will be when that input is activated. Having an already active input stream greatly simplifies the initial configuration process.

Naming the Output Stream

2. Under Output stream options, enter a name in the Name field. Create a name that will be descriptive to your users for this specific output stream.

Figure 97. Output Stream Naming

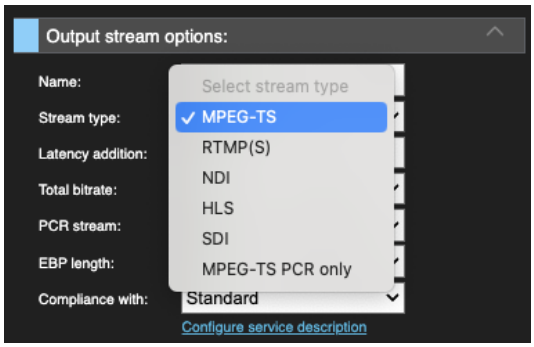


NOTE: The name of the Output Stream is intended for user convenience and does not affect signal transport operation. However, it is important that Input and Output Stream names be descriptive enough so users can distinguish between them, especially when multiple streams are being configured for simultaneous operation.

Selecting Output Stream Type

1. Click on the Stream Type box and select your desired Output stream type.

Figure 98. Output Stream Type Selection



2. After creating, naming, and selecting the pipeline's Output Stream type, you can configure the audio (if any) to be included in the output stream.

NOTE: If you want to use a hostname instead of an IP address in the URL, you need to set an appropriate DNS server. If it is in the external network, the set Default route needs to have access to the Internet. Both can be done in the Setup. For more information, see "Initial System Setup Process" on page 31.

Selecting Latency Addition

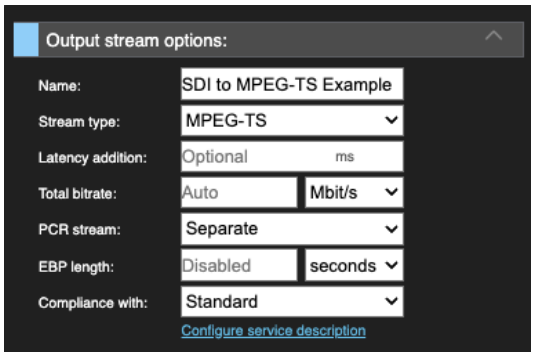
Specify optional latency in milliseconds. Latency addition can be set to dynamically calculate latency addition (PTS offset) for each pipeline by entering a value of '-1' See *Figure 99.*

Specifying Total Bitrate

Specify Total Bitrate in Mbits per second. Total output bitrate defaults to 'Auto' and will auto adjust if the input signal changes. A known manual bitrate may also be specified.

NOTE: If a manual bitrate is entered which is insufficient to support the configured signal path, an error will be presented.

Figure 99. Latency Addition and Total Bitrate fields



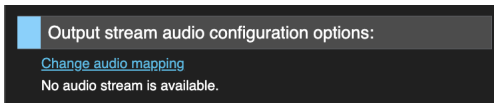
Configure Audio Mapping

By default a newly created pipeline will not include any audio in the output stream. You must manually map incoming audio channels to the output stream.

NOTE: Some RTMP streaming services will not accept streams without audio.

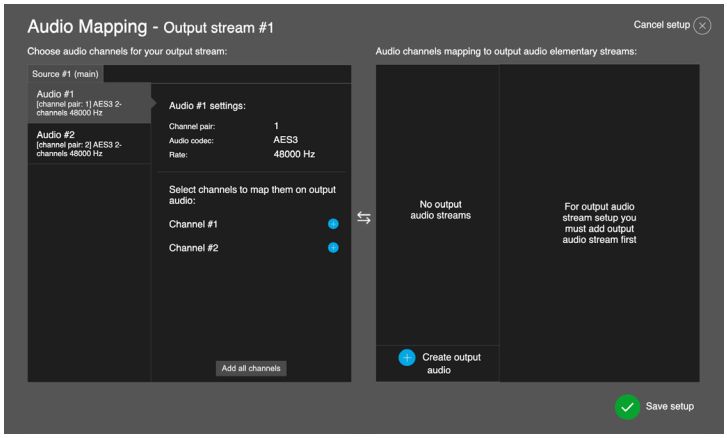
1. Click on **Change Audio Mapping** near the bottom of the Output Stream pane.

Figure 100. Change Audio Mapping Button



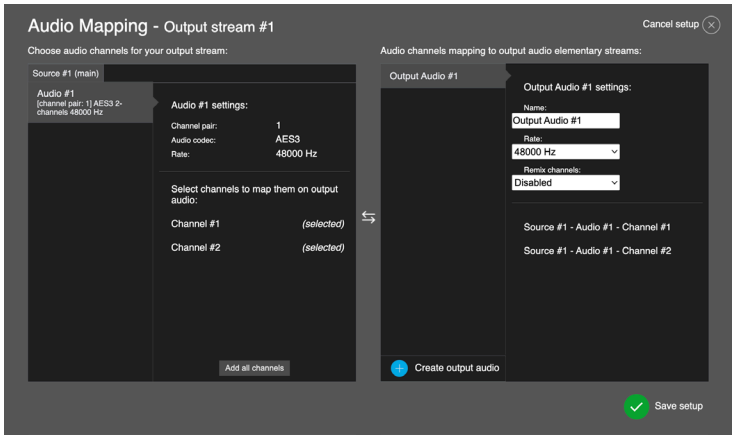
2. A screen will appear displaying the available incoming source audio.

Figure 101. Audio Mapping Window, No Output Stream Audio



3. In order to add the incoming audio to the output, select a desired audio pair to send to the output. Then select **Add all channels**. This will add the two channels in the selected pair to the output section of the Audio channel selector. The audio channels can then be inserted into the desired output audio pairs. If more than 1 pair of audio mapping is needed, repeat the above procedure for each needed pair.

Figure 102. Output Stream with 2 Channels



4. You can name that audio output stream, and adjust other audio related settings for conversion.
5. Click on the **Save Setup** button. The window closes.
6. You can now configure additional Output Stream Options. Different options are available, depending on the Output Stream Type. Follow the link below to the appropriate sub-procedure for your Output Stream Type:

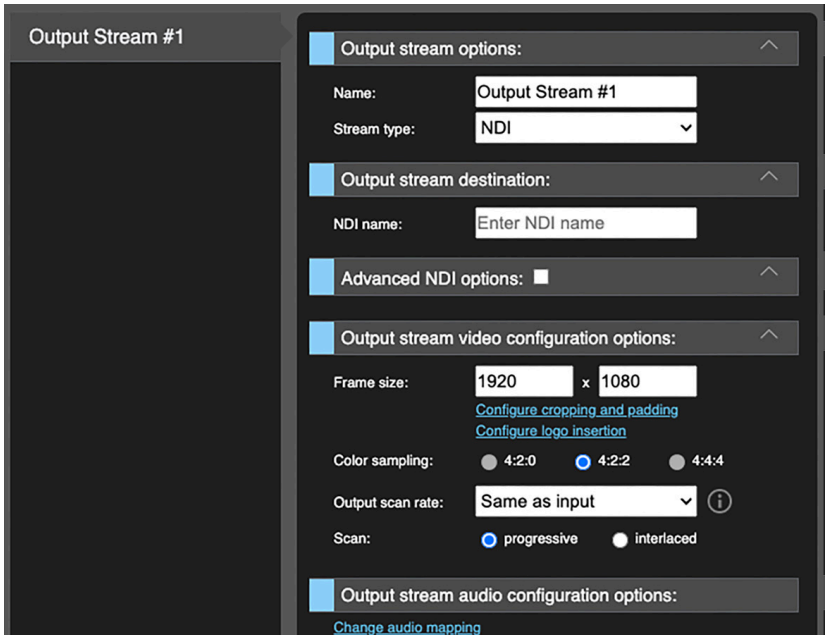
- NDI (go to *"Configuring an NDI Output Stream" on page 84*)
- MPEG-TS (go to *"Configuring an MPEG-TS Output Stream" on page 84*)

Configuring an NDI Output Stream

NOTE: Procedure continued from the conclusion of "Selecting Output Stream Type" on page 81.

1. After selecting NDI as the output stream type with a valid Input stream source detected, the following parameters are displayed by default. It will be auto-populated with the incoming signal video format.

Figure 103. Output Stream, NDI Defaults

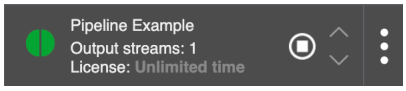


2. Enter a descriptive name for the NDI Output stream.
3. Click on **Save and Restart** at the bottom of the screen.

Figure 104. Save & Restart button

4. The NDI output stream will be activated, and both circles for that pipeline status will be colored green.

Figure 105. Pipeline Status



5. This completes the procedure for creating an NDI pipeline.

NOTE: When this NDI Output stream is active, its name will appear in all other pipeline NDI Input stream Detected Sources lists, becoming available for selection. When that NDI Output stream is stopped, its name will be removed from all pipeline selection lists.

Configuring an MPEG-TS Output Stream

NOTE: Procedure continued from the conclusion of "Selecting Output Stream Type" on page 81

About Port Numbers

Ethernet port numbers can be used to direct network communications to a specific application associated with a destination Network Interface Card (NIC). Specifying a port number is required for network communications, and default port numbers are often used.

A NIC configured with a specific IP address may communicate with multiple applications at the same time. Because each NIC has only one IP address, defining a unique port number in the sent message packets can direct the communications to the correct receiving application using that port number.

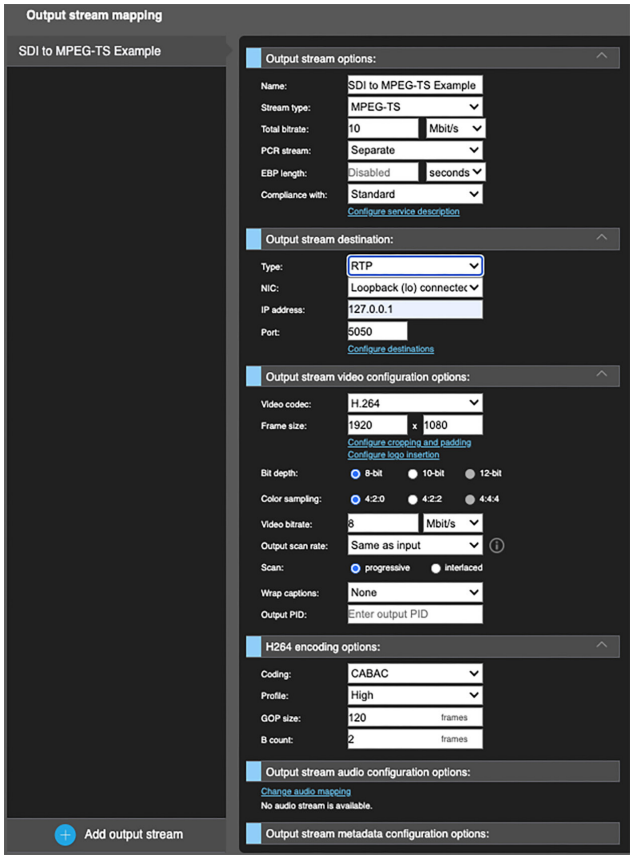
Numbering conventions exist defining ranges of port numbers, but generally all that is required is to have the port numbers of the sending and receiving message packets match each other.

About Loopback

Loopback is a special Ethernet configuration used for internal network traffic, and is commonly used for pre-testing network settings. Loopback can be useful to protect the network from excessive or inappropriate data traffic during network configuration. The localhost (127.0.0.1) IP address can be used to communicate only with your local computer.

1. After selecting MPEG-TS as the Stream type with a valid Input stream source detected, the following parameters are displayed by default. It will be auto-populated with the detected incoming signal video format.

Figure 106. Output Stream, MPEG-TS Defaults



Select Output Stream Destination Type

2. Select the Output Stream Destination Type. Choose from:
   - RTP or UDP- see *"RTP or UDP Output Stream Destination" on page 86*
   - SRT - see *"SRT Output Stream Destination" on page 87*

RTP or UDP Output Stream Destination

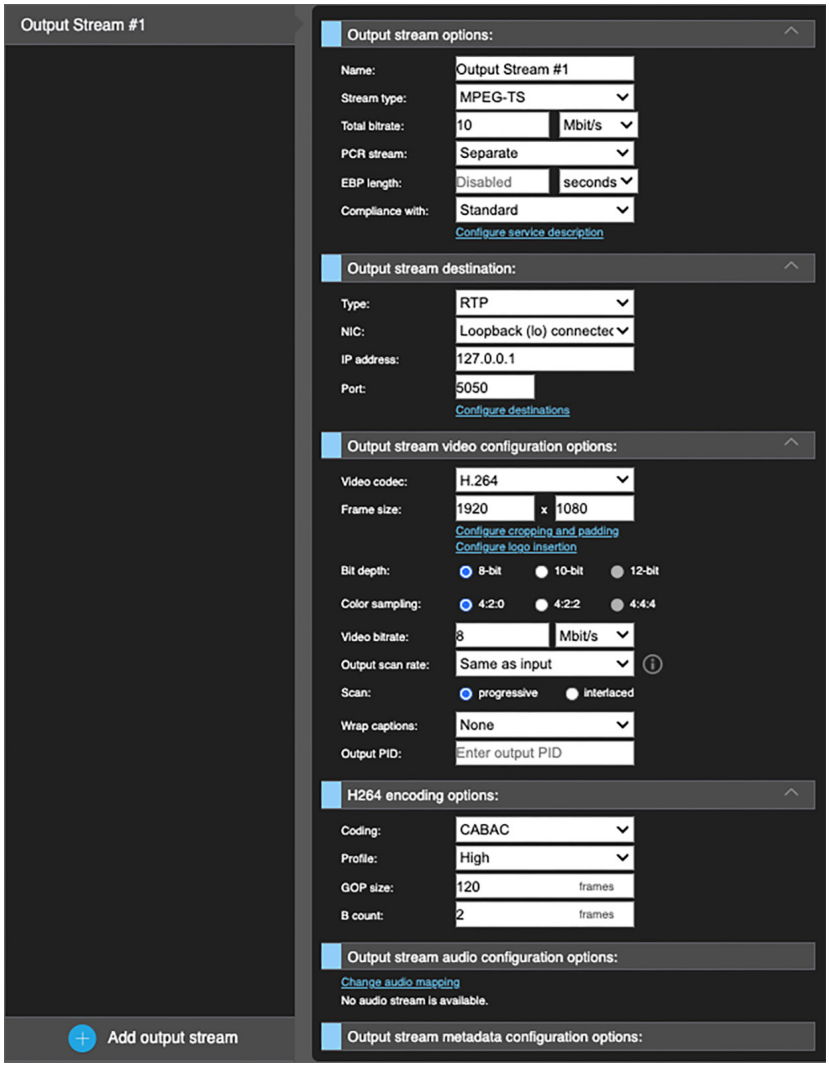
NOTE: Procedure continued from the conclusion of "Select Output Stream Destination Type" on page 86.

The BRIDGE LIVE's RTP and UDP Output Stream Destination parameters are identical.

This sub-procedure demonstrates using Loopback to internally test the pipeline's network settings, using default settings.

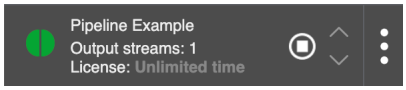
1. Enter the desired IP address for your Output stream destination. In this example the default 127.0.0.1 (localhost) IP address is used for testing.
2. Enter the desired port number. In this example use the default port **5050**.
3. Under NIC, select Ethernet card or Loopback. In this example use the default **Loopback I/O Connected** setting for testing. The remaining default settings can be used for this test only pipeline configuration.
4. Click on **Save and Restart** at the bottom of the screen.

Figure 107. Loopback Example, Default Settings



5. The pipeline will be activated and loopback the signal through only the NIC card. When the path is complete and active, both halves of the Status circle for that pipeline will go green.

Figure 108. Pipeline Status



6. This completes the procedure for creating a pipeline that demonstrates Loopback operation for testing.

Stream to the Network Instead of Loopback

To configure and run an actual network stream, instead of loopback, select an Output Stream Ethernet Card, enter the desired IP address and Port number, and click **Save & Restart**.

SRT Output Stream Destination

NOTE: Procedure continued from the conclusion of "Select Output Stream Destination Type" on page 86.

About SRT Operating Modes

NOTE: SRT encode and decode are only utilized with MPEG-TS streams.

BRIDGE LIVE supports two SRT stream modes of operation, Listener and Caller (a client–server model).

Listener - The Listener unit is configured with a pipeline that always waits/ listens for a connection from an external Caller unit. After the connection is established, if the Listener is output, it will start sending the streaming data. If the Listener is input, it starts receiving the streaming data.

Caller - The Caller unit is configured with a pipeline that first seeks a connection with an external Listener unit, and when that is achieved the Caller receives streaming data from the Listener. The Caller pipeline is configured with the remote Listener unit's IP address and port.

This method works as long as each stream has one Listener and one Caller that use matching IP and port numbers, regardless of which unit is actually sending or receiving data. BRIDGE LIVE can even act as the Listener for one pipeline, and simultaneously act as the Caller for a different pipeline.

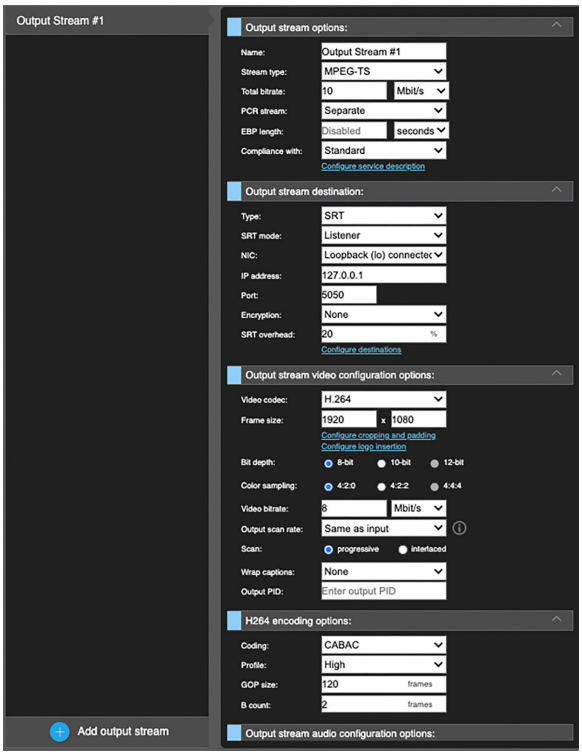
NOTE: SRT is a one-to-one connection scheme and cannot be used in a one-to-many workflow. If multiple SRT destinations are needed, simply add additional output streams following the above procedure. Each output stream will need its own unique port number.

This example procedure demonstrates methods for sending the identical or related SRT streams to multiple clients using a single pipeline.

Configuring Output Side of SRT Transmission

1. After selecting SRT as the type of output stream, the following default screen will be shown.

Figure 109. SRT Output Default Settings

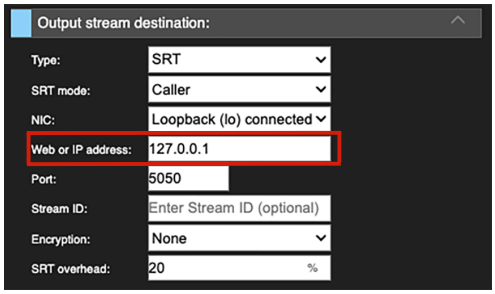


For the SRT mode, select either **Listener** or **Caller**. Choose the mode opposite to that configured for the other end of the stream.

DNS Resolution of Hostname for SRT Caller Output

2. When using SRT output with Caller mode, you can use either an IP address or a web URL name. This can be useful when a URL points to multiple IP addresses for distribution.

Figure 110. SRT Caller Mode



3. Enter the IP Address to which you want to send the stream.
   - For Caller mode, enter the address which is being called (sending to).
   - For Listener mode, enter the address which is being called (receiving a request from said address to which the stream will be sent).

Port

4. Port 5050, 5051, 5052 and 5053 are all viable. It usually does not matter which port is used, it just needs to match on both ends.

NIC

5. Because this example does not use loopback, select a BRIDGE LIVE NIC.

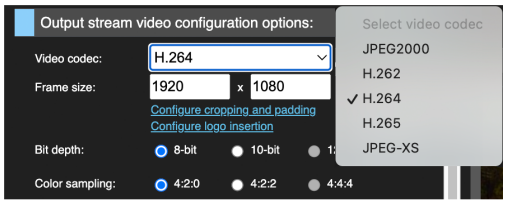
SRT Overhead

6. In addition, you should define the SRT overhead parameter – a percentage amount over Total Bit Rate that can be surpassed in order to achieve the lost data recovery. As a result, the maximum used connection bit rate is equal to the configured Total Bit Rate + SRT overhead. In general, this is the upper limit and the connection does not require it for normal operation.

Select Video Codec

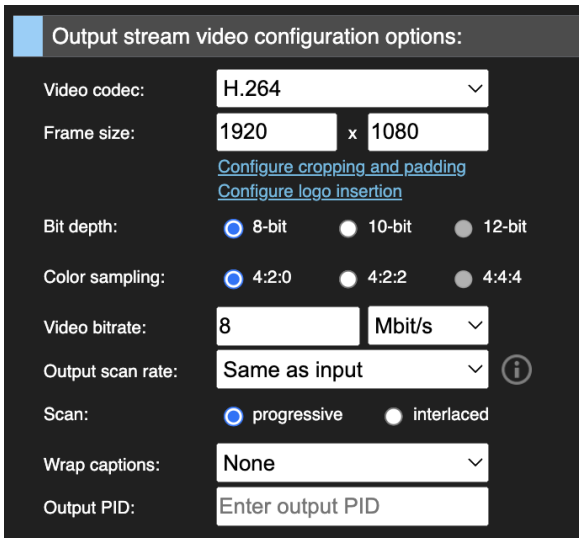
7. Next, under the heading Output stream video configuration options, for Video codec, select H.264.

Figure 111. Multiple video codec selections available



8. The Frame size is auto-populated to reflect the detected input signal. The Scan rate and other properties are also auto-populated. Leave the remaining fields with their default values.

Figure 112. Output stream video configuration options

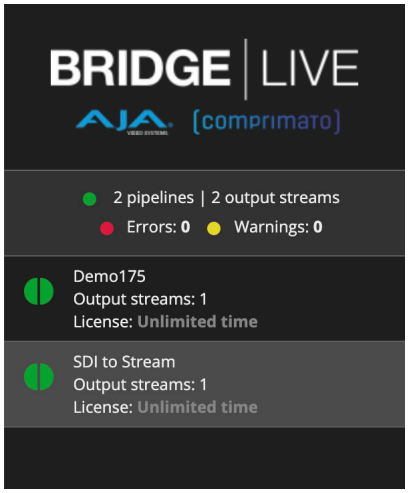


9. Click **Save & Restart**.

Figure 113. Save & Restart button

10. BRIDGE LIVE takes just a few moments to process the settings. Once finished, the left column updates to show your newly created pipeline. The two green circle halves indicate that both the input and output sides of the pipeline are running with no errors.

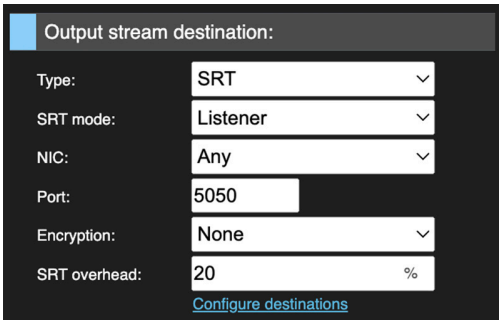
Figure 114. The newly created Pipeline displaying in the left column



One SRT Output Stream, Multiple Clients Example

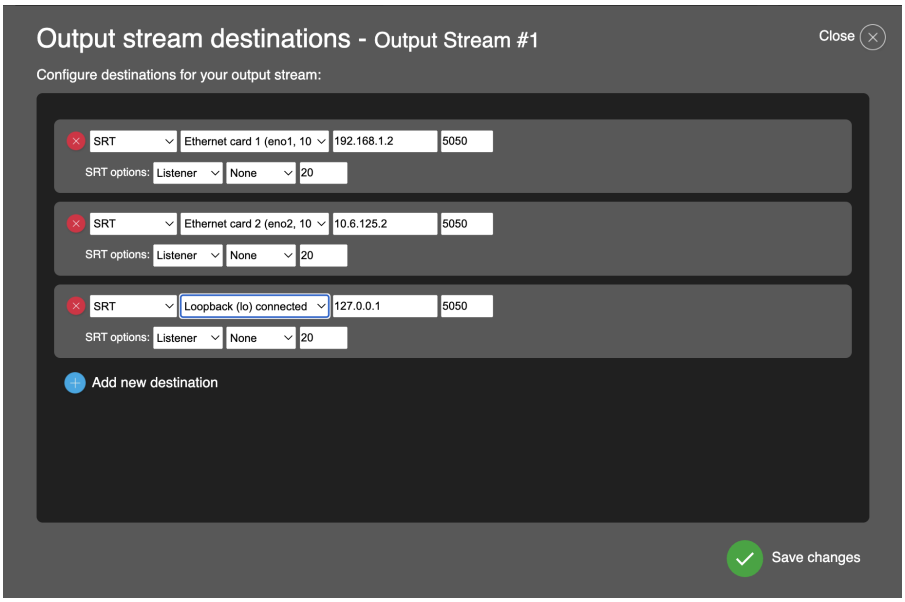
If you have 10 remote clients who all want to view the same SRT stream, you can configure destinations to add 10 new destinations and increment the IP, port number or a combination of both, as long as each is unique. In this example only the port numbers are incremented. For example, client 1 is assigned port 5051, client 2 is assigned port 5052, client 3 is assigned port 5053, and so on.

Figure 115. The Configure destinations link



1. To add a new destination with a new Port number, from the Output stream destination panel, click **Configure destinations**. The Output stream destinations window displays.

Figure 116. Adding port numbers



2. Click **Add new destination**. A new row is added for the new stream destination.
3. Edit the port number to match your port configuration plan.
4. Repeat as needed, then click **Save changes**. The new stream destinations are added to the pipeline. This is an efficient approach since it requires only one output stream and BRIDGE LIVE does not need to do any extra encoding.

Two SRT Output Streams, Multiple Clients Example

If you have 10 remote clients who all want to view the same SRT stream, but 5 of them require 15Mbps and the other 5 require 8Mbps, you would need to create two separate output streams—one for 15Mbps and another for 8Mbps.

1. For each output stream, configure five destinations, each with a unique IP and port number combination, to correspond to the 5 remote receiving clients.

NOTE: Encoding two output streams rather than one is more demanding on the BRIDGE LIVE system. However, it meets the needs of the two sets of remote clients with varying bit rate requirements.

When to Reduce the CPU/GPU Load

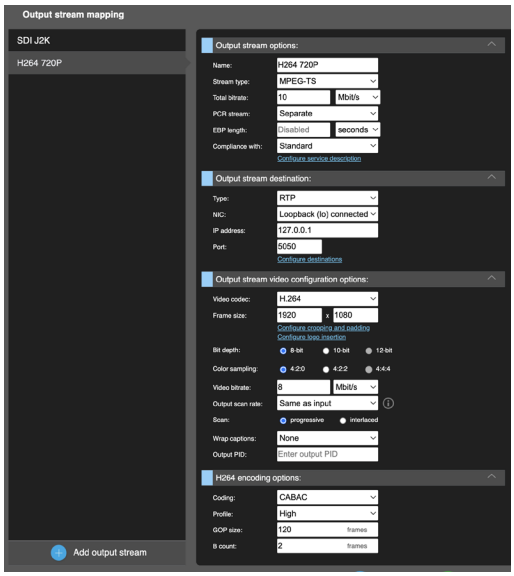
Users are advised to look out for errors, alarms, dropped frames, etc. If the BRIDGE LIVE is consistently dropping frames, check to see if the CPU/GPU resources are running at or near 100%. If so, consider reducing the CPU/GPU load by reducing channel count, number of outputs, 4:2:2 10-bit to 4:2:0 8-bit encoding, lowering the frame rate, etc.

Clearly Naming Multiple Output Streams

When adding an output stream, it is important to name it clearly to eliminate any potential confusion as to what it is. *Figure 117* shows the configuration panels for output stream settings and shows a situation where there are multiple output streams already configured.

Besides the mandatory options to direct the output to a specific network interface and a receiving device, these settings have more attributes that impact the quality of the resulting stream.

Figure 117. Additional Output Stream Configuration

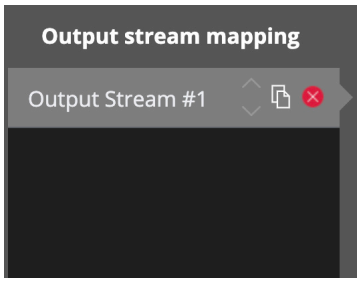


Cloning an Output Stream

If you need multiple similar output streams within one pipeline, you can clone an output stream that you have created earlier.

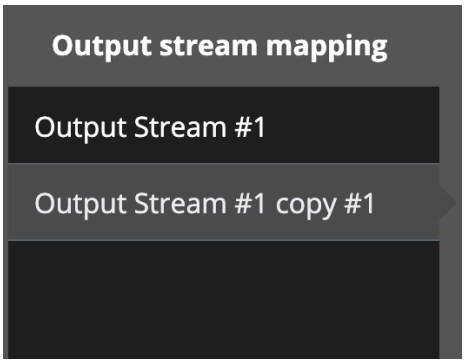
1. Hover your mouse over the output stream that you want to clone. A clone button displays.

Figure 118. Hovering mouse over output stream shows cloning button



2. Click the clone button. A copy of the output stream displays beneath the original.
3. Make any modifications you need to the copy of the original output stream.

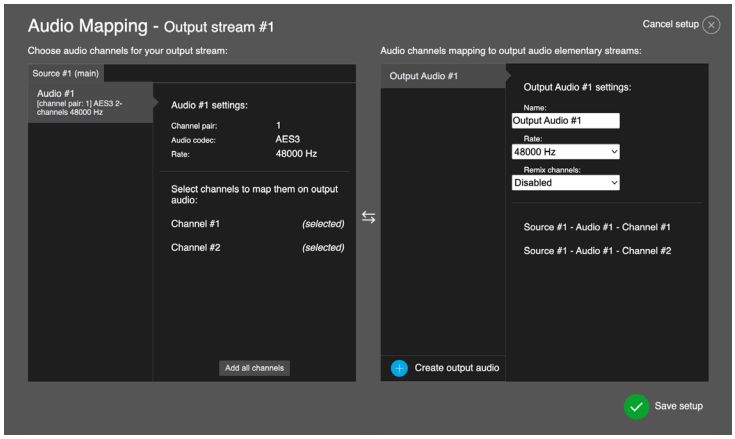
Figure 119. The cloned output stream (copy #1)



Output Stream Audio Configuration Options

While configuring the output stream, you can choose which transmitted audio or metadata channels you wish to include (*Figure 120*).

Figure 120. Audio Mapping



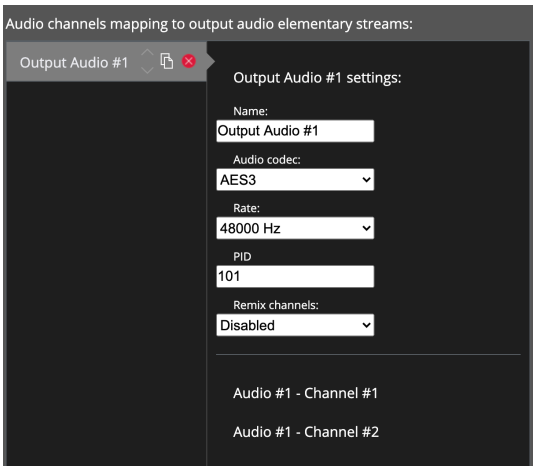
Cloning Output Audio Streams

If you need multiple similar output audio streams within one Audio Mapping, you can clone an output audio stream that you have created earlier.

To Clone an Output Audio Stream

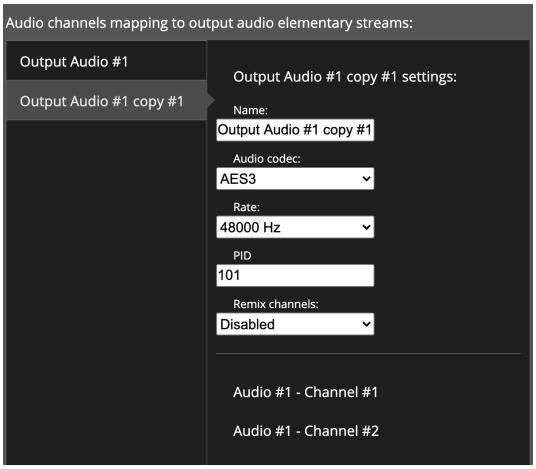
1. Hover your mouse over the output audio stream that you want to clone. A clone button displays.

Figure 121. Hovering mouse over output audio stream shows cloning button



2. Click the clone button. A copy of the output audio stream displays beneath the original.

Figure 122. The cloned output audio stream (copy #1)



3. Make any modifications you need to the copy of the original output audio stream.

Creating and Loading Preset Stream Configurations

In order to avoid manually configuring Pipelines, you can save configuration settings to a file. You can then load the saved configuration settings from the file and instantly populate all the settings, saving time and potential configuration errors.

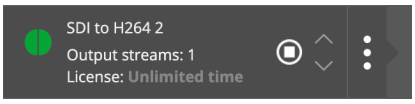
Presets can also serve as a way to backup, clone or restore pipeline configuration settings.

These configuration files are stored in the .json structured file format.

To save as a preset

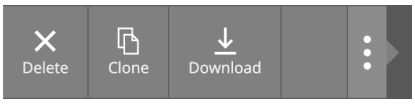
1. From the left column of Dashboard, click on the configured stream that you want to save as a preset. The window opens showing the Input stream configuration options and the Output stream mapping.
2. With the stream selected, or while hovering the mouse over the stream, a vertical ellipsis displays along the right edge.

Figure 123. Initial display of vertical ellipsis



3. Click on the vertical ellipsis. Three buttons display, giving you the choice to Delete, Clone, or Download the Pipeline.

Figure 124. Delete, Clone, and Download buttons

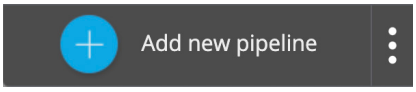


4. Select **Download**. A JSON file downloads to your computer that contains all of the configuration settings. If your pipeline is named "SDI to H264," the downloaded file will be named "SDI to H264.json." This is the Preset file. You can view or edit it using a text editor.

To load a preset configuration

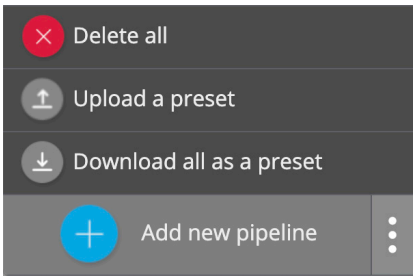
1. From Dashboard, hover your mouse over **Add new pipeline** from the lower left area.

Figure 125. Add new pipeline



2. Click on the vertical ellipsis. Choose from **Delete all**, **Upload a preset**, or **Download all as a preset**.

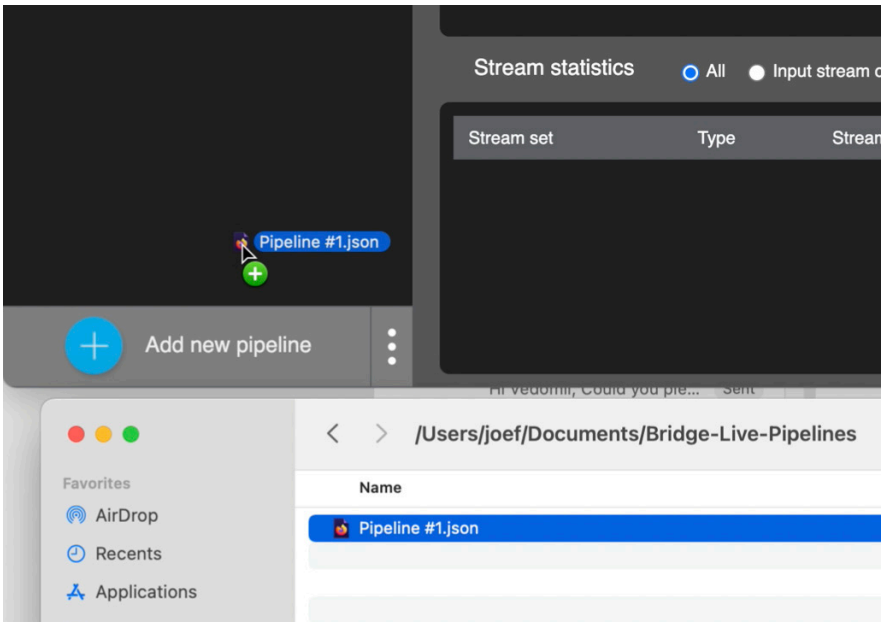
Figure 126. Three buttons displaying after clicking the vertical ellipsis



3. Select **Upload a preset**. A navigation window displays.
4. Navigate to the .json file that you want to upload, select it, then click **Open**. Dashboard refreshes to display the pipeline populated with all the configuration settings that were stored in the JSON preset configuration file.

Alternatively, if you have previously created a pipeline and saved it, you can drag and drop its .json file onto the left column as another method of adding a pipeline.

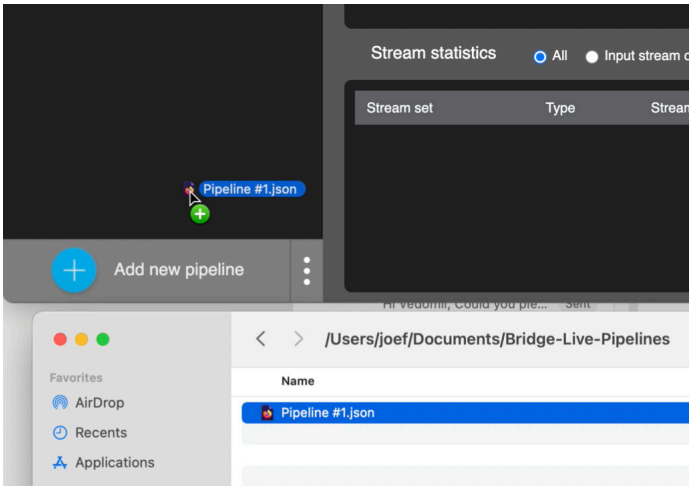
Figure 127. Adding New Pipeline by Dragging a .json File



JSON Created Pipelines

If you have previously created a pipeline and downloaded it, you can drag and drop its .json file onto the left column as another method of adding a pipeline. This new pipeline will have the previously selected parameters, but can be a good starting point for creating a new variation of that pipeline.

Figure 128. Adding pipeline with a .json file



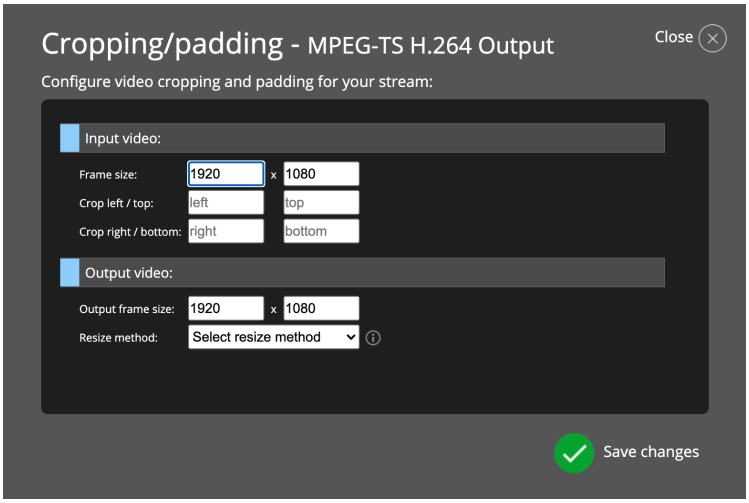
When a .json file is loaded, the pipeline will have the original name of the downloaded pipeline. If you modify the settings to create a pipeline with different functionality, you should rename it.

Additional BRIDGE LIVE Features

Output Stream Cropping and Padding

In order to address how you want BRIDGE LIVE to handle resolution changes, use the Cropping/Padding configuration window to adjust settings for the input video and output video. Click **Configure cropping and padding** in the Output stream video configuration options area to access the configuration window.

Figure 129. The Cropping/Padding configuration window

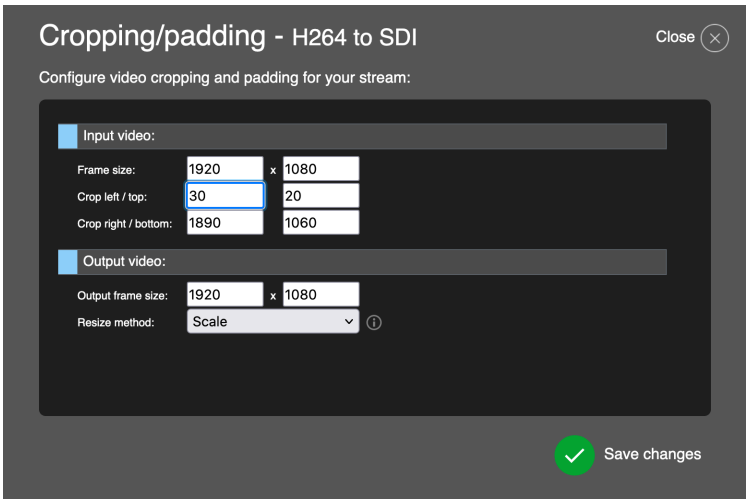


For the input video, you can adjust frame size, left/top cropping and right/bottom cropping.

Cropping Example

As an example, let's consider a case in which you want to crop an image with a frame size of 1920 x 1080. You want to crop 30 pixels off of the left side, 30 pixels off of the right side, 20 pixels off of the top, and 20 pixels off of the bottom. In that case, you would enter the numbers as shown below. Select Scale for Resize method.

Figure 130. Example of entering numbers into Crop number fields



- In the above example, the number "30" is being used to crop the left side. "30" indicates the horizontal offset of the first pixel to be used from the input video (0 by default). Use a negative value to create explicit padding.
- The number "20" is being used to crop the top. "20" indicates the vertical offset of the first pixel to be used from the input video (0 by default). Use a negative value to create explicit padding.
- The number "1890" is being used to crop the right side. "1890" indicates the horizontal offset after the last pixel to be used from the input video (frame width by default). Use a value greater than the width to create explicit padding.
- The number "1060" is being used to crop the bottom. "1060" indicates the vertical offset after the last pixel to be used from the input video (frame height by default). Use a value greater than the height to create explicit padding.

For the output video, you can adjust the output frame size and resize method.

Resize Method

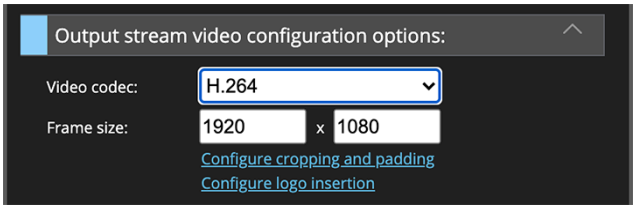
From the Resize method pull-down menu, available selections are:

- Scale: Resizes the configured input frame to the configured output frame and changes the aspect ratio when it differs.
- Crop: Resizes the configured input frame to the configured output frame, but keeps the input frame aspect ratio. The input will be automatically cropped horizontally or vertically.
- Pad: Resizes the configured input frame to the configured output frame, but keeps the input frame aspect ratio. The input will be automatically expanded with horizontal or vertical black bars.

Logo Insertion

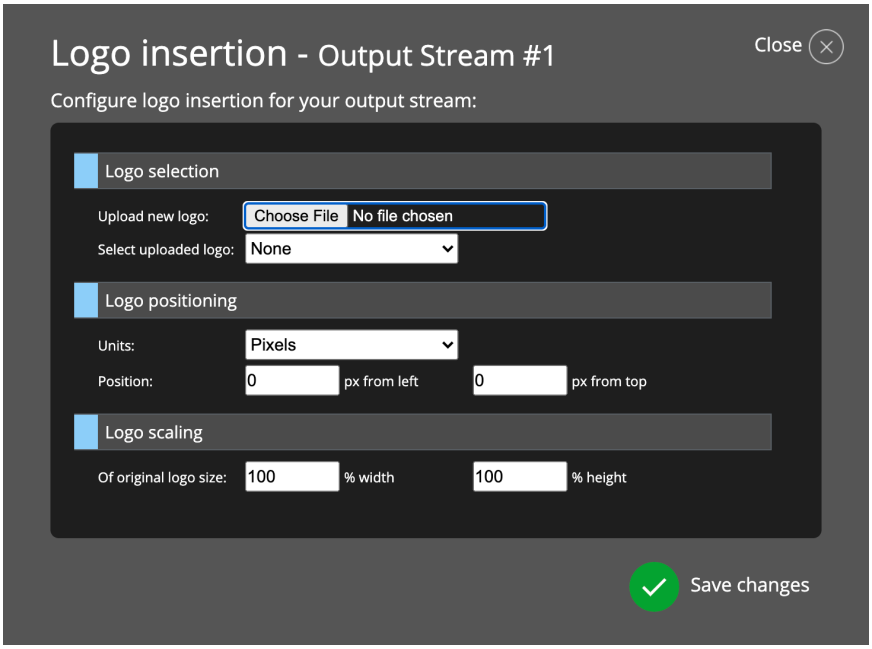
You can insert a logo into the stream. You can configure it in the “Output stream video configuration options” section by clicking the “Output stream video configuration options” button.

Figure 131. Logo Insertion Button



Select the 'Configure logo insertion' link to bring up the Logo Insertion window.

Figure 132. Logo Insertion Configuration



First, a logo file in the .png format must be uploaded and selected. After that, the user can choose to position the logo either in pixels, or set its positions using percent. If for some reason a logo has to have adjusted scale, it's possible to do it using the Logo scaling option.

If you save a pipeline that uses the Logo insertion function and has some logo uploaded as a preset, it will be saved with the logo file, too.

Verifying Pipeline Configurations

You can use a variety of methods to verify your pipeline configurations.

For an encoded stream using stream type MPEG-TS, you can use RTP, UDP, or SRT to send the stream to an output stream destination device.

For RTP or UDP, BRIDGE LIVE needs to be able to send the stream directly to the target location. If the target location is behind a router that blocks it, or if the target location is in a network behind NAT (network address translation), your target location will not be able to receive the stream.

For an encoded stream using stream type RTMP(S), the stream cannot do point-to-point. It has to bounce off of a server first.

See *"Alternative Methods for Verifying Pipeline Configuration" on page 114* for more advanced methods of testing pipelines.

Verifying the Configuration of Your Pipeline Remotely

When an SRT output pipeline is configured on BRIDGE LIVE, you can verify it is functioning correctly by accessing the stream with off-the-shelf software for monitoring.

Besides the BRIDGE LIVE itself, a few examples are:

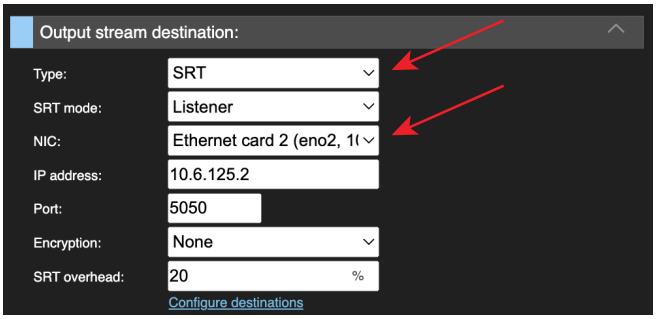
- VLC - (see https://www.videolan.org)
- OBS - (see https://obsproject.com)

Verifying BRIDGE LIVE Output Stream

In this example we will use VLC media player to monitor a BRIDGE LIVE output stream.

BRIDGE LIVE Configuration for Sending an SRT Stream

1. Under the BRIDGE LIVE Output stream destination heading, select SRT from the Type drop-down menu.
2. For the IP address field, enter the IP address for the computer you will use to run VLC media player.
3. The default 5050 port number can be used, provided it is not used by another BRIDGE LIVE output stream.
4. Select the desired Ethernet card from the NIC drop-down menu.



5. Note what the SRT mode is. VLC will need to be configured with the opposite SRT mode.
6. From the lower right corner of Dashboard, click **Save and start**. BRIDGE LIVE applies your configuration changes.

VLC Media Player Configuration for Receiving an SRT Stream

You now configure VLC to receive the SRT stream you just configured on BRIDGE LIVE.

NOTE: This is not intended to be a comprehensive instruction set and may differ from later releases of VLC. Please follow VLC documentation for complete instructions.

1. From VLC media player, go the Network configuration window.
2. In the URL field, enter **`srt://<IP Address>:<Port Number>`**. For example, a VLC URL could look like:

   srt://198.169.208.120:5050
3. Configure the SRT mode to be either **Caller** or **Listener**, whichever is opposite the BRIDGE LIVE's configuration.
4. Click **Open**. VLC will open a new window displaying the live stream of the SDI source that you selected in your new BRIDGE LIVE pipeline. VLC may take a brief moment to open the new window.

Verifying BRIDGE LIVE Input Stream

Generating an External SRT Output Stream for Input Testing

Besides the BRIDGE LIVE itself, the following are examples of external devices or applications that can be used to generate an SRT stream for testing purposes:

- HELO Plus - (see https://www.aja.com/products/helo-plus)
- VLC - (see https://www.videolan.org)
- OBS - (see https://obsproject.com)

Multiple Input Sources

Tabs at the top of the pane allow selection of additional audio or metadata sources. The **Source #1 (main)** tab is dedicated to the main video source, and is automatically assigned for that purpose on all pipelines.

Clicking on the Blue plus symbol adds another Input source tab, and displays information for that source.

Up to two more input sources can be added, to provide the capability to merge separate video, audio, and metadata into a single output. Using another SDI input for audio or metadata is considered utilization of the SDI port, and it will not be available to be used in another pipeline.

Auto Reconfiguration

Enabling this feature will automatically recognize the incoming video and audio formats and pass it through to the output. The output setting will then determine if the formats will follow the incoming format change or follow the output setting rules. If the incoming signal changes, such as a switch from a 1080p59.94 signal to a 720p59.94, the input change will be detected and passed to the output.

When an input format change is autodetected, the audio should be verified, to ensure it is as desired. If the Audio format changes (eg: from AES3 to AAC), the Audio output settings will need to be adjusted.

Encoding Incoming Uncompressed SDI to Various Stream Types

BRIDGE LIVE provides four channels of HD, 2 channels of UltraHD up to 30p or a single channel of UltraHD up to 60p for SDI input or output.

When it comes to deriving streams from incoming uncompressed SDI sources, each SDI input can be output to multiple formats and/or destinations using H.264 (AVC), H.265 (HEVC), MPEG2, NDI, and optionally JPEG 2000 (TR-01) and JPEG XS (TR-07).

Regarding Containers and Protocols, BRIDGE LIVE supports HLS, SRT (plus encryption), RTMP, RTMP(S), RTP, UDP, and MPEG-TS.

Input SDI

All four SDI ports can be used simultaneously for 3G-SDI I/O. The SDI ports can be used as all inputs, all outputs, or a mixture.

Alternatively, one SDI port can be used for 12G-SDI I/O, but doing so will disable the remaining ports.

Output Stream Options

Supported Output Data for Single Program Transport Stream

BRIDGE LIVE supports the following types of output data in a single program transport stream:

- Video
  - H.262 – 4:2:0, 8bit, up to 3840x2160p60/i60
  - H.264 CPU – 4:2:2/4:2:0, 8bit/10bit, baseline/main/high profile, up to 3840x2160p60/i60
  - H.264 GPU – 4:2:0, 8bit, main/high profile, up to 3840x2160p60/i60
  - H.265 GPU – 4:2:0, 8/10bit, main/main10 profile, up to 3840x2160p60
  - JPEG 2000 GPU – 4:2:0/4:2:2, 8bit/10bit, up to 3840x2160p60/i60
    - Encapsulation – standard TR-01 only
  - JPEG XS GPU – 4:2:2, 10bit, up to 3840x2160p60/i60
    - Encapsulation – standard TR-07 only
  - SDI Uncompressed – 4:2:2, 10bit, up to 2048×1080p60/i60
  - MPEG-2
  - NDI
  - HLS
- Audio
  - AAC (ADTS, LATM)
  - AAC-HE (ADTS, LATM)
  - AAC-HEv2 (ADTS, LATM)
  - AC3 up to 6 channels
  - AES3
  - MPEG 2
  - NDI
  - Uncompressed PCM
- Closed Captions – H264 insertion
- Metadata – LTC insertion, SCTE 104 to SCTE 35 conversion

Stream Type

NDI

SDI Inputs can be encoded to NDI for output to the network.

NDI Inputs can be received, decoded and output as SDI.

IP Video Stream inputs can be transcoded to NDI for output to the network.

NDI Inputs can be received, transcoded and output as IP Video Streams.

NOTE: NDI HX is unsupported at this time.

HLS (Input)

HLS sources can be input to BRIDGE LIVE, and then decoded to SDI for output.

HLS Input supports AVC TS segments and fragmented MP4.

BRIDGE LIVE supports UltraHD HLS.

HLS (Output)

HLS Output supports AVC TS segments.

BRIDGE LIVE supports up to HD HLS.

SDI sources can be input to BRIDGE LIVE, and then encoded for sharing via HLS.

IP Video Stream sources can be input to BRIDGE LIVE, and then encoded for sharing via HLS.

MPEG-TS

BRIDGE LIVE supports data transmission using MPEG-TS (MPEG Transport Stream) container format. The transport stream is used in broadcast systems and is designed to be used in terrestrial or satellite broadcast, for example. It can carry multiple programs. Each program contains packets of video stream, audio stream and metadata (if present).

BRIDGE LIVE supports receiving and processing the MPEG-TS streams, detects all programs, and allows its users to choose them easily.

RTMP (Input and Output)

BRIDGE LIVE supports three methods for RTMP stream key configuration.

Custom - The RTMP sender does not have a stream key or does not have an IP/stream key. You type in a custom (abc123) stream key. If the sender has an IP and just needs the key, copy/paste the key into the sender. If the sender does not have an IP or key, copy and paste the desired NICs IP/key combination into the RTMP sender.

Random Key Generation- The RTMP sender does not have a stream key or does not have an IP/stream key. Select 'generate random'. If the sender has an IP and just needs the key, copy/paste the key into the sender. If the sender does not have an IP or key, copy and paste the desired NICs IP/key combination into the RTMP sender.

Sender has IP/Key -Type or paste in the IP/Key combo into the 'RTMP Stream Key' window.

RTMP(S) (Output)

RTMP in BRIDGE LIVE supports streams both with and without authentication. The protocol is used for secure video, audio and data streaming over the Internet.

BRIDGE LIVE supports RTMP in the H.264 video codec and the AAC audio codec. Some services, such as YouTube, do not accept RTMP streams without audio.

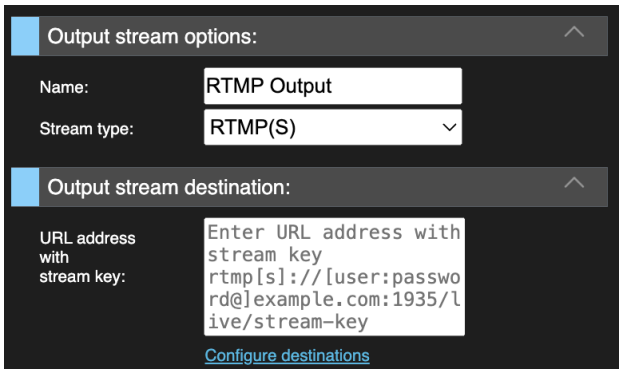
To set up an RTMP output stream, select Output stream options, Stream type as RTMP and just beneath it, fill out the URL address. An example URL of a stream with authentication is the following:

rtmp://user:pass@IPADDRESS/application/stream-key

If you have provided a valid URL, BRIDGE LIVE will produce an output stream upon starting the configured pipeline using RTMP.

You can see how the UI looks without a configured URL address in *Figure 133*.

Figure 133. Configuring RTMP



Total Bit Rate

Total Bit Rate and Data Quality

The overall amount of data that is transmitted is controlled by the total allowed bit rate. This attribute combines the sum of video, audio and remaining bit rates.

Distinction between Total Bit Rate and Video Bit Rate

Total bit rate is the whole bit rate of the transport stream. Total bit rate contains video, audio and metadata, plus possible padding.

Video bit rate, on the other hand, is the bit rate of the video only. This attribute has a direct impact on the resulting quality – the lower the allowed video bit rate, the less the quality of transmitted data.

You can limit the total video bit rate which will define which part of the total bit rate is dedicated to video data. In some scenarios, it may be necessary to adjust the total bit rate overhead over the video bit rate.

PCR Stream

Some receivers require PCR to be stand-alone and not to be in the video stream. This control allows you to select whether the PCR stream should be included in the video stream or be a stand-alone stream included in the total bit rate, under its own PID.

EBP Length (Encoder Boundary Point)

Use the EBP setting to define the parameter for Encoder Boundary Point insertion, which is often used in ABR streaming. This field is typically left empty.

Compliance With

This refers to the transport stream encapsulation standards, and it is relevant to all stream types. If you are using an Evertz device, select the Evertz standard. Otherwise, select Standard.

Configure Service Description

To access this functionality, you need to be subscribed to a service.

This is for timing and synchronization for specific end point services for streaming. Certain service providers may have some specialized version of streaming that would require this level of setup, but this is not frequently used.

Output Stream Destinations

Configure Destinations

You can have multiple output stream destinations for each pipeline.

Type

- RTP
- UDP
- SRT

SRT Protocol for Reliable Data Transmission

BRIDGE LIVE supports data transmission using SRT (Secure Reliable Transport) protocol. SRT is a video transport protocol that is intended to be used over unreliable networks such as public Internet. It adjusts the packet loss, jitter and fluctuating bandwidth in order to maintain the high quality of the transported video stream. It has end-to-end security mechanisms to protect the transmitted data, and it is easy to configure to work with network firewalls. If you wish to learn more about the protocol, please visit the official SRT Alliance website:

https://www.srtalliance.org

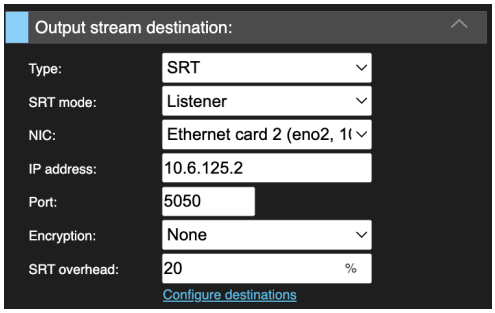
BRIDGE LIVE supports 2 SRT modes of operation – Listener, and Caller. In other words, this is simply the client–server model. The Listener unit is configured to connect to its own local IP address that will be receiving data from the (external) Caller unit. Therefore, the Caller machine is configured with the IP address of an external (to it) unit where the data will be listened to.

NOTE: SRT is a connection-oriented communication and therefore cannot use multicast IP delivery.

Configuring Output Side of SRT Transmission

When creating the pipeline's output side, you can choose to send the traffic via SRT in order to make the connection more reliable and prevent image loss during transmission. In the Output stream destination section, you can select Type > SRT which will add the SRT configuration options. See *Figure 134*. Similarly, as for Input configuration, you can choose between 2 modes – Caller, and Listener.

Figure 134. Configuring SRT Output



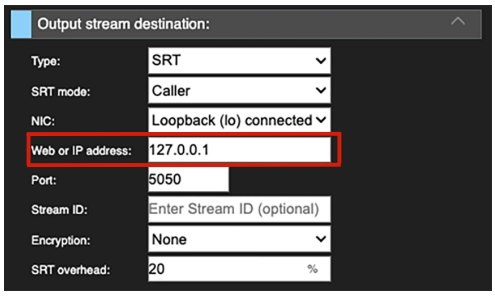
SRT Mode

- Listener - Select the desired NIC for connection. The selected NIC IP address and Port 5000 will be autopopulate and can be adjusted depending on your access requirements. An external Caller unit will request a connection via the entered IP and port.
- Caller - Select the desired NIC for connection. Enter the Web or IP address and Port of the external unit it will connect to.

DNS Resolution of Hostname for SRT Caller Output

When using SRT output with Caller mode, you can use either an IP address or a web URL name. This can be useful when a URL points to multiple IP addresses for distribution.

Figure 135. SRT Caller Mode



SRT Overhead

In addition, you should define the SRT overhead parameter – a percentage amount over Total Bit Rate that can be surpassed in order to achieve the recovery of lost data. As a result, the maximum used connection bit rate is equal to the configured Total Bit Rate + SRT overhead. In general, this is the upper limit and the connection does not require it for normal operation.

IP Address

The IP Address to which you want to send the stream. While using SRT in Caller mode, it is the address which is being called (sending to) and for the Listener mode, it is the address which is being called (receiving a request from said address to which the stream will be sent).

In this case, the IP Address of the local machine where an external Caller unit will request a connection is Ethernet Card 2 (eno 2).

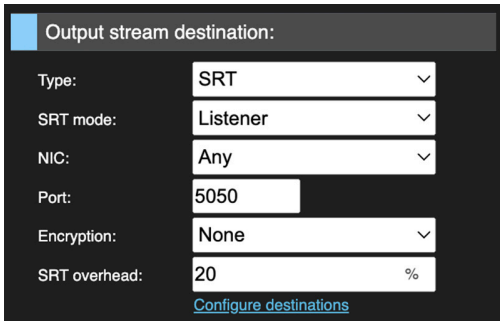
Port

Port 5050, 5051, 5052 and 5053 are all viable to enable easy traversing of firewalls and other potential obstacles. It usually does not matter which port is used, it just needs to match on both ends.

One Output Stream, Multiple Port Numbers

If you have 10 remote clients who all want to view the same SRT stream, you can Configure destinations to add 10 new destinations, incrementing the port number for each additional remote client; for example, client 1 is assigned port 5051, client 2 is assigned port 5052, client 3 is assigned port 5053, and so on.

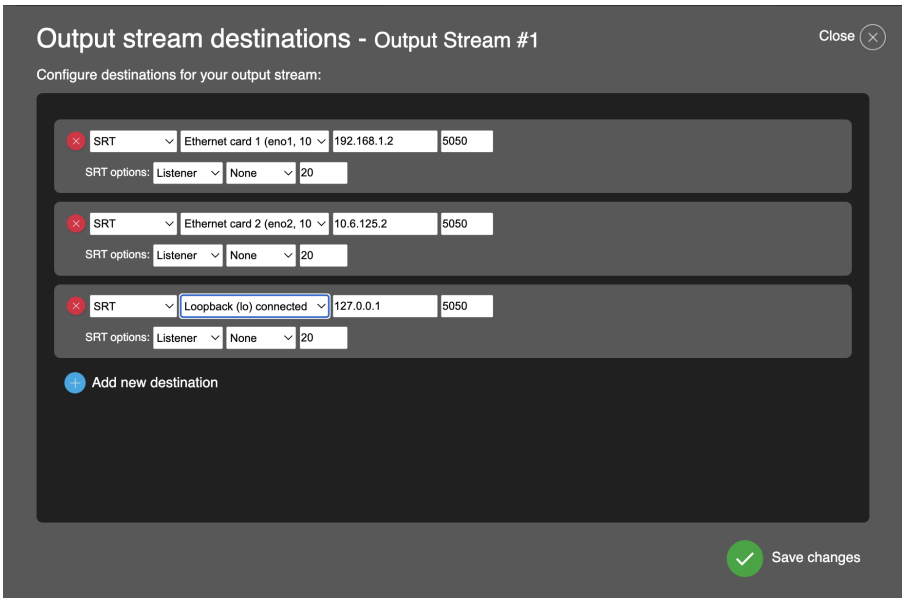
Figure 136. The Configure destinations link



To Add a New Destination with a New Port Number

1. From the Output stream destination panel, click Configure destinations. The Output stream destinations window displays.

Figure 137. Adding port numbers



2. Click Add new destination. A new row is added for the new stream destination.
3. Edit the port number to match your port configuration plan.
4. Repeat as needed, then click Save changes. The new stream destinations are added to the pipeline.

This is an efficient approach since it requires only one output stream and BRIDGE LIVE does not need to do any extra encoding.

Two Output Streams, Multiple Port Numbers

If you have 10 remote clients who all want to view the same SRT stream, but 5 of them require 15Mbps and the other 5 require 8Mbps, you would need to create two separate output streams—one for 15Mbps and another for 8Mbps.

For each output stream, configure five destinations, each with a unique port number, to correspond to the 5 remote receiving clients.

Encoding two output streams rather than one is more demanding on the BRIDGE LIVE system. However, it meets the needs of the two sets of remote clients with varying bit rate requirements.

NIC

Network Interface Card (NIC) options typically include:

- Ethernet card 1
- Ethernet card 2
- Loopback (lo)

This list of selections can vary based on the configuration done during UI Setup. Users might be able to select only one Ethernet card and Loopback based on how BRIDGE LIVE is configured.

Video Codec

When selecting which codec to use, one aspect to consider is the type of equipment being used by the receivers. If their equipment does not support the higher demands of the codec, that could present challenges, especially if the receivers would be required to purchase new equipment in order to be able to receive the signal.

Choose from settings for the chosen video codec that define quality vs. speed difference.

NDI

NDI is a flexible and versatile solution, allowing multiple video streams on a shared connection. NDI supports high quality, low latency, frame-accurate video over standard Ethernet networks. NDI stands for Network Device Interface and is developed by NewTek.

HLS

BRIDGE LIVE supports output stream type HLS (HTTP Live Streaming), an adaptive bit rate streaming protocol. HLS supports both AVC TS segments with H.264 and Fragmented MP4 with both H.264 and H.265. HLS supports audio formats EAC3, AC3 and AAC.

SDI sources or IP video stream sources can be input to BRIDGE LIVE, and then encoded for output via HLS.

Based on TCP, HLS is used to deliver content to end point devices such as phones and tablets or applications such as web browsers. For browsers all that is needed is the URL with the playlist extension. Safari has this support natively; Chrome and Firefox have extensions available for HLS playback.

NOTE: HLS is not useful for contribution, backhaul or any other workflow that requires low latency.

The best way to deliver HLS with BRIDGE LIVE is to provide the pre-packed video to a CDN. This means many end-point-devices can utilize the content simultaneously.

JPEG 2000

JPEG 2000 is an image coding system that uses state-of-the-art compression techniques based on wavelet technology and offers an extremely high level of scalability and accessibility. Content can be coded once at any quality, up to lossless, but accessed and decoded at a potentially very large number of other qualities and resolutions and/or by region of interest, with no significant penalty in coding efficiency.

Two methods used to transport JPEG 2000 are VSF TR-01:2103 and VSF TR-01:2018.

JPEG XS

BRIDGE LIVE JPEG XS input supports H.264 4:2:2 10-bit. JPEG XS (VSF TR-07) is a paid for feature which much be purchased and have the licenses activated on the BRIDGE LIVE server. Each BLVE-JXS01 license is for one HD channel (encode or decode). Each BLVE-JXS04 license is for one UHD channel or 4 HD channels (encode or decode). The license is non-transferable. JPEG XS is supported in MPEG-TS streams via UDP, RTP and SRT.

JPEG XS Configuration, Input Stream

Input stream autodetection and configuration is now supported for all MPEG-TS input streams as defined in *"Configure Input Stream Options" on page 72*

If you want to set it up manually, follow these procedures.

1. Select the appropriate MPEG-TS option:

- MPEG-TS over UDP or RTP
- MPEG-TS over SRT

2. Check 'Input Stream Video Configuration Options'.

   A. If the incoming source has been detected via port #, this section should be filled with detected frame and scan rate.

   B. If it's necessary to manually configure the Input stream, open the 'Video Codec dropdown and select 'JPEG XS'.

   C. Select the correct frame size and scan rate.

   D. The Bit depth and Color sampling will default to 10-bit and 4:2:2.

JPEG XS Configuration, Output Stream

3. JPEG XS output will only be supported via MPEG-TS Stream type. In 'Output Stream Options', select 'MPEG-TS'. In 'Output Stream Video Configuration Options 'Select 'video codec' dropdown and select 'JPEG XS'.

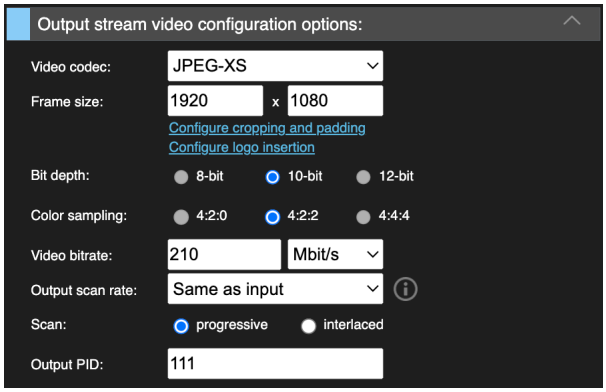
   A. Select the correct frame size and scan rate.

   B. The Bit depth will default to 10-bit and will not be selectable. The Color sampling will default to 4:2:2 and will not be selectable.

   C. Select the desired Video bit rate.

   D. Configure the 'Scan rate', 'Field Order', and 'Output PID', as necessary.

Figure 138.



H.262 Encoding Options

H.262 is the official name for MPEG-2. Since it is the oldest of the codecs and it has been around for a long time, many people are familiar with it and know how to work with it. It is known to be reliable.

- Profile: High, Main, Simple
  - The Simple profile allows you to use only I and P frames, while Main or High profiles support even B frames. All H.262 profiles are 4:2:0. The High profile also supports Spatial and SNR scalability modes. For bit rates and profiles, you may decide to use an older profile because of compatibility with older devices (especially older phones)
- GOP size – distance between two I-frames
- B count – number of B-frames between two P-frames

H264 Encoding Options

H.264 is newer than H.262, and it has better image quality and is more efficient.

- Coding – CABAC, CAVLC
  - CAVLC is typically used for compatibility with old devices. CAVLC is an older coding option and is easier to decode. However, for the same bit rate, it produces lower video quality
  - CABAC is a newer coding option and is a bit harder to decode. It provides the same quality of video as CAVLC while using a lower bit rate
- Profile – Baseline, Main, High
  - Similar to H.262 profiles, the higher the profile, the more capabilities it has. The Main profile and higher allows B frames and CABAC. The High profile supports 4:2:2 sampling and 10-bit depth
- GOP size – distance between two I-frames
- B count – number of B-frames between two P-frames

H265 Encoding Options

H.265 supports UltraHD. It is newer and even more efficient than H.264. Its efficiency is in decoding. (Encoding requires more computing power up front.)

- Profile: Main, Main10
  - Main uses 8-bit encoding/decoding. Main 10 uses 10-bit encoding/decoding. On a system level, 10-bit I/O is more resource intensive
- GOP size – distance between two I-frames
- B count – number of B-frames between two P-frames

Video Bit Rate

Enter a bit rate to define how much of the total bit rate is dedicated to video data. You can specify the units in terms of Mbit/s, kbit/s or bit/s.

Scan Rate

BRIDGE LIVE can either keep original frame rates or convert frame rates as required.

Supported Frame Rate Conversions

BRIDGE LIVE supports frame rate 50% down-conversion capabilities, for example:

- 60p to 30p
- 59.94 to 29.97
- 50p to 25p

BRIDGE LIVE also supports frame rate 50% up-conversion, such as:

- 50i to 50p

Frame Rate Conversions Not Supported

BRIDGE LIVE does NOT currently support these frame rate conversions:

- 25 to 30
- 50 to 60
- 23.976 to 24.00
- 59.94i to 60p

NOTE: You can choose from only two different frame rate (fps) options on the output - either (i) same as the source, or (ii) halved in rate.

Wrap Captions

The H.264 video codec supports wrapping closed captions. These are available to be selected and wrapped to output in the video elementary stream only if they are detected in the source SDI metadata stream as CEA 608 or CEA 708.

Output PID

In general, each elementary stream or table in MPEG-TS is identified by a packet Identifier. You can specify the PID for your output MPEG-TS. Otherwise it defaults to the source's PID.

Overwriting a PID

There may be situations in which you would want to overwrite the PID. When MPEG-TS is used for both the input and the output, BRIDGE LIVE offers the option to overwrite the value of the incoming PID by filling in a new value in the Output PID field.

In some broadcast environments, operators use fixed PIDs for specific types of elementary streams; for example, 100 for video, 200 for audio, 300 for captioning, etc.

If you need to filter a specific PID at the input, or if you need to set the PID manually at the output for another device that also uses a PID filter, the ability to overwrite the PID becomes useful.

If you leave the Output PID field empty, the output PID will be the same as the input PID. If you are not using MPEG-TS and leave the Output PID field empty, BRIDGE LIVE will generate a new output PID.

Decoding Incoming Streams and Outputting Uncompressed SDI

Input Stream

Input streams can be one of the following:

- NDI
- HLS
- MPEG-2
- JPEG 2000
- JPEG XS
- RTMP
- H.265
- H.264

Configuring Input Streams

MPEG-TS over RTP, UDP, or SRT Input Stream Sources

When configuring MPEG-TS input streams of type RTP, UDP, or SRT, you will need to configure network settings.

There are circumstances in which you will need to fill out the IP address and Port:

- When the input stream has a multicast address
- When the input stream is of type SRT and BRIDGE LIVE is set as the caller

Enter the IP address and port number that corresponds to where the input stream is being sent.

For example, when BRIDGE LIVE is using the IP address 172.23.26.29, it will receive a unicast transport stream at that IP address and port 5000. So the valid input combination in BRIDGE LIVE will be an IP address of 172.23.26.29 (or just 0.0.0.0) and port number 5000.

NOTE: Entering the IP address of 0.0.0.0 for the input stream tells BRIDGE LIVE to use the IP address of its selected Ethernet port where the signal is being received.

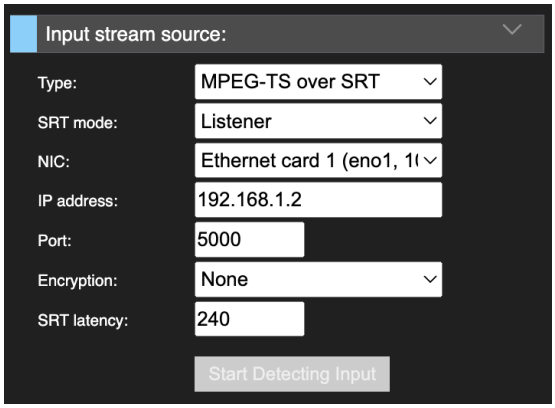
For SRT configuration, see *"SRT Protocol for Reliable Data Transmission" on page 105*.

MPEG-TS and MPTS (Multiple Program Transport Streams) are found in Input Stream configuration. This means that if you have one transport stream being sent to one particular IP address and Port combination, it can contain various programs. With MPEG-TS and MPTS, you can differentiate whether it is just one program or if there are multiple programs. If it is MPTS, there are more video streams, and you choose between the program number that you want to decode and process. If it is single stream, then you work with only one.

Configuring Input Side of SRT Transmission

When you wish to configure SRT for use for MPTS (Multiple Program Transport Streams), select the Input Stream Type item called MPEG-TS over SRT. Before configuring the IP address and IP port, select whether you intend to use Caller/Listener mode. This directly impacts what IP you need to provide.

Figure 139. Configuring SRT Input Source



When you select SRT mode:

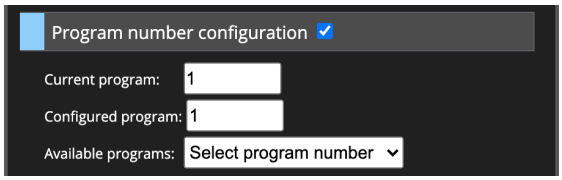
- Listener – IP address and Port of the same machine where the data is being received (listened to) from an external source
- Caller – IP address and Port of the remote machine from where the data will be sent

It is necessary to define the SRT latency variable in milliseconds (ms). The parameter is the time of intended delay of network packets (a buffer) that is allowed for the connection to slow down the data in transmission in order to provide a time slot to re-send lost UDP packets if they occur. This is what allows SRT protocol to establish a reliable connection with the focus on removing video disruptions.

Choosing the Program Number

When you wish to choose which program to use, you need to enable the Program number configuration in Input stream configuration options. Once allowed, you can select the program number from a drop-down menu. Current program informs about the current configuration, while Configured program has to be applied first in order to take effect. If you do not set up anything, the first program in the list is selected. If a Configured program number is not present in the stream, BRIDGE LIVE reports an error. Once you change the program number and apply the configuration, video with another PID is detected (if present).

Figure 140. Configuring MPTS

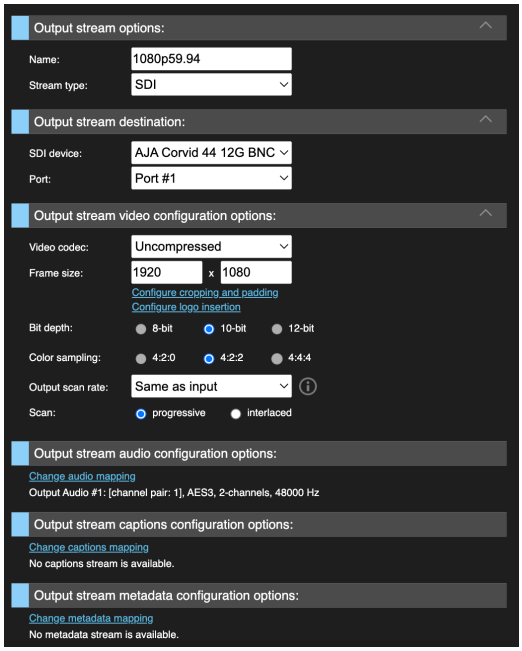


Output SDI

You can send an output stream from BRIDGE LIVE using uncompressed SDI.

To configure the SDI output, set the Stream type to SDI first, then select the correct SDI device and Port that you want to use.

Figure 141. SDI Output Example



Muxing

BRIDGE LIVE is capable of muxing multiple streams such as audio inputs, captions and metadata streams into a single output stream. The list of supported input data is as follows:

Video

- 3G SDI

    - Uncompressed 4:2:2; 8bit/10bit, up to 1080i60/720p30; 4:2:2; 8bit/10bit, up to UltraHDp60 – AJA Corvid 44 12G BNC
- Generic single program MPEG transport stream
    - Encapsulation – standard TR-01, Evertz TR-01, MediaLinks TR-01, legacy NetInsight TR-01
    - High-bit rate JPEG 2000 – 4:2:2, 10bit/12bit, up to 3840x2160p60/i60
    - H.262 – 4:2:0, 8bit, up to 3840x2160p60/i60
    - H.264 – 4:2:2/4:2:0, 8bit/10bit, up to 3840x2160p60/i60
    - H.265 – 4:2:0, 8bit/10bit, up to 3840x2160p60
    - High-bit rate JPEG XS – 4:2:2, 10bit, up to 3840x2160p60/i60

Audio

- AES3 uncompressed (SMPTE 302M)
- MPEG2 audio
- AAC (ADTS, LATM)
- AAC-HE (ADTS, LATM)
- AAC-HEv2 (ADTS, LATM)
- AC3
- E-AC3

Closed Captions

- SMPTE 2038 (608/708)
- EIA-708 or EIA-608 (in SDI)

Metadata

- LTC timestamps
- MPEG TS PCR
- Ad-markers – SCTE104 (in SDI)
- Pass-through capabilities

Alternative Methods for Verifying Pipeline Configuration

Using RTMP Server for Mac

A free application, Local RTMP Server for macOS, is available through GitHub. You can use it to stream straight to a Mac host, reading it back with VLC and verifying it locally to make sure RTMP is working. The application can be found through the following link:

https://github.com/sallar/mac-local-rtmp-server

Capturing Outgoing Packets and Creating a Transport Stream

Another method for verifying the pipeline configuration involves capturing the outgoing packets from the BRIDGE LIVE server directly on BRIDGE LIVE, downloading the PCAP (Packet Capture) file, and creating a transport stream out of that data for inspection.

NOTE: Generating a PCAP file can be helpful when working with tech support on certain issues.

Prerequisite

Before going through the steps of this process, it is a requirement that BRIDGE LIVE is actively sending out a stream through a configured pipeline.

Generating a PCAP (Packet Capture) File

You can generate a PCAP file in the command line (SSH) as a sudo user.

- It is ideal to use a sample that does not contain any dropped packets
- Capturing data using this method must use UDP or RTP. It will not work for SRT

WARNING: ***When using SSH to access the BRIDGE LIVE system and run commands as a root (sudo) user, please exercise caution. It is possible to severely or irreparably damage the system if you are not clear on what you are doing. Please seek appropriate guidance if you are uncertain about how to proceed.***

Make Sure that SSH Daemon is Running on BRIDGE LIVE

1. From the Admin menu of BRIDGE LIVE, select Security. The Secure Shell (SSH) and Password Management page displays.
2. Check that the status of SSH daemon is "running." If the status is "stopped," click Enable next to Manage SSH daemon. The SSH daemon status will change to "running."

Figure 142. SSH Daemon is stopped

Figure 143. SSH Daemon is running

Login to BRIDGE LIVE as Transcoder

1. Launch the Terminal app on a Mac or the Command Prompt on a Windows computer.

2. From the prompt, enter the following UNIX command:

```
ssh transcoder@device _ ip
```

For example, if the IP address of your BRIDGE LIVE unit is 10.6.0.18, you would use this command:

```
ssh transcoder@10.6.0.18
```

You will need to enter the SSH password.

Run the Generate PCAP Command

The command that generates the PCAP file looks like this:

```
sudo tshark -f "dst port 50010" -i eno1 -w /tmp/input _
sample.pcap -a duration:60
```

This command as written above will capture every packet with set destination port 50010 going through the interface (Ethernet card) eno1 for 60 seconds. When executed successfully, it will create a file on the BRIDGE LIVE device located at this path:

```
/tmp/input _ sample.pcap
```

NOTE: Modify the command as needed to reflect your own port number, eno (Ethernet card), and duration to match your pipeline configuration and requirements.

Download the PCAP File

1. Use sFTP (SSH) to login to BRIDGE LIVE.
2. Navigate to the **/tmp** path and download the **.pcap** file. For example:

```
get "input _ sample.pcap" "F:\input _ sample.pcap"
```

3. If you encounter permission issues, you could try using the following command:

```
sudo chown transcoder /tmp/input _ sample.pcap
```

Create a Transport Stream for Inspection

While the steps for doing so are not covered within the scope of this manual, the next part of the process is to create a transport stream out of the data in the **.pcap** file for inspection.

Probes or Other Tools

Some large organizations may have probes or other various tools that can be used to verify the streams, and therefore may not need to visually see what the stream looks like.

SRT Bonding for Path Redundancy

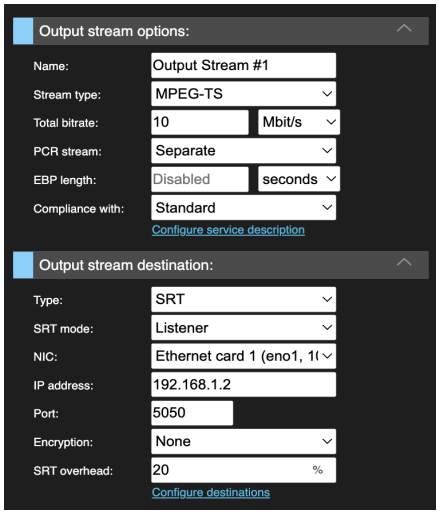
Starting with v1.16, BRIDGE LIVE supports SRT Bonding for path redundancy over public internet connections. SRT Bonding is a hitless protection switching technology that relies on more than one IP network path to prevent disruption to live video streams in the event of network congestion or outages by maintaining continuity of service. SRT Bonding also increases the reliability and quality of live video streams over IP networks.

Path Redundancy enables continual routing of live video streams even if one IP network path fails or experiences temporary issues such as packet delivery delays or outages, thus maintaining high-quality feeds for must-notfail event coverage. Similar to SMPTE ST2022-7 over managed networks, SRT Bonding adds seamless packet switching, making live video transport over the public internet an extremely reliable and cost-effective option compared to using satellite or managed fiber.

Configuration of 'Sending' BRIDGE LIVE

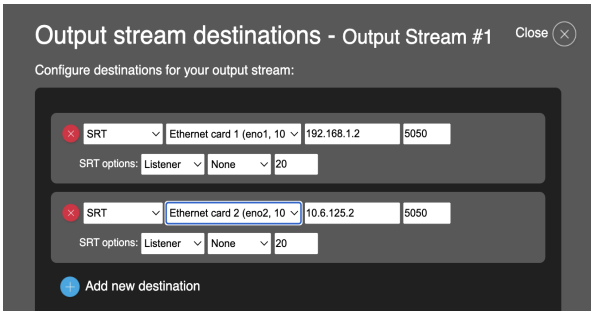
- The sending BRIDGE LIVE is configured as the Listener, which means it will only send the redundant media when the receiving device requests it. The Sender/Listener combination must use unique IP and Port combinations that are valid on the selected Ethernet cards.
  - Under outputs, after configuring the MPEG-TS stream and video Codec, build the primary Output stream destination as follows:
    - Type: SRT
    - SRT Mode: Listener
    - NIC: Set to Ethernet Card 1
    - IP address: IP address to egress from Ethernet Card 1
    - Port: User specified. Port # is REQUIRED
    - Encryption: User specified
    - SRT overhead: User specified

Figure 144. Listener Configuration



- Configure the Secondary/Redundant output as follows:
  - Under Output stream destination, select 'Configure destinations'.
  - Select 'Add new destination'.
  - Replicate the Primary output setting with the exception of the IP address, which should be the IP address to egress from Ethernet Card 2. Set to 'Ethernet Card 2'.

Figure 145. Secondary/Redundant Output Configuration



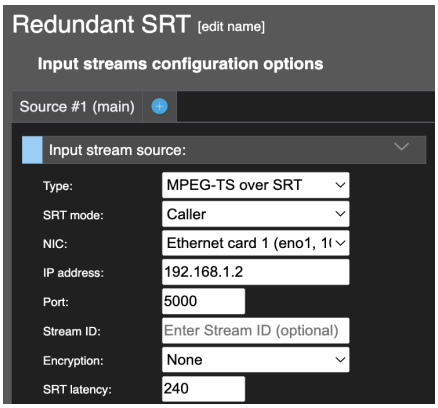
Configuration of 'Receiving' BRIDGE LIVE

- The receiving BRIDGE LIVE is configured as the Caller, which means it will reach out to the sending device to send the redundant streams. The Receiver/Caller shall use the redundant IPs and port #s from the sending device and must be a unique combination of IP and Port.

NOTE: The SRT redundancy section will only appear when the Type is set to 'MPEG-TS over SRT' and the SRT mode is set to 'Caller'.

  - Type: Set to 'MPEG-TS over SRT'
  - SRT mode: Set to 'Caller'
  - NIC: Set to the Primary NIC to be used, typically 'Ethernet card 1'
  - IP address: Set to the Primary Sending/Listener IP
  - Port: Set to the Primary Sending/Listener Port #
  - Stream ID: User specified
  - Encryption: User specified. Defaults to None
  - SRT Latency: User specified. Defaults to 240 milliseconds (ms)
- SRT Redundancy
  - NIC: Set to the Secondary NIC to be used, typically 'Ethernet card 2'
  - IP address: Set to the Secondary Sending/Listener IP
  - Port: Set to the Secondary Sending/Listener Port #

Figure 146. Caller Configuration



Monitoring Service

Starting with v1.16 BRIDGE LIVE supports the BRIDGE LIVE Monitoring Service. The BRIDGE LIVE Monitoring Service provides a centralized view of pipelines between multiple BRIDGE LIVE units and Comprimato's Live Transcoder (on-premises or cloud based) instances. The Monitoring Service connects the BRIDGE LIVE and LT(Live Transcoder) instances through Comprimato's server portal to provide a comprehensive view of each pipeline on a Monitoring Dashboard. The Monitoring Dashboard is accessed via a web browser.

NOTE: Activation of this feature requires access to the public internet.

The Monitoring Service must be set up on each BRIDGE LIVE server that will be monitored so it is necessary to change parameters in the active .ini settings file on each of those servers. See *"Advanced Setup" on page 66*.

- Download the active .ini settings file and remove the semi-colons as follows to activate the service:
  - ; monitoring_enabled=1
    - monitoring_enabled=1
  - ; monitoring_group_id= (unique value)
    - monitoring_group_id=(unique value)

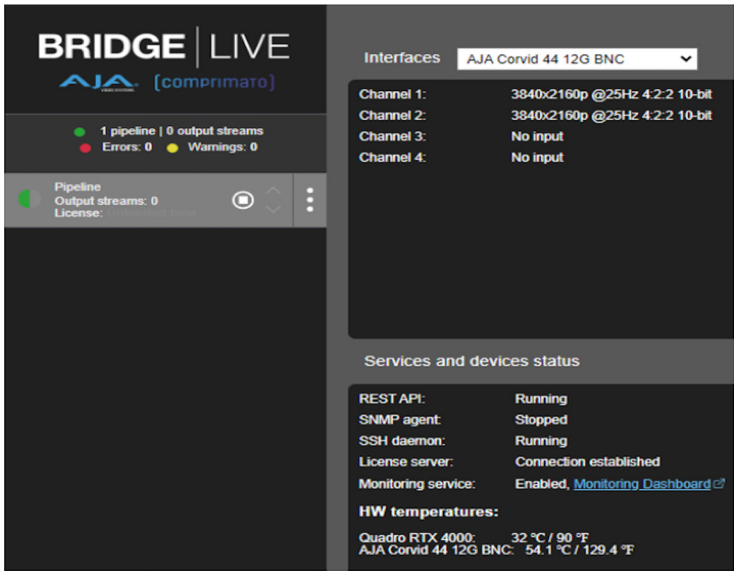
NOTE: You must insert a unique value after the =. It can be human-readable but it should contain a part that makes it unique, e.g. BLVE01_MER1_RACK04_25. This value should be kept secure, as it provides visibility into the monitoring dashboard.

Figure 147. Unique Monitoring Group ID

```
;enable monitoring metrics
monitoring_enabled=1
;OTEL OTLP endpoint where metrics are emitted to
;monitoring_otel_endpoint=localhost:4317
;use any unique string hash to group several transcoder instances into single monitored group
monitoring_group_id=BLVE01_MER1_RACK04_25
```

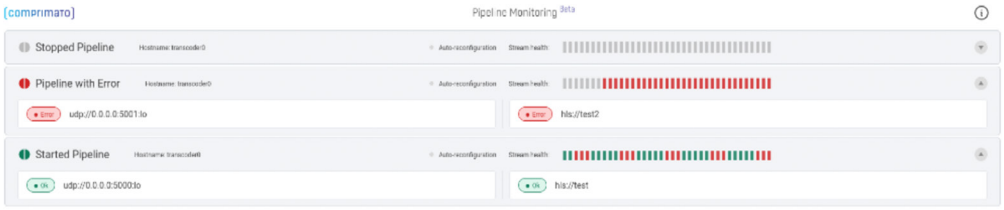
- Save your changes, then Upload the updated .ini settings file. Select the file, click Apply, then follow directions to activate
- On the BRIDGE LIVE homepage, verify that the Monitoring Service is running. 'Services and devices status' section will show 'Monitoring Service : Enabled'

Figure 148. Monitoring Service Enabled



- Select Monitoring Dashboard. The web browser will open to the appropriate page and show active pipelines

Figure 149. Monitoring Dashboard



Dolby E Passthrough

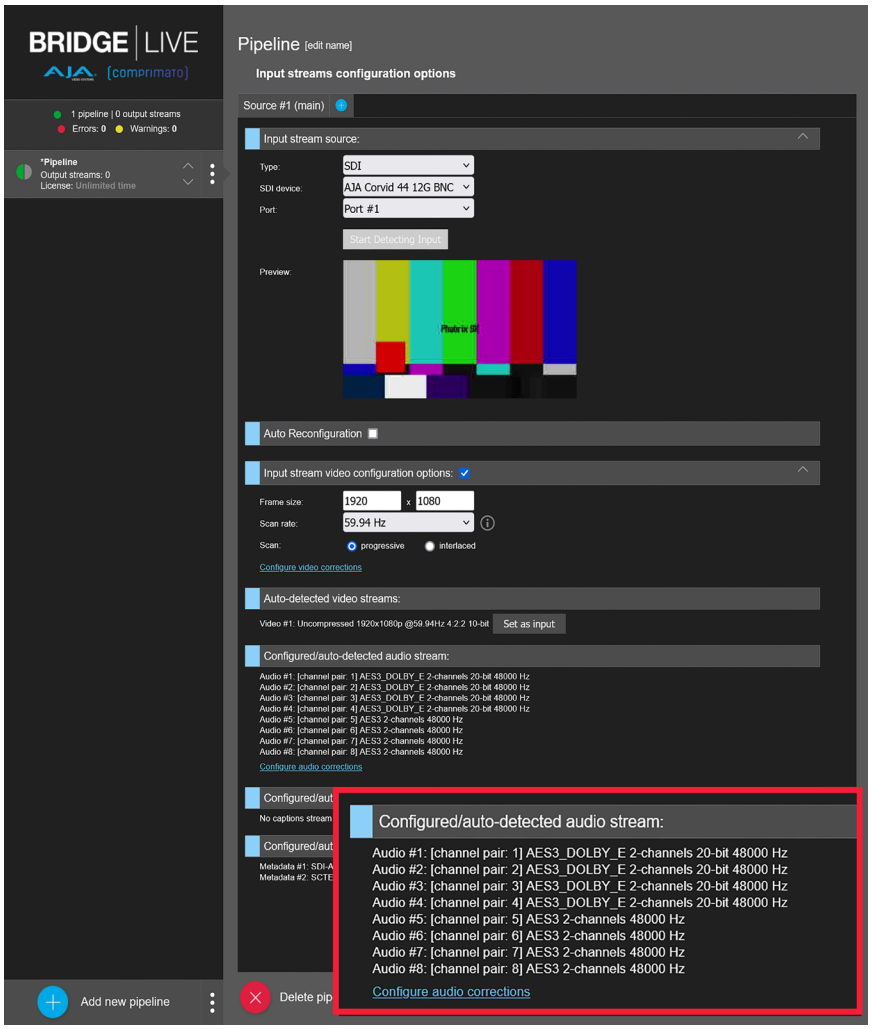
Starting with v1.16, BRIDGE LIVE supports 20-bit Dolby-E passthrough. The Dolby-E passthrough feature provides the capability to receive and send Dolby-E within SDI or MPEG-TS audio. This feature does not provide access to decode or encode to/from Dolby-E and AES-3; it is only a passthrough feature. The Dolby E flag must be present for the data to be recognized and applied correctly.

NOTE: 16-bit Dolby E is not supported.

Configuration of SDI or IP Input

- Select SDI or IP input Type
- Auto detects Dolby E and presents on the audio channels

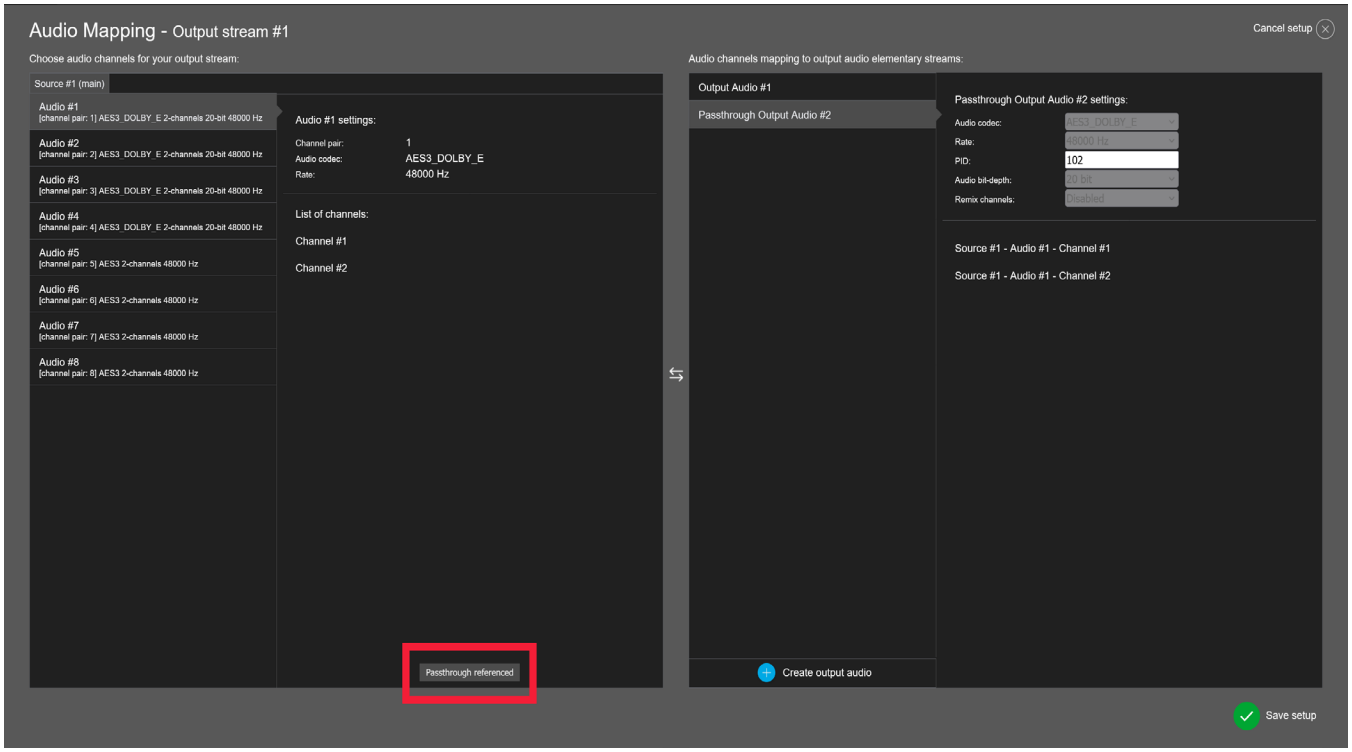
Figure 150. 20bit Dolby E Passthrough Input Configuration



Configuration of Dolby E Passthrough Output

- Under 'Output stream audio configuration options', click on 'Change audio mapping'.
- When building an output pipeline, highlight the desired Dolby-E channels, then select 'Passthrough referenced'.
- The mapping will automatically set those output types to Dolby-E for passthrough.

Figure 151. 20bit Dolby E Passthrough Output Configuration



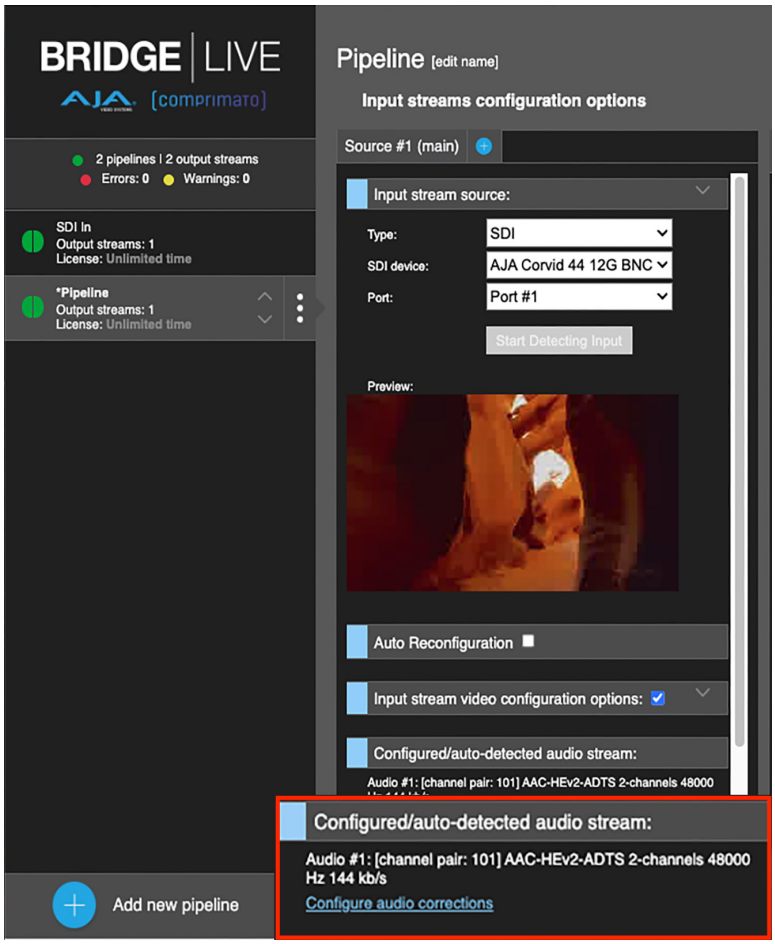
AAC-HE Decode and Encode

Starting with v1.16, BRIDGE LIVE supports decoding and encoding of AAC-HE audio.

Configuration of Input with AAC-HE Audio

- Select input.
- Auto detects AAC-HE and presents on the audio channels.

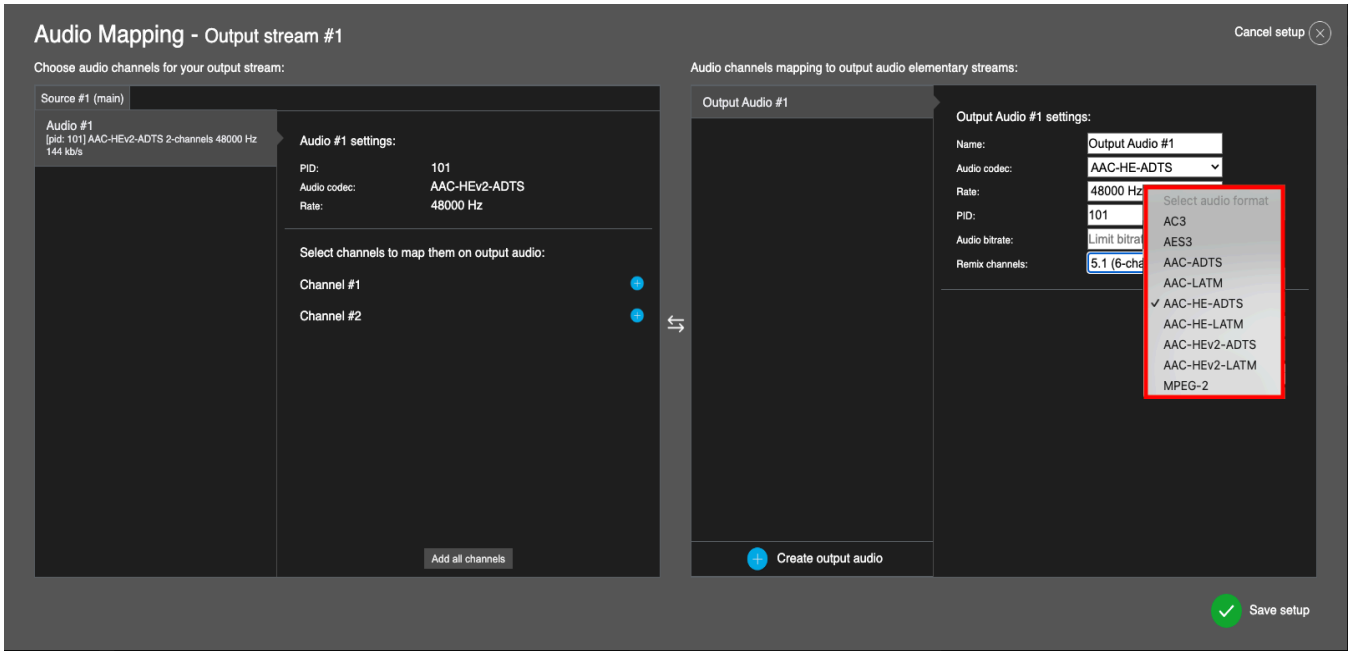
Figure 152. AAC-HE Input Configuration



Configuration of AAC-HE Output

- Under 'Output stream audio configuration options', click on 'Change audio mapping'. Under 'Output stream audio configuration options', click on 'Change audio mapping'.
- When building an output pipeline, click on **Audio codec** and select an AAC-HE codec. The following codecs are supported:
  - AAC-HE-ADTS
  - AAC-HE-LATM
  - AAC-HEv2-ADTS
  - AAC-HEv2-LATM

Figure 153. AAC-HE Output Configuration



Chapter 5 – Interoperability

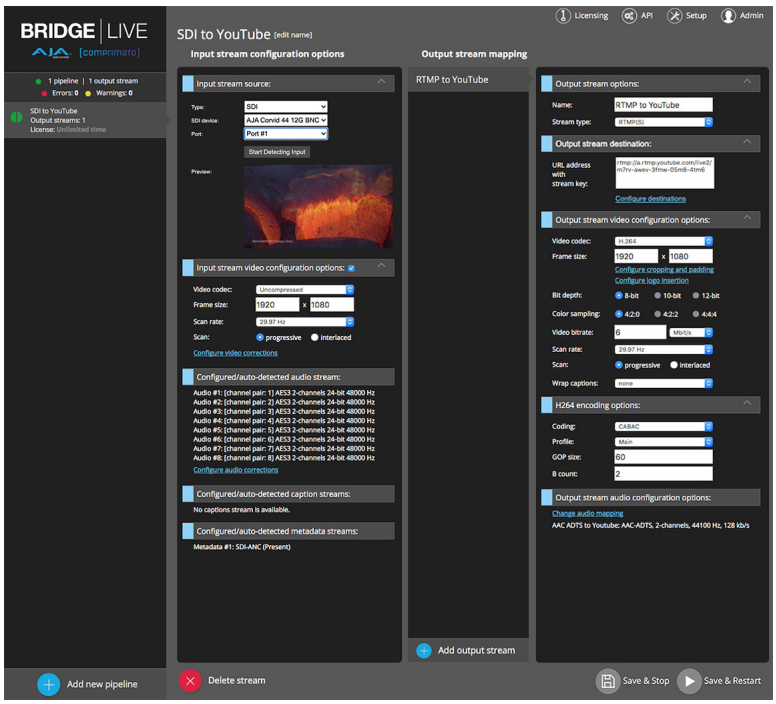
Example of Streaming to YouTube

NOTE: The last steps about the stream URL and key are critical elements.

In this example, we assume that you already have a pipeline setup that has a streaming output. We are going to add an output stream to that pipeline for streaming to YouTube.

Adding an Output Stream for YouTube

Figure 154. Configuring a new output stream for streaming to YouTube



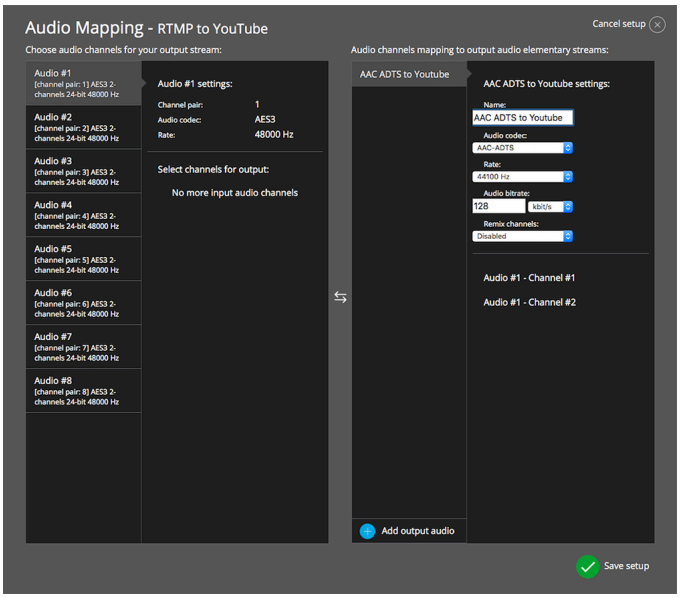
1. Click **Add output stream**.
2. Under Output stream options, provide a name for your new output stream.
3. Set Stream type to RTMP(S).
4. Under Output stream video configuration options, set Video codec to H.264.
5. Set Frame size to your desired YouTube resolution, for example, 1920x1080.
6. Set Bit depth to 8-bit.
7. Set Color sampling to 4:2:0.
8. Set Video bit rate to the YouTube recommended rate of 3 to 6 Mbit for 1080p23.98 to 1080p30.
9. Set Scan rate to match the video input scan rate (can be half for high frame rate inputs if desired).
10. Set Scan to progressive (YouTube prefers progressive video).
11. Under H.264 encoding options, set Coding to CABAC.

12. Set Profile to Main.
13. Set GOP size to 2x the frame rate. For example, 1080p29.97 = GOP of 60).

Audio Settings

1. Under Output stream audio configuration options, click Change audio mapping.

Figure 155. Audio Mapping RTMP to YouTube

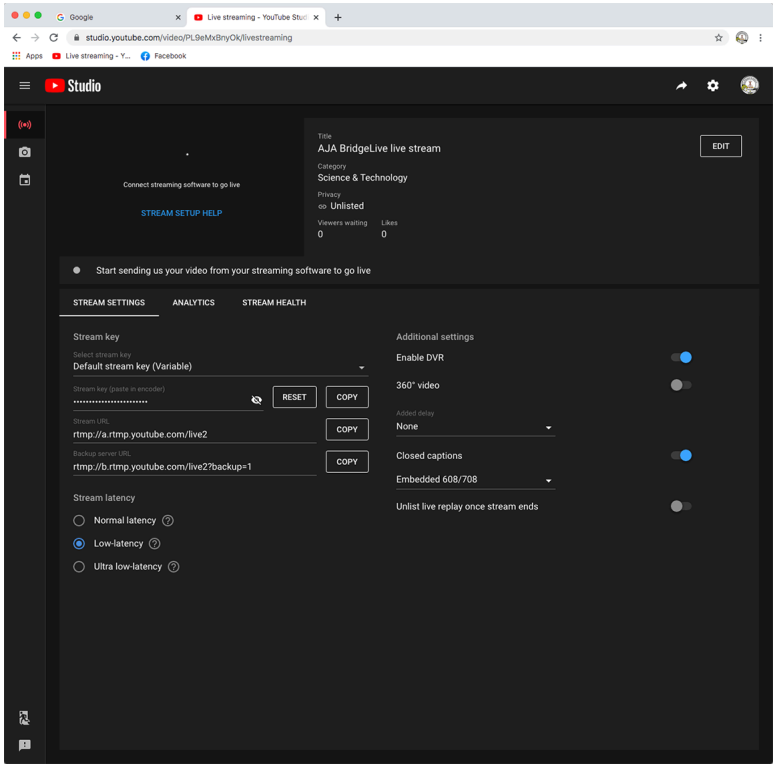


2. Name your Output Audio settings.
3. Select AAC-ADTS under Audio codec.
4. Set Rate to 44100 Hz.
5. Set Audio bit rate to 128 kbit/s.
6. Click **Save setup**.

YouTube Studio Live Streaming Page

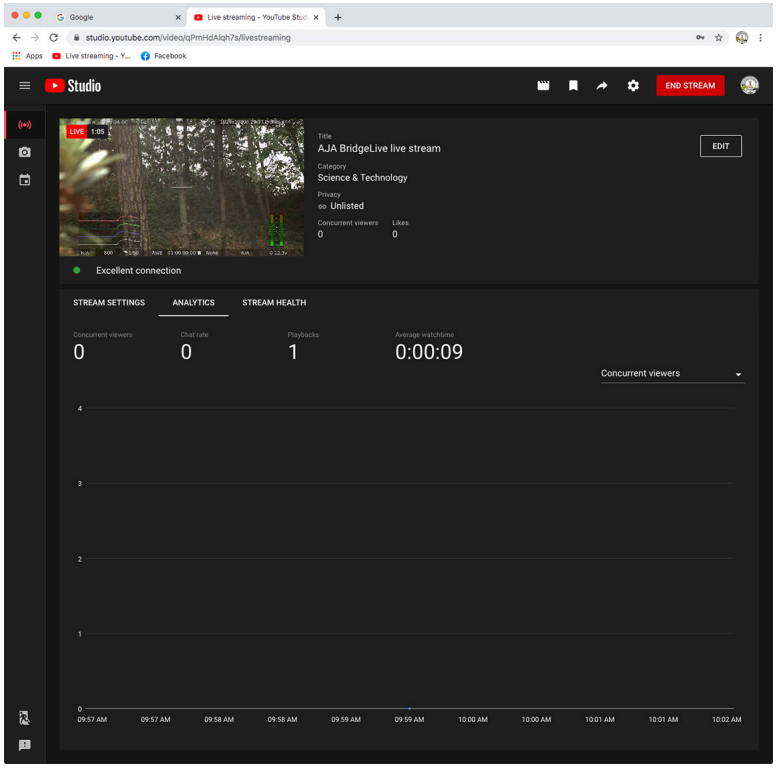
1. Go to your YouTube Studio live streaming page.

Figure 156. YouTube Studio Live Streaming Page



2. Copy the Stream URL.
3. Paste the stream URL into **URL address with stream key** field under Output stream sink of pipeline Output stream mapping.
4. Go back to the YouTube Studio live streaming page.
5. Copy the Stream key.
6. Go back to the RTMP **URL address with stream key** field.
7. Add a "/" to end of the pasted URL address, then paste in the copied stream key.
8. Apply configuration.

Figure 157. YouTube Studio Live Stream Page Now Streaming



Streaming to Wowza Live Video Streaming Platform

If you wish to stream to Wowza, note that you can provide authentication through the URL format.

Destination Syntax Examples

See the following destination syntax examples:

- rtmp://USERNAME:PASSWORD@address:1935/live
- rtmp[s]://[user:pass@]example.com:19xx/live/stream-key

Please see https://www.wowza.com/ for more detailed information.

Chapter 6 – Using the REST API

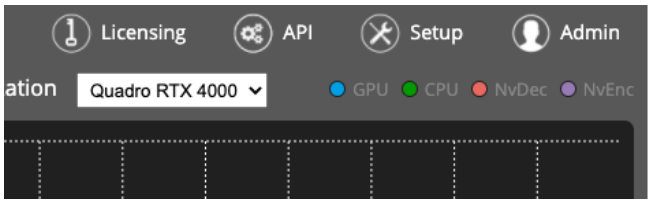
The REST API is accessed with standard methods, including through the browser URL field and through Curl commands.

Can use other methods too. Can use through web browser. For automation, would use something like Curl. But it is a typical REST API in terms of how someone would access and use it.

Accessing the API Documentation

BRIDGE LIVE is REST API ready. You can access the complete API documentation by selecting the API button in the top right corner of Dashboard.

Figure 158. The API button



Featured Curl commands

The API documentation is extensive. However, the following list of certain Curl commands may be especially useful as you get started:

list network interfaces

- $ curl 'http://localhost:8080/api/system/network-interfaces' -i -H 'Accept: application/json'

list all available pipelines

- $ curl 'http://localhost:8080/api/pipelines' -i -H 'Accept: application/json'

add simple pipeline with input stream data

- $ curl 'http://localhost:8080/api/pipeline' -i -X POST -H 'Content-Type: application/json' \ -d '{ "name" : "pipeline 3", "source" : "udp://127.0.0.1:5000:lo", "complianceWith" : "TR_01", "video" : { "format" : "J2K", "width" : 1920, "height" : 1080, "sampling" : "4:2:2", "depth" : 10, "framerate" : "24", "fieldOrder" : "PROGRESSIVE" } }

get the state of pipeline with ID 0

- $ curl 'http://localhost:8080/api/pipeline/0/state' -i -H 'Accept: application/json'

Chapter 7 – Using SNMP

BRIDGE LIVE Server SNMP Enabled by Default

BRIDGE LIVE server uses SNMPv2 and is enabled by default. The SNMP daemon can be enabled and disabled via systemctl in ssh/terminal.

To disable/stop the daemon, use:

```
sudo systemctl disable snmpd.service
sudo systemctl stop snmpd.service
sudo systemctl disable snmptrapd.service
sudo systemctl stop snmptrapd.service
```

To enable/start the daemon, use:

```
sudo systemctl enable snmpd.service
sudo systemctl start snmpd.service
sudo systemctl enable snmptrapd.service
sudo systemctl start snmptrapd.service
```

BRIDGE LIVE Server SNMP Disabled by Default

BRIDGE LIVE SNMP functions are disabled by default. However, you can enable it by editing the snmp_enable entry line in the active .ini file Advanced Settings to the value of "1".

For example:

```
snmp _ enable=1
```

To modify this setting, see *"Advanced Setup" on page 66*.

Example of SNMP Commands

It is possible to automate system monitoring with the Simple Network Management Protocol (SNMP). Below is the list of commands that you may use.

NOTE: The monitoring only works while the BRIDGE LIVE is actually transcoding. You will not see a correct response if the system is idle.

CPU utilization

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.2021.11.9

GPU utilization

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.1.4.1.3

Available GPUs

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.1.4.1.2

Inbound streams

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.2.2.1

Outbound streams

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.2.3.1

Dropped frames

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.2.3.1.8

Overall status

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.1.3.1

Network received data

snmpwalk -v2c -cpublic <IP> .1.3.6.1.2.1.2.2.1.10

Network transmitted data

snmpwalk -v2c -cpublic <IP> .1.3.6.1.2.1.2.2.1.16

Network interfaces

snmpwalk -v2c -cpublic <IP> .1.3.6.1.2.1.2.2.1.2

Obtaining the name of an object in a tree

– outputs COMPRIMATO-SYSTEMS-MIB:cmpto

snmptranslate .1.3.6.1.4.1.50087

Obtaining the location of a certain object from MIB

– outputs .1.3.6.1.4.1.50087.1.1.3

snmptranslate –On COMPRIMATO-SYSTEMS-MIB:trcOutputStreamTable

SNMP Traps

BRIDGE LIVE uses standard SNMP traps. SNMP traps are used to send event messages. An event has a start and an end which are conveyed by event messages. Below is an example of events we use:

- user launched a pipeline
- user stopped a pipeline
- a pipeline crashed
- the device is receiving no input
- the device is producing no output
- some frames are being dropped by the transcoder
- invalid data on input

Each event has assigned a severity, which can be:

- info(0)

- warning(1)
- error(2)
- clear(3)

Events get cleared by a trap containing an event message with severity clear(3). Event messages regarding the same event are linked together by the same trcEventKey.

trcEvent structure:

- trcEventIndex
- trcEventKey
- trcEventObject
- trcEventObjectName
- trcEventSeverity
- trcEventText
- trcEventCreatedTime

The event message contains all necessary information about the event:

- eventObject – OID of the alarming object within the node having the alarm
- eventObjectName – human-friendly name of the alarming object
- severity – the severity of the event (CLEAR - add)
- text – an event text providing more information about the issue
- createTime – time when the event was raised/cleared

There are also two related tables – lastEventsTable and activeEventsTable. lastEventsTable contains the 10 most recent event messages (one row for each sent trap). activeEventsTable contains all raised events which have not been cleared yet, alongside the four most recently cleared ones.

OIDs of relevant tables:

- lastEventsTable .1.3.6.1.4.1.50087.1.1.2.1
- activeEventsTable .1.3.6.1.4.1.50087.1.1.3.1

Configuration of SNMP Manager

You can find the MIB file in BRIDGE LIVE here:

/usr/share/snmp/mibs/COMPRIMATO-SYSTEMS-MIB.txt

Setup to configure the SNMP agent:

- open “/etc/snmp/snmpd.conf” for editing as sudo,
- find the line that reads “trap2sink localhost public”,
- replace “localhost” with the IP address of the SNMP manager. The line should then look like this:

  “trap2sink 172.12.5.123 public”,
- save the file,
- restart SNMP services: “sudo systemctl restart snmpd” and “sudo systemctl restart snmptrapd”.

Chapter 8 – Troubleshooting

What if BRIDGE LIVE fails?

Chromium has an ability to restart itself. However, we restricted this for BRIDGE LIVE because there is a possibility to get into an infinite loop due to a bad config file. Instead, you should use system tools to (re)start the BRIDGE LIVE using the command:

```
sudo systemctl stop transcoder-base
```

in order to turn off the service. Use the following command to investigate service logs; alternatively you can also edit config .json files (located /opt/transcoder/).

```
sudo journalctl –u transcoder-base
```

and start the service again

```
sudo systemctl start transcoder-base
```

In case this procedure fails to reinitiate the correct operation of BRIDGE LIVE, please try to also reboot the whole machine. If the problem is still not gone, contact Support.

How do I access the system administration environment?

You can access the system administration environment only through the local interface. It is not available through remote browser.

Use the Rocky Linux 9 standard shortcut Ctrl + Alt + F1 in order to switch the view. Here you can use Unix commands to operate the system. Using Ctrl + Alt + F2 will bring you back to the web UI.

How can I collect BRIDGE LIVE log files?

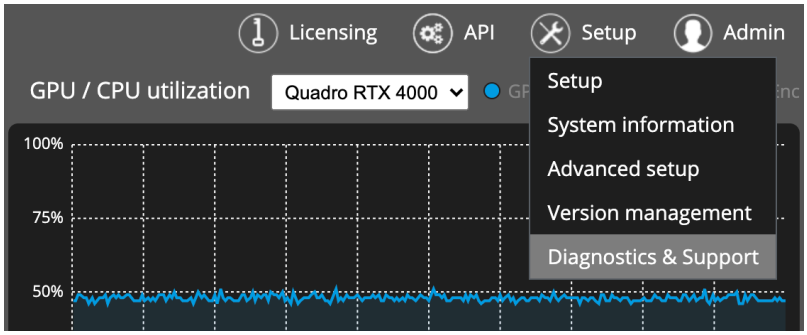
You can see logs in the folder:

```
/opt/transcoder/transcoder/logs/
```

If you need to send logs to Support, please copy the contents of the folder, archive them and share.

Alternatively, you can download them from the Diagnostics and Support page. To access the page, select **Diagnostics & Support** from the Setup menu in the upper right area of Dashboard.

Figure 159. Accessing Diagnostics and Support page from the Setup menu



From the Diagnostics and Support page, click **Create and download diagnostic report**. The diagnostic report will download to your computer. The report contains system information, pipeline configuration information, pipeline error messages, and system logs. Please send the diagnostic report to AJA Support (support@aja.com).

How can I change the default system password?

See also: *"Password Administration" on page 37*

BRIDGE LIVE installation runs on Rocky Linux 9, and you can use standard system commands. If you need to change the password for user "myuser" then use the command:

```
sudo passwd myuser
```

in the system terminal. You can access the terminal window with the keyboard shortcut Ctrl + Alt + F1 while browsing the BRIDGE LIVE UI.

How can I change the admin password?

See also: *"Password Administration" on page 37*

We have a script ready that can change the admin password. Switch to the system console environment (described above) and navigate to /opt/transcoder/ where there is a script set_ui_password.sh that will accomplish the task. Run the script with sudo permissions.

The UI shows streams are working but no data on output.

It is highly probable that there is an issue on the network and the data are being lost in transmission. Please verify that the network route is accessible between devices (source, BRIDGE LIVE, receiver) including firewall settings, which may be configured to block BRIDGE LIVE-related traffic (e.g., ports). You can use Wireshark to verify whether your target machine is receiving network data, or VLC to visualize the content.

I see frame drops in the UI. What can be the cause?

There are two possible causes – flaws in the input, or performance bottlenecks. The rule of thumb is to investigate whether drops occur when the machine is not fully utilized. If so, the problem may be in the input itself when some frames can be corrupted by losses during network transmission or compatibility issues.

The other case is that high workload is responsible for frame drops; for example, high utilization of HW resources (CPU, GPU, NI). Try to lower the performance drain by stopping some streams and observe the situation further.

Another possibility is to configure the Pipeline to have higher Total bit rate overhead over Video bit rate. Sometimes, the video bit rate fluctuation is higher, which causes the video stream to not be able to fit into the overall data limit, resulting in dropped frames.

Information needed for troubleshooting by Support?

In order to provide troubleshooting we need:

- Your description of the issue
- Any error messages you are seeing
- Parameters of input stream(s) – standard compliance, resolution, framerate, audio channels, the number of configured input streams

- Parameters of output stream(s) – bit rates, resolution, framerate, encoding option, the number of configured output streams
- Identification of successive devices that receive BRIDGE LIVE's output stream
- Network configuration (for example, do devices see each other on the network?)

Bear in mind that providing an extensive and detailed description of your issue will help us work more efficiently and deliver the solution faster.

A list of possible error messages in UI:

{stream} is not producing any data to sink – no video output is produced, rather, the stream is filled with NULL packets

This message is normal during the stream initialization. Otherwise, there may be a problem.

Some video frames are being dropped

A frame that cannot be processed by the pipeline due to flawed images, high latency, etc., in a specified time slot, is dropped.

{stream} wasn't detected in source stream

The provided stream parameters (width, height, frame rate or standard compliance) during configuration in the UI do not match the auto-detected parameters from the input Transport stream.

Video is being encoded at a lower frame rate {xxx} than required {yyy}

The video encoder is busy encoding too many streams. Try reducing the number of encoding streams.

Video is being decoded at lower frame rate {xxx} than required {yyy}

The video decoder is busy decoding too many frames. Try reducing the number of input streams.

{stream} is in unexpected state: {status}

Contact Support.

{stream} is not receiving any PCR from source

BRIDGE LIVE cannot detect any input data or all PCR packets are dropped.

Appendix A – Specifications

BRIDGE LIVE Tech Specs

Video Formats

- (UltraHD) 3840x2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (2K) 2048x1080p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 1080i 50, 59.94, 60
- (HD) 720p 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 59.94

Video Color Component Sampling

- SDI
  - YCbCr, 4:2:2, 10-bit
- Transport Streams
  - YCbCr, 4:2:2, 10-bit/8-bit
  - YCbCr, 4:2:0, 10-bit/8-bit
- NDI
  - P216, 4:2:2, 16-bit
  - UYVY, 4:2:2, 8-bit

Video Codecs

- H.264 (AVC, MPEG-4)
- H.265 (HEVC)
- JPEG 2000 (VSF TR-01)
- MPEG-2
- NDI
- JPEG XS (VSF TR-07)

Audio Streams/Codecs

- AAC-LC (ADTS, LATM)
- AAC-HEv1 (ADTS, LATM)
- AAC-HEv2 (ADTS, LATM)
- AC3
- E-AC3 (input)
- Dolby E pass-through
- MPEG-2 Audio
- NDI (uncompressed float)
- Uncompressed PCM multi-channel (SMPTE 302M-2007)

Metadata

- MPEG-2 ancillary packet support (SMPTE 2038)
- HDR over SDI end-to-end via VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry, and Luminance
- Closed Captioning (EIA-608/708)
- Line 21 Captions
- Metadata pass-through
- SCTE-35, SCTE-104
- Subtitles embedded within H.264 SEI messages
- Electronic program guide (EPG) on input
- SEI Timecode for HEVC and H264

Containers and Protocols

- HLS (input)
  - AVC TS segments
  - Fragmented MP4
- HLS (output)
  - AVC TS segments
- MPEG-TS
- MPTS (input)
- RTMP
- RTMPS (output)
- RTP, UDP
- SRT (including encryption)
- VSF TR-01
- VSF TR-07

Video Processing

- Auto Color Component Sampling based on I/O settings
- Cropping / Padding
- Color adjustments
- Deinterlacing
- Frame rate 50% down-conversion (60p->30p, 59.94->29.97, 50p->25p)
- Frame rate up-conversion (50i->50p)
- Logo insertion
- Resizing

Audio Processing

- Channel Remapping
- Gain
- Sample Rate conversion
- Up/Down-mixing (e.g. 5.1 to stereo and vice versa)

Synchronization

- Input PCR
  - Global configuration (in separate transport stream)
  - Local configuration (in each transport stream)
- Output PTS
  - Pass-through
  - Add offset to input PTS
- NTP
  - Encoder Synchronous Multi-Channel Transport
- PCR
  - Decoder Synchronous Multi-Channel Transport

Performance

- Stream startup time maximum 5 seconds after configuration applied
- Latency down to sub 150ms input to output (based on codec and other parameters)
- Encode/Decode simultaneously up to 4x incoming SDI 1080 60p streams (to numerous IP video output destinations/variations*)
- Encode/Decode simultaneously up to 2x incoming SDI UltraHD 30p streams (to numerous IP video output destinations/variations*)
- Encode/Decode up to 1x incoming SDI UltraHD 60p streams (to numerous IP video output destinations/variations*)
- Additional transcoding tasks can be carried out when Encoding/Decoding to/from SDI*
- NDI 1080p is supported up to 60p, NDI 4K is supported up to 60p

*Final additional stream count per output is dependent on settings and configuration. See Manual for more details.

Video Input Digital

- 12G-SDI, SMPTE-2082, 10-bit
- 6G-SDI*, SMPTE-2081, 10-bit
- 3G-SDI, SMPTE-424, 10-bit
- 1.5G-SDI, SMPTE 292M, 10-bit
- 270 Mbit/s SDI, SMPTE 259M-C, 10-bit

*Only UltraHD 2160-line single link is supported, as defined in SMPTE-2081-1 and SMPTE-2081-10

Video Output Digital

- 12G-SDI, SMPTE-2082, 10-bit
- 6G-SDI*, SMPTE-2081, 10-bit
- 3G-SDI, SMPTE-424, 10-bit
- 1.5G-SDI, SMPTE 292M, 10-bit
- 270 Mbit/s SDI, SMPTE 259M-C, 10-bit

*Only UltraHD 2160-line single link is supported, as defined in SMPTE-2081-1 and SMPTE-2081-10

Audio Input Digital

- 16-channel, 16 and 24-bit SDI embedded audio, 48 kHz sample rate, synchronous per SDI connection

Audio Output Digital

- 16-channel, 16 and 24-bit SDI embedded audio, 48 kHz sample rate, synchronous per SDI connection

Configuration and Monitoring

- Local “Kiosk” interface (keyboard, mouse and monitor)
- Remote access via Browser
- REST API
- SNMP

Form Factor

- 1RU turnkey system
- 4x full size BNC (12G/6G/3G/1.5G-SDI compatible)
- 2x 10GigE
- Local interface via Display Port and USB
- OS custom image
- Update and license via download

Size (w x d x h)

- 17.2” x 16.9" x 1.7" (436.88 x 429.26 x 43.18 mm)

Weight

- 28 lb. (12.7kg) in box
- 18 lb. (8.2kg) server only

Power

- 100-240 VAC 50/60 Hz (Dual, redundant power supplies)
- 190W typical, 245W Maximum

Environment

- Safe Operating Temperature: 5 to 35 C (41 to 95 F)
- Safe Storage Temperature (Power OFF): -40 to 60 C (-40 to 140 F)
- Operating Relative Humidity: 8-90% noncondensing
- Nonoperating Relative Humidity: 5-95% noncondensing

Appendix B – Safety and Compliance

Federal Communications Commission (FCC) Compliance Notices

Class A Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15, Subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian ICES Statement

Canadian Department of Communications Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio-noise emissions from a digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

Règlement sur le brouillage radioélectrique du ministère des Communications

Cet appareil numérique respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

European Union, European Free Trade Association (EFTA) and United Kingdom Regulatory Compliance

This equipment may be operated in the countries that comprise the member countries of the European Union, European Free Trade Association and the United Kingdom. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CROATIA, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, ICELAND, IRELAND, ITALY, LATVIA, LIECHTENSTEIN, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, NORWAY, POLAND, PORTUGAL, REPUBLIC OF CYPRUS, ROMANIA, SLOVAK REPUBLIC, SLOVENIA, SPAIN, SWEDEN, SWITZERLAND, UNITED KINGDOM

Declaration of Conformity

Marking by these symbols indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2014/30/EU.

This equipment meets the following conformance standards:

EN 62368-1: 2014 + A11 (T-Mark License),

IEC 62368-1: 2014; (CB Scheme Certificate)

Additional licenses issued for specific countries available on request.

Emissions

EN 55032: 2015 + A11: 2020, CISPR 32: 2015,

EN 61000-3-2: 2014, EN 61000-3-3: 2013

Immunity

EN 55035: 2017 + A11: 2020, EN 61000-4-2:2009,

EN 61000-4-3: 2006 + A1:2008 + A2:2010,

EN 61000-4-4: 2012, EN 61000-4-5: 2014 + A1: 2017, EN 61000-4-6: 2014,

EN 61000-4-11: 2020

Environments: E2, E3 and E4

The product is also licensed for additional country specific standards as required for the International Marketplace.

Warning! This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

Achtung! Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Attention! Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.

Recycling Notice

This symbol on the product or its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.

Korea KCC Compliance Statement

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정 용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

Taiwan Compliance Statement

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Japan Compliance Statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI－A

This is a Class A product based on the standard of the VCCI Council (VCCI 32: 2016). If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

China Compliance Statement

This product has been tested to the following Chinese standards:

GB/T 13837-2012; GB 17625.1-2012; GB 8898-2011; GB/T 9254-2008 (Class A)

This is to certify that the above mentioned product(s) complies with the requirements of certification rules of CQC12-045800-2022 under certificate number CQC2021010805367344.

Translated Warning and Caution Messages

The following caution statements, warning conventions, and warning messages apply to this product and manual.

 Warning Symbol  Hazard Symbol  Caution Symbol

Before Operation Please Read These Instructions

Warning! Read and follow all warning notices and instructions marked on the product or included in the documentation.

Avertissement! Lisez et conformez-vous à tous les avis et instructions d'avertissement indiqués sur le produit ou dans la documentation.

Warnung! Lesen und befolgen Sie die Warnhinweise und Anweisungen, die auf dem Produkt angebracht oder in der Dokumentation enthalten sind.

¡Advertencia! Lea y siga todas las instrucciones y advertencias marcadas en el producto o incluidas en la documentación.

Aviso! Leia e siga todos os avisos e instruções assinalados no produto ou incluídos na documentação.

Avviso! Leggere e seguire tutti gli avvisi e le istruzioni presenti sul prodotto o inclusi nella documentazione.

Warning! Do not use this device near water and clean only with a dry cloth.

Avertissement! N'utilisez pas cet appareil près de l'eau et nettoyez-le seulement avec un tissu sec.

Warnung! Das Gerät nicht in der Nähe von Wasser verwenden und nur mit einem trockenen Tuch säubern.

¡Advertencia! No utilice este dispositivo cerca del agua y límpielo solamente con un paño seco.

Aviso! Não utilize este dispositivo perto da água e limpe-o somente com um pano seco.

Avviso! Non utilizzare questo dispositivo vicino all'acqua e pulirlo soltanto con un panno asciutto.

Warning! Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

Avertissement! Ne bloquez aucune ouverture de ventilation. Suivez les instructions du fabricant lors de l'installation.

Warnung! Die Lüftungsöffnungen dürfen nicht blockiert werden. Nur gemäß den Anweisungen des Herstellers installieren.

¡Advertencia! No bloquee ninguna de las aberturas de la ventilación. Instale de acuerdo con las instrucciones del fabricante.

Aviso! Não obstrua nenhuma das aberturas de ventilação. Instale de acordo com as instruções do fabricante.

Avviso! Non ostruire le aperture di ventilazione. Installare in conformità con le istruzioni del fornitore.

Warning! Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

Avertissement! N'installez pas l'appareil près d'une source de chaleur telle que des radiateurs, des bouches d'air de chauffage, des fourneaux ou d'autres appareils (amplificateurs compris) qui produisent de la chaleur.

Warnung! Nicht in der Nähe von Wärmequellen wie Heizkörpern, Heizregistern, Öfen oder anderen Wärme erzeugenden Geräten (einschließlich Verstärkern) aufstellen.

¡Advertencia! No instale cerca de fuentes de calor tales como radiadores, registros de calor, estufas u otros aparatos (incluidos amplificadores) que generan calor.

Aviso! Não instale perto de nenhuma fonte de calor tal como radiadores, saídas de calor, fogões ou outros aparelhos (incluindo amplificadores) que produzam calor.

Avviso! Non installare vicino a fonti di calore come termosifoni, diffusori di aria calda, stufe o altri apparecchi (amplificatori compresi) che emettono calore.

Warning! Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

Avertissement! La sécurité de la prise polarisée ou de la prise de type mise à la terre ne doit en aucun cas être empêchée de fonctionner. Une prise polarisée a deux broches, l'une étant plus large que l'autre. Une prise de type mise à la terre a deux broches et une troisième broche pour la mise à la terre. La broche large ou la troisième broche sont fournies pour votre sécurité. Si la prise fournie ne s'insère pas dans votre prise femelle, consultez un électricien pour le remplacement de la prise femelle obsolète.

Warnung! Der Sicherheitszweck des gepolten bzw. Schukosteckers ist zu berücksichtigen. Ein gepolter Stecker verfügt über zwei Pole, von denen einer breiter als der andere ist. Ein Schukostecker verfügt neben den zwei Polen noch über einen dritten Pol zur Erdung. Der breite Pol bzw. der Erdungspol dienen der Sicherheit. Wenn der zur Verfügung gestellte Stecker nicht in Ihren Anschluss passt, konsultieren Sie einen Elektriker, um den veralteten Anschluss zu ersetzen.

¡Advertencia! No eche por tierra la finalidad del tipo de enchufe polarizado con conexión a tierra. Un enchufe polarizado tiene dos espigas, una más ancha que la otra. Un enchufe con conexión a tierra tiene dos espigas iguales y una tercera espiga que sirve para la conexión a tierra. La expiga ancha, o la tercera espiga, sirven para su seguridad. Si el enchufe suministrado no encaja en el tomacorriente, consulte con un electricista para reemplazar el tomacorriente obsoleto.

Aviso! Não anule a finalidade da segurança da ficha polarizada ou do tipo ligação terra. Uma ficha polarizada tem duas lâminas sendo uma mais larga do que a outra. Uma ficha do tipo de ligação à terra tem duas lâminas e um terceiro terminal de ligação à terra. A lâmina larga ou o terceiro terminal são fornecidos para sua segurança. Se a ficha fornecida não couber na sua tomada, consulte um electricista para a substituição da tomada obsoleta.

Avviso! Non compromettere la sicurezza della spina polarizzata o con messa a terra. Una spina polarizzata ha due spinotti, di cui uno più largo. Una spina con messa a terra ha due spinotti e un terzo polo per la messa a terra. Lo spinotto largo o il terzo polo sono forniti per motivi di sicurezza. Se la spina fornita non si inserisce nella presa di corrente, contattare un elettricista per la sostituzione della presa obsoleta.

Warning! Since the Mains plug is used as the disconnection for the device, it must remain readily accessible and operable.

Avertissement! Puisque la prise principale est utilisée pour débrancher l'appareil, elle doit rester aisément accessible et fonctionnelle.

Warnung! Da der Netzstecker als Trennvorrichtung dient, muss er stets zugänglich und funktionsfähig sein.

¡Advertencia! Puesto que el enchufe de la red eléctrica se utiliza como dispositivo de desconexión, debe seguir siendo fácilmente accesible y operable.

Aviso! Dado que a ficha principal é utilizada como a desconexão para o dispositivo, esta deve manter-se prontamente acessível e funcional.

Avviso! Poiché il cavo di alimentazione viene usato come dispositivo di sconnessione, deve rimane prontamente accessibile e operabile.

Warning! Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the device.

Avertissement! Protégez le cordon d'alimentation pour que l'on ne marche pas dessus ou qu'on le pince, en particulier au niveau des prises mâles, des réceptacles de convenance, et à l'endroit où il sort de l'appareil.

Warnung! Vermeiden Sie, dass auf das Netzkabel getreten oder das Kabel geknickt wird, insbesondere an den Steckern, den Steckdosen und am Kabelausgang am Gerät.

¡Advertencia! Proteja el cable de corriente para que no se le pise ni apriete, en especial cerca del enchufe, los receptáculos de conveniencia y el punto del que salen del equipo.

Aviso! Proteja o cabo de alimentação de ser pisado ou de ser comprimido particularmente nas fichas, em tomadas de parede de conveniência e no ponto de onde sai do dispositivo.

Avviso! Proteggere il cavo di alimentazione in modo che nessuno ci cammini sopra e che non venga schiacciato soprattutto in corrispondenza delle spine e del punto in cui esce dal dispositivo.

Warning! Unplug this device during lightning storms or when unused for long periods of time.

Avertissement! Débranchez cet appareil pendant les orages avec éclairsou s'il est inutilisé pendant de longues périodes.

Warnung! Das Gerät ist bei Gewitterstürmen oder wenn es über lange Zeiträume ungenutzt bleibt vom Netz zu trennen.

¡Advertencia! Desenchufe este dispositivo durante tormentas eléctricas o cuando no se lo utilice por largos periodos del tiempo.

Aviso! Desconecte este dispositivo da tomada durante trovoadas ou quando não é utilizado durante longos períodos de tempo.

Avviso! Utilizzare soltanto i collegamenti e gli accessori specificati e/o venduti dal produttore, quali il treppiedi e l'esoscheletro.

Warning! Refer all servicing to qualified service personnel. Servicing is required when the device has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the device, the device has been exposed to rain or moisture, does not operate normally, or has been dropped.

Avertissement! Référez-vous au personnel de service qualifié pour tout entretien. L'entretien est exigé quand l'appareil a été endommagé de quelque manière que ce soit, par exemple lorsque le cordon d'alimentation ou la prise sont endommagés, que du liquide a été versé ou des objets sont tombés dans l'appareil, que l'appareil a été exposé à la pluie ou à l'humidité, ne fonctionne pas normalement ou est tombé.

Warnung! Das Gerät sollte nur von qualifizierten Fachkräften gewartet werden. Eine Wartung ist fällig, wenn das Gerät in irgendeiner Weise beschädigt wurde, wie bei beschädigtem Netzkabel oder Netzstecker, falls Flüssigkeiten oder Objekte in das Gerät gelangen, das Gerät Regen oder Feuchtigkeit ausgesetzt wurde, nicht ordnungsgemäß funktioniert oder fallen gelassen wurde.

¡Advertencia! Consulte al personal calificado por cuestiones de reparación. El servicio de reparación se requiere cuando el dispositivo ha recibido cualquier tipo de daño, por ejemplo cable o espigas dañadas, se ha derramado líquido o se han caído objetos dentro del dispositivo, el dispositivo ha sido expuesto a la lluvia o humedad, o no funciona de modo normal, o se ha caído.

Aviso! Remeta todos os serviços de manutenção para o pessoal de assistência qualificado. A prestação de serviços de manutenção é exigida quando o dispositivo foi danificado mediante qualquer forma, como um cabo de alimentação ou ficha que se encontra danificado/a, quando foi derramado líquido ou caíram objectos sobre o dispositivo, quando o dispositivo foi exposto à chuva ou à humidade, quando não funciona normalmente ou quando foi deixado cair.

Avviso! Fare riferimento al personale qualificato per tutti gli interventi di assistenza. L'assistenza è necessaria quando il dispositivo è stato danneggiato in qualche modo, ad esempio se il cavo di alimentazione o la spina sono danneggiati, è stato rovesciato del liquido è stato rovesciato o qualche oggetto è caduto nel dispositivo, il dispositivo è stato esposto a pioggia o umidità, non funziona correttamente o è caduto.

Warning! Do not open the chassis. There are no user-serviceable parts inside. Opening the chassis will void the warranty unless performed by an AJA service center or licensed facility.

Avertissement! Ne pas ouvrir le châssis. Aucun élément à l'intérieur du châssis ne peut être réparé par l'utilisateur. La garantie sera annulée si le châssis est ouvert par toute autre personne qu'un technicien d'un centre de service ou d'un établissement agréé AJA.

Warnung! Öffnen Sie das Gehäuse nicht. Keine der Geräteteile können vom Benutzer gewartet werden. Durch das Öffnen des Gehäuses wird die Garantie hinfällig, es sei denn, solche Wartungsarbeiten werden in einem AJA-Service-Center oder einem lizenzierten Betrieb vorgenommen.

¡Advertencia! No abra el chasis. El interior no contiene piezas reparables por el usuario. El abrir el chasis anulará la garantía a menos que se lo haga en un centro de servicio AJA o en un local autorizado.

Advertência! Não abra o chassi. Não há internamente nenhuma peça que permita manutenção pelo usuário. Abrir o chassi anula a garantia, a menos que a abertura seja realizada por uma central de serviços da AJA ou por um local autorizado.

Avvertenza! Non aprire lo chassis. All'interno non ci sono parti riparabili dall'utente. L'apertura dello chassis invaliderà la garanzia se non viene effettuata da un centro ufficiale o autorizzato AJA.

Warning! Disconnect the external AC power supply line cord(s) from the mains power before moving the unit.

Avertissement! Retirez le ou les cordons d'alimentation en CA de la source d'alimentation principale lorsque vous déplacez l'appareil.

Warnung! Trennen Sie die Wechselstrom-Versorgungskabel vom Netzstrom, bevor Sie das Gerät verschieben.

¡Advertencia! Cuando mueva la unidad desenchufe de la red eléctrica el/los cable(s) de la fuente de alimentación CA tipo brick.

Advertência! Remova os cabos CA de alimentação brick da rede elétrica ao mover a unidade.

Avvertenza! Scollegare il cavo dell'alimentatore quando si sposta l'unità.

Warning! Only use attachments and accessories specified and/or sold by the manufacturer.

Avertissement! Utilisez seulement les attaches et accessoires spécifiés et/ou vendus par le fabricant.

Warnung! Verwenden Sie nur Zusatzgeräte und Zubehör angegeben und / oder verkauft wurde durch den Hersteller.

¡Advertencia! Utilice solamente los accesorios y conexiones especificados y/o vendidos por el fabricante.

Aviso! Utilize apenas equipamentos/acessórios especificados e/ou vendidos pelo fabricante.

Avviso! Utilizzare soltanto i collegamenti e gli accessori specificati e/o venduti dal produttore.

Hazard! High Voltage. This situation or condition can cause injury due to electric shock.

Avertissement! Tension élevée. Cette situation ou condition peut causer des blessures dues à un choc électrique.

Warnung! Hochspannung. Diese Situation oder Bedingung kann zu Verletzungen durch Stromschlag führen.

¡Advertencia! Alto voltaje. Esta situación o condición puede causar lesiones debidas a una descarga eléctrica.

Aviso! Alta Tensão. Esta situação ou condição pode causar danos devido a choques elétricos.

Avviso! Alta tensione. Questa situazione o condizione può causare lesioni a causa di scosse elettriche.

Warning! Dual Power Cord Notice—please read this. To reduce the risk of electrical shock,disconnect both power cords before servicing equipment.

Avertissement! Avis concernant la double alimentation électrique — à lire soigneusement. Pour éviter tout risque d'électrocution, débranchez les deux câbles électriques avant d'intervenir sur l'équipement.

Achtung! Hinweis auf Doppel-Netzkabel—bitte lesen. Um das Risiko eines Elektroschocks zu verringern, müssen beide Netzkabel ausgestöpselt werden, bevor die Vorrichtung gewartet wird.

Avvertenza. Avviso concernente il cavo di alimentazione doppio – leggere attentamente. Per ridurre il rischio di elettrocuzione, scollegare entrambi i cavi di alimentazione prima di eseguire la manutenzione o riparazioni di questo apparecchio.

Aviso! Aviso de Cabo Elétrico Duplo - por favor, leia isto. Para reduzir o risco de choque elétrico, desconecte ambos os cabos elétricos antes de fazer manutenção ao equipamento.

¡Advertencia! Aviso del doble cable de alimentación - leer esto por favor. Para reducir el riesgo de descarga eléctrica, desconecte ambos cables de alimentación antes de dar servicio al equipo.

Caution! To meet safety regulations for leakage current, connect the dual power supplies to separate branch circuits.

¡Advertencia! Para cumplir con las normas de seguridad para la corriente de fuga, conecte las dos fuentes de alimentación para circuitos derivados diferentes.

Attention! Pour répondre aux mesures de sécurité concernant le courant de fuite, raccorder les sources d'alimentation doubles à des circuits de dérivation distincts.

Warnung! Zur Erfüllung der Sicherheitsbestimmungen bezüglich Reststrom schließen Sie bitte die zwei Netzteile an unterschiedlichen Abzweigleitungen an.

Cuidado! Para atender aos regulamentos de segurança para correntes de fuga, conecte as fontes duplas a circuitos elétricos separados.

Attenzione! Per soddisfare le norme di sicurezza sulla corrente di perdita, collegare i doppi alimentatori a circuiti derivati separati.

Warning! Hazardous Voltages! The safe operation of this product requires that a protective earth connection be provided. This protective earth is provided by the grounding conductor in the equipment's supply cord. To reduce the risk of electrical shock to operator and service personnel, this ground conductor must be connected to an earthed ground.

Avertissement : tensions dangereuses — Pour utiliser ce produit en toute sécurité, il faut un raccordement à la terre. Ce raccordement s'effectue par l'intermédiaire du connecteur de terre dans le cordon d'alimentation de l'équipement. Pour réduire le risque d'électrocution de l'opérateur ou du personnel de maintenance, ce cordon avec conducteur de terre doit être branché sur une prise reliée à la terre.

Achtung! Gefährliche Spannungen — Sichere Bedienung dieses Geräts erfordert, dass ein Schutzleiteranschluss vorgesehen wird. Dieser Schutzleiteranschluss wird mittels der Erdungsleitung im Netzkabel der Vorrichtung vorgesehen. Um die Gefahr eines Elektroschocks für Bedien- und Wartungspersonal zu verringern, muss diese Erdungsleitung mit einer geerdeten Masse verbunden werden.

Avvertenza – Alte tensioni – Il funzionamento in sicurezza di questo prodotto richiede una presa di terra, che viene fornita dal conduttore di messa a terra presente nel cavo di alimentazione dell'apparecchio. Per ridurre il rischio di elettrocuzione per l'operatore e il personale di manutenzione, tale conduttore deve essere collegato a un punto al potenziale di terra.

Advertencia de voltajes peligrosos — El funcionamiento seguro de este producto require que se proporcione una conexión terrestre protegida. Esta protección terrestre es proporcionada por el conductor de conexión en la tierra del cable de alimentación del equipo. Para reducir el riesgo de descarga eléctrica al operador y el personal de servicio, este conductor de conexión de la tierra debe ser conectado a la misma tierra.

3 Year Warranty and Liability Information

Limited Warranty on Hardware

AJA Video Systems, Inc. (AJA Video) warrants that the hardware product, not including storage modules or software components, will be free from defects in materials and workmanship for a period of three years from the date of purchase. AJA Video warrants that the storage modules provided as part of the hardware product will be free from defects in materials and workmanship for a period of one year from the date of purchase. AJA Video provides a separate software warranty as part of the license agreement applicable to software components.

If the Customer brings a valid claim under this limited warranty for a hardware product or storage module (hereafter, a "product") during the applicable warranty period, AJA Video will, at its sole option and as the Customer's sole remedy for breach of the above warranty, provide one of the following remedies:

- Repair or facilitate the repair the product within a reasonable period of time, free of charge for parts and labor.
- Replace the product with a direct replacement or with a product that performs substantially the same function as the original product.
- Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

To obtain service under this warranty, the Customer must notify AJA Video of the defect before expiration of the warranty period and make suitable arrangements for the performance of service by contacting AJA Video support through the channels set forth on the support contacts web page at https://www.aja.com/support. Except as stated, the Customer shall bear all shipping, packing, insurance and other costs, excluding parts and labor, to effectuate repair. Customer shall pack and ship the defective product to a service center designated by AJA Video, with shipping charges prepaid. AJA Video shall pay to return the product to Customer, but only if to a location within the country in which the AJA Video service center is located. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR LIMITATIONS ON APPLICABLE STATUTORY RIGHTS OF A CONSUMER, SO SOME OR ALL OF THE TERMS OF THIS PARAGRAPH MAY NOT APPLY TO YOU.

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