HAIVISION

Kraken Encoder/Transcoder 2.9

User's Guide

HVS-ID-UG-KRAK-29, Issue 01

Edition Notice

About Haivision

Founded in 2004, Haivision is now a market leader in enterprise video and video streaming technologies. We help the world's top organizations communicate, collaborate and educate. Recognized as one of the most influential companies in video by Streaming Media and one of the fastest growing companies by Deloitte's Technology Fast 500, organizations big and small rely on Haivision solutions to deliver video. Headquartered in Montreal, Canada, and Chicago, USA, we support our global customers with regional offices located throughout the United States, Europe, Asia and South America.

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About This Document

Conventions

The following conventions are used to help clarify the content.

Typographic Conventions and Elements

Italics	Used for the introduction of new terminology, for words being used in a different context, and for placeholder or variable text.
bold	Used for strong emphasis and items that you click, such as buttons.
`Monospaced`	Used for code examples, command names, options, responses, error messages, and to indicate text that you enter.
>	In addition to a math symbol, it is used to indicate a submenu. For instance, **File** > **New** where you would select the New option from the File menu.
...	Indicates that text is being omitted for brevity.

Action Alerts

The following alerts are used to advise and counsel that special actions should be taken.

Tip

Indicates highlights, suggestions, or helpful hints.

Note

Indicates a note containing special instructions or information that may apply only in special cases.

Important

Indicates an emphasized note. It provides information that you should be particularly aware of in order to complete a task and that should not be disregarded. This alert is typically used to prevent loss of data.

Caution

Indicates a potentially hazardous situation which, if not avoided, may result in damage to data or equipment. It may also be used to alert against unsafe practices.

Warning

Indicates a potentially hazardous situation that may result in physical harm to the user.

Obtaining Documentation

This document was generated from the Haivision InfoCenter. To ensure you are reading the most up-to-date version of this content, access the documentation online at https://doc.haivision.com. You may generate a PDF at any time of the current content. See the footer of the page for the date it was generated.

Getting Service Support

For more information regarding service programs, training courses, or for assistance with your support requirements, contact Haivision Technical Support using our Support Portal at: https://support.haivision.com.

Introduction

This section provides a brief overview of Haivision's Kraken H.264/HEVC Video Encoder/Transcoder, along with a description of the main hardware components for the appliance.

Topics Discussed

- New Features
- Product Overview
- Kraken Features
- Appliance Options
- Physical Description (Kraken Server)

New Features

Kraken v2.9 introduces the following features and enhancements:

- **KLV Metadata Filtering** — Filter out undesired or unused MISB 0601 UAS KLV metadata tags to reduce the outbound metadata bitrate. This allows more bandwidth to be allocated to video on limited capacity network links. See **Filtering UAS KLV Metadata Tags**.
- **KLV Metadata Decimation** — Configure the transcoder to frame-decimate KLV (Key Length Value) metadata. This can reduce the rate at which metadata is transmitted from Kraken to allow better control of the outbound metadata bitrate. See **Configuring Transcoder Parameters**.
- **Improved System Feedback** — A new feedback component features stream event reporting within the Web Interface with the option to download the stream event log. This feature is intended to aid in diagnostics and debugging sessions. See **Monitoring Stream Health**.
- **Security** — A continual commitment to security. Updates to the kernel and other related mitigations to ever-evolving vulnerabilities.

History

Kraken v2.8 introduced the following features and enhancements:

- SRT 1.3.1 — Integration of the latest SRT 1.3.1 libraries. Expanded configurability of SRT to include MTU, and TTL. SRT Passphrases is now protected in logs and Kraken configuration files.
- Improved UX — Enhanced debugging logs per transcode session. Alpha version of v2 API available upon request to Haivision Technical Support.
- Streaming — Added MPEG4 (Part 2) Encoding capability. Improved and enhanced the interoperability with RTSP camera sources. Updated underlying QSV libraries.
- Security — Continual commitment to security. Updates to the kernel and other related mitigations to ever-evolving vulnerabilities.

Product Overview

Note

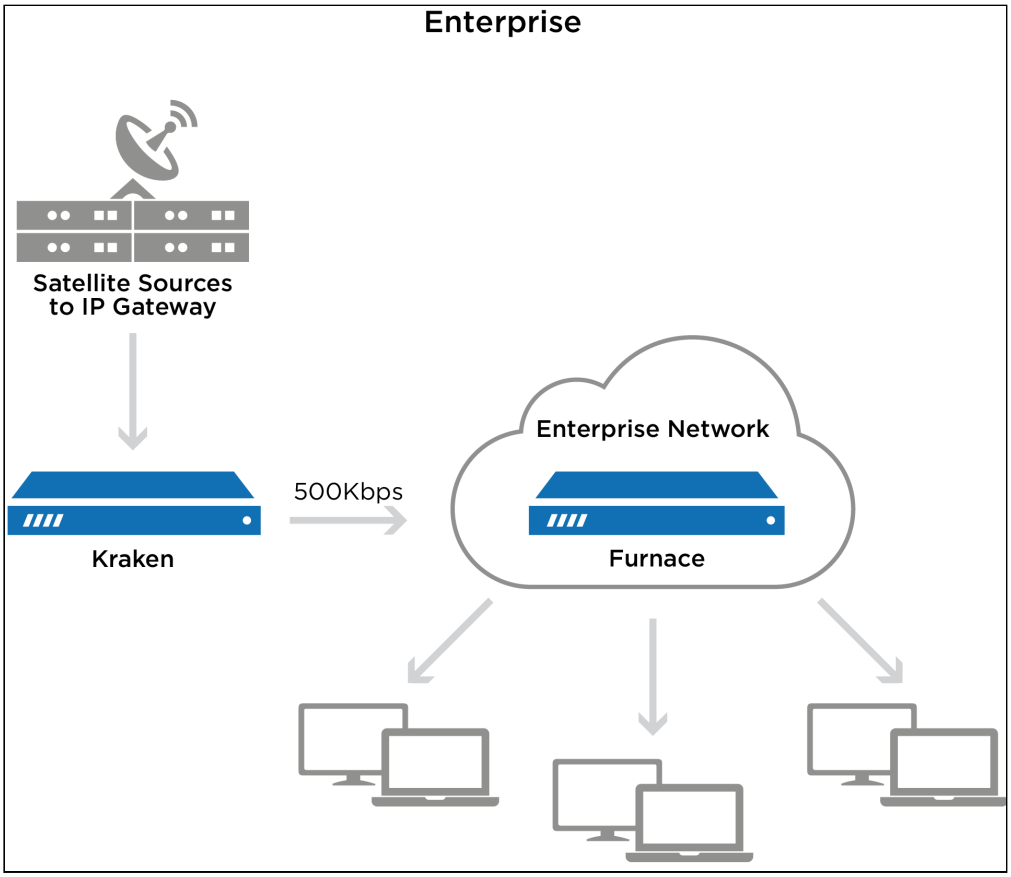
Transcoding is defined as the process of converting a media stream or object from one format to another. This may be done in cases where a target device (or workflow) does not support the format, has limited storage capacity or limited network bandwidth that mandates a reduced stream size, or to convert incompatible or obsolete data to a better supported or modern format.

Haivision's Kraken Video Encoder/Transcoder delivers performance IP video transcoding. Kraken is designed for Transport Stream to Transport Stream in enterprise or satellite video distribution applications. The base model redistributes digital video broadcasts over enterprise networks. Kraken ISR (with ISR firmware option) provides low latency transcoding for metadata-rich applications, such as within military Intelligence, Surveillance, and Reconnaissance (ISR) full motion video applications.

Haivision also enables live HEVC baseband encoding and H.264 to HEVC or HEVC to H.264 transcoding.

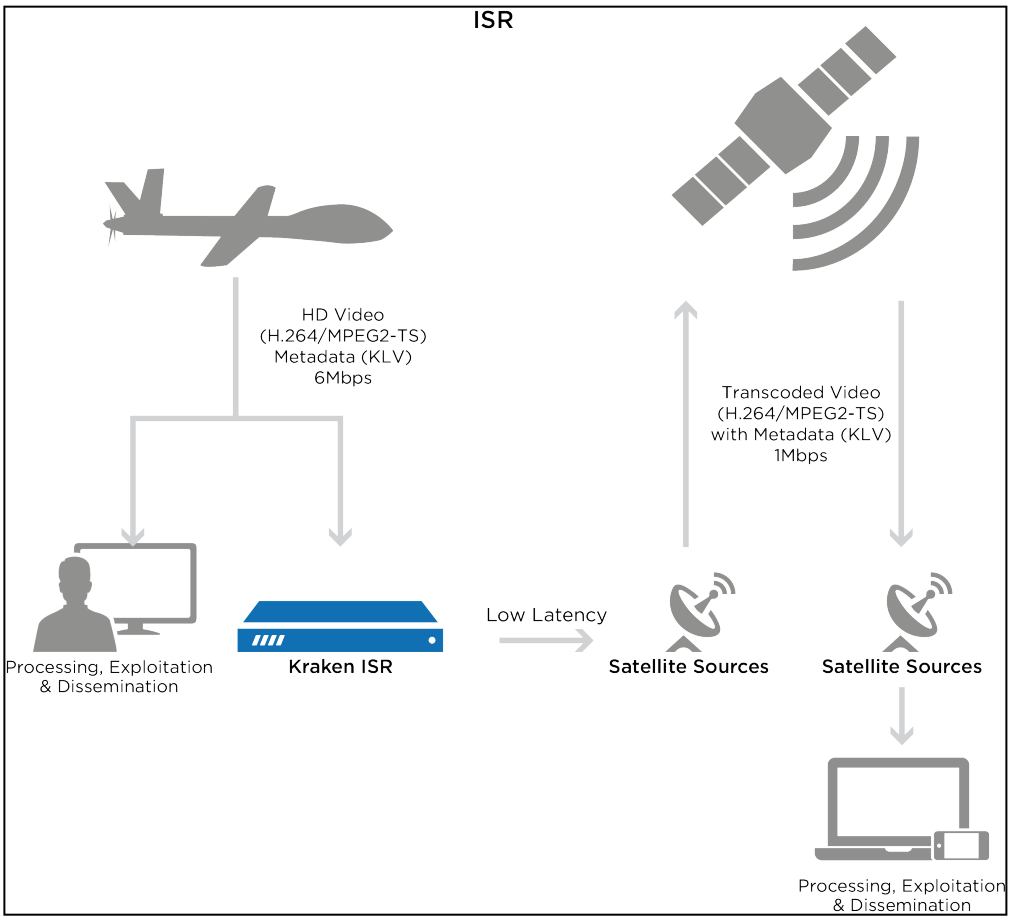
Kraken Enterprise – Distributing Streams for Enterprise

Kraken is used to groom high bandwidth broadcast streams for various destinations on the network. It provides a solution to IP video deployments that capture digital video broadcasts for redistribution over the LAN to enterprise viewers. For example, a set-top box such as Haivision's Stingray may consume 6 Mbps HD H.264 multicast streams, whereas a desktop computer only 1 Mbps H.264 streams at a lower resolution.



Kraken ISR – Intelligence, Surveillance, and Reconnaissance

Kraken ISR is designed to collect, process, and disseminate information for full motion video applications. This includes passing through MISP-compliant metadata, typically in KLV (Key-Length-Value) format. Kraken ISR is optimized to disseminate information in the formats required by downstream systems, networks, and viewers, while preserving any required metadata with frame accurate synchronization.



Kraken Features

Kraken is designed to be used by consumers of HD video who are contending with high bitrate / high quality streams that are either too big to transport over some network segments or too costly for users' end points to render the video smoothly.

As a transcoder, Kraken takes the stream from a source URL, re-encodes the audio/video, and sends it out as a new stream with different encoding characteristics. The characteristics that may be changed include Audio Bitrate, Video Bitrate, Video Resolution, Frame Rate, Group of Pictures (GOP) size, and Maximum Transmission Unit (MTU).

As a baseband encoder (Kraken CR platform), Kraken captures and encodes/processes baseband digital video, digital audio and ancillary metadata.

Kraken may be controlled and managed either through a Web interface or a Representational State Transfer (REST) Application Programming Interface (API). For details on the API, please refer to the **Kraken REST API Integrator's Guide**.

Audio/Video Characteristics

Kraken input streams are MPEG Transport Streams with the following characteristics:

- Video Codecs: MPEG-1, MPEG-2, MPEG-4, H.264 or H.265 (HEVC)
- Audio Codecs: AAC 2 channel, AAC 5.1 channel, AC3 2 channel, AC3 5.1 channel, or MPEG 1 Layer 2

> **Note**
>
> Kraken only supports Single Program Transport Stream (SPTS) inputs. Multi Program Transport Stream (MPTS) inputs are not supported.

Output streams are MPEG Transport Streams with H.264 or H.265 (HEVC) video (Main Profile 4.2 level maximum) and AAC 2 channel stereo audio. Kraken outputs video in progressive format only.

Any input stream that had a mono audio source will have that source replicated into Left and Right stereo channels. Audio may be disabled, which will remove any audio tracks on the output stream.

Transport Characteristics

Kraken input streams may be unicast UDP (the stream is sent to Kraken), UDP multicast, TCP unicast (the stream is sent to Kraken), or TCP unicast (Kraken obtains the stream). Input streams may be CBR, VBR or Constant Quantizer (ConstQ). The maximum bandwidth of a single input stream is 20 Mbps.

Output streams may be Unicast UDP (the stream is sent to a third party device), TCP Unicast (Kraken listens for a request), TCP Unicast (Kraken sends a stream to a third party device), or UDP multicast. Output streams are VBR. The maximum single bandwidth for an output stream is 20 Mbps. Note that Kraken requires a connection to a Haivision Furnace server to integrate each TCP stream.

Note

The presence of Referenced B-Frames, streams without a "low-delay" bit set in the stream, and/or streams where the audio and video are not interleaved can cause an increase in latency.

SRT (Secure Reliable Transport)

Kraken supports Haivision's Secure Reliable Transport (SRT) input and output streaming format for interoperability with the Haivision eco-system. This enables end-to-end security and stream resiliency for recording and streaming applications. For more information, please refer to the *SRT Deployment Guide* (available from the **Download Center** on the Haivision Support Portal).

SRT is a transport technology that optimizes streaming performance across unpredictable networks, including the public Internet, for secure, reliable, low latency HD video. SRT as a protocol is included with Makito X encoders and decoders and Haivision's Media Gateway.

Console User Interface (Appliance Only)

A Console UI is available for Kraken appliances which may be accessed directly by connecting a keyboard and monitor to the appliance (either from the front or the back of the appliance), or through SSH. The Console UI allows administrators to perform basic system administration tasks and network tests, as follows:

- Set basic network settings such as the IP address, netmask and default gateway.
- View statistics about the appliance's health, including current IP address, Kraken Version, CPU use, Memory use, and System uptime.

The Console UI requires a username and password. Console UI users will be able to change their password.

Related Topics

- **Using the Console UI with Haivision Hardware**

Appliance Options

Kraken server is available in Base, Premium, and Ultra System server appliance options. Kraken CR is a small form factor H.264/HEVC encoding/transcoding appliance.

Kraken Server

Kraken Server is available in Base, Premium, and Ultra System appliance options.

- The Base System contains only one power supply and will therefore be affected by power interruptions as a single point of failure. It supports up to 2x HD H.264/AVC encoding channels only (no H.265/HEVC encoding), so is typically used where fewer channels need to be transcoded. Its short-depth form factor makes it suitable for applications and installations where space is limited.
- The Premium System provides redundant power supplies, so it can be plugged into redundant power sources, ensuring higher availability. It supports up to either 8x HD H.264/AVC encoding channels or 2x HD H.265/HEVC encoding channels, thereby providing more transcoding channel density, enabling users to transcode more streams and more outputs. It also features a short-depth form factor.
- The Ultra System also provides redundant power supplies. It supports up to either 16x HD H.264/AVC encoding channels or 4x HD H.265/HEVC encoding channels, thereby providing the most transcoding channel density. It is full depth.
  The Ultra System also provides redundant Hot Swap Hard drives (RAID 1) and power supplies.

All server appliances are 1RU tall. For more information, see **Physical Description (Kraken Server)**.

Kraken CR

Kraken CR is a small form factor H.264/HEVC encoding/transcoding appliance, supporting capture of Analog Composite Video or HD/SD-SDI digital.

> **Note**
>
> References to Kraken CR include variants of Kraken CR that provide HEVC hardware acceleration.

For more information, please refer to the Kraken CR Quick Start Guide.

Physical Description (Kraken Server)

Kraken Server comes delivered as an enterprise-ready, ultra-compact appliance made for single-tier architectures. Following is a description of the Kraken appliance interfaces and LED status indicators.

Note

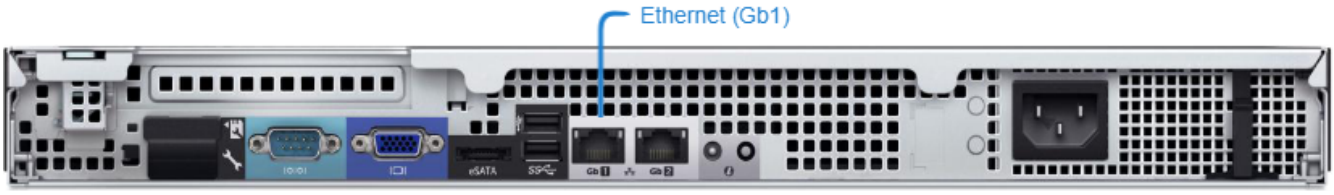
For information on installing and connecting to your Kraken appliance, please refer to the Kraken Server Quick Start Guide.

System Interfaces

Kraken Server provides 10/100/1000 Gigabit Ethernet ports for both traffic and management. The RJ-45 connectors are located on the rear of the appliance.

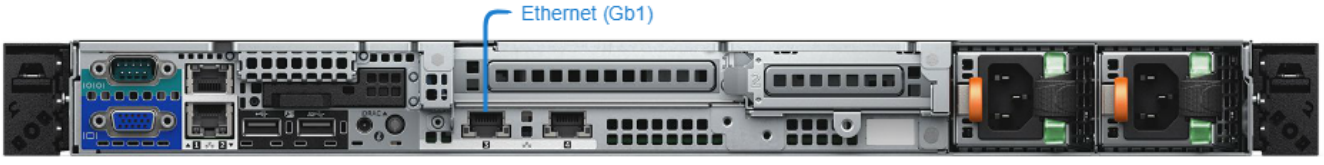
Base System Appliance | Premium System Appliance | Ultra System Appliance

Base System Appliance



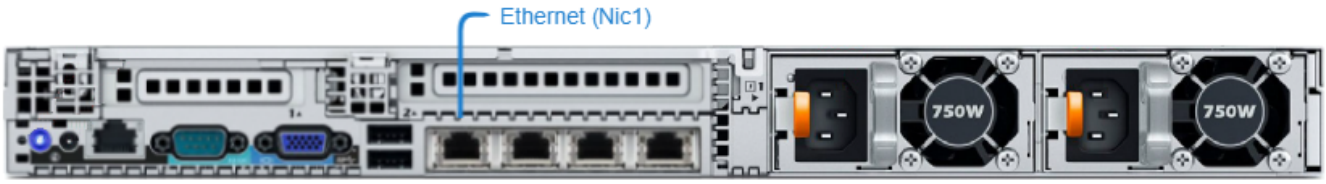
Base System Appliance | Premium System Appliance | Ultra System Appliance

Premium System Appliance



Base System Appliance | Premium System Appliance | Ultra System Appliance

Ultra System Appliance



Related Topics

- Connecting Kraken Server
- Getting Started with the Web Interface

Getting Started with the Web Interface

This section provides system access control information, followed by a basic overview of the Kraken Web interface.

Topics Discussed

- Signing in to the Web Interface
- Exploring the Web Interface
- Changing Your Password
- Signing Out

Signing in to the Web Interface

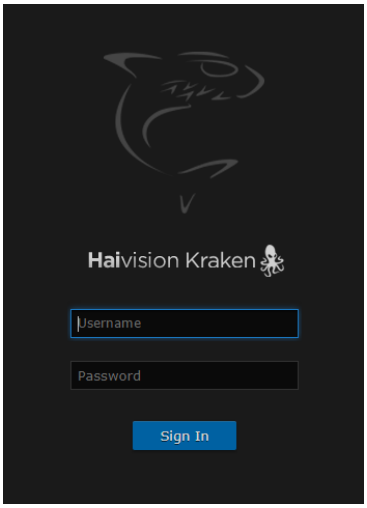
> **Tip**
>
> Make sure that your browser is configured to accept cookies.

To sign in to the Kraken configuration Web page:

1. From your computer, open a Web browser.
2. Type the Kraken's IP Address in the browser's address bar and press **Enter**.

> **Note**
>
> The appliance's IP address is set by Haivision prior to delivery. Please refer to the *Important Notice* for the default IP address and administrative user information. The *Important Notice* is shipped with the device or available from the Download Center on the Haivision Support Portal.
>
> The Web Interface is available over HTTPS only, port 443 TCP. HTTP traffic will be redirected to HTTPS.

3. On the Sign-in page, type the Username and Password and click **Sign In** (or press Enter).



Please refer to the *Important Notice* document for the default sign-in credentials.
Kraken provides three predefined user accounts. For information, see **Role-based Authorization**.

Role-based Authorization

Kraken uses role-based authorization control to secure the Web interface and provides the following predefined user accounts to assign privileges to users:

Account	Default Username	Privileges
Viewer	viewer	Read-only access to the system.
Operator	operator	All rights to configure A/V and stream settings, start/stop streams, etc. Does not include rights to reboot or upgrade the system, modify the network settings, install licenses, or manage accounts.
Administrator	haiadmin	All access rights and Administrator privileges.

Caution

For security purposes, Haivision strongly advises you to change the default passwords during initial configuration.

- Administrators can change the password for all accounts (see Managing User Accounts).
- Operators and viewers can change their password from the My Account page (see Changing Your Password).

Note

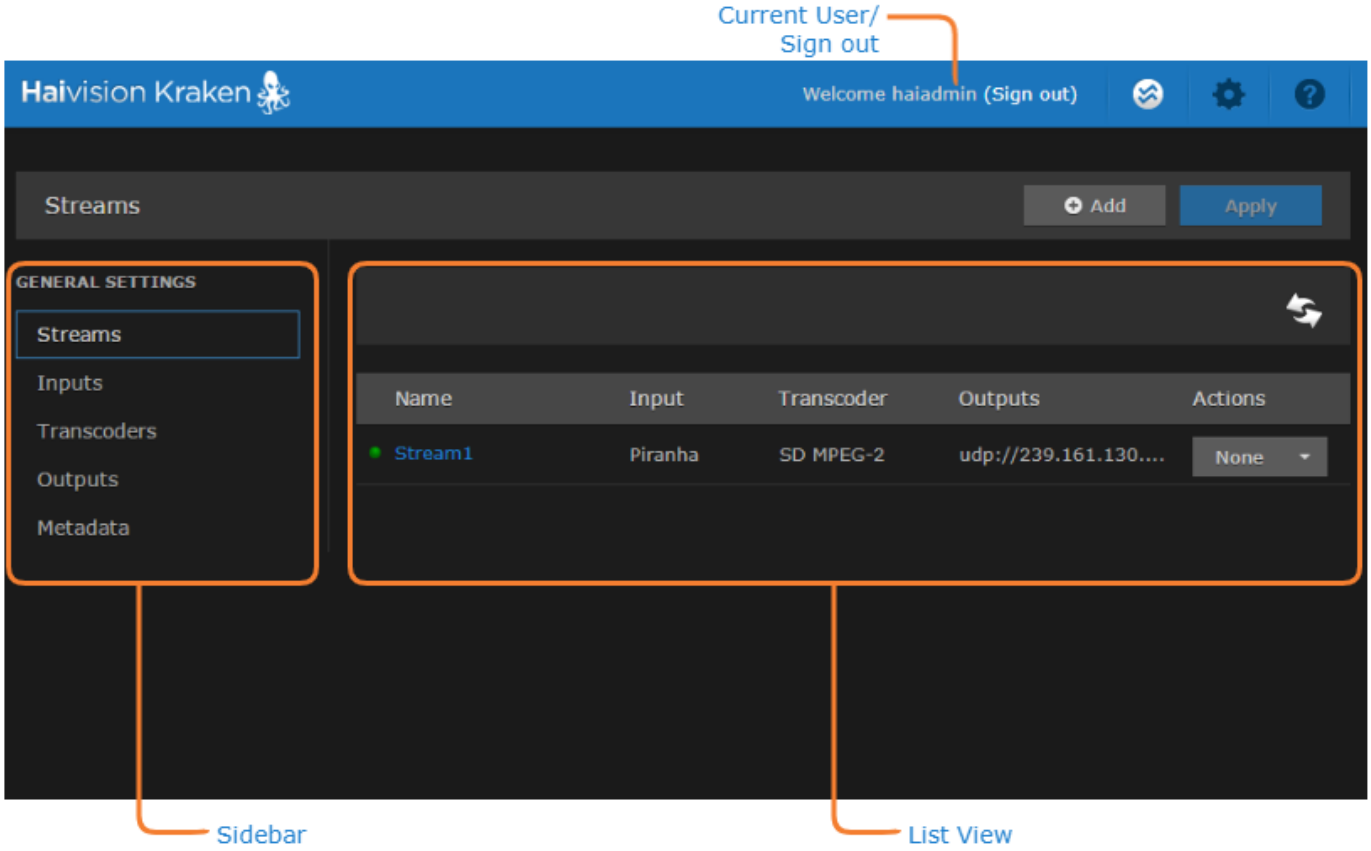
Any changes to the default passwords will be lost after a Factory Reset or a firmware downgrade. Factory Reset restores the default passwords.

Exploring the Web Interface

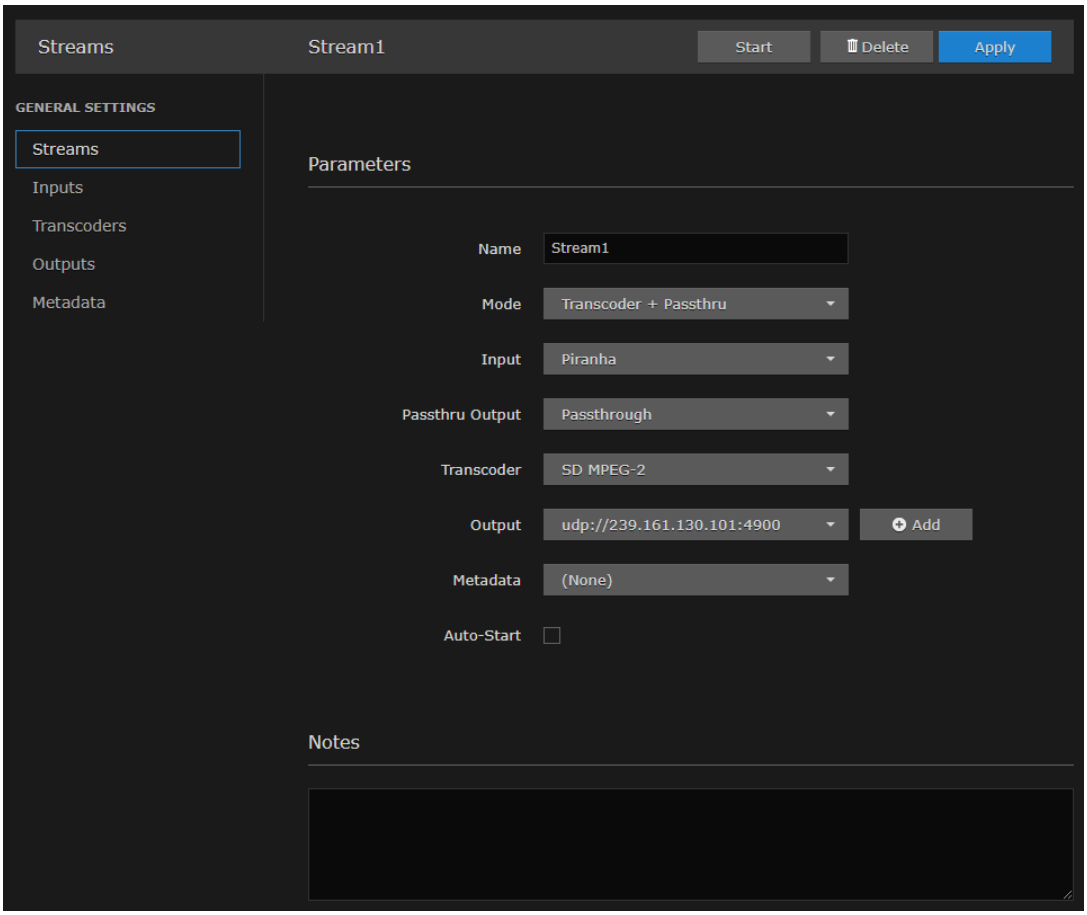
After logging in to the Web configuration interface, you will have access to the appliance configuration settings.

Navigational Menus

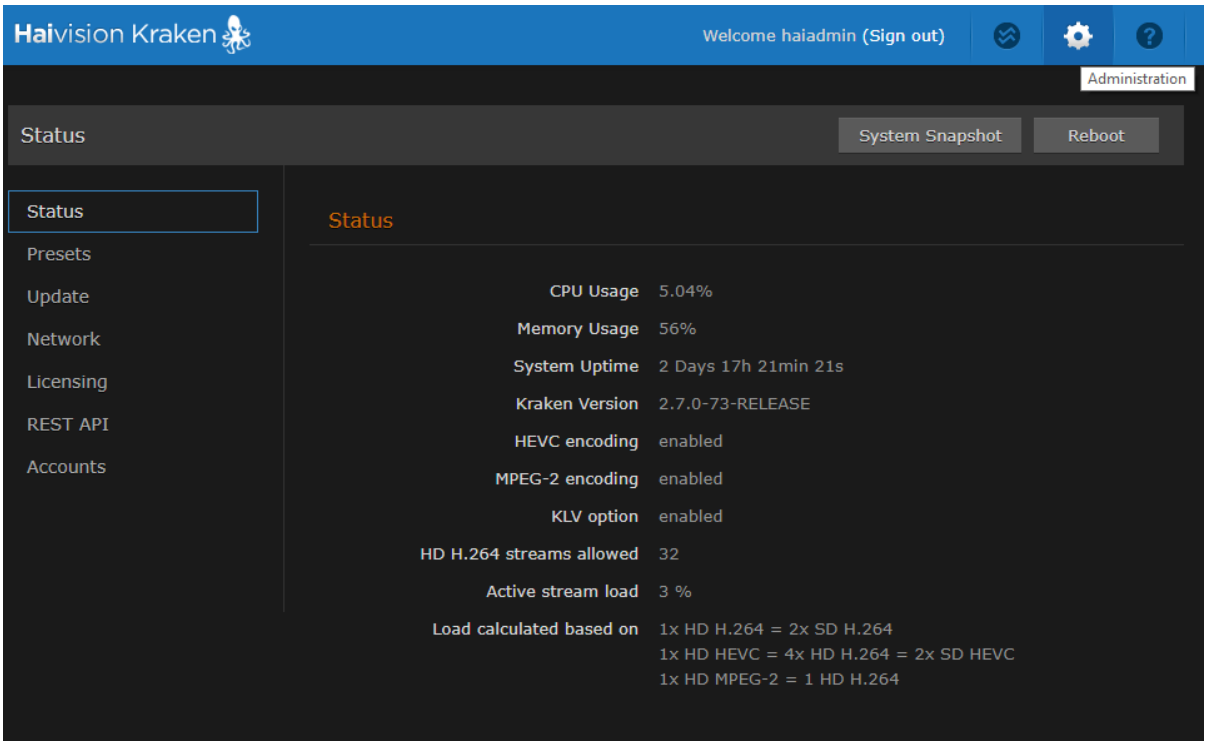
Once you have successfully signed in, the Kraken Web interface opens to the Streams List View. Your account information is displayed on the toolbar (along the top).



- To set up stream-based transcoding or encoding, select the configuration option from the sidebar, for example, **Streams**, **Inputs**, **Transcoders**, or **Outputs**.
- On the List View, click a link (any line) in the table to open the Detail View. For example, on the Streams List View (shown above), click a link to open the Streams Detail View (shown following).



- To access the administration settings, click the **Administration** icon on the toolbar and then select the option from the sidebar, for example **Presets**, **Network**, or **Accounts**.


Haivision Kraken
Welcome haiadmin (Sign out)
Administration
Status
System Snapshot
Reboot
Status
Presets
Update
Network
Licensing
REST API
Accounts
Status
CPU Usage 5.04%
Memory Usage 56%
System Uptime 2 Days 17h 21min 21s
Kraken Version 2.7.0-73-RELEASE
HEVC encoding enabled
MPEG-2 encoding enabled
KLV option enabled
HD H.264 streams allowed 32
Active stream load 3 %
Load calculated based on 1x HD H.264 = 2x SD H.264
1x HD HEVC = 4x HD H.264 = 2x SD HEVC
1x HD MPEG-2 = 1 HD H.264

Changing Your Password

Important

For security purposes, be sure to change the default password!

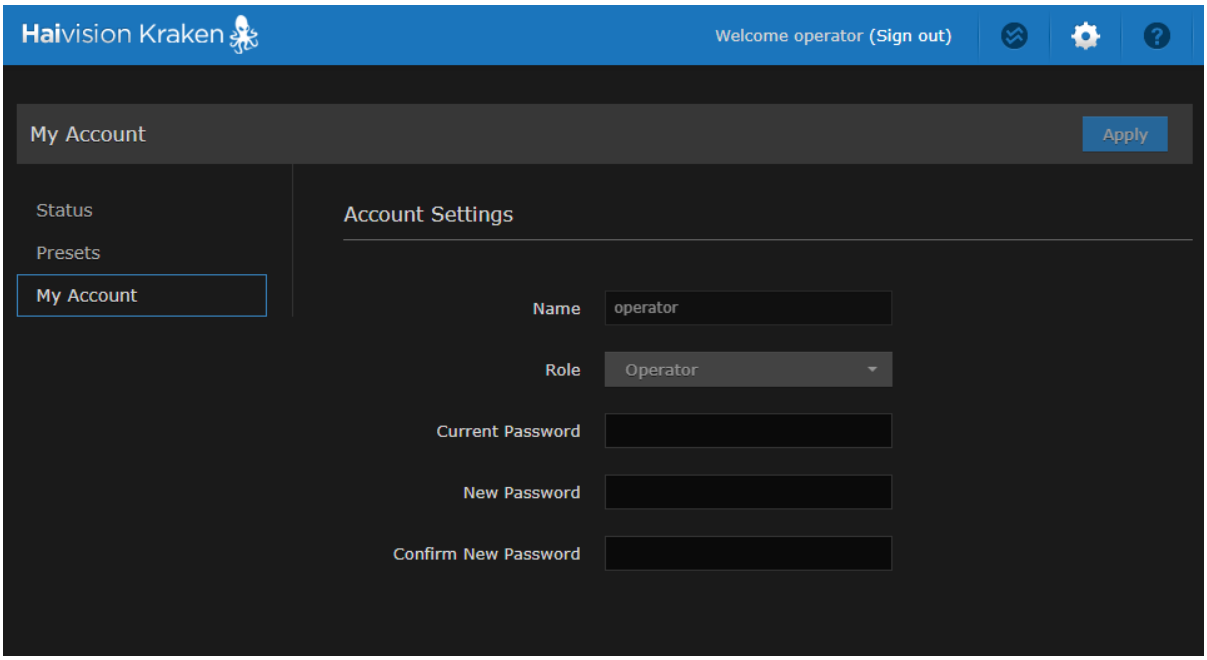
If you are logged in as a non-administrative user, you can change your own password from the My Account page, as described in this section. This is useful when logging into a Kraken on which the factory defaults have not been changed.

Note

The My Account page is available to users assigned either Operator or Viewer accounts. Administrative users may change their passwords from the Accounts page. For the privileges assigned to accounts, see Role-based Authorization.

To change your password:

1. Click the **Administration** icon on the toolbar and then click **My Account** on the sidebar. The My Account page opens as shown in the following example.



2. Type your current password in the Current Password field.
3. Type the new password in the Password field and again in the Confirm New Password field.
4. Click **Apply**. The new password will take effect immediately.

Related Topics

- Password Requirements

Password Requirements

Passwords may be up to 80 characters and composed of any combination of upper and lower case letters, numbers, and the following special characters:

!	@	#	$	%	^	&	*	(	)	~	`	_	-	+
=	{	}	[	]	:	;	"	<	>	.	,	?	/	(space)

Note

Basically, all printable characters of the QWERTY keyboard are supported.

Signing Out

After you finish using the Kraken, be sure to log out. To do so, click **Sign out** from the toolbar.

Signing out prevents misuse and unauthorized access to the appliance.

Managing Kraken from the Web Interface

This section explains how to set up real-time stream-based transcoding and/or encoding using the Web interface.

Tip

To set up transcoding, you need to define:

- **Inputs** – the source URL, or an SDI or Analog Composite Input (Kraken CR or other supported hardware) for baseband input encoding
- **Transcoders** – audio and video characteristics to change
- **Outputs** – one or more output URLs
- **Streams** – select from defined Inputs, Outputs, Transcoders, and (optionally) Metadata sources.

You may optionally configure Kraken to capture KLV or CoT **Metadata** from a UDP network source or from the SDI or Serial Input interface.

Topics Discussed

- Configuring Streams
- Configuring Inputs
- Configuring Transcoders
- Configuring Outputs
- Configuring Metadata Capture

Configuring Streams

A Kraken stream typically consists of a user-defined stream Name, Input, Transcoder, Output(s), and (optionally) Metadata source(s).

From the Streams pages, you can define an unlimited number of Kraken streams. However, the number of active streams supported by Kraken depends on your Kraken hardware and Haivision licensing applied to that hardware.

Stream Routing

Kraken supports three stream routing modes:

Mode	Stream Routing	Description
Transcoder	Input, Transcode and Output(s)	This is the traditional transcoding workflow (i.e., the only option pre-Release 2.5).

Mode	Stream Routing	Description
Transcoder + Passthru	Input with Retransmission, Transcode, and Output(s)	This is similar to the **Transcoder** workflow but also re-transmits the input stream to another destination (i.e., to "pass through" the system and be rerouted to a different remote IP address).
Bypass	Input and Output(s)	This mode does not transcode the input stream, but simply re-transmits it to the outputs without any manipulation of the content.

Topics Discussed

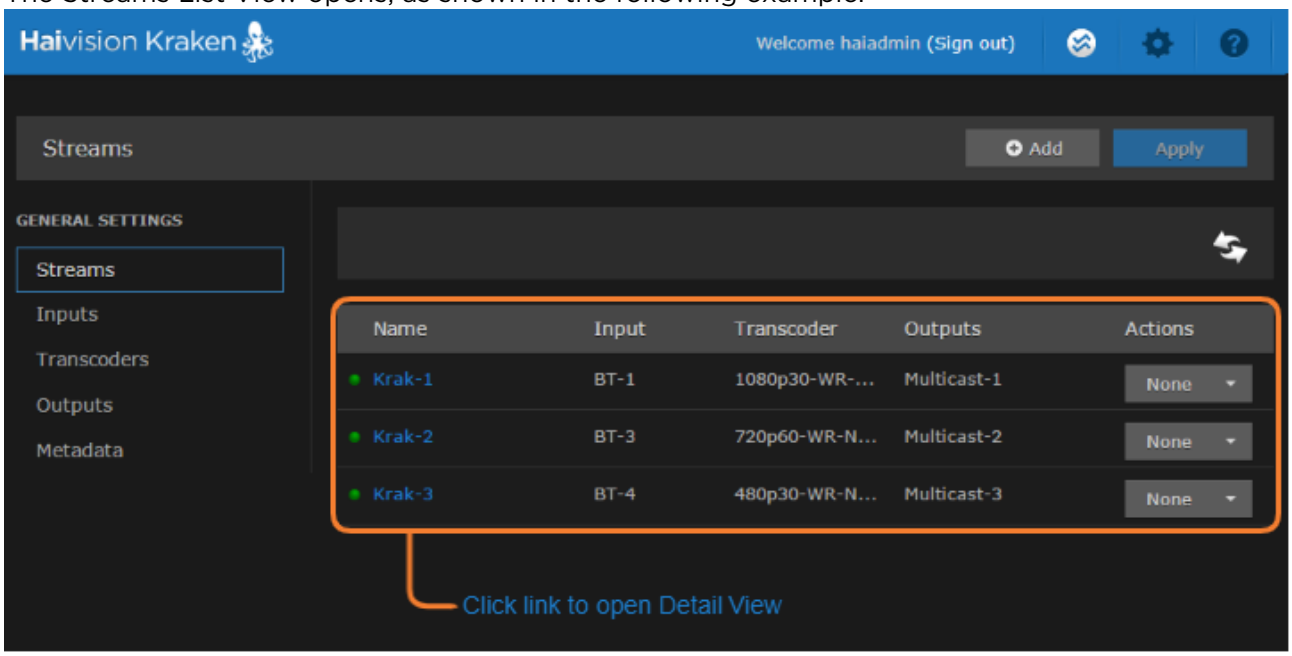
- Streams List View
- Configuring Stream Parameters
- Stream Settings
- Stream Statistics

Streams List View

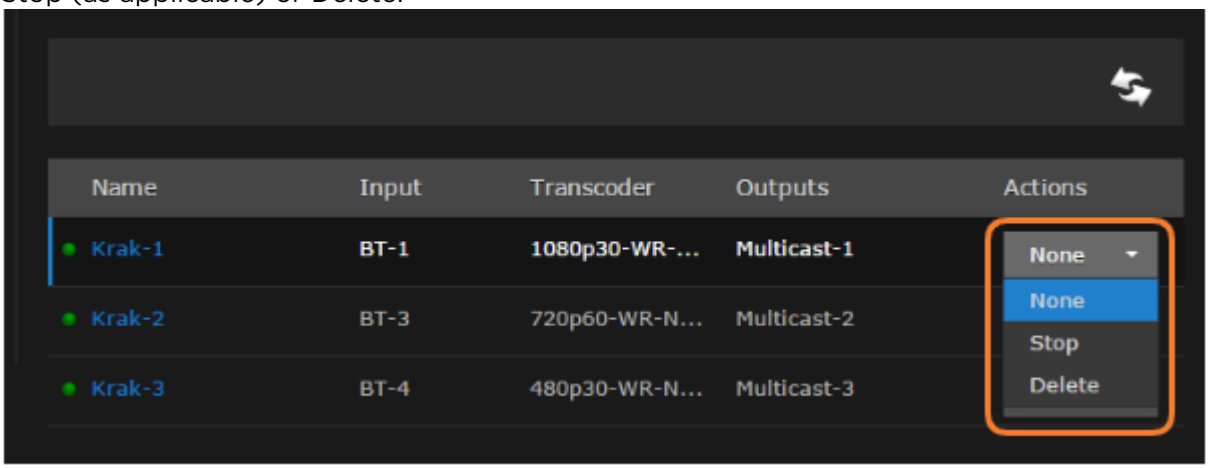
The Streams List View displays a status icon along with the Stream Name, Input, Transcoder, and Output(s) for each defined stream. It also provides options for you to start, stop or delete a stream.

To open the Streams List View:

1. Click the **Streaming** icon on the toolbar, and then click **Streams** on the sidebar.
   The Streams List View opens, as shown in the following example.



   - To add a stream, click the **Add** button.
   - To view details or modify the components of a stream, click a line in the table to open the Streams Detail View.
   - To change the status for a stream, click the drop-down list under **Actions** and select either Start/Stop (as applicable) or Delete.



2. To apply your changes, click **Apply**.

Related Topics

- Stream Settings

Configuring Stream Parameters

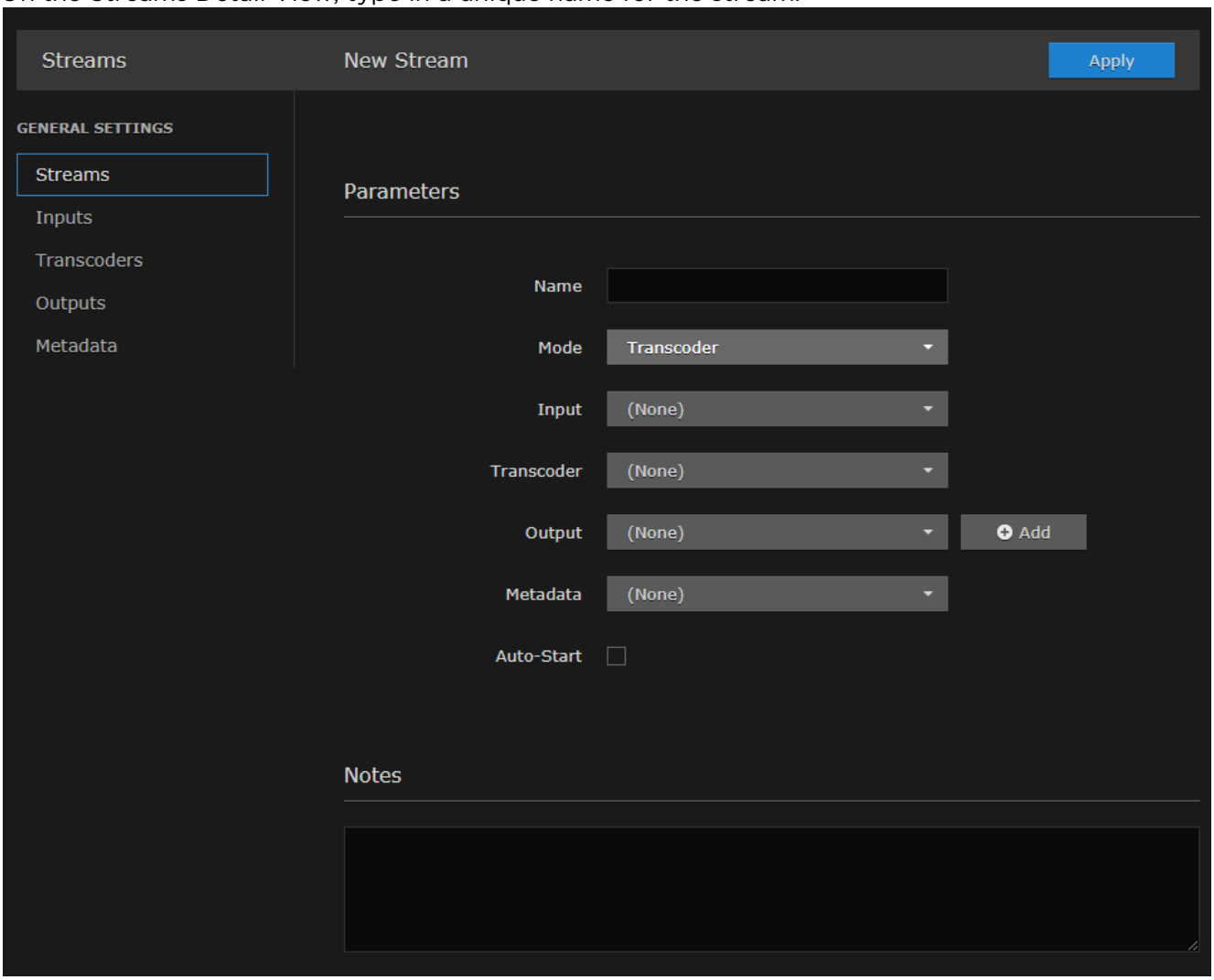
Note

You must first define the Inputs, Transcoders, Outputs, and (optionally) Metadata sources before you can define a Stream.

The Inputs, Transcoders, Outputs, and Metadata sources that you have previously defined will be selectable when you add or modify a stream.

To view and configure Stream parameters:

1. From the Streams List view, click the **Add** button or click any line in the table for an existing stream.
2. On the Streams Detail View, type in a unique name for the stream.



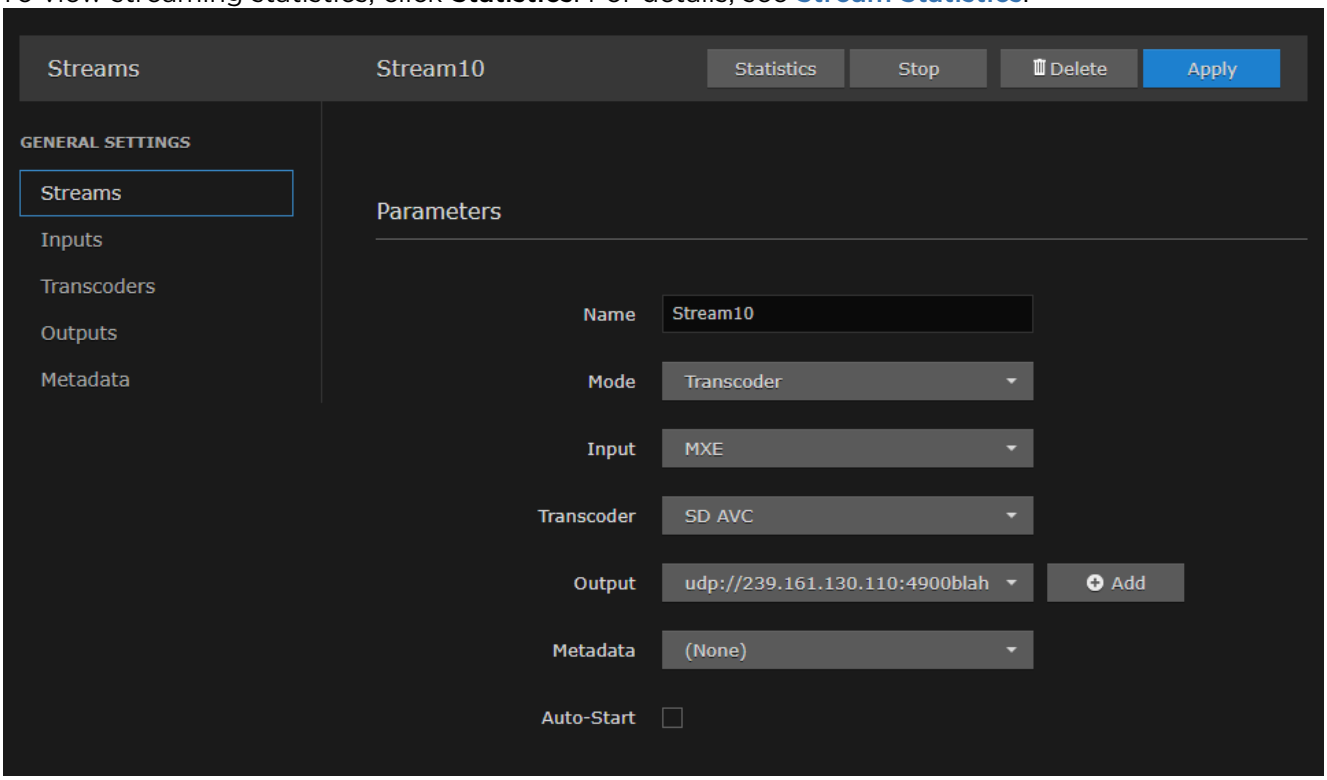
3. (Optional) To configure alternate stream routing modes, such as “Transcoder + Passthru” or “Bypass”, select the stream routing mode. See Stream Routing.
4. Select an Input, Transcoder, one or more Outputs, and (optionally) one or more Metadata sources to define the stream. See Stream Settings.

5. To apply your changes (to the current session only), click **Apply**.
   The changes will take effect immediately but will not be saved and will be lost after a reboot.

   Note

   You must click **Apply** in order for your changes to take effect. However, your changes will not be saved and will be lost after a reboot. To save the current settings, open the **Administration** > **Presets** page. See Saving and Loading Presets.

   The new stream is added to the Streams List.
6. To start or stop the stream, click **Start** or **Stop** (as applicable).
   Or click **Streams** from the sidebar to return to the Streams List View.
7. To view streaming statistics, click **Statistics**. For details, see Stream Statistics.



Note

- With MPEG TS or RAW Motion JPEG inputs, Kraken takes the source URL, re-encodes the audio/video, and sends it out as a new stream with different encoding characteristics.
- With SDI or Analog Composite inputs, the Kraken CR captures and encodes/processes baseband video and ancillary metadata.

Stream Settings

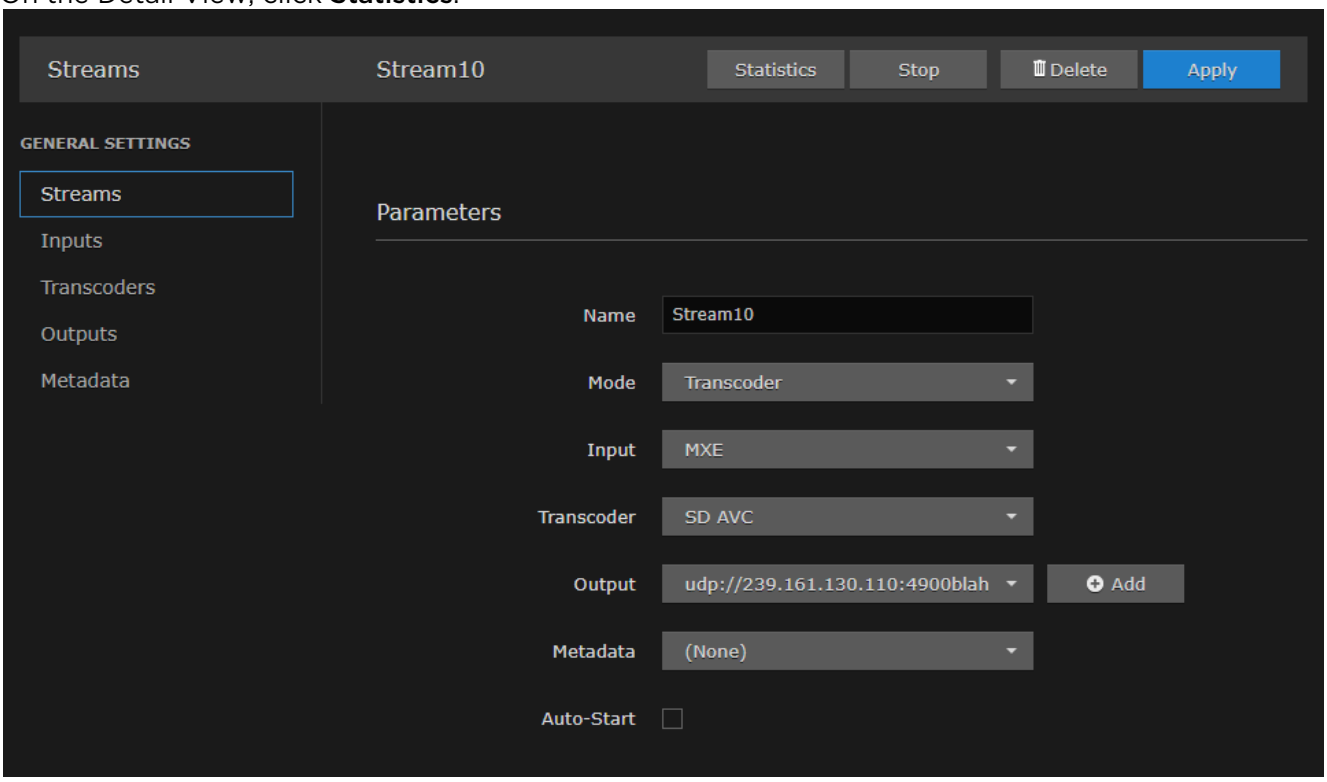
The following table lists the Kraken Stream settings:

Stream Setting	Description/Values
Name	Enter a unique name for the stream.
Mode	Select the stream routing mode: See **Stream Routing**. • Transcoder (default): The Input will be transcoded to one or more Outputs. • Transcoder + Passthru: The Input will be transcoded and also re-transmitted to another destination. • Bypass: The Input will not be transcoded, but simply copied (as is) to the Outputs. **Note** Bypass supports the TS/UDP and TS/SRT stream types, but does not support RTSP input streams. Passthru (in Transcoder + Passthru) is limited to stream types that the transcoder supports. Bypass supports multiple outputs whereas Passthru supports only one.
Input	Select the Input for the stream.
Passthru Output	(Mode must be Transcoder + Passthru) Select the Output for the re-transmitted stream.
Transcoder	(Mode *cannot* be Bypass) Select the Transcoder to apply to the stream.
Output	**Note** To specify multiple Outputs, click Add and select from the list.
Metadata	(Mode must be Transcoder or Transcoder + Passthru) Select the Metadata source for the transcoded stream.
Auto-Start	Check this checkbox to auto-start this stream when a Preset is loaded via the Administration Preset page or applied after a reboot.
Notes	(Optional) Type in any related information or comments.

Stream Statistics

To view stream statistics:

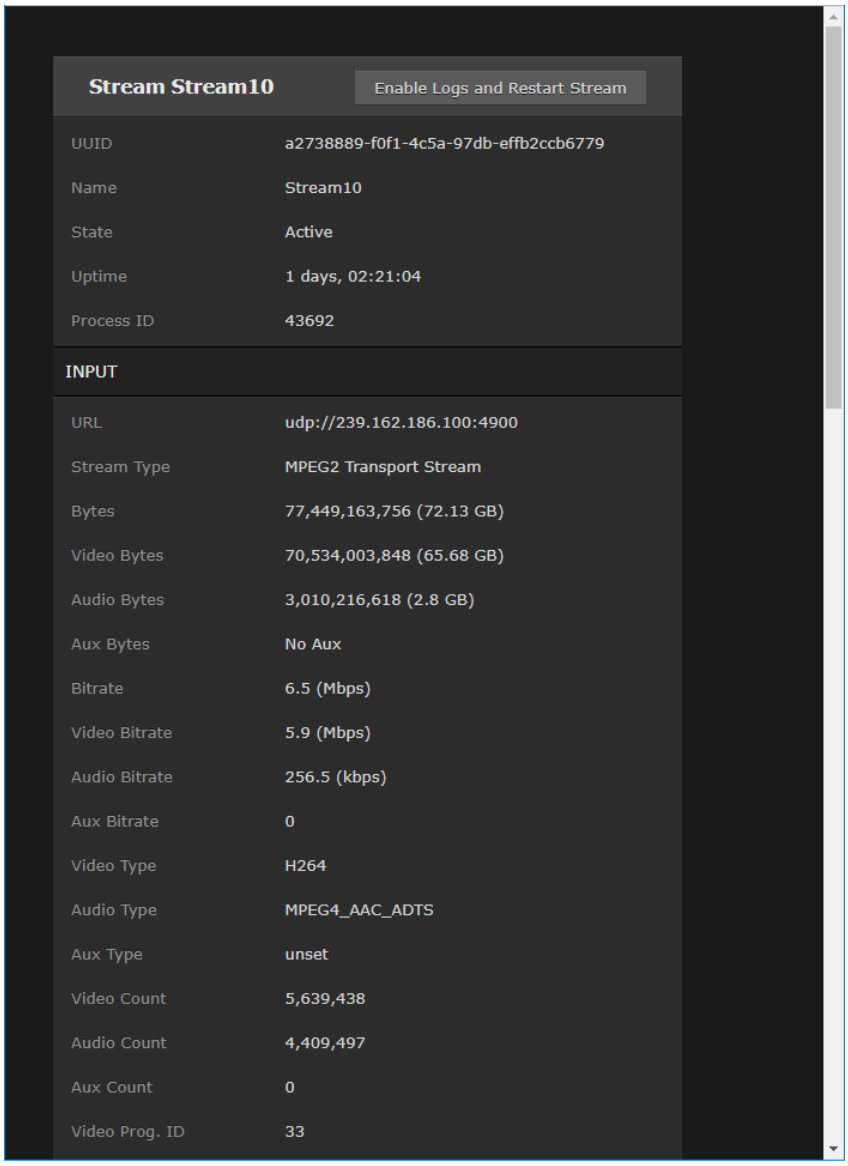
1. From the Streams List view, click any line in the table to open the Detail View for an active stream.
2. On the Detail View, click **Statistics**.



The Statistics page opens in a separate tab.

3. Scroll down to view the statistics.

The Streams Statistics page shows statistics for the stream Input, Decoder, Encoder, and Output.


Stream Stream10
Enable Logs and Restart Stream
UUID a2738889-f0f1-4c5a-97db-effb2ccb6779
Name Stream10
State Active
Uptime 1 days, 02:21:04
Process ID 43692
INPUT
URL udp://239.162.186.100:4900
Stream Type MPEG2 Transport Stream
Bytes 77,449,163,756 (72.13 GB)
Video Bytes 70,534,003,848 (65.68 GB)
Audio Bytes 3,010,216,618 (2.8 GB)
Aux Bytes No Aux
Bitrate 6.5 (Mbps)
Video Bitrate 5.9 (Mbps)
Audio Bitrate 256.5 (kbps)
Aux Bitrate 0
Video Type H264
Audio Type MPEG4_AAC_ADTS
Aux Type unset
Video Count 5,639,438
Audio Count 4,409,497
Aux Count 0
Video Prog. ID 33

Configuring Inputs

You must first define one or more Inputs before you can define a Stream. Inputs can either be a source URL, an SRT source, or an SDI or Analog Composite input:

- For transcoding, each Input consists of a valid source URL with an optional name and notes. In addition, with TS over UDP, you can select the network interface to input streams from any of the available Network Interface Cards (NICs).

  The default stream type for the Input is MPEG TS over UDP. You may also select TS over SRT, RTSP, or Raw Motion JPEG (MJPEG), which Kraken will transcode into a standard H.264 or HEVC MPEG Transport Stream.

- To configure encoding/processing of baseband video and ancillary metadata (depending on your hardware setup), you may select an SDI or Analog Composite input.

Topics Discussed

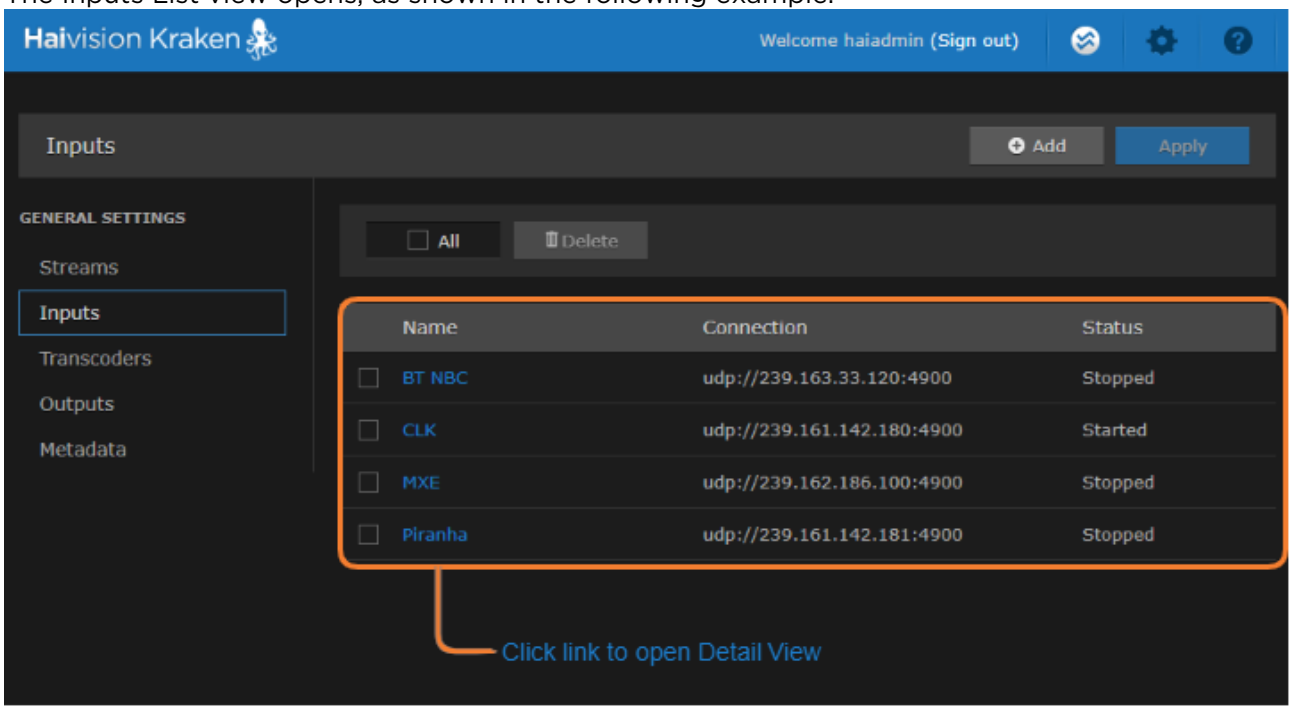
- Inputs List View
- Configuring Input Parameters
- Input Settings
- Input Statistics

Inputs List View

The Inputs List view displays a summary of defined inputs for Kraken, including the Input Name, Connection (source) URL, and Status for each input. It also provides an option for you to delete an input.

To open the Inputs List View:

1. On the Streaming page, click **Inputs** on the sidebar.
   The Inputs List view opens, as shown in the following example.



   - To add a new input, click the **Add** button.
   - To view details or modify the settings for an input, click a line in the table to open the Inputs Detail View.
   - To delete an existing input, check the checkbox next to the item in the list and click the **Delete** button.
2. To apply your changes, click **Apply**.

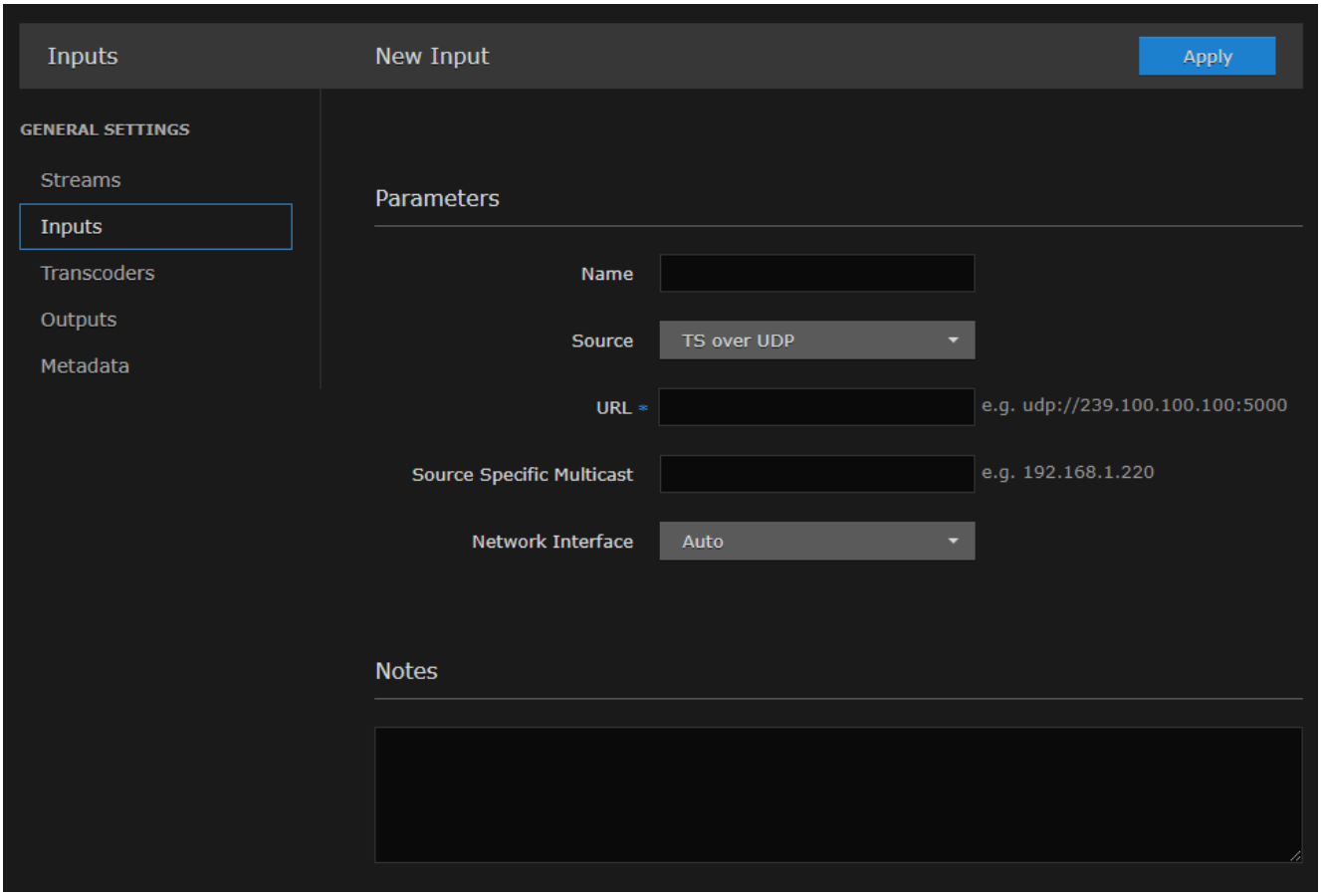
Related Topics

- Input Settings

Configuring Input Parameters

To view and configure Input parameters:

1. From the Inputs List view, click the **Add** button or click any line in the table.
2. On the Inputs Detail View, type in a unique name for the input and select the Source.



3. Select or enter values in the fields to define the input. For details, see Input Settings.
4. The Input parameters vary depending on the hardware setup of the appliance and the Input Source selected.
   - For transcoding, select either TS over UDP (default), RTSP, or Raw Motion JPEG (MJPEG). Type in a valid source URL. For TS over UDP input, select the network interface.
   - To configure SRT input, select TS over SRT for the source and then complete the additional fields under SRT Settings. See SRT Input Settings
5. (**Kraken CR** or appliance with SDI capture card installed) To encode HD/SD-SDI video, select DeckLink Micro Recorder 1 and then select the DeckLink (capture card) Mode. See "DeckLink Mode" (under Input Settings).

> **Tip**
>
> For HD/SD-SDI encoding, begin by using "Autodetect" for the DeckLink Mode. If this does not work correctly on your system, refer to "DeckLink Mode" (under Input Settings) for details on manually selecting the DeckLink Mode.

6. (**Kraken CR** or appliance with Analog Composite capture card installed) To encode Analog Composite video, select Analog Capture 1 and then select the capture card Mode. See **Analog Capture Mode**.
7. To apply your changes, click **Apply**.
   The new input is added to the Inputs List.
8. To view input statistics, click **Statistics**. For details, see **Input Statistics**.

Input Settings

The following table lists the Kraken Input settings:

General | **SRT Input Settings**

General Input Settings

Input Setting	Description/Values
Name	**Note** The Input name is not required. Kraken will use the Input URL as the name if none is provided.
Source	Select the Source for the Input, either: • TS over UDP: MPEG2 Transport Stream over UDP (no RTP header, default) • TS over SRT: Haivision's Secure Reliable Transport. See **SRT (Secure Reliable Transport)**. • RTSP: Select to configure Kraken to interoperate with ISR "sensors" such as wearable IP cameras, which are typically H.264 RTP/RTSP. See NOTE: below. • Raw Motion JPEG: Allows you to input a Motion JPEG (MJPEG) live stream and transcode the payload into a standard H.264 or HEVC video within an MPEG Transport Stream. • DeckLink Micro Recorder 1 (Kraken CR or SDI capture card must be installed): Select to capture HD/SD-SDI video for baseband input encoding. • **Note** Kraken supports RTSP Input for H.264 video only under these conditions: • Stream authentication through RTSP URL (username and password) • H.264 video instance selection through RTSP URL
URL	Type in the source URL for the Input, for example, `udp://239.100.100.100:5000` Examples of supported input formats: • `udp://239.100.100.100:5000` = multicast UDP to 239.100.100.100 port 5000 • `udp://:5000` = unicast UDP. Allows an inbound stream to be sent to this server's IP address on port 5000.

Input Setting	Description/Values
Source Specific Multicast	**Note** As of Release 2.6, Kraken supports IGMPv3 Source Specific Multicast reception, which allows input streams to join a multicast group and filter the input streams based on a specific source IP address. Only streams originating from the specified source IP will be forwarded to Kraken. This allows Kraken to quickly and easily select an input stream in environments with many sources sharing a common multicast IP. When the receiving device specifies a source device IP address, the IGMP protocol will filter out devices that use the same multicast group address and only forward the traffic with the specified source IP address as well the destination IP multicast address to the requesting destination device.
Network Interface	Select the network (Ethernet) interface for the Input, either: • Auto (default): Uses static route, if defined; otherwise uses the default • eth0 • eth1 **Note** Network Interface names for Ethernet interfaces may vary, such as eth0/eth1/..., pNp1/pNp2/..., or em1/em2/.... **Caution** Because input multicast listening routes are based on IP addresses, do not reuse the same address even if they are assigned to different NICs. Doing so would produce corrupted output in all associated sessions.
DeckLink Mode	(Source must be DeckLink) Select the capture card mode: • **Note** DeckLink inputs start up and match the input regardless of whether Autodetect is set or the chosen inputs match. When set to Autodetect, Kraken attempts to detect the input resolution and frame-rate. If the input resolution and frame-rate cannot be detected, then you have the option of providing a resolution and frame-rate hint to the DeckLink card so as to allow the DeckLink card to lock on the input signal. The selected DeckLink input resolution and frame-rate must match the actual input resolution and frame-rate for the signal to be correctly recognized and processed. **Tip** Autodetect may not work correctly for some cameras. For instance the capture card may detect a wrong mode. Also the capture card may not detect all sources for all modes. For instance, it may correctly detect a certain camera when it is in 720-60p but not when it is in 720-50p. Therefore, we recommend that you use Autodetect mode when possible and when it works, and use the manual mode selection if necessary. Also, some capture cards do not support “Autodetect” in which case only the supported modes of the capture card will be listed and can be selected. • Manually select the resolution
Analog Capture Mode	(Source must be Analog Capture) Select the capture card mode: • Autodetect (default) • Manually select the display system (NTSC, PAL, etc.)

General SRT Input Settings

SRT Input Settings

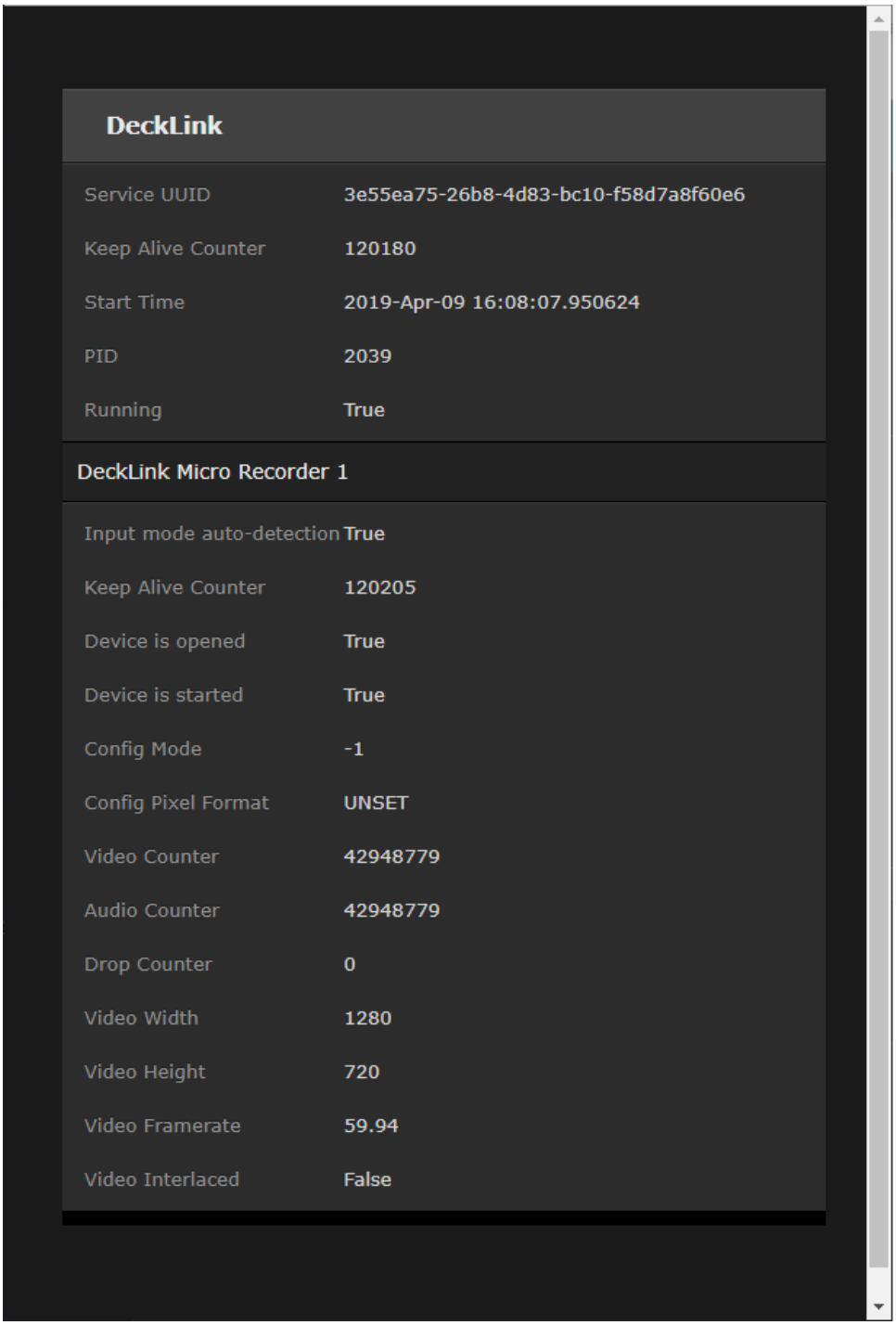
Input Setting	Description/Values
Mode	Selects the SRT Connection Mode: • Caller: Kraken acts like a client and connects to a server listening and waiting for an incoming call. • Listener (default): Kraken acts like a server and listens & waits for clients to connect to it. • Rendezvous: Allows calling and listening at the same time. **Note** To simplify firewall traversal, Rendezvous Mode allows Kraken and the encoder to traverse a firewall without the need for IT to open a port.
Address	**Tip** You can also enter a Fully Qualified Domain Name (FQDN).
Source Port	**Note** This simplifies firewall configuration as the firewall/NAT rules can be precisely tailored to the SRT stream.
Destination Port	(Caller and Rendezvous Connection Modes) Specifies the UDP destination port for the SRT stream.
Port	(Listener Connection Mode only) Specifies the UDP local port for the SRT stream.
Latency	Specifies how long Kraken will buffer received packets. The size of this buffer adds up to the total latency. A minimum value must be 3 times the round-trip-time (RTT). Range = 20-8000 ms Latency is for the SRT protocol only and does not include the capture, encoding, decoding and display processes of the end-point devices.
Passphrase	(Optional, must match encoder passphrase) This parameter is required if the stream is encrypted and is used to retrieve the cryptographic key protecting the stream. Range = 10-79 UTF-8 characters
Notes	(Optional) Type in any related information or comments

Note

An asterisk (*) next to a field indicates that it is required.

Input Statistics

The Input Statistics page shows statistics for the selected SDI (DeckLink) or Analog Capture encoding input.



Configuring Transcoders

Topics Discussed

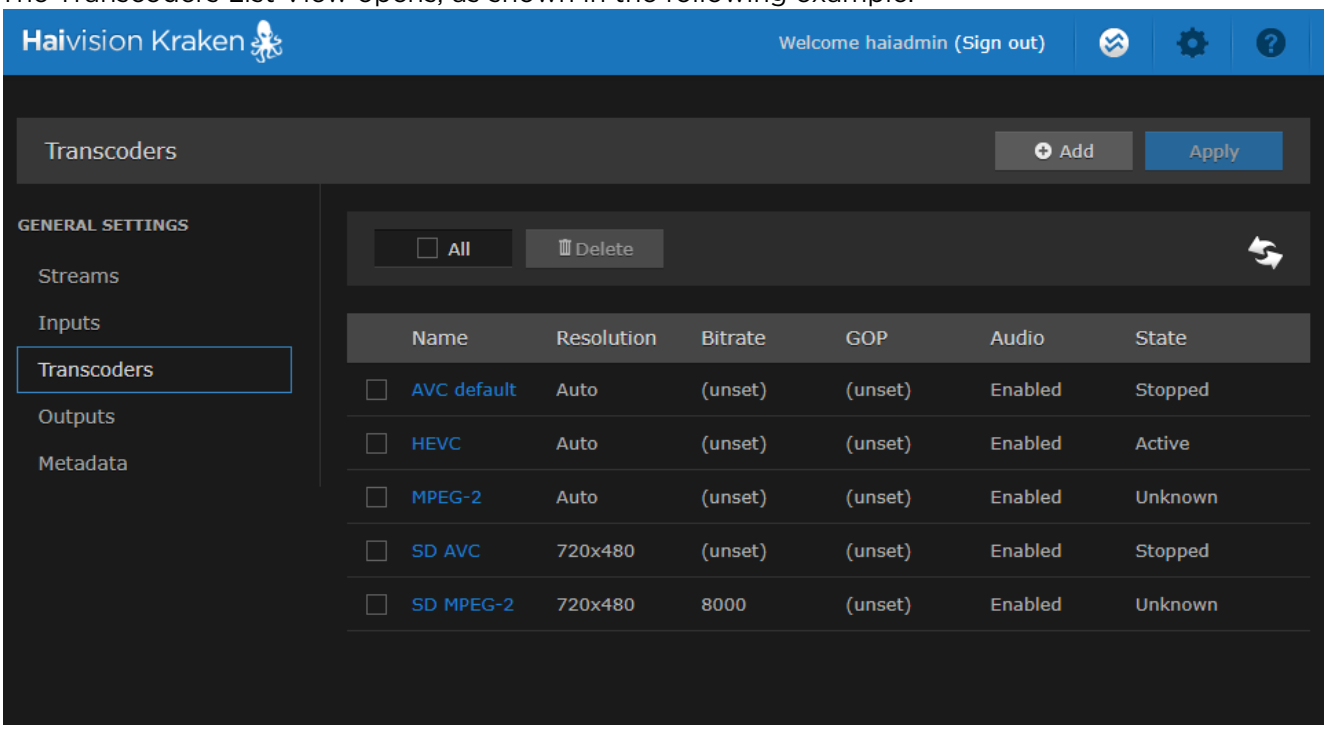
- Transcoders List View
- Configuring Transcoder Parameters
- Filtering UAS KLV Metadata Tags
- Transcoder Settings
- Advanced Shaping Settings
  - Recommended Start Settings for Advanced Shaping Settings

Transcoders List View

The Transcoders List view displays a summary of defined transcoders for Kraken, including the Name, Resolution, Video Bitrate, Group of Pictures (GOP) size, Audio enable setting, and State for each transcoder. It also provides an option for you to delete transcoders.

To open the Transcoders List View:

1. On the Streaming page, click **Transcoders** on the sidebar.
   The Transcoders List View opens, as shown in the following example.



   - To refresh the page, click .
   - To add a transcoder, click the **Add** button.
   - To view transcoder details or add a transcoder, click a line in the table to open the Transcoders Detail View.
   - To delete one or more existing transcoders, check the checkbox(es) next to the item(s) in the list and click the **Delete** button.
2. To apply your changes, click **Apply**.

Related Topics

- Transcoder Settings

Configuring Transcoder Parameters

Transcoder Settings include the Format, Video Bitrate and Resolution, Frame Rate, GOP size, Audio Bitrate, Stream Shaping, and Output Pacing. Optional advanced settings are available to fine-tune Stream Shaping.

With KLV (Key Length Value) input, you can also configure the transcoder to reduce the KLV data rate by frame-decimating the KLV metadata and/or filtering out data fields from MISB 0601 UAS KLV metadata. This is useful to lower the amount of bandwidth consumed by metadata and thereby allow higher video bitrates within bandwidth-constrained ISR workflows.

- KLV Rate Decimation causes Kraken to ingest KLV metadata at one KLV frame rate and decimate it to another rate. You select the factor (1:N, N=1..60), and then (N-1/N) metadata frames are dropped and only 1/N frames are passed through to the Output Stream. (See "KLV Decimation" under **Transcoder Settings**)
- KLV Tag Filtering filters out selected data fields from MISB 0601 UAS KLV metadata. You select either a 0601 minimum UAS metadata set or a 0601 minimum security set, or you can define a custom set by removing tags for fields deemed not relevant to your operation. (See **Filtering UAS KLV Metadata Tags**)

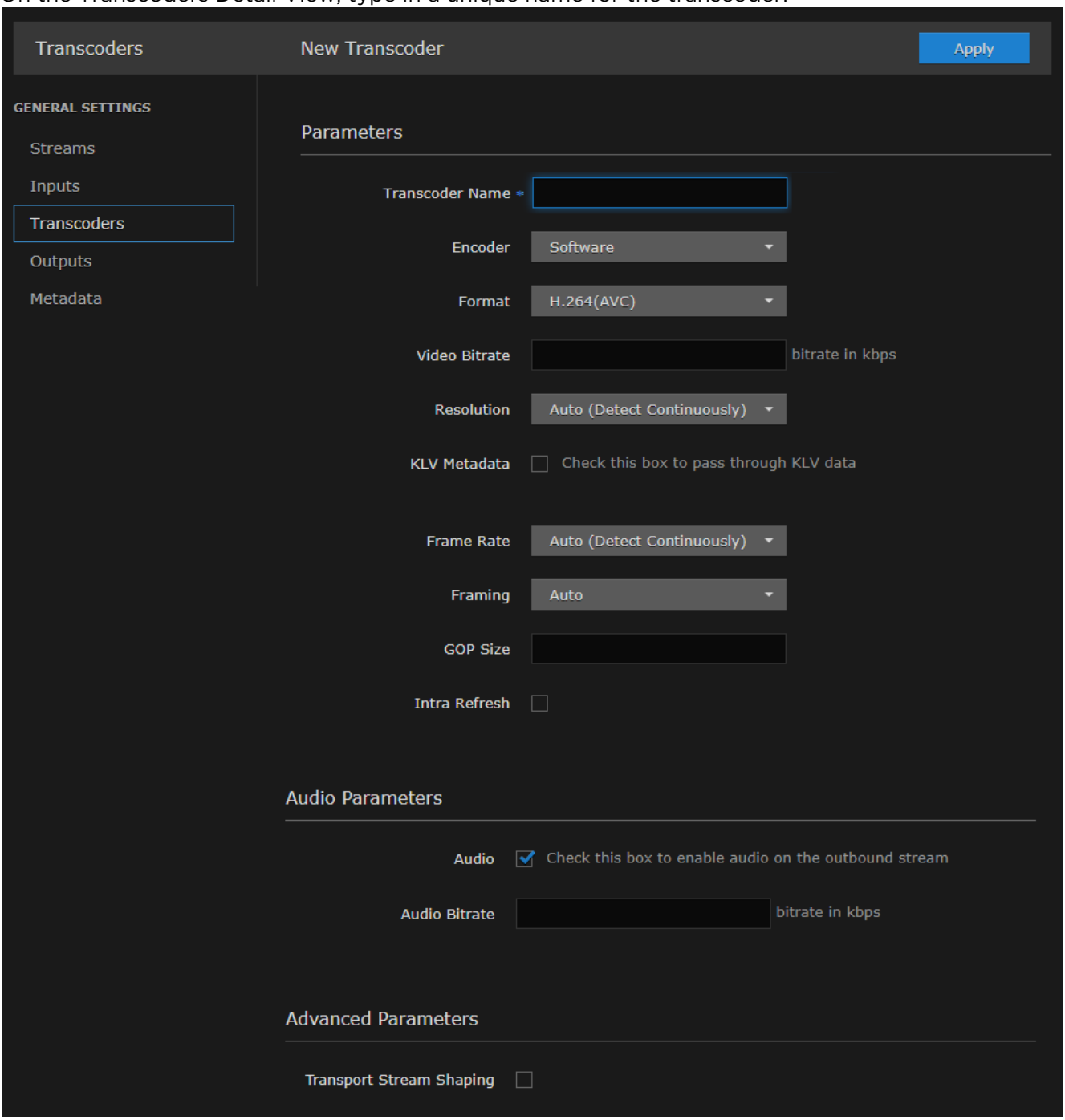
Note

If the Resolution fields are left blank or unchanged in the Transcoders section, the resolution of the source stream will remain intact in the outbound stream. However, the GOP Size and Bitrate are set to a default value based on the resolution.

To view and configure Transcoder parameters:

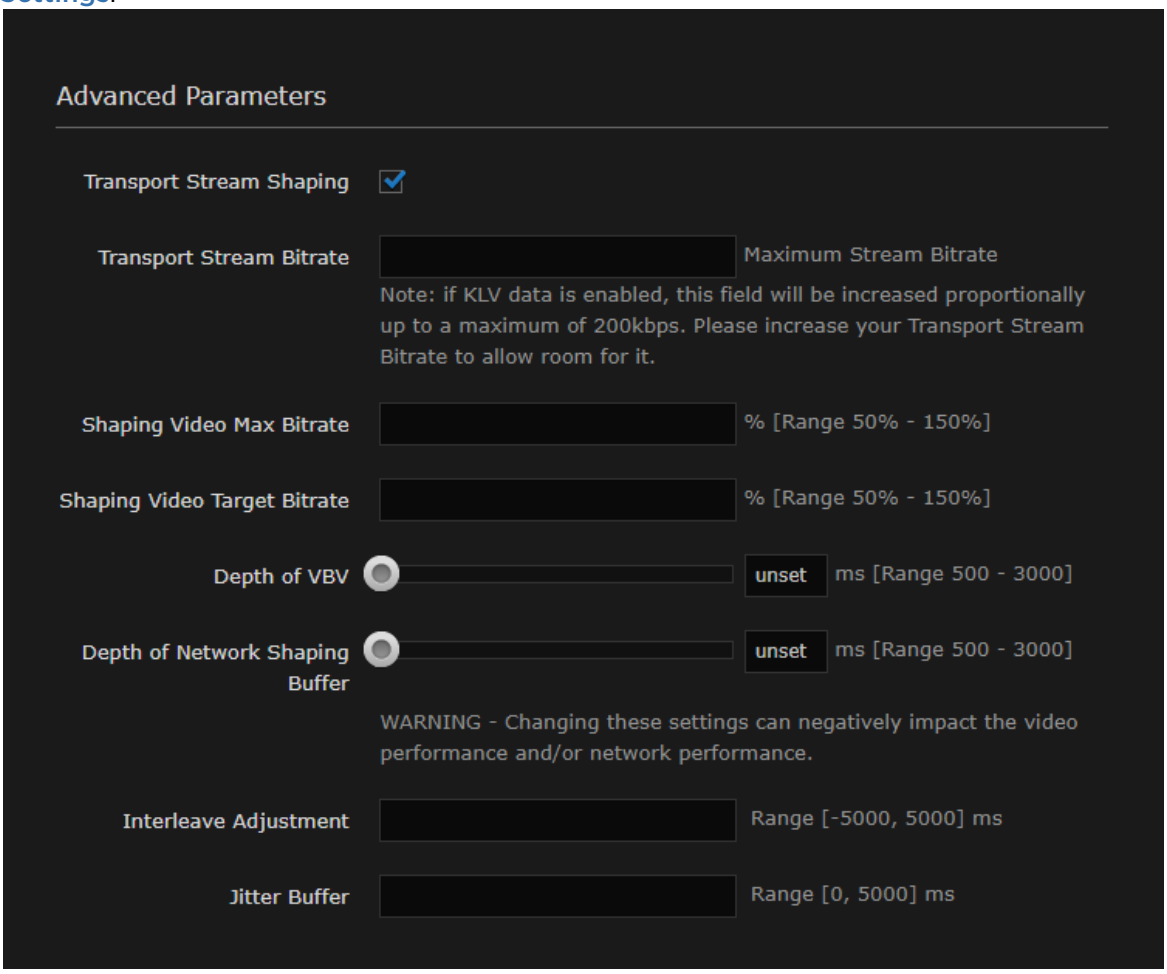
1. From the Transcoders List view, click the **Add** button or click any line in the table.

2. On the Transcoders Detail View, type in a unique name for the transcoder.

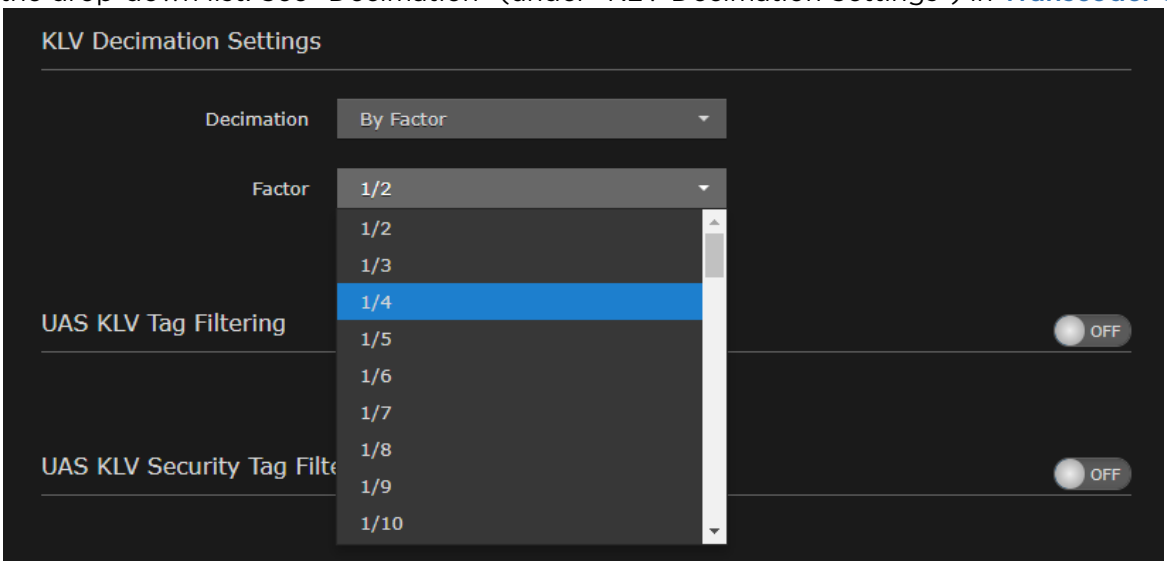


3. Select or enter values in the fields to define the transcoder (i.e., to change in the outbound stream), for example, the Format, Video Bitrate, or Resolution. For details, see Transcoder Settings.
4. To pass through KLV data, check the KLV Metadata checkbox.
5. To enable audio on the outbound stream, check the Audio checkbox.
6. (Optional) If Transport Stream Shaping is enabled (under Advanced Parameters), you can define additional parameters, as shown in the following example. For details, see Advanced Shaping

Settings.



7. To configure KLV Rate Decimation, select By Factor for Decimation and then select the factor from the drop-down list. See “Decimation” (under "KLV Decimation Settings") in Transcoder Settings.



8. To configure UAS KLV Tag Filtering or UAS KLV Security Tag Filtering, see Filtering UAS KLV Metadata Tags.
9. To apply your changes, click **Apply**.

The new transcoder is added to the Transcoders List.

Filtering UAS KLV Metadata Tags

You can configure the transcoder to filter out data fields from MISB 0601 UAS KLV metadata in order to reduce the KLV data rate. Lowering the amount of bandwidth consumed by metadata allows higher video bitrates within bandwidth-constrained ISR workflows.

You can filter MISB 0601 metadata tags on a per tag basis, by specifying all or any subset of the MISB 0601 tags. If a tag is included, it is allowed to proceed to the metadata elementary stream (ES). Tags that are not included are filtered out of the metadata AU and not transmitted in the metadata ES. Non-MISB 0601 metadata (such as MISB 0605 or custom metadata adhering to SMPTE 336) is not affected by the MISB 0601 filtering.

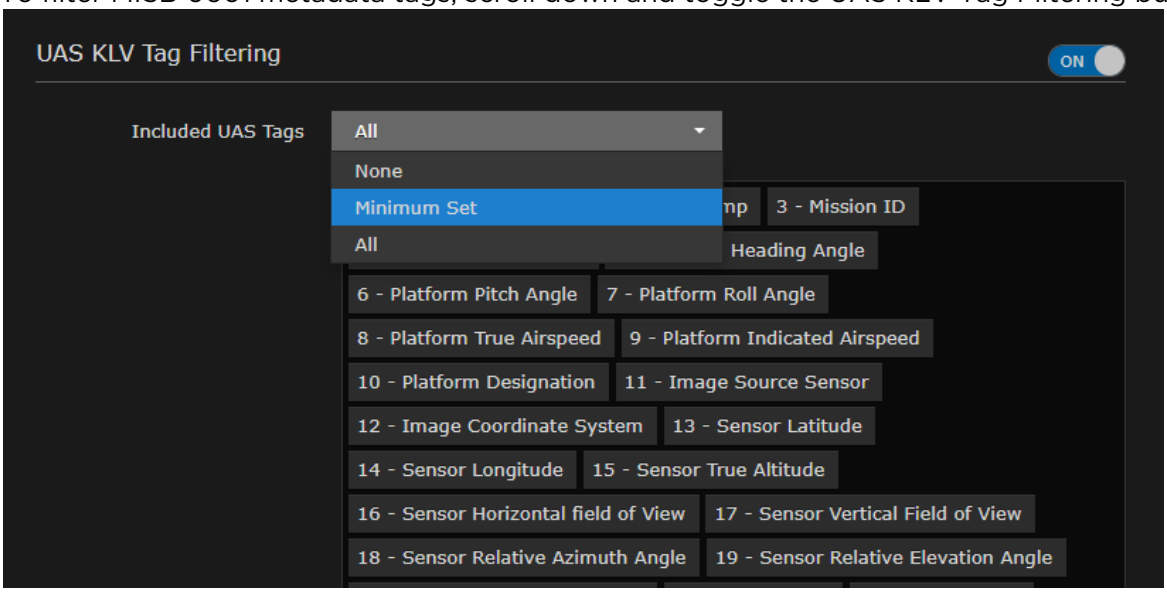
When filtering MISB 0601 metadata tag 48 (security metadata), you can also filter the security metadata tags defined in MISB 0102.

This is useful to eliminate unwanted KLV information in order to minimize the metadata bandwidth required. You may choose to down-scale and frame-decimate the video and decimate the metadata as well.

> **Tip**
>
> Frame decimation on the video is accomplished by reducing or down-scaling the frame rate of the encoder on the Transcoders page.

To filter UAS KLV metadata tags:

1. From the Transcoders List view, click the link for the transcoder to filter.
2. On the Transcoders Detail View, check the KLV Metadata checkbox to pass through KLV data.
3. To filter MISB 0601 metadata tags, scroll down and toggle the UAS KLV Tag Filtering button to **On**.



4. To configure the scope of filtering, select either Minimum Set or All from the Included UAS Tags drop-down list.

- To remove tags for fields deemed not relevant to your operation, browse through the list and click **X** next to any tag labels to exclude, i.e., to filter out of the metadata. This creates a new option “Custom Set” on the Included UAS Tags drop-down list.
- To re-include a tag that has been excluded, click the down arrow at the bottom right of the list box and select the tag from the drop-down list of excluded tags.

5. To filter the security metadata tags defined in MISB 0102, toggle the UAS KLV Security Tag Filtering button to **On**, select Minimum Set or All, and fine-tune the Included Security Tags list as required to configure the scope of filtering.

   Tip

   Make sure #48 is included under UAS KLV Tag Filtering.

6. Fill in the remaining fields and click **Apply**.

Related Topics

- Configuring Transcoder Parameters

Transcoder Settings

The following table lists the Kraken Transcoder settings:

Basic Parameters | Audio Parameters | Advanced Parameters | KLV Decimation | UAS KLV Tag Filtering

Basic Parameters

Transcoder Setting	Description/Values
Transcoder Name	Enter a unique name for the transcoder. This name will be selectable from the list of Transcoders when you define a stream.
Encoder	(Optional, to enable hardware acceleration on qualified hardware) Select the encoding format, either: • Software (default, Kraken legacy): CPU-based encoding • Hardware (QSV): Video encoding will be hardware accelerated using the Intel Quick Sync Video capabilities of the processor.
Format	Select the video format for the outbound stream, either: • H.264 (AVC) (default) • H.265 (HEVC) • MPEG-4 (Part 2) • MPEG-2: The stream will be transcoded to MPEG-2 Video (ISO/IEC 13818-2) and MPEG-1 or MPEG-2 audio with closed captioning pass-through. This allows Kraken to inter-operate with legacy systems.
Codec Profile	(Format must be MPEG-2 or MPEG-4) Select the video profile for the encoder: • Auto: Defaults to Main profile. • Simple: Specifies that the output encoded video will adhere to the ISO/IEC 13818-2 / MPEG-2 Simple Profile. • Main: Specifies that the output encoded video will adhere to the ISO/IEC 13818-2 / MPEG-2 Main Profile.
Video Bitrate	Type in the Video Bitrate in kbps for the outbound stream, for example, 1024. Range = `150..15000`
Resolution	Select the resolution for the outbound stream: • Auto (Detect Continuously) (default) • Auto (Detect on Stream Start) • Custom: Type in a horizontal and vertical (W x H) resolution, for example, 1280x720. **Note** In previous releases, if the Resolution fields were left blank, the resolution of the outbound stream would be what was detected at stream start and would stay that way even if the input resolution changed. This is now achieved by selecting “Auto (Detect on Stream Start)”. 720x576 or lower is considered SD resolution.
KLV Metadata	**Note** Disabled if KLV isn’t licensed.

Transcoder Setting	Description/Values
Frame Rate	Select the coded picture frame rate per second (fps): • Auto (Detect Continuously) (default) • Auto (Detect on Stream Start) • Select a frame rate from the list: 60..1 **Note** In previous releases, selecting "Auto" caused the frame rate of the outbound stream to be what was detected at stream start. The legacy "Auto" setting has been renamed "Auto (Detect on Stream Start)" since it does an early detection of the input frame rate and uses that as the fixed output frame rate for the transcoder. The new default "Auto (Detect Continuously)" is an additional encoding/transcoding mode where the output Frame Rate follows the source frame rate. This mode monitors the incoming frame rate and if it can detect a steady frame rate that differs from the one it is currently using, it resets the video encoder and configures it accordingly.
Framing	Select the number of B-frames and B reference frames per P-Frames to allow in the output stream: • Auto (default): The Kraken software decides how many B-Frames and B reference frames to allow • IP: I and P frames only (lowest delay; lowest quality) • IBP: I, B and P frames • IBBP: I, BB (two B-frames and B reference frames in sequence) and P frames (higher delay; higher quality) • IBBBP: I, BBB (three B-frames and B reference frames in sequence) and P frames (highest delay; highest quality) **Note** B-Frames improve the quality by increasing the efficiency of the encoding, thus allowing higher quality at the same bitrate. But B-Frames increase the encoder processing overhead, e.g., higher CPU utilization of the encoder.
GOP Size	Type in the GOP (Group of Pictures) Size for the outbound stream, for example, 30. Range = `0..1000` **Note** You may choose to adjust the GOP to get different video quality on the outbound stream or to make the stream compatible with a different system than the original stream was intended for. **Tip** Increasing the GOP size can increase the time required for a player to tune into the stream. Reasonable GOP sizes tend to range from half the frame rate to up to 5 times the frame rate. A GOP size equal to the output frame rate is a good rule of thumb.
Intra Refresh	Check this checkbox to enable Intra Refresh for X.264 and X.265. This is an advanced feature that puts the encoder into a mode where it does not generate I-Frames. Instead the individual macro blocks are refreshed and over time all of the picture is refreshed. **Note** Not all decoders may support this feature so it can be enabled/disabled as desired.

Basic Parameters Audio Parameters Advanced Parameters KLV Decimation
UAS KLV Tag Filtering

Audio Parameters

Transcoder Setting	Description/Values
Audio	**Tip** Kraken will automatically insert a silent audio stream into the output when the input source has no audio (see “Silent Audio Insertion” on page 61) **Note** When audio is removed on the outbound stream, the PID for the audio track is removed, as is the reference to it in the PMT.
Audio Codec	(Format must be MPEG-2 or MPEG-4) Select the audio compression algorithm: • Auto: Defaults to MPEG1 Layer II • MPEG1 Layer II: Encodes audio using the ISO/IEC 11172-3 / MPEG-1 Layer II algorithm. • MPEG2 AAC ADTS: Encodes audio using the ISO/IEC 13818-7 / MPEG-2 AAC-LC algorithm with an ADTS header.
Audio Bitrate	Type in the Audio Bitrate in kbps for the outbound stream, for example, 128. Range = 14..576 Kbps

Basic Parameters Audio Parameters Advanced Parameters KLV Decimation
UAS KLV Tag Filtering

Advanced Parameters

Transcoder Setting	Description/Values
Performance Control System	(Video Format must be HEVC) Check this checkbox to enable the Performance Control System, an HEVC encoder feature that dynamically monitors the runtime performance of the encoder and adjusts the video encoder quality based on the instantaneous performance of the encoder. The goal is to provide optimal quality of the video encoder based on the performance of the system. It is particularly useful on small form factor (i.e., lower power) systems such as Kraken CR.

Transcoder Setting	Description/Values
Transport Stream Shaping	Check this checkbox to enable Shaping on the outbound stream. Checking this checkbox also displays advanced settings (see Advanced Shaping Settings). **Note** Traffic Shaping is used on some networks to smooth the traffic and respect the absolute upper limit configured. When Shaping is enabled, you can set the Maximum Bitrate for the Transcoder Stream (see Transport Stream Bitrate in Advanced Shaping Settings). **Tip** When Shaping is enabled, the Video Bitrate becomes the ceiling video bitrate target. When Shaping is disabled, this parameter represents the average video bitrate.
Output Pacing	**Note** Output Pacing is used to make the traffic more or less smooth on the network, to allow the stream traffic to leave the Kraken in a more even manner. When pacing is enabled, you can set the Output Pacing Buffering Interval (see below).
Output Pacing Buffering Interval	(Output Pacing must be enabled) This Buffering Interval defines the depth of the Output Pacing in milliseconds (ranging from 0 to 1000ms). It is used to define the latency and smoothness added by the output pacing. **Note** The higher the buffer is set, the more smooth the traffic is on the network. However, the optimal buffer setting will depend on the “spikiness” of the source stream.
Interleave Adjustment	(Optional) Type in the number of milliseconds to delay audio before multiplexing (“muxing”). Range = `-5000, 5000ms` • -1 (the default) leaves it up the transcoder to decide. • 0 makes no Interleaving adjustment. • > 0 specifies the number of milliseconds to delay audio before muxing. • < -1 Number of milliseconds to delay video before muxing. **Note** Interleave adjustment is actually a muxer interleave adjustment of the packets without touching timestamps and does not affect AV sync. **Note** The latency within the transcoder pipeline is higher for the video than the audio, so users typically want to delay the audio so that the video comes out of the muxer before the corresponding audio. By default, the transcoder attempts to adjust the interleaving to some appropriate value. This control allows you to override that when desired.

Transcoder Setting	Description/Values
Jitter Buffer	(Optional) Type in the Jitter Buffer for the inbound source/stream. A jitter buffer may be applied to video streams coming in at irregular intervals to help output the video in a steady stream (default = 250 ms). Range = `0, 5000ms` **Note** Transcoding latency will be affected proportionately.

Basic Parameters Audio Parameters Advanced Parameters KLV Decimation
UAS KLV Tag Filtering

KLV Decimation

Transcoder Setting	Description/Values
Decimation	(KLV Metadata pass-through must be enabled) Select "By Factor" to frame-decimate ingested KLV messages to reduce the bandwidth used by the metadata service. • None • By Factor: `1/2..1/60` **Note** `1/2` means divide the amount by half, etc.
Factor	("By Factor" must be selected) Select the decimation factor.

Basic Parameters Audio Parameters Advanced Parameters KLV Decimation
UAS KLV Tag Filtering

UAS KLV Tag Filtering (See Filtering UAS KLV Metadata Tags)

Transcoder Setting	Description/Values
UAS KLV Tag Filtering	(KLV Metadata pass-through must be enabled) Specifies a list of tag numbers/labels from the UAS Datalink Local Set that are allowed to be streamed. Tags not included in this list will be discarded. Select either: • None • Minimum Set: the set of metadata objects as define in MISB 0902. • All: the set of metadata objects as define in MISB 0601.

Transcoder Setting	Description/Values
UAS KLV Security Tag Filtering	Specifies a list of tag numbers/labels from the Security Local Data set inside the UAS that are allowed to be streamed. Tags not included will be discarded. Select either: • None • Minimum Set: the set of metadata objects as define in MISB 0902. • All: the set of metadata objects as define in MISB 0102. **Tip** #48 must be included under UAS KLV Tag Filtering

Note

An asterisk (*) next to a field indicates that it is required.

Advanced Shaping Settings

Caution

Changing these settings can have a negative impact on the video performance and/or network performance.

Tip

See Recommended Start Settings for Advanced Shaping Settings.

Advanced Setting	Description/Values
Transport Stream Bitrate	(Transport Stream Shaping must be enabled) Type in the Maximum Transport Stream (TS) Bitrate in kbps for the outbound stream, for example, 3000. Kraken automatically generates a minimum value based on the Video Bitrate, Audio Bitrate and whether or not there is KLV metadata. This minimum value may be used by default, or you may set the Maximum TS Bitrate to a higher value (but not lower). **Note** If KLV metadata pass-through is enabled, 200 kbps will be added to the Maximum TS Bitrate value by default. If your site is utilizing KLV streams that are higher than 200 kbps, you should increase the Maximum TS Bitrate value to make room for the KLV stream. For example, to use a 1 Mbps KLV stream, you should increase the Maximum TS Bitrate by 800 kbps to allocate enough room in the Kraken output stream for the KLV, Audio and Video. **Tip** If the encoder is overrunning the ceiling bitrate and you have room in the channel to spare, you can increase this value, which allows more room in the channel for higher spikes in the encoder. By default, the Web Interface tries to set this to 20% above the expected aggregate bitrate of the elementary streams. For instance, it adds the Video Bitrate, Audio Bitrate, and expected KLV bitrate and adds 20%. This can be increased, but should probably not drop below 12%. You need at least 3% and sometimes more for the TS packetization and PSI tables, etc.

Advanced Setting	Description/Values
Shaping Video Max Bitrate	Type in the maximum video bitrate for shaping the outbound stream, as a percentage. **Note** Increasing this above 80% will increase the quality, but also increases the probability that the encoder will overrun the ceiling. At higher bitrates, it should be possible to increase this to 85%. **Tip** You can try setting this to 90% or higher to see where you start observing problems due to overrunning the network buffers. In most situations, you should not exceed 100%. The optimal setting is reached when this value is as close to 100% as possible without overrunning the buffers. This depends on a large number of factors, including Bitrate, Frame Rate, GOP size, Resolution, scene complexity, and VBV size.
Shaping Video Target Bitrate	Type in the target video bitrate for shaping the outbound stream, as a percentage. **Tip** As a general rule, keep this at 70% for all operating points. It should be lower than the Shaping Video Max Bitrate and lower than 100%. 70% is fairly optimal for the Kraken's encoder.
Depth of VBV	Type in or adjust the slider to specify the value in milliseconds for the Video Buffering Verifier (VBV) depth. **Note** The VBV is a theoretical MPEG video buffer model used to ensure that an encoded video stream can be correctly buffered and played back at the decoder device. By definition, the VBV will not overflow nor underflow when its input is a compliant MPEG stream. **Tip** This is the depth of the CBR buffer in the decoder VBV model in milliseconds. A value that you should strive for is 1000ms; lower values may decrease the rate at which the encoder overruns the network buffers at lower bitrates. Increasing this parameter increases latency and also increases quality. It should not be lowered below 1000ms. A good quality encoder will make intra frames 12- 15 times larger than non-intra frames. At 30fps, this means half of the stream bitrate is consumed for a single video frame. Since it must fit inside the VBV, the optimal point for our low delay application is 1000ms.

Advanced Setting	Description/Values
Depth of Network Shaping Buffer	Type in or adjust the slider to specify the value in milliseconds for the network shaping buffer depth. **Note** This is the depth in milliseconds of the network traffic shaper's buffers. Since a good quality encoder will generate an intra frame consuming approximately 50% of the available bitrate in one frame, this is the interval over which the bitrate spike of the intra frame is sent out over the network to keep it inside the channel bitrate. If the encoder overshoots this buffer, because the bitrate is too low for the resolution, frame rate, and/or scene complexity, the encoder will overrun this buffer. As a result, a decoder will receive a corrupt stream.

Recommended Start Settings for Advanced Shaping Settings

Following are the recommended start settings when using the Advanced Shaping settings:

Shaping Video Max Bitrate	100%
Shaping Target Bitrate	70%
VBV Size	1000ms
Network Shaping Buffer	1000ms

The goal should be to try and maximize the channel utilization (and thus the quality) while minimizing the shaping buffer overruns and minimizing the latency. Starting with the above values, you may try the following:

- Increase the bitrate percentages to improve quality.
- Increase the VBV and network shaping size to decrease bitstream drop based on shaping buffer overrun.

We do *not* recommend dropping the VBV and/or network shaping buffer much below 1000ms.

Silent Audio Insertion

Kraken provides a valid silent (blank) audio track, which may be inserted within streams that did not originally contain any audio, in order to achieve Furnace interoperability with these specific streams. The Kraken will automatically:

- Insert a silent audio stream into the Kraken output when the input source has no audio.
- Utilize an audio stream from the source, should one become available after the transcoder session has started.
- Start silence injection should the audio stream become unavailable in the source after the transcoder session has started.
- Adapt to streams where the source audio stream becomes intermittently available and unavailable unexpectedly within the source (assuming the availability/non-availability of audio in the source stream does not change more rapidly than 30 second intervals).

Note

There may be some transition artifacts. If you disable audio in the Transcoder session configuration, no silence injection will be performed.

Configuring Outputs

> **Note**
>
> In addition, you can select the network interface for the Output. The Kraken may be configured to output streams to any of the available Network Interface Cards (NICs).

You can also enable Session Announcement Protocol (SAP) transmission for the stream to provide a playlist to viewers. SAP is a protocol for broadcasting multicast session information. An SAP announcer periodically multicasts an announcement packet to a well known multicast address and port. SAP listeners will listen on the well known SAP address and learn of all the sessions being announced.

When SAP is enabled, the Kraken sends an SAP signal out to the player when it starts streaming. Any player that supports the SAP protocol will provide the end user an automatic playlist when the Kraken is streaming.

Topics Discussed

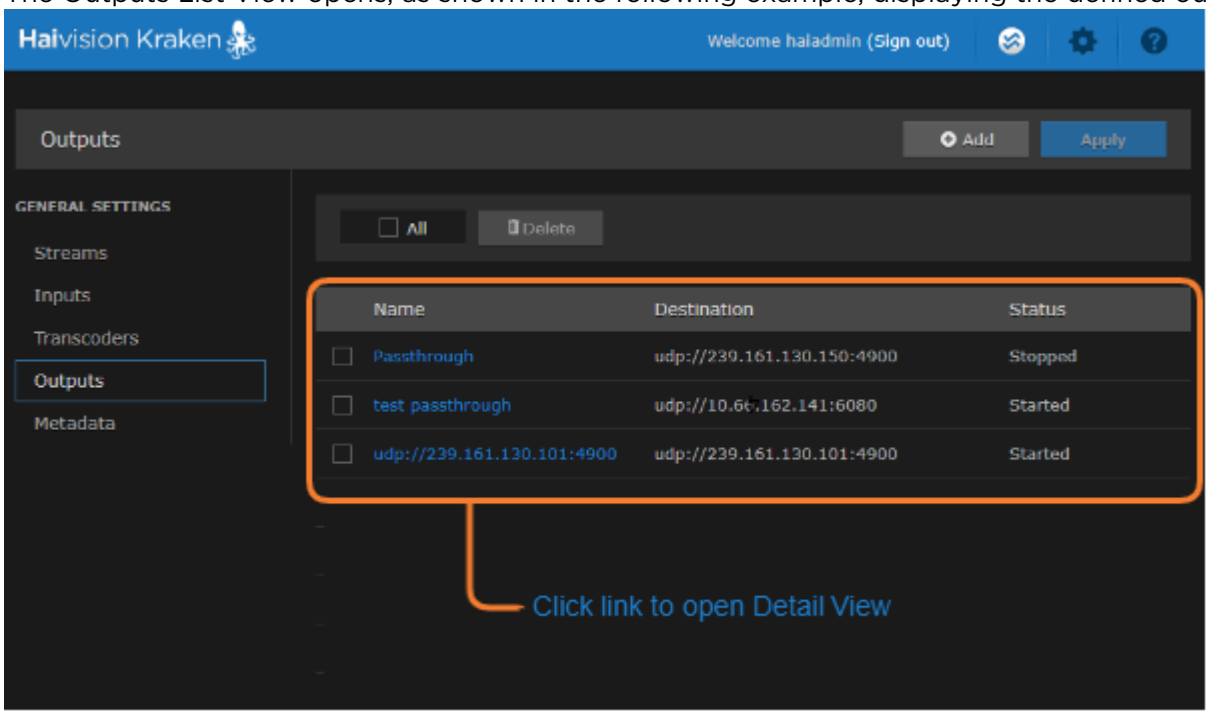
- Outputs List View
- Configuring Output Parameters
- Output Settings

Outputs List View

The Outputs List view displays a summary of defined outputs for Kraken, including the Output Name, Destination (output) URL, and Status for each output. It also provides an option for you to delete an output.

To open the Outputs List View:

1. On the Streaming page, click **Outputs** on the sidebar.
   The Outputs List View opens, as shown in the following example, displaying the defined outputs.



   - To add an output, click the **Add** button.
   - To view output details or add an output, click a line in the table to open the Outputs Detail View.
   - To delete an existing output, check the checkbox next to the item in the list and click the **Delete** button.
2. To apply your changes, click the **Apply** button.

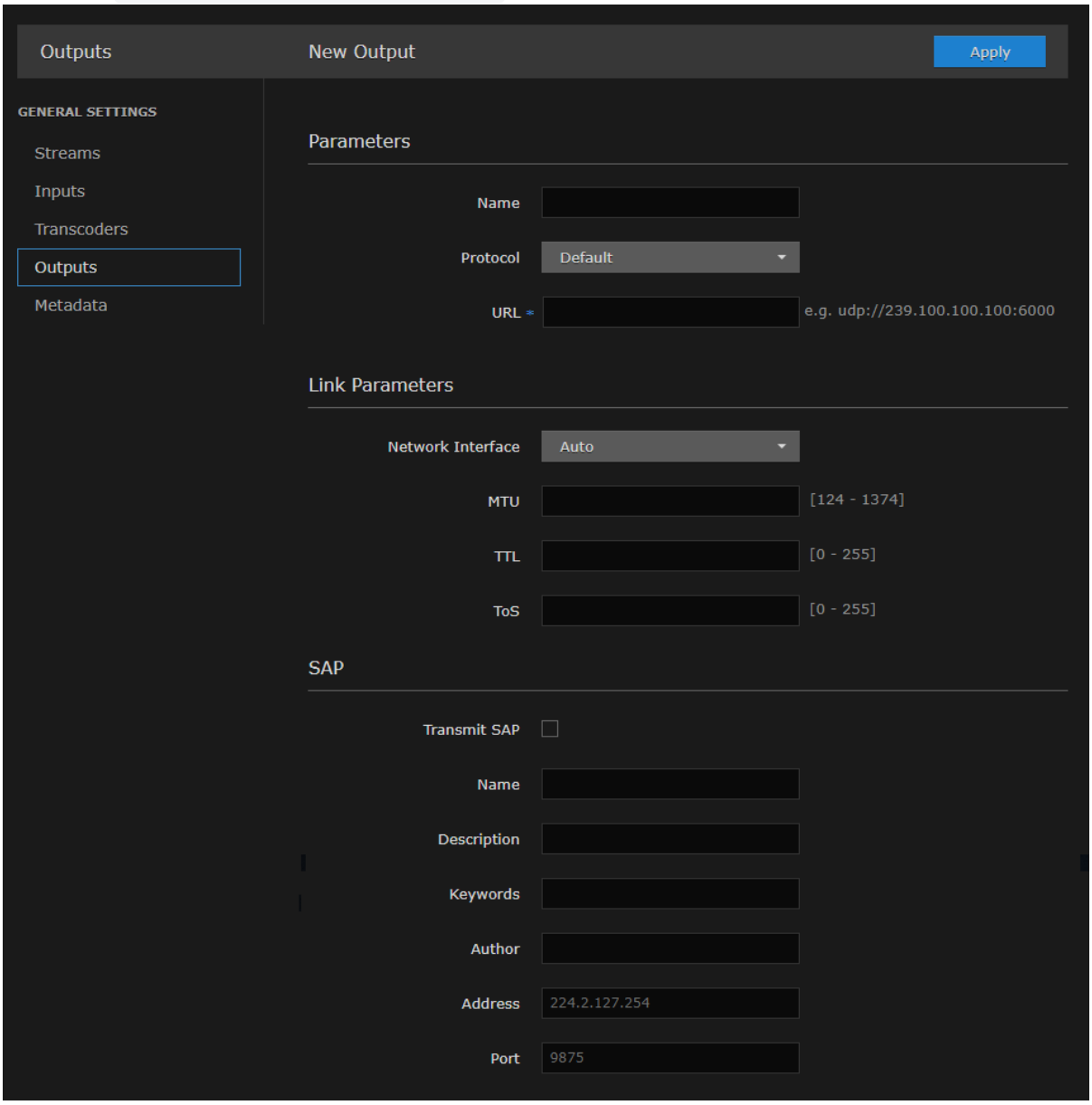
Related Topics

- Output Settings

Configuring Output Parameters

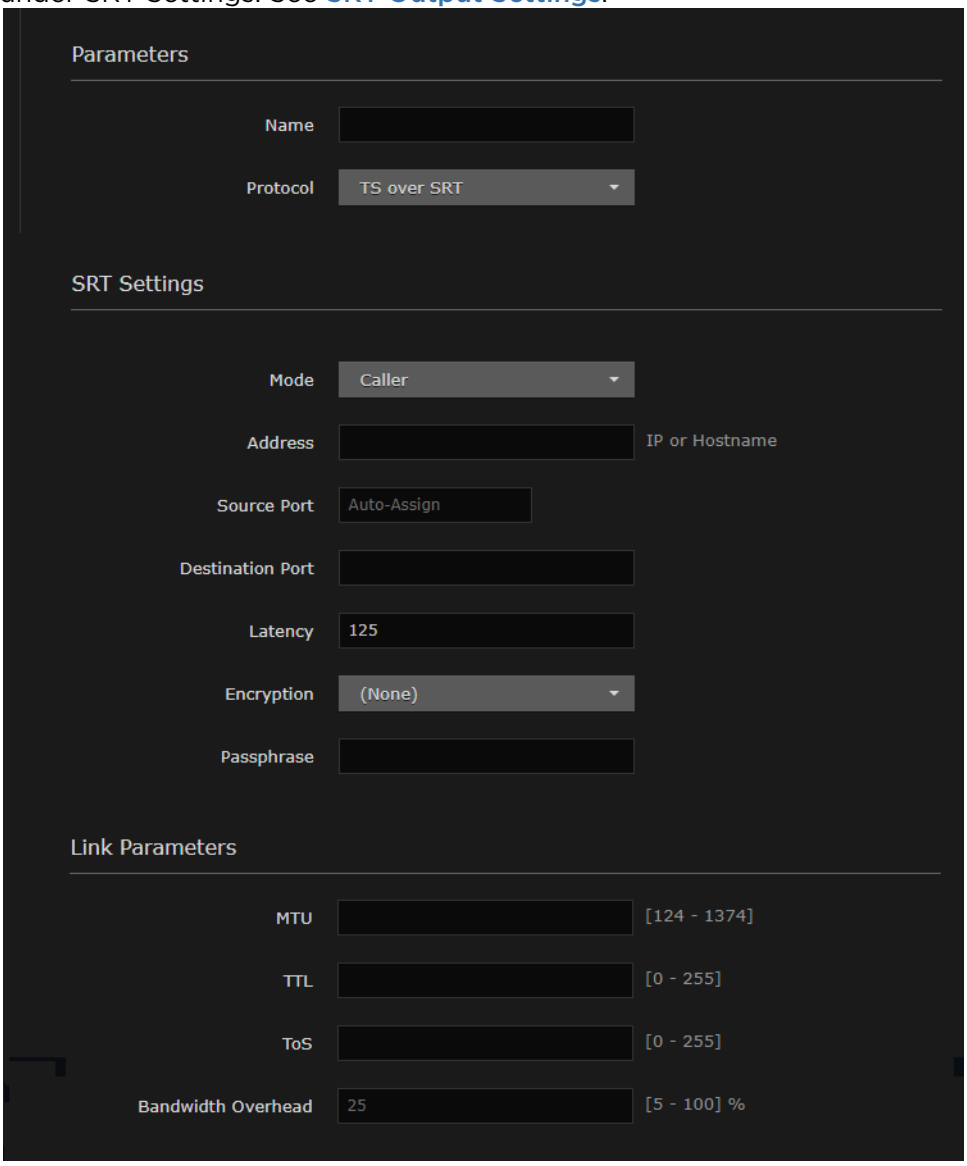
To view and configure Output parameters:

1. From the Outputs List view, click the **Add** button or click any line in the table.
2. On the Outputs Detail View, type in a unique name for the output and an output URL, for example, `udp://239.100.100.100:4900`.



3. Select or enter values in the fields to define the output. See **Output Settings**.
4. To modify link parameters, such as the MTU (Maximum Transmission Unit) size, TTL (Time-to Live for stream packets), or To (Type of Service) values, type these in.

5. To configure SRT output, select TS over SRT for the source and then complete the additional fields under SRT Settings. See **SRT Output Settings**.



6. To apply your changes, click **Apply**.
   The new output is added to the Outputs List.

Output Settings

The following table lists the Kraken Output settings:

General | Link Parameters | SAP | SRT Output Settings

General Settings

Output Parameter	Description/Values
Name	**Note** The Output name is not required. The Kraken will use the Output URL as the name if none is provided.
Protocol	Select the Protocol type for the output streaming format: • Default (TS over UDP) • To use Haivision's Secure Reliable Transport (SRT) input and output streaming format, select TS over SRT for the protocol. For more information, please refer to the SRT Deployment Guide.
URL	(Protocol must be "Default") Type in the URL for the Output, for example, `udp://239.100.100.100:4900` Examples of supported output formats: • `udp://239.100.100.100:4900` = multicast UDP on 239.100.100.100 port 4900 • `udp://10.1.10.10:4900` will send unicast UDP to host 10.1.10.10 on port 4900

General | Link Parameters | SAP | SRT Output Settings

Link Parameters

Output Parameter	Description/Values
Network Interface	(Protocol must be "Default") Select the network (Ethernet) interface for the Output, either: • Auto (uses static route, if defined; otherwise uses the default) • <eth0> • <eth1> • ... **Note** Network Interface names for Ethernet interfaces may vary, such as eth0/eth1/..., pNp1/pNp2/..., or em1/em2/....

Output Parameter	Description/Values
MTU	(Maximum Transmission Unit Size) Specifies the maximum allowed size of IP packets for the outgoing data stream. Range = `124..137` 4 **Tip** You may want to change the MTU on the outbound Kraken stream in order to be compatible with network segments or other systems/devices.
TTL	(Time-to Live for stream packets) Specifies the number of router hops that IP packets from this stream are allowed to traverse before being discarded. Range = `0..255`
ToS	(Type of Service) Specifies the desired quality of service (QoS). This value will be assigned to the Type of Service field of the IP Header for the outgoing streams. Range = `0..255` (decimal) or `0x00..0xFF` (hex) **Important** A DiffServ or DSCP (Differentiated Services Code Point) value must be converted to a ToS precedence value. For example, AF41 or DSCP 34 becomes ToS 136. For more information, see RFC2474. **Note** The ToS setting must be chosen so as to not interfere with Voice over IP systems and other equipment that may reside on your network. For example, when the ToS value for a stream is set to 0xB8, it can interfere with some third party Voice / IP Telephony systems.
Bandwidth Overhead (%)	(Protocol must be TS over SRT) Specifies how much data SRT is allowed to add to the transmission over the actual bitrate of the stream being transcoded. This defines the extra bandwidth used to accommodate SRT controls as well as retransmission of lost packets. For example, with the overhead set to the default 25%, for a 10 MBit/s MPEG-TS stream, SRT is allowed to use 12.5 MBit/s of bandwidth on the network link. Range = 5-100% (default value is 25%). **Note** SRT streams may temporarily overshoot the defined bandwidth overhead limit.

General Link Parameters SAP SRT Output Settings

SAP (Protocol must be "Default")

Output Parameter	Description/Values
Transmit SAP	Check this checkbox to enable SAP announcements.
Name	**Note** Name is a required field for SAP entry.
Description	(Optional) Enter an expanded description of the Session.
Keywords	(Optional) Enter one or more keywords to associate with the Session. Keywords can serve as filters.
Author	(Optional) Enter the name of the program's author.
Address	Type in a valid multicast address for the SAP announcement. **Note** Leave this blank to use the standard SAP address.
Port	Type in a valid port number for the SAP announcement. Range = 1025-65535 **Note** Leave this blank to use the standard SAP port.

General Link Parameters SAP SRT Output Settings

SRT Output Settings

Output Parameter	Description/Values
Mode	Selects the Connection Mode for the SRT output: • Caller: Kraken acts like a client and connects to a server listening and waiting for an incoming call. • Listener: Kraken acts like a server and listens & waits for clients to connect to it. • Rendezvous: Allows calling and listening at the same time. **Tip** When using Listener or Rendezvous mode with multiple active interfaces, be sure to set the Default Interface on the Network page (see **Network Settings**). Listener and Rendezvous output modes require that an IP address be specified in the endpoint. However, since you cannot specify which interface to use with an SRT output, setting the Default Interface forces Kraken to use that specified interface for SRT. Otherwise the SRT endpoint may not receive the stream from Kraken.

Output Parameter	Description/Values
Address	(Mode must be Caller or Rendezvous) The target IP address or hostname for the SRT stream (i.e., another device such as HMP or Media Gateway).
Source Port	(Mode must be Caller or Rendezvous) The UDP source port for the SRT stream, which is the unique port over which Kraken will be sending the SRT stream. You can (optionally) specify the UDP source port. If not filled in, an ephemeral source port will be assigned (between 32768 and 61000).
Destination Port	(Mode must be Caller or Rendezvous) The port over which the other device (i.e., HMP or Media Gateway) will be listening (between 1025 and 65535).
Latency	Specifies how long Kraken will buffer received packets. The size of this buffer adds up to the total latency. A minimum value must be 3 times the round-trip-time (RTT). Range = 20 - 8000ms Latency is for the SRT protocol only and does not include the capture, encoding, decoding and display processes of the end-point devices.
Encryption	Select the AES (Advanced Encryption Standard) encryption key length and cipher: • None (default) • AES-128 • AES-256
Passphrase	(Only required and accepted if Encryption is enabled) Specifies a string used to generate the encryption keys to protect the stream (between 10 and 79 UTF8 characters).
Notes	(Optional) Type in any related information or comments.

Note

An asterisk (*) next to a field indicates that it is required.

Configuring Metadata Capture

Note

KLV Metadata Capture is an optional feature which may be installed at the factory or via a field upgrade by installing a license file.

From the Metadata pages, you can configure the Kraken to capture either KLV (Key Length Value) or CoT (Cursor on Target) metadata and then incorporate data information within the metadata elementary stream of the standard MPEG Transport Stream. You can set up multiple metadata inputs to include in Transport Streams. The Kraken supports up to three metadata input types: either from the COM1 serial port, the HD-SDI interface, or a user definable network port (up to eight UDP inputs).

- **Serial port:** The Kraken SDI extracts either KLV or CoT metadata packets from the serial port. From the Metadata Detail View, you must specify the Data Format, and for CoT metadata, the Max AirCraft-SPI Delta.
- **SDI:** The Kraken SDI extracts KLV metadata packets from the HD-SDI interface as per MISB RP 0605.2. Only progressive scan formats are supported (i.e., 1280x720p and 1920x1080p). The Kraken can capture only 1024 bytes of KLV metadata per video frame.
- **Network:** The Kraken can receive either (a) KLV payload encapsulated in UDP or (b) CoT inside UDP that is converted to KLV and then streamed. You must specify the UDP port on which the Kraken will listen for incoming metadata. The Multicast Address is only required for reception of multicast metadata, or if you only want to accept messages coming from a specific sender.

You can define a small set of static KLV objects (i.e., mission IDs and security classification) for KLV and CoT metadata sources. For more information, see Configuring KLV Metadata Insertion.

CoT/UDP and CoT/Serial metadata sources can also be retransmitted to other IP destinations. For more information, see Configuring CoT Retransmission.

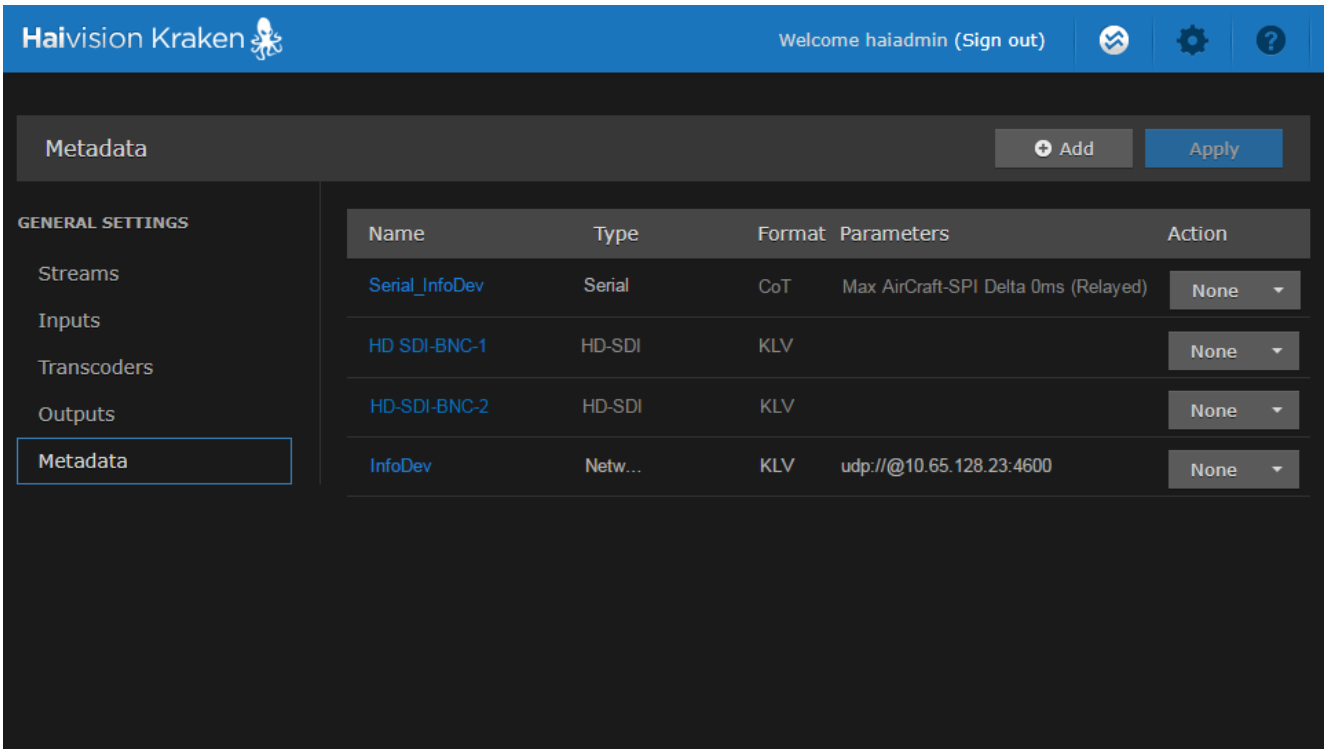
Topics Discussed

- Metadata List View
- Configuring Metadata Parameters
- Configuring CoT Retransmission
- Configuring KLV Metadata Insertion
- Metadata Settings

Metadata List View

The Metadata List View displays a summary of defined metadata sources for Kraken, including the Source Name, Type (Input Method), Data Format (KLV or CoT), and Parameters (Network Settings) for each source. It also provides an option for you to delete a source.

1. On the Streaming page, click **Metadata** on the sidebar.
   The Metadata List View opens, as shown in the following example.



- To add a metadata source, click the **Add** button.
- To view details or modify the settings for a metadata source, click a line in the table to open the Metadata Detail View.
- To delete a metadata source, click the drop-down list under Actions and select **Delete**.

2. To apply your changes, click **Apply**.

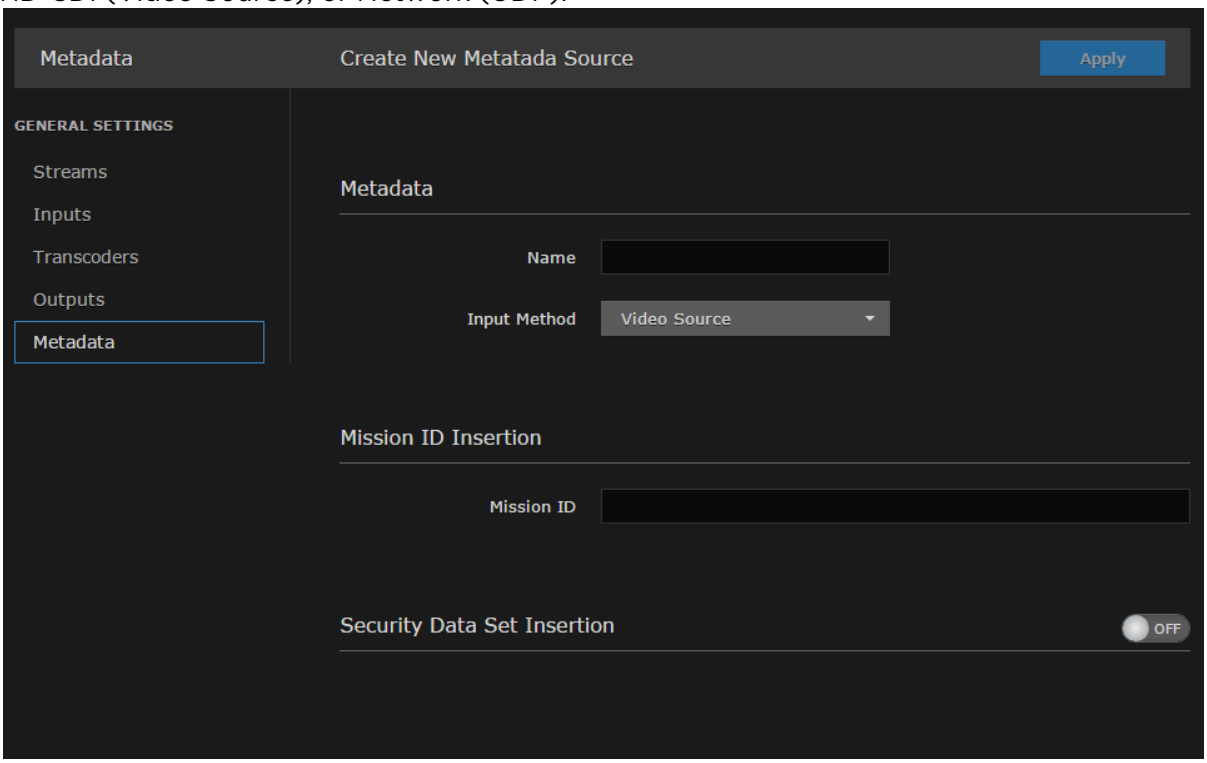
Related Topics

- Metadata Settings

Configuring Metadata Parameters

To view and configure Metadata source parameters:

1. From the Metadata List view, click the **Add** button or click any line in the table.
2. On the Metadata Detail View, type in the source Name and select the Input Method, either Serial, HD-SDI (Video Source), or Network (UDP).



The remaining parameters vary depending on the Input Method selected. For more information, see Metadata Settings.

HD-SDI Source | Serial Source | Network Source

HD-SDI Source

To configure HD-SDI (Video Source) input:

1. Select Video Source for the Input Method (as shown in the figure above).
2. (Optional) To define a set of static KLV objects to be used to replace erroneous or insert missing metadata within outbound TS streams, see Configuring KLV Metadata Insertion.
3. To apply your changes, click **Apply**.

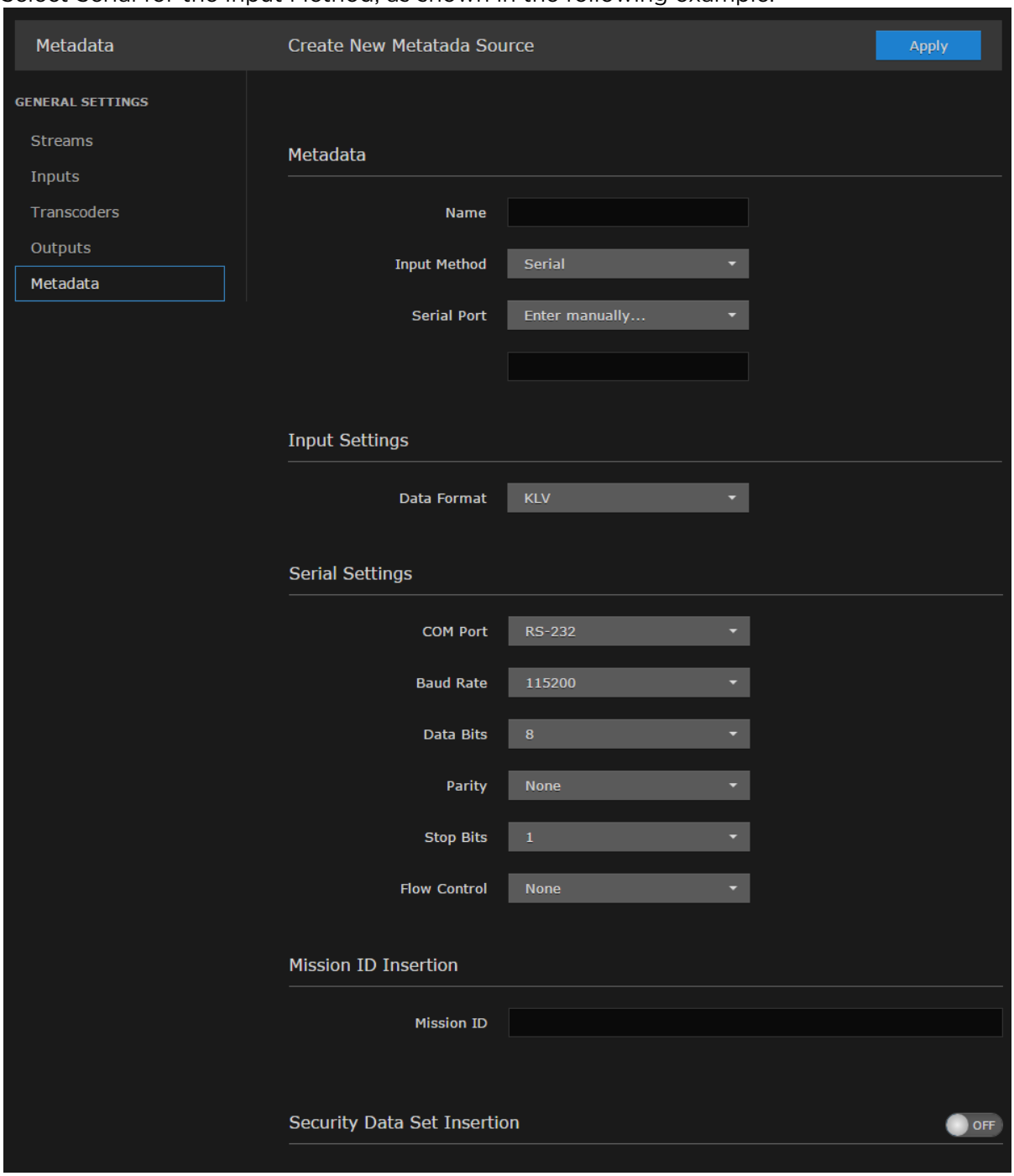
The new source is added to the Metadata List.

HD-SDI Source | Serial Source | Network Source

Serial Source

To capture CoT or KLV metadata from the serial port:

1. Select Serial for the Input Method, as shown in the following example.



2. Select the serial port from the drop-down list or type in the text box.

3. If CoT has been installed, select CoT for the Data Format (under Input Settings) and fill in the **Max AirCraft-SPI Delta** and **SPI UID**.
4. If required, adjust the Serial settings.
5. (Optional) For CoT sources, you can configure CoT Relaying to retransmit CoT sources to other IP destinations for analysis and archiving. See **Configuring CoT Retransmission**.
6. (Optional) To define a set of static KLV objects (i.e., Mission IDs and Security Classification) to be used to replace erroneous or insert missing metadata within outbound TS steams, see **Configuring KLV Metadata Insertion**.
7. To apply your changes, click **Apply**.

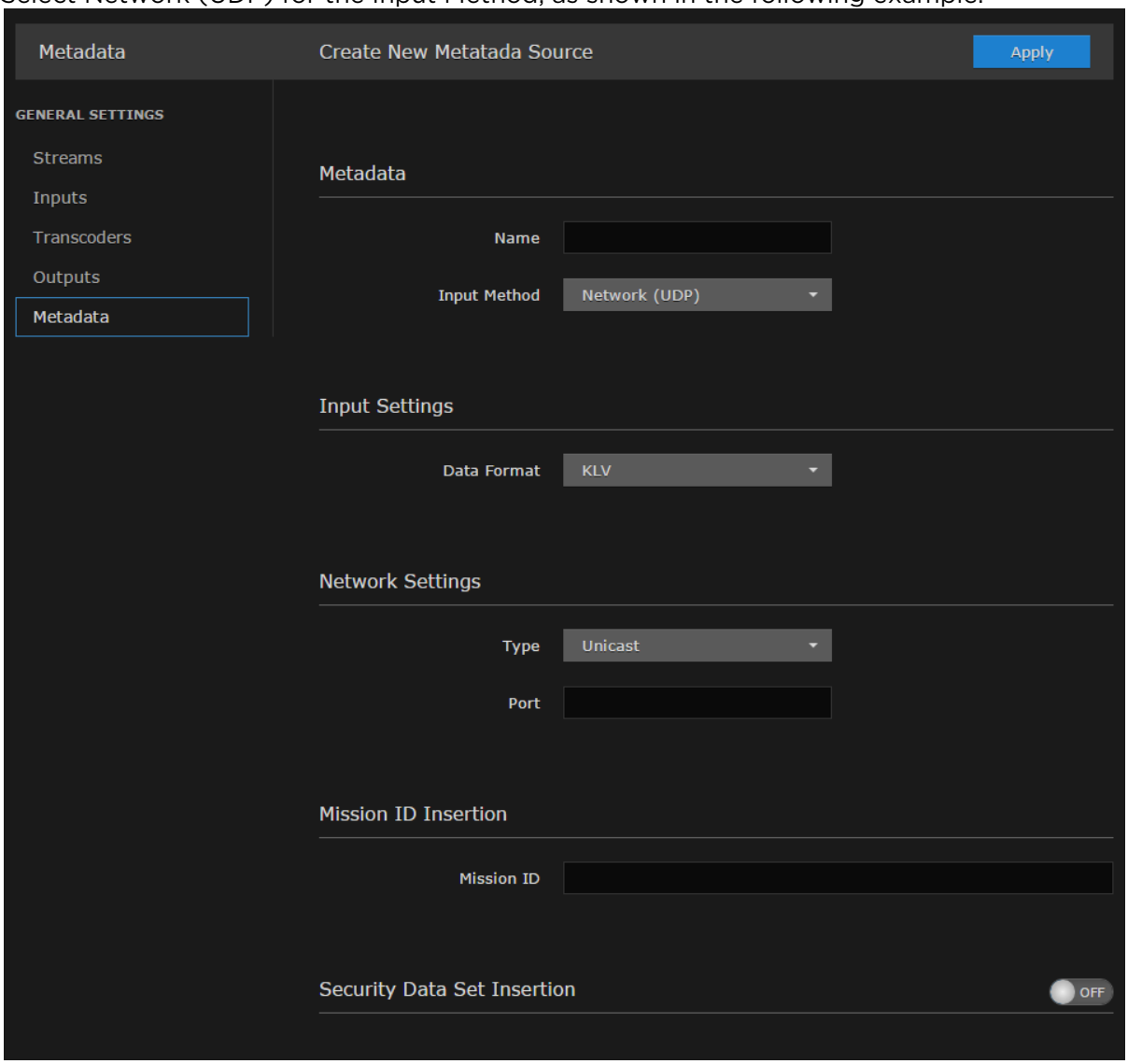
The new source is added to the Metadata List.

HD-SDI Source Serial Source Network Source

Network Source

To configure a network input:

1. Select Network (UDP) for the Input Method, as shown in the following example.



2. If CoT has been installed, select CoT for the Data Format (under Input Settings) and fill in the Max AirCraft-SPI Delta and SPI UID.
3. If required, under Network Settings, select Multicast for the type and fill in the multicast address and port.
4. (Optional) For CoT sources, you can configure CoT Relaying to retransmit CoT sources to other IP destinations for analysis and archiving. See Configuring CoT Retransmission.

5. (Optional) To define a set of static KLV objects (i.e., Mission IDs and Security Classification) to be used to replace erroneous or insert missing metadata within outbound TS steams, see **Configuring KLV Metadata Insertion**.
6. To apply your changes, click **Apply**.

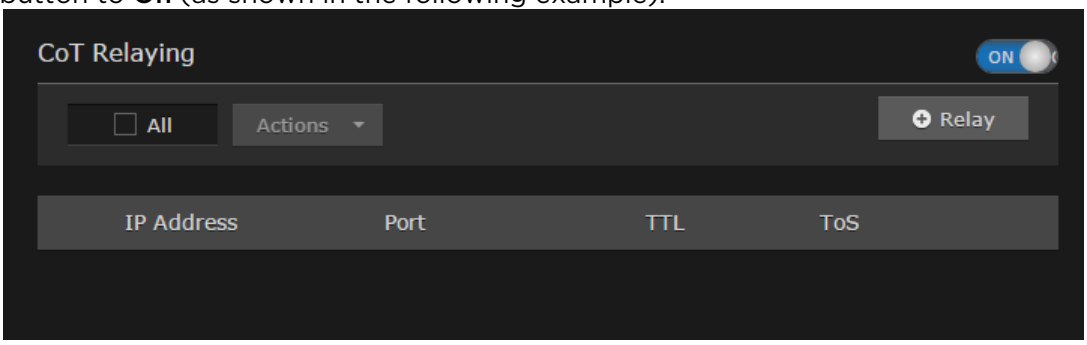
The new source is added to the Metadata List.

Configuring CoT Retransmission

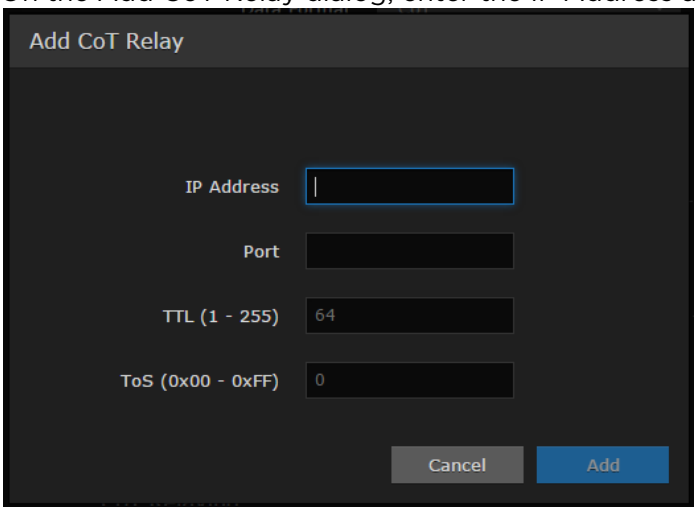
From the Metadata Detail View, you can configure CoT retransmission of COT metadata received over the Serial or UDP interface. The metadata will be retransmitted as a CoT/UDP unicast or multicast stream so that multiple CoT listeners can access the source CoT data. You can retransmit up to 8 CoT/UDP messages.

To configure CoT Retransmission:

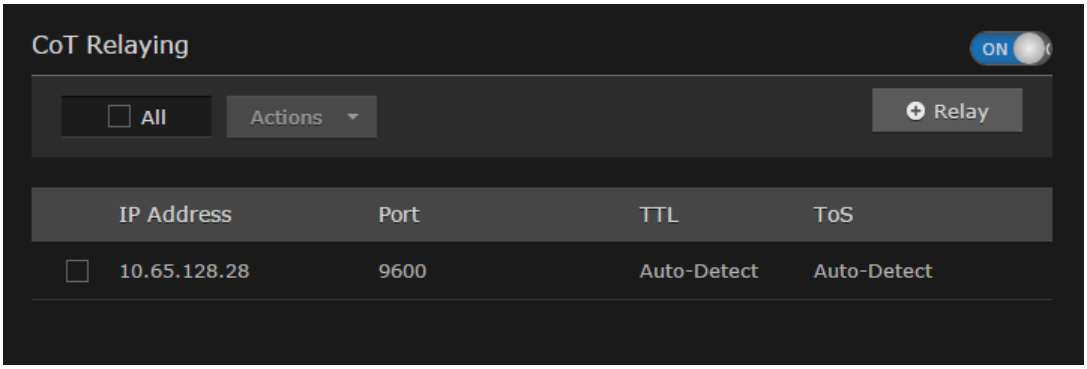
1. From the Metadata List View, create of click the link for a serial or UDP CoT metadata source to retransmit. For details on setting up the metadata source, see **Configuring Metadata Parameters**.
2. On the Metadata Detail View, (if necessary) scroll down the page and toggle the CoT Relaying button to **On** (as shown in the following example).



3. To add a CoT retransmission destination, click the **Relay** button.
4. On the Add CoT Relay dialog, enter the IP Address and Port for the destination.



5. Click **Add**.
   The stream is added to the list:



6. To edit or delete a CoT relay destination, select the relay from the list and select Edit or Delete from the Actions drop-down menu.

Related Topics

- Metadata Settings

Configuring KLV Metadata Insertion

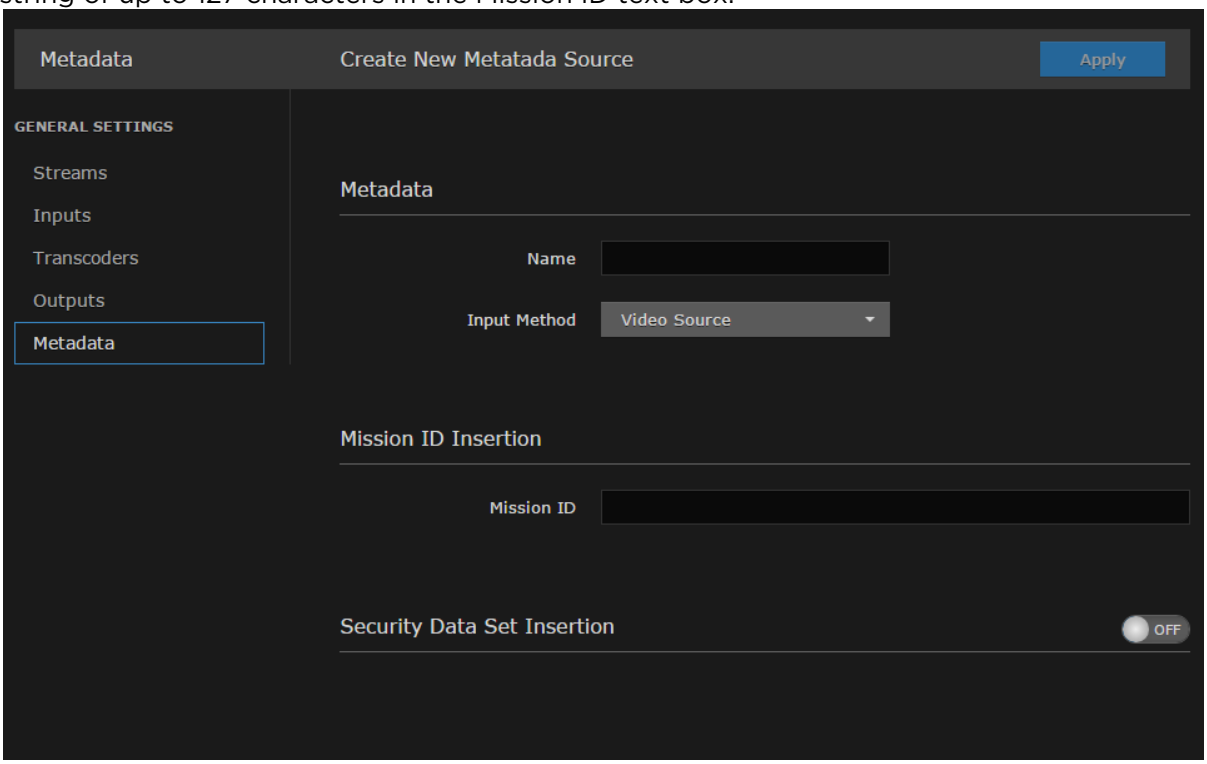
From the Metadata Detail View, you can define a small set of static KLV objects (i.e., mission IDs and security classification) for KLV and CoT metadata sources. This allows customers to modify erroneous or insert missing metadata within outbound TS steams. These options are available:

- Configure a mission ID string of up to 127 characters: When the mission ID is configured, any received UAS KLV dataset will be processed in order to modify the existing mission ID or add a mission ID element if not there with the configured value.
- Enable or disable the update/generation of the security data set in UAS messages: When this feature is enabled, you then specify the classification (Unclassified, Restricted, Confidential, Secret, or Top Secret), the classifying country, and the object country/ies (up to 6) (using the proper ISO 3-letter country code).

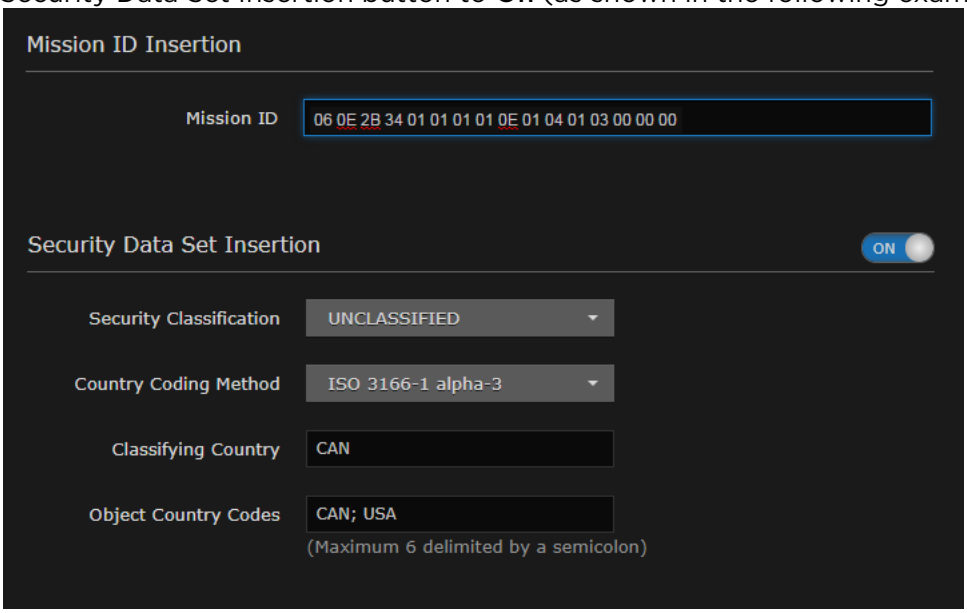
In both cases, the mission ID or security data will get replaced or inserted with the ones created by the Kraken based on the configuration.

To configure insertion of static KLV objects:

1. From the Metadata List View, click the link for the metadata source to define static KLV objects. For details on setting up the metadata source, see **Configuring Metadata Parameters**.
2. On the Metadata Detail View, if necessary, scroll down the page and (optional) type in a mission ID string of up to 127 characters in the Mission ID text box.



3. (Optional) To enable the update/generation of the security data set in UAS messages, toggle the Security Data Set Insertion button to **On** (as shown in the following example).



4. Fill in the remaining fields and click **Apply**.

Related Topics

- Metadata Settings

Metadata Settings

The following table lists the Kraken Metadata settings:

General | Input Settings | Network Settings | CoT Relaying | KLV Insertion

General

Metadata Setting	Default	Description/Values
Name	n/a	Enter a unique name for the metadata source.
Input Method	HD-SDI	Select the input interface for the source, either: • Serial • Video Source (HD-SDI) • Network (UDP)
Serial Port	n/a	(Serial input only) Enter the serial port name if not auto-detected. For example, `/dev/ttyS0` or `/dev/ttyUSB1`.

General | Input Settings | Network Settings | CoT Relaying | KLV Insertion

Input Settings

Metadata Setting	Default	Description/Values
Input Settings (Serial or Network input)		
Data Format	KLV	Select the data format for the metadata. • KLV (Key Length Value) or • CoT (Cursor on Target)
Max AirCraft-SPI Delta	0 ms	(CoT input only) Specifies the maximum delta between SPI and Aircraft message time-stamps for them to be considered a valid pair that can be converted to KLV. `0..1000` ms
SPI UID	n/a	(CoT input only) Double-click the text box to display the list of the SPI messages detected by the Krakenand select a string for the UID filter.

General | Input Settings | Network Settings | CoT Relaying | KLV Insertion

Network Settings

Metadata Setting	Default	Description/Values
Network Settings (UDP Input)		
Type	Unicast	Select the stream type, either unicast or multicast.

Metadata Setting	Default	Description/Values
Network Settings (UDP Input)		
Multicast Address	n/a	(Optional) The address is only required for reception of multicast metadata. In this case, you need to provide the multicast IP address to which the data is being sent. You can also specify the address if you only want to accept KLV messages coming from a specific sender.
Port	n/a	(Required) Specifies the local UDP port on the Kraken that is receiving the packets.

General Input Settings Network Settings CoT Relaying KLV Insertion

CoT Relaying

Metadata Setting	Default	Description/Values
CoT Relaying (See Configuring CoT Retransmission)		
CoT Relaying	Off	When set to On, the system will retransmit received CoT/UDP or CoT/Serial metadata to up to 8 other hosts over UDP. `on,off`
+Relay	n/a	Use to specify the IP address and UDP port for each relayed packets. You can optionally specify the `ttl` and `tos`.
TTL	64	(Time-to Live for stream packets) Specifies the number of router hops that IP packets from this stream are allowed to traverse before being discarded. Range = `0..255`
ToS	0xB8	(Type of Service) Specifies the desired quality of service (QoS). This value will be assigned to the Type of Service field of the IP Header for the outgoing streams. Range = `0..255` (decimal) or `0x00..0xFF` (hex) **Important** A DiffServ or DSCP (Differentiated Services Code Point) value must be converted to a ToS precedence value. For example, AF41 or DSCP 34 becomes ToS 136. For more information, see RFC2474. **Note** The ToS setting must be chosen so as to not interfere with Voice over IP systems and other equipment that may reside on your network. For example, when the ToS value for a stream is set to 0xB8, it can interfere with some third party Voice / IP Telephony systems.

General Input Settings Network Settings CoT Relaying KLV Insertion

KLV Insertion

Metadata Setting	Default	Description/Values
KLV Insertion (See Configuring KLV Metadata Insertion)		
Mission ID Insertion	n/a	Enter a string of up to 127 characters.
Security Data Set Insertion	Off	When set to On, enables reclassification of received UAS KLV messages. `on,off`
Security Classification	UNCLASSIFIED	Specifies the classification of the security data set: UNCLASSIFIED, RESTRICTED, CONFIDENTIAL, SECRET, TOP SECRET
Country Coding Method	ISO 3166-1 alpha-3	The country coding method: ISO 3166-1 alpha-3 (only)
Classifying Country	n/a	The ISO 3166-1 3-letter code for the classifying country.
Object Country Codes	n/a	The ISO 3166-1 3-letter code(s) for up to six object countries separated by semicolons.

System Administration

Note

Before proceeding, make sure that the appliance is set up correctly and the network connection is established. For information on installing and connecting to your Kraken appliance, please refer to the Kraken Server Quick Start Guide or Kraken CR Quick Start Guide.

Topics Discussed

- Monitoring the System Status
- Saving and Loading Presets
- Monitoring Stream Health
- Installing Firmware Updates
- Configuring Network Settings
- Updating the System License
- Setting Up the REST API
- Managing User Accounts

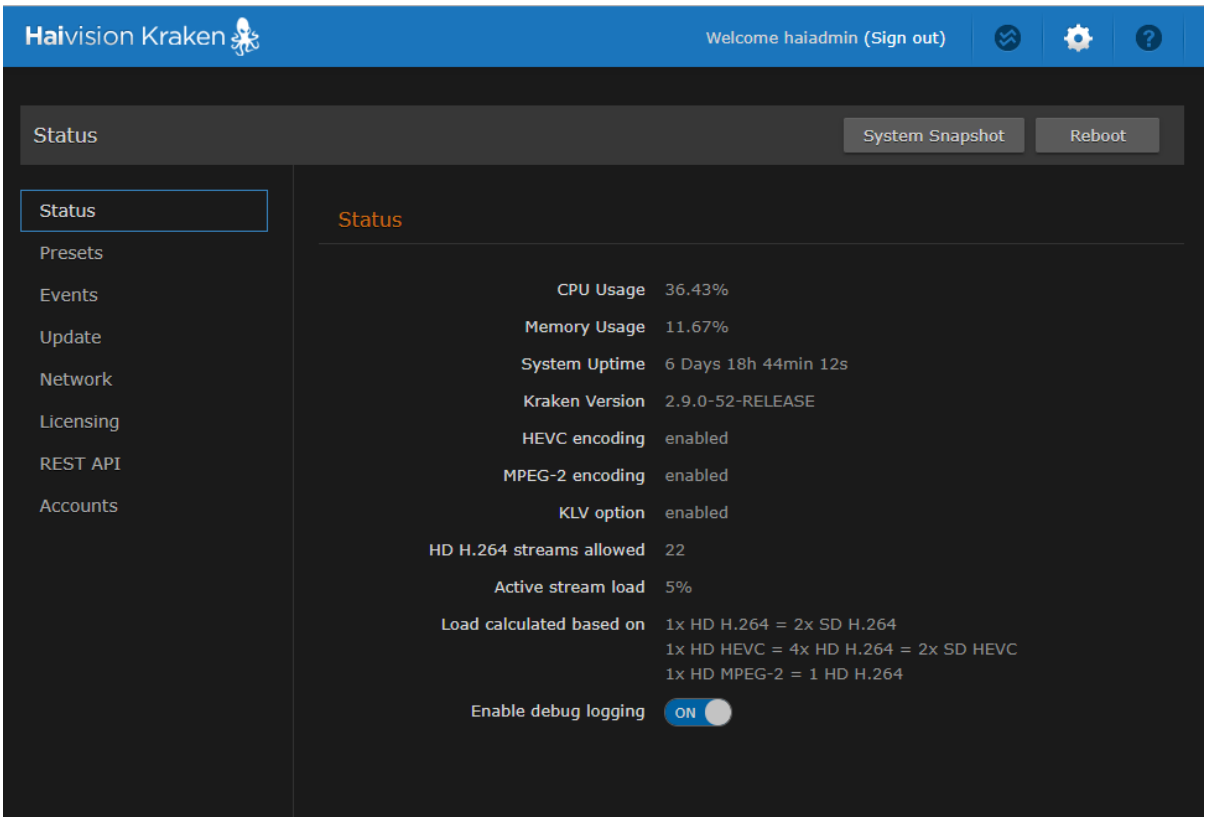
Monitoring the System Status

The Status page displays system status information about the Kraken such as the version, system load, system uptime, and licensed capacity.

You can also reboot the Kraken and take a system snapshot from the Status page.

To view status information:

1. Click the **Administration** icon on the toolbar to navigate to the Administration page. The Status page opens, as shown in the following example.



The Status settings are read-only. For details, see Status Settings.

2. To reboot the encoder, see Rebooting Kraken.
3. To display a snapshot of system information, see Taking a System Snapshot.

Topics Discussed

- Status Settings
- Rebooting Kraken
- Taking a System Snapshot

Status Settings

The following table lists the Status settings. Status information can be useful for troubleshooting and may be forwarded to Haivision Technical Support if you are requesting technical support.

Status Setting	Description/Values
CPU Usage	The combined CPU usage (across all cores). [100% minus the percentage of time the CPU remains idle.]
Memory Usage	The total RAM usage in percentage% (does not include swap space = 0).
System Uptime	The length of time (dd:hh:mm:ss) the appliance has been “up” and running.
Kraken Version	The firmware version of the Kraken, e.g., v2.6- XXXXX

Status Setting	Description/Values
HEVC Encoding	Whether the HEVC Encoding license is enabled or disabled.
MPEG-2 Encoding	Whether the MPEG-2 Encoding license is enabled or disabled.
KLV option	Whether the KLV pass-through license is enabled or disabled.
HD H.264 streams allowed	The number of HD/SD H.264 channels licensed.
Active stream load	The system load based on the stream license. When the system is licensed for 8 HD H.264 streams, it will show 50% when 4 HD H.264 streams are active or 100% when 2 HD HEVC streams are active.
Load calculated based on	The rules that describe the load calculation.
Enable debug logging	Set to On or Off to enable or disable transcoder debug logging. **Note** Enabling transcoder logs may affect system performance and should *not* be used in production. We recommend that transcoder logs be used for debugging purposes only, under the guidance of Haivision Technical Support. Transcoder logs are Off by default and can be turned On/Off individually for each stream with a button in the Stream Statistics page. If you disable debug logging, streams with logs previously enabled will be restarted.
System Snapshot	Displays a snapshot of system information in a new window. See Taking a System Snapshot.
Reboot	Reboots the encoder. See the following section, Rebooting Kraken.

Rebooting Kraken

To reboot Kraken:

1. Click the **Administration** icon on the toolbar.
2. On the Status page, click **Reboot**.

Kraken will reboot and you will be returned to the Login page. If you did not save your configuration/ presets, you will end up with the default configuration with no streams at all.

Taking a System Snapshot

Taking a system snapshot can be useful for troubleshooting and may be forwarded to Haivision Technical Support if you are requesting technical support.

The system snapshot lists information such as component versions, network settings, loaded modules, running processes, system traces, configured streams and stream status checks, configured video encoders and status checks, configured audio encoders and status checks, startup configuration file contents, global settings file contents, debug logging settings file contents, downloaded software packages, last software update log, and OS statistics.

To take a system snapshot:

1. From the Status page, click **System Snapshot**.
   The system will display a timestamped snapshot of system information in a new window, as shown in the following example:

```
================================================================================
START OF SYSTEM SNAPSHOT
================================================================================

--------------------------------------------------------------------------------
Credentials:
--------------------------------------------------------------------------------
uid=0(root) gid=0(root) groups=0(root) context=system_u:system_r:initrc_t:s0

--------------------------------------------------------------------------------
Local Time:
--------------------------------------------------------------------------------
Tue Apr 16 13:44:06 EDT 2019

--------------------------------------------------------------------------------
Universal Time:
--------------------------------------------------------------------------------
Tue Apr 16 17:44:06 UTC 2019

--------------------------------------------------------------------------------
System UP Time:
--------------------------------------------------------------------------------
 13:44:06 up 3 days, 23:38,  1 user,  load average: 0.23, 0.18, 0.12

--------------------------------------------------------------------------------
System Information:
--------------------------------------------------------------------------------
Created VFLOG to HVMAF Logger adapter.
Haivision Transcoder Application -- Version 2.9.0-52-RELEASE
{
  "release-info": {
    "product": "Kraken",
    "version": "2.9.0",
    "build_id": "52",
    "build_type": "RELEASE",
    "commit_id": "885b30455a372a47e6c9077cc3b4bfa20e564c52",
    "pretty_version": "2.9.0-52",
    "pretty_name": "Haivision Kraken release 2.9.0-52"
  }
}

================================================
IGNORE Protobuf SPAM
================================================


HVMAF DeckLink Capture Client -- hvmaf-0.9.0 (20190327 12:34:27)

ffmpeg version 885b30455a372a47e6c9077cc3b4bfa20e564c52-VF Copyright (c) 2000-2018 the FFmpeg developers
built with gcc 4.4.7 (GCC) 20120313 (Red Hat 4.4.7-23)
configuration: --extra-version=VF --prefix=/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/ffmpeg --cc=/usr/bin/gcc --objcc=/usr/bin/gcc --cxx=/usr/bin/g++ --ar=/usr/bin/ar --nm=/usr/bin/nm --target-os=linux --
arch=x86_64 --cpu=x86_64 --enable-pic --enable-static --enable-shared --enable-rpath --disable-appkit --enable-avfilter --enable-zlib --enable-
bzlib --enable-runtime-cpudetect --enable-hardcoded-tables --disable-doc --disable-audiotoolbox --disable-videotoolbox --disable-amf --disable-
cuda --disable-cuvid --disable-d3d11va --disable-dxva2 --disable-nvdec --disable-nvenc --disable-vdpau --
x86asmexe=/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-ortbuild/ort/tools/nasm/bin/nasm --sdl2-
config=/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-ortbuild/ort/stage/sdl2/lib/../bin/sdl2-config --
enable-vaapi --disable-vaapi-x11 --extra-cflags='-I/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/zlib/include -I/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/bzip2/include -I/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/lzma/include -I/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/sdl2/include -I/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/vaapi/include -DVFBUILD_DISABLE_INTMATH_OPTIMIZATIONS=1' --extra-ldflags='-L/var/tmp/tinderbox_build/vfcore-
kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-ortbuild/ort/stage/zlib/lib -L/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-
2.9.0/vf.git/vfcore/kraken-ortbuild/ort/stage/bzip2/lib -L/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-
ortbuild/ort/stage/lzma/lib -L/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-ortbuild/ort/stage/sdl2/lib -
L/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-ortbuild/ort/stage/vaapi/lib -Wl,-
rpath,/var/tmp/tinderbox_build/vfcore-kraken/2.9/release_Kraken-2.9.0/vf.git/vfcore/kraken-ortbuild/ort/stage/vaapi/lib' --disable-stripping --
enable-optimizations
libavutil      56. 21.100 / 56. 21.100
libavcodec     58. 34.202 / 58. 34.202
libavformat    58. 19.202 / 58. 19.202
libavdevice    58.  4.106 / 58.  4.106
libavfilter     7. 39.200 /  7. 39.200
libswscale      5.  2.100 /  5.  2.100
libswresample   3.  2.100 /  3.  2.100


================================================
IGNORE Protobuf SPAM
================================================


HVMAF Shared Memory IPC EnCoder -- hvmaf-0.9.0 (20190327 12:34:27)
```

2. Save the file.

Saving and Loading Presets

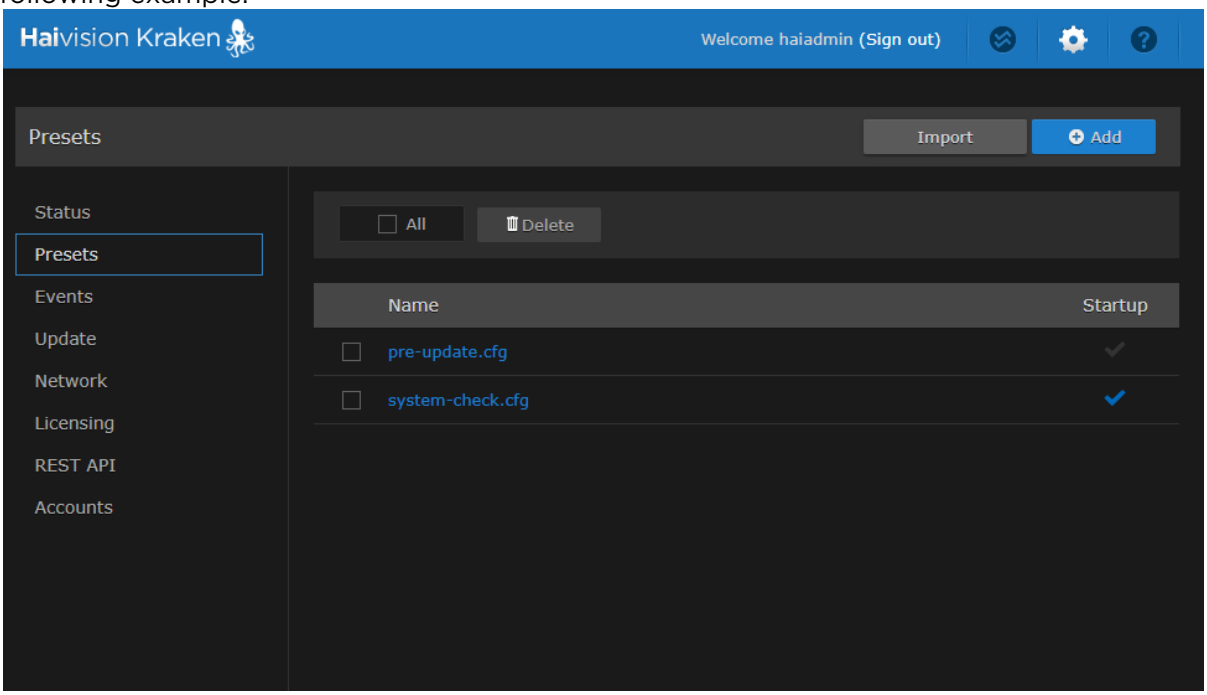
Each Kraken is configured by users' selecting and setting values of applicable system settings, such as encoder and stream settings and the stream destination. Although these configuration settings are not automatically saved, *presets* provide a way for you to save groups of settings and recall these configurations settings to apply to other streams.

Configuration settings saved as the "startup" preset will continue to be used after a reboot, or when the unit is turned off and on. You can also direct the system to apply a preset to restore settings when the system startup process performs the configuration autoload.

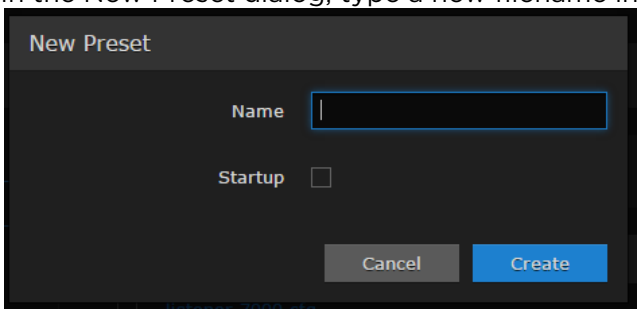
From the Presets page, you can view the list of saved presets, load a saved preset, and save the current settings as a preset. You can also view the contents of a preset file, delete a preset, and select the preset to load at startup.

To view and manage presets:

1. On the Administration page, click **Presets** on the sidebar.
2. The Presets List View opens displaying the list of saved presets for the encoder, as shown in the following example.



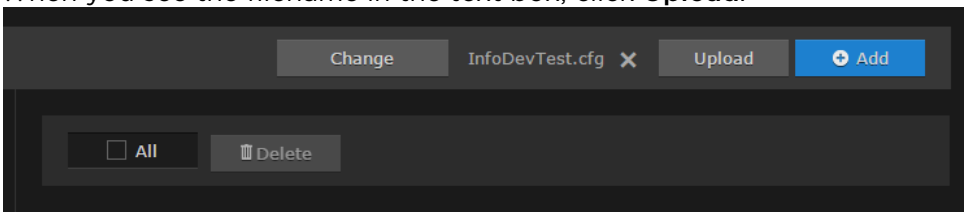
   The Presets List View opens displaying the list of saved presets for the encoder, as shown in the following example.
3. To load an existing preset into the current session, hover over the preset name or anywhere in the row and click **Load**.
4. To select an existing preset to load at startup, hover over the preset row and click the (grayed out) check mark under **Startup**.
5. To save the current settings as a new preset, click **Add** button.
   a. In the New Preset dialog, type a new filename in the Name text box.



   b. To select this preset to load at startup, check the **Startup** checkbox.

c. Click **Create**.

6. To save the current settings as an existing preset, hover over the preset row and click **Save**. You can (optionally) check the **Startup** check mark.
7. To save the preset as a text file to view or export to other Kraken encoders, click the preset name and save it in the Save As dialog. Note that the file is in Unix format.
8. To import a preset, for example, from another Kraken encoder, click **Import** and select the file in the Open File dialog box.
9. When you see the filename in the text box, click **Upload**.



Tip

To select a different preset file, click **Change**. To remove the selection, click the ✕ icon.

10. To delete one or more presets, check the checkbox next to one or more preset names (or check **All**) and click **Delete** on the Content toolbar.

Monitoring Stream Health

Release 2.9 features stream event reporting with the option to download the stream event log. This feature is designed to aid in diagnostics and debugging sessions, in particular, providing feedback related to problematic streams that have been restarted by Kraken error handling or the watchdog process.

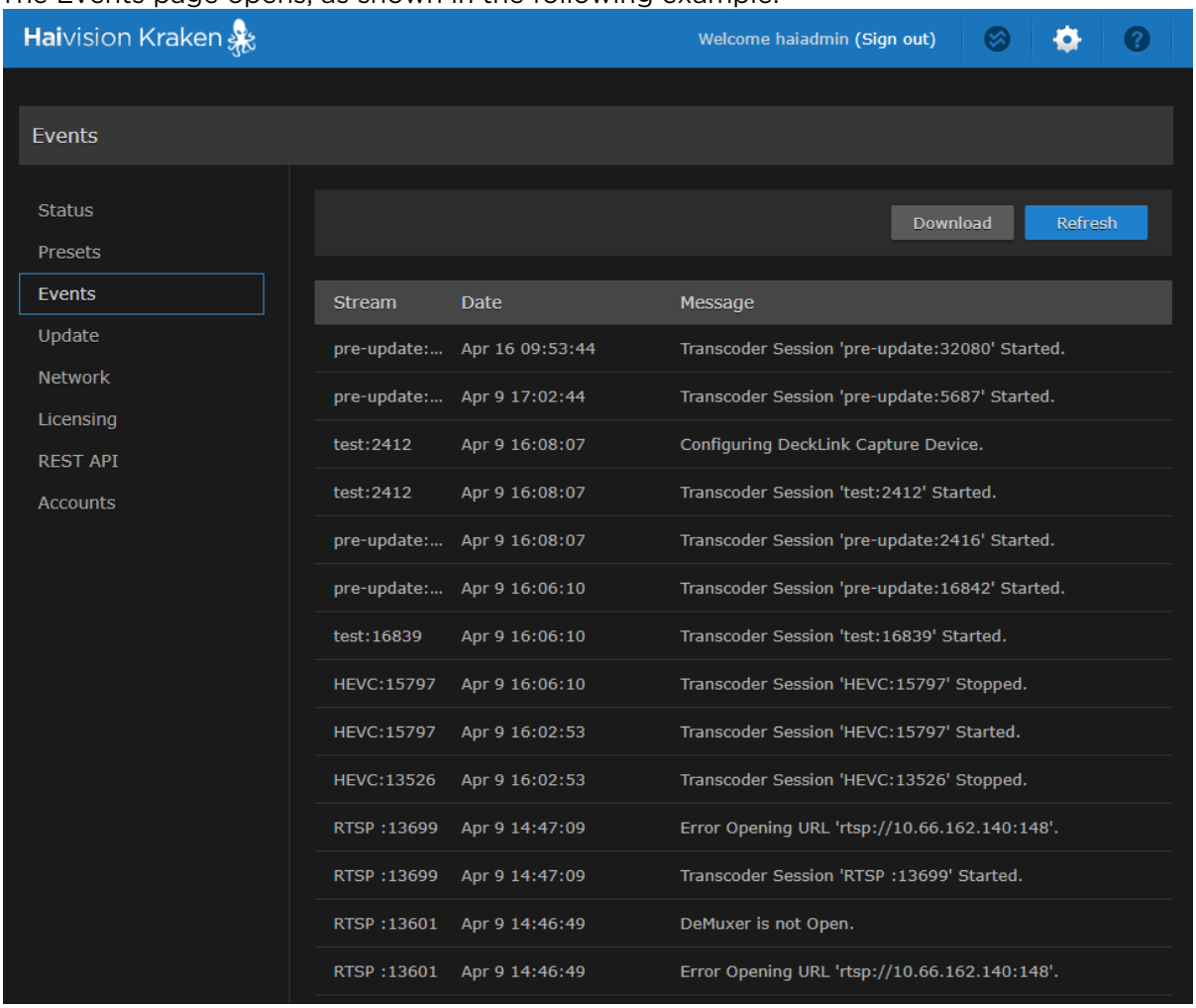
The Events page displays a list of events in reverse chronological order (newest to oldest). The list shows the stream name and UUID, followed by the date and a description of the event. Hovering your mouse over a message displays the full message, which is useful for longer messages.

Note

The event log rolls over every two days; i.e., events are removed from the list after two days.

To view event information:

1. On the Administration page, click **Events** on the sidebar.
   The Events page opens, as shown in the following example.



2. To refresh the list, click **Refresh**.

3. To download the list, click **Download** and save the log file. You can then open the log in a text editor.

Installing Firmware Updates

> **Tip**
>
> On systems licensed for MPEG-2 output, when upgrading from v2.5.0 or earlier, you will need to apply the license *before* the upgrade and a second time after the upgrade to license the new features.

When you first receive the Kraken, the necessary firmware is pre-installed on it. Firmware updates are issued through Haivision's Download Center on our website at: https://support.haivision.com

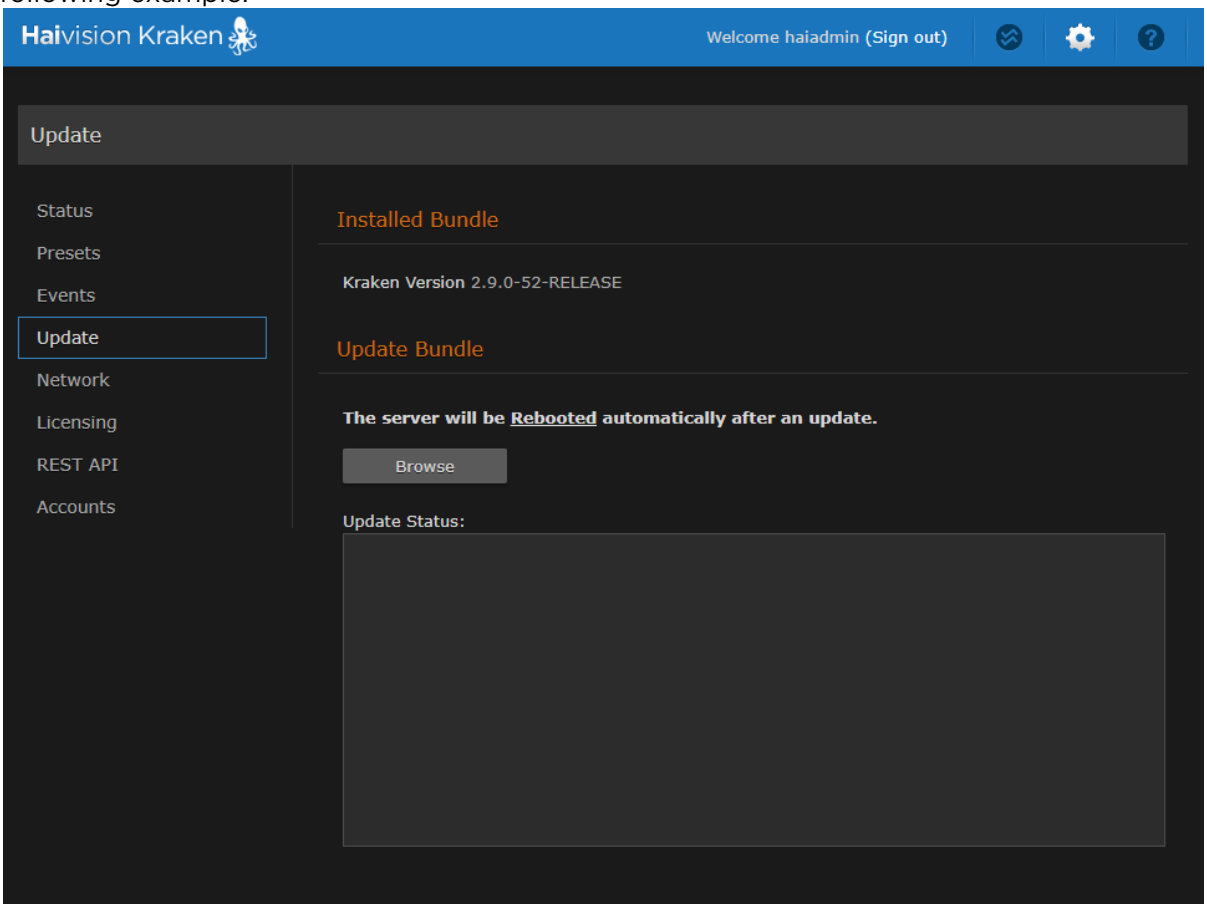
Please note that you may download the latest firmware and documentation by registering via the Haivision Support Portal.

When a firmware update becomes available, you can easily install it from the Web interface. You will first need to copy the update file to your local computer or network. The firmware update comes in the form of a file with the extension .hai, which when loaded will replace the application on your Kraken.

To install a firmware update:

1. On the Administration page, click **Update** on the sidebar.

2. The Update page opens displaying the currently installed firmware version, as shown in the following example.



3. Click **Browse** (or **Choose File**, depending on your browser) to select the .hai file to upload.
4. Click **Update**.

> **Important**
>
> Wait for the file to be uploaded. Remain on this page and do *not* click anything else in the Kraken Web interface during the upload.

When the file is uploaded, the upgrade will start automatically.

> **Caution**
>
> You must remain on this page until the system completes the process of unpacking the firmware. Failure to do so could result in damage to your system.

5.

> **Tip**
>
> After upgrading, clear your browser's cache to ensure that all new screens display correctly.

6. Type the Username and Password and click **Log In** (or press Enter).

Configuring Network Settings

Note

Network settings are not configurable through the Web Interface on the software-only Kraken. The Network Settings page is only available for Kraken appliances.

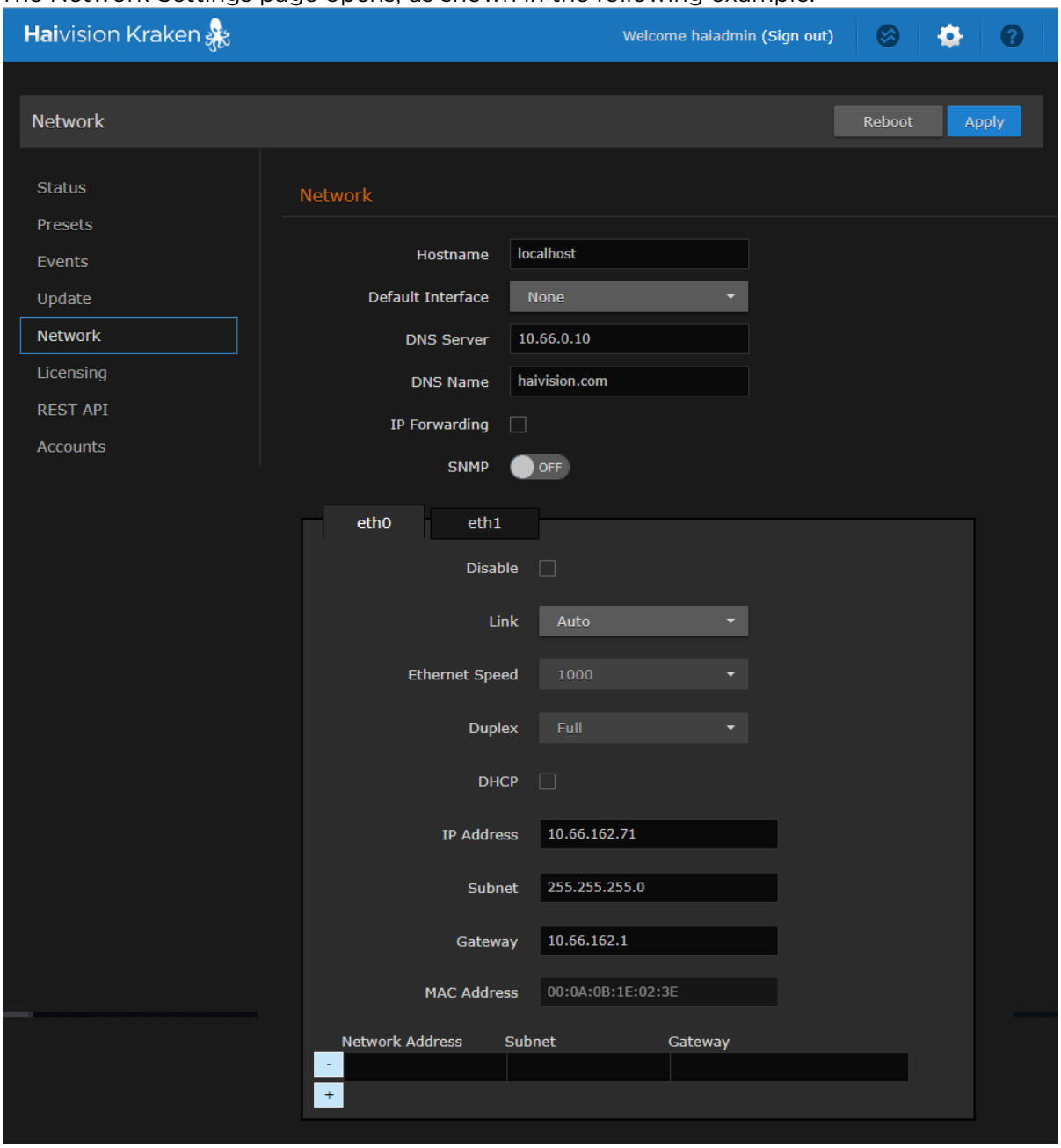
From the Network Settings page, you can modify the network interface settings for the Kraken, including the unit's IP Address.

Caution

When you make changes to the Network Settings, be sure to write down the new IP Address or label the chassis. After you save your changes and reboot, you will have to redirect the browser to the new IP address and log in again in order to access the appliance.

To view and configure the Network Settings:

1. On the Administration page, click **Network** on the sidebar.
   The Network Settings page opens, as shown in the following example.



2. Select or enter the new value(s) in the appropriate field(s). See Network Settings.
3. To enable SNMP alerts, toggle the SNMP button to On and specify the read-only community string and trap server(s).
4. To add a static route, fill in the Network Address, Subnet, and Gateway in the routing table below the MAC Address field. Click + to add additional static routes.

> **Tip**
>
> All entries in the routing table must be in dotted-decimal format.

5. To configure additional NICs (Network Interface Cards) for the server, click the next available interface tab (if available) and configure the required settings.

6. Click **Apply**.
   You must reboot the system for the changes to take effect. The **Reboot** button appears after you click **Apply**.
7. To apply your saved changes, click **Reboot**.

The Kraken will reboot. You need to refresh the page after approximately five minutes to see the Login page again.

Topics Discussed

- Network Settings

Network Settings

The following table lists the Kraken Network settings:

Network Setting	Description/Values
Hostname	You may, optionally, enter a unique name for the Kraken.
Default Interface	The default Ethernet interface: Select an available interface, such as eth0, eth1, em1, or em2. **Note** Network Interface names for Ethernet interfaces may vary, such as eth0/eth1/... or em1/em2/.... "None" indicates that the default interface is not set.
DNS Server	(Optional) Enter the DNS server address for your network.
DNS Name	(Optional) Enter the domain for the Kraken.
IP Forwarding	Check this checkbox to enable IP forwarding when setting up streams using non-primary interfaces for their input.
SNMP	To enable SNMP (Simple Network Management Protocol) alerts for out-of-band monitoring, toggle this button to **On**. This tells Kraken to start the SNMP server, in order to query for OS information, such as CPU usage. SNMP alerts are typically used by IT administrators to monitor system health.

Read-Only Community	(SNMP must be enabled) Type in the SNMP community string associated with the SNMP Trap Server. This is the string to use when sending a trap to an SMTP Trap server. For example: "Kraken"
SNMP Trap Servers	(SNMP must be enabled) The SNMP server to send SNMP Traps to. This is an IPv4 or FQDN of an SMTP Trap server listening for traps via SNMP. For example: **SNMP1.mycompany.com**
Network Interface (eth0, eth1, etc.)	
Disable	Check this checkbox to disable (i.e., bypass) transcoding. This may be useful in the following cases: • Monitoring: Kraken's NICs are often used over multiple network segments, where it routes inbound traffic from one NIC to a second one with transcoding involved during the process. This feature supports routing the traffic from one NIC to another – straight through, as is – without any transcoding for distribution to the "public" segment where monitoring/troubleshooting tools can be used (such as VLC, InStream, Amino STB, etc.) • High quality routing: In IPTV applications, the need may be present to send high quality HD content to set-top boxes and lower resolution streams to desktops. This feature may be used to send the inbound streams straight out (to an STB), while a copy would be then transcoded/transrated to a lower bit rate for desktop consumption.
Link	Determines whether the Ethernet parameters are set automatically or manually (i.e., enables or disables autonegotiation): • Auto - The system will match the Ethernet Speed and Duplex Mode to the Ethernet hub to which it is connecting: • Manual - These values must be set manually. See following settings. **Note** Always use Auto with Gigabit Ethernet (GigE) speed (1000 Mbps).
Ethernet Speed	If Link is set to Auto, the actual value for the Ethernet Speed (read-only). If Link is set to Manual, select the Ethernet Speed (in Mbps): • 100 • 10
Duplex	If Link is set to Auto, the actual value for the Duplex Mode (read-only). If Link is set to Manual, select the Duplex Mode: • Full • Half
DHCP	**Note** When DHCP is enabled, the Kraken will get an IP Address from a DHCP server on the network. When it is disabled, you must manually enter the appliance's IP Address, Netmask & Gateway Address.
IP Address	**Note** If DHCP is disabled, you may enter an IP address in dotted-decimal format.
Subnet	**Note** If DHCP is disabled, you may enter a Netmask in dotted-decimal format.

Gateway	**Note** If DHCP is disabled, you may enter a gateway address in dotted-decimal format.
MAC Address	(Read-only) The Media Access Control address assigned to the Kraken.
static routes	Fill in first row to add a static route. Click + to add routes.
Network Address	Type in the IP address for the route in dotted-decimal format.
Subnet	Type in the Subnet Mask (Netmask) for the route.
Gateway	Type in the gateway address for the route.

Updating the System License

You can update your Kraken license directly from the Web Interface. Updating a license is typically required to expand the feature set or capabilities of the system, for example, to upgrade from SD to HD, enable KLV data, or obtain more input streams or unique transcodes.

Your first step is to obtain the new license file from Haivision Technical Support (https://support.haivision.com). Next you need to copy and paste the new license string into the License page and submit it. Only a valid license will be accepted; if an invalid license is entered, it will be rejected and not replace the current license being used.

Note

Kraken offers licensable options (perpetual licenses) for KLV pass-through, HEVC Encoding, as well as the number of H.264 encoding channels. HEVC Decoding does not require a license.

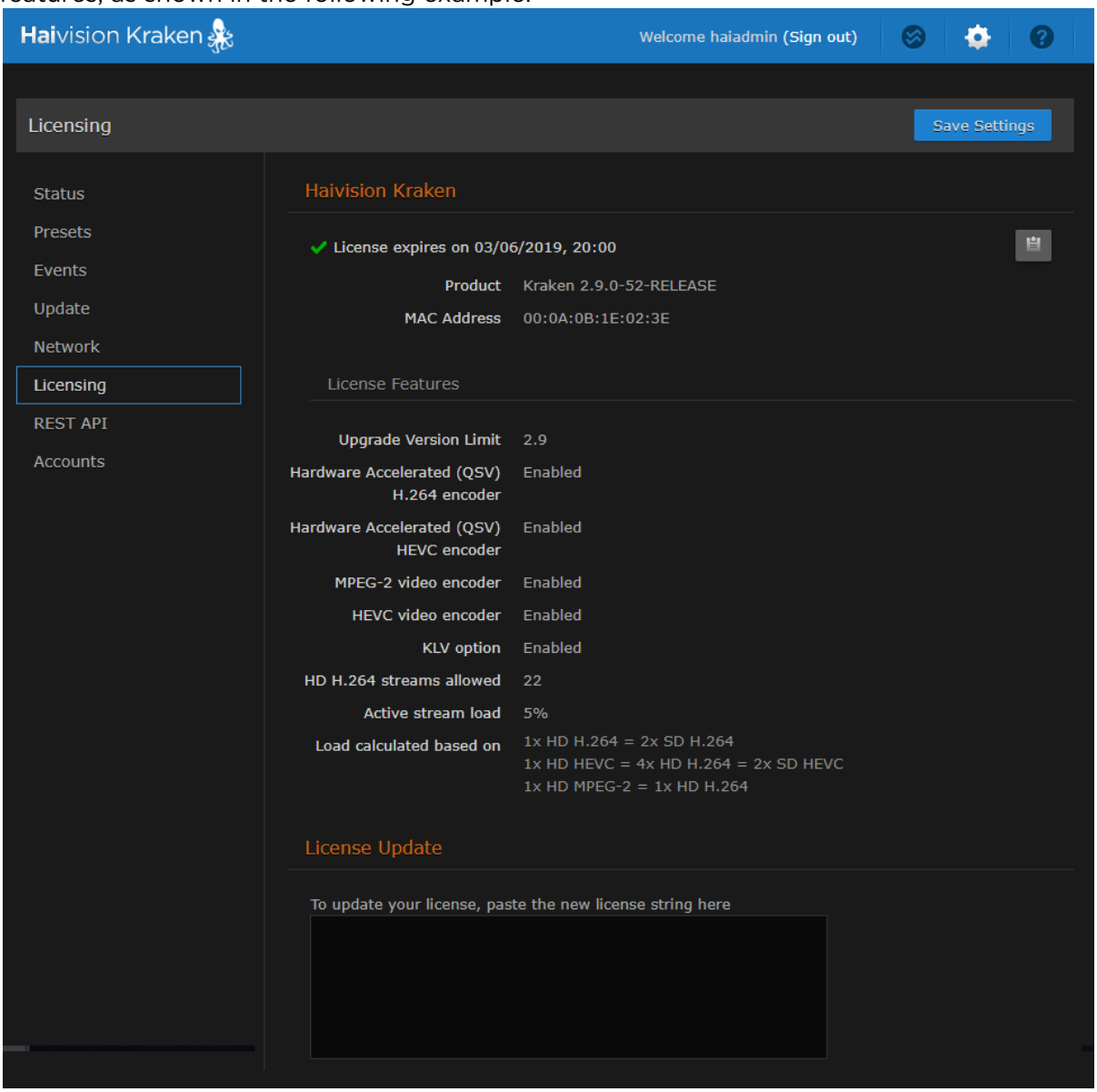
Tip

The Upgrade Version Limit indicates the highest version that the current license supports. For example, if the upgrade version limit is 2.8, you would need to re-license your system for 2.9 (or higher) prior to upgrading to 2.9.

To update your system license:

1. On the Administration page, click **Licensing** from the sidebar.
   The Licensing page opens displaying the installed license, including its expiration date and license

features, as shown in the following example.



Note

If you are running a VM Kraken version, the Licensing page also shows the Instance UUID and CPU ID.

2. To update your license, copy the new license string in the text box.
3. Click **Apply** to load the license.

Setting Up the REST API

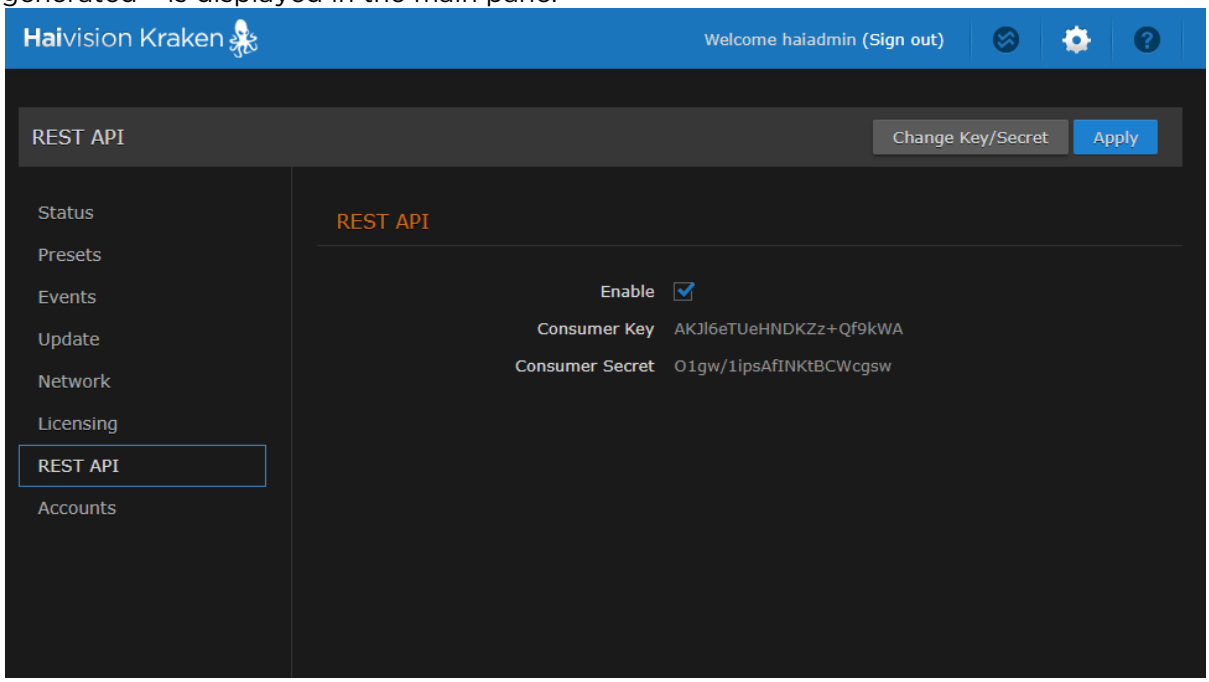
The Kraken API (Application Programming Interface) is a REST (Representational State Transfer) API. The Kraken API uses the OAuth standard for authorization when a third party application requests access. For details on the API, please see the Kraken REST API Integrator's Guide.

Important

Because there is only one user account on the Kraken, only one key pair is supported at a time. Therefore, each time you generate a new key, this will overwrite and invalidate the previous key.

To generate the API Credential:

1. On the Administration page, click **REST API** on the sidebar.
   The REST API page opens, as shown in the following example. The current key pair – if previously generated – is displayed in the main pane.



2. To enable API access for the Kraken, check the Enable checkbox.
3. To generate a key pair, click **Change Key/Secret**. The key and secret pair are now displayed/updated and may be shared with developers of third party applications.
4. If you checked or cleared the Enable REST API checkbox, click **Apply**.

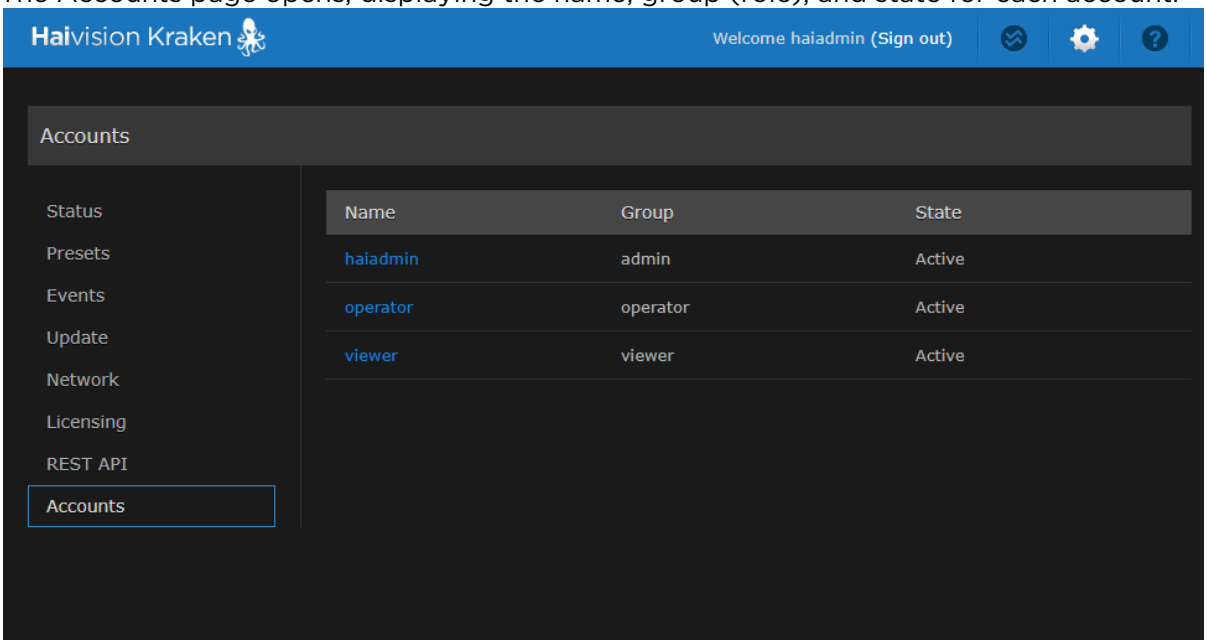
Managing User Accounts

Note

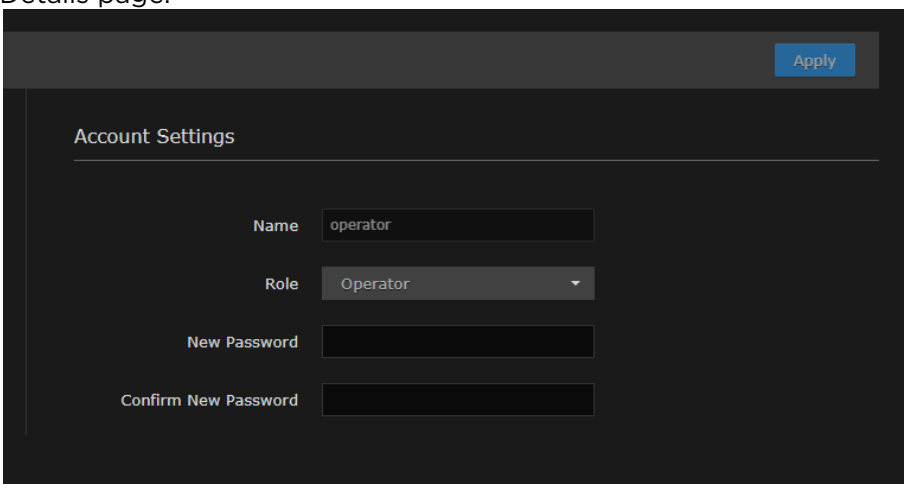
The My Account page is available to users assigned either **Operator** or **Viewer** accounts. See Changing Your Password.
Kraken provides three predefined user accounts to assign privileges to users. For the privileges assigned to accounts, see Role-based Authorization.

To view and configure the user accounts:

1. On the Administration page, click **Accounts** on the sidebar.
   The Accounts page opens, displaying the name, group (role), and state for each account.



2. To change the password for an account, click the account link in the table to open the Account Details page.



3. To reset your own password (i.e., for the account to which you have logged in), type in your current password in the Current Password field.

or

(`haiadmin` only) To reset the password for the `operator` or `viewer` accounts, skip to the following step.

4. Type the new password in the New Password field and again in the Confirm New Password field.
5. Click **Apply**.

Technical Specifications

This section lists the technical specifications for the Kraken.

Topics Discussed

- Transcoding
- Video Processing
- Networking
- Management
- Kraken Transcoding System
- Physical

Transcoding

Sources	
• Makito, Piranha Encoders • 3rd Party Encoders • MJPEG from L-3 Vortex • Digital Video Broadcast	
Input H.265/HEVC	**Output H.265/HEVC**
• Main Profile • Up to Level 4 (1080p30) • Transport Stream • Up to 10 Mbps • CBR, VBR	• Main Profile • Up to Level 4 (1080p30) • Transport Stream • Up to 10 Mbps • Transport Stream Shaping, VBR
Input H.264/AVC	**Output H.264**
• Baseline, Main, High Profile • Up to Level 4.2 (1080p60) • Transport Stream • 0 kbps - 20 Mbps • CBR, VBR	• Baseline, Main, High Profile • Up to Level 4.2 (1080p60) • Transport Stream • Up to 20 Mbps • Transport Stream Shaping, VBR
Input MPEG-2	**Output MPEG-2 Video**
• MainProfile@MainLevel (SD) • MainProfile@HighLevel (HD) • Transport Stream • Up to 20 Mbps • CBR, VBR	• Simple and Main Profile@MainLevel • Up to 10 Mbps • Transport Stream Shaping, VBR
Input Audio	**Output AAC Audio**
• MPEG1 layer 2 • AAC 2 channel and 5.1	• AAC 2 channel • Audio Sync Preserved

	Output MPEG-1 Audio
	• 2 Channel MPEG-1 Layer II • Audio Sync Preserved
Metadata Pass-through (Supported Standards)	
• Closed Captioning (EIA-608 & EIA-708) • KLV with support of both Asynchronous and Synchronous KLV • Support of MISB Standard 0601 • Support of MISB Standard 0604 • SMPTE 336M-2007 Data Encoding Protocol	

Video Processing

Video Processing
De-interlacing
Down Scaling
Aspect Ratio Preserved
Configurable Frame Rate

Networking

Networking
Note Multi Program Transport Stream (MPTS) inputs are *not* supported.
Unicast/Multicast
TS over UDP
Session Announcement (SAP)

Management

Management
Web User Interface (HTTPS only)
REST API
Console UI

Kraken Transcoding System

Kraken Transcoding System	
Operating System:	Software-only for Linux or appliance form factor
Standard IP Interfaces:	2 x RJ-45 Ethernet

Physical

Kraken Server Base System (S-KR-BASE)

Physical Specifications - Kraken Server Base System (S-KR-BASE)	
Capacity:	Up to 2x HD H.264/AVC encoding channels only (no H.265/ HEVC encoding)
Dimensions (H x W x D):	Dimensions without faceplate (1RU): • 1.66″ x 17.09″ x 15.52″ • 42.4 mm x 434.0 mm x 394.3 mm
Weight:	17.76 lbs. (8.06 kg)
Power:	1x Non-Redundant 100-240 VAC 250 W Power Supply

Kraken Server Premium System (S-KR-PREMIUM)

Physical Specifications - Kraken Server Premium System (S-KR-PREMIUM)	
Capacity:	• Up to 8x HD H.264/AVC encoding channels • Up to 2x HD H.265/HEVC encoding channels
Dimensions (H x W x D):	Dimensions without faceplate (1RU): • 1.68″ x 17.09″ x 23.9″ • 42.8 mm x 434.0 mm x 607 mm
Weight:	43.87 lbs. (19.9 kg)
Power:	2x Redundant 100-240 VAC 550 W Power Supplies

Kraken Server Ultra System (S-KR-ULTRA)

Physical Specifications - Kraken Server Ultra System (S-KR-ULTRA)	
Capacity:	• Up to 16x HD H.264/AVC encoding channels • Up to 4x HD H.265/HEVC encoding channels
Dimensions (H x W x D):	Dimensions without faceplate (1RU): • 1.68″ x 18.98″ x 27.6″ • 42.8 mm x 482.3 mm x 700.5 mm
Weight:	59 lbs. (26.76 kg)
Power:	2x Redundant 100-240 VAC 750 W Power Supplies

Kraken CR (S-KR-CR-KLV)

Physical Specifications - Kraken CR (S-KR-CR-KLV)	
Dimensions (L x W x H):	• 8.42" x 4.92" x 1.75" • 213.87 mm x 124.97 mm x 44.45 mm
Weight:	2.6 lbs. (1.18 kg)
Power:	100-240 VAC External locking power supply 12-28 VDC, 45W
Temperature:	• Operating: 0° to 50°C (32° to 122° F) • Non-Operating: -40° to 50°C (-40° to 122° F)

Open Source Software Credits

Kraken ships with and/or utilizes the following Open Source Projects:

Package	Version	Description / License Information
CentOS	6.9	Operating System Distrubution: https://www.centos.org/ License: GPLv2.0, Creative Commons Attribution-Share Alike License http://mirror.centos.org/centos/6/os/x86_64/RELEASE-NOTES-en-US.html End User License Agreement: http://mirror.centos.org/centos/6/os/x86_64/EULA Legal Disclaimers: https://www.centos.org/legal/
acl	2.2.49	Utilities to manipulate access control lists: http://acl.bestbits.at/ License: GPLv2.0
acpid	1.0.10	Daemon that dispatches ACPI events to user-space programs: http://acpid.sourceforge.net/ License: GPLv2.0
aesgladman	2013	AES crypto library: http://brg.a2hosted.com//oldsite/cryptography_technology/index.php License: BSD
aften	0.0.8	Audio Encoder library: http://aften.sourceforge.net/ License: LGPLv2.0 and BSD
alsa-lib alsa-utils	1.1.0	Advanced Linux Sound Architecture (ALSA) library: http://www.alsa-project.org/ License: LGPLv2.0
amtu	1.0.8	Abstract Machine Test Utility (AMTU): http://sourceforge.net/projects/amtueal/ License: CPL
anaconda-yum-plugins	1.0.5	Installation-related yum plugins: http://fedoraproject.org/wiki/Anaconda License: GPLv2.0
apr apr-util apr-util-ldap	1.3.9	Apache Portable Runtime library: http://apr.apache.org/ License: APLv2.0
aspell	0.60.6	Spell checker: http://aspell.net/ License: LGPLv2.0
at	3.1.10	Job spooling tools: http://ftp.debian.org/debian/pool/main/a/at/ License: GPLv2.0
atk	1.30.0	Interfaces for accessibility support: http://developer.gnome.org/projects/gap/ License: LGPLv2.0
attr	2.4.44	Utilities for managing filesystem extended attributes: http://acl.bestbits.at/ License: GPLv2.0
audiofile	0.3.6	Library to read and write audio files: https://github.com/mpruett/audiofile/ License: LGPLv2.1

Package	Version	Description / License Information
audit audit-libs audit-libs-python	2.4.5	User space tools for 2.6 kernel auditing: http://people.redhat.com/sgrubb/audit/ License: GPLv2.0
authconfig	6.1.12	Tool for setting up authentication from network services: https://fedorahosted.org/authconfig License: GPLv2.0
autossh	1.4c	Utility to autorestart SSH tunnels: http://www.harding.motd.ca/autossh/index.html License: BSD
avahi-libs	0.6.25	Libraries for avahi run-time use: http://avahi.org License: LGPLv2.0
b43-openfwwf	5.2	Open firmware for some Broadcom 43xx series WLAN chips: http://www.ing.unibs.it/openfwwf/ License: GPLv2.0
basesystem	10.0	The skeleton package which defines a simple Red Hat Enterprise Linux system: https://www.centos.org/ License: PublicDomain
bash	4.1.2	The GNU Bourne Again shell: http://www.gnu.org/software/bash License: GPLv3.0
bc	1.06.95	GNU's bc (a numeric processing language) and dc (a calculator): http://www.gnu.org/software/bc/ License: GPLv2.0
bind-libs bind-utils	9.8.2 9.11.0-P1	Utilities and libraries for querying DNS name servers: http://www.isc.org/products/BIND/ License: ISC
binutils	2.20.51.0.2	A GNU collection of binary utilities: http://sources.redhat.com/binutils License: GPLv3.0
biosdevname	0.7.2	Udev helper for naming devices per BIOS names: http://linux.dell.com/files/biosdevname License: GPLv2.0
bison	2.4.1	A GNU general-purpose parser generator: http://www.gnu.org/software/bison/ License: GPLv3.0
blktrace	1.0.1	Utilities for performing block layer IO tracing in the linux kernel: http://brick.kernel.dk/snaps License: GPLv2.0
boost	1_66_0	Portable C++ libraries: http://www.boost.org/ License: http://www.boost.org/LICENSE_1_0.txt
boost-process	0.5	Boost.Process: http://www.highscore.de/boost/process0.5/index.html License: http://www.boost.org/LICENSE_1_0.txt
bridge-utils	1.2	Utilities for configuring the linux ethernet bridge: http://bridge.sourceforge.net/ License: GPLv2.0
bsd-imports	10.3 11.1	Functions cherry picked from BSD distributions: https://www.freebsd.org/ and https://www.openbsd.org/ License: BSD

Package	Version	Description / License Information
btparser	0.17	Parser and analyzer for backtraces produced by GDB: http://fedorahosted.org/btparser License: GPLv2.0
bwidget	1.8.0	Extended widget set for Tk: http://tcllib.sourceforge.net/ License: https://www.tcl.tk/software/tcltk/license.html
bzip2 bzip2-libs	1.0.5 1.0.6	File compression utility and library: http://www.bzip.org/ License: BSD
ca-certificates	2017.2.14	The Mozilla CA root certificate bundle: http://www.mozilla.org/ License: PublicDomain
cairo	1.8.8	A 2D graphics library: http://cairographics.org License: LGPLv2.0
cdparanoia-libs	10.2	Libraries for libcdda_paranoia (Paranoia III): http://www.xiph.org/paranoia/index.html License: LGPLv2.0
checkpolicy	2.0.22	SELinux policy compiler: https://www.centos.org/ License: GPLv2.0
chkconfig	1.3.49.5	Tool for maintaining the /etc/rc*.d hierarchy: https://www.centos.org/ License: GPLv2.0
cloog-ppl	0.15.7	Parma Polyhedra Library backend: http://www.cloog.org License: GPLv2.0
cmrt	1.0.6	C for media runtime: https://github.com/intel/cmrt License: MIT
ConsoleKit ConsoleKit-libs	0.4.1	ConsoleKit libraries and utilities: http://www.freedesktop.org/wiki/Software/ConsoleKit License: MIT
coreutils coreutils-libs	8.4	Libraries and utilities for coreutils: http://www.gnu.org/software/coreutils/ License: GPLv3.0
cpio	2.10	A GNU archiving program: http://www.gnu.org/software/cpio/ License: GPLv3.0
cpupowerutils	1.3	CPU power management utilities: http://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/tools/power License: GPLv2.0
cpuspeed	1.5	CPU frequency adjusting daemon: http://carlthompson.net/Software/CPUSpeed License: GPLv2.0
cracklib cracklib-dicts cracklib-python	2.8.16	A password-checking library: http://sourceforge.net/projects/cracklib/ License: LGPLv2.0
crda	3.13_2015.10.22	Regulatory compliance daemon for 802.11 wireless networking: http://www.linuxwireless.org/en/developers/Regulatory/CRDA License: ISC
cronie	1.4.4	Cron daemon for executing programs at set times: https://fedorahosted.org/cronie License: ISC, MIT, BSD, GPLv2.0
crontabs	1.10	Root crontab files used to schedule the execution of programs: https://www.centos.org/ License: GPLv2.0, PublicDomain

Package	Version	Description / License Information
cups-libs	1.4.2	Common Unix Printing System - libraries: http://www.cups.org/ License: LGPLv2.0
curl	7.19.7	A utility for getting files from remote servers (FTP, HTTP, and others): http://curl.haxx.se/ License: MIT
cvs	1.11.23	A version control system: http://www.cvshome.org/ License: GPLv2.0, LGPLv2.0
cyrus-sasl cyrus-sasl-lib	2.1.23	Cyrus SASL: http://asg.web.cmu.edu/sasl/sasl-library.html License: BSD
dash	0.5.5.1	Small and fast POSIX-compliant shell: http://gondor.apana.org.au/~herbert/dash/ License: BSD
db4 db4-utils	4.7.25	Berkeley DB (version 4) databases: http://www.oracle.com/database/berkeley-db/ License: BSD, https://opensource.org/licenses/Sleepycat
dbus	1.2.24	D-BUS message bus: http://www.freedesktop.org/software/dbus/ License: GPLv2.0, AFL
desktop-file-utils	0.15	Utilities for manipulating .desktop files: http://www.freedesktop.org/software/desktop-file-utils License: GPLv2.0
desktopvideo	10.9.11	Blackmagic Design Desktop Video 10.9.11 - Driver and Firmware Update Utility: http://blackmagicdesign.com License: Proprietary
dev86	0.16.17	A real mode 80x86 assembler and linker: http://homepage.ntlworld.com/robert.debath/ License: GPLv2.0, LGPLv2.0
device-mapper	1.02.117	Device mapper utility: http://sources.redhat.com/dm License: GPLv2.0
dhclient dhcp-common	4.1.1	ISC DHCP: http://isc.org/products/DHCP/ License: ISC
diffutils	2.8.1	A GNU collection of diff utilities: http://www.gnu.org/software/diffutils/diffutils.html License: GPLv2.0
dkms	2.4.0	Dynamic Kernel Module Support Framework: http://linux.dell.com/dkms License: GPLv2.0
dmidecode	2.12	Tool to analyse BIOS DMI data: http://www.nongnu.org/dmidecode/ License: GPLv2.0
dmraid	1.0.0	Device-mapper RAID tool and library: http://people.redhat.com/heinzm/sw/dmraid License: GPLv2.0
dosfstools	3.0.9	Utilities for making and checking MS-DOS FAT filesystems on Linux: http://www.daniel-baumann.ch/software/dosfstools/ License: GPLv3.0
doxygen	1.6.1	A documentation system for C/C++: http://www.stack.nl/~dimitri/doxygen/index.html License: GPLv2.0

Package	Version	Description / License Information
dracut	004-409	Initramfs generator using udev: http://apps.sourceforge.net/trac/dracut/wiki License: GPLv2.0
e2fsprogs e2fsprogs-libs	1.41.12	Utilities for managing ext2, ext3, and ext4 filesystems: http://e2fsprogs.sourceforge.net/ License: GPLv2.0, LGPLv2.0
ecryptfs-utils	82	The eCryptfs mount helper and support libraries: https://launchpad.net/ecryptfs License: GPLv2.0
ed	1.1	The GNU line editor: http://www.gnu.org/software/ed/ License: GPLv3.0, GFDL
efibootmgr	0.5.4	EFI Boot Manager: http://linux.dell.com/efibootmgr/ License: GPLv2.0
eggdbus	0.6	Experimental D-Bus bindings for GObject: http://cgit.freedesktop.org/~david/eggdbus License: LGPLv2.0
eject	2.1.5	A program that ejects removable media using software control: http://www.pobox.com/~tranter License: GPLv2.0
elfutils	0.164	A collection of libraries, utilities and DSOs to handle compiled objects: https://fedorahosted.org/elfutils/ License: GPLv3.0, GPLv2.0, LGPLv3.0
elinks	0.12	A text-mode Web browser: http://elinks.or.cz License: GPLv2.0
ethtool	3.5	Ethernet settings tool for PCI ethernet cards: http://sourceforge.net/projects/gkernel/ License: GPLv2.0
expat	2.0.1 2.2.5	An XML parser library: http://www.libexpat.org/ License: MIT
expect	5.44.1	A program-script interaction and testing utility: http://expect.nist.gov/ License: PublicDomain
ezoptionparser	0.2.1	EZ Option Parser library: http://ezoptionparser.sourceforge.net/ License: MIT
faac	1.29.9.2	Freeware AAC Codec: https://sourceforge.net/projects/faac/ License: LGPLv2.0
fdk-aac	0.1.5	Fraunhofer OpenSource AAC Codec: http://opencore-amr.sourceforge.net/ License: ASLv2.0
fetchmail	6.3.17	A remote mail retrieval and forwarding utility: http://fetchmail.berlios.de/ License: GPL, PublicDomain
ffmpeg	3.5-DEV	Cross platform solution to record, convert, and stream audio and video: https://www.ffmpeg.org/ License: LGPLv2.1
file file-libs	5.04	Libraries for applications using libmagic: http://www.darwinsys.com/file/ License: BSD
filesystem	2.4.30	The basic directory layout for a Linux system: https://fedorahosted.org/filesystem License: PublicDomain

Package	Version	Description / License Information
findutils	4.4.2	The GNU versions of find utilities (find and xargs): http://www.gnu.org/software/findutils/ License: GPLv3.0
fipscheck fipscheck-lib	1.2.0	FIPS validated modules: http://fedorahosted.org/fipscheck/ License: BSD
flac	1.2.1 1.3.2	An encoder/decoder for the Free Lossless Audio Codec: http://flac.sourceforge.net/ License: BSD, GPLv2.0
flex	2.5.35	A tool for creating text pattern recognizers: http://flex.sourceforge.net/ License: BSD
fontconfig	2.8.0	Font configuration and customization library: http://fontconfig.org License: MIT
fprintd fprintd-pam	0.1	D-Bus service for Fingerprint reader access: http://www.reactivated.net/fprint/wiki/Fprintd License: GPLv2.0
freetype	2.3.11 2.7.1	A free and portable font rendering engine: http://www.freetype.org License: https://www.freetype.org/license.html
ftp	0.17	The standard UNIX FTP Client: ftp://ftp.uk.linux.org/pub/linux/Networking/netkit License: BSD
gamin	0.1.10	Library providing the FAM File Alteration Monitor API: http://www.gnome.org/~veillard/gamin/ License: LGPLv2.0
gawk	3.1.7	The GNU version of the awk text processing utility: http://www.gnu.org/software/gawk/gawk.html License: GPLv3.0
gcc	3.4.6 4.4.7	GNU Compiler Collection: http://gcc.gnu.org License: GPLv2.0 with exceptions.
GConf2	2.28.0	A process-transparent configuration system: http://projects.gnome.org/gconf/ License: LGPLv2.0
gdb	7.2	A GNU source-level debugger: http://gnu.org/software/gdb/ License: GPLv3.0, GPLv2.0, LGPLv2.0, GFDL, BSD, PublicDomain
gdbm	1.8.0	A GNU set of database routines which use extensible hashing: http://www.gnu.org/software/gdbm/ License: GPLv2.0
gdk-pixbuf2	2.24.1	An image loading library: http://www.gt.org License: LGPLv2.0, MPL, PublicDomain
genisoimage	1.1.9	Creates an image of an ISO9660 filesystem: http://cdrkit.org/ License: GPLv2.0
gettext	0.17	GNU libraries and utilities for producing multi-lingual messages: http://www.gnu.org/software/gettext/ License: GPLv3.0, LGPLv2.0
ghostscript ghostscript-fonts	8.70	A PostScript interpreter and renderer: http://www.ghostscript.com/ License: GPLv3.0 and Redistributable, no modification permitted
glib2	2.28.8	A library of handy utility functions: http://www.gtk.org License: LGPLv2.0

Package	Version	Description / License Information
glibc	2.12	The GNU libc libraries: http://sources.redhat.com/glibc/ License: LGPLv2.0, LGPLv2.0 with exceptions, GPLv2.0
gmp	4.3.1	A GNU arbitrary precision library: http://gmplib.org/ License: GPLv3.0, LGPLv2.0, LGPLv3.0
gnupg2	2.0.14	Utility for secure communication and data storage: http://www.gnupg.org/ License: GPLv3.0
gnutls	2.12.23	A TLS protocol implementation: http://www.gnutls.org/ License: GPLv3.0, LGPLv2.0
gpgme	1.1.8	GnuPG Made Easy - high level crypto API: http://www.gnupg.org/related_software/gpgme/ License: LGPLv2.0
gpm gpm-libs	1.20.6	A mouse server for the Linux console: http://www.nico.schottelius.org/software/gpm/ License: GPLv2.0
grep	2.20	Pattern matching utilities: http://www.gnu.org/software/grep/ License: GPLv3.0
groff	1.18.1	A document formatting system: http://groff.ffii.org License: GPLv2.0, GFDL
grub	0.97	Grand Unified Boot Loader: http://www.gnu.org/software/grub/ License: GPLv2.0
grubby	7.0.15	Command line tool for updating bootloader configs: http://git.fedorahosted.org/git/grubby.git License: GPLv2.0
gstreamer	0.10.29	GStreamer streaming media: http://gstreamer.freedesktop.org/ License: LGPLv2.0
gtk2	2.24.23	GIMP ToolKit (GTK+): http://www.gtk.org License: LGPLv2.0
gzip	1.3.12	GNU data compression program: http://www.gzip.org/ License: GPLv2.0, GFDL
hal	0.5.14	Hardware Abstraction Layer: http://www.freedesktop.org/Software/hal License: GPLv2.0, AFL
hdparm	9.43	A utility for displaying and/or setting hard disk parameters: http://sourceforge.net/projects/hdparm/ License: GPLv2.0, BSD
hesiod	3.1.0	Shared libraries for querying the Hesiod naming service: https://www.centos.org/ License: MIT
hicolor-icon-theme	0.11	Basic requirement for icon themes: http://icon-theme.freedesktop.org/wiki/HicolorTheme License: GPL
hmaccalc	0.9.12	Tools for computing and checking HMAC values for files: https://fedorahosted.org/hmaccalc/ License: MIT
hunspell hunspell-en	1.2.8	A spell checker and morphological analyzer: http://hunspell.sourceforge.net/ License: GPLv2.0, LGPLv2.0, MPL, SISSL

Package	Version	Description / License Information
hwdata	0.233	Hardware identification and configuration data: http://git.fedorahosted.org/git/hwdata.git License: GPLv2.0
iconv	1.15	Unicode and user/system string conversion library: https://www.gnu.org/software/libiconv/ License: LGPLv2.0
iftop	1.0	Command line tool that displays bandwidth usage on an interface: http://www.ex-parrot.com/~pdw/iftop/ License: GPLv2.0
ilmbase	1.0.1	Math Libraries: http://www.openexr.com/ License: BSD
ImageMagick	6.7.2.7	Image Manipulation: http://www.imagemagick.org/ License: https://www.imagemagick.org/script/license.php
imake	1.0.2	imake source code configuration and build system: http://www.x.org License: MIT
indent	2.2.10	A GNU program for formatting C code: http://indent.isidore-it.eu/beautify.html License: GPLv3.0
info	4.13a	Reader for GNU texinfo documentation: http://www.gnu.org/software/texinfo/ License: GPLv3.0
initscripts	9.03.58	The inittab file and the /etc/init.d scripts: http://fedorahosted.org/releases/i/n/initscripts/ License: GPLv2.0
iperf	2.0.5	Measurement tool for TCP/UDP: http://sourceforge.net/projects/iperf License: BSD
ipmitool	1.8.15	Utility for IPMI control: http://ipmitool.sourceforge.net/ License: BSD
iproute	2.6.32	Advanced IP routing and network device configuration: http://linux-net.osdl.org/index.php/Iproute2 License: GPLv2.0, PublicDomain
iptables	1.4.7	Tools for managing Linux kernel packet filtering capabilities: http://www.netfilter.org/ License: GPLv2.0
iputils	20071127	Network monitoring tools: http://www.skbuff.net/iputils License: GPLv2.0 and Rdisc, BSD
irqbalance	1.0.7	IRQ balancing daemon: https://github.com/Irqbalance/irqbalance License: GPLv2.0
iscsi-initiator-utils	6.2.0.873	iSCSI daemon and utility programs: http://www.open-iscsi.org License: GPLv2.0
iso-codes	3.16	ISO code lists and translations: http://alioth.debian.org/projects/pkg-isocodes/ License: LGPLv2.0
isomd5sum	1.0.6	Utilities for working with md5sum implanted in ISO images: http://git.fedorahosted.org/git/?p=isomd5sum.git;a=summary License: GPLv2.0

Package	Version	Description / License Information
ivtv-firmware	20080701	Firmware for the Hauppauge PVR: http://dl.ivtvdriver.org/ivtv/firmware/ License: Redistributable, no modification permitted
iw	4.1	A nl80211 based wireless configuration tool: http://www.linuxwireless.org/en/users/Documentation/iw License: ISC
iw-firmware ipw-firmware	various	Firmware for Intel® PRO/Wireless: http://intellinuxwireless.org/ License: Redistributable, no modification permitted
jasper-libs	1.900.1	Runtime libraries for jasper: http://www.ece.uvic.ca/~mdadams/jasper/ License: http://www.ece.uvic.ca/~frodo/jasper/#license
jwhois	4.0	Internet whois/nicname client: http://www.gnu.org/software/jwhois/ License: GPLv3.0
kbd kbd-misc	1.15	Tools for configuring the console: http://ftp.altlinux.org/pub/people/legion/kbd License: GPLv2.0
kernel	4.15.13	The Linux kernel: https://www.kernel.org/ License: GPLv2.0
keyutils keyutils-libs	1.4	Key utilities: http://people.redhat.com/~dhowells/keyutils/ License: GPLv2.0, LGPLv2.0
kpartx	0.4.9	Partition device manager: http://christophe.varoqui.free.fr/ License: GPL
krb5-libs	1.10.3	Kerberos 5 Libraries: http://web.mit.edu/kerberos/www/ License: MIT
ksh	20120801	ATT Korn Shell: http://www.kornshell.com/ License: EPL
lame	3.100	MPEG1 Layer III Audio Encoder: http://lame.sourceforge.net/ License: LGPLv2.0
lcms-libs	1.19	Library for lcms: http://www.littlecms.com/ License: MIT
ledmon	0.79	Enclosure LED Utilities: http://sourceforge.net/projects/ledmon/ License: GPLv2.0
less	436	A text file browser: http://www.greenwoodsoftware.com/less/ License: GPLv3.0
lftp	4.0.9	A sophisticated file transfer program: http://lftp.yar.ru/ License: GPLv3.0
libacl	2.2.49	Dynamic library for access control list: http://acl.bestbits.at/ License: LGPLv2.0
libaio	0.3.107	Linux-native asynchronous I/O access library: http://git.kernel.org/?p=libs/libaio/libaio.git License: LGPLv2.0
libao	1.2.0	Cross platform audio library: https://xiph.org/ao/ License: LGPLv2.0
libarchive	2.8.3	A library for handling streaming archive formats: http://code.google.com/p/libarchive/ License: BSD

Package	Version	Description / License Information
libasyncns	0.8	Asynchronous Name Service Library: http://0pointer.de/lennart/projects/libasyncns/ License: LGPLv2.0
libattr	2.4.44	Dynamic library for extended attribute support: http://acl.bestbits.at/ License: LGPLv2.0
libblkid	2.17.2	Block device ID library: ftp://ftp.kernel.org/pub/linux/utils/util-linux-ng License: LGPLv2.0
libcap	2.16	Library for getting and setting POSIX.1e capabilities: http://ftp.kernel.org/pub/linux/libs/security/linux-privs/kernel-2.6/ License: LGPLv2.0, BSD
libcap-ng	0.6.4	An alternate posix capabilities library: http://people.redhat.com/sgrubb/libcap-ng License: LGPLv2.0
libcgroup	0.40.rc1	Tools and libraries to control and monitor control groups: http://libcg.sourceforge.net/ License: LGPLv2.0
libcom_err	1.41.12	Common error description library: http://e2fsprogs.sourceforge.net/ License: MIT
libcroco	0.6.2	A CSS2 parsing library: https://github.com/GNOME/libcroco License: LGPLv2.0
libcurl	7.19.7	A library for getting files from web servers: http://curl.haxx.se/ License: MIT
libdrm	2.4.65	Direct Rendering Manager runtime library: http://dri.sourceforge.net License: MIT
libedit	2.11	NetBSD Editline library: http://www.thrysoee.dk/editline/ License: BSD
libertas-usb8388-firmware	5.110.22.p23	Firmware for Marvell Libertas USB 8388 Network Adapter: http://www.marvell.com/ License: Redistributable, no modification permitted
libevent	1.4.13	Abstract asynchronous event notification library: http://monkey.org/~provos/libevent/ License: BSD
libffi	3.0.5	Portable foreign function interface library: http://sourceware.org/libffi License: BSD
libfontenc	1.1.2	X.Org X11 libfontenc runtime library: http://www.x.org License: MIT
libfprint	0.1.0	Tool kit for fingerprint scanner: http://www.reactivated.net/fprint/wiki/Main_Page License: LGPLv2.0
libgcc	4.4.7	GCC support library: http://gcc.gnu.org License: GPLv3.0 with exceptions
libgcrypt	1.4.5	General-purpose cryptography library: http://www.gnupg.org/ License: LGPLv2.0
libglade2	2.6.4	Library for loading user interfaces: http://www.gnome.org License: LGPLv2.0

Package	Version	Description / License Information
libgomp	4.4.7	GCC OpenMP v3.0 shared support library: http://gcc.gnu.org License: GPLv3.0 with exceptions
libgpg-error	1.7	Library for error values used by GnuPG components: ftp://ftp.gnupg.org/gcrypt/libgpg-error/ License: LGPLv2.0
libgsf	1.14.15	GNOME Structured File library: http://www.gnome.org/projects/libgsf/ License: LGPLv2.0
libgssglue	0.1	Generic Security Services Application Programming Interface: http://www.citi.umich.edu/projects/nfsv4/linux/ License: GPL
libgudev1	147	Libraries for adding libudev: http://www.kernel.org/pub/linux/utils/kernel/hotplug/udev.html License: LGPLv2.0
libhugetlbfs	2.16	A library which provides easy access to huge pages of memory: http://libhugetlbfs.sourceforge.net/ License: LGPLv2.0
libICE	1.0.6	X.Org X11 ICE runtime library: http://www.x.org License: MIT
libIDL	0.8.13	Library for parsing IDL: https://ftp.gnome.org/pub/gnome/sources/libIDL/ License: LGPLv2.0
libidn	1.18	Internationalized Domain Name support library: http://www.gnu.org/software/libidn/ License: GPLv2.0, LGPLv2.0, GFDL
libitm	7.1.1	GNU Transactional Memory library: http://gcc.gnu.org License: GPLv3.0 with exceptions
libjpeg-turbo	1.2.1	Accelerated library for manipulating JPEG images: http://sourceforge.net/projects/libjpeg-turbo License: https://www.wxwidgets.org/about/licence/
libmng	1.0.10	Library for Multiple-image Network Graphics support: http://www.libmng.com/ License: https://www.zlib.net/zlib_license.html
libnetfilter_conntrack	0.0.100	Netfilter conntrack userspace library: http://netfilter.org License: GPLv2.0
libnfnetlink	1.0.0	Netfilter netlink userspace library: http://netfilter.org License: GPLv2.0
libnih	1.0.1	Lightweight application development library: https://launchpad.net/libnih License: GPLv2.0
libnl	1.1.4	Convenience library for kernel netlink sockets: http://www.infradead.org/~tgr/libnl/ License: LGPLv2.0
libogg	1.1.4 1.3.2	Ogg bitstream file format library: http://www.xiph.org/ License: BSD
liboil	0.3.16	Library of Optimized Inner Loops, CPU optimized functions: http://liboil.freedesktop.org/ License: BSD

Package	Version	Description / License Information
libpcap	1.4.0	System-independent interface for user-level packet capture: http://www.tcpdump.org License: BSD
libpciaccess	0.13.4 0.14	PCI access library: http://gitweb.freedesktop.org/?p=xorg/lib/libpciaccess.git License: MIT
libpng	1.2.49 1.6.29	Library for manipulating PNG images: http://www.libpng.org/pub/png/ License: https://www.zlib.net/zlib_license.html
libproxy	0.3.0	A library handling all the details of proxy configuration: http://code.google.com/p/libproxy/ License: LGPLv2.0
librsvg2	2.26.0	SVG library: https://github.com/GNOME/librsvg License: LGPLv2.0
libpthread-stubs	0.1	Library that provides weak aliases for pthread functions not in the c runtime or not available by default: https://xcb.freedesktop.org/dist/ License: MIT
libsamplerate	0.1.7 0.1.9	Sample rate conversion library: http://www.mega-nerd.com/SRC/ License: GPLv2.0 Permissive License for v0.1.9: http://www.mega-nerd.com/SRC/license.html
libselinux	2.0.94	SELinux library: http://www.selinuxproject.org License: PublicDomain
libsemanage	2.0.43	SELinux binary policy manipulation library: http://www.selinuxproject.org License: LGPLv2.0
libsepol	2.0.41	SELinux binary policy manipulation library: http://www.selinuxproject.org License: LGPLv2.0
libSM	1.2.1	X.Org X11 SM runtime library: http://www.x.org License: MIT
libsmbclient	3.6.23	SMB client library: http://www.samba.org/ License: GPLv3.0, LGPLv3.0
libsmbios	2.2.26	Libsmbios C/C++ shared libraries: http://linux.dell.com/libsmbios/main License: GPLv2.0, OSLv2.1
libsndfile	1.0.20 1.0.28	Library for reading and writing sound files: http://www.mega-nerd.com/libsndfile/ License: GPLv2.0, LGPLv2.0, BSD
libss	1.41.12	Command line interface parsing library: http://e2fsprogs.sourceforge.net/ License: MIT
libssh2	1.4.2	Library implementing the SSH2 protocol: http://www.libssh2.org/ License: BSD
libstdc++	4.4.7	GNU Standard C++ Library: http://gcc.gnu.org License: GPLv3.0 with exceptions
libsysfs	2.1.0	Library for interfacing with sysfs: http://sourceforge.net/projects/linux-diag/ License: LGPLv2.0
libtalloc	2.1.5	The talloc library: http://talloc.samba.org/ License: LGPLv3.0

Package	Version	Description / License Information
libtar	1.2.11	Tar file manipulation API: http://www.feep.net/libtar/ License: MIT
libtasn1	2.3	ASN.1 library used in GNUTLS: http://www.gnu.org/software/libtasn1/ License: GPLv3.0, LGPLv2.0
libtdb	1.3.8	The tdb library: http://tdb.samba.org/ License: LGPLv3.0
libtevent	0.9.26	The tevent library: http://tevent.samba.org/ License: LGPLv3.0
libthai	0.1.12	Thai language support routines: http://linux.thai.net License: LGPLv2.0
libtheora	1.1.0	Theora Video Compression Codec: http://www.theora.org License: BSD
libtiff	3.9.4	Library of functions for manipulating TIFF format images: http://www.remotesensing.org/libtiff/ License: https://spdx.org/licenses/libtiff.html
libtirpc	0.2.1	Transport Independent RPC Library: http://nfsv4.bullopensource.org/ License: SISSL, BSD
libtool-ltdl	2.2.6	GNU Libtool Dynamic Module Loader: http://www.gnu.org/software/libtool/ License: LGPLv2.0
libudev	147	Library to access udev device information: http://www.kernel.org/pub/linux/utils/kernel/hotplug/udev.html License: LGPLv2.0
libusb	0.1.12	Library which allows userspace access to USB devices: http://sourceforge.net/projects/libusb/ License: LGPLv2.0
libusb1	1.0.9	Library which allows userspace access to USB devices: http://sourceforge.net/projects/libusb/ License: LGPLv2.0
libuser libuser-python	0.56.13	User and group account administration library: https://fedorahosted.org/libuser/ License: LGPLv2.0
libutempter	1.1.5	Privileged helper for utmp/wtmp updates: ftp://ftp.altlinux.org/pub/people/ldv/utempter License: LGPLv2.0
libuuid	2.17.2	Universally unique ID library: ftp://ftp.kernel.org/pub/linux/utils/util-linux-ng License: BSD
libv4l	0.6.3	Video4linux support libraries: http://hansdegoede.livejournal.com/3636.html License: GPLv2.0, LGPLv2.0
libvisual	0.4.0	Abstraction library for audio visualisation plugins: http://libvisual.sf.net License: LGPLv2.0
libvorbis	1.2.3 1.3.5	Vorbis General Audio Compression Codec: http://www.xiph.org/ License: BSD
libvpx	f7e767d8ee	VP8/VP9 Codec and WebM library: https://www.webmproject.org/code/ License: https://github.com/webmproject/libvpx/blob/master/LICENSE

Package	Version	Description / License Information
libwmf libwmf-lite	0.2.8	Windows MetaFile Library: http://wvware.sourceforge.net/libwmf.html License: GPLv2.0, LGPLv2.0
libX11	1.6.4	Core X11 protocol client library: http://www.x.org License: MIT
libXau	1.0.6	Sample Authorization Protocol for X: http://www.x.org License: MIT
libxcb	1.12	C binding to the X11 protocol: http://www.x.org License: MIT
libXcomposite	0.4.3	X Composite Extension library: http://xcb.freedesktop.org/ License: MIT
libXcursor	1.1.14	Cursor management library: http://www.x.org License: MIT
libXdamage	1.1.3	X Damage extension library: http://www.x.org License: MIT
libXdmcp	1.1.1	X Display Manager Control Protocol library: http://www.x.org License: MIT
libXext	1.3.3	X.Org X11 libXext runtime library: http://www.x.org License: MIT
libXfixes	5.0.3	X Fixes library: http://www.x.org License: MIT
libXfont	1.5.1	X.Org X11 libXfont runtime library: http://www.x.org License: MIT
libXft	2.3.2	X.Org X11 libXft runtime library: http://www.x.org License: MIT
libXi	1.7.8	X.Org X11 libXi runtime library: http://www.x.org License: MIT
libXinerama	1.1.3	X.Org X11 libXinerama runtime library: http://www.x.org License: MIT
libxml2 libxml2-python	2.7.6	Library providing XML and HTML support: http://xmlsoft.org/ License: MIT
libXpm	3.5.10	X.Org X11 libXpm runtime library: http://www.x.org License: MIT
libXrandr	1.5.1	X.Org X11 libXrandr runtime library: http://www.x.org License: MIT
libXrender	0.9.10	X.Org X11 libXrender runtime library: http://www.x.org License: MIT
libxslt	1.1.26	Library providing the Gnome XSLT engine: http://xmlsoft.org/XSLT/ License: MIT
libXt	1.1.4	X.Org X11 libXt runtime library: http://www.x.org License: MIT
libXtst	1.2.3	X.Org X11 libXtst runtime library: http://www.x.org License: MIT
libXv	1.0.11	X.Org X11 libXv runtime library: http://www.x.org License: MIT

Package	Version	Description / License Information
libXxf86vm	1.1.3	X.Org X11 libXxf86vm runtime library: http://www.x.org License: MIT
libyuv	77f6916da	YUV scaling and conversion functionality: https://chromium.googlesource.com/libyuv/libyuv/ License: https://chromium.googlesource.com/libyuv/libyuv/+/master/LICENSE
lm_sensors lm_sensors-libs	3.1.1	Hardware monitoring tools: http://www.lm-sensors.org/ License: GPLv2.0
lmoptionparser	1.3	Lean and Mean Option Parser Library: http://optionparser.sourceforge.net/ License: MIT
logrotate	3.7.8	Rotates, compresses, removes and mails system log files: https://fedorahosted.org/logrotate/ License: GPL
logwatch	7.3.6	A log file analysis program: http://www.logwatch.org/ License: MIT
lshw	B.02.17	Hardware lister: http://ezix.org/project/wiki/HardwareLiSter License: GPLv2.0
lsof	4.82	Utility which lists open files: ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof License: https://www.zlib.net/zlib_license.html
ltrace	0.5	Tracks runtime library calls from dynamically linked executables: http://ltrace.alioth.debian.org/ License: GPLv2.0
lua	5.1.4	Powerful light-weight programming language: http://www.lua.org/ License: MIT
lvm2 lvm2-libs	2.02.143	Userland logical volume management tools: http://sources.redhat.com/lvm2 License: GPLv2.0, LGPLv2.0
m2crypto	0.20.2	Support for using OpenSSL in python scripts: http://wiki.osafoundation.org/bin/view/Projects/MeTooCrypto License: MIT
m4	1.4.13	GNU macro processor: http://www.gnu.org/software/m4/ License: GPLv3.0
mailx	12.4	Enhanced implementation of the mailx command: http://heirloom.sourceforge.net/mailx.html License: BSD, MPL
make	3.81	GNU tool which simplifies the build process: http://www.gnu.org/software/make/ License: GPLv2.0
MAKEDEV	3.24	Tool for creating device files in /dev: http://www.lanana.org/docs/device-list/ License: GPLv2.0
man	1.6f	Documentation tools: http://primates.ximian.com/~flucifredi/man/ License: GPLv2.0
man-pages	3.22	Man (manual) pages from the Linux Documentation Project: http://www.kernel.org/pub/linux/docs/manpages/ License: GPLv2.0, BSD, MIT, Copyright Only, IEEE
mcstrans	0.3.1	SELinux Translation Daemon: https://www.centos.org/ License: GPL

Package	Version	Description / License Information
mdadm	3.3.4	Program controls Linux md devices: http://www.kernel.org/pub/linux/utils/raid/mdadm/ License: GPLv2.0
mesa-drivers	10.0.7	Mesa-based drivers: http://www.mesa3d.org License: MIT
mgetty	1.1.36	Getty replacement for use with data and fax modems: http://mgetty.greenie.net/ License: GPLv2.0
microcode_ctl	1.17	Tool to update x86/x86-64 CPU microcode: http://www.urbanmyth.org/microcode/
mingetty	1.08	A compact getty program for virtual consoles only: http://sourceforge.net/projects/mingetty/ License: GPLv2.0
mlocate	0.22.2	An utility for finding files by name: https://fedorahosted.org/mlocate/ License: GPLv2.0
module-init-tools	3.9	Kernel module management utilities: https://www.centos.org/ License: GPLv2.0
mpfr	2.4.1	A C library for multiple-precision floating-point computations: http://www.mpfr.org/ License: GPLv2.0, LGPLv2.0, GFDL
mtools	4.0.12	Programs for accessing MS-DOS disks without mounting the disks: http://mtools.linux.lu/ License: GPLv2.0
mtr	0.75	A network diagnostic tool: http://www.BitWizard.nl/mtr License: GPLv2.0
mysql-libs	5.1.73	Libraries required for MySQL clients: http://www.mysql.com License: GPLv2.0 with extensions
nano	2.0.9	Small text editor: http://www.nano-editor.org License: GPLv3.0
nc	1.84	Reads and writes data across network connections using TCP or UDP: http://www.openbsd.org/cgi-bin/cvsweb/src/usr.bin/nc/ License: BSD
ncompress	4.2.4	Fast compression and decompression utilities: http://ncompress.sourceforge.net/ License: PublicDomain
ncurses	5.7	Ncurses support utilities: http://invisible-island.net/ncurses/ncurses.html License: MIT
net-snmp	5.5	SNMP protocol tools and libraries: http://net-snmp.sourceforge.net/ License: BSD
net-tools	1.60	Basic networking tools: http://net-tools.berlios.de/ License: GPL
newt newt-python	0.52.11	Library for text mode user interfaces: https://fedorahosted.org/newt/ License: LGPLv2.0
nfs-utils nfs-utils-lib	1.2.3 1.1.5	Network File System Support Libraries and Utilities: http://www.citi.umich.edu/projects/nfsv4/linux/ License: BSD

Package	Version	Description / License Information
nmap	5.51	Network exploration tool and security scanner: http://nmap.org/ License: GPLv2.0, LGPLv2.0, BSD
nspr	4.13.1	Netscape Portable Runtime: http://www.mozilla.org/projects/nspr/ License: MPL
nss	3.28.4	Network Security Services: http://www.mozilla.org/projects/security/pki/nss/ License: MPL
ntp ntpdate	4.2.6p5	NTP daemon and utilities: http://www.ntp.org License: GPLv2.0, MIT, BSD
ntsysv	1.3.49.5	Tool to set the stop/start of system services: https://www.centos.org/ License: GPLv2.0
numactl	2.0.9 2.0.11	Library for tuning for Non Uniform Memory Access: ftp://oss.sgi.com/www/projects/libnuma/download License: GPLv2.0, LGPLv2.0, LGPLv2.1
OpenEXR	1.6.1	OpenEXR runtime: http://www.openexr.com/ License: BSD
OpenIPMI OpenIPMI-libs	2.0.16	Intelligent Platform Management Interface library and tools: http://sourceforge.net/projects/openipmi/ License: GPLv2.0, LGPLv2.0, BSD
openldap	2.4.40	OpenLDAP: http://www.openldap.org/ License: http://www.openldap.org/software/release/license.html
openssh	5.3p1	SSH protocol versions 1 and 2: http://www.openssh.com/portable.html License: BSD
openssl	1.0.1e 1.0.2k	Cryptography library with TLS implementation: http://www.openssl.org/ License: https://www.openssl.org/source/license.html
ORBit2	2.14.17	CORBA Object Request Broker: http://www.gnome.org/projects/ORBit2 License: GPLv2.0, LGPLv2.0
p11-kit	0.18.5	Loading and sharing PKCS#11 modules: http://p11-glue.freedesktop.org/p11-kit.html License: BSD
pam	1.1.1	Provides authentication for applications: http://www.linux-pam.org/ License: GPLv2.0, BSD
pango	1.28.1	System for layout and rendering of internationalized text: http://www.pango.org License: LGPLv2.0
parted	2.1	GNU disk partition manipulation program: http://www.gnu.org/software/parted License: GPLv3.0
passwd	0.77	Utility for setting or changing passwords using PAM: http://fedorahosted.org/passwd License: GPLv2.0, BSD
pciutils pciutils-libs	3.1.10	PCI bus related utilities and library: http://atrey.karlin.mff.cuni.cz/~mj/pciutils.shtml License: GPLv2.0
pcmciautils	015	PCMCIA utilities and initialization programs: http://www.kernel.org/pub/linux/utils/kernel/pcmcia/pcmcia.html License: GPLv2.0

Package	Version	Description / License Information
pcre	7.8	Perl-compatible regular expression library: http://www.pcre.org/
perf	4.15.13	Performance monitoring of the Linux kernel: https://www.kernel.org/ License: GPLv2.0
perl	5.10.1	Practical Extraction and Report Language: http://www.perl.org/ License: GPL or ATL and Copyright Only and MIT and UCD
perl-modules	various	Various Perl Modules License: Various
pinentry	0.7.6	Collection of simple PIN or passphrase entry dialogs: http://www.gnupg.org/aegypten/ License: GPLv2.0
pinfo	0.6.9	An info file viewer: http://pinfo.alioth.debian.org License: GPLv2.0
pixman	0.32.8	Pixel manipulation library: http://cgit.freedesktop.org/pixman/ License: MIT
pkgconfig	0.23	Tool for determining compilation options: http://pkgconfig.freedesktop.org License: GPLv2.0
plymouth	0.8.3	Graphical Boot Animation and Logger: http://freedesktop.org/software/plymouth/releases License: GPLv2.0
pm-utils	1.2.5	Power management utilities and scripts: http://pm-utils.freedesktop.org License: GPLv2.0
policycoreutils	2.0.83	SELinux policy core utilities: http://www.selinuxproject.org License: GPLv2.0
polkit	0.96	PolicyKit Authorization Framework: http://www.freedesktop.org/wiki/Software/PolicyKit License: LGPLv2.0
popt	1.13	C library for parsing command line parameters: http://www.rpm5.org/ License: MIT
portaudio	v190600	Portable, realtime audio IO library: http://www.portaudio.com/download.html License: http://www.portaudio.com/license.html
portreserve	0.0.4	TCP port reservation utility: http://cyberelk.net/tim/portreserve/ License: GPLv2.0
postfix	2.6.6	Postfix Mail Transport Agent: http://www.postfix.org License: http://www.postfix.org/IBM-Public-License-1.0.txt
ppl	0.10.2	Parma Polyhedra Library: http://www.cs.unipr.it/ppl/ License: GPLv3.0
procmail	3.22	Mail processing program: http://www.procmail.org License: GPLv2.0 or ATL
procps	3.2.8	System and process monitoring utilities: http://procps.sourceforge.net License: GPLv2.0, LGPLv2.0
protobuf	2.5.0	Google Protocol Buffers: https://github.com/google/protobuf/releases Licese: BSD
psacct	6.3.2	Utilities for monitoring process activities: https://www.centos.org/ License: GPLv2.0 and PublicDomain

Package	Version	Description / License Information
psmisc	22.6	Utilities for managing processes: http://sourceforge.net/projects/psmisc License: GPLv2.0
pth	2.0.7	GNU Portable Threads library: http://www.gnu.org/software/pth/ License: LGPLv2.0
pulseaudio	0.9.21	Improved Linux Sound Server: http://pulseaudio.org/ License: LGPLv2.0
python	2.6.6	Python object-oriented programming language: http://www.python.org/ License: https://docs.python.org/3/license.html
python modules	various	Various python modules License: Various
qt	4.6.2	Qt toolkit: http://www.qtsoftware.com/ License: LGPLv2.0 with exceptions or GPLv3.0 with exceptions and ASL, BSD, FLT, MIT
quota	3.17	System administration tools: http://sourceforge.net/projects/linuxquota/ License: GPLv2.0 and BSD
rcs	5.7	Revision Control System: http://www.gnu.org/software/rcs/ License: GPLv2.0
rdate	1.4	Tool for getting the date/time from a remote machine: ftp://people.redhat.com/sopwith/ License: GPLv2.0
rdist	6.1.5	Maintains identical copies of files on multiple machines: http://www.MagniComp.com/rdist License: BSD
readahead	1.5.6	Read a preset list of files into memory: https://fedorahosted.org/readahead/ License: GPLv2.0
readline	6.0.4	Library for editing typed command lines: http://cnswww.cns.cwru.edu/php/chet/readline/rltop.html License: GPLv3.0
redhat-logos	60.0.14	CentOS-related icons and pictures: https://www.centos.org/ License: Copyright 1999-2010 the CentOS Project. All rights reserved.
rfkill	0.3	Tool for enabling and disabling wireless devices: http://www.linuxwireless.org/en/users/Documentation/rfkill License: ISC
rhdb-utils	8.4.0	Miscellaneous utilities for PostgreSQL - Red Hat Edition: http://sources.redhat.com/rhdb/ License: GPLv2.0 and MIT
rng-tools	5	Random number generator related utilities: http://sourceforge.net/projects/gkernel/ License: GPLv2.0
rootfiles	8.1	root user's directory: https://www.centos.org/ License: PublicDomain
rpcbind	0.2.0	Universal Addresses to RPC Program Number Mapper: http://nfsv4.bullopensource.org License: GPL
rpm	4.8.0	RPM package management system: http://www.rpm.org/ License: GPLv2.0

Package	Version	Description / License Information
rsync	3.0.6	Program for synchronizing files over a network: http://rsync.samba.org/ License: GPLv3.0
rsyslog	5.8.10	Enhanced system logging: http://www.rsyslog.com/ License: GPLv3.0 and ASL
rtkit	0.5	Realtime Policy and Watchdog Daemon: http://git.0pointer.de/?p=rtkit.git License: GPLv3.0 and BSD
samba	3.6.23	Samba programs: http://www.samba.org/ License: GPLv3.0, LGPLv3.0
scl-utils	20120927	Utilities for alternative packaging: http://jnovy.fedorapeople.org/scl-utils/ License: GPLv2.0
screen	4.0.3	Screen manager: http://www.gnu.org/software/screen License: GPLv2.0
sdl2	2.0.7	Simple Direct Media Layer v2: http://www.libsdl.org/index.php License: https://wiki.libsdl.org/FAQLicensing
sed	4.2.1	GNU stream text editor: http://sed.sourceforge.net/ License: GPLv3.0
selinux-policy	3.7.19	SELinux policy configuration: http://oss.tresys.com/repos/refpolicy/ License: GPLv2.0
sendmail	8.14.4	Mail Transport Agent: http://www.sendmail.org/ License: https://spdx.org/licenses/Sendmail.html
setools	3.3.7	Policy analysis tools for SELinux: http://oss.tresys.com/projects/setools License: GPLv2.0
setserial	2.17	Utility for configuring serial ports: http://setserial.sourceforge.net/ License: GPL
setup	2.8.14	System configuration and setup files: https://www.centos.org/ License: PublicDomain
setuptool	1.19.9	Text mode system configuration tool: http://git.fedorahosted.org/git/?p=setuptool.git License: GPLv2.0
sg3_utils-libs	1.28	Library for sg3_utils: http://sg.danny.cz/sg/sg3_utils.html License: GPLv2.0 and BSD
sgml-common	0.6.3	Common SGML catalog and DTD files: http://www.w3.org/2003/entities/ License: GPL
sgpio	1.2.0.10	SGPIO captive backplane tool: http://sources.redhat.com/lvm2/wiki/DMRAID_Eventing License: GPLv2.0
sha2	07.01.07	SHA1, SHA2, HMAC and key derivation library: http://brgladman.org/oldsite/cryptography_technology/sha/index.php License: BSD
shadow-utils	4.1.5.1	Utilities for managing accounts and shadow password files: http://pkg-shadow.alioth.debian.org/ License: GPLv2.0 and BSD
shared-mime-info	0.70	Shared MIME information database: http://freedesktop.org/Software/shared-mime-info License: GPLv2.0

Package	Version	Description / License Information
slang	2.2.1	Library for the S-Lang extension language: http://www.jedsoft.org/slang/ License: GPLv2.0
smartmontools	5.43	Tools for monitoring SMART capable hard disks: http://smartmontools.sourceforge.net/ License: GPLv2.0
smbios-utils-bin	2.2.26	Binary utilities that use libsmbios: http://linux.dell.com/libsmbios/main License: GPLv2.0, OSLv2.1
sodium	1.0.12	Encryption, decryption, signature, and password hasing library: https://github.com/jedisct1/libsodium/ License: https://github.com/jedisct1/libsodium/blob/master/LICENSE
sos	3.2	Tools to gather troubleshooting information: http://fedorahosted.org/sos License: GPLv2.0
speex	1.2.rc1	A voice compression format (codec): http://www.speex.org/ License: BSD
sqlite	3.6.20	Embeddable SQL database engine: http://www.sqlite.org/ License: PublicDomain
squid	3.1.23	Squid proxy caching server: http://www.squid-cache.org License: GPLv2.0 and LGPLv2.0 and PublicDomain
srt	1.1.6	Secure, reliable transport protocol library: https://github.com/Haivision/srt License: MPL
strace	4.8	Tracks and displays system calls: http://sourceforge.net/projects/strace/ License: BSD
stunnel	4.29	SSL-encrypting socket wrapper: http://stunnel.mirt.net/ License: GPLv2.0
sudo	1.8p3	Allows restricted root access: http://www.courtesan.com/sudo/ License: ISC
swig	1.3.40	Connects C/C++/Objective C to some high-level programming languages: http://swig.sourceforge.net/ License: GPLv2.0 and LGPLv2.0 and BSD
symlinks	1.4	Utility which maintains a system's symbolic links: ftp://metalab.unc.edu/pub/Linux/utils/file/ License: Copyright only
sysfsutils	2.1.0	Utilities for interfacing with sysfs: http://sourceforge.net/projects/linux-diag/ License: GPLv2.0
sysstat	9.0.4	System monitoring commands: http://perso.orange.fr/sebastien.godard/ License: GPLv2.0
systemtap-runtime	2.9	Programmable system-wide instrumentation system: http://sourceware.org/systemtap/ License: GPLv2.0
sysvinit-tools	2.87	Process and utmp management tools: https://alioth.debian.org/projects/pkg-sysvinit/ License: GPLv2.0
tar	1.23	GNU file archiving program: http://www.gnu.org/software/tar/ License: GPLv3.0

Package	Version	Description / License Information
tcl	8.5.7	Tool Command Language: http://tcl.sourceforge.net/ License: https://www.tcl.tk/software/tcltk/license.html
tcpdump	4.0.0	Network traffic monitoring tool: http://www.tcpdump.org License: BSD
tcp_wrappers tcp_wrappers-libs	7.6	Wrapper for TCP daemons: ftp://ftp.porcupine.org/pub/security/index.html License: BSD
tcsh	6.17	C shell: http://www.tcsh.org/ License: BSD
telnet	0.17	Remote login protocol client: https://www.centos.org/ License: BSD
texinfo	4.13a	Texinfo format documentation tools: http://www.gnu.org/software/texinfo/ License: GPLv3.0
tftp	0.49	TFTP client: http://www.kernel.org/pub/software/network/tftp/ License: BSD
time	1.7	GNU utility for monitoring a program's use of system resources: http://www.gnu.org/software/time/ License: GPLv2.0
tk	8.5.7	Graphical toolkit for the Tcl scripting language: http://tcl.sourceforge.net License: https://www.tcl.tk/software/tcltk/license.html
tmpwatch	2.9.16	Utility for removing files based on when they were last accessed: https://fedorahosted.org/tmpwatch/ License: GPLv2.0
traceroute	2.0.14	Traceroute utility: http://traceroute.sourceforge.net License: GPLv2.0
tree	1.5.3	File system tree viewer: http://mama.indstate.edu/users/ice/tree/ License: GPLv2.0
trousers	0.3.13	TCG's Software Stack: http://trousers.sourceforge.net License: BSD
twolame	0.3.13	MPEG1 Layer II audio encoder: http://www.twolame.org/ License: LGPLv2.1
tzdata	2018d	Timezone data: https://www.iana.org/time-zones License: PublicDomain
udev	147	Userspace implementation of devfs: http://www.kernel.org/pub/linux/utils/kernel/hotplug/udev.html License: GPLv2.0
unixODBC	2.2.14	ODBC driver manager: http://www.unixODBC.org/ License: GPLv2.0 and LGPLv2.0
unzip	6.0	Utility for unpacking zip files: http://www.info-zip.org/UnZip.html License: BSD
upstart	0.6.5	Event-driven init system: http://upstart.ubuntu.com License: GPLv2.0 and LGPLv2.0
uriparser	0.8.4	URI parser library: https://uriparser.github.io/ License: BSD

Package	Version	Description / License Information
urw-fonts	2.4	Standard PostScript fonts: http://svn.ghostscript.com/ghostscript/tags/urw-fonts-1.0.7pre44/ License: GPL with exceptions
usbutils	003	USB utilities: http://www.linux-usb.org/ License: GPLv2.0
usermode	1.102	User account management tools: https://fedorahosted.org/usermode/ License: GPLv2.0
ustr	1.0.4	String library: http://www.and.org/ustr/ License: MIT or LGPLv2.0 or BSD
utf8cpp	2.3.4	Library for handling UTF-8 encoded strings: http://utfcpp.sourceforge.net/ License: MIT
util-linux-ng	2.17.2	Basic system utilities: ftp://ftp.kernel.org/pub/linux/utils/util-linux-ng License: GPLv1 and GPLv2.0 and LGPLv2.0 and MIT and BSD and PublicDomain
uuidd	2.17.2	Helper daemon to guarantee uniqueness of time-based UUIDs: ftp://ftp.kernel.org/pub/linux/utils/util-linux-ng License: GPLv2.0
v4l2	1.8.1	Video for Linux utilities and libraries: http://linuxtv.org/downloads/v4l-utils/ License: GPLv2.0 and LGPLv2.1
vaapi	2.0.0	Video Acceleration API: https://01.org/linuxgraphics/downloads/ License: BSD
vconfig	1.9	VLAN configuration utility: http://www.candelatech.com/~greear/vlan.html License: GPLv2.0
vim	7.4.629	VIM editor: http://www.vim.org/ License: https://www.gnu.org/licenses/vim-license.txt
virt-what	1.11	Toosl to detect if we are running in a virtual machine: http://people.redhat.com/~rjones/virt-what/ License: GPLv2.0
vlock	1.3	Utility which locks one or more virtual consoles: http://cthulhu.c3d2.de/~toidinamai/vlock/vlock.html License: GPLv2.0
wget	1.12	Utility for retrieving files: http://www.gnu.org/software/wget/ License: GPLv3.0 and GFDL
which	2.19	Displays where a particular program in your path is located: http://www.xs4all.nl/~carlo17/which/ License: GPLv3.0
wireless-tools	29	Wireless ethernet configuration tools: http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Tools.html License: GPL
words	3.0	Dictionary of English words: http://en.wikipedia.org/wiki/Moby_Project License: PublicDomain
x86info	1.25	x86 processor information tool: http://www.codemonkey.org.uk/projects/x86info License: GPLv2.0

Package	Version	Description / License Information
xdelta	1.1.4	Binary file delta generator and an RCS replacement library: http://xdelta.org/ License: GPLv2.0
xdg-utils	1.0.2	Basic desktop integration functions: http://portland.freedesktop.org/ License: MIT
xfsprogs	3.1.1	Utilities for managing the XFS filesystem: http://oss.sgi.com/projects/xfs/ License: GPL and LGPLv2.0
xinetd	2.3.14	Secure replacement for inetd: http://www.xinetd.org License: https://fedoraproject.org/wiki/Licensing/Xinetd_License
xml-common	0.6.3	Common XML catalog and DTD files: http://www.w3.org/2003/entities/ License: GPL
xmlrpc-c xmlrpc-c-client	1.16.24	Lightweight RPC library: http://xmlrpc-c.sourceforge.net/ License: BSD and MIT
xorg-x11-drv-ati-firmware	7.6	ATI firmware: http://www.x.org License: MIT
xorg-x11-font-utils	7.2	X.Org X11 font utilities: http://www.x.org License: MIT
xz	4.999 5.2.3	LZMA compression utilities: http://tukaani.org/xz/ License: LGPLv2.0
yum	3.2.29	RPM package installer/updater/manager: http://yum.baseurl.org/ License: GPLv2.0
zeromq	4.2.2	Multi-platform distributed RPC library: http://zeromq.org/ License: GPLv2.0 or LGPLv3.0
zip	3.0	File compression and packaging utility: http://www.info-zip.org/Zip.html License: BSD
zlib	1.2.3 1.2.11	zlib compression and decompression library: http://www.gzip.org/zlib/ Library: https://www.zlib.net/zlib_license.htmlcd ../bz
zvbi	20160208	Zapping VBI library: http://zapping.sourceforge.net/ZVBI/ License: LGPLv2.0

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[ISC] Internet Systems Consortium License https://opensource.org/licenses/ISC .

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[BSD] Berkeley Software Distribution Licenses https://en.wikipedia.org/wiki/BSD_licenses .

[EPL] Eclipse Public License https://www.eclipse.org/legal/epl-v10.html .

[PublicDomain] Public Domain License https://en.wikipedia.org/wiki/Public_domain .

[MIT] Massachusetts Institute of Technology License https://en.wikipedia.org/wiki/MIT_License .

[MPL] Mozilla Public License https://www.mozilla.org/en-US/MPL/ .

[OSLv2.1] Open Software License v2.1 https://opensource.org/licenses/osl-2.1.php .

[ATL] Open Source Initiative Artistic License https://opensource.org/licenses/artistic-license .

[SISSL] Sun Industry Standards Source License https://opensource.org/licenses/sisslpl .

Note

Source code for packages covered under the LGPL that contain modifications is located in the file system of the appliance at `/opt/haivision/src/` and can be accessed through the appliance console.

Warranties

1-Year Limited Hardware Warranty

Haivision warrants its hardware products against defects in materials and workmanship under normal use for a period of ONE (1) YEAR from the date of equipment shipment ("Warranty Period"). If a hardware defect arises and a valid claim is received within the Warranty Period, at its option and to the extent permitted by law, Havision will either (1) repair the hardware defect at no charge, or (2) exchange the product with a product that is new or equivalent to new in performance and reliability and is at least functionally equivalent to the original product. A replacement product or part assumes the remaining warranty of the original product or ninety (90) days from the date of replacement or repair, whichever is longer. When a product or part is exchanged, any replacement item becomes your property and the replaced item becomes Haivision's property.

EXCLUSIONS AND LIMITATIONS

This Limited Warranty applies only to hardware products manufactured by or for Haivision that can be identified by the "Haivision" trademark, trade name, or logo affixed to them. The Limited Warranty does not apply to any non-Haivision hardware products or any software, even if packaged or sold with Haivision hardware. Manufacturers, suppliers, or publishers, other than Haivision, may provide their own warranties to the end user purchaser, but Haivision, in so far as permitted by law, provides their products "as is".

Haivision does not warrant that the operation of the product will be uninterrupted or error-free. Haivision does not guarantee that any error or other non-conformance can or will be corrected or that the product will operate in all environments and with all systems and equipment. Haivision is not responsible for damage arising from failure to follow instructions relating to the product's use.

This warranty does not apply:

(a) to cosmetic damage, including but not limited to scratches, dents and broken plastic on ports;

(b) to damage caused by accident, abuse, misuse, flood, fire, earthquake or other external causes;

(c) to damage caused by operating the product outside the permitted or intended uses described by Haivision;

(d) to a product or part that has been modified to alter functionality or capability without the written permission of Haivision; or

(e) if any Haivision serial number has been removed or defaced.

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OBTAINING WARRANTY SERVICE

Before requesting warranty service, please refer to the documentation accompanying this hardware product and the Haivision Support Portal **https://support.haivision.com**. If the product is still not functioning properly after making use of these resources, please contact Haivision or Authorized Reseller using the information provided in the documentation. When calling, Haivision or Authorized Reseller will help determine whether your product requires service and, if it does, will inform you how Haivision will provide it. You must assist in diagnosing issues with your product and follow Haivision's warranty processes.

Haivision may provide warranty service by providing a return material authorization ("RMA") to allow you to return the product in accordance with instructions provided by Haivision or Authorized Reseller. You are fully responsible for delivering the product to Haivision as instructed, and Haivision is responsible for returning the product if it is found to be defective. Your product or a replacement product will be returned to you configured as your product was when originally purchased, subject to applicable updates. Returned products which are found by Haivision to be not defective, out-of-warranty or otherwise ineligible for warranty service will be shipped back to you at your expense. All replaced products and parts, whether under warranty or not, become the property of Haivision. Haivision may require a completed pre-authorized form as security for the retail price of the replacement product. If you fail to return the replaced product as instructed, Haivision will invoice for the pre-authorized amount.

APPLICABLE LAW

This Limited Warranty is governed by and construed under the laws of the Province of Quebec, Canada.

This Limited Hardware Warranty may be subject to Haivision's change at any time without prior notice.

EULA - End User License Agreement

READ BEFORE USING

THE LICENSED SOFTWARE IS PROTECTED BY COPYRIGHT LAWS AND TREATIES. READ THE TERMS OF THE FOLLOWING END USER (SOFTWARE) LICENSE AGREEMENT ("AGREEMENT") CAREFULLY BEFORE ACCESSING THE LICENSED SOFTWARE. BY SCANNING THE QR CODE TO REVIEW THIS AGREEMENT AND/OR ACCESSING THE LICENSED SOFTWARE, YOU CONFIRM YOUR ACCEPTANCE OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THESE TERMS, HAIVISION IS UNWILLING TO LICENSE THE LICENSED SOFTWARE TO YOU AND YOU ARE NOT AUTHORIZED TO ACCESS THE LICENSED SOFTWARE.

Click the following link to view the Software End-User License Agreement: **Haivision EULA.pdf**

If you have questions, please contact **legal@haivision.com**

SLA - Service Level Agreement

1. Introduction

This Service Level and Support supplement forms a part of and is incorporated into the Service Agreement (the “Agreement”) between You and Haivision Network Video Inc. (“Haivision”). Capitalized terms used but not otherwise defined in this supplement shall have the meaning ascribed to them in the Agreement. Haivision may, upon prior written notice to You, amend this supplement to incorporate improvements to the service levels and support commitments at no additional cost to You. This supplement applies only to those products and services set forth below.

2. Definitions

- "Audience Member" means an individual or entity that accesses Your Published Media Objects through a public URL.
- "Access Service" means the service provided by Haivision VCMS that verifies an Audience Member’s credentials.
- "Digital Media File" means a computer file containing text, audio, video, or other content.
- "Outage" is a 12-minute period of consecutive failed attempts by all six agents to PING the domain on the Haivision Streaming Media network.
- "Published Media Object" means a Digital Media File with a public URL.
- "Transaction" means the creation of a right for an Audience Member to access a Media Object and the completion of an order logged in the order history service.

3. Service Levels for the Video Content Management System

The service levels in this **Section 3** apply only to the hosted version of Haivision VCMS and the Haivision VCMS development kit (collectively, the “Standard Hosted Components” of Haivision Video Cloud Services). Subject to the exceptions noted in **Section 4** below, the aforementioned components of Haivision Video Cloud Services will be available for use over the course of each calendar month as follows:

Type of Access	Definition	Availability Level
Write Functions	• Access to all functions through the administrative user interface. • Ability to add or modify objects and metadata through the application programming interface ("API") • Ability of ingest service to check for new or updated files or feeds	99.999%
Read-Only Functions	• Ability to retrieve data through the API • Ability for Audience Members to authenticate through the Access Service • Ability for Audience Members to play Published Media Objects • Ability for Audience Members to play Haivision VCMS-authenticated or entitled Published Media Objects • Ability to complete Transactions	99.999%

4. Exceptions to Availability for the VCMS

The Standard Hosted Components may not be available for use under the following circumstances, and in such case such periods of unavailability shall not be counted against Haivision Video Cloud for purposes of calculating availability:

a. Normal Maintenance, Urgent Maintenance and Upgrades as defined in the table below;
b. Breach of the Agreement by You as defined in the Agreement;
c. The failure, malfunction, or modification of equipment, applications, or systems not controlled by Haivision Video Cloud;
d. Any third party, public network, or systems unavailability;
e. Acts of Force Majeure as defined in the Agreement;
f. Modification of software made available to You as part of Haivision Video Cloud Services by You or a third party acting on Your behalf; and
g. Any third party product or service not incorporated into Haivision Video Cloud Services or any third party plug-in.

Haivision Video Cloud shall make commercially reasonable efforts to notify, or work with, applicable third parties to repair or restore Haivision VCMS functionality affected by such exceptions.

Type of Maintenance	Purpose	Write Functions Available	Read Functions Available	Maximum Time Per Month	Continuous Time in Mode (Max)	Window (Central Time)	Min Notice
Normal	• Preventive maintenance on the software/ hardware components of Haivision VCMS • Addition of new features/functions • Repair errors that are not immediately affecting Your use of Haivision VCMS	No	Yes	10 Hours	6 Hours	10:00pm - 5:00am	48 Hours
Urgent	• Repair errors that are immediately affecting Your use of Haivision VCMS	No	Yes	30 Minutes	15 Minutes	Any Time	3 Hours

Type of Maintenance	Purpose	Write Functions Available	Read Functions Available	Maximum Time Per Month	Continuous Time in Mode (Max)	Window (Central Time)	Min Notice
Upgrades	• Perform upgrades on software or hardware elements necessary to the long term health or performance of Haivision VCMS, but which, due to their nature, require that certain components of Haivision VCMS to be shut down such that no access is possible	No	No	1 Hour	1 Hour	12:00am - 4:00am M-F	5 Days

5. Credits for Downtime for the VCMS

Haivision Video Cloud will grant a credit allowance to You if You experience Downtime in any calendar month and you notify Haivision Video Cloud thereof within ten (10) business days after the end of such calendar month. In the case of any discrepancy between the Downtime as experienced by You and the Downtime as measured by Haivision Video Cloud, the Downtime as measured by Haivision Video Cloud shall be used to calculate any credit allowance set forth in this section. Such credit allowance shall be equal to the pro-rated charges of one-half day of Fees for each hour of Downtime or fraction thereof. The term "Downtime" shall mean the number of minutes that Standard Hosted Components are unavailable to You during a given calendar month below the availability levels thresholds in Section 3, but shall not include any unavailability resulting from any of the exceptions noted in Section 4. Within thirty (30) days after the end of any calendar month in which Downtime occurred below the availability levels thresholds in Section 3, Haivision Video Cloud shall provide You with a written report detailing all instances of Downtime during the previous month. Any credit allowances accrued by You may be offset against any and all Fees owed to Haivision Video Cloud pursuant to the Agreement, provided that a maximum of one month of credit may be accrued per month.

6. Support Services for the VCMS

Support for Haivision Video Cloud Services as well as the Application Software (defined as the VCMS application software components that Haivision licenses for use in conjunction with the Video Cloud Services) can be reached at hvc-techsupport@haivision.com and shall be available for all Your support requests. Haivision Video Cloud will provide 24x7 monitoring of the Standard Hosted Components.

Cases will be opened upon receipt of request or identification of issue, and incidents will be routed and addressed according to the following:

Severity Level	Error State Description	Status Response Within	Incident Resolution within
1 – Critical Priority	Renders Haivision VCMS inoperative or causes Haivision VCMS to fail catastrophically.	15 minutes	4 hours
2 – High Priority	Affects the operation of Haivision VCMS and materially degrades Your use of Haivision VCMS.	30 minutes	6 hours
3 – Medium Priority	Affects the operation of Haivision VCMS, but does not materially degrade Your use of Haivision VCMS.	2 hours	12 hours

Severity Level	Error State Description	Status Response Within	Incident Resolution within
4 – Low Priority	Causes only a minor impact on the operation of Haivision VCMS.	1 business day	3 business days

7. Service Levels for Haivision Streaming Media Service

Haivision agrees to provide a level of service demonstrating 99.9% Uptime. The Haivision Streaming Media Service will have no network Outages.

The following methodology will be employed to measure Streaming Media Service availability:

Agents and Polling Frequency

a. From six (6) geographically and network-diverse locations in major metropolitan areas, Haivision's Streaming Media will simultaneously poll the domain identified on the Haivision Streaming Media network.
b. The polling mechanism will perform a PING operation, sending a packet of data and waiting for a reply. Success of the PING operation is defined as a reply being received.
c. Polling will occur at approximately 6-minute intervals.
d. Based on the PING operation described in (b) above, the response will be assessed for the purpose of measuring Outages.

If an Outage is identified by this method, the customer will receive (as its sole remedy) a credit equivalent to the fees for the day in which the failure occurred.

Haivision reserves the right to limit Your use of the Haivision Streaming Media network in excess of Your committed usage in the event that Force Majeure events, defined in the Agreement, such as war, natural disaster or terrorist attack, result in extraordinary levels of traffic on the Haivision Streaming Media network.

8. Credits for Outages of Haivision Streaming Media Service

If the Haivision Streaming Media network fails to meet the above service level, You will receive (as your sole remedy) a credit equal to Your or such domain's committed monthly service fee for the day in which the failure occurs, not to exceed 30 days of fees.

9. No Secondary End User Support

UNDER NO CIRCUMSTANCES MAY YOU PROVIDE CONTACT INFORMATION FOR HAIVISION SERVICES TO CUSTOMERS OR AUDIENCE MEMBERS OR OTHER THIRD PARTIES WITHOUT HAIVISION'S EXPRESS PRIOR WRITTEN CONSENT.

Getting Help

General Support	North America (Toll-Free) **1 (877) 224-5445** International **1 (514) 334-5445** *and choose from the following:* Sales - 1, Cloud Services - 3, Support - 4
Managed Services	U.S. and International 1 (512) 220-3463
Fax	1 (514) 334-0088
Support Portal	https://support.haivision.com
Product Information	info@haivision.com

info@haivision.com
www.haivision.com

North America: 1.877.224.5445
International: +1.514.334.5445

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