



# HAIVISION

**Makito X4 Decoder 1.0**  
User's Guide

HVS-ID-UG-MX4D-10

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# About This Document

## Conventions


The following conventions are used to help clarify the content.

### Typographic Conventions and Elements


<i>Italics</i>	Used for the introduction of new terminology, for words being used in a different context, and for placeholder or variable text.
<b>bold</b>	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, <b>File &gt; New</b> 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.

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## 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 an overview of the Makito X4 decoder, along with a description of the main hardware components and key features.

## Topics in This Chapter

- **Product Overview**
  - Chassis Styles
  - Secure Reliable Transport (SRT)
  - IPv4 and IPv6 Support
- **Physical Description**
  - System Interfaces
  - Audio/Video Interfaces
  - LED Status Indicators



## Product Overview



The Makito X4 decoder is a low latency, quad channel SDI video decoder for live sports coverage, news broadcasts, corporate video, and mission-critical ISR (Intelligence, Surveillance, Reconnaissance) deployments. It is designed to be used with the Makito X4 encoder in Broadcast, Defense, and Enterprise markets.

Features include the following:

- **4K UHD / Quad HD Video Decoding** – The Makito X4 is a versatile real-time HEVC/H.265 and AVC/H.264 video decoder that can receive up to four 1080p50/60 HD streams or a single full 2160p50/60 4K UHD (Ultra High Definition) stream over IP, along with 32 channels of digital audio. The Makito X4 can decode video streams with either 8- or 10-bit pixel depth and 4:2:0 or 4:2:2 chroma subsampling. Decoded streams can be output as 12G-SDI video for 4K content or in HD with up to four 3G-SDI outputs.
- **Ultra Low Latency End-to-End** – The Makito X4 decoder decodes HEVC and H.264 video with extremely low latency and is ideally suited for live broadcast interviews and remote production.
- **Remote Production with Stream Sync** – The Makito X4 decoder supports Haivision’s Stream Sync technology which automatically synchronizes multiple streams based on timecodes embedded by Makito X4 encoders. Stream Sync supports remote production of live video over IP by enabling synchronized switching between multiple video and audio sources.
- **High Density Form Factor** – The Makito X4 decoder is available as a compact standalone appliance or as a blade for Haivision rack-mountable enclosures. With the same single-height form factor as the Makito X4 encoder, the Makito X4 decoder offers high channel density for up to 84 HD or 21 UHD video encoding or decoding sources within a single 4RU rack module.
- **Secure Reliable Transport** – The Makito X4 decoder can decode video streams secured with AES 128- or 256-bit encryption using the SRT protocol. In order to reliably deliver streams over unmanaged networks, SRT adapts to changing network conditions and recovers lost packets in real-time.

## Chassis Styles

The Makito X4 decoder is available in the following chassis styles:

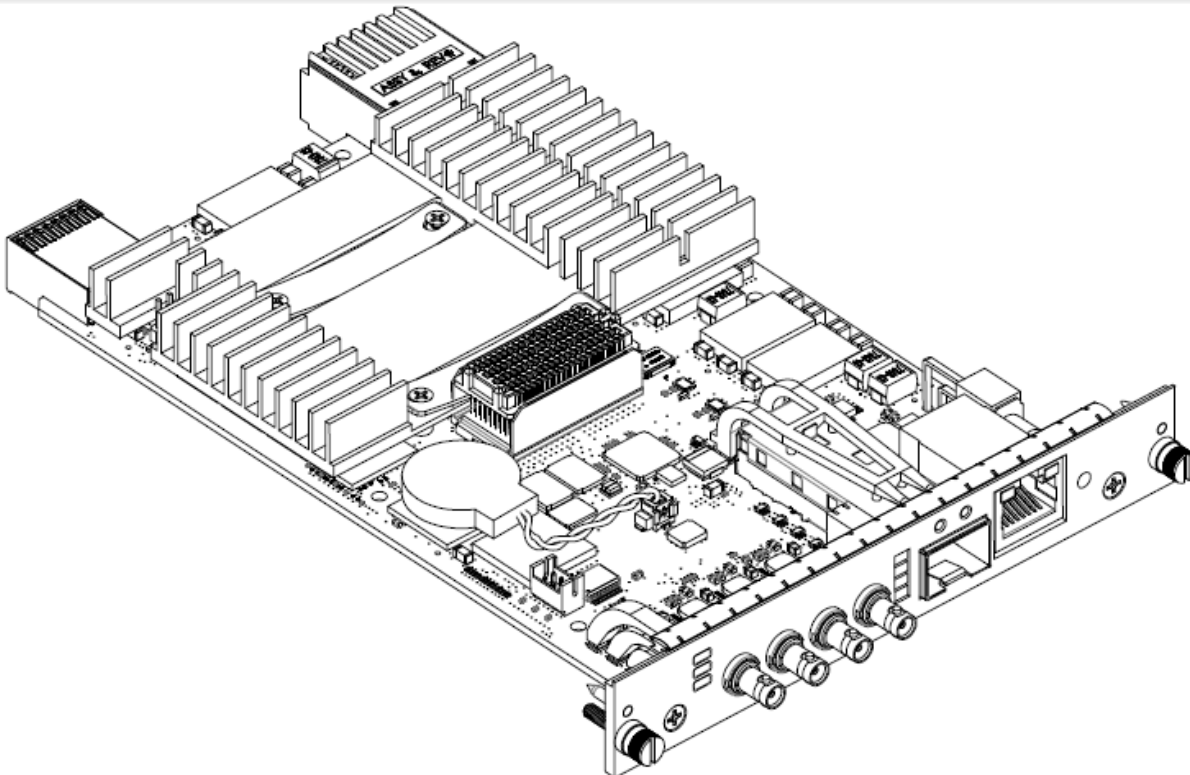
- as an ultra-compact appliance for single, dual or quad channel encoding.
- as a blade within a 1RU chassis (MB6X) that can contain up to six single-height or three dual-height Makito X Series or other Haivision encoder/decoder blades.
- as a blade within a 4RU chassis (MB21) that can contain up to 21 single-height or ten dual-height Makito X Series or other Haivision encoder/decoder blades.

The Makito X4 decoder appliance and blade and MB6X and MB21 chassis are shown in the following figures.

### *Makito X4 Decoder (#S-MX4D-SDI4)*



### *Makito X4 Decoder blade (#B-MX4D-SDI4)*



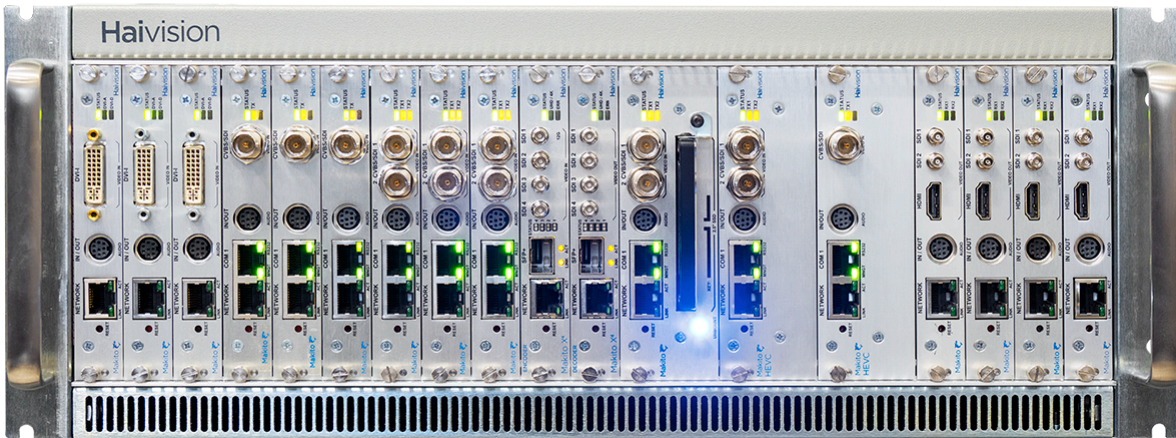
## MB6X Multichannel Chassis (Front and Rear Views, #MB6X-RAC)



### **Note**

The MB6X is available with a single AC, DC, or medical grade AC power supply. For details, please refer to the *MB6 Chassis Installation Guide*.

## MB21 Multichannel Chassis (Front and Rear Views, #F-MB21X-R)





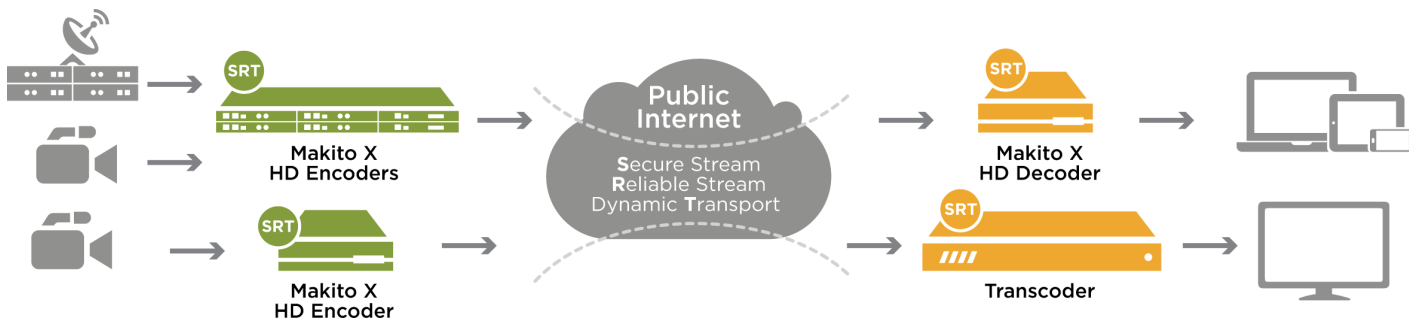
For information on the MB21 chassis, refer to the [MB21 Chassis Installation Guide](#).

## Secure Reliable Transport (SRT)

Haivision’s Secure Reliable Transport (SRT) technology is available on Makito X Series encoders and decoders. The SRT streaming protocol is designed to provide reliable and secure end-to-end transport between two SRT-enabled devices over a link which traverses the public Internet. SRT optimizes video streaming performance across unpredictable networks, recovering from packet loss, jitter, network congestion and bandwidth fluctuations that can severely affect the viewing experience.

SRT is applied to contribution and distribution endpoints as part of a video stream workflow. After encoding (or transcoding), SRT applies encryption and provides error recovery. Prior to decoding (or transcoding), SRT decrypts the stream and enables recovery from packet loss typical of Internet connections. At the same time, SRT detects the realtime network performance between the encode / decode / transcode endpoints. The endpoints can be dynamically adjusted for optimal stream performance and quality.

### *Makito X SRT Workflow*



For additional information required to set up and tune SRT streams from the encoder to the decoder, please refer to the [SRT Deployment Guide](#).

## IPv4 and IPv6 Support

The Makito X4 series and Makito FX devices support Internet Protocol Version 4 (IPv4-only) and Version 6 (IPv6-only) as well as dual-stack IPv4/IPv6 networks. You can install the Makito X4 or FX on an IPv4 network, an IPv6 network, or on a network supporting both IPv4 and IPv6. You will be able to access the Web Interface, CLI and SNMP via the IPv4 and/or IPv6 addresses assigned to the device.

Makito X4 and FX IPv4-IPv6 capabilities include the following:

- Static and dynamic assignment of IPv6 addresses via DHCPv6 or Stateless Autoconfiguration (SLAAC) to Makito X4/FX products in addition to the existing IPv4 capabilities.
- Dual-stack IPv4 and IPv6 may be used simultaneously for management and video streaming purposes.
- All administration functions may be performed from an IPv4 or IPv6 network client, including upgrade/downgrade, preset import/export, license install, system snapshots and specifying audit servers.
- User functions include creating and starting streams from an IPv4 or IPv6 device.

### Related Topics

- [Configuring Network Settings](#)
- [ipconfig](#) (CLI command)
- [ipv6config](#) (CLI command)

## Physical Description

Following is a description of the Makito X4 decoder interfaces, connectors, and LED status indicators.

## System Interfaces

The Makito X4 decoder comes equipped with the following interfaces:

- 10/100/1000 Base-T Gigabit Ethernet Network
- SFP+ (Small Form-factor Pluggable Plus) Expansion Port, 10GbE – future use, will enable (future) ST-2110 output support



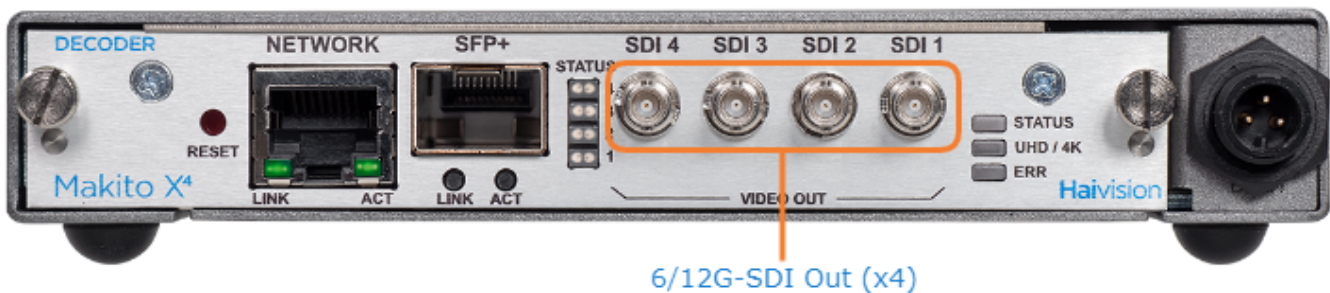
### Related Topics:

- [Connect to the Network](#)

## Audio/Video Interfaces

### SDI Video and Embedded Digital Audio Interfaces

The Makito X4 decoder SDI video interface consists of four 75 Ω HD-BNC connectors.



The HD-BNC connector(s) are used for SD-SDI (Serial Digital Interface), HD-SDI, 3G-SDI, 6G-SDI and 12G-SDI video output signals. All ports are 6/12G-SDI capable.

In addition, the HD-BNC connector(s) support auto-detection of the HD resolution and embedded digital audio.

**Related Topics:**

- [Connect to A/V Displays](#)

## LED Status Indicators

Front panel LED colors and flashing (blinking) speed indicate network traffic, Video Output status and output resolution modes of the decoder.

There are four SDI Status Output LEDs, one corresponding to each output. Each LED (1-4) reflects the state associated with the same HD-BNC output (SDI 1-4).



- [Network Port](#)
- [SFP+ Port \(Future Use\)](#)
- [SDI Output Status](#)
- [General](#)

### Network Port

Function	Description	Indication
LINK	Off	Not connected
	Green blinking once per second	Connected at 10 Mbps
	Green blinking twice per second	Connected at 100 Mbps
	Green blinking three times per second	Connected at 1000 Mbps
ACT	Off	No activity
	Green intermittent	Little activity (e.g., management). The LED should be lit when there is activity.
	Green solid	Intense activity (e.g., receiving video traffic)



Network Port SFP+ Port (Future Use) SDI Output Status General

### SFP+ Port (Future Use)

Function	Description	Indication
LINK	Off	Not connected
	Green solid	Connected
ACT	Off	No activity
	Green intermittent	Little activity (e.g., management). The LED should be lit when there is activity.
	Green solid	Intense activity (e.g., receiving video traffic)

Network Port SFP+ Port (Future Use) SDI Output Status General

### SDI Output Status

Function	Description	Indication
SDI1 / SDI2 / SDI3 / SDI4	Off	No data. Either the decoder is off, the stream is not flowing, or the stream does not contain any audio or video.
	Solid Amber	SDI is being driven by either audio or video, but not both.
	Solid Green	SDI is being driven by both audio and video.
	Blinking Amber	<div style="border: 1px solid #ffc107; padding: 5px;"> <p><b>Note</b></p> <p>The only error that currently triggers this is Oversubscription. For more information, see <a href="#">Oversubscription of Decoder Channels</a>.</p> </div>

## General

Function	Description	Indication
STATUS	Blinking Green	Booting/Initialization. When there is a problem, in addition to lighting the Error LED.
	Solid Green	Normal operation.
UHD/4K	Solid Green	A valid 4K input stream is actively being processed.  <div style="border: 1px solid #ffc107; padding: 5px;"> <p><b>Note</b> All SDI channels support 6G/12G (UHD/4K) video output.</p> </div>
ERR	Solid Green	The decoder has encountered an unrecoverable error.

# Getting Started with the Web Interface

## ! Important

Before proceeding, make sure that the decoder is set up correctly and all necessary network and A/V connections are established. For information on installing and connecting to the Makito X4, please refer to the [Makito X4 Decoder Quick Start Guide](#).

All Makito X4 decoder interfaces and applications such as Audio/Video services and IP links may be configured, managed, and monitored through the Web Interface, the Command Line Interface (CLI), or an SNMP server. All methods require access to the decoder through its Ethernet LAN port.

## Topics in This Chapter

- [Accessing the Decoder](#)
- [Signing In to the Web Interface](#)
- [Exploring the Web Interface](#)
- [Changing Your Password](#)
- [Signing Out](#)

## Accessing the Decoder

Managing the Makito X4 decoder from the Web interface requires a connection from the unit's LAN port to your network. You must then connect a computer with a Web browser to the network to access the Web interface.

To access the Makito X4 decoder configuration Web page:

1.

### Note

The Makito X4 decoder supports the latest production versions (as of this document date) of the Firefox, Safari, Chrome, and Edge browsers. Internet Explorer is not supported. Please see the Release Notes (available from the [Download Center](#) on the Haivision Support Portal) for any limitations for specific versions of these browsers.

2. Type the decoder's IP Address in the browser's address bar and press Enter.
3. Sign in. (See [Signing In to the Web Interface](#).)

### Tip

For a list and description of the CLI commands to configure and manage the Makito X4 decoder, see [CLI Command Reference](#).  
For information on SNMP management of the Makito X4 decoder, see [Using SNMP to Configure A/V Services](#).

## Security Steps

Only secured HTTP (HTTPS) is supported for the Web interface; therefore, a server certificate is required. The encoder automatically generates a self-signed certificate and your browser will recommend that you do not proceed.

If you have not changed the factory defaults on the encoder, a certificate with factory default subjects exists (DNS: haivision-ace, IP: `10.5.1.2`). Proceed temporarily if you can since this default certificate will be deleted and re-generated (see below).

### Note

The Makito X4 identity certificate and trusted root certificates are managed using the CLI `certificate` command. For details, see [certificate](#) (CLI).

## Default Decoder IP Address

### Note

If you haven't changed the factory presets, and if not specified elsewhere in the shipment, the Makito appliance's IP Address is set by default to: `10.5.1.2`.

To be able to sign in to the Web interface, your computer has to be in the same IP Address range (subnet).

You may have to temporarily change your computer's IP Address to be in the same subnet as your Makito appliance. Only then you will be able to access the unit and change its IP Address, and then afterwards change your computer's IP Address back.

 **Tip**

After you change the Makito appliance's IP Address, be sure to document it somewhere or label the chassis. Otherwise, if you do not know the current IP Address, you will need to reset the device to its factory settings, which will return the unit to the default IP address (and you will lose any saved configurations and settings).

### Related Topics

- [Resetting the Decoder](#)

## Role-based Authorization

The Makito X Series uses role-based authorization control to secure the Web interface and CLI. Administrators can create new accounts and thus allocate an account to each user of the system.

The Makito X Series provides three defined account roles to assign privileges to users:

Role	Default Username	Privileges
Guest	user	Read-only access to the system.
Operator	operator	All rights to configure A/V and stream settings. Does <i>not</i> include rights to reboot or upgrade the system, modify the network settings, or manage accounts.
Administrator	admin	All access rights and Administrator privileges.

All three roles provide both Web interface and CLI access to the system. These roles and their privileges are also supported using VACM (View-based Access Control Model) for SNMP access control.

Please refer to the *Important Notice* (postcard included in the box or available from the [Download Center](#) on the Haivision Support Portal) for the default sign-in credentials.

 **Caution**

For security purposes, Haivision strongly advises you to change the default password for all accounts during initial configuration.

 **Note**

Any changes to the default passwords, created accounts, and deleted default accounts will be lost after a Factory Reset or a firmware downgrade. Factory Reset restores the default accounts and passwords.

Administrators can create, delete, lock, and unlock user accounts, including changing the password, from the Accounts page (see [Managing User Accounts](#)). Operators and guests can manage their password from the My Account page (see [Changing Your Password](#)).

You can also change your own account password CLI using the `passwd` command.

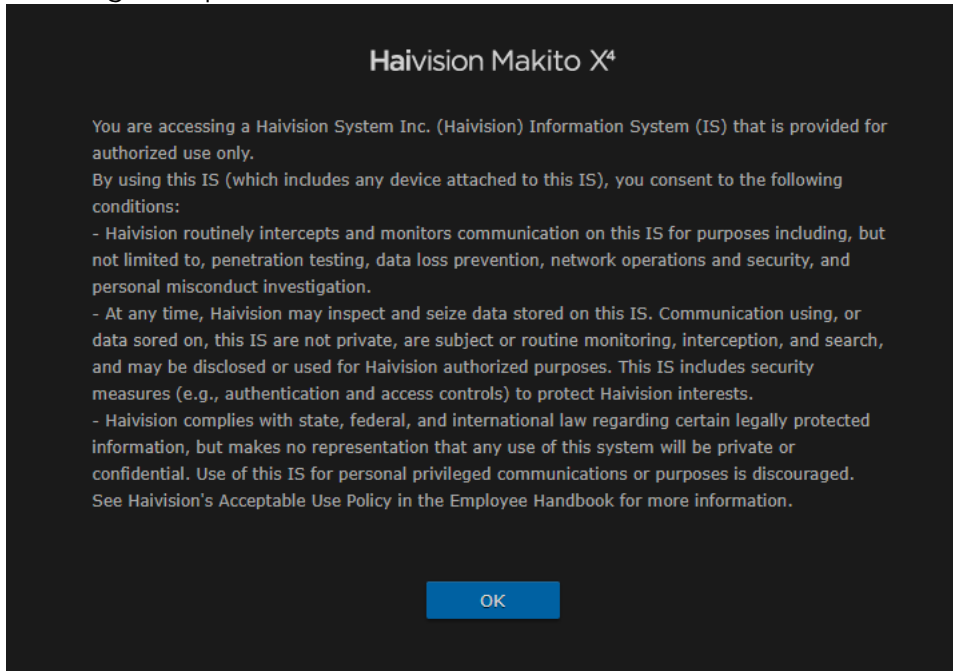
### Related Topics

- [Command Summary and Access Control](#)

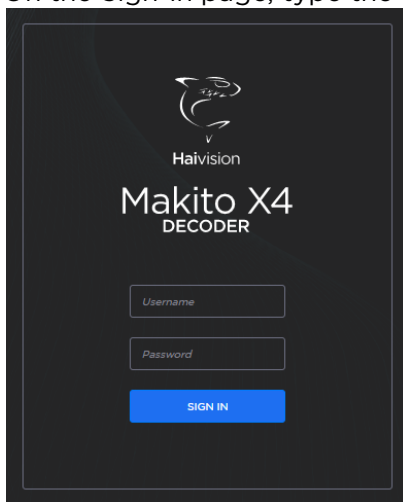
## Signing In to the Web Interface

To sign in to the Makito X4 decoder Web interface:

1. From your Web browser, type the Makito X4's IP Address into the address field and press Enter. (Optional) On some systems, you will see an Advisory and Consent Banner, as shown in the following example.



2. Review the Advisory and Consent terms as required for your system and click **OK**.
3. On the Sign-in page, type the Username and Password and click **Sign In** (or press Enter).



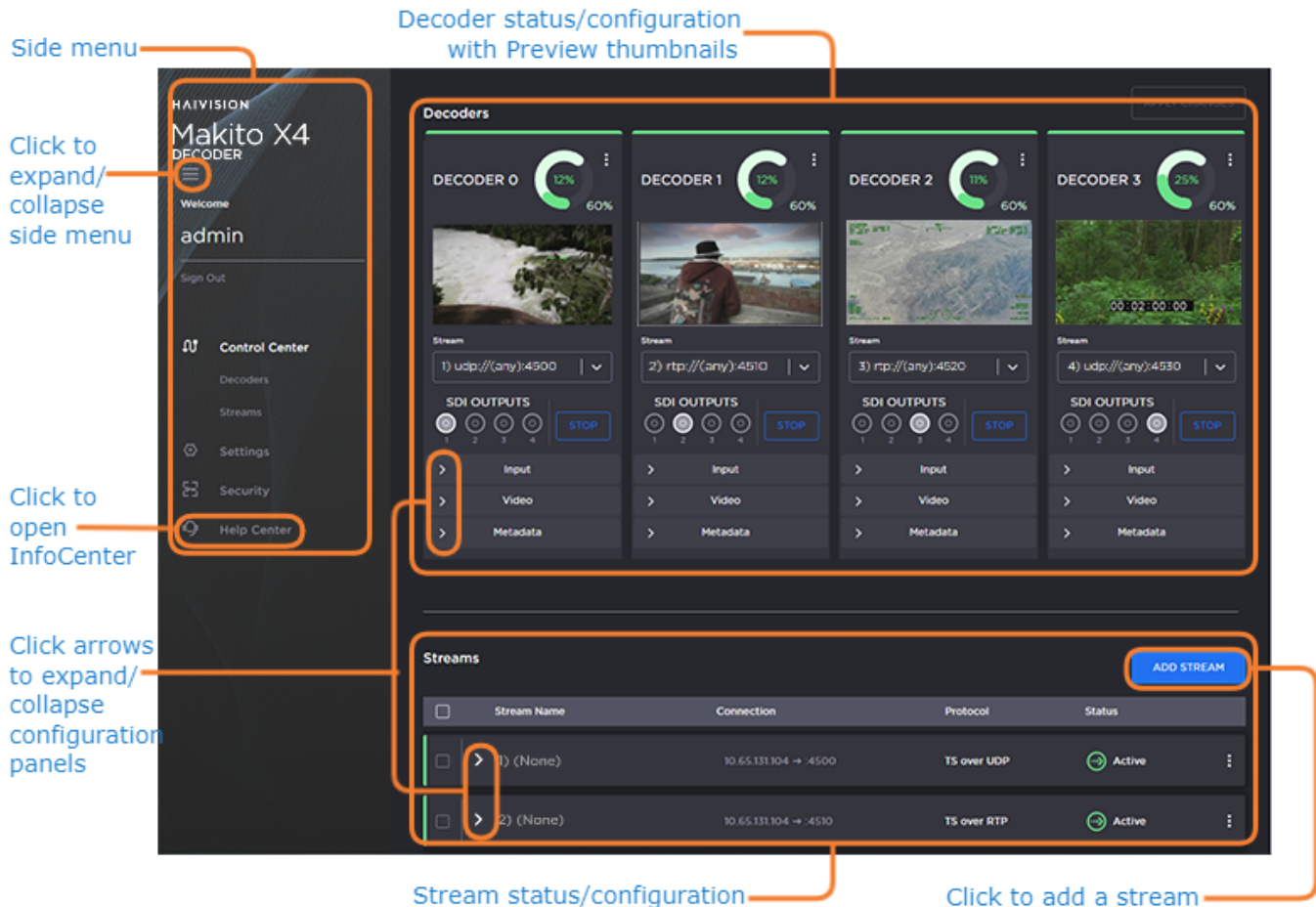
Please refer to the *Important Notice* (postcard shipped with the appliance or available from the [Download Center](#) on the Haivision Support Portal) for the default sign-in credentials.

Makito X4 provides three pre-defined user accounts. For information, see [Role-based Authorization](#).

## Exploring the Web Interface

After signing in to the Web interface, you will have access to the decoder configuration settings. All of the settings can be adjusted via the Web browser.

The Web interface opens to the Control Center, as shown in the following example. Your account information is displayed in the side menu. You can create streams and configure the decoders all on one page.



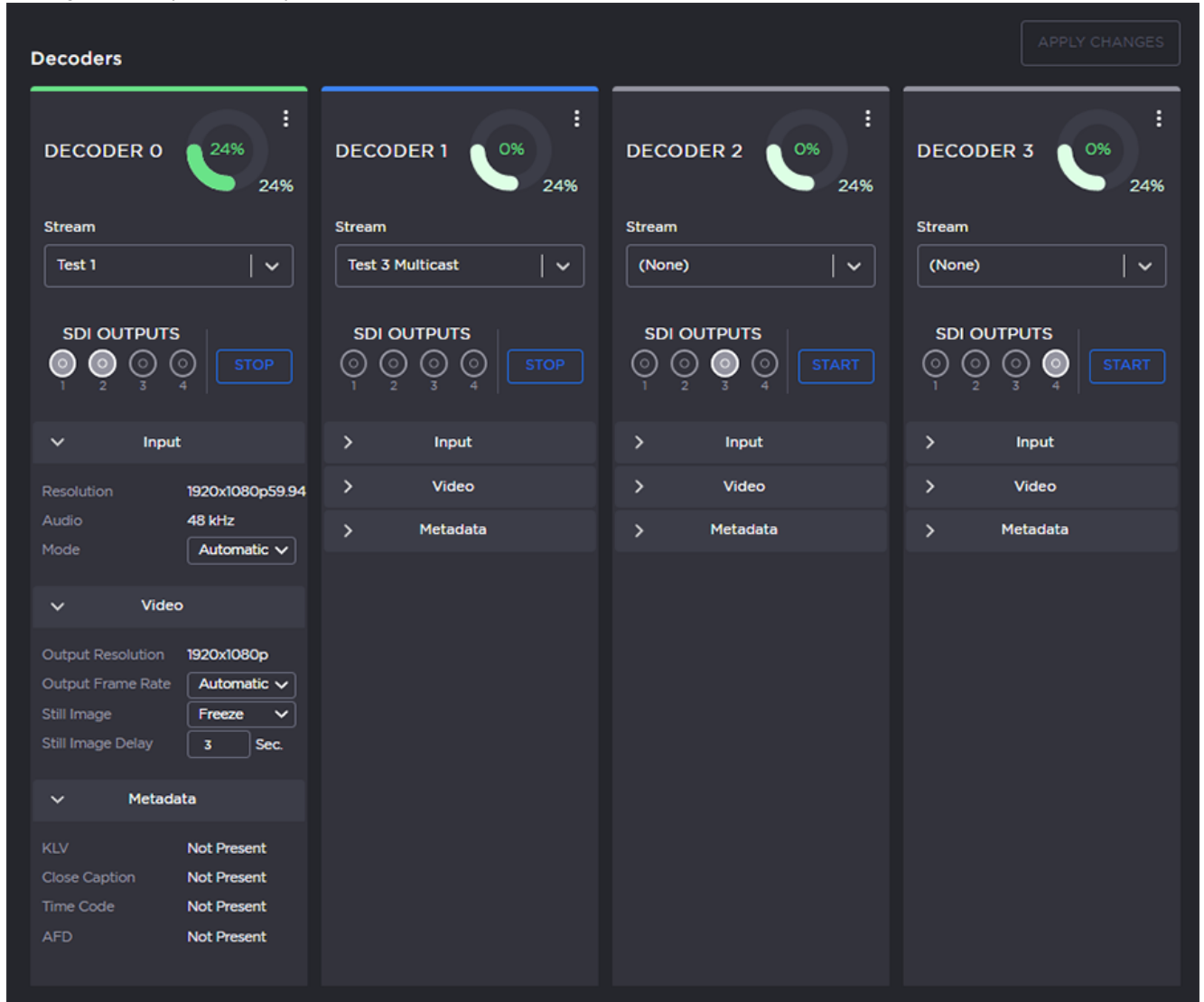
- To configure decoder settings, select **Decoders** from the side menu.
- To set up streaming, select **Streams** from the side menu.
- To access the administration or security settings, select **Settings** or **Security** from the side menu and then select the option from the tab bar, for example **Network** or **Accounts**.
- To access online **Help**, select **Help Center** from the side menu. This opens the **Haivision InfoCenter** website to the Makito X4 decoder documentation page.

### **Note**

If no external internet connection is available, a local Makito X4 decoder online Help is opened in your Web browser. For the most up-to-date documentation, please visit the [Haivision InfoCenter](#).



- (Where applicable) Click the arrow ( ▶ ) to expand or collapse the Decoders or Streams configuration panels. The following example shows the Decoder 0 Input, Video and Metadata configuration panels expanded.



**Tip**

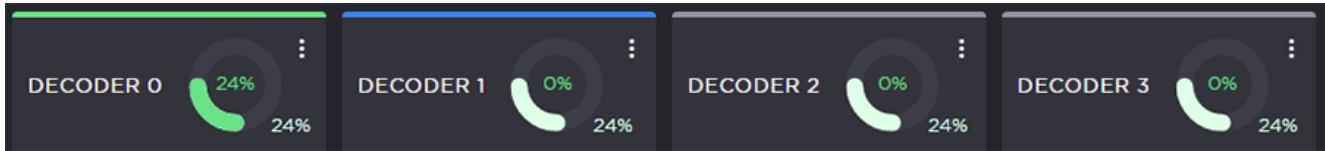
The donut charts on each Decoder panel show the resources used per decoder (darker green slice), as well as globally (lighter green slice). For more information, see [Donut Charts](#).

**Related Topics**

- [Donut Charts](#)

## Donut Charts

The donut charts on the Control Center Decoder panels show the resources used per decoder, as well as globally.



The actual percent usage for the decoder is displayed as text within the ring, while the slice length gives a quick glance view of the percentage. The slice color also changes as follows:

	Darker green	Indicates the percentage of resources used for that decoder.
	Lighter green	Indicates overall percentage of resources used. It is the same value on all active decoders.

The color bar at the top of each Decoder panel indicates the status of the streams assigned to it (if any):

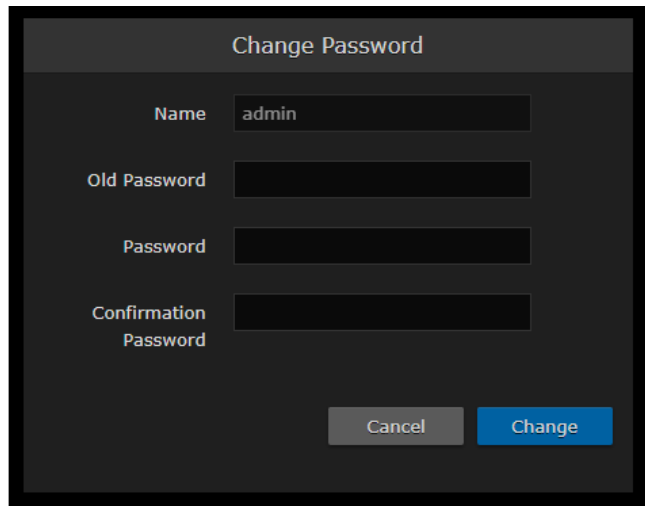
Color	Indication	Description
Blue	Listening	The decoder has started and is currently waiting for an input stream to be received / connected.
Green	Active	The decoder has started and is actively decoding a stream.
Gray	Inactive	The decoder is stopped.
Red	Error	The decoder has started but is unable to decode the incoming stream due to some errors. Please see the decoder statistics for more details on the error.

## Changing Your Password

- [Password Requirements](#)

### ! Important

For security purposes, be sure to change the default password! The first time you sign into a newly created account, you will see a Change Password dialog (as shown in the following example).

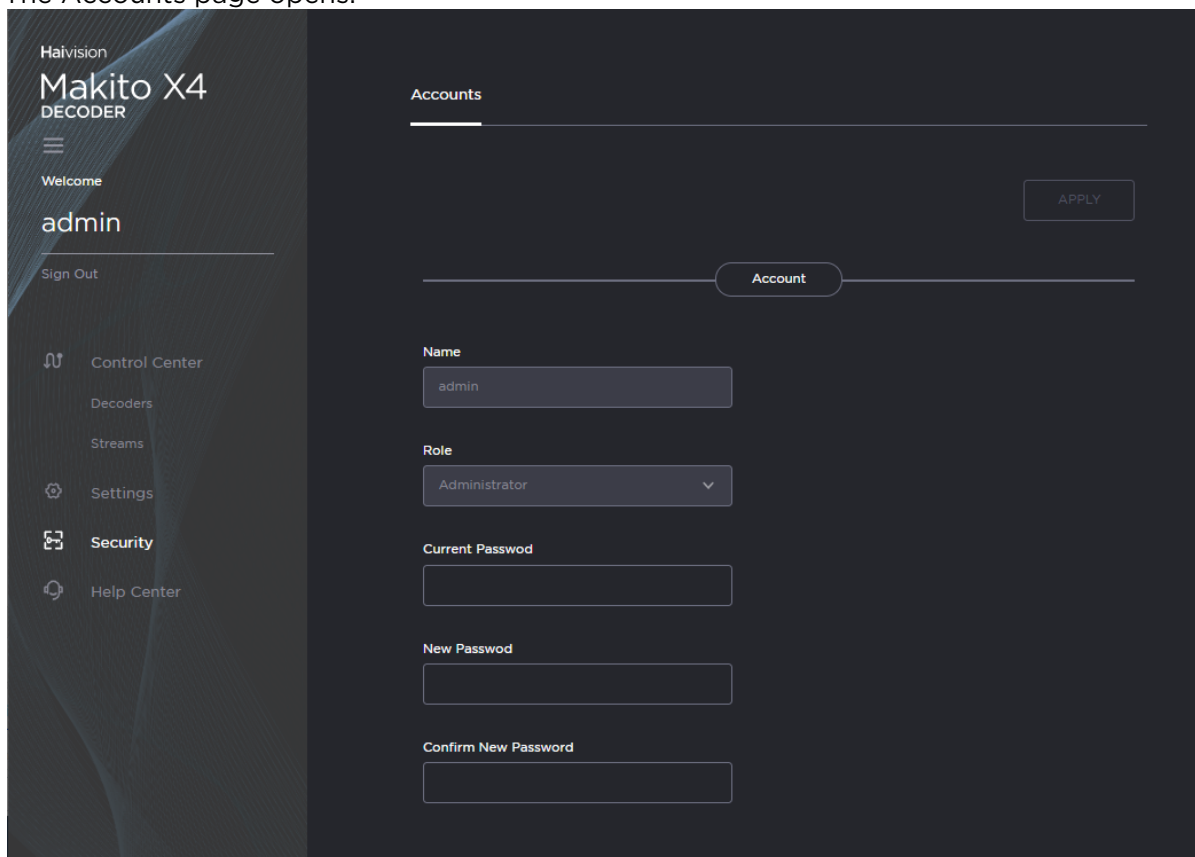


The screenshot shows a dark-themed dialog box titled "Change Password". It contains four input fields: "Name" with the value "admin", "Old Password", "Password", and "Confirmation Password". At the bottom, there are two buttons: "Cancel" and "Change".

You can also change your password from the Accounts page.

To change your password:

1. To navigate to the Accounts page, click **Security** on the sidebar. The Accounts page opens.



The screenshot shows the 'Accounts' page in the Haivision Makito X4 Decoder interface. The sidebar on the left contains the following items: 'Welcome admin', 'Sign Out', 'Control Center', 'Decoders', 'Streams', 'Settings', 'Security' (highlighted), and 'Help Center'. The main content area is titled 'Accounts' and features a form for editing an account. The form includes the following fields: 'Name' (admin), 'Role' (Administrator), 'Current Password', 'New Password', and 'Confirm New Password'. An 'APPLY' button is located at the top right of the form area.

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

**Tip**

Be sure to write down the new password.

You can also upload and manage personal public keys for your account to enable public key authentication (instead of password-based authentication). Note that this only applies to SSH CLI access to the decoder. For more information, see [pubkey](#) (CLI command).

## 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.

Your system may have in place security policies that determine the minimum password length as well as other requirements such as minimum number of upper case characters, digits, and symbols. In this case, you will be prompted to modify your password to comply with these policies.

## Signing Out

After you finish using the Makito X4, be sure to sign out. To do so, click **Sign out** from the toolbar.

Signing out prevents misuse and unauthorized access to the decoder.

# Managing the Decoder

**Note**

For a management overview of the Makito X4 Decoder as well as an overview of the Web interface, see [Getting Started with the Web Interface](#).

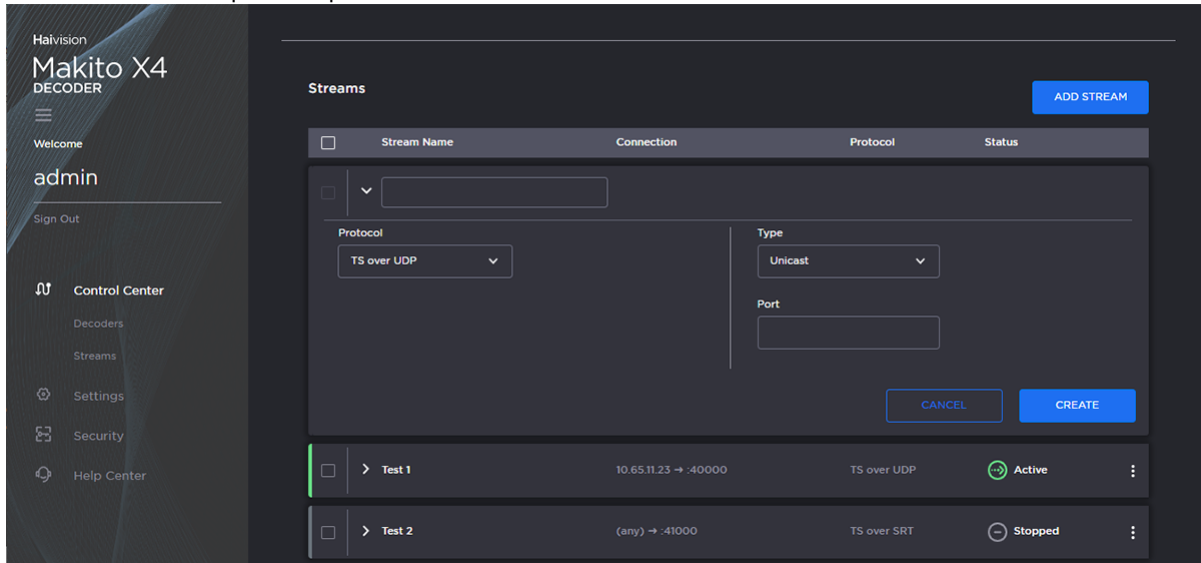
## Topics in This Chapter

- [Configuring Streams](#)
- [Configuring Decoder Outputs](#)

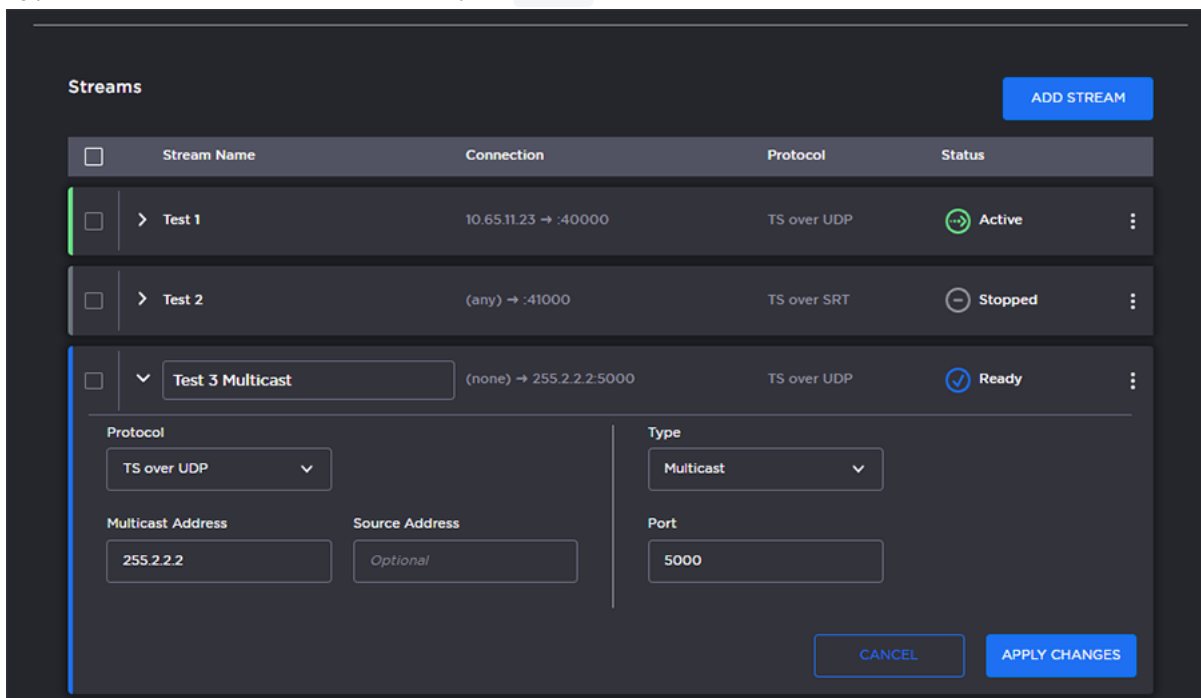
## Configuring Streams

To add a stream:

1. On the Control Center, click **Add Stream** to add the first stream. The New Stream panel opens.

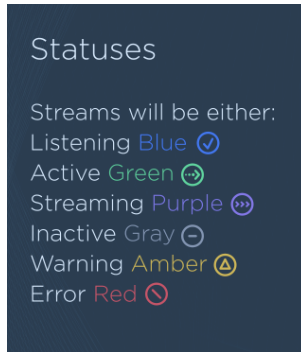


2. Type a name for the stream in the Name field.
3. Select the stream Protocol, for example, **TS over UDP**.
4. Select the stream Type, either Unicast or Multicast.
5. For Multicast streams, type in the Multicast Address, for example, **225.2.2.2**.
6. Type in the Port number, for example, **5000**.



7. Click **Create**.

The new stream is active and is added to the Streams List. The stream status indicators are as follows:



8. To add another stream, click **Add Stream** and follow the previous steps (Step #2 - #7) to configure the stream.

### Related Topics

- [Stream Settings](#)
- [Stream Statistics](#)



## Stream Settings

The following table lists the stream controls and settings:

Stream Setting	Default	Description/Values
Name	N/A	Specify a name for the stream. 1 to 32 characters
Protocol	TS over UDP	Select the Encapsulation Protocol type for the decoded stream. <ul style="list-style-type: none"> <li>• TS over UDP: MPEG transport stream over UDP (no RTP header)</li> <li>• TS over RTP: MPEG2 transport stream over RTP</li> <li>• TS over SRT: Haivision's Secure Reliable Transport (see <a href="#">Secure Reliable Transport (SRT)</a>)</li> </ul>
Type	Unicast	Select the Stream Type for the decoded stream. <ul style="list-style-type: none"> <li>• Unicast</li> <li>• Multicast</li> </ul>
Multicast Address	N/A	(Multicast streams only) Enter the multicast IP address in dotted-decimal format.
Source Address	N/A	(Multicast streams only) The Source Address specifies where the multicast stream is coming from (i.e., what address is broadcasting). In cases where many devices are sending multicast streams on the same multicast address, specifying the source encoder address can reduce the amount of multicast traffic being forwarded on your network. Only the multicast traffic from that specific source to that address will be forwarded (instead of all of them).
Address	N/A	(TS over SRT only) Enter the source IP address in dotted-decimal format.
Port	N/A	Enter the source UDP port for the stream. Enter a number in the range 1025 . . 65,535 . Note that RTP streams use even numbers only within this range.
FEC	None	(Optional, TS over RTP only) Enable Forward Error Correction (FEC). Select either: <ul style="list-style-type: none"> <li>• (None)</li> <li>• Pro-MPEG FEC (TS over RTP only)</li> </ul> On the Encoder, you set all these parameters, whereas on the decoder they are detected from the stream, and are available in the stream stats.

## SRT Stream Settings

The following table lists the TS over SRT-specific parameters:

[Connection](#)   [SRT Settings](#)   [SRT to UDP Stream Conversion](#)

### Connection

Setting	Default	Description/Values
Mode	Listener	Specifies the SRT Connection Mode (to simplify firewall traversal): <ul style="list-style-type: none"> <li>• Caller: The decoder acts like an SRT caller and connects to a server listening and waiting for an incoming call.</li> <li>• Listener: The decoder acts like an SRT listener and listens for a server to connect to it.</li> <li>• Rendezvous: Allows calling and listening at the same time. To simplify firewall traversal, Rendezvous Mode allows the encoder and decoder to traverse a firewall without the need for IT to open a port.</li> </ul>
Address	n/a	(Caller and Rendezvous Connection modes) Specifies the destination IP address for the SRT stream.
Source Port	Auto-Assign	<div style="border: 1px solid #ccc; padding: 5px; background-color: #fff9c4;"> <p><b>Note</b></p> <p>This simplifies firewall configuration as the firewall/NAT rules can be precisely tailored to the SRT stream.</p> </div>
Destination Port	n/a	(Caller and Rendezvous Connection modes) Specifies the UDP destination port for the SRT stream.
Port	n/a	(Listener Connection mode only) Specifies the UDP local port for the SRT stream.

## SRT Settings

Setting	Default	Description/Values
Latency	125	<p>Specifies how long the decoder will buffer received packets.</p> <div style="border: 1px solid #f0e68c; padding: 5px; margin: 5px 0;"> <p><b>Note</b></p> <p>The SRT buffer, configured as “Latency”, is the time reserved in the decoder to recover missing packets.</p> </div> <p>Because real-time video cannot be paused, restarted, slowed down, or accelerated, the buffer adds a fixed delay in the end-to-end latency. If a lost packet cannot be recovered, this may result in an A/V artifact. In this case, you should increase the SRT latency as it is likely too low. Please see the <a href="#">SRT Deployment Guide</a> for tuning guidance.</p>
Encrypted	Off	Toggle to On to enable decryption of encrypted streams.
Passphrase	n/a	(Encrypted must be On; 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 UTF8 characters
Reject Unencrypted Callers	On	(Listener Connection mode only, and Encrypted must be On) For security reasons, when encryption is enabled in the decoder’s SRT Listener stream configuration, this option causes the decoder to reject all unencrypted SRT Caller streams.

SRT to UDP Stream Conversion

Setting	Default	Description/Values
Enable	Disabled	<p><b>Note</b></p> <p>The SRT input stream may be encrypted and includes error correction. Enable this to rebroadcast the SRT stream on the local LAN without the encryption and error correction elements over UDP. A single multicast or unicast destination TS/UDP stream is supported for re-streaming.</p>
Address	n/a	Specifies the destination IP address for the stream.
Destination Port	n/a	Specifies the UDP source port for the stream.
TTL	64	<p>(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.</p> <p>Range = 1..255</p>
ToS	184 or 0xB8	<p>(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.</p> <p>Range = 0..255 (decimal) or 0x00..0xFF (hex)</p> <p><b>Important</b></p> <p>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.</p> <p><b>Note</b></p> <p>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.</p>

Stream Statistics

The following table lists the Stream statistics:

## General

Statistic	Description/Values
<b>Stream</b>	
Stream ID	ID number of the stream the statistics describe.
Name	Name of the stream (if provided by the user).
<b>Statistics</b>	
State	<p>The current operating status of the stream. Possible values are:</p> <ul style="list-style-type: none"> <li>• STOPPED: Stream is currently stopped by the user.</li> <li>• LISTENING: Stream has been started by the user, but no data is currently being received.</li> <li>• ACTIVE: Stream is actively flowing into the decoder system.</li> <li>• UNLICENSED: The stream contains features that are not permitted by the current license set. This can include TS-SRT (although licensing will prevent the creation of SRT streams, so this protection may not trigger).</li> <li>• RESOLVING: For TS-SRT only, a FQDN host address is currently resolving.</li> <li>• CONNECTING: For TS-SRT and TS-RTP with FEC only, a connection is in the process of being established.</li> <li>• SCRAMBLED: For TS-SRT, stream is scrambled and cannot be decoded. I think this one may be deprecated in the SRT library in favor of stricter encryption to prevent a possible denial-of-service attack.</li> <li>• SECURING: For TS-SRT, encrypted but keying material not ready (wrong secret?)</li> <li>• FAILED: For TS-SRT and TS-RTP with FEC only, the streaming connection attempt failed.</li> </ul>
Output	The output destination for the stream.
Up Time	Time elapsed since the streaming session was first started.
Source Address	IP address and port of the remote streaming source (sender). For example, 10.66.131.62 port 37435 .
Bit Rate	Measured rate of data transfer that is being received in the stream (in kbps).
Received Packets	Total number of packets that have been received and processed.
Received Bytes	Total number of bytes that have been received and processed.
Last Received	How long ago the last packet was received.
<b>Errors</b>	
Unlicensed Packets	Number of packets that were flagged as UNLICENSED (See “State” description above).
Dropped Packets	<p>Number of packets that were dropped. A packet could be dropped for various reasons, including:</p> <ul style="list-style-type: none"> <li>• Corrupted frame</li> <li>• PID filtering (not supported in 1.0)</li> <li>• Demuxing error</li> </ul>
Dropped Bytes	How many bytes were dropped, corresponding to “Dropped Packets”.
Last PID Dropped	The MPEGTS PID number of the last packet that was dropped.
Errors	The number of errors encountered in the streaming module. Also includes when the last one occurred.
Last Error	The most recently encountered error with a brief description.

Corrupted Frames	When present, the number of frames that had missing or bad MPEGTS continuity counters.
Corrupted Frames	When present, how many frames had missing or bad MPEGTS continuity counters.
Timestamp Rollovers	How many times the timestamp “rolled over” from a high value to a much lower value.
PES Size Mismatches	How many times the PES Size Mismatch error occurred.
MPEG2TS Lost Packets	How many lost packets were detected based on MPEGTS continuity counters.
RTP Lost Packets	(RTP Only) How many RTP packets were lost.
Connections	How many times the streaming module attempted to connect to the stream.
Program Number	For MPEGTS streaming protocols only, the Program Number of the stream.
PCR PID	For MPEGTS streaming protocols only, the PID of the Program Clock Reference.
Streams	A summary of the streams that have been recognized. This includes: <ul style="list-style-type: none"> <li>• Video - H.264 or HEVC video streams (possible values are 0 or 1)</li> <li>• Audio - recognized audio streams (possible values are from 0 to 8)</li> <li>• KLV - recognized KLV streams (possible values are 0 or 1)</li> <li>• Filtered - When PID filtering (not supported in v1.0) is used, the number of streams that were rejected because of the filter. Video, Audio and KLV could all be filtered and counted here.</li> </ul>
Reset	Click to reset the Stream statistics.

General SRT SRT Graph Pro-MPEG FEC

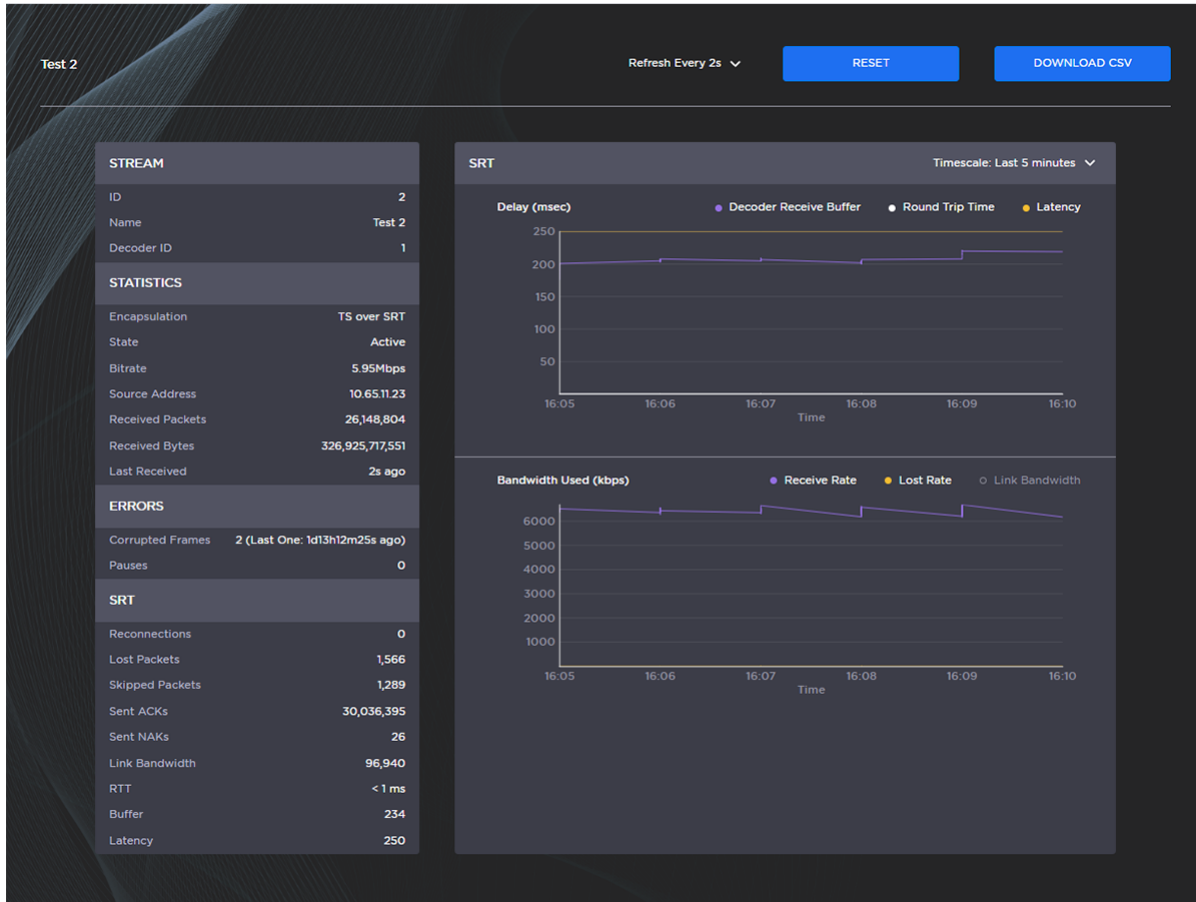
## SRT

Statistic	Description/Values
Local Version	Version of the SRT Library implementation on the decoder.
Peer Version	Version of the SRT Library implementation on the remote streamer.
Connections	Number of connection attempts. Severe network congestion may cause the connection to drop and automatically reconnect.
Local Port	Port number being used on the decoder.
Remote Port	Port number being used on the remote streamer.
AES Encryption	Indicates whether AES encryption has been enabled. Either On or Off.
Key Length	(AES encryption must be enabled) The key length for AES encryption. Either None, AES-128 or AES-256.
Decryption	(AES encryption must be enabled) Indicates whether the decoder can decrypt the stream/State of the decryption. Possible values are: <ul style="list-style-type: none"> <li>• Active</li> <li>• Initializing</li> <li>• Inactive (no passphrase)</li> <li>• Inactive (invalid passphrase)</li> </ul>

Statistic	Description/Values
Lost Packets	<div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b></p> <p>This is the raw number of packets dropped by the network. Most are recovered by retransmission at the source and so do not necessarily result in any artifacts.</p> </div>
Dropped Packets	Number of SRT packets that were ultimately dropped. These are packets that have arrived at the destination device too late, or that never arrive at all. The time to play the packet has arrived and the lost packet was not recovered, so the decoder/receiver will continue playing. Some type of video artifact may result (i.e., a replayed frame or video blocking artifacts).
Dropped Bytes	Number of bytes corresponding to “Dropped Packets”.
Sent ACKs	Transmission progress acknowledgment and feedback sent.
Sent NAKs	Lost packet reports sent.
Link Bandwidth	An estimate of the actual link bandwidth.
RTT	Measured Round Trip Time.
Local Buffer Level	SRT decoder buffers are the received stream packets waiting to be decoded. This statistic shows the portion of the decoder buffers up to the first missing packet. In other words, the remaining time to transmit the missing packet before it’s too late. The level of the decoder buffer in absence of packet lost is just below the latency value. In presence of packets lost, it is between 0 and the latency value.
Latency	<p>Maximum of the decoder and encoder configured Latency. For example:</p> <ul style="list-style-type: none"> <li>• Encoder Configured SRT Latency = 750 ms</li> <li>• Decoder Configured SRT Latency = 20 ms</li> </ul> <p>The SRT Stats Latency (which is the current SRT connection applied Buffering Latency) = 750 (largest of the two).</p> <p>At startup, handshake exchanges the value configured on both sides, and the largest one is selected.</p>

### SRT Graph

SRT streams include a graphical statistics display as shown in the following example:



**Note**

Not all browsers can support the statistics graphics for SRT. You need an up-to-date version of Chrome (Chromium), Firefox, Safari (WebKit), or Edge to support the graphics in the SRT statistics page.

**Tip**

For both the Delays and Bandwidth Used displays, you can select the inputs, such as the link bandwidth available over the time period.



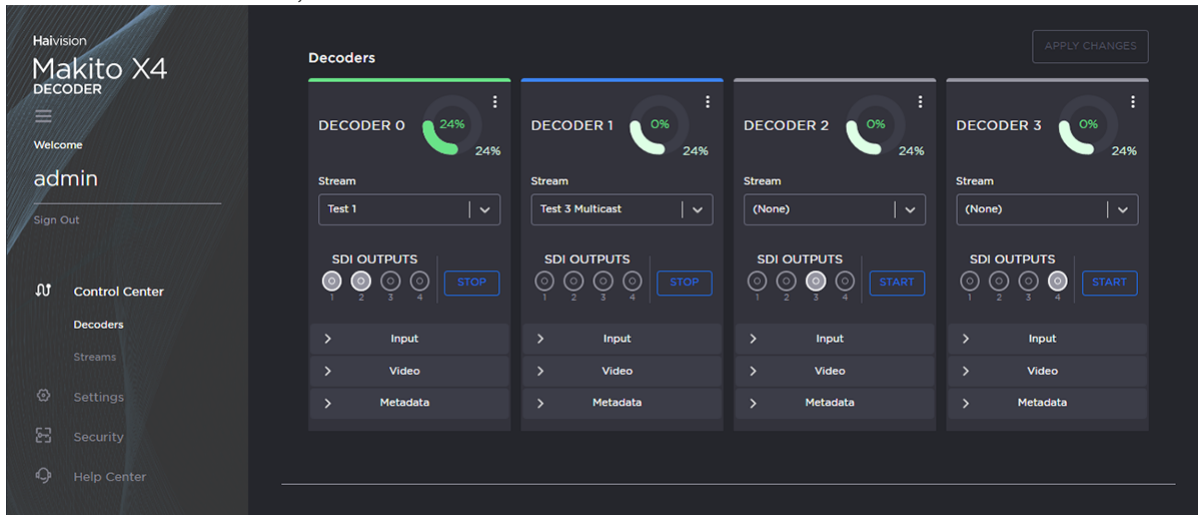
## Pro-MPEG FEC

Statistic	Description/Values
Level	The level of FEC protection: <ul style="list-style-type: none"> <li>• A (Column only): uses the column FEC stream.</li> <li>• B (Row and Column): uses both column and row FEC streams.</li> </ul>
Number of Columns/Rows	Number of columns and rows in the FEC matrix.
Block Aligned	The type of FEC matrix scheme: <ul style="list-style-type: none"> <li>• Yes: Sequential columns within a group start on the same row.</li> <li>• No: Each column starts on the row below the row on which the previous column started.</li> </ul>
Dropped Packets	The number of packets that were detected as missing by FEC.
Recovered Packets	The number of packets that were recovered by FEC. Tracking Mode
Lost Packets	The number of packets that could not be recovered by FEC.

## Configuring Decoder Outputs

To configure decoder outputs:

1. On the Control Center, select **Decoders** from the side menu.



2. Select the decoder to configure, for example Decoder 0.
3. Select the Output port(s) for the decoder (if not using the default selection).  
You can route the decoded video and audio to any set of physical outputs to specify which interfaces you want to see the video on.

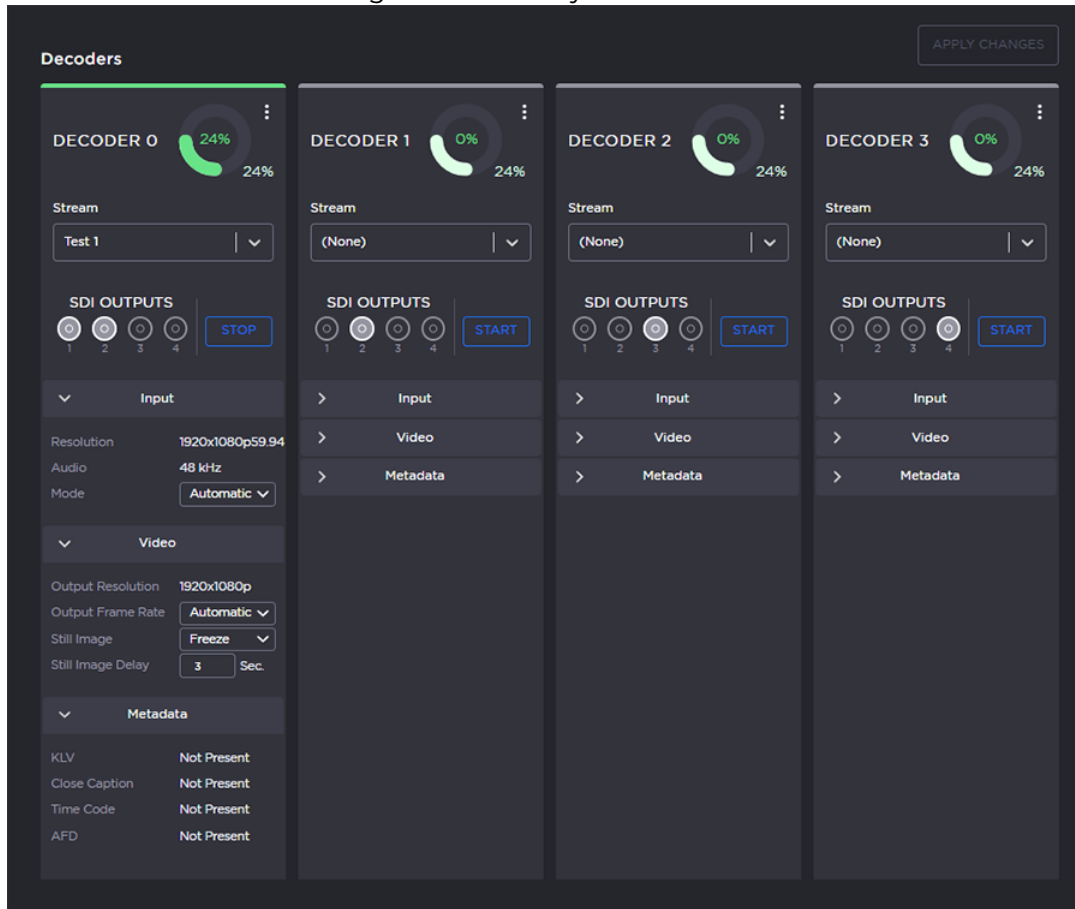
**Important**

Decoder 0 has highest priority, and the video decoding resources are prioritized with the lower decoder numbers (i.e., 0, then 1, 2, and 3) having higher priority. For more information, see [Oversubscription of Decoder Channels](#).

**Note**

To configure 2SI UHD output mode, all four outputs must be selected. The Quad Mode option becomes available when all four outputs are selected.

- Click the Input, Video and Metadata arrows ( > ) to expand the configuration panels. Some of the Decoder settings are read-only.



**Tip**

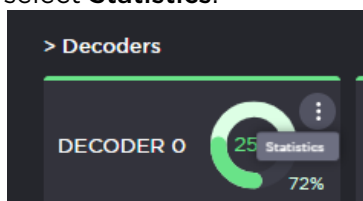
The donut charts on each Decoder panel show the resources used per decoder (darker green slice), as well as globally (lighter green slice). For more information, see [Donut Charts](#).

- Adjust settings where available. For example, you can change the Input Mode, Output Frame Rate, Still Image type, and Still Image Delay.

**Note**

The decoder will display the Still Image if it is no longer receiving video (for example, if the encoder stream has stopped or the network connection is lost).

- Click **Start** to begin decoding the stream.
- To view statistics for the decoder, click the More Options ("three dots") menu icon and select **Statistics**.



## Topics Discussed

- [Decoder Settings](#)
- [Decoder Statistics](#)
- [Oversubscription of Decoder Channels](#)
- [Multi-channel Synchronization](#)





## Decoder Settings

The following table lists the decoder controls and settings:

### [Input](#) [Video](#)

#### Input

Setting	Default	Description/Values
Name	N/A	(Read-only) The Name of the selected input stream.
Resolution	N/A	(Read-only) The input signal detected from the incoming video stream. It includes the number of pixels per line, and whether the video is interlaced or progressively scanned (indicated by <b>i</b> or <b>p</b> ).
Audio	N/A	(Read-only) The sampling rate of the incoming audio signal.

Setting	Default	Description/Values
Mode	Automatic	<p>The type of buffering to use. A jitter buffer temporarily stores arriving packets in order to remove the effects of jitter from the decoded stream.</p> <ul style="list-style-type: none"> <li>  <b>Note</b>                      The added delay will not decrease with time even if the video jitter disappears.                 </li> </ul> <p>The added delay depends on the monitored video jitter. It also depends on the audio arrival time; if the audio is late, this delay will be added to the current calculated delay. For example, if the audio is late by 500 ms (vs Video), an additional 500 ms delay will be added to allow the Audio/Video synchronization.</p> <ul style="list-style-type: none"> <li>Fixed: Fixed mode allows users to specify a delay to be added to the decode pipeline after the content is decoded. The amount of delay does not vary and artifacts may result if a too low value is used. (See "Delay (Fixed Mode)" below.)</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;">  <b>Note</b>                      The decoder has a minimum buffer set based on the resolution and frame-rate of the stream content. In addition, users can add more delay if desired: (1) to achieve a specific decoding latency for inter-channel synchronization purposes; (2) to deal with unusually large amounts of jitter in the stream; or (3) to allow A/V sync to occur when the stream content is highly out of sync.                 </div> <ul style="list-style-type: none"> <li>MultiSync: Use to synchronize the content across multiple channels to within one frame period. This is designed to allow down-stream equipment to switch smoothly between video and audio sources. You need to set the "(MultiSync) Delay" on all of the decoder channels to the same value. For the steps to configure multi-channel sync on a Makito X and Makito X4 Series encoder and decoder, see <a href="#">Multi-channel Synchronization</a>.</li> </ul>
Delay (Fixed Mode)	0 ms	<p>The delay in ms when using buffering in Fixed mode. Range = 0...2000 ms</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;">  <b>Note</b>                      The maximum delay is 2000 ms. If for any reason the system requires more than this value to play smoothly, video or audio artifacts will be noticed.                 </div>
Delay (MultiSync Mode)	1000 ms	<p>The delay in ms required to ensure that two or more decoder channels are synchronized. Range = 0...10000 ms</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;">  <b>Note</b>                      The difference in the values between the decoder channels cannot exceed 2000 ms.                 </div>

Input Video

Video

Setting	Default	Description/Values
Output Resolution	Automatic	(Read-only) The dimensions of the frames (width and height) sent to the display, with an indicator ( <i>i</i> or <i>p</i> ) designating whether the video is interlaced or progressive.
Output Frame Rate	Automatic	<p>The frame rate per second generated for the displays:</p> <ul style="list-style-type: none"> <li>Automatic: The decoder will select the best display frame rate based on the stream parameters and the connected display's capabilities.</li> <li>75, 60, 59, 50, 30, 29, 25, 24 or 23</li> </ul> <div style="border: 1px solid #f0e68c; padding: 5px;"> <p><b>Note</b></p> <p>If Automatic is selected, the actual frame rate generated will be the next highest valid frame rate supported by the SDI and HDMI interface, plus the one that gives the best decimation factor. For example, 30 Hz could be chosen instead of 29.970 Hz.</p> </div>
Still Image	Freeze	<p>This setting controls what the decode channel outputs when the decoder is not receiving a video stream (e.g., a stream is stopped (at the encoder) or the network connection fails). A still image is inserted on the output SDI interface having the same resolution and frame rate as the last decode picture of the last stream. The options available are:</p> <ul style="list-style-type: none"> <li>Freeze: continues to display the last decoded video frame.</li> <li>Black Screen: displays a black screen.</li> <li>Blue Screen: displays a blue screen.</li> <li>Color Bars: displays a series of vertical color bars across the width of the display.</li> <li>Mute: disables the video output.</li> </ul> <div style="border: 1px solid #f0e68c; padding: 5px;"> <p><b>Note</b></p> <p>When the still image is substituted on the display outputs, the video frame rate and resolution will be maintained.</p> </div>
Still Image Delay	3	<p>The delay in seconds before the still image is displayed. Range = 1...1.000 seconds</p> <div style="border: 1px solid #f0e68c; padding: 5px;"> <p><b>Note</b></p> <p>Until the selected still image is displayed, the output will freeze.</p> </div>

## Decoder Statistics

The following tables list the Decoder statistics:

[General](#) [Buffering](#) [Video](#) [Audio](#) [Metadata](#) [Clock Recovery](#)

### General

Statistic	Description/Values
Decoder ID	ID Number of the decoder (Possible values are 0 to 3).
State	Current state of the decoder engine. Possible values are: <ul style="list-style-type: none"> <li>• STOPPED - The decoder is currently stopped by the user.</li> <li>• STARTED - The decoder is currently started by the user.</li> <li>• OVERSUBSCRIBED - The decoder is currently started by the user; however, there are insufficient processing resources to decode the video portion of the active stream. Higher priority decoders (those that have lower Decoder IDs) are consuming them.</li> </ul>
Up Time	Time elapsed since the decoder was first started.
Oversubscribed Frames	If the decoder was oversubscribed at any point, the number of frames that were rejected as a result.

[General](#) [Buffering](#) [Video](#) [Audio](#) [Metadata](#) [Clock Recovery](#)

### Buffering Statistics

Statistic	Description/Values
Buffering State	The state of the buffering module. Possible values are: <ul style="list-style-type: none"> <li>• IDLE - The buffering module is running, but not actively processing data.</li> <li>• ACTIVE - The buffering module is actively processing data.</li> <li>• MultiSync NO NTP CLIENT - MultiSync buffering was selected but NTP client is not active</li> <li>• MultiSync Timecode NOT PRESENT - MultiSync buffering was selected, but the stream does not contain the required timecode.</li> <li>• MultiSync Timecode INVALID - MultiSync buffering was selected, but the timecode in the stream is considered to be invalid. The embedded timecode is likely not close enough to the current system time or it may even be in the future.</li> </ul>
Buffering Mode	The type of buffering used.
Video Latency	The expected delay from streaming receive time to the display of video frames with the current buffering scheme.
STC to PCR Lead Time	<div style="border: 1px solid #f0e68c; padding: 5px;"> <p><b>Note</b></p> <p>The PCR is the clock reference that is contained in the MPEG transport stream. The STC is the clock reference that the output of video, audio and KLV frames are scheduled against. For lower latency, the STC runs ahead of the PCR. For higher latency, the STC runs behind the PCR.</p> </div>

## Video Statistics

Statistic	Description/Values
Algorithm	The video compression standard in use. Possible values are H.264 and H.265.
Profile	<p>The profile tier for the incoming video stream from the H.264 / H.265 standard:</p> <ul style="list-style-type: none"> <li>(AVC/H.264) Main, High, or Baseline</li> <li>(HEVC/H.265) Main or High, optionally with 4:2:2 and/or 10-bit</li> </ul> <div style="border: 1px solid #f0e68c; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The profiles and levels are defined in the corresponding AVC/H.264 or HEVC/H.265 specifications.</p> </div>
Level	<p>The level tier from the H.264 / H.265 standard (i.e., the required level of decoder performance to be able to process the incoming video stream):</p> <ul style="list-style-type: none"> <li>(AVC/H.264) 3, 3.2, 4, or 4.2</li> <li>(HEVC/H.265) 1, 2, 2.1, 3, 3.1, 4, 4.1, 5, 5.1, 5.2, 6, 6.1 or 6.2</li> </ul>
Framing	<p>The framing structure detected in the stream. Possible values are:</p> <ul style="list-style-type: none"> <li>I - Only I frames are detected in the GOP</li> <li>IP - Only I and P frames are detected in the GOP</li> <li>IBP - I, P and one B-frame are detected in the GOP</li> <li>IBBP - I, P and two B-frames are detected in the GOP</li> <li>IBBBP - I, P and three B-frames are detected in the GOP</li> <li>IBBBBBP - I, P and four B-frames are detected in the GOP</li> <li>IP + N B-pictures - I, P and N B-frames are detected in the GOP (where N is the number of B-frames that were found).</li> <li>Intra Refresh - No I-frames have been detected in the GOP since the decoder was started.</li> </ul>
Preprocessor State	<p>The current state of the video preprocessor. Possible values are:</p> <ul style="list-style-type: none"> <li>IDLE - The video preprocessor is not actively receiving data.</li> <li>ACTIVE - The video preprocessor is actively receiving data.</li> <li>UNSUPPORTED - The video stream is not supported by our implementation. This includes interlaced H.264 streams and video larger than 3840x2160p.</li> <li>UNLICENSED - The video stream contains features that are not permitted by the current license set. This can include 4:2:2 color space, 10-bit, and a higher resolution than is currently licensed (Tiers are SD, HD, Full-HD, and UHD).</li> </ul>
Video Input Packets	The number of video input packets recognized by the decoder.
Video Decoder State	<p>The state of the video decoder engine. Possible values include:</p> <ul style="list-style-type: none"> <li>IDLE - The video decoder engine is not decoding frames.</li> <li>ACTIVE - The video decoder engine is actively decoding frames.</li> </ul>
Display Format	The format of the video stream as it was encoded. This information includes resolution (Width x Height), picture structure ("p" for progressive, "i" for interlaced) and frame rate. Example: 1280x720p59.94.
Video Decoder Load	How much of the system's total video decoding capacity that is taken up by the current stream. The total capacity is 3840x2160 at 60fps. For example, a stream encoded at 1920x1080p60 would consume 25% of the total video decoding capacity.
Still Image	The most recent still image displayed, its current state and number of instances displayed.



Statistic	Description/Values
Displayed Frames	The number of frames displayed.
Skipped Frames	Skipped frames occur when the time to play a video frame has already passed when the decoder is finished producing a new video frame. In this case, the video frame is dropped (never displayed) and it is counted as skipped. The decoder does this to minimize the latency and maintain audio/video sync. The most likely reason for this to occur is that the video is complex and takes more time to decode than is expected by the decoder.
Replayed Frames	A replay frame occurs when the same video frame is played twice in a row on a decoder output. It occurs when the decoder is too slow to produce a video frame and there is nothing else to display. In this case, the decoder will replay the last frame played. Conditions such as network congestion and packet loss, complex video scenes, and the decoder attempting to minimize latency can all cause replay frames.

[General](#)
[Buffering](#)
[Video](#)
[Audio](#)
[Metadata](#)
[Clock Recovery](#)

## Audio Statistics

Statistic	Description/Values
Audio Decoder State	The state of the audio decoding engine. Possible values are: <ul style="list-style-type: none"> <li>• IDLE - The audio decoder engine is running, but not decoding frames.</li> <li>• ACTIVE - The audio decoder engine is actively decoding frames.</li> <li>• STOPPED - The audio decoder engine is stopped.</li> </ul>
Audio Sample Rate	The number of audio samples per second taken from the output signal. 48 kHz only.
Number of Pairs	The number of audio pairs currently being decoded.
Played Frames	The number of decoded audio frames.
Skipped Frames	The number of skipped audio frames.

[General](#)
[Buffering](#)
[Video](#)
[Audio](#)
[Metadata](#)
[Clock Recovery](#)

## Metadata Statistics

Statistic	Description/Values
Received Packets	Number of packets received by the metadata processing engine. Packets can be of type KLV, TC, CC or AFD.
Synchronous Packets	Number of packets that were synchronous in nature (had a timestamp associated with them).
Asynchronous Packets	Number of packets that were asynchronous in nature (did not have a timestamp associated with them).
Timecode	The current timecode

[General](#)
[Buffering](#)
[Video](#)
[Audio](#)
[Metadata](#)
[Clock Recovery](#)

## Clock Recovery Statistics

Statistic	Description/Values
Tracking Mode	Whether or not clock recovery is ENABLED.
Status	The current status of clock recovery. Possible values are: <ul style="list-style-type: none"> <li>• LOCKED - The clock adjustment did not vary buy more then 5 ppm in the last 2 minutes.</li> <li>• UNLOCKED - The clock adjustment was over 5 ppm in the last 2 minutes.</li> </ul>
ReSync Count	The number of times clock recovery needed to resynchronize.
Current STC	The current value of the System Time Clock, and how far away from the nominal frequency in PPM.
STC Avg (last 2 min)	Average value of the the STC clock for the last 2 minutes, plus the deviation in PPM.

### Related Topics:

- [Decoder Settings](#)



## Decoder Statistics Example

Decoder 0 Statistics
Refresh Every 2s ▼
RESET

---

General	
State	Active
Up Time	5d3h32m36s
Buffering	
Buffering State	ACTIVE
Buffering Mode	AUTOMATIC
Video Latency	154 ms
STC to PCR Lead Time	61 ms (STC is ahead of PCR by 61 ms)
Video	
Algorithm	H.265
Profile	Main
Level	4.1
Framing	IP
Preprocessor State	ACTIVE
Video Input Packets	26635212
Video Decoder State	ACTIVE
Display Format	1920x1080p59
Video Decoder Load	24%
Still Image	FREEZE (INACTIVE) [Count=7]
Displayed Frames	26,404,871 [99.13%] (Last One: 0s ago)
Skipped Frames	104,807 [0.39%] (Last One: 54m15s ago)
Replayed Frames	127,123 [0.48%] (Last One: 54m14s ago)
Audio	
Audio Decoder State	ACTIVE
Audio Sample Rate	48 kHz
Number of Pairs	1
Played Frames	20,830,119 [99.92%] (Last One: 0s ago)
Skipped Frames	17,100 [0.08%] (Last One: 54m14s ago)
Clock Recovery	
Tracking Mode	ENABLE
Status	LOCKED (0.0PPM)
ReSync Count	5
Current STC	27,000,002Hz (0PPM from Nominal)
STC Avg (last 2 min)	27,000,003Hz (Deviation 0.0PPM)

## Oversubscription of Decoder Channels

Oversubscription occurs when the sum of the streams being decoded exceeds the capabilities of the decoder. This can be due to bitrate (aggregate bitrate ingress limit) or resolution/frame-rate (limit is 1 x UHDp60 or equivalent). This topic explains the behavior of the decoder when streams are sent that overtax its capabilities.

The Makito X4 decoder can decode up to a single 3840x2160p60 stream. This represents 100% of the system's decoding capacity.

The video decoding resources are prioritized with the lower decoder numbers having higher priority, i.e.:

- Decoder 0 has highest priority
- Decoder 1 has 2nd highest priority
- Decoder 2 has 3rd highest priority
- Decoder 3 has lowest priority

This priority logic is only exercised if one of the active streams is UHD, because the Makito X4 can decode up to four 1920x1080p60 streams simultaneously without difficulty.

Oversubscription occurs when more than one 3840x2160p60 stream or more than two 3840x2160p30 streams are decoded. In this situation, Decoder 0 will always run, and Decoder 1 will run if there are enough resources remaining, then Decoder 2, then Decoder 3.

### Important

Any streams that are mission-critical and cannot be interrupted should always be decoded on Decoder 0. The lower-priority decoders that are running may be interrupted during decoding if the video decoding resources are required for a higher-priority decoder.

## Multi-channel Synchronization

The Makito X and Makito X4 Series multi-channel synchronization feature is designed to work in the broadcast industry where remote producers typically capture multiple views of the same content and transport it over a network to a central production facility. All these channels need to be synchronized to within one frame period at the decoders, so that downstream equipment does not experience replay issues when switching between video and audio sources.

Following is a summary of the steps to configure multi-channel sync on the Makito X and Makito X4 encoder and decoder to synchronize content across multiple channels. For additional information, please refer to the *Multi-Channel Synchronization Technical Brief* (available through the [Download Center](#) on the Haivision Support Portal.).

[Step 1: NTP](#)   [Step 2: Encoder](#)   [Step 3: Decoder Pass 1](#)   [Step 4: Measure \(Decoder Pass 2\)](#)

[Step 5: Finalize \(Decoder Pass 3\)](#)

The source of timecodes must be “NTP locked” on both the encoder and decoder. You can configure the encoder and the decoder to use NTP (Network Time Protocol) on the (Web interface) Administration> Date and Time page. For the decoder, see [Configuring Date and Time](#).

**Note**

The encoder can also pass the timecode from the video signal, so the camera can also be the source. In this case, encoder does not need to be synced to an NTP server, but the cameras do (in order to generate the timecodes).

There are two possible options for multi-channel sync:

Option 1 - The encoder is configured to use “System” timecodes and must be “NTP locked”.

Option 2 - The encoder is configured to use “Video” timecodes; therefore, the video source must generate timecodes which are locked to the same master clock.

**Tip**

Make sure your devices are configured to use the same fast, precise NTP server. We recommend an offset (difference between local clock and remote clock) of around 5 ms.

Step 1: NTP   [Step 2: Encoder](#)   Step 3: Decoder Pass 1   Step 4: Measure (Decoder Pass 2)

Step 5: Finalize (Decoder Pass 3)

---

On the Video Encoder settings page:

1. Set the Timecode Source to:
  - "System" if the timecodes are to be generated by the encoder.
  - or-
  - "Video" if the timecodes are pre-synchronized by the upstream equipment and embedded into the SDI signal.
2. Start the stream output on all encoders.

Step 1: NTP   Step 2: Encoder   [Step 3: Decoder Pass 1](#)   Step 4: Measure (Decoder Pass 2)

Step 5: Finalize (Decoder Pass 3)

---

For each decode channel to be synchronized, on the Control Center Decoder panel:

1. Select MultiSync for the buffering Mode. (See [Decoder Settings](#).)
2. Initially, enter a value such as the default (1000ms) for the MultiSync Delay (unless SRT is configured, then add the negotiated SRT latency value for the stream).
3. Start the stream reception on all decoders.

Step 1: NTP   Step 2: Encoder   Step 3: Decoder Pass 1   [Step 4: Measure \(Decoder Pass 2\)](#)

Step 5: Finalize (Decoder Pass 3)

---

### Observe Delay Ranges

On the Decoder panel:

1. Wait 10 to 20 seconds while the decoder starts receiving the stream and gathers statistics.
2. Either open the Statistics pane or check beside the MultiSync Delay field, and you will see a range of valid multisync values, such as "Min=1,317 ms, Max=3,112 ms".
3. Note down the min/max ranges for all channels to be synchronized.

#### Tip

If you are synchronizing many decoder channels, complete **Step 3** for all of them and then go back to record the range values.



Step 1: NTP   Step 2: Encoder   Step 3: Decoder Pass 1   Step 4: Measure (Decoder Pass 2)

**Step 5: Finalize (Decoder Pass 3)**

---

**Configure MultiSync Delay**

Based on the results of Decoder Pass 2:

1. Select a single delay value that is in the acceptable range for all of the decoders. Avoid using the minimum or maximum values.
2. On the Decoder panel, set the MultiSync Delay on all of the decoder channels to the same value.

After a few seconds of playback, all of the decoder channels will be playing in sync with each other.



# System Administration

## Note

Unless otherwise indicated, the Administration Settings pages are only accessible to administrators. The exceptions are as follows:

- Status is accessible to all users.
- Presets is accessible to Operators as well as Administrators.

## Topics in This Chapter

- [Viewing System Status Information](#)
- [Saving and Loading Presets](#)
- [Installing Firmware Upgrades](#)
- [Configuring Network Settings](#)
- [Configuring Date and Time](#)
- [Enabling and Disabling Network Services](#)
- [Managing Licenses](#)

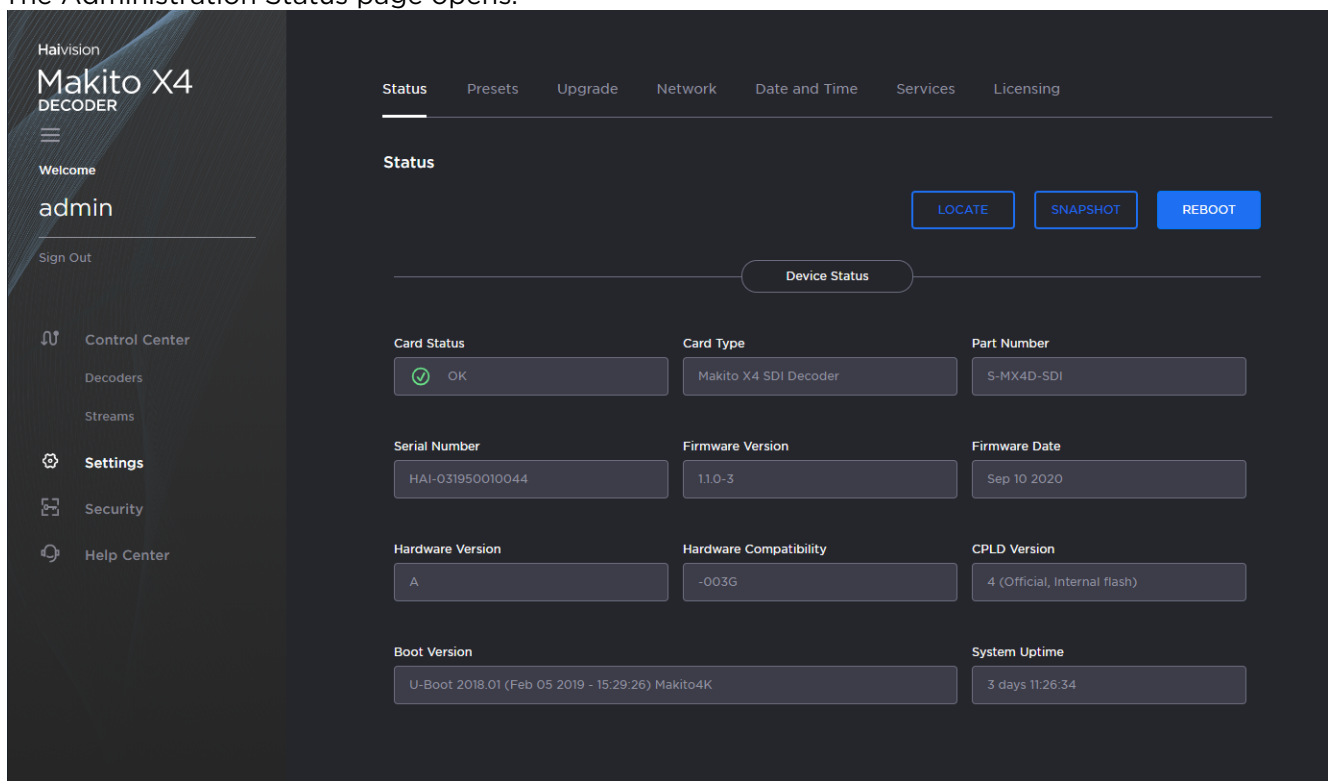
## Viewing System Status Information

From the Status page, you can view status information about the Makito X4 decoder, such as the operating system uptime, along with information about the hardware and software components. You can also initiate blinking of the Status and TX LEDs (to help locate particular decoders in a lab or rack), as well as take a system snapshot and reboot the decoder.

The Status page is available to Operator and Guest users as well as Administrators.

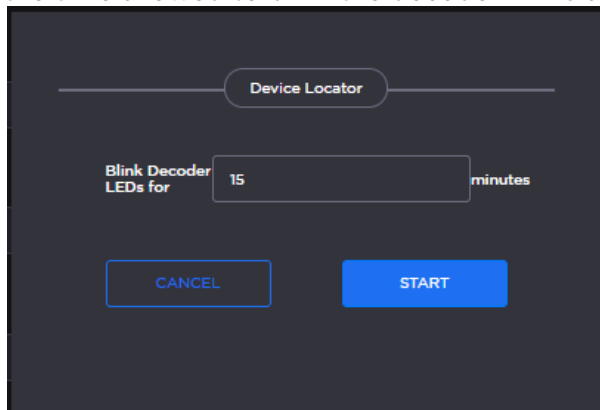
To view status information:

1. Click **Settings** on the side menu and **Status** on the navigation bar. The Administration Status page opens.



2. The Status settings are read-only. For details, see [Status Settings](#).
3. To display a snapshot of system information, see [Taking a System Snapshot](#).

- To initiate blinking of the Status and TX LEDs, click **Locate**. On the Device Locator dialog, adjust the time allowed to blink the decoder LEDs and click **Start**.



**Note**

The blinking can last from 1 minute to 1 hour; the default is 15 minutes.

- To reboot the decoder, see [Rebooting the Decoder](#).

## 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
Personality	Select between SDI, SQD (version 1.6 and later), DEFENSE (version 1.7 and later) and SMPTE 2110 (version 1.4 and later). This setting will take effect upon the next reboot.
Card Status	OK (or error message if applicable).
Card Type	The type of device, e.g., Makito X4 SDI Encoder.
Part Number	The Haivision part number for the encoder or decoder, e.g., B-MX4E-SDI4 or S-MX4D-SDI.
Serial Number	The serial number for this appliance or card.
Firmware Version	The firmware version of the device, e.g., 1.0.0-23.
Firmware Date	The firmware release date.
Hardware Version	The hardware version of the device.
Hardware Compatibility	-001G or -002G (basic card assembly).
Carrier Type	(Makito X4 Rugged Encoder only) The interface carrier board.  <div style="border: 1px solid #ccc; padding: 5px; background-color: #fff9c4;"> <p><b>Note</b></p> <p>In Release 1.2, the number of CVBS inputs supported depends on the Carrier Type. "Makito 4KR" indicates the three-input variant, whereas "Makito 4KR 12G" indicates the four-input variant.</p> </div>
CPLD Version	The CPLD version of the device.
Boot Version	The Boot version of the device.
System Uptime	The length of time the encoder or decoder has been "up" and running (e.g., 4 days 17:42:03).
Encoding Chipset Load	(Encoder only) The combined video encoding processor usage in percentage% (combining both Hi and Lo streams).
Temperature	The current board temperature in degrees Celsius.

## Rebooting the Decoder

To reboot the decoder:

1. Click **Settings** on the sidebar and **Status** on the navigation bar.
2. On the Status page, click **Reboot**.

 **Tip**

You can also reboot the decoder from the Network Settings page. See [Configuring Network Settings](#).

## 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 or decoders and status checks, configured audio encoders or decoders 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 generate a snapshot of system information in a new window, as shown in the

following example:

```

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

-----
Credentials:
-----
uid=500(admin) gid=511(haiadmin) groups=511(haiadmin),510(haisecur),512(haioper)

-----
Local Time:
-----
Thu Jun  4 16:41:13 EDT 2020

-----
Universal Time:
-----
Thu Jun  4 20:41:13 UTC 2020

-----
System UP Time:
-----
16:41:13 up 3:09,  1 user,  load average: 1.43, 1.42, 1.44

-----
Manufacturing Information:
-----
MAC Address   : 5c:77:57:00:e0:be
Serial Number : HAI-031950010016
Boot Revision : U-Boot 2018.01 (May 28 2020 - 19:11:18 -0400) Xilinx ZynqMP MakitoX4D

-----
Card Temperature:
-----
Temperature Status:
  Current Temperature   : 35 Celsius measured 1s ago
  Maximum Temperature  : 35 Celsius measured 3h8m35s ago
  Minimum Temperature  : 34 Celsius measured 3h8m41s ago
Debug Statistics:
  Invalid Readings     : 0
  Discarded Deltas    : 0

-----
System Information:
-----
Card Type           : "Makito X4 SDI Decoder"
Part Number         : S-MX4D-SDI
Serial Number       : HAI-031950010016
MAC Address         : 5c:77:57:00:e0:be
Firmware Version    : 1.0.0-34
Firmware Date       : "Jun  4 2020"
Firmware Time       : "11:36:11"
Hardware Version    : A
Hardware Compatibility : -002G
CPLD Version        : 4 (Official, Internal flash)
Boot Version        : "U-Boot 2018.01 (Feb 05 2019 - 15:29:26) Makito4K"

-----
Installed Debian Packages:
-----
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
|/ Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
||/ Name          Version          Description
+-----+-----+-----+

```



2. Save the file.

 **Tip**

You can also take a system snapshot from the CLI using the [system\\_snapshot.sh](#) command.

## Saving and Loading Presets

Each Makito X Series device is configured by users' selecting and setting values of applicable encoder or decoder settings, such as Video and Audio Encoder, Streaming Output, and (if licensed) Metadata settings; or Decoder Output and Stream settings. 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.

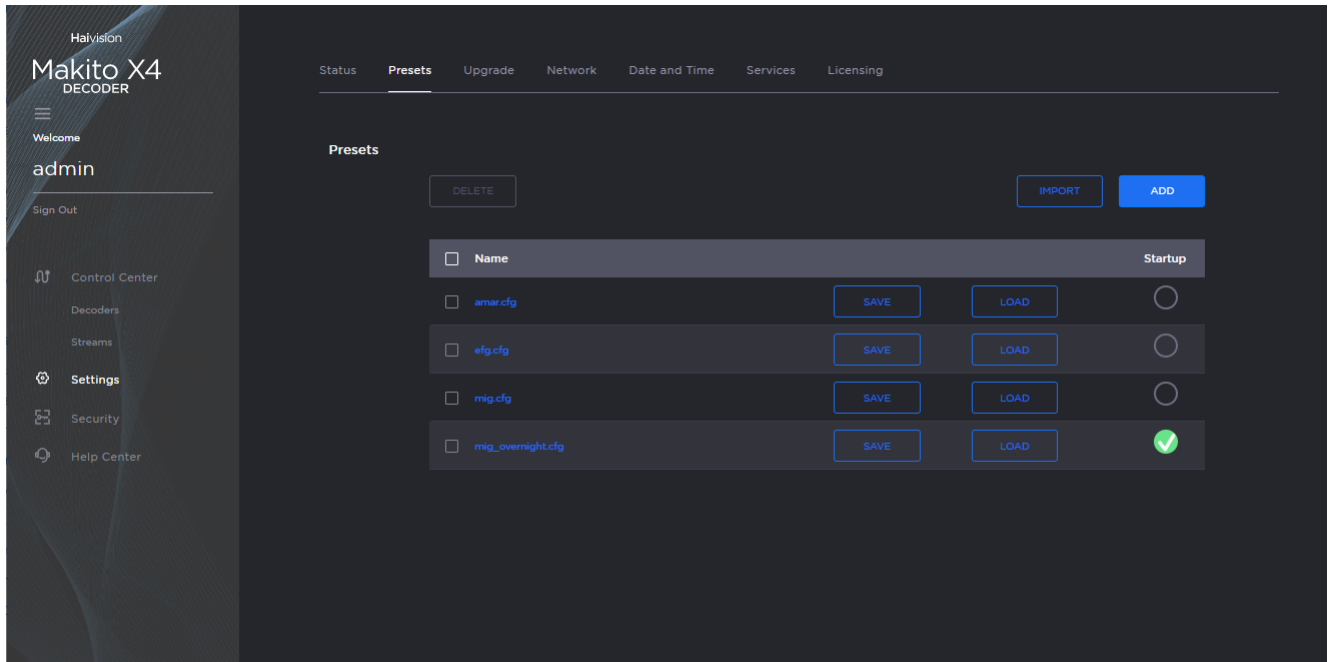
 **Note**

Presets do not include System Administration (e.g., Network) or Security settings.

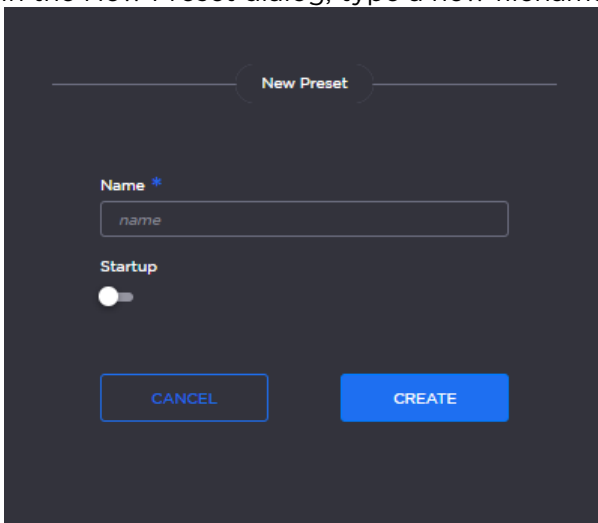
The Preset Manager displays a list of saved presets. From here you can load, rename, duplicate, or delete a saved preset, as well as view the contents of a preset file and select a preset to load at startup.

To view and manage presets:

1. Click **Settings** on the side menu and **Presets** on the navigation bar.  
The Presets page opens displaying the list of saved presets for the decoder. The startup preset is indicated with a green check mark.

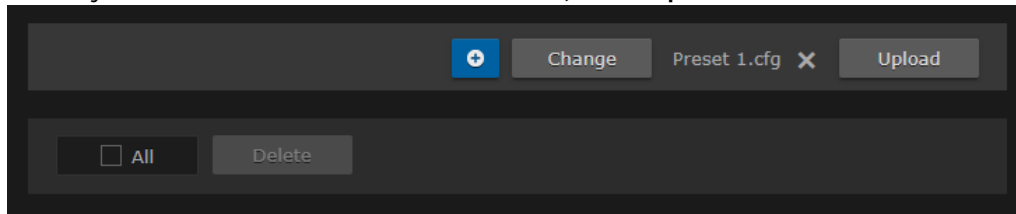


2. To load an existing preset into the current session, hover over the preset name or anywhere in the row and click **Load**.
3. To select an existing preset to load at startup, hover over the preset row and click the (empty) circle under **Startup**.
4. To save the current settings as a new preset, click **Add**.
  - a. In the New Preset dialog, type a new filename in the Name text box.



- b. To select this preset to load at startup, turn on the **Startup** toggle.
  - c. Click **Create**.
5. To save the current settings as an existing preset, hover over the preset row and click **Save**. You can (optionally) select **Startup**.
6. To import a preset, for example, from another Makito X4 decoder, click **Import** and drag the preset file to the drop area or click **Browse** or **Choose a file** to select the file.

7. 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 **X** icon.

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

## Installing Firmware Upgrades

### Note

Before you can install a firmware upgrade on the Makito X4, you may need to obtain and install an updated license (depending on the version limit and expiration date of the currently installed license). For more information, see [Managing Licenses](#).

When you first receive a Makito X Series appliance, the necessary firmware is pre-installed on it. Firmware upgrades and licenses 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 upgrade becomes available, you can easily install it from the Web interface. You will first need to copy the upgrade file to your local computer or network.

The firmware upgrade comes in the form of a file with the extension `.hai`, which when loaded will replace the application on your Makito X Series appliance. The firmware upgrade components are digitally signed, and these signatures are all verified before performing the installation.

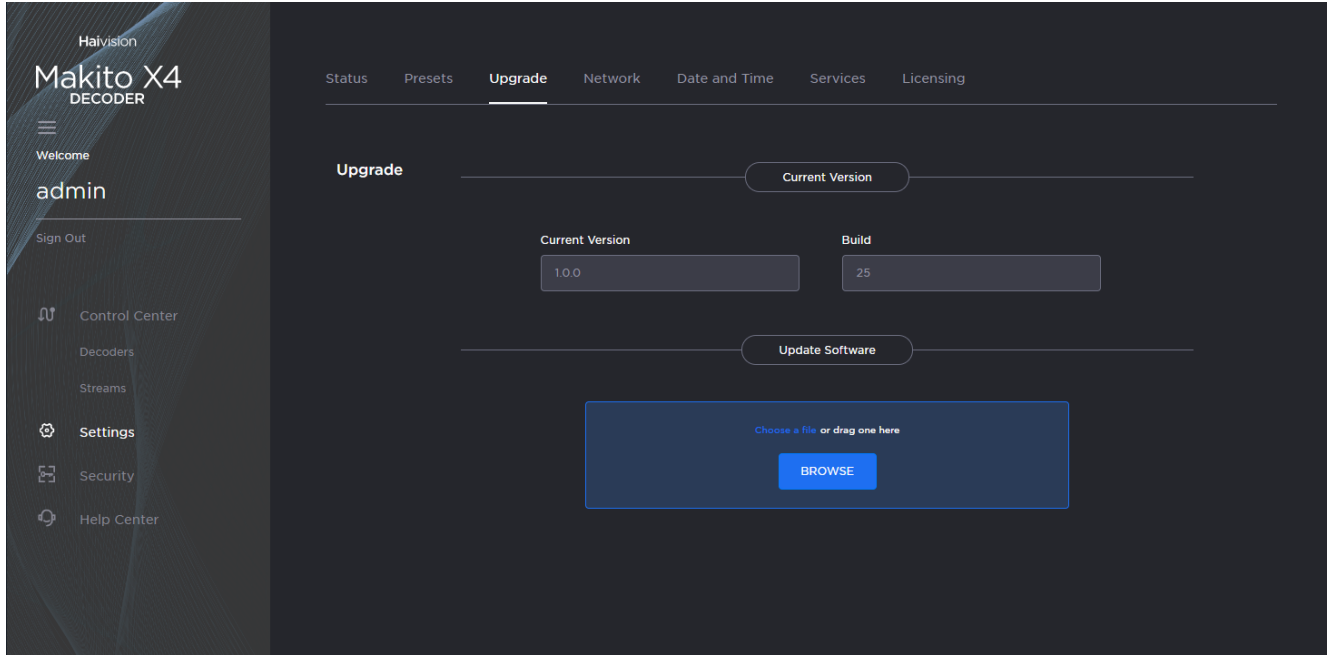
This section provides instructions to install a firmware upgrade from the Web interface.

### Tip

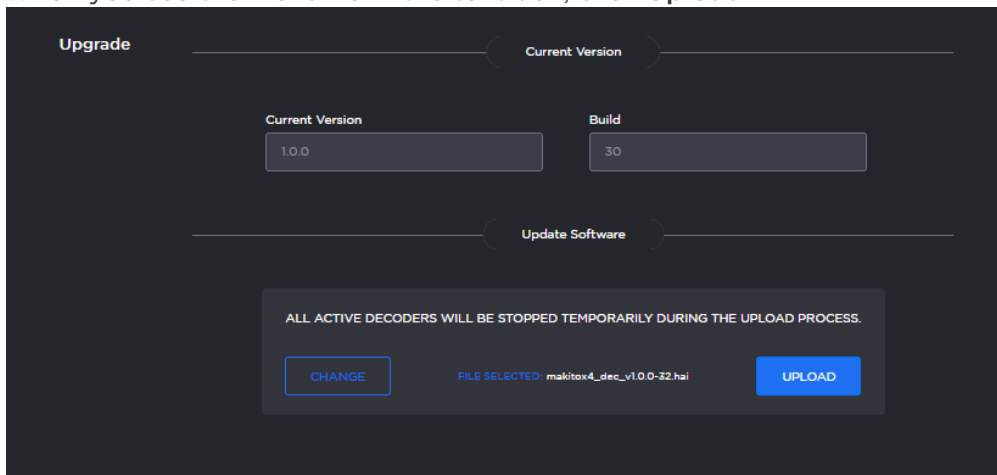
Do not delete existing licenses before uploading the new license when upgrading to a new release.

To install a firmware upgrade:

1. Click **Settings** on the side menu and **Upgrade** on the navigation bar. The Upgrade page opens.



2. Drag the upgrade file to the drop area or click **Browse** or **Choose a file** to select the file.
3. When you see the filename in the text box, click **Upload**.



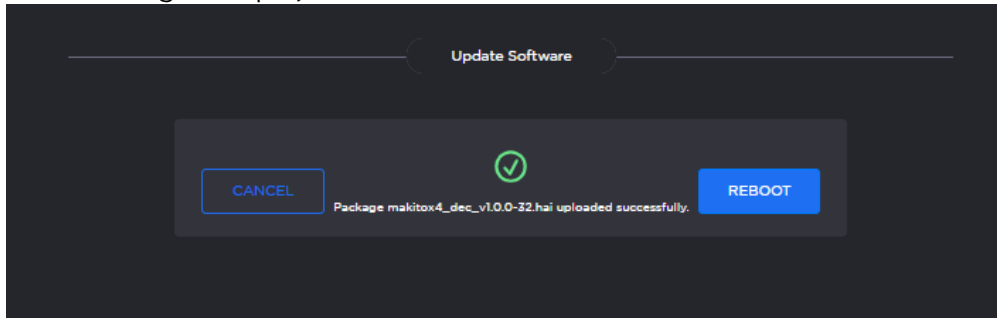
4. Wait for the file to be uploaded and verified and the file system synced.

**! Important**

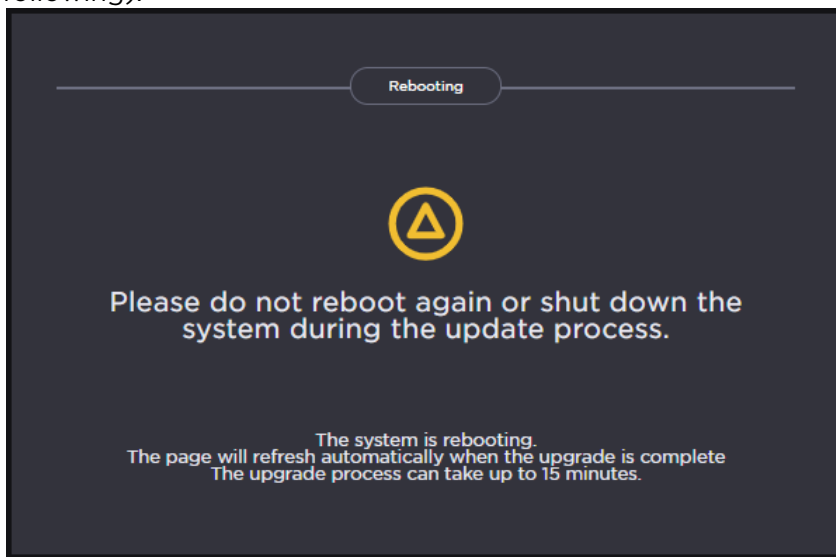
Remain on this page and do not click anything else in the Makito X4 Web interface during the upload.

If any of the package components has been modified or is not signed by a valid certificate, the verification will fail and the downloaded package will be discarded.

- When the file is uploaded and verified successfully, you will see a confirmation page (as shown in the following example).



- Click **Reboot**. While the unit is rebooting, the Status LEDs will flash, and you will see a warning page (as shown following).



**⚠ Caution**

Do not proceed or shut down the system while the Status LEDs are still flashing. Failure to wait could result in damage to your system.

- Once the unit has rebooted, the browser will display the Sign-In page for the Web interface (depending on your Web browser and settings). If not, reload the Sign-In page.
- Clear your browser cache after the firmware upgrade.
  - Sign in again in order to access the decoder. For more information, see [Signing In to the Web Interface](#).

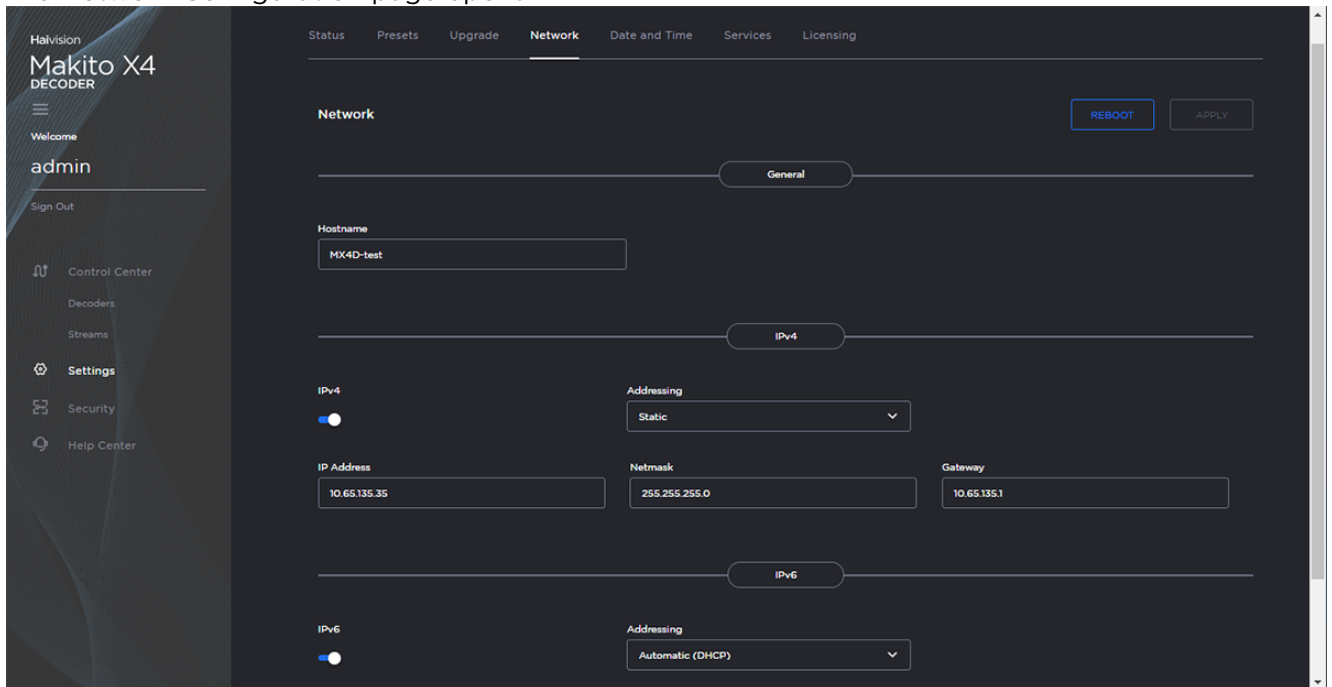
## Configuring Network Settings

**Caution**

When you make changes to the Network settings, be sure to write down the new decoder IP Address or label the chassis. After you apply your changes and reboot, you will have to redirect the browser to the new IP address and sign in again in order to access the decoder. If you are connecting to the decoder through an IPv4 connection, disabling the IPv4 interface will drop your connection after a reboot. You will need to reconnect using IPv6 or the serial interface (if available).

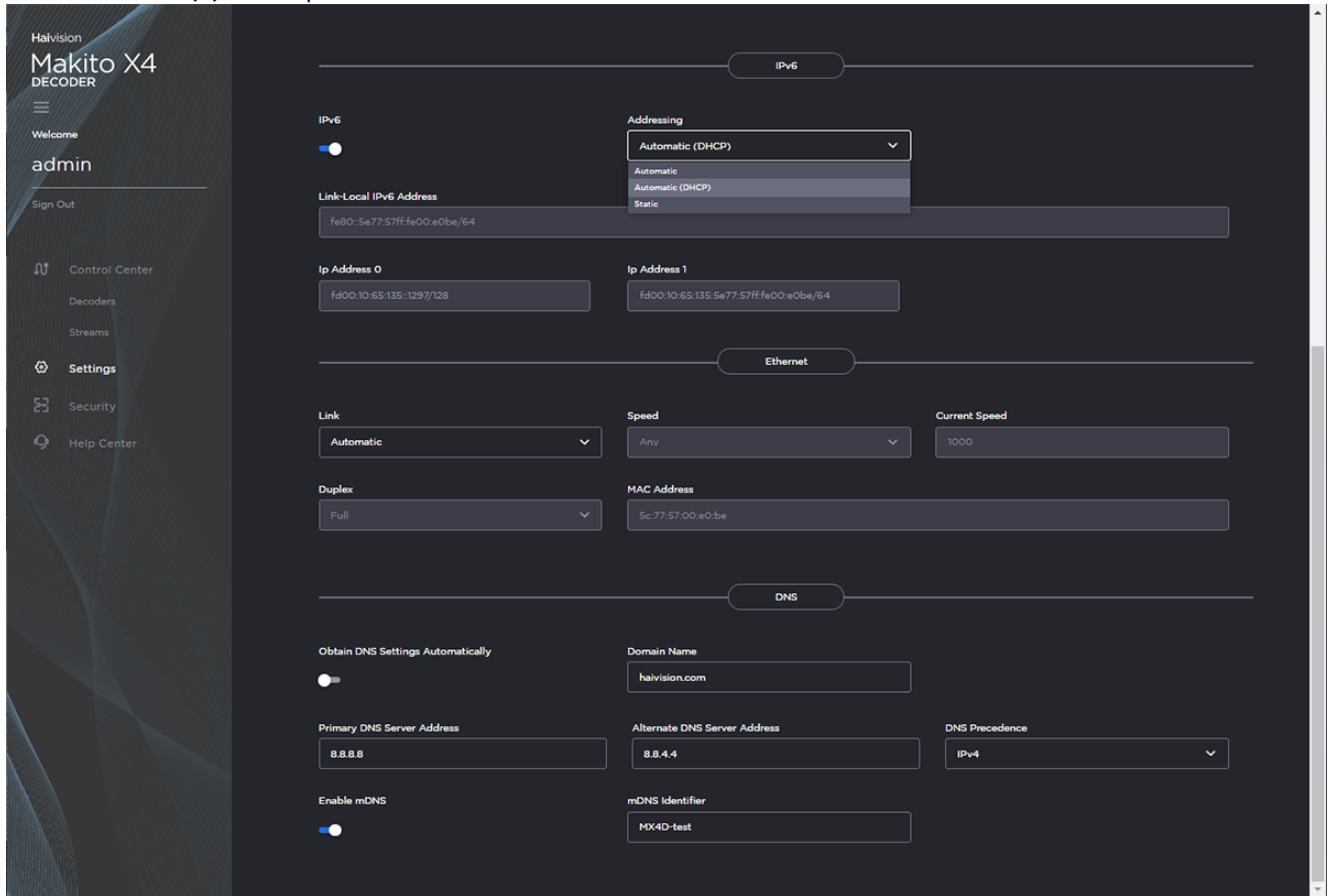
To view and configure the Network settings:

1. Click **Settings** on the side menu and **Network** on the navigation bar. The Network Configuration page opens.



2. Select or enter the new value(s) in the appropriate field(s). For details, see [Network Settings](#).

- To configure IPv6 addressing, toggle the IPv6 button to **On** and select the Addressing option. Enter the new value(s) as required.



- Click **Apply**.
- Click **Reboot**.

**Note**

You must reboot the system for the changes to take effect.

After the decoder reboots, you will be returned to the Sign-In page. When you open the Network Configuration page again, if you configured the unit using either Automatic or Automatic (DHCP) Addressing, you will see the IP address(es) obtained by the system.



## Network Settings

The following table lists the shared Encoder-Decoder Network settings:

### General

Network Setting	Description/Values
Hostname	Enter a unique name for the Makito X Series encoder.
IPv4	When set to On, configures the network to use IPv4 addressing.
IPv6	When set to On, configures the network to use IPv6 addressing.

### Interfaces

Network Setting	Description/Values
eth0   eth1	(Encoder-only) Allows for multiple network interfaces. Select the appropriate tab to view and configure.

### IPv4

Network Setting	Description/Values
Addressing	<p>Select DHCP or Static to enable or disable the Dynamic Host Configuration Protocol.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>When DHCP is enabled, the Makito X will get an IP Address from a DHCP server on the network. When it is disabled, you must manually enter the device's IP Address, Netmask and Gateway Address.</p> </div>
DHCP Vendor Class ID	(DHCP must be enabled) You may, optionally, specify the DHCP Vendor Class ID (option 60). This allows IT departments to identify Makito X devices on their networks. The default Device Identification value is "Haivision Makito X4 Encoder" or "Haivision Makito X4 Decoder" for the Makito X4 encoder or decoder, and "Haivision Makito X1 Encoder" the for Makito X1 encoder.
Assign Link-Local Address When DHCP Fails	(DHCP must be enabled) When this checkbox is checked, and DHCP is used but no DHCP server is present to assign an IP address to the device, the Makito X will automatically assign itself an IP address in the 169.254.0.0/16 range. This allows you to use the device locally on a LAN (the address is NOT routable) in situations where DHCP is not available or failed.
IP Address	Displays the IP Address for the Makito X. This is a unique address that identifies the unit in the IP network. If DHCP is disabled, you may enter an IP address in dotted-decimal format.
Netmask	Displays the Subnet Mask for the Makito X. This is a 32-bit mask used to divide an IP address into subnets and specify the network's available hosts. If DHCP is disabled, you may enter a Netmask in dotted-decimal format.
Gateway	Displays the gateway address of the network (typically the address of the network router). If DHCP is disabled, you may enter a gateway address in dotted-decimal format.

## IPv6


Network Setting	Description/Values
Addressing	Select one of the following options to obtain an IPv6 address for the unit: <ul style="list-style-type: none"> <li>• Automatic: Uses SLAAC (Stateless Address Autoconfiguration) to obtain IP addresses automatically without the need for a DHCP server</li> <li>• Automatic (DHCP): Enables the Dynamic Host Configuration Protocol to get an IP address from a DHCP server on the network</li> <li>• Static: Use to manually configure the device’s IP and gateway addresses.</li> </ul>
Global IPv6 Address	Displays the IPv6 Address for the Makito X. This is a unique address that identifies the unit in the IP network. There may be multiple IPv6 addresses on a single interface. If Static Addressing is used, enter an IPv6 address in hexadecimal notation.
Subnet Prefix Length	( <b>Static</b> Addressing only) The Prefix Length in IPv6 is the equivalent of the Subnet Mask in IPv4. However, instead of being expressed in four octets as it is in IPv4, it is expressed as an integer between 1 through 128.
Gateway	Displays the gateway address of the network (typically the address of the network router). If Static Addressing is used, enter a gateway address in hexadecimal notation.
Enable Privacy Extensions	( <b>Automatic</b> Addressing only) Check this checkbox to enable SLAAC Privacy Extensions. As documented in <a href="#">RFC 4941</a> "Privacy Extensions for Stateless Address Autoconfiguration in IPv6", this entails using randomly generated, temporary, global scope IPv6 addresses that are regularly discarded and replaced with different addresses.
Link-Local IPv6 Address	(Read-only) A link-local address is an Internet Protocol (IP) unicast address intended to be used only to connect to the hosts on the same network. A link-local address starts with fe80: and is always automatically assigned.

## Ethernet

Network Setting	Description/Values
Link	Determines whether the Ethernet link settings will be negotiated automatically or configured manually: <ul style="list-style-type: none"> <li>Automatic - The system will match the Ethernet Speed and Duplex Mode to the Ethernet hub to which it is connecting:</li> <li>Manual - These values must be set manually. See following settings.</li> </ul>
Speed	Select the Ethernet Speed (in Mbps): <ul style="list-style-type: none"> <li>Any (default)</li> <li>1000</li> <li>100</li> <li>10</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>⚠ Note</b></p> <p>When Link is set to Automatic, setting the Ethernet speed to anything other than Any means that only that specific value will be advertised to the connected hub/switch during the negotiation process. This makes it possible, for instance, when connected to a GigE switch to force the link down to 100Mb when some network problems are encountered.</p> </div>
Current Speed	(Read-only) Displays the actual Ethernet Speed.
Duplex	If Link is Auto, displays the actual value for the Duplex Mode (read-only). If Link is Manual, select the Duplex Mode: <ul style="list-style-type: none"> <li>Full</li> <li>Half</li> </ul>
MAC Address	(Read-only) The Media Access Control address assigned to the Makito X.
<b>Encoder-only</b>	
Total TX Bandwidth (Limit)	(Encoder only) The maximum transmit bandwidth for the encoder in kbps. Specifies the bandwidth "ceiling" for the Ethernet port.

## DNS Settings

Network Setting	Description/Values
Domain Name	Enter the domain for the Makito X.
Obtain DNS Settings Automatically	(Addressing cannot be <b>Static</b> ) Check this checkbox to obtain DNS settings from DHCP. DHCP servers often provide DNS information to the device on top of the IP address. When DHCP is enabled and this checkbox is enabled, the system will attempt to learn its DNS settings from the DHCP servers (which avoids unnecessary user configuration).
Primary DNS Server Address	( <b>Obtain DNS Settings Automatically</b> must be disabled) Enter the primary DNS server address for your network.
Alternate DNS Server Address	( <b>Obtain DNS Settings Automatically</b> must be disabled) Enter an alternate DNS server address for your network. The alternate DNS server is used only if the primary server is not responding.

Network Setting	Description/Values
DNS Precedence	<p>Select either IPv4 or IPv6 to specify the priority for DNS resolution. On systems with both IPv6 and IPv4 enabled, if users use HOSTNAMES instead of specifying IP addresses when creating connections, the default behavior is to resolve to IPv6 first if it is available.</p>
Enable mDNS	<p>Check this checkbox to enable the Multicast DNS (mDNS) protocol as a means for third party entities to discover the IP address of the Makito X.</p> <div data-bbox="667 495 1498 753" style="border: 1px solid #c8e6c9; padding: 10px; margin-top: 10px;"> <p> <b>Tip</b></p> <p>Enabling mDNS allows an mDNS application to automatically find the Makito X4. mDNS is enabled on units shipped from the factory or reset to factory defaults to allow them to advertise their existence. A user can then click <b>Locate</b> (Status page) to start the Status and TX or RX LEDs flashing in order to discover the location of the device, for example, within a large server room.</p> </div>
mDNS Identifier	<p>(Optional) Enter a unique name for the Makito X4. By default, the system creates a unique name “MakitoXD (%HOSTNAME%)” for the device.</p>

## Related Topics

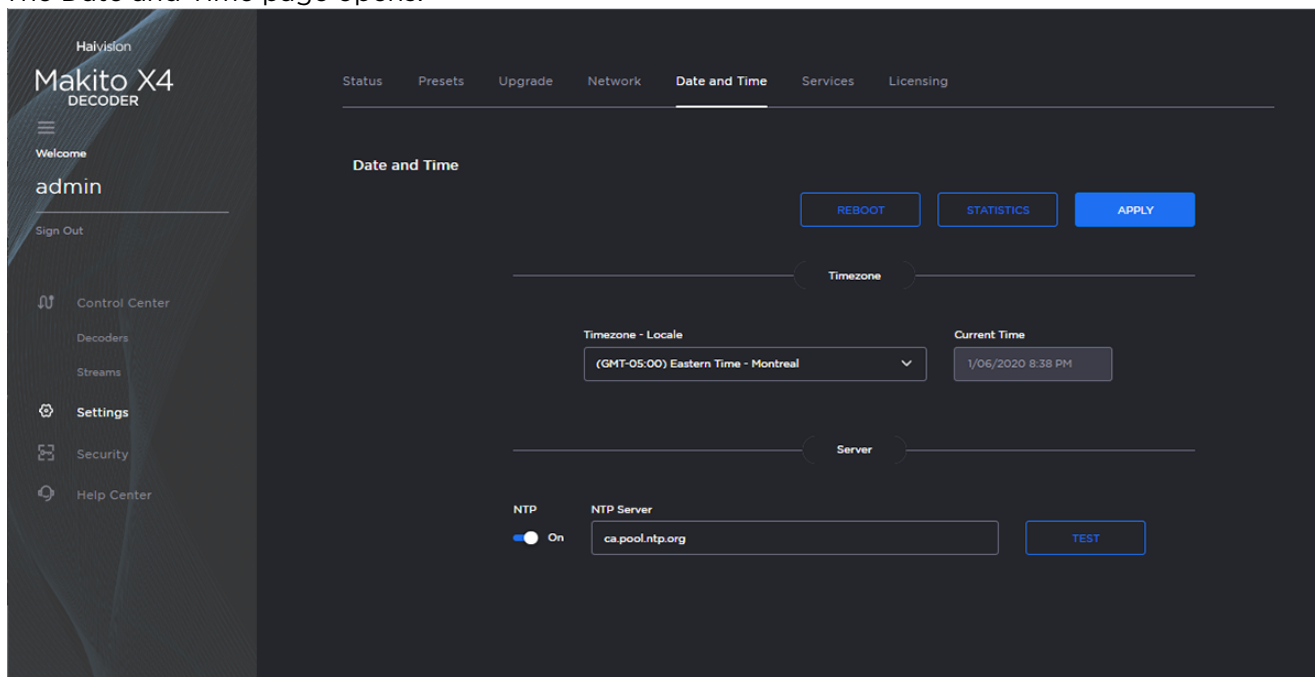
- [Configuring Network Settings](#)
- [Viewing System Status Information](#)

## Configuring Date and Time

From the Date and Time page, you can configure Network Time Protocol (NTP) support to synchronize the encoder clock with the selected time zone.

To view and configure the date and time:

1. Click **Settings** on the side menu and **Date and Time** on the navigation bar. The Date and Time page opens.



2. Select or enter the new value(s) in the appropriate field(s). For details, see [Date and Time Settings](#).
3. To apply your changes, click **Apply**.
4. To validate that the NTP server is reachable, click **Test** (beside the NTP server field).
5. To view statistics for the NTP server, click **Statistics**. For details, see [NTP Statistics](#).

### Topics Discussed

- [Date and Time Settings](#)
- [NTP Statistics](#)

## Date and Time Settings

The following table lists the Date and Time settings:

Date and Time Setting	Description/Values
<b>Timezone</b>	
Time Zone	Select the desired time zone and corresponding city. <div style="border: 1px solid #f0e68c; padding: 5px; margin-top: 10px;"> <b>Note</b>                      The times are based on hours added to or subtracted from Greenwich Mean Time (GMT).                 </div>
Current Time	(Read-only) The current local date and time.
<b>Server</b>	
Use NTP	Toggle on to connect to a Network Time Protocol (NTP) server to synchronize the encoder or decoder clock.
NTP Server	If NTP is enabled, enter the IP address of the NTP server.
Manually Set Date & Time	If NTP is disabled, select the date and time from the calendar.
<b>Test</b>	If NTP is enabled, click to validate that the NTP server is reachable.
<b>Statistics</b>	If NTP is enabled, click to display tracking and source information, and source statistics for the NTP server.
<b>Reboot</b>	If changes have been made to the date and time settings, click to apply changes.

### Related Topics

- [NTP Statistics](#)

## NTP Statistics

Following is an example of the NTP Statistics:

NTP Statistics

**Tracking**

```

Reference ID      : 3265C1A8 (50.101.193.168)
Stratum          : 3
Ref time (UTC)   : Thu Jun 04 21:06:42 2020
System time      : 0.000129267 seconds fast of NTP time
Last offset      : -0.000025439 seconds
RMS offset       : 0.000073620 seconds
Frequency        : 9.903 ppm slow
Residual freq    : -0.007 ppm
Skew             : 0.078 ppm
Root delay       : 0.010799318 seconds
Root dispersion  : 0.012566406 seconds
Update interval  : 513.6 seconds
Leap status      : Normal
                
```

**Sources**

```

210 Number of sources = 4
MS Name/IP address      Stratum Poll Reach LastRx Last sample
=====
^~ 216.6.2.70           2 10 377 98 +371us[ +371us] +/- 62ms
^+ 198.27.76.102        2 9 377 502 -828us[ -848us] +/- 49ms
^* 50.101.193.168       2 9 377 171 +180us[ +155us] +/- 26ms
^~ 207.34.49.172        2 10 377 104 +116us[ +116us] +/- 40ms
                
```

**Source Stats**

```

210 Number of sources = 4
Name/IP Address        NP  NR  Span  Frequency  Freq Skew  Offset  Std Dev
=====
216.6.2.70             32 17 198m  -0.036     0.009    +411us   38us
198.27.76.102          11 7 64m   -0.018     0.074   -876us   62us
50.101.193.168         6 3 42m   +0.027     0.246   +533us   48us
207.34.49.172          37 19 215m  -0.039     0.009    +210us   59us
                
```

CLOSE

## Enabling and Disabling Network Services

For security purposes, an administrator may need to stop one or more network services from accessing the Makito X4 decoder. From the Services page, you can enable and disable network services, including HTTP, SSH, Telnet, SNMP, and Haivision EMS.

**Important**

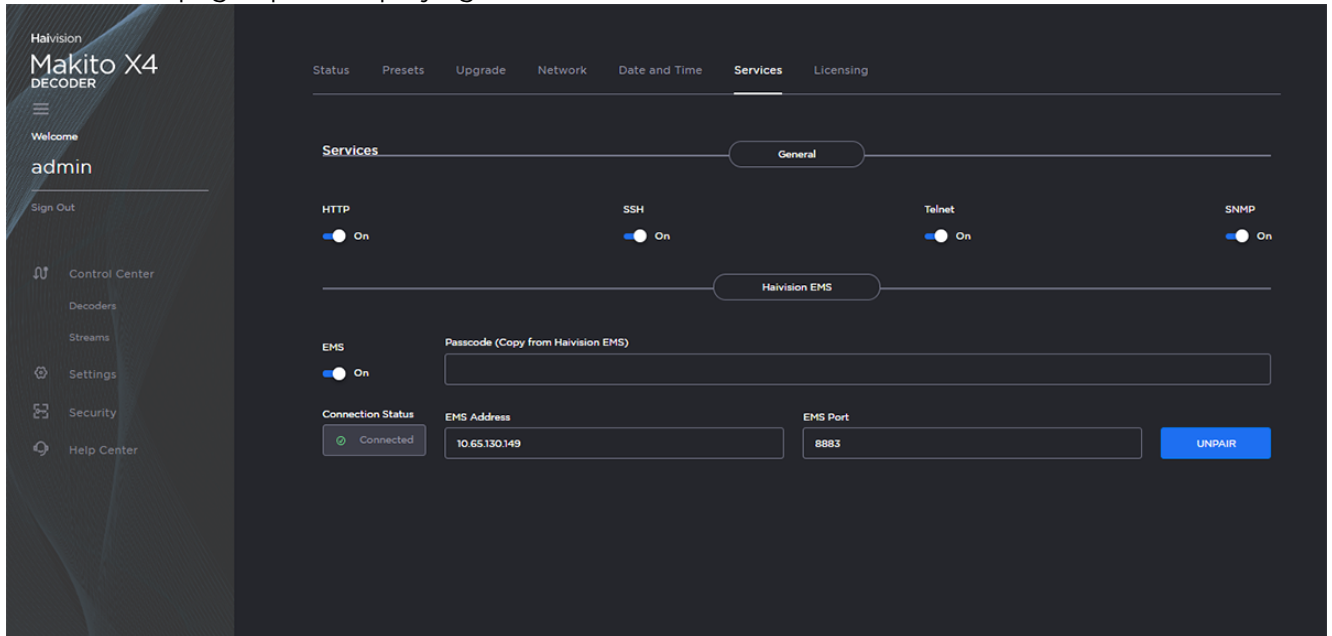
In order to optimize your decoder’s performance, it is recommended that *only* the required network services be enabled. Please review the network services to make sure services used for your application are enabled or disabled as appropriate.

**Caution**

Take care not to disable *all* network services; you must at least keep `http` (Web interface), `telnet`, or `ssh` active. Otherwise you will lose access control to the unit, and the only way to re-enable these services is by a Factory Reset (For details, see [Resetting the Decoder](#)).

To enable or disable network services:

1. Click **Settings** on the side menu and **Services** on the navigation bar. The Services page opens displaying the current status of network services.



2. To enable or disable a service, toggle the associated Service button to **On** or **Off**. For details, see [Services Settings](#).
3. To pair the encoder with Haivision-EMS, toggle the Haivision-EMS button to **On** and click **Configure**. See [Pairing the Decoder with Haivision EMS](#).

The service(s) will be stopped or started immediately. (You do not need to click **Apply**).






**Tip**

Network services can also be enabled/disabled using the CLI **service** command.

## Services Settings

The configurable Services are as follows:

### Network Services

Service	Description/Values
HTTP	Hypertext Transfer Protocol, used for Web browsers acting as a client. <div style="border: 1px solid #ffc107; padding: 5px; margin-top: 5px;">  <b>Note</b>                          Only secured HTTP (HTTPS) is supported.                     </div>
SSH	Secure Shell, a network protocol that allows data to be exchanged using a secure channel between two networked devices.
Telnet	Telnet, a network protocol used on the Internet or local area networks to provide bidirectional communications via a virtual terminal connection.
SNMP	Simple Network Management Protocol, a network protocol used mostly in network management systems to monitor network attached devices.
Haivision EMS	EMS (Element Management System) allows simple management of Haivision-only devices.
Product Analytics	Toggle <b>Enable Anonymous Product Analytics</b> on or off to enable or disable the collection of anonymous product analytics.
Thumbnail Preview	Preview Thumbnails provide a visual reference of each video encoder's input. By default, previews are enabled and set to 10 second intervals.

## Encoder-only

Service	Description/Values
Serial Pass-Through	<p>(Makito X Series Rugged Encoders only) Bi-directional serial pass-through for controlling serially attached devices such as PTZ controlled cameras. Both RS-232 and RS422 are supported.</p> <div style="border: 1px solid #f0e68c; padding: 5px; margin-top: 10px;"> <p><b>⚠ Note</b> The COM Port Mode must first be set to Pass-Through.</p> </div>
Port	(Serial Pass-Through must be enabled) Specifies the TCP port that the Makito X will listen on for remote commands.
RTSP	Enables streaming of video feeds from the Makito X encoder to a Milestone server for archiving and analysis using the RTSP protocol.
ONVIF	Enables the ONVIF management API to send commands from the Milestone XProtect video management software (VMS) to the Makito X encoder .

## Related Topics

- [Managing Certificates](#) (to manage HTTP TLS certificates)

## Pairing the Decoder with Haivision EMS

Haivision EMS (Element Management System) allows simple management of Haivision-only devices. To get started, you enable the EMS service on the Makito X decoder and then pair the decoder with Haivision-EMS. This allows the EMS to communicate with the decoder, for example, to monitor the connection status.

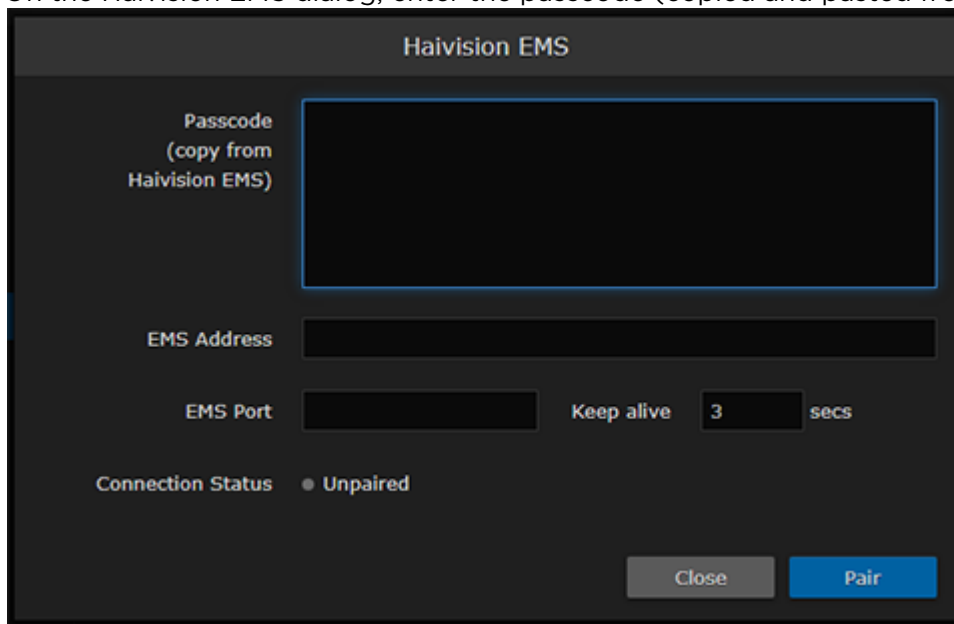
To manage a Makito X Series device through Haivision-EMS, the device must first be discovered and paired with the system.

**Note**

For device discovery to work, mDNS must be enabled on each of the Makito X devices you wish to pair.

To pair the Makito X device with Haivision-EMS:

1. On the Services page, toggle the Haivision-EMS button to **On**.
2. Hover over Haivision-EMS and click **Configure** next to the tools icon.
3. On the Haivision EMS dialog, enter the passcode (copied and pasted from Haivision EMS).



**Note**

On a new system, the EMS Address and Port are blank. When a pairing code is pasted in, the address and port are automatically filled in to reflect the IP address and port contained in the pairing code.

(Optional) You may change the EMS Address and Port in order to override the defaults extracted from the pairing code, for example, to accommodate network security requirements.

4. (Optional) Increase the value in the Keep Alive field to ensure the Makito X can be paired with EMS and remain connected during file transfer.

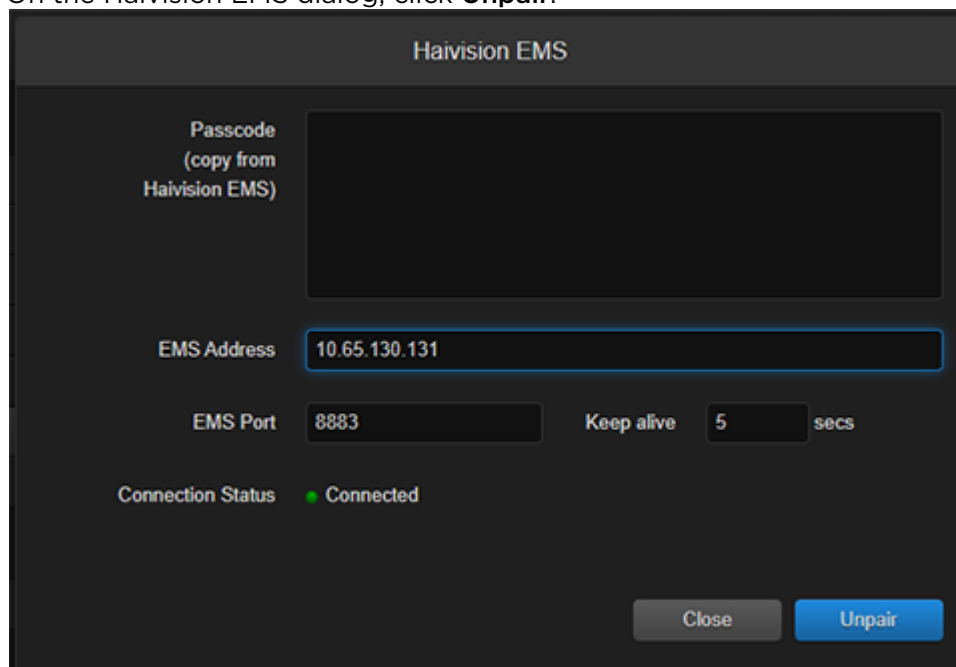
The Keep Alive value is also filled in when the pairing code is pasted in. "Keep Alive" is the time interval in seconds in which the device will ping the EMS server to maintain its connection.

5. Click **Pair**.

This initiates the pairing and communication with the EMS server.

To unpair the Makito X device from Haivision-EMS:

1. On the Haivision EMS dialog, click **Unpair**.



The unpairing takes effect immediately.

## Managing Licenses

- [License File Errors](#)

Feature licensing allows you to view the licensed capabilities of your Makito X Series appliance as well as add new functionality to already deployed systems.

To acquire a new license, please contact your Authorized Reseller or Haivision at: <https://support.haivision.com>. Indicate the appropriate feature SKU and provide the hardware serial number (or list of numbers in the case of multiple devices) to which it applies.

The license is delivered by email as a plain-text ASCII license file with the extension `.lic` to be installed on your Makito X Series appliance.

You may install and manage licenses from the Web interface or from the CLI using the `license` command. Both methods allow you to view the content and status (valid/invalid) of the license file to confirm the ordered features.

The licensing of the unit will survive a factory reset and upgrade of the firmware.

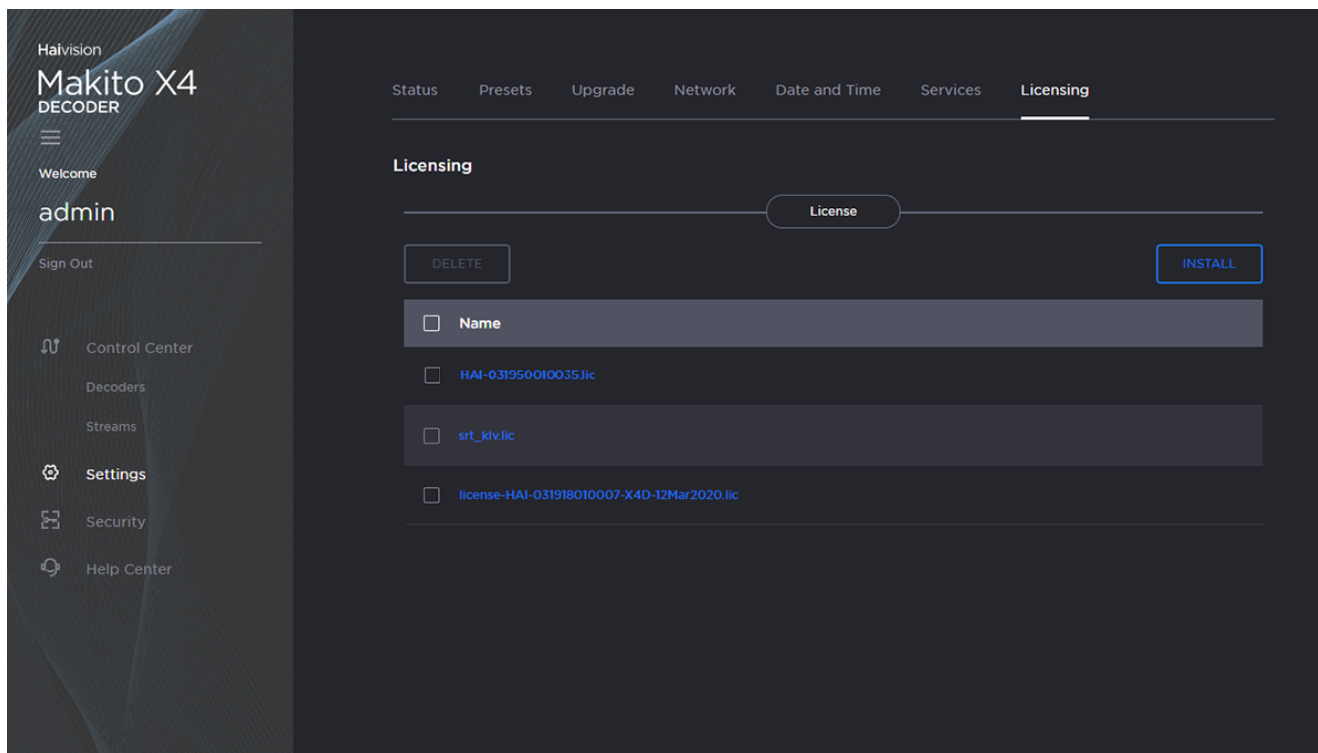
This section provides instructions to install a license from the Web interface as well as view current licenses on your system.

### Caution

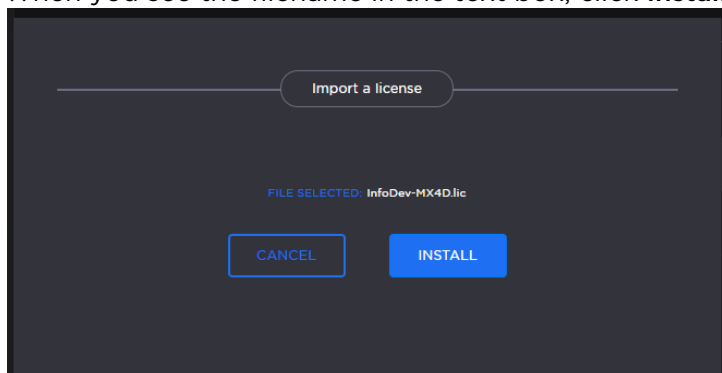
Do not delete existing licenses before uploading the new license. New licenses are typically add-ons to complement the base license. You should only delete existing licenses if *instructed* to do so by Haivision.

To install a license file:

1. Click **Settings** on the side menu and **Licensing** on the navigation bar. The Licensing page opens, displaying the list of currently installed licenses.



2. To select the license file to install, click **Install**.
3. Drag the license file to the drop area or click **Browse** or **Choose a file** to select the file.
4. When you see the filename in the text box, click **Install**.



5. To apply your changes, click the **Reboot** button. The decoder will reboot and you will be returned to the Sign-in page.
6. To view an installed license file, click the file in the list. The license file opens in a separate window.
7. To delete a previously installed license, select the file in the list and click **Delete**.

## License File Errors

The license file signature check occurs at license installation and system startup time. The following table lists the possible validation errors.

Validation Error	Description
Unrecognized license file format or extension	The file extension or content is not recognized as a licensed features license.
Not for this device (serial number)	The current device's serial number is not specified in the license.
File integrity compromised	Invalid signature: The license file has been corrupted or altered.
File authenticity cannot be confirmed	The license signing certificate cannot be authenticated.

### Related Topics

- [license](#) (CLI command)

# Using SNMP to Configure A/V Services

This section provides information required to manage the Makito X4 through the Simple Network Management Protocol (SNMP). SNMP-based management uses Network Management Stations (NMSs) to collect data or configure devices (SNMP agents) across a TCP/IP network. The NMS communicates with the Makito X4 through the exchange of SNMP messages.

## Audience

This content is intended for users who are familiar with SNMP-based management and who will be developing applications such as provisioning services, or creating and modifying existing network management systems to manage the Makito X4.



### Tip

To develop new SNMP applications, see the list of [Supported MIBs](#).

## Topics in This Chapter

- [SNMP Overview](#)
- [Supported MIBs](#)
- [SNMP Agent Components](#)
- [SNMPv3](#)
- [SNMP Utilities](#)
- [SNMP Syntax for Setting Up Streams](#)



## SNMP Overview

To support management of Makito X devices by third party Network Management Stations (NMSs), the system includes an SNMP agent that may be used to configure and control the system's Audio/Video services and streams.

**Note**

The Makito X Series uses Net-SNMP Version 5.7.3 and support SNMP v1, v2c, and v3.

The Makito X Series supports a number of SNMP commands used to set or get Management Information Base (MIB) objects on the local host or on other SNMP agents reachable over IP networks.

## Supported MIBs

The Makito X4 SNMP agent supports the MIB-II (RFC 1213) standard and its updates, SNMPv3 MIBs, as well as the Haivision proprietary Enterprise MIB. The following table lists the supported MIBs:

Supported MIBs	Standard	Description
<ul style="list-style-type: none"> <li>• RFC1213-MIB.txt</li> <li>• SNMPv2-MIB.txt</li> <li>• IP-MIB.txt</li> <li>• IF-MIB.txt</li> <li>• TCP-MIB.txt</li> <li>• UDP-MIB.txt</li> </ul>	MIB-II (RFC 1213)	Defines the general objects for use with a network management protocol in TCP/IP internets and provides general information about the unit.
<ul style="list-style-type: none"> <li>• SNMP-USER-BASED-SM-MIB.txt</li> <li>• SNMP-USM-AES-MIB.txt</li> <li>• SNMP-VIEW-BASED-ACM-MIB.txt</li> </ul>	SNMPv3	Supports SNMPv3 User-based Security Model (USM) and View-based Access Control (VACM).
<ul style="list-style-type: none"> <li>• IPV6-MIB.txt</li> </ul>	RFC-2465	Management Information Base for IP Version 6.
<ul style="list-style-type: none"> <li>• HAI-VISION-MIB.txt</li> <li>• HAI-AVT-STREAM-MIB.txt</li> <li>• HAI-HDC-MIB.txt</li> </ul>	Haivision Enterprise	Supports configuration, status, and statistics.

<b>Encoder-only</b>		
<ul style="list-style-type: none"> <li>HAI-MAKITO-X4-ENC-CAPS.txt</li> </ul>	Haivision Enterprise	This MIB formally specifies the capabilities of the Makito X4 (encoder) SNMP AGENT. It specifies which object groups from the listed MIB files are implemented, and furthermore, it specifies implementation constraints and deviations from the MIB OBJECT specification such as differences in ranges.
<b>Decoder-specific</b>		
<ul style="list-style-type: none"> <li>HAI-MAKITO-X4-DEC-CAPS.txt</li> </ul>	Haivision Enterprise	This MIB formally specifies the capabilities of the Makito X4 (decoder) SNMP AGENT. It specifies which object groups from the listed MIB files are implemented, and furthermore, it specifies implementation constraints and deviations from the MIB OBJECT specification such as differences in ranges.

**Note**

You can also download the MIBs directly from your Makito X4 under: `/usr/share/snmp/mibs/HAI-*.txt`

## SNMP Agent Components

This section presents key components used to set up SNMP management on the Makito X4.

- `snmpd`
- `snmpd.conf`
- `snmpd.local.conf`
- `nmcfg`

### snmpd

`snmpd` is an SNMP agent that binds to a port and listens for requests from SNMP management software. Upon receiving a request, it performs the requested operation, either retrieving information or configuring the system. When finished processing the request, the agent sends a response to the sender with the requested information or the status of the configuration operation.

When you start an SNMP agent on a Makito X Series device using the `service snmp start` command, it loads the management database with the MIB files in the directory `/usr/share/snmp/mibs` and configures the agent with the files in `/usr/share/snmp`.

### snmpd.conf

`snmpd.conf` is the configuration file that defines how the SNMP agent works. You may need to edit this file to specify the location of the Network Management System (NMS). However, for most settings, it is preferable to use the `nmcfg` configuration script.

On a Makito X Series device, the `snmpd.conf` file includes:

- access control setup (i.e., community and user privileges),
- system information setup (e.g., system location, services and contact).

`snmpd.conf` is located in the directory `/usr/share/snmp`.

For a detailed description, see the `snmpd.conf` file.

## snmpd.local.conf

`snmpd.local.conf` is the configuration file that defines the VACM (View-based Access Control Model) views modeling the privilege levels of the Makito X Series user groups: admins, operators, and users. These groups can be used for v1/v2c communities and v3 USM users.

This file cannot be modified. Access groups are used in place of the traditional `ro` (readonly) and `rw` (read-write) permissions when setting communities' and users' access with the `nmcfg` configuration script.

### SNMP Community Names

Following are the default SNMP community names and their privileges for accessing the Makito X Series MIBs.

SNMP Community Name	Access Rights
<code>admin</code>	Read and write permission from local network and local host
<code>public</code>	Read-only permission from local network

## nmcfg

`nmcfg` is the configuration script that helps the configuration of the SNMP agent. It is particularly useful for the creation and management of SNMPv3 users of the User-based Security Model (USM) and the assignment of VACM (View-based Access Control Model) access rights to communities and users. The script interacts with the `/var/net-snmp/snmpd.conf` persistent data file, which maintains the USM user database and other SNMP agent persistent information. The script also performs `snmpget` commands to display the list of USM users, which is not available in a human readable form in any configuration file.

The script also reads and modifies the `snmpd.conf` configuration file to manage system parameters (contact, location), community-based (v1/v2c) security, and user access control. Used without parameters, it displays a summary of the SNMP agent configuration: system parameters, access control, and SNMPv3 USM users.

Following is an example of the `nmcfg` configuration script output:

```
# nmcfg
system parameter      value
-----
engineid              0x80001f88030050c2c611ad
contact               "john doe <jdoe@example.net>"
location              "QA lab"

model      perm/group      level      user/community      source
-----
usm        guest           auth       guest               -
usm        administrator    priv       johndoe             -
v2c        administrator    noauth     admin               localhost
```

```
v2c      administrator  noauth  admin  localnet
v2c      guest         noauth  public localnet
v2c      rw           noauth  tech   any
```

auth protocol	priv protocol	user
MD5	DES	admin
MD5	nopriv	guest
SHA	AES	johndoe

```
# nmcfg help
usage: nmcfg
nmcfg help
nmcfg access help
nmcfg access usm permit <uname> {<group>|ro|rw} [{noauh|auth|priv}]
nmcfg access usm delete <uname>
nmcfg community help
nmcfg community permit <community> {<group>|ro|rw} [<host>]
nmcfg community delete <community> [{<group>|ro|rw} [<host>]]
nmcfg system help
nmcfg system define <param> "<value>"
nmcfg system delete <param>
nmcfg user help
nmcfg user define <uname> [{MD5|SHA} "<apwd>" [{DES|AES} ["<ppwd>"]]]
nmcfg user delete <uname>
```

## SNMPv3

For SNMPv3, the definition of a user and its access permission are separate steps, whereas for v1/v2c community-based security, a single command (e.g., `nmcfg community permit admin rw`) defines both.

The following command creates the user "johndoe" and defines its authentication protocol and password, and its privacy (encryption) protocol and password.

These examples use MD5 for authentication and DES for privacy. They provide broader compatibility but if your SNMP client supports SHA (authentication) and AES (privacy), use these as they provide better security. (Note that you can type `nmcfg user help` to view the supported protocols and pass phrase restrictions.)

```
# nmcfg user define johndoe MD5 "password" DES "pass phrase"
```

The new user has no permissions until its access rights are defined. The command below assigns the operator role to the user.

```
# nmcfg access usm permit johndoe operator auth
```

Note that the Makito X Series administrative user roles are preferred over the read-only or read-write permissions (to the whole MIB). These roles provide to SNMP v1/v2c communities and SNMPv3 users access privileges modeled on the Makito X SeriesX Accounts roles.

## Examples

The following examples show how the v3 parameters are used with the SNMP commands.

The following `get` command has the required security level (authentication) and succeeds.

```
# snmpget -v3 -u johndoe -a MD5 -A "password" -l authNoPriv localhost sysName.0
SNMPv2-MIB::sysName.0 = STRING: razor #
```

The following `get` command provides no security (no authentication, no privacy) and fails.

```
# snmpget -v3 -u johndoe -l noAuthNoPriv localhost sysName.0

Error in packet
Reason: authorizationError (access denied to that object) #
```

The following `set` command provides the highest security level (authentication and privacy), even if access policy only required authentication, and succeeds.

```
# snmpset -v3 -u johndoe -a MD5 -A "password" -x DES -X "pass phrase" -l authPriv localhost
haiAvtStreamEncapsulation.1 i directRtp
```


```
HAI-AVT-STREAM-MIB::haiAvtStreamEncapsulation.1 = INTEGER:
directRtp(1)
```

The following `set` command provides the highest security level (authentication and privacy), even if access policy only required authentication, and succeeds.

```
# snmpset -v3 -u johndoe -a SHA -A "password" -x AES -X "pass phrase" -l authPriv localhost
haiAvtStreamEncapsulation.1 i directRtp
HAI-AVT-STREAM-MIB::haiAvtStreamEncapsulation.1 = INTEGER:
directRtp(1)
```

## SNMP Utilities

The following table summarizes the SNMP commands which can be used to set values or request information from the MIB objects on the local host or on other SNMP agents reachable over the IP networks.

To do this...	Use this command ...
To retrieve the value of an object from a network entity.	<code>snmpget</code>
To set information on a network entity.	<code>snmpset</code>
To retrieve management information from a network entity.	<code>snmpstat</code> <code>us</code>
To retrieve the values of <i>all</i> objects under a particular location in the MIB object hierarchy tree. Use to obtain the values of all the objects under the system and interfaces nodes.	<code>snmpwalk</code>
<p> <b>Note</b> The retrieval of a complete subtree is referred to as "walking the MIB."</p>	

The SNMP utilities are located in the directory `/usr/bin`.

For more information on an SNMP command, enter the command with the `-h` (or `--help`) argument.

## SNMP Syntax for Setting Up Streams

The Haivision Audio/Video Transport Stream MIB (HAI-AVT-STREAM-MIB) is composed of multiple tables described below.

Table	Index	Description
haiAvtStreamNewID.0	none	Next available stream ID
haiAvtStreamInverseTable	IP address type IP address Port	Table to retrieve the stream ID from the IP address and port
haiAvtStreamTable	Stream ID	Stream configuration and status
haiAvtStreamStatsTable	Stream ID	Stream statistics
haiAvtStreamPgmTable	Stream ID Program Index	Transport Stream programs. Only SPTS (Single Program Transport Stream) supported. Not present for non Transport Streams (directRTP, QuickTime).
haiAvtStreamContentTable	Stream ID Program Index Content Index	Contents (video, audio, ad insertion, and/or metadata). Elementary Streams (ES) for Transport Stream. Only one entry for non-TS in which case Program Index is 1. One to three entries exist for Transport Streams.

MIB object names and values are similar to their CLI parameter counterparts while following MIB syntax (for example, haiAvtStreamPort for port, directRtp for directRTP).

Streams are created and deleted using the SNMPv2 RowStatus object ( haiAvtStreamRowStatus ). All RowStatus values are supported ( active , notInService , notReady , createAndGo , createAndWait , estroy ). See the description in the SNMPv2-TC.txt file of the MIBs directory. Stream writable objects can only be set at creation time (RowStatus is createAndGo or createAndWait ) or while the stream is not active (RowStatus is notInService or notReady ).

Objects from the haiAvtStreamPgmTable and haiAvtStreamContentTable cannot be set before the corresponding haiAvtStreamTable row is created and can only be set when the stream entry is not active ( haiAvtStreamRowStatus is not active).



## Examples

The following example, using `netsnmp` CLI commands on the Makito X Series encoder, creates a streaming session to IP Address `198.51.100.106` at port `2000`, and starts streaming immediately. The Stream ID `0` (`haiAvtStreamTable` index) is used to create a stream; this value will be set to the first available Stream ID ( $>=1$ ) on `createAndGo` or when set to active after `createAndWait`:

```
>snmpset -v2c -c admin localhost haiAvtStreamAddrType.0 = ipv4 haiAvtStreamAddr.0 d 198.51.100.106
haiAvtStreamPort.0 u 2000 haiAvtStreamRowStatus.0 i createAndGo
```

The example below shows the same command, using the prefix (-IS) and suffix (-Is) options to remove repetition:

```
>snmpset -v2c -c admin -IS haiAvtStream -Is .0 localhost AddrType = ipv4 Addr d 198.51.100.106 Port u
2000 RowStatus i createAndGo
```

To retrieve the Stream ID of the stream just created, the `haiAvtStreamInverseTable` is used:

```
>snmpget -v2c -c admin localhost haiAvtStreamInverseID.ipv4.4.198.51.100.106.2000
HAI-AVT-STREAM-MIB::haiAvtStreamInverseID.ipv4."198.51.100.106".2000 = HaiAvtStreamID: 5
```

To create a Stream with a known ID, the `haiAvtStreamNewID.0` object reports the next available Stream ID. In the example below, the Transport Stream Program number is set to `7` and the video encoder `1` is selected for the video content. Note that `createAndWait` is used so the program and content table can be set after stream creation.

```
>snmpget -v2c -c admin localhost haiAvtStreamNewID.0
HAI-AVT-STREAM-MIB::haiAvtStreamNewID.0 = HaiAvtStreamID: 5
>snmpset -v2c -c admin -IS haiAvtStream -Is .5 localhost AddrType = ipv4 Addr d 198.51.100.106
Port u 2000 Encapsulation i tsUdp RowStatus i createAndWait
>snmpset -v2c -c admin -IS haiAvtStream localhost PgmNumber.5.1 i 7 PgmNbContents.5.1 i 2 ContentType.5.1.1
i video ContentToolID.5.1.1 i 1 ContentType.5.1.2 i audio ContentToolID.5.1.2 i 0
>snmpset -v2c -c admin localhost haiAvtStreamRowStatus.5 i active
```

# Resetting the Decoder

- **Default Network Settings**

This section describes the steps to perform a hardware reset on the Makito X4 decoder. The Reset button is used either to reset the system or to restore the factory default settings.

- **System Reset:** In some cases, if your decoder is experiencing a problem, resetting the system can return the decoder to normal operation.
- **Factory Reset:** If the problem remains after performing a reset, it may help to restore the decoder to its factory default settings. A factory reset returns the decoder to the same settings it originally had when shipped from Haivision, including the factory default IP address, subnet, and gateway.

**Note**

After a factory reset, only the firmware revision, serial number, and MAC address are preserved. All other data is deleted (including saved presets, added user accounts, modified passwords, and decoding settings). All settings are returned to their factory preset conditions (including the IP address).

Use one of the following methods to either reset or restore the Makito X4 decoder settings:

1. With the decoder on, insert a small plastic tool into the small opening labeled **Reset** on the Makito X4 faceplate.



2. **System Reset:** Press the recessed micro switch (you will feel the button depress) for at least one second and release. Be sure to release the button in less than five (5) seconds.  
-or-  
**Factory Reset:** Press and hold the recessed micro switch for five (5) seconds.
3. Wait for the decoder to reboot. As soon as the lights stop blinking and the Status LED is solid green, the decoder is ready.

## Default Network Settings

After a factory reset, the Network settings should be:

IP Address	Subnet Mask	Gateway
10.5.1.2	255.255.0.0	10.5.0.1

### Related Topics:

- [Default Decoder IP Address](#)

# CLI Command Reference

Management via the CLI is possible through a telnet session, SSH, or (if applicable) RS-232. This alphabetical command reference lists and describes the available Command Line Interface (CLI) commands to configure and manage the Makito X4 decoder.

## Accessing the CLI

To access the decoder CLI:

1. Open a telnet session to the decoder (for the default encoder IP address, see [Accessing the Decoder](#)).
2. At the login prompt, type the username and password (see [Role-based Authorization](#)).

## Syntax Conventions

The following syntax conventions are used in this appendix:

Convention	Description
Monospaced font	Indicates command names and options, filenames and code samples.
<i>italic font</i>	Indicates variables or placeholders that you replace with a user-defined value or name.
< >	Same as italics. Variables are enclosed in angle brackets in contexts that do not allow italics.
[ ]	Square brackets indicate optional items or parameters.
x   y	A vertical bar separates items in a list of options from which you must select one. If options are not separated by  , you may use combinations.
{ x   y   z }	Items separated by vertical bars and enclosed in braces indicate a choice of required elements.
[ x { y   z } ]	Vertical bars and braces within square brackets indicate a required choice within an optional element.

 **Tip**

Parameter names and enumerated values are case-insensitive and can be abbreviated.

## Command Summary and Access Control

The Makito X4 decoder CLI commands are divided in two main groups: operation and administration:

- **Operation Commands** are used to manage video decoding. Operation command effects are immediate but not persistent (i.e., between reboots) unless the current operating configuration is explicitly saved (using the `config` command).
- **Administration Commands** address the security and network configuration. Their effects are persistent but not always immediate; some require system reboot to take effect.

Below is a list of CLI commands and other functionalities supported by the system, the privileges for each role, and their descriptions.

[Operation Commands](#)   [Administration Commands](#)   [Access](#)   [Other/Utilities](#)

### Operation Commands

Command	Role			Description
	Admin	Operator	Guest	
<code>dec</code>	Yes	Yes	"get" only	Manage A/V decoder settings.
<code>leds</code>	Yes	Yes	"get" only	Display current LED status and initiate blinking of Status LEDs on the Makito X4 face-plate in order to help locate the device.
<code>mkstill</code>	Yes	Yes	No	Generate still images from a picture.
<code>still</code>	Yes	Yes	"list" only	Manage still image files on the Makito X4 file system.
<code>stream</code>	Yes	Yes	"get" only	Create and manage streams to map decoder inputs to output interfaces.
<code>temperature</code>	Yes	Yes	"get" only	Display the current temperature of the unit.

[Operation Commands](#)   [Administration Commands](#)   [Access](#)   [Other/Utilities](#)

### Administration Commands

Command	Role			Description
	Admin	Operator	Guest	
<b>Network and Management</b>				
<code>config</code>	Yes	Yes	"list" only	Manage configurations on the Makito X4.

<b>date</b>	Yes	Yes	Yes	Display the current date.
<b>emspair</b>	Yes	No	No	Pair and unpair the Makito X4 with a Haivision EMS (Element Management System).
<b>ethercfg</b>	Yes	No	No	View, manually control, and save the Ethernet configuration parameters.
<b>haiversion</b>	Yes	Yes	Yes	Display the Firmware Build ID, Build Time, and serial number for the Makito X4.
<b>ipconfig</b>	Yes	No	No	Set and view the parameters that specify the networking context for the Makito X4, including the IPv4 settings, hostname, and DNS.
<b>ipv6config</b>	Yes	No	No	Set and view the IPv6 settings.
<b>license</b>	Yes	No	No	Manage licensed features.
<b>package</b> (for upgrade)	Yes	No	No	View and manage software packages, including firmware upgrades.
<b>passwd</b>	Yes	"operator" password only	"user" password only	Change the password for a user account.
<b>reboot</b>	Yes	No	No	Halt and restart the Makito X4.
<b>service</b>	Yes	No	No	Enable and disable network services, including HTTP, passthrough, snmp, ssh, talkback, telnet, and vf.
<b>Security Commands</b>				
<b>account</b>	Yes	No	No	Manage user accounts for the decoder.
<b>audit</b>	Yes	No	No	Enable remote logging of security and administrative events and configure the remote audit (syslog) server connection.
<b>banner</b>	Yes	No	No	Manage the Advisory Notice and Consent Banner.
<b>certificate</b>	Yes	No	No	Manage TLS certificates for the Web interface HTTPS server and the secured TLS connection to the remote audit server.
<b>messages</b>	Yes	No	No	View and manage administrative login messages.
<b>policy</b>	Yes	No	No	Manage security policy settings.
<b>pubkey</b>	Yes	Yes	Yes	Manage the user's own authorized SSH public keys.

[Operation Commands](#)
[Administration Commands](#)
[Access](#)
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## Access

Command	Role		
	Admin	Operator	Guest
Web access	Yes	Yes	Yes
Telnet to/from decoder	Yes	Yes	Yes

[Operation Commands](#)
[Administration Commands](#)
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## Other Commands and Utilities

Command	Role			Description
	Admin	Operator	Guest	
iperf	Yes	Yes	Yes	Measure and tune network performance.
ping	Yes	Yes	Yes	Send packets to network hosts to test a network connection.
tcpdump	Yes	—	—	Display TCP/IP and other packets being transmitted or received over a network interface.
tracert	Yes	Yes	Yes	Display the route (path) and measure transit delays of packets across an IP network.

For an overview of system access control on the Makito X4 decoder, see [Role-based Authorization](#).

## Operation Commands

- `dec`
- `leds`
- `mkstill`
- `still`
- `stream`
- `temperature`




## dec

The `dec` command is used to manage A/V decoder settings. The `dec start` and `dec stop` commands can be used to start and stop decoding video. ID can be `all` or `id1[,id2,id3,id4]` with values from `0` to `3`. You can specify a comma-separated list of IDs for the operation, as shown in the examples that follow.

## Synopsis

```
dec ID start
dec ID stop
dec ID set parameter=value [parameter=value]
dec ID get [config/stats/all] [video/buffer/metadata/audio/clockrecovery/all]
dec ID clear
```

## Actions

Action	Description
start	Starts decoding the video input.
stop	Stops decoding the video input.
set	Configures A/V decoder settings. A series of one or more <code>parameter=value</code> pairs can be specified at once. See <a href="#">Parameters</a> below.
get	Displays information on the decoder. You can choose to display the configuration ( <code>config</code> ), <code>stats</code> , or <code>all</code> [ <code>config/stats/all</code> ], and optionally specify a section of interest [ <code>video/buffer/metadata/audio/clockrecovery/all</code> ]
	<div style="border: 1px solid green; padding: 10px; background-color: #e6f2e6;"> <p> <b>Tip</b></p> <p>To display a summary of all the decoders in a table format, you can use <code>dec all get table</code>:</p> <pre># dec all get table ID STREAM ALT-STREAM STATE   FORMAT BUFFERING OUTPUTS ----- 0  1      (None)    ACTIVE  NATIVE  AUTOMATIC SDI-1 1  (None) (None)    STOPPED NATIVE  AUTOMATIC SDI-2 2  (None) (None)    STOPPED NATIVE  AUTOMATIC SDI-3 3  (None) (None)    STOPPED NATIVE  AUTOMATIC SDI-4</pre> </div>
clear	Clears the decoder's statistics.
help	Displays usage information for the <code>dec</code> command.

## Parameters

Parameter	Default	Description/Values
streamId	n/a	Positive stream index. See <a href="#">Configuring Decoder Outputs</a> .
stillImage	freeze	<p>The type of static image to display when the decoder is not receiving a video stream.</p> <ul style="list-style-type: none"> <li><code>freeze</code> : continues to display the last decoded video frame.</li> <li><code>black</code> : displays a black screen.</li> <li><code>blue</code> : displays a blue screen.</li> <li><code>bars</code> : displays a series of vertical color bars across the width of the display.</li> <li><code>mute</code> : disables the video output.</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>When the still image is substituted on the display outputs, the video frame rate and resolution will be maintained. When the video decoder receives a new video stream, it waits until it receives a new IDR frame and re-starts the display with that IDR frame.</p> </div>
stillDelay	3	The delay in seconds before the still image is displayed: 1...1000
format	auto	<p>The output display format:</p> <ul style="list-style-type: none"> <li><code>Auto</code>: The decoder will select an output resolution that attempts to closely match the coded picture resolution, taking into account the capabilities of any displays connected to the HDMI interface.</li> <li><code>Native</code>: The output resolution will be exactly the same as the coded picture resolution. If the coded picture resolution is not compatible with the output interfaces, nothing will be displayed. See "Output Resolution" in <a href="#">Decoder Settings</a>.</li> </ul> <p>Video scaling is not supported.</p>
frameRate	auto	<p>The output frame rate for the displays. <code>Auto</code>, <code>23</code>, <code>24</code>, <code>25</code>, <code>29</code>, <code>30</code>, <code>50</code>, <code>59</code> or <code>60</code></p> <ul style="list-style-type: none"> <li>If <code>Auto</code> is selected, the actual frame rate generated will be the next highest valid frame rate supported by the SDI interface, plus the one that gives the best decimation factor. For example, 30Hz could be chosen instead of 29.970 Hz.</li> <li>Values set which are impossible to implement will be treated as <code>Auto</code>. Reasons for not supporting the selection can range from "Display does not support the frame rate" or "Frame rate is undefined for the detected input resolution".</li> </ul>
buffering	automatic	<p>The type of buffering to use. A jitter buffer temporarily stores arriving packets in order to remove the effects of jitter from the decoded stream.</p> <ul style="list-style-type: none"> <li><code>automatic</code> - Set buffering automatically for good quality and proper sync</li> <li><code>fixed</code> - Set buffering for fixed delay (use <code>delay=X</code> parameter)</li> <li><code>multisync</code> - Set buffering for fixed delay from the encode time (use <code>multiSyncDelay=X</code> parameter, requires SYSTEM TC and NTP)</li> </ul>
delay	n/a	The delay in ms when using <code>stc syncmode</code> with fixed buffering: 0...3000
multiSyncDelay	n/a	The delay in ms from encoder TC when using multisync buffering: 0...10000
outputs	n/a	<p>A list of physical SDI outputs the decoder core will feed: 1..4</p> <ul style="list-style-type: none"> <li><code>none</code>, <code>all</code>, <code>default</code>, <code>quad2SI</code>, or <code>id1[,id2,id3,id4]</code></li> </ul>

## Examples

```
# dec 1 set stillimage=blue
```

Sets the static image to blue. You will receive the following confirmation:  
Decoder configured successfully.

```
# dec 3,2,0 start
```

Starts decoders 3, 2 and 0 (in the order specified)

```
# dec 0,1 get stats
```

Returns (all) decoder statistics for decoders 0 and 1:

```
Decoder ID          : 0
Statistics
  State             : STARTED
  Up Time           : 4d20h38m51s
Buffering
  Buffering State    : IDLE
  Video Latency     : 613ms
  PCR Updates       : 10,136 (Last One: 21h53m28s ago)
  STC Updates       : 6 (Last One: 2d19h16m54s ago)
  Buffering Adjustments : 6 (Last One: 2d19h16m54s ago)
  STC to PCR Lead Time : -399ms (STC is behind PCR by 399ms)
Video
  Preprocessor State : IDLE
  Stream Properties
    Compression      : H.264
    Color             : 4:2:0 8-bit
    Profile           : Main
    Level             : 4.2
    Format            : 1920x1080p60
    Bit Rate          : 4.56Mbps
    Framing           : IP
    GOP Interval      : 120
    Metadata Present  : None
  Format Changes     : 5 (Last One: 2d19h17m16s ago)
  Video Decoder State : IDLE
  Display Format      : 1920x1080p60
  Video Decoder Load : 0%
  Still Image        : FREEZE (ACTIVE) [Count=6, Max=2m30s, Last On=21h49m54s ago, Last
Off=2d19h17m13s ago]
  Displayed Output Frms : 17,799,215 [86.9759%] (Last One: 21h49m57s ago)
  Skipped Output Frames : 373 [0.0018%] (Last One: 1d9h27m38s ago)
  Replayed Output Frames: 2,664,952 [13.0223%] (Last One: 1d9h25m47s ago)
Audio
  Audio Decoder State : IDLE
  Number of Pairs     : 1
  Played Output Frames : 15,982,390 [99.8937%] (Last One: 21h49m57s ago)
  Skipped Output Frames : 17,011 [0.1063%] (Last One: 21h52m14s ago)
Metadata
  Metadata State      : IDLE
Clock Recovery
  Tracking Mode       : ENABLE
  Status              : LOCKED (0.6PPM)
  ReSync Count        : 2
  Current STC         : 27,000,264Hz (9PPM from Nominal)
  STC Avg (last 2 min) : 27,000,258Hz (Deviation 0.6PPM)

Decoder ID          : 1
Statistics
  State             : ACTIVE
  Up Time           : 4d20h38m51s
```

```

Buffering
  Buffering State      : ACTIVE
  Video Latency       : 623ms
  PCR Updates         : 11,803 (Last One: 4m9s ago)
  STC Updates         : 14 (Last One: 4d20h31m44s ago)
  Buffering Adjustments : 15 (Last One: 4d20h31m44s ago)
  STC to PCR Lead Time : -408ms (STC is behind PCR by 408ms)
Video
  Preprocessor State  : ACTIVE
  Stream Properties
    Compression       : H.265
    Color              : 4:2:0 8-bit
    Profile            : Main
    Level              : 4.1
    Format             : 1920x1080p60
    Bit Rate           : 5.05Mbps
    Framing            : IP
    GOP Interval       : 120
    Metadata Present   : None
  Format Changes      : 2 (Last One: 4d20h32m2s ago)
  Video Decoder State : ACTIVE
  Display Format       : 1920x1080p60
  Video Decoder Load  : 24%
  Still Image         : FREEZE (INACTIVE) [Count=3, Max=2m33s, Last On=2d19h21m12s ago, Last
Off=2d19h18m39s ago]
  Displayed Output Frms : 22,514,832 [89.4138%] (Last One: 0s ago)
  Skipped Output Frames : 405 [0.0016%] (Last One: 3h18m ago)
  Replayed Output Frames: 2,665,249 [10.5846%] (Last One: 1h7m59s ago)
Audio
  Audio Decoder State : ACTIVE
  Number of Pairs     : 1
  Played Output Frames : 19,651,839 [99.9122%] (Last One: 0s ago)
  Skipped Output Frames : 17,275 [0.0878%] (Last One: 13s ago)
Metadata
  Metadata State      : IDLE
Clock Recovery
  Tracking Mode       : ENABLE
  Status              : LOCKED (0.3PPM)
  ReSync Count        : 2
  Current STC         : 27,000,242Hz (8PPM from Nominal)
  STC Avg (last 2 min) : 27,000,247Hz (Deviation 0.3PPM)
  
```

```
dec 0 get stats v
```

Returns video decoder statistics for decoder 0:

```
Decoder ID      : 0
Statistics:
  State         : STARTED
  Up Time       : 4d29m15s
Video
  Preprocessor State : IDLE
  Stream Properties
    Compression     : H.264
    Color           : 4:2:0 8-bit
    Profile         : Main
    Level          : 3.2
    Format          : 1920x1080p60
    Bit Rate       : 4.56Mbps
    Framing        : IP
    GOP Interval   : 120
    Metadata Present : None
  Format Changes   : 5 (Last One: 2d19h40m34s ago)
  Video Decoder State : ACTIVE
  Display Format   : 1280x720p59
  Video Decoder Load : 11%
  Still Image     : FREEZE (INACTIVE) [Count=0, Max=0s, Last On=Never, Last Off=Never]
```

## Related Topics

- [Configuring Decoder Outputs](#)
- [Decoder Settings](#)
- [Decoder Statistics](#)

## leds

The `leds` command may be used to help locate a Makito X4 device by initiating blinking of the Status LEDs on the Makito X4 face-plate. This allows easy location of the device in large server room deployments, for example, to help identify a specific blade in a rack.

The blinking duration can be set from 1 to 60 minutes. If no duration is set, blinking will last for 15 minutes and can be cancelled at any time using `leds stop`.

## Synopsis

```
leds get
leds start [duration=15]
leds stop
```

## Actions

Action	Description
start	Initiates blinking of the Status LEDs on the Makito X4 face-plate.
stop	Cancels blinking of the Status LEDs on the Makito X4 face-plate.
get	Displays LED status information for the Makito X4.

## Parameters

Parameter	Default	Description/Values
duration	n/a	The blinking duration can be set from 1 to 60 minutes. If no duration is set, blinking will last for 15 minutes.

## Examples

```
# leds start duration=2
```

Initiates blinking of the Status LEDs, provides the following confirmation:  
LEDs set to blink for 2 minutes.

```
# leds get
```

Displays current LED status:

```
LED States:
Status      : Green
4K Status   : Off
Error       : Off
SDI-1 Status : Off
SDI-2 Status : Green
SDI-3 Status : Green
SDI-4 Status : Green
```

```
# leds stop
```

Cancels blinking of the LEDs.  
 LEDs no longer blinking.

## Related Topics

- [LED Status Indicators](#)
- [Viewing System Status Information](#)

## mkstill

The `mkstill` command is used to generate still images from a picture. The static image is displayed when the decoder is not receiving a video stream.

The supported source formats for the static image are JPEG and PNG.

**Note**

The maximum size of the source image is 2048x2048 pixels.

The resulting still image files are stored on the Makito X Series file system under `/usr/share/haivision/still_images`.

## Synopsis

```
mkstill <infile> resolution [-f]
```

## Parameters

Name	Default	Option	Description/Values
infile	n/a		The name of the image file to convert into a still image.
resolution	n/a		Specifies the desired resolution of the still image. Supported values include: <ul style="list-style-type: none"> <li>• 1080 for 1920x1080</li> <li>• 720 for 1280x720</li> <li>• 480, NTSC for 720x480</li> <li>• 576, PAL for 720x576</li> <li>• VGA for 640x480</li> <li>• SVGA for 800x600</li> <li>• XGA for 1024x768</li> <li>• XGA+ for 1152x864</li> <li>• WXGA for 1280x768</li> <li>• WXGA2 for 1280x800</li> <li>• SXGA for 1280x1024</li> <li>• WXGA3 for 1360x768</li> <li>• WXGA4 for 1366x768</li> <li>• WXGA+ for 1440x900</li> <li>• SXGA+ for 1400x1050</li> <li>• HD+ for 1600x900</li> <li>• UXGA for 1600x1200</li> <li>• WSXGA+ for 1680x1050</li> <li>• WUXGA for 1920x1200</li> </ul>
		-f	Forces overwrite of the still image at the destination.



## Example

```
# mkstill myimage.jpg resolution=1080
```

Converts the image file `myimage.jpg` into a 1920x1080 still image.

## Related Topics

- [still](#) (CLI command)

## still

The `still` command is used to manage available still image files on the Makito X4 file system.

Static image files must already have been generated (see following NOTE) and be located the folder `/usr/share/haivision/still_images` on the Makito X4 file system.

**Note**

You can generate the image file using the `mkstill` command.

Static images may be used to replace the “real” video stream when streaming is paused. You can then configure a Makito X4 stream with a static image using the `dec set` command.

## Synopsis

```
still list
still delete <filename>
still delete all
```

## Actions

Action	Description
list	Lists the available still image files in <code>/usr/share/haivision/still_images</code>
delete	Deletes the specified still image file or all still image files.

## Example

```
# still delete myimage.png
Deletes the image file myimage.png
```

## Related Topics

- [mkstill](#) (CLI command)
- `stillImage` under [dec](#) Parameters
- “Still Image” under [Decoder Settings](#)

## stream

The stream command is used to create and manage streams to map the decoder inputs to output interfaces.

When creating a stream you can specify a unique id to assign to it or let the system assign one for you. You can also specify a name for the stream if needed. The IP Address ( `addr` field) is only required for multicast, but not for unicast streams. Most commands will accept the stream id or name in order select the proper stream to manage.

Once a stream is connected to the decoder (using the `dec` command), you can start/stop the decoder by way of the stream ID (e.g., `stream 1 start`).

## Synopsis

```
stream create [port=udpport] [addr=ipaddr] [id=number] [name=text]
  [encapsulation=ts-udp | ts-udp | ts-srt] [decoderId=number (0-3)]
  [sourceaddr=mcastsenderaddr]

stream id/name start
stream id/name stop
stream id/name delete
stream id/name/all get
stream all get table
stream id/name clear
```

## Possible Encapsulation Formats

Possible encapsulation formats and their specific options:

```
ts-rtp: MPEG2 transport stream over RTP [fec=yes,no]
ts-udp: MPEG2 transport stream over UDP (no RTP header)
ts-srt: MPEG2 transport stream over SRT (Secure Reliable Transport)
  [latency=number] [passphrase=text] [rejectunencrypted=yes,no]
  [mode=listener, caller, rendezvous] [sourceport=udpport]
  [flipaddr=ipaddr] [flipport=udpport] [flipttl=ipttl] [fliptos=iptos]
```

If encapsulation is ts-srt, you can specify a passphrase (10-79 characters) and the maximum latency (how long the decoder will buffer received packets, from 20-8000 ms).

## Actions

Action	Description
create	Creates a decoder streaming session. A series of one or more <code>parameter=value</code> pairs can be specified at once.
delete	Removes the specified stream (entirely).
start	Starts the stream and its associated decoder.
stop	Stops the stream and its associated decoder.

Action	Description
get	Displays stream information. See <a href="#">Parameters</a> below. You can specify to display the stream configuration, statistics, or all. <code>stream all get table</code> displays a summary of all the streams in a table format.
clear	Clears the stream's statistics.
help	Displays usage information for the <code>stream</code> command.

## Parameters

Parameter	Default	Description/Values
port	n/a	The UDP port for the Decoder. Enter a number in the range <code>1025..65,535</code> . Note that RTP streams use even numbers only within this range.
addr	n/a	(Optional, only required for multicast) Enter a Multicast IP address in dotted-decimal format.  <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>⚠ Note</b></p> <p>The Multicast address range is from <code>224.0.0.0</code> to <code>239.255.255.255</code>. Multicast addresses from <code>224.0.0.0</code> to <code>224.0.0.255</code> are reserved for multicast maintenance protocols and should not be used by streaming sessions. We recommend that you use a multicast address from the Organization-Local scope (<code>239.192.0.0/14</code>).</p> </div>
id	n/a	<div style="border: 1px solid #ccc; padding: 5px;"> <p><b>i Note</b></p> <p>When creating a stream, you can specify a unique id to assign to it or let the system assign one (a sequential number) for you.</p> </div> <p>Most commands will accept the stream id or name (see below) in order to select the proper stream to manage.</p>
name	n/a	(Optional) When creating a stream, you can also specify a name for the stream. <code>1</code> to <code>32</code> characters
encapsulation	ts-rtp	(Optional) The Encapsulation Type for the stream. <ul style="list-style-type: none"> <li><code>ts-rtp</code> - MPEG2 transport stream over RTP</li> <li><code>ts-udp</code> - MPEG2 transport stream over UDP (no RTP header)</li> <li><code>ts-srt</code> - MPEG2 transport stream over SRT (Secure Reliable Transport)</li> </ul>
decoderId	n/a	The decoder SDI output port selected for the stream. <code>0</code> to <code>3</code>  <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>i Important</b></p> <p>Decoder 0 has highest priority, and the video decoding resources are prioritized with the lower decoder numbers (i.e., 0, then 1, 2, and 3) having higher priority. For more information, see <a href="#">Oversubscription of Decoder Channels</a>.</p> </div>

sourceaddr	n/a	(Multicast streams only) Enter the multicast sender IP address in dotted-decimal format (i.e., what address is broadcasting). See "Source Address" under <a href="#">Stream Settings</a> .
<b>ts-rtp only</b>		
FEC	None	(Optional) To enable Forward Error Correction (FEC), specify <code>fec=yes</code> . FEC varies with the protocol (encapsulation): <ul style="list-style-type: none"> <li>• TS over UDP = VF FEC</li> <li>• TS over RTP = Pro-MPEG FEC</li> </ul> NOTE: VF FEC is a proprietary FEC and is not interoperable with devices outside of the Haivision family. The FEC level is read from the encoded stream.

ts-srt only		
latency	125	Specifies how long the decoder will buffer received packets, from 20-8000 ms. See "Latency" under <a href="#">SRT Stream Settings</a> .
passphrase	n/a	(Optional) A sequence of words or other text used to control access to the stream. Similar to a password in usage, but is generally longer for added security. This parameter is required if the stream is encrypted and is used to retrieve the cryptographic key protecting the stream. From 10-79 characters.
rejectunencrypted	yes	(Listener Connection mode only) For security reasons, when encryption is enabled in the decoder's SRT Listener stream configuration, this option causes the decoder to reject all unencrypted SRT Caller streams.
mode	listener	Specifies the SRT Connection Mode (to simplify firewall traversal): <ul style="list-style-type: none"> <li><code>caller</code> : The SRT stream acts like a client and connects to a server listening and waiting for an incoming call.</li> <li><code>listener</code> : The SRT stream acts like a server and listens and waits for clients to connect to it.</li> <li><code>rendezvous</code> : Allows calling and listening at the same time. Also, to simplify firewall traversal, Rendezvous Mode allows the encoder and decoder to traverse a firewall without the need for IT to open a port.</li> </ul>
sourceport		<div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b></p> <p>This simplifies firewall configuration as the firewall/NAT rules can be precisely tailored to the SRT stream.</p> </div>
SRT to UDP Stream Conversion (ts-srt only)		
flipaddr	n/a	Specifies the destination IP address for the stream. See "SRT to UDP Stream Conversion (TS over SRT only)" under <a href="#">SRT Stream Settings</a> .
flipport	n/a	Specifies the UDP source port for the stream.
flipttl	64	(Time-to Live for stream packets) Specifies the number of router hops the stream packet is allowed to travel/pass before it must be discarded. <code>1..255</code>
fliptos	184 or 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 = <code>0..255</code> (decimal) or <code>0x00..0xFF</code> (hex)

## stream Examples

<pre># stream create addr=10.6.230.106 port=2000 name=infodev</pre> <p>Creates a streaming session from IP Address 10.6.230.106 at port 2000. Returns a confirmation such as: Stream created successfully - ID: 1.</p>
<pre># stream 1 start</pre> <p>Starts the the stream and its associated decoder. Returns a confirmation such as: Stream started successfully.</p>

```
# stream 1 get all
```

Returns configuration information for decoder stream #1, such as:

```
Stream ID      : 1
Name          : (None)
Configuration
  Address      : 10.65.135.55
  UDP Port     : 3436
  Decoder      : 0
  Encapsulation : TS-SRT
  Mode         : Rendezvous
  AES Encryption : On
  Latency      : 250 ms
  Stream Flipping : Off
Statistics:
  State        : ACTIVE
  Up Time      : 8m21s
  Source Address : 10.65.135.55 port 3436
  Bit Rate     : 5.87Mbps
  Received Packets : 53,460 (Last One: 0s ago)
  Received Bytes  : 382,894,959
  Connections   : 1 (Last One: 8m20s ago)
  Program Number : 1
  PCR PID       : 34
  Streams       : 2 (1 video, 1 audio, 0 KLV, 0 filtered)
SRT Stats
  Local Version  : 1.3.2
  Peer Version   : 1.3.2
  Connections    : 1
  Local Port     : 3436
  Remote Port    : 3436
  AES Encryption : On
  Key Length     : 128 bits
  Decryption     : Active
  Sent ACKs      : 32,573
  Link Bandwidth : 161,005 kbps
  RTT            : < 1 ms
  Local Buffer Level : 222 ms
  Latency        : 250 ms
```

```
# stream 1 get stats
```

Returns status information for decoder stream #1, such as:

```
Stream ID      : 1
Name          : (None)
Statistics:
  State        : Streaming
  Output       : DECODER-1
  Up Time      : 2d4h42m4s
  Bitrate      : 6,149 kbps
  Received Packets : 20,260,289
  Received Bytes  : 1,479,361,480
  Received Errors : 0
  Last Received  : 0s ago
  Stream PCR    : 0x1f9c7ab31
  MPEG2TS Lost Packets : 4
  Corrupted Frames : 2
  Pauses       : 0
  Source Address : fd00:10:65:132:5e77:57ff:fe00:ae6a
```

```
# stream 1 delete
```

Deletes Stream #1.

## Related Topics

- [Configuring Streams](#)



## temperature

The `temperature` command is used to display the current temperature of the unit.

### Synopsis

```
temperature get
```

### Actions

Action	Description
get	Displays the current temperature status of the unit.

### Parameters

N/A

### Example

```
# temperature get

Displays the current temperature for the unit, see example below:
Temperature Status :
  Current Temperature   : 47 Celsius measured 1s ago
  Maximum Temperature  : 48 Celsius measured 20m48s ago
  Minimum Temperature   : 45 Celsius measured 20m48s ago
```

## Administration Commands

- `account`
- `audit`
- `banner`
- `certificate`
- `config`
- `date`
- `emspair`
- `ethercfg`
- `haiversion`
- `ipconfig`
- `ipv6config`
- `license`
- `messages`
- `nmcfg`
- `package`
- `passwd`
- `policy`
- `pubkey`
- `reboot`
- `service`
- `system_snapshot.sh`

## account

The `account` command is used to create, delete, and modify user accounts for Makito X Series devices.

### Note

Only an administrator can use the `account` command.

### Important

Makito X Series devices ship from the factory with only the `admin` account enabled. For security reasons, the two default user accounts ( `user` and `operator` ) are locked at the factory as well as after a factory reset. An administrator must unlock them and change the passwords to use them for the first time.

## Synopsis

```
account uname create [role=admin]
account uname/all get
account uname/all list
account uname passwd
account uname pubkey add|remove keyfile
account uname pubkey list
account uname lock
account uname unlock
account uname delete
```

## Actions

Action	Description
create	Creates a new user account. See <a href="#">Parameters</a> below for roles. You will be prompted to enter and confirm the initial password.
get	Displays the account information for the user or the Makito X device, including account name, role, state, password expiry status, and public key(s).
list	Lists the account information for the user or the Makito X device in table format.
passwd	Modifies the user account password. You will be prompted to enter and confirm the password (which the user will have to change upon first login). For the allowed characters, see "Changing Your Password" (link below).
pubkey add remove keyfile	Adds or removes a public key to the user account. See "Managing Public Key Authentication" (link below) for more information.
pubkey list	Lists any public key files that have been uploaded for this account.
lock	Locks the user account (if Enabled).
unlock	Unlocks the user account (if Locked).
delete	Deletes the user account.

## Parameters

Parameter	Default	Description/Values
role	Administrator	Use with the <code>account create</code> command to specify the role for the user account, either: <ul style="list-style-type: none"> <li>Administrator</li> <li>Operator</li> <li>Guest</li> </ul> For details on roles, see "Role-based Authorization" (link below).

## Examples

```
# account all list

Returns the list of all accounts, for example:
name           role           state          pwd expiry     pubk
-----
admin          Administrator  Enabled        never          Yes
jdube          Guest          Enabled        never          No
mrmichel       Operator       Enabled        by admin      No
operator       Operator       Locked         never          No
user           Guest          Enabled        never          No
```

## Related Topics

- [Changing Your Password](#)
- [Role-based Authorization](#)
- [pubkey](#) (CLI command)

## audit

The `audit` command is used to enable remote logging of system events and configure the remote audit ( `syslog` ) server connection.

**Note**

The `audit` command can only be used by an administrator.

### Synopsis

```
audit start
audit stop
audit set parameter=value [parameter=value ...]
audit get [config|stats|all]
audit verify [debug]
```

### Actions

Action	Description
start	Establishes a connection from the Makito X Series device to a remote audit server and enables logging to it.
stop	Disables the connection to the remote audit server.
set	Modifies the audit parameters. A series of one or more <code>parameter=value</code> pairs can be specified at once. See <a href="#">Parameters</a> below.
get	Displays audit configuration and connection status information. You can specify configuration, statistics, or all information.
verify	Verifies the validity of the TLS connection parameters. <div data-bbox="516 1318 1498 1444" style="border: 1px solid green; padding: 5px; margin-top: 10px;"> <p><b>Tip</b> Connect to the audit server in verbose mode to help diagnose connection or certificate problems.</p> </div>

## Parameters

Parameter	Default	Description/Values
server	n/a	<p>The server IP address. Enter an IP address in one of the following formats:</p> <ul style="list-style-type: none"> <li>fqdn[:port]</li> <li>ipv4_addr[:port]</li> <li>[ipv6_addr][:port]</li> </ul> <div style="border: 1px solid orange; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>When configuring an IPv6 server, the address must be enclosed in square brackets.</p> </div> <ul style="list-style-type: none"> <li>hostname[:port]</li> </ul>
transport	UDP	<p>The transport protocol, either:</p> <ul style="list-style-type: none"> <li>UDP (User Datagram Protocol): Default UDP port = 514</li> <li>TLS (Transport Layer Security): Default TLS port = 6514</li> </ul>
trusted	All	<p>If transport is TLS, the type of server authentication:</p> <ul style="list-style-type: none"> <li>All : No server authentication</li> <li>CA-signed : Root-CA certificate imported</li> <li>Self-signed : Fingerprint</li> </ul>
fingerprint	n/a	<p>If trusted is self-signed, specify the audit server certificate fingerprint ( md5 or sha1 ):</p> <ul style="list-style-type: none"> <li>md5-fingerprint:</li> <li>sha1-fingerprint:</li> </ul>

## Example

```
# audit get
```

Returns audit server configuration information, such as:

Configuration:

```
Audit server address : syslog.example.com:10533
Transport            : TLS
Trusted servers      : CA-signed
```

## banner

The `banner` command is used to manage the Advisory Notice and Consent Banner. This is a single text file that is displayed to users who sign in for interactive sessions on Makito X Series devices. The banner is typically an advisory/warning notice to be displayed before the Sign-in page.

Only ASCII file format is supported for the banner file; the maximum file size for the banner is 4KB.


### Note

The `banner` command can only be used by an administrator.

## Synopsis

```
banner enable
banner disable
banner install bannerfile
banner get
banner delete
```

## Actions

Action	Description
enable	Enables display of the installed Advisory and Consent Banner page at login (a banner must be installed).
disable	Disables display of the current Advisory and Consent Banner page at login.
install	Installs a text file as the Advisory and Consent Banner page. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p> <b>Important</b></p> <p>The text file must be downloaded to the encoder and locally stored in the current (administrative) user's directory before it can be installed from the CLI. The Makito X Series supports FTP and TFTP client, as well as SCP client and server for downloading and uploading files.</p> </div>
get	Displays banner status information
delete	Deletes the banner file from the system.

## Parameters

Parameter	Default	Description/Values
bannerfile	N/A	The name of the .txt file to display as the Advisory Notice and Consent Banner for the encoder.

## Examples

```
# banner get
The Advisory Notice and Consent Banner is disabled.
Unable to display banner: No banner file.
If enabled, the following banner is displayed upon user login:
-----
*****
                * WARNING *
*****

THIS IS A PRIVATE COMPUTER SYSTEM.
This computer system, including all related equipment and network devices,
are provided only for authorized use. All computer systems may be
monitored for all lawful purposes, including to ensure that their use is
authorized, for management of the system, to facilitate protection against
unauthorized access, and to verify security procedures, survivability and
operational security.

*****
                * Haivision Systems - Makito X QA *
*****
```



## certificate

The `certificate` command is used to manage the system’s certificates that are used to establish TLS connections to the audit server as well as to secure HTTPS sessions.

**⚠ Note**

The `certificate` command can only be used by an administrator.  
 The `autocert` file is a default certificate file, generated when the IP address is changed from factory settings, or when an audit or an HTTPS session starts with no selected certificate.

### Synopsis

```
certificate name/all get
certificate name/all list
certificate name view
certificate name create [sign=self] [subject=query]
certificate name delete [type=id]
certificate name import infile= [type=id] [fmt=auto]
certificate name select
certificate name verify
```

### Actions

Action	Description
get	Displays the information for the specified certificate or all certificates, including certificate name, type, signature, subject, issuer, expiration, and fingerprint.
list	Lists the specified certificate or all certificates installed on the encoder, including the type and name.
view	Displays the content of the named certificate file.
create	Generates a Self-signed certificate or a Certificate Signing Request. The <code>sign</code> and <code>subject</code> can be specified. See <a href="#">Parameters</a> below.
delete	Deletes the selected certificate. The <code>type</code> can be specified. See <a href="#">Parameters</a> below. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>⚠ Note</b></p> <p>The <code>type</code> specification may be added to specify the deletion of the Identity certificate, the chain associated with it, or the CA certificate with the given name.</p> </div>
import	Imports a certificate to be installed on the device. The <code>infile</code> , i.e., the file to import the certificate from, must be provided. The file’s <code>type</code> and <code>format</code> can also be specified. See <a href="#">Parameters</a> below.
select	Selects the certificate used when establishing a TLS connection with the audit server or starting an HTTPS session.

Action	Description
verify	Verifies the validity of the specified certificate.

## Parameters

Parameter	Default	Description/Values
sign	self	<p>The signature type for the certificate:</p> <ul style="list-style-type: none"> <li><code>self</code> : Creates a self-signed identity certificate.</li> <li><code>Request</code> : Creates an identity Certificate Signing Request (CSR)</li> </ul>
subject	query	<p>Sets the certificate's distinguished name parameters:</p> <ul style="list-style-type: none"> <li><code>auto</code> : Automatically gets the subject Common Name which is <code>HOSTNAME.DOMAIN</code> if DNS is configured, or <code>IPADDR</code> otherwise. The subject Alt Name is set to <code>DNS:HOSTNAME.DOMAIN, DNS:HOSTNAME, IPAddress:IPADDR</code></li> <li><code>query</code> : Prompts the user for Distinguished Name (DN) attributes</li> <li><code>DN</code> : Distinguished Name in the form: <code>" /C=US/ST=Maine..."</code> where the most common attributes are:            /C Two Letter Country Name            /ST State or Province Name            /L Locality Name            /O Organization Name            /OU Organizational Unit Name            /CN Common Name</li> </ul>
type	id	<p>The type of certificate to either import or generate:</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> <p><b>Note</b></p> <p>Only ID certificates can be generated. Chain and CA certificates can only be imported.</p> </div> <ul style="list-style-type: none"> <li><code>id</code> : Identity certificate (for HTTPS service and audit ( <code>syslog</code> client))</li> <li><code>chain</code> : Identity certificate CA chain (Import only)</li> <li><code>ca</code> : Certificate Authority Certificate (for peer certificate validation, Import only)</li> </ul>
fmt	auto	<p>The format in which the certificate is encrypted:</p> <ul style="list-style-type: none"> <li><code>auto</code> : Detects the certificate format based on file extension when importing.</li> <li><code>pem</code> : Privacy Enhanced Mail Base64 encoded DER certificate</li> <li><code>p7</code> : PKCS#7</li> <li><code>p12</code> : PKCS#12</li> <li><code>pfx</code> : PKCS#12</li> <li><code>der</code> : Distinguish Encoding Rules</li> </ul>
infile	N/A	<p>The name of the file to import.</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> <p><b>Note</b></p> <p>The administrator has previously downloaded/uploaded the certificate file to import in its home directory (using SCP, for example).</p> </div>

## Examples

```
# certificate all get

Returns the certificate information for the Makito X4.
Certificate Name      : autocert (default)
Type                 : id
Signature            : Self-signed
Subject              : test.haivision.com
Issuer               : test.haivision.com
Expiration           : Feb 13 18:54:26 2029 GMT
Fingerprint          : md5:70:AC:75:C5:B4:5E:C8:51:1C:13:CA:9E:E2:CB:EF:E3
X509v3 Subject Alternative Names:
  DNS                 : test.haivision.com
  IP Address          : 10.65.11.148

Certificate Name      : cert1
Type                 : id
Signature            : Self-signed
Subject              : MX4-test
Issuer               : MX4-test
Expiration           : Aug 3 18:31:37 2022 GMT
Fingerprint          : md5:45:5B:7E:C2:BF:D6:6E:9F:32:B9:7F:BE:73:E1:3F:DC
X509v3 Subject Alternative Names:
  DNS                 : MX4-test
  IP Address          : 10.65.135.35

Certificate Name      : cert2
Type                 : id
Signature            : Request not signed
Subject              : QA-test
Issuer               : Request not signed
Expiration           : No expiration date is set before certificate is signed.
Fingerprint          : md5:75:85:8d:ec:82:61:6d:11:be:fe:28:45:d6:2d:68:00
```

## config

The `config` command is used to manage configurations on Makito X Series devices. This includes saving the current configuration, loading a saved configuration, and specifying the configuration file to load at startup.

### Related Topics

- [Saving and Loading Presets](#)

## date

The `date` command is used to display the current date and time.

### Synopsis

```
date
```

### Actions

N/A

### Parameters

N/A

### Example

```
# date
```

```
Displays the current date, e.g.:  
Tue Jun 9 17:04:18 EDT 2020
```

### Related Topics

- [Configuring Date and Time](#)

## emspair

The `emspair` command is used to pair and unpair a Makito X Series device with/from a Haivision EMS (Element Management System). This allows the Haivision EMS to discover, manage and monitor the Makito X Series. Administrators of multiple Makito X Series devices can use Haivision EMS to manage activities such as rebooting and upgrading the software and monitoring the status of devices for large installed bases. The EMS server managing may be in one facility while the devices being managed are in another facility.

Device unpairing is achieved by running the `emspair unpair` command. The current EMS agent state can be queried with the `emspair status` command.

- If the device is in `UNPAIRED` state, the `unpair` command has no effect.
- If device is in `PAIRED`, `CONNECTING` or `CONNECTED` states, the `unpair` command will attempt to communicate the intention to the EMS server immediately (if `CONNECTED`) or upon next successful connection. The EMS server will then proceed with removing the device registration and instructing the device to erase local pairing information.
- If the `-f` (force) flag is specified, the device will immediately inform the EMS server that it wishes to unpair if it is in `CONNECTED` state. The device will proceed to disconnect and erase all local pairing information regardless of server response or current state.

**Note**

A Makito X Series device can only talk to a single EMS at a time. After a factory reset, the EMS service is disabled, and the Makito X Series device loses all of its locally stored pairing information and must be re-paired with an EMS server afterwards.

## Synopsis

```
emspair <operation> [args]

emspair pair [-c <passcode>] [-h <host>] [-p <port>] [-k <seconds>] [-r <seconds>]
emspair unpair -f
emspair status
```

## Actions

Action/Operation	Option/Argument	Description
pair	-c <passcode> -h <host> -p <port> -k <seconds> -r <seconds>	Pairs the Makito X Series device with an EMS server: Passcode to use for pairing operation Overrides server host address Overrides server host port Override keepalive period Override reconnect delay period

Action/Operation	Option/Argument	Description
unpair	-f	Unpairs the Makito X Series device from the EMS server: Forces unpairing
status		Queries agent status

## Examples

```
# emspair pair -c CIqn9+kFUncKDDEwLjY1LjExLjE4NxCzRVJkCkBmZTB1MD
A1ZGYyNzM3MmI4MmY0Njc1ODUzZGQ3MDhhZDk4MWE2NGJjNDEyODliNDNlMDAxYzJjNTJmMmZhODZhEi
A4N2YyM2ZkNi1kNGEyLWExNGYtNzNhZi0yMjliNmRiZA==
```

Pairing configuration:

-----  
Expires: Sun Jul 28 16:55:38 2019

Server: 10.65.11.187:8883

-----  
\* Starting operation...  
\* Waiting for completion...  
\* Operation completed successfully!  
Status Report:

-----  
Last State: PAIRED  
Server: 10.65.11.187:8883  
Device ID: 26637ed0-7a22-ab4f-71bf-baf4dc59  
Enabled: Yes  
Waiting To Unpair: No

```
# emspair unpair
* Starting operation...
* Waiting for completion...
* Operation completed successfully!
Status Report:
```

-----  
Last State: UNPAIRED  
Server: (None)  
Device ID:  
Enabled: Yes  
Waiting To Unpair: No

```
# emspair status
* Starting operation...
* Waiting for completion...
Status Report:
```

-----  
Last State: PAIRED  
Server: 10.66.131.132:8883  
Device ID: 37a1de75-4aac-bf4f-70bf-ee7f66dc  
Enabled: Yes  
Waiting To Unpair: No

```
# emspair status
* Starting operation...
* Waiting for completion...
Status Report:
-----
Last State: CONNECTED
Server: 10.65.11.187:8883
Device ID: bcda955f-15f2-b14f-67af-497000ca
Enabled: Yes
Waiting To Unpair: No
```

```
# emspair status
* Starting operation...
* Waiting for completion...

Status Report:
-----
Last State      : CONNECTED
Server          : 10.65.130.149:8883
Device ID       : 24adb057-a3b2-cc4f-4abf-933cd63a
Enabled         : Yes
Waiting To Unpair: No
Keepalive       : 3 sec

Reconnect Delay 5 sec
```

#### Related Topics:

- [Pairing the Decoder with Haivision EMS](#)



## ethercfg

The `ethercfg` command is used to view, manually control, and save the Ethernet configuration parameters.

When a Makito X Series device boots up, it automatically initializes and configures the Ethernet interface to match the settings on the Ethernet switch to which it is connecting. However, you may need to manually force settings such as the Ethernet interface line rate and duplex mode.

- You can change the Ethernet interface line rate while autonegotiation is enabled.
- However, in order to change the duplex mode, you must disable autonegotiation.

If no options are specified, the system displays the current settings, as shown in the following example.

```
ethercfg
Speed           : 1000mbps
Duplex          : Full
Auto-Negotiation : On
Advertised Mode : All
Link Detected   : Yes
Ceiling         : 100000kbps
```

## Synopsis

```
ethercfg [-a on|off] [-s 10|100|1000] [-d half|full] [-c bandwidth] [-w yes|no]
```

## Options

Option	Description/Values
-a      --autoneg	Enables (on) or disables (off) autonegotiation.
-s      --speed	If autonegotiation is disabled, sets the speed: 10, 100, 1000. If autonegotiation is enabled, this is the advertised supported speed which will be available for the peer Ethernet switch to use.
-d      --duplex	If autonegotiation is disabled, sets the duplex mode: half, full. If autonegotiation is enabled, this will be the advertised duplex mode.
-c      --ceiling	Puts a "ceiling" (in kbps or Mbps) on the bandwidth available to the Ethernet port.
-w      --write	If yes, skips the save settings prompt.

### Note

When the entire set of parameters is not specified, the system will try to combine the current Ethernet settings with the newly supplied ones. Therefore, you should carefully review the outputted configuration when the command completes to make sure it matches the desired Ethernet settings.

Always enable autonegotiation with Gigabit Ethernet (GigE) speed (1000 Mbps).

## Parameter

N/A

## Actions

N/A

## Example

```
# ethtool -s 100  
Sets the line speed to 100 Mbps (which also modifies the advertised mode, see example below).  
# ethtool -s 100  
Speed : 100mbps  
Duplex : Full  
Auto-Negotiation : On  
Advertised Mode : 100mbps Full-Duplex  
Link Detected : Yes  
Ceiling : 100000kbps  
  
Do you wish to save these settings ? (y,n): y  
Settings saved successfully.
```

## Related Topics

- [Configuring Network Settings](#)

## haiversion

The `haiversion` command is used to display status information about Makito X Series devices. Status information can be useful for troubleshooting and may be forwarded to Haivision Technical Support if you are requesting technical support.

It also displays the Firmware Build ID and Build Time as well as the serial number for the unit.



### Tip

The MAC Address is shown on the Network page (Web Interface) and in the System Snapshot.

## Synopsis

```
haiversion
```

## Actions

N/A

## Parameters

N/A

## Example

```
# haiversion

Displays information about the hardware and software components.
Card Type           : "Makito X4 SDI Decoder"
Part Number         : S-MX4D-SDI
Serial Number       : HAI-031950010016
MAC Address         : 5c:77:57:00:e0:be
Firmware Version    : 1.0.0-6
Firmware Date       : "Apr 23 2020"
Firmware Time       : "12:16:51"
Hardware Version    : A
Hardware Compatibility : -002G
CPLD Version        : 4 (Official, Internal flash)
Boot Version        : "U-Boot 2018.01 (Feb 05 2019 - 15:29:26) Makito4K"
```

## Related Topics

- [Viewing System Status Information](#)

## ipconfig

The `ipconfig` command is used to view and set the parameters that specify the IP (IPv4) networking context for Makito X Series devices, including the IP settings, hostname, and DNS. It may also be used to set the Network Time Protocol (NTP) server address and Time Zone.

As shown in the examples that follow, when you enter the `ipconfig configure` command, the system displays the current IP settings and takes you through a series of prompts enabling you to change the IP settings, optionally enable DHCP, and change the hostname, DNS settings, NTP settings, and/or Time Zone setting.

When DHCP is enabled, you can configure the `DHCP Vendor Class ID` (option 60), which is set by default, for example, “Haivision Makito X4 Encoder” or “Haivision Makito X4 Decoder”. This allows IT departments to identify Makito X Series devices on their networks.

Also, if there is a slow DHCP server at the client’s site, you may find it useful to adjust the `DHCP Client Retries` and `Timeout` options to obtain a DHCP address. These options were added to circumvent issues caused by the unit’s booting before having obtained a valid DHCP address.

**Note**

Enabling the Multicast DNS (mDNS) protocol allows mDNS applications such as the Safari Web browser to automatically find the encoder. In Safari, navigate to Bookmarks and then select Bonjour to see the Makito X Series device listed.

**Warning**

If you are connecting to the Makito X Series through an IPv4 connection, disabling the IPv4 interface will drop your connection. You will need to reconnect using IPv6 or the serial interface (if available).

You must reboot for any changes to take effect.

## Synopsis

```
ipconfig display [iface]
ipconfig configure [iface]
ipconfig renew
ipconfig release
ipconfig disable [iface]
```

## Actions

Action	Description
display	Displays the current IP configuration for the specified network interface. See <a href="#">Parameters</a> below for interface.
configure	Configures IP settings for the specified network interface. See <a href="#">Parameters</a> below for interface.

Action	Description
renew	Renews the DHCP address lease.
release	Releases the current DHCP address lease.
disable	<p>Disables IPv4 functionality for the specified network interface. See <a href="#">Parameters</a> below for interface. Use to configure the device to use IPv6 network only.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>You cannot disable IPv4 if IPv6 is already disabled.</p> </div>

## Parameters

Parameter	Default	Description/Values
iface	eth0	Allows for multiple network interfaces. Select the interface to view and configure. Either eth0 or eth1.

## Examples

```
# ipconfig display

Returns current IP settings for decoder:
Current IP Settings:

  IP Address           : 10.65.135.35
  Network Mask         : 255.255.255.0
  Gateway              : 10.65.135.1
  Hostname             : MX4D-test

Current DNS Settings:
  Domain               : haivision.com
  Primary Server       : 8.8.8.8
  Alternate Server     : 8.8.4.4
  DNS Resolve Precedence : IPv6

Current Multicast DNS (mDNS) Settings:
  Responder            : Enabled
  Identifi             : "MX4D-test"

Current NTP Settings:
  Server               : ca.pool.ntp.org
  Timezone             : "America/Montreal"
```

## Related Topics

- [Configuring Network Settings](#)
- [Network Settings](#)

## ipv6config

The `ipv6config` command is used to view and set the parameters that specify the IPv6 network configuration of Makito X Series devices.

As shown in the examples that follow, when you enter the `ipv6config configure` command, the system displays the current IPv6 settings and takes you through a series of prompts enabling you to change these settings. You can either assign a static IPv6 address or use DHCPv6 (Dynamic Host Configuration Protocol for IPv6).

You must reboot for any changes to take effect.

### Synopsis

```
ipv6config display
ipv6config configure
ipv6config disable
```

### Actions

Action	Description
display	Displays the current IPv6 configuration.
configure	Configures IPv6 settings.
disable	Disables IPv6 functionality. <div style="border: 1px solid #ffc107; padding: 5px; margin-top: 5px;"> <p><b>⚠ Note</b> You cannot disable IPv6 if IPv4 is already disabled.</p> </div>

### Parameters

N/A

**✓ Tip**

For descriptions of the parameters that follow, see [Network Settings](#).

## Example

```
# ipv6config display

Returns current IPv6 settings for a decoder configured to use IPv6:
Current configured IPv6 Settings:
  Global IPv6 Address : fd00:10:65:135::1297/128
  Global IPv6 Address : fd00:10:65:135:5e77:57ff:fe00:e0be/64
  Link-Local IPv6 Address : fe80::5e77:57ff:fe00:e0be/64
  Gateway Address : fe80::2efa:a2ff:febl:a959
  Hostname : MX4D-test
Current DNS Settings:
  Domain : haivision.com
  Primary Server : 8.8.8.8
  Alternate Server : 8.8.4.4
  DNS Resolve Precedence : IPv6
Current Multicast DNS (mDNS) Settings:
  Responder : Enabled
  Identifier : "MX4D-test"
Current NTP Settings:
  Server : ca.pool.ntp.org
  Timezone : "America/Montreal"
```

## Related Topics

- [Configuring Network Settings](#)
- [Network Settings](#)

## license

The `license` command is used to manage licensed features. The license is delivered as a plain-text ASCII license file with the extension `.lic` to be installed on your Makito X device.

**Note**

Multiple licenses may be installed on the same device at the same time.

### Synopsis

```
license list
license info <feature.lic/all> [-w]
license view <feature.lic>
license install <features.lic>
license verify <features.lic>
license delete <features.lic>
```

### Actions

Action	Description
list	Displays a list of installed licenses. Licenses are stored on the Makito X file system in the folder <code>/usr/share/haivision/licenses</code> .
info	Displays options information for license file(s). -w Display warnings (*W)
view	Displays the content of the specified license file.
install	Installs the specified (uploaded) license.  <div style="border: 1px solid #f0e68c; padding: 5px;"> <p><b>Note</b></p> <p>The license file must be uploaded to the encoder and locally stored in the current (administrative) user's folder before it can be installed. The Makito X supports FTP and TFTP client, as well as SCP client and server for downloading and uploading files.</p> </div>
verify	Verifies the specified license (either installed or uploaded).
delete	Deletes a previously installed license file from the system.

### Parameters

N/A



## Examples

```
# license list
```

Displays a list of licenses currently installed on the system:

```
License Files (in /usr/share/haivision/licenses):
QA-MX4D-Full.lic
```

```
# license info all
```

Displays options information for the license file:

```
[L1] QA-MX4D-Full.lic: Ok
System:
  Maximum Upgradable Release          9.9
  Firmware Expiration Date            Never
Audio/Video Outputs:
  Number of decode channels            4
  Maximum output resolution            HD
Video:
  High Efficiency Video Coding (H.265) On
  Maximum Video Bit Depth              10
  Maximum Video Color Subsampling      4:2:2
Metadata:
  Key-Length-Value (KLV)              On
Stream:
  Secure Reliable Transport (SRT)      On
```

## Related Topics

- [Managing Licenses](#)

## messages

The `messages` command is used to manage administrative login messages. This is a log of a limited number of important events recorded such as installation of a software package, failure to establish or maintain connectivity with a remote audit server, Power-On Self Test (POST) errors, and other noteworthy events that require the administrator’s attention.

These events will result in a message being sent directly to all logged-in administrators and will appear on their terminals. The message will also be displayed at the next administrative Web interface or CLI login.

**Note**

The `messages` command can only be used by an administrator. Messages starting with “POST” are Power-On Self Test events. If you repeatedly get POST errors, the cryptographic module of the encoder may be compromised, and it is recommended to re-install the firmware.

## Synopsis

```
messages add <msgtext>
messages get
messages delete
```

## Actions

Action	Description
add <msgtext>	Adds the message text to the log. This could be used to send messages to other administrators.
get	Displays messages.
delete	Deletes the messages.

## Parameters

N/A

## Example

```
# messages get

Tue Jun 9 11:56:34 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
Tue Jun 9 11:56:53 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
Tue Jun 9 12:33:50 EDT 2020: There were 3 failed login attempts on the admin account since the
last successful login.
Tue Jun 9 16:05:00 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
Tue Jun 9 16:12:55 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
Tue Jun 9 16:27:19 EDT 2020: Software package makitox4_dec_v1.0.0-35.hai was successfully
installed.
Tue Jun 9 16:35:02 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
Wed Jun 10 10:08:49 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
Wed Jun 10 10:31:57 EDT 2020: Software package makitox4_dec_v1.0.0-36.hai was successfully
installed.
Wed Jun 10 10:40:30 EDT 2020: There was 1 failed login attempt on the admin account since the
last successful login.
```

## nmcfg

The `nmcfg` (Network Management Configuration) command is used by system administrators or GUI/ Web interface applications in the configuration of SNMP for certain Makito X series devices. The `nmcfg` script reads and edits the standard SNMP configuration files, and then restarts the SNMP agent (`snmpd`) to apply the new settings.

The `nmcfg` script supports the configuration of v1/v2c community-based security model and v3 USM (User-based Security Model). The script supports the traditional access permissions (read-only, read-write) and VACM (View-based Access Control Model) views modeling the Makito X user groups (administrator, operator, and guest).

A detailed help, describing the options is available for each command option (for example, `nmcfg access help` or `nmcfg user help`).

### Synopsis

```
nmcfg help
nmcfg access help
nmcfg access usm permit <uname> {<group>|ro|rw} [{noauth|auth|priv}]
nmcfg access usm delete <uname>

nmcfg community help
nmcfg community permit <community> {<group>|ro|rw} [<host>]
nmcfg community delete <community> [{<group>|ro|rw} [<host>]]

nmcfg system help
nmcfg system define <param> "<value>"
nmcfg system delete <param>

nmcfg user help
nmcfg user define <uname> [{MD5|SHA} "<pwd>" [{DES|AES} ["<pwd>"]]]
nmcfg user delete <uname>
```

### Options

Name	Description
access	Defines the access permissions granted to the v1/v2c communities and USM (v3) users. Only the USM security model option is shown in the summary help. The v2c security model, a different format for community configuration, is only displayed in the access detailed help. Note that the v2c security model also applies to SNMP v1.
community	Defines community-based (v1v/2c) security configuration for the Makito X.
system	Defines contact and location system parameters.
user	Defines user-based (v3) security configuration for the Makito X.

## Actions

Action	Description
define	Acts as both create and update. If an object does not exist, it is added. If it exists, it is replaced or updated with the new settings. It is then not necessary to delete an existing object to change its settings. All required settings of an object are specified when defining/changing an object. It is not possible to set settings individually.
permit	<p>Defines the access permissions for the community or the user.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Info</b></p> <p>Access permissions may be additive. For example, permitting a new source for an existing community adds to the existing one if it complements it.</p> </div>
delete	Deletes the specified object.
help	Displays usage information for the command, or if specified, the option.

**⚠ Note**

`nmcfg` settings persist after reboots, unlike other Makito X settings which are lost when the unit is rebooted unless saved as a configuration.

## Parameters

N/A

## Example #1: Initializing a Community-Based (v1/v2c) System

In the example below, a system with default settings is configured to add a distant host access (198.51.100.122) to the existing localhost and localnet accesses of the admin community. Note that the localnet source is a special keyword that translates at runtime to the network settings of the LAN interface. System parameters are also defined. Both IPv4 and IPv6 are enabled.

```
# nmcfg
snmp agent
-----
status running
transport udp:161
        udp6:161

system parameter      value
-----
engineid              0x80001f88035c775700b3dc
contact               <undefined>
location              <undefined>

model perm/group      level user/community      af  source
-----
v2c  rw               noauth admin            ipv4 localhost
v2c  rw               noauth admin            ipv4 localnet
v2c  rw               noauth admin            ipv6 ::1
v2c  rw               noauth admin            ipv6 fe80::/10
v2c  ro               noauth public           ipv4 localnet
v2c  ro               noauth public           ipv6 fe80::/10

# nmcfg system define contact "myname <myname@example.org>"
Starting SNMP Service

# nmcfg system define location "Media Lab"
Starting SNMP Service

# nmcfg community permit admin rw 198.51.100.122
Starting SNMP Service
```

## Example #2: Creating an SNMPv3 User

Two commands are required to create a USM (v3) user and define its access:

```
# nmcfg user define johnsmith SHA "arfds23dsjs" AES "2394urscxkvn"
# nmcfg access usm permit johnsmith operator
```

## Example #3: Initializing a USM-only (SNMPv3) System

In the example below, system security is enforced by completely disabling SNMPv1/v2c access, and by requiring v3 USM authentication only for users group-based access, and encryption for admins and operators group-based access. Both IPv4 and IPv6 are enabled.

```
# nmcfg
snmp agent
-----
status          running
transport       udp:161
                 udp6:161

system parameter      value
-----
engineid              0x80001f88035c775700b3dc
contact                <undefined>
location               <undefined>

model perm/group      level user/community      af   source
-----
v2c  rw                noauth admin          ipv4 localhost
v2c  rw                noauth admin          ipv4 localnet
v2c  rw                noauth admin          ipv6 ::1
v2c  rw                noauth admin          ipv6 fe80::/10
v2c  ro                noauth public         ipv4 localnet
v2c  ro                noauth public         ipv6 fe80::/10

# nmcfg agent stop

# nmcfg system define contact "joe net <jnet@example.org>"

# nmcfg system define location "Media Lab"

# nmcfg community delete admin

# nmcfg community delete public

# nmcfg user define joenet SHA "arfds23dsjs" AES "2394urscxkvn"
nmcfg: snmp agent is not running, user settings will apply when started

# nmcfg user define johnsmith SHA "89ss5dkj" AES "jfdsf78998sd"
nmcfg: snmp agent is not running, user settings will apply when started

# nmcfg user define guest MD5 "nososecret"
nmcfg: snmp agent is not running, user settings will apply when started

# nmcfg access usm permit joenet administrator priv

# nmcfg access usm permit johnsmith operator priv

# nmcfg access usm permit guest guest

# nmcfg agent start
Starting SNMP Service

# nmcfg
snmp agent
-----
status          running
transport       udp:161
                 udp6:161
```

system parameter	value				
engineid	0x80001f88035c775700b3dc				
contact	joe net <jnet@example.org>				
location	Media Lab				
model	perm/group	level	user/community	af	source
usm	guest	auth	guest	-	-
usm	administrator	priv	joenet	-	-
usm	operator	priv	johnsmith	-	-
auth protocol	priv protocol	user			
MD5	nopriv	guest			
SHA	AES	joenet			
SHA	AES	johnsmith			

## Related Topics

- [SNMP Agent Components](#)



## package

The `package` command is used to view and manage software packages.

**Note**

The `package` command can only be used by an administrator.

When `package` is entered without any actions or parameters, the system displays usage information for the command.

Package files are digitally signed to ensure integrity and authenticity. Package component signatures and their certificate validity are verified when downloading, manually with the `verify` action, and when actually performing the installation upon reboot.

If the verification fails after downloading, an error message is reported by the download command and the downloaded package is discarded. If verification fails while actually installing upon reboot, installation is canceled and a package install failure notice is added to the messages displayed to administrators. A successful package installation notice is added to the messages upon successful installation.

## Synopsis

```
package list
package info <pkgfile>.hai
package verify <pkgfile>.hai
package install <pkgfile>.hai
package download <pkgfile>.hai <tftppipaddr>
package delete <pkgfile>.hai | all
package cancel <pkgfile>.hai
```

## Actions

Action	Description
list	Displays a list of downloaded packages.
info	Displays information about the currently installed package. If a filename is specified, displays information about the package.
verify	Verifies the authenticity and integrity of the specified package.
install	Installs the specified package. The package will be automatically verified before installation.
download	Downloads the specified package file using TFTP and then verifies.
delete	Deletes a previously downloaded package file. You can specify the package file or all.
cancel	Cancels installation of a package scheduled for the next reboot.

## Parameters

N/A

### Example #1: Package Download and Installation

```
# package download makitox_enc_v2.2.0-59.hai mytftp.example.com
1/5) Temporarily pausing encoder(s)...
2/5) Downloading package makitox_enc_v2.2.0-59.hai from mytftp.example.com...
3/5) Verifying integrity of downloaded package...Package verified successfully.
4/5) Syncing file system...
5/5) Resuming encoder(s)...
Package downloaded successfully.

# package install makitox_enc_v2.2.0-59.hai
Package makitox_enc_v2.2.0-59.hai will be installed on next boot sequence.
You must REBOOT to complete the update process!
```

### Example #2: Package Download Verification Failure

```
# package download makitox_enc_v2.2.0-59.hai mytftp.example.com
1/5) Temporarily pausing encoder(s)...
2/5) Downloading package makitox_enc_v2.2.0-59.hai from mytftp.example.com...
3/5) Verifying integrity of downloaded package...Package verification failed!
Try downloading the package again.
```

## Examples (General)

```
# package list

Displays the list of downloaded packages:
Package Files (in /usr/share/haivision/packages/):
  makitox_enc_v2.2.0-59.hai
  makitox_enc_v2.2.0-58.hai
```

```
# package info makitox_enc_v2_2_0.hai

Displays information about the package.
```

```
# package install makitox_enc_v2_2_0.hai

Installs the package.
```

## Related Topics

- [messages](#) (CLI command)

## passwd

The `passwd` command is used to change your own password.

### Note

To modify the password for other users' accounts, see the `account` CLI command (link below). Passwords can be up to 80 characters long. See "Password Requirements" under "Changing Your Password" (link below) for the supported character set. Password policies set by the administrator may enforce the selection of strong passwords.

## Synopsis

```
passwd
```

## Actions

N/A

## Parameters

N/A

## Examples

```
# passwd
```

Changes the password for the current user account. The system prompts you to enter the old password and then the new password.

## Related Topics

- [account](#)
- [Changing Your Password](#)
- [Role-based Authorization](#)
- [Managing User Accounts](#)

## policy

The `policy` command is used to configure and manage security policy settings. Policies are needed to define security criteria such as the required quality, length and composition of passwords. The security policies are: Password, Session, and Cryptographic Strength.

Security policies may be applied to bring the Makito X4 device to its Common Criteria (CC) evaluated configuration. During the hardening procedure, it is important for the administrator to set the policies before creating accounts.

**Note**

The `policy` command can only be used by an administrator.

## Synopsis

```
policy password set [quality=basic] [minlen=6] [minuppers=0] [mindigits=0]
  [minsymbols=0] [expiry=yes] [lifetime=90] [remember=5]
policy session set [autologout=yes] [idletimeout=15]
policy crypto set [compliance=None] [tlsv1.{0|1|2}=yes] [ssl3=no]
policy https set hsts=no
policy pname/all get
```

## Actions

Action	Description
password set	Modifies the password policy parameters. A series of one or more <code>parameter=value</code> pairs can be specified at once. See "password" under <a href="#">Parameters</a> below.
session set	Modifies the session policy parameters. A series of one or more <code>parameter=value</code> pairs can be specified at once. See "session" under <a href="#">Parameters</a> below.
crypto set	Specifies the cryptographic policy. The <code>compliance</code> parameter can be specified. See "crypto" under <a href="#">Parameters</a> below.
https set	Enables HTTP Strict Transport Security (HSTS). When enabled, HSTS forces web browsers to only contact the Web interface over HTTPS, instead of using HTTP.
pname/all get	Displays the policy information for either the policy (i.e., password, session, or crypto) or the Makito X4.

## Parameters

Parameter	Default	Description/Values
<b>crypto</b>		
compliance	None	<p>Specifies the required cryptographic compliance, either:</p> <ul style="list-style-type: none"> <li>• None</li> <li>• NDPP11: Activates cryptographic security to a level compliant with the Network Device Protection Profile v1.1.</li> <li>• FIPS140: All management cryptography is operated in the FIPS 140-2 mode.</li> <li>• Sp800-52r1(Deprecated): All management cryptography follows the guidelines of NIST Special Publication 800-52 Rev 1.</li> <li>• SP800-52r2</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>Either selection reinforces security for all management functions of the device in terms of cryptography. This setting takes effect upon the next reboot.</p> </div>
sslsv3	See Note	<p>Enables or disables SSLv3 as a supported TLS version: Yes, No</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>SSLv3 is disabled on factory new systems. On upgraded systems, SSLv3 is enabled only if upgrading a system where no (None) cryptographic compliance is configured. SSLv3 can be enabled only if compliance is set to None.</p> </div>
Specifies which TLS (Transport Layer Security) versions are accepted from the HTTPS client. At least one TLS version must be enabled.		
tlsv1.0	Yes	Enables or disables TLSv1.0 as a supported TLS version: Yes, No
tlsv1.1	Yes	Enables or disables TLSv1.1 as a supported TLS version: Yes, No
tlsv1.2	Yes	Enables or disables TLSv1.2 as a supported TLS version: Yes, No
https	No	<p>Enables or disables HTTP Strict Transport Security (HSTS). When enabled, HSTS forces web browsers to only contact the Web interface over HTTPS, instead of using HTTP.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>When preparing a Makito X4 device for hardening, you need to enable the HSTS policy.</p> </div>
<b>password</b>		
quality	Basic	<p>Specifies the required password strength, either:</p> <ul style="list-style-type: none"> <li>• Basic</li> <li>• Strong</li> </ul>

Parameter	Default	Description/Values
minlen	6	Specifies the minimum password length. Range: 6-40
minuppers	See Note	(quality must be Strong) Specifies the minimum number of uppercase letters. Range: 0 -40  <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b> Default is N/A if quality=Basic, 0 if quality=Strong.</p> </div>
mindigits	See Note	(quality must be Strong) Specifies the minimum number of digits. Range: 0 -40  <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b> Default is N/A if quality=Basic, 0 if quality=Strong.</p> </div>
minsymbols	See Note	(quality must be Strong) Specifies the minimum number of symbols. Range: 0 -40  <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b> Default is N/A if quality=Basic, 0 if quality=Strong.</p> </div>
expiry	No	Enables or disables password expiration: Yes, No
lifetime	90 days	(expiry must be Yes) Specifies the number of days after which users must change their passwords. Range: 1 -180 days
remember		(quality must be Strong) Saves the specified last number of passwords used for the Makito X4, and prevents users from changing their password to any password used within the specified history count. Range: 5 -400
<b>session</b>		
autologout	No	Enables or disables auto-logou: Yes, No
idletimeout	15 minutes	(autologout must be Yes) Specifies the maximum length of time the system may be idle before the user will be logged out. Range: 1 -1440 minutes

## Examples

<pre># policy crypto set compliance=NDPP11</pre> <p>Sets the required cryptographic compliance to Network Device Protection Profile v1.1.</p>
<pre># policy password set quality=strong minlen=10 minuppers=1 minsymbols=1   expiry=yes lifetime=30</pre> <p>Sets the password policy to be Strong, requiring passwords to be at least 10 characters in length, with one uppercase letter, one symbol. Passwords will expire in 30 days.</p>

```
# policy all get
```

Returns policy information for the Makito X4 such as:

Crypto:

```
Compliance : NDPP11
SSLv3       : Disallowed
TLSv1.0     : Yes
TLSv1.1     : Yes
TLSv1.2     : Yes
```

HTTPS:

```
HSTS        : Yes
```

Password:

```
Quality     : Strong
MinLen      : 10
MinUppers   : 1
MinDigits   : 0
MinSymbols  : 1
Remember    : 5
Expiry      : Yes
Lifetime    : 30 days
```

Session:

```
Autologout  : Yes
IdleTimeout : 20 minutes
```

## pubkey

The pubkey command is used to manage your account’s authorized SSH public keys. You must first get the public key of your SSH client. Note that this only applies to SSH CLI access to Makito X devices.

**⚠ Note**

The `pubkey` command can only be used by an administrator.

### Synopsis

```
pubkey add <KEYFILE.pub>
pubkey remove <KEYFILE.pub>
pubkey list
```

### Actions

Action	Description
add	Uploads a new public key file ( <code>.pub</code> extension) to the Makito X.
remove	Removes the specified public key file from the Makito X.
list	Lists the public key files currently loaded on the Makito X.

### Examples

```
# pubkey add makito.pub
```

Uploads the public key file makito.pub to the Makito X.

```
# pubkey list
```

Lists all public key files currently loaded on the encoder along with their fingerprints. In this example, there is one public key file:

```
makito.pub      : rsa[2048]
  b7:ae:79:92:0d:86:f9:8d:2d:ee:99:fc:ff:24:95:87:ee:78:1d:fd
```



## Related Topics

- [account](#) (CLI command)

## reboot

The reboot command is used to turn off and restart Makito X devices. Any unsaved configurations will be lost. The unit will restart with the saved startup configuration.

### Note

The reboot command can only be used by an administrator.

## Synopsis

```
reboot
```

## Example

```
# reboot
```

Reboots the Makito X.

### Note

While the unit is rebooting, you will lose your connection to the CLI. This will take approximately two minutes. Once the unit has rebooted, you can reconnect to the unit and sign in again.

## Related Topics

- [Rebooting the Decoder](#)

## service

For security purposes, you may need to stop one or more network services from accessing the Makito X4. The service command is used to enable and disable the following decoder network services: all, or (depending on the platform) EMS, HTTP, SNMP, SSH, and TELNET.

### ⚠ Caution

Take care not to disable *all* network services; you must at least keep `http` (Web interface), `telnet`, or `ssh` active. Otherwise you will lose access control to the unit, and the only way to re-enable these services is by a Factory Reset.

## Synopsis

```
service svcname action
where (depending on the platform):
svcname can be: all, ems, http, snmp, ssh, telnet
```

## Actions

Action	Description
start	Activates the service immediately and configures the unit so that the service will be started automatically when the unit is rebooted.
stop	De-activates the service immediately and configures the unit so that the service will be disabled when the unit is rebooted.
restart	Restarts the service and configures the unit so that the service will be started automatically when the unit is rebooted.
status	Displays the current status of the service, i.e., if it has been started or stopped. Also displays the startup status of the service.

## Examples

```
# service all status
Displays information about all services, such as:
ems service is currently enabled
ems service is enabled at system startup
http service is currently enabled
http service is enabled at system startup
snmp service is currently enabled
snmp service is enabled at system startup
ssh service is currently enabled
ssh service is enabled at system startup
telnet service is currently enabled
telnet service is enabled at system startup
```

```
# service

Displays usage information for the service command .
Usage: service svcname action
svcname can be: all, ems, http, snmp, ssh, telnet

action can be:
start  activates the service right away and configures the unit so that
       the service will be started automatically when the unit is rebooted.

stop   de-activates the service right away and configures the unit so that
       the service will be disabled when the unit is rebooted.

restart restarts the service and configures the unit so that the service
       will be started automatically when the unit is rebooted.

status displays the current and startup status of the service.
```

```
# service telnet stop

Stops telnet connection to the Makito X4.
```

```
# service telnet restart

Re-starts telnet connections to the Makito X4.
```

## Related Topics

- [Enabling and Disabling Network Services](#)
- [Services Settings](#)

## system\_snapshot.sh

The `system_snapshot.sh` command is used to take a system snapshot for the purpose of 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 config file contents, global settings file contents, debug logging settings file contents, downloaded software packages, last software update log, and OS statistics.

### Synopsis

```
system_snapshot.sh > filename
```

where:

`filename` is the name of the file to store the system snapshot.

### Related Topics

- [Taking a System Snapshot](#)

# Technical Specifications

This appendix lists the technical specifications for the Makito X4 decoder.

## Topics Discussed

- [Audio/Video Interface Specifications](#)
- [Video Decoding](#)
- [Audio Decoding](#)
- [Metadata \(Optional\)](#)
- [Network and Management Interfaces](#)
- [Chassis Options](#)
- [Power Connector Pinouts \(Single-Height Chassis\)](#)
- [Regulatory/Compliance](#)

## Audio/Video Interface Specifications

[Video Interfaces](#)   [Audio Interfaces](#)

<b>Output Video Interfaces (Quad HD-BNC Outputs)</b>		
SD-SDI	SMPTE 259M-C	270 Mbps Interface, 720 x 480i video format (29.97/30 Hz) 720 x 576i (25 Hz)
HD-SDI	SMPTE 292M	1,485 Gbps interface
	SMPTE 274M	1920 x 1080 video format 1920x1080i (23.98/24/25/29.97/30 Hz) 1920x1080p (23.98/24/25/29.97/30 Hz)
	SMPTE 296M	1280 x 720 video format 1280x720p (50/59.94/60 Hz)
3G-SDI	SMPTE 424M (Level A only)	3 Gbps interface
	SMPTE 425M	1080p60 video format 1920x1080p (50/59.94/60 Hz)
6G-SDI	SMPTE 2081	Up to 3840 x 2160p (24/25/29.97/30 Hz)
12G-SDI	SMPTE 2082	Up to 3840 x 2160p (50/59.94/60 Hz)
<b>Impedance</b>		
SDI	75 Ohms	

[Video Interfaces](#)   [Audio Interfaces](#)

<b>Digital Embedded Audio</b>		
SD-SDI	SMPTE-272M	Formatting AES/EBU Audio and Auxiliary Data into Digital Video Ancillary Data Space
HD/3G-SDI	SMPTE 299M	Formatting 24-Bit Digital Audio Format for SMPTE Bit-Serial Interfaces

## Video Decoding

Video Decoding - H.264 AVC/H.265 HEVC (MPEG-4 Part 10)	
Output Video Resolutions	<ul style="list-style-type: none"> <li>• 3840x2160p 60/59.94/50/30/29.97/25 HZ</li> <li>• 1920x1080p 60/59.94/50/30/29.97/25/24/23.98 HZ</li> <li>• 1920x1080i 60/59.94/50 HZ</li> <li>• 1280x720p 60/59.94/50/30/29.97/25 HZ</li> </ul> (interlaced show in fields per second) No scaling capabilities
H.264/AVC Video Decoding	<ul style="list-style-type: none"> <li>• MPEG-4 AVC part 10 / ISO/IEC 14496-10</li> <li>• Baseline, Main and High Profiles up to Level 5.2</li> <li>• I, IP, IBP, IBBP, IBBBBP, IBBBBP framing</li> <li>• 8-bit or 10-bit pixel depth</li> <li>• Chroma sub-sampling 4:2:0 or 4:2:2</li> </ul>
H.265/HEVC Video Decoding	<ul style="list-style-type: none"> <li>• ISO/IEC 23008-2</li> <li>• Baseline, Main and High Profiles up to Level 5.1</li> <li>• I, IP, IBP, IBBP, IBBBBP, IBBBBP framing</li> <li>• 8-bit or 10-bit pixel depth</li> <li>• Chroma sub-sampling 4:2:0 or 4:2:2</li> </ul>
Video Decoding	Configurable output frame rate

## Additional Video Decoding Specifications

- Video elementary streams may contain one HEVC or H.264 coded video ES.
- Field coded, frame coded, MBAFF and PAFF coded frames are supported.
- The GOP size may vary from 1 to 1000.
- Open or Closed GOP is supported.
- Intra-refresh is supported providing the ability to tune into a stream at any random access point.
- CAVLC or CABAC coding is supported for H.264.
- The following interlaced or progressive coded picture resolutions are supported for HEVC/H.265: 480i, 576i, 720p, 1080i, 1080p, 2160p.
- The following progressive coded picture formats are supported for AVC/H.264: 720p, 1080p, 2160p.
- Video Decoding Limitations: The Makito X4 decoder does *not* support decoding H.264 interlaced video coded pictures.



## Audio Decoding

Audio Decoding	
Audio Channels	Up to 16 stereo pairs per blade (SDI)
Audio Bitrates	Mono: 56 to 160 kbps per audio pair Stereo: 80 to 320 kbps per audio pair
Frequency Response	From 20 Hz to 22 kHz
Compression Standards	MPEG-2 AAC-LC ISO/IEC 13818-7 MPEG-4 AAC-LC ISO/IEC 14496-3

## Metadata (Optional)

Metadata Outputs
<ul style="list-style-type: none"> <li>• KLV over SDI (SMPTE 336)</li> <li>• SMPTE 336M compliant</li> <li>• MISB 0601.10 compliant</li> <li>• MISB 0604.2 compliant, supporting:               <ul style="list-style-type: none"> <li>• Asynchronous &amp; synchronous modes as per MISB 0604.2</li> <li>• High precision timecode insertion as per MISB 0604.2</li> </ul> </li> <li>• KLV Metadata Processing (SMPTE 336, MISB 0601, 0102 and 0605 support)</li> <li>• Time Code Support (SMPTE 12M)</li> <li>• Closed Captioning (SMPTE 334-1/2)</li> <li>• CEA-608 and CEA-607</li> <li>• SMPTE 2016 AFD (Active Format Description)</li> </ul>

## Network and Management Interfaces

[IP Network Interfaces](#) [Management Interfaces](#)

### IP Network Interfaces

Standard	<ul style="list-style-type: none"> <li>• Single Ethernet 10/100/1000</li> <li>• Base-T, auto-detect, Half/Full-duplex</li> <li>• Unicast streaming IPv4/IPv6</li> <li>• Multicast unicast streaming (IGMPv3, Internet Group Management Protocol and IPv6)</li> <li>• 10G SFP+ Port (future use)</li> </ul>
Streaming Protocols	<ul style="list-style-type: none"> <li>• MPEG-TS over UDP</li> <li>• MPEG-TS over RTP</li> <li>• Secure Reliable Transport (SRT)</li> </ul>
Advanced Streaming Features	<ul style="list-style-type: none"> <li>• AES encryption 128-bit or 256-bit</li> <li>• SRT Latency Control</li> <li>• Still image insertion on loss of stream</li> <li>• Forward Error Correction (FEC)</li> </ul>

[IP Network Interfaces](#) [Management Interfaces](#)

### Management Interfaces

Physical Interface	<ul style="list-style-type: none"> <li>• IP/Ethernet (IPv4 and IPv6)</li> </ul>
Management Protocols	<ul style="list-style-type: none"> <li>• HTTPS (Web browser)</li> <li>• Command line over SSH/Telnet</li> <li>• SFTP/TFTP/SCP Client/Server</li> <li>• SNMP v3</li> <li>• Haivision EMS (option)</li> </ul>

## Chassis Options

### Topics in This Chapter

- [Single-Height Appliance](#)
- [MB6X – 6 Blade Chassis](#)
- [MB21X \(#F-MB21X-R\)](#)

### Single-Height Appliance

<b>Single Blade Appliance (#S/B-MX4D-SDI4)</b>	
Dimensions (H x W x D)	21mm H x 129mm W x 196mm D (0.83" H x 5.1" W x 7.7" D)
Weight	1.14 kg (2.55 lbs)
Power Requirements	12 VDC Nominal, 18W (each blade)  <div style="border: 1px solid #ccc; padding: 5px; background-color: #fff9c4;"> <p><b>Note</b> IEC 60601-1 Class I and II power supplies are available from Haivision.</p> </div>
Power Connector	On unit: Conxall p/n 17282-3PG-300 Mating connector: Conxall p/n 16282-3SG-318
Temperature**	Operating: 0°C to 40°C (32°F to 104°F) Non-operating*: -30°C to 70°C (-22°F to 158°F) *Limited by the power supply storage: -30°C **Ambient environmental temperature
Relative Humidity	Up to 95% without condensation
Heat	20 Watts or 68.3 BTU/hr
Sound Emission	41.2 dB(A) L'p(AVG)

Compatible with Haivision MB6X and MB21X multi-blade chassis.

### Related Topics

- [Install the Decoder](#)
- [Power Connector Pinouts \(Single-Height Chassis\)](#)

### MB6X – 6 Blade Chassis

<b>MB6X - 6-Blade Chassis (#F-MB6X-RAC, #F-MB6X-MED, #F-MB6X-DC)</b>	
Dimensions (H x W x D)	19" rack mountable, 1 RU 44.069mm H x 440.004mm W x 420.37mm D (1.735" H x 17.323" W x 16.55" D) Tolerances are +/-0.50mm (+/- 0.020in.)
Weight	6 slot empty chassis: 7.94 kg. (17.5 lbs.) Single blade: Approximately 240 g (0.529 lbs.)

<b>MB6X - 6-Blade Chassis (#F-MB6X-RAC, #F-MB6X-MED, #F-MB6X-DC)</b>	
Power Requirements	Single Internal Power Supply: <ul style="list-style-type: none"> <li>• F-MB6X-RAC (Redundant AC type): 90-264VAC 47Hz-63Hz</li> <li>• F-MB6X-MED (Medical Grade): 90-264VAC 47Hz-63Hz</li> <li>• F-MB6X-DC (DC type): 20-36 VDC</li> </ul> 300 watt maximum (all types)
Temperature	Operating: 0°C to 50°C (32°F to 122°F) Non-operating: -40°C to 70°C (-40°F to 158°F)
Relative Humidity	Up to 95% without condensation
Heat	155 Watts or 530 BTU/hr
Sound Emission	<ul style="list-style-type: none"> <li>• Room temperature: 57.0 dB(A) L'p(AVG)</li> <li>• 50°C Ambient: 65.9 dB(A) L'p(AVG)</li> </ul>

## MB21X (#F-MB21X-R)

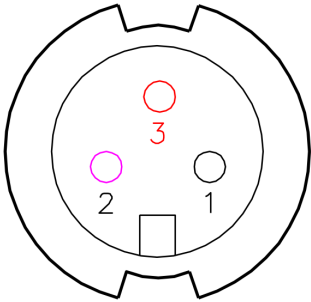
<b>MB21X - 21-Blade Chassis (#F-MB21X-R)<sup>1</sup></b>	
Dimensions (H x W x D)	19-inch rack mountable, 4RU *177.29 mm H x +441.35 mm W x 461.92 mm D (6.980 inches H x 17.376 inches W x 18.186 inches D) *186.76 mm / 7.353 inches H with rubber feet installed +482.60 mm / 19.000 inches W including mounting flanges
Weight	Empty 21-slot chassis: 32.5 pounds Single blade: Approximately 240 gm (0.529 lbs.)
Power (internal power supply)	Dual redundant power supplies: <ul style="list-style-type: none"> <li>• 100-240VAC 47Hz-63Hz</li> <li>• 600 watt maximum per PSU</li> </ul>
Temperature	Operating: 0°C to 50°C (32°F to 122°F) Non-operating: -40°C to 70°C (-40°F to 158°F)
Relative Humidity	Up to 95% without condensation
Heat	560 Watts or 1910 BTU/hr *assumes chassis full of Makito X Series blades
Sound Emission	<ul style="list-style-type: none"> <li>• Room temperature: 56.4 dB(A) L'p(AVG)</li> <li>• 50°C Ambient: 63.3 dB(A) L'p(AVG)</li> </ul>
Advanced Features	<ul style="list-style-type: none"> <li>• Removable fan trays</li> <li>• Station Alarm Interface</li> </ul>

1. Supports Makito X/X4 products *only*; excludes classic Makito encoder/decoder or Torpedo blades

## Power Connector Pinouts (Single-Height Chassis)

The power connectors for the Single-Height Chassis have the following pinout:

### Single-Height - Power Connector

Pin #	Description (Conxall P/N 16282-3SG-318)	
1	Reserved / Not Connected	
2	Ground	
3	VCC=+12VDC	

## Regulatory/Compliance

Regulatory/Compliance	
Certification	UL / CSA / CE
Compliance	Electromagnetic Compatibility: EN 55022 (Emissions) / 55024 (Immunity) / EN 61000-3-2 / EN 61000-3-3
	Safety (Low Voltage Directives): EN 60950-1 (CSA C/US) / IEC/EN 60950-1 (International /CB Scheme)
	Industry Canada Warnings: Canadian ICES-003, "Electromagnetic Compatibility" / Avis d'Industrie Canada: la norme NMB-003 du Canada, "La Compatibilité électromagnétique"
	FCC Part 15, Subpart B, Class A
	STANAG 4609 compliant (NATO Digital Motion Imagery Standard)
Compliance with Environmental Regulations	RoHS2, European Union Directive 2011/65/EU
	RoHS, Marking Control for China, Regulation SJ/T 11364-2006
Acoustic Noise	Telcordia GR-63 Section 4.6, Issue 3

**⚠ Note**

Please refer to the product Declaration of Conformity (DoC) for complete details.

# Open Source Software Credits

This appendix lists the Open Source software packages currently deployed on the Makito X4 decoder platform. For more details, please consult the provider of the package.

## References

GNU General Public License v2: GPL-2.0

GNU General Public License v3: GPL-3.0

GNU Lesser General Public License v2: LGPL-2.1

BSD type licenses, or those describe by Regents of the University of California identifier are typically described by the following: BSD-2-Clause and BSD-3-Clause (revised BSD license).

Permissive Free Software License: Rights are owned by an individual, group of individuals, institution or consortium but is generally free provided minimal conditions are met. See: Permissive free software licence wikipedia entry for more information.

## Topics Discussed

- [Open Source Software Credits List](#)
- [Third Party License Information](#)



## Open Source Software Credits List

Haivision is grateful to the following organizations for making available their Open Source software packages:

Package	Version	Description	License	Included in X4 version
Linux kernel	5.4.0	Linux Kernel	GPL v2, June 1991	1.0
Linux-PAM	1.3.0	Linux Pluggable Authentication Module	Permissive free software license or GPLv2; 1996-2005; Morgan, Levine, Kukuk, Tricaud & Mraz	1.0
attr	2.4.47	Extended filesystem attributes	GPL v2, June 1991	1.0
bash	4.3.47	Bourne Again Shell - Posix.2 Shell	GPL v3, June 2007	1.0
beecrypt	4.2.1	Cryptography library	GPL v2, June 1991	1.0
busybox	1.24.1	Common Unix utilities	GPL v2, June 1991	1.0
chkconfig	1.3.30c	Service run level configuration	GPL v2, June 1991	1.0
chrony	3.3.2	Alternate Network Time Protocol (NTP)	GPL v2, June 1991	1.0
coreutils	8.25	Basic shell, file and text manipulation	GPL v3, June 2007	1.0
cracklib	2.8.18	Password resilience library	LGPL v2.1, June 1999	1.0
cron	3.0pl1	Time base job scheduler	Permissive free software license; 1988, 1990, 1993 Paul Vixie	1.0
debianutils	4.5.1	Misc. utilities	Small General Public License, February 1988, G. Maol, C. Adams, L. Knoll, R. Carr	1.0
dhcp	4.4.1	DHCP client	Mozilla Public License v2.0, 1995-2003, 2004-2018 Internet Software Consortium (ISC), ISC inc.	1.0
dos2unix	7.4.0	Text file conversion	BSD styled license, 1994-1995 B Lin, 1998 J Wuebben C Wurll, 2009-2018 E Waterlander	1.0
dpkg	1.16.0	Debian Package Manager	GPL v2, June 1991	1.0
ethtool	4.19	Network interface configurator	GPL v2, June 1991	1.0
ffmpeg	4.3.0	Multimedia framework (Decoder only)	LGPL v2.1, June 1999	1.0
gawk	4.1.3	GNU AWK - Pattern scanning and processing	GPL v3, June 2007	1.0

Package	Version	Description	License	Included in X4 version
gdb	7.11.1	GNU Debugger	GPL v2, June 1991	1.0
ifupdown	0.8.19	Network Interface configurator	GPL v2, June 1991	1.0
iperf	2.0.5	Internet bandwidth measurement tool	Copyright (c) 1999-2007, The Board of Trustees of the University of Illinois	1.0
iperf3	3.1	Internet bandwidth measurement tool	Permissive free software license - 2014-2016 University of California	1.0
iproute2	4.16	Linux TCP/IP traffic control	GPL v2, June 1991	1.0
jpeg	8b	JPEG Software Tools	Permissive free software license - 2010 Independent JPEG group	1.0
lftp	4.8.3	File Transfer Program	GPLv3, June 2007	1.0
libcap	2.25	Library for setting/getting Posix capabilities	Permissive free software license or GPLv2	1.0
libevent	2.1.8	Event notification library	3-clause (“modified”) BSD License	1.0
libpcap	1.9.0	User-level packet capture	BSD	1.0
lighttpd	1.4.41	Lightweight open-source Web server	Permissive free software license, Jan Kneschke, 2004	1.0
mDNSResponder	320.10.80	Multicast DNS Responder (Bonjour component)	Apache 2.0 Three-Clause BSD National ICT Australia Limited (NICTA) Public Software	1.0
ncurses	5.5	Text-base UI library	Permissive free software license	1.0
net-snmp	5.7.3	Simple Network Management Protocol	Multiple BSD Licenses	1.0
net-tools	1.60	Network tools	GPL v2, June 1991	1.0
netkit-ftp	0.17	File Transfer Protocol	Regents of the University of California	1.0
netkit-telnet	0.17	Telnet	Regents of the University of California	1.0
ntp	4.8.2-p10	Network Time Protocol	Permissive free software license, University of Delaware	1.0
openresolv	3.9.0	DNS management framework	2-clause BSD license, present since v1.0 but inactive (not used) <a href="https://www.freebsd.org/copyright/freebsd-license.html">https://www.freebsd.org/copyright/freebsd-license.html</a>	1.0
openssh	7.3p1	Open SSH	Multiple BSD style licenses	1.0
openssl	1.0.2r	Open Secure Socket Layer	Dual OpenSSL / SSLeahy	1.0
pcre	8.39	Perl Compatible Regular Expression Library	BSD License	1.0

Package	Version	Description	License	Included in X4 version
popt	1.16	Command Line Parsing Library	BSD License	1.0
procps	3.2.8	Process reporting utilities	GPL v2, June 1991	1.0
readline	6.1	Command Line Editing Library	GPL v3, June 2007	1.0
rpm	4.4.2.3	RPM Package Manager	Dual GPL v2 - June 1991 and LGPL v2 - June 1991	1.0
sed	4.2.2	Stream Editor	GPL v3, June 2007	1.0
shadow	4.6	Shadow Passwords	Permissive free software license	1.0
sudo	1.9.5p2	Privilege modification	Permissive software license, Copyright (c) 1994-1996, 1998-2021, T. Miller et al.	1.0
sysstat	10.0.0	Performance monitoring	GPL v2, June 1991	1.0
tcpdump	4.9.1	Network monitoring and data acquisition	Permissive free software license	1.0
tftp-hpa	0.43	TFTP server	Permissive free software license	1.0
u-boot	2018.1	U-Boot boot loader	GPL v2, June 1991	1.0
UDT	4.11	UDP-based Data Transfer	Permissive free software license. See <a href="#">Third Party License Information</a>	1.0
zlib	1.2.11	Compression library	Permissive free software license, Jean-Loup Gailly	1.0

## Related Topics

- [Third Party License Information](#)

## Third Party License Information

### UDT4, 4.11, UDP-based Data Transfer, Permissive free software license.

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# 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, Haivision 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](mailto: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	<ul style="list-style-type: none"> <li>• Access to all functions through the administrative user interface.</li> <li>• Ability to add or modify objects and metadata through the application programming interface (“API”)</li> <li>• Ability of ingest service to check for new or updated files or feeds</li> </ul>	99.999%
Read-Only Functions	<ul style="list-style-type: none"> <li>• Ability to retrieve data through the API</li> <li>• Ability for Audience Members to authenticate through the Access Service</li> <li>• Ability for Audience Members to play Published Media Objects</li> <li>• Ability for Audience Members to play Haivision VCMS-authenticated or entitled Published Media Objects</li> <li>• Ability to complete Transactions</li> </ul>	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	<ul style="list-style-type: none"> <li>• Preventive maintenance on the software/hardware components of Haivision VCMS</li> <li>• Addition of new features/functions</li> <li>• Repair errors that are not immediately affecting Your use of Haivision VCMS</li> </ul>	No	Yes	10 Hours	6 Hours	10:00p m - 5:00a m	48 Hours
Urgent	<ul style="list-style-type: none"> <li>• Repair errors that are immediately affecting Your use of Haivision VCMS</li> </ul>	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	<ul style="list-style-type: none"> <li>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</li> </ul>	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](mailto: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

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

