MoIN
User Manual

MoIN Distribution **MoIN** Studio **MoIN** Streaming

Multimedia over IP Network
All-in-one audio software solution

MoIN User Manual V2.1

Bundle Version: 3.0.3

November 2024

Your audio. Our solution.

2wcom

Contents

1   About this Manual

You can download the latest version of this user manual here:

https://download.2wcom.com/products/MoIN_HSND/

2   Product Overview

2.1   About the MoIN

The MoIN — **M**edia **o**ver **I**P **N**etwork — is a software solution that is able to encode, decode and transcode multiple audio channels simultaneously. It fulfills various use cases in a broadcast environment can be easily adapted into broadcast eco systems as it supports all protocols for Audio over IP interoperability and is compatible with codecs/encoders from any brand. Its transcoding capabilities allow to feed distribution sources accordingly, whether DAB+, IP or satellite.

For web radio streaming, it is possible to transform Livewire, AES67 or Ravenna audio signals to Icecast or adaptive bitrate protocols like HLS. The MoIN Software gives you the possibility to receive web audio streams and provide them as MPEG-TS streams for injection into cable or satellite networks. Stressful conditions and Wide Area Networks can be handled by robustness mechanisms as well as streaming and error correction.

The software can be run on various platforms, such as VMware, Linux Docker or Kubernetes.

For the MoIN Distribution Software, it does not matter where your signal comes from, it transports it safely to your transmitters and provides you with accurate statistics about your service. By being able to collect numerous channels in one digital software codec, you drastically reduce your ecological footprint.


MoIN Studio simplifies the communication between the main studio and remote teams such as reporters, playout-vans, moderators, or other studios. Even with multiple locations involved in the process, audio streams can be handled flexibly by the main studio.

MoIN Streaming makes it possible to transcode any audio file and use it for streaming. This facilitates a trouble-free integration into already existing networks and eases the usage of streaming engines like Wowza.

2.2   Software architecture

The MoIN software consists of several containers that can be run separately and isolated to achieve a good scalability and reliability of the system.
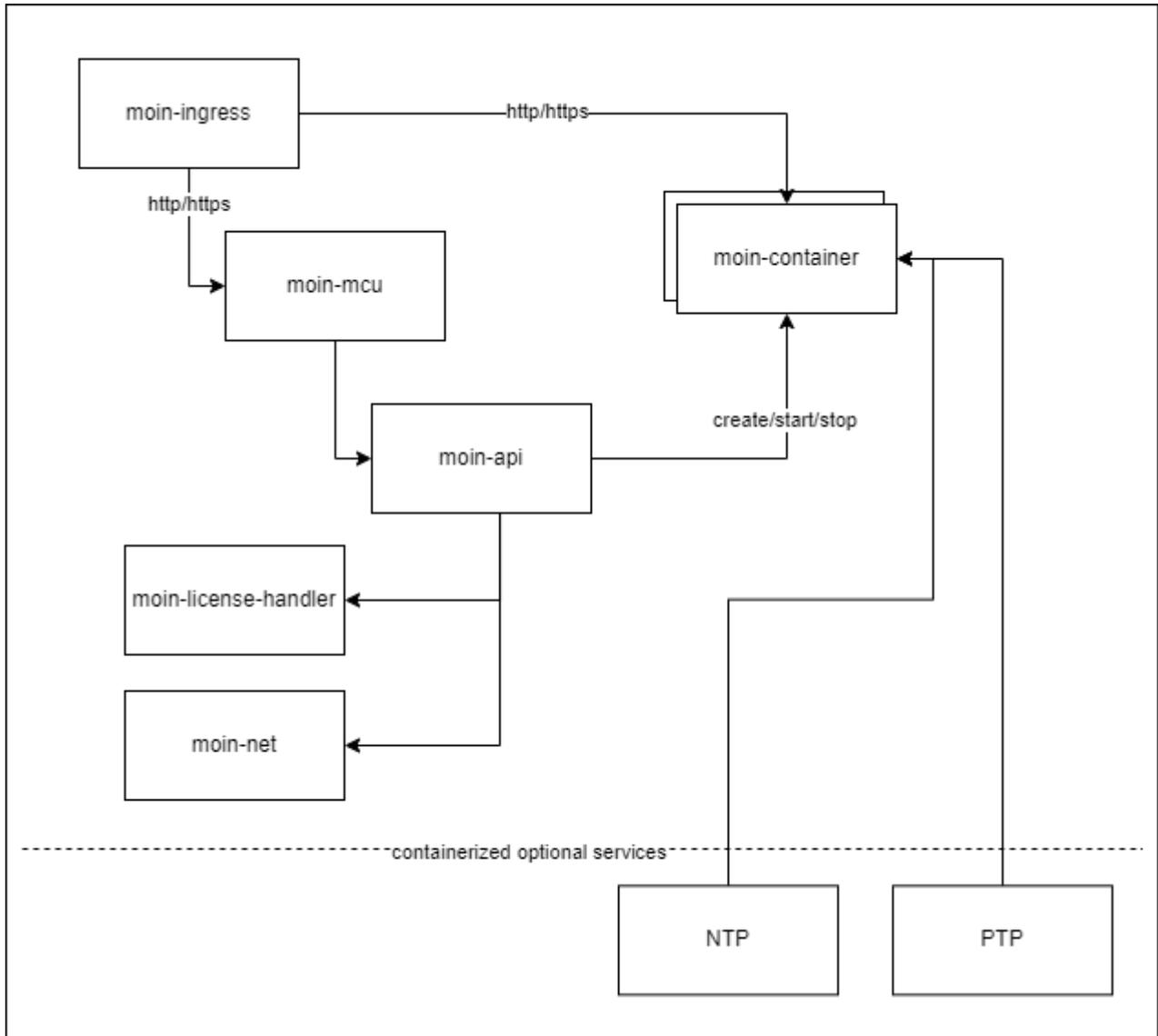
moin-ingress

The MoIN ingress serves as the external interface for the MoIN system. It manages incoming HTTP/HTTPS traffic, handling requests from external systems and users. It provides a unified entry point for all external interactions over HTTP/HTTPS, ensuring secure communication with the system.

moin-mcu

The MCU (Master Control Unit) acts as the interface that connects directly to the orchestration platform. It provides network abstraction and can create, start, stop or duplicate MoIN containers. Along with a flexible license mechanism, this unit gives scalability and flexibility directly into the hands of the administrator.

moin-api

This container connects to the Kubernetes stack and empowers the MCU to operate. It enables the moin-mcu to execute container management tasks, such as starting, stopping, or duplicating containers, by providing a direct bridge to the underlying container platform.

moin-container

The MoIN containers are the real audio over IP codecs—the workers in our system. The administrator can start one or multiple instances of these codecs and assign numbers of encoders or decoders to them during creation of the container. After creation, the administrator can hand over a multichannel codec to another engineer. The codec is completely isolated with its own password and settings so that it will not conflict with other codecs.

3 Installation instructions

This chapter describes the installation and commissioning of the MoIN software. The MoIN software is available using the following deployment options:

- MoIN cloud-init setup
- MoIN standalone setup

Follow the installation instructions for the deployment type of your choice. To test your installation, follow the instructions for commissioning the software.

3.1 Option 1: Installation via cloud-init image

General requirements:
- A virtual machine running on a ESXi / VMWare host (alternative: a bare metal server)
- Two hard disks **or** one hard disk with two partitions (SSD storage recomended)
- Minimum of 2 CPU kernels
- Minimum of 8 GB memory (RAM)
- Minimum of 2 interfaces or controllers. Up to 9 interfaces or controllers are possible.

Prerequisite: You have already installed an ESXi server. We recommend version 6.7 and newer.

1. Download the following files and extract them on your computer:
   https://download.2wcom.com/products/MoIN_HSND/

2. Create a new virtual machine on an ESXi or VMware host. Define the the needed number of network adapters during the setup. It will be more complicated to add and configure further adapters after the setup is finished. Make sure the MoIN iso file is mounted into the CD/DVD device and the device is mounted on system startup.

   The MoIN and Kubernetes data need at least 20 GB space on your hard disk and will be installed on a second partition. There are 2 options for the MoIN setup:
   - The virtual machine has at least 2 hard disks. The OS will be installed on disk 1, the MoIN will be installed on disk 2.
   - The virtual machine only has 1 hard disk. In this case, specify 2 partitions within the installation process and install the OS on the first partition and the MoIN on the second partition.
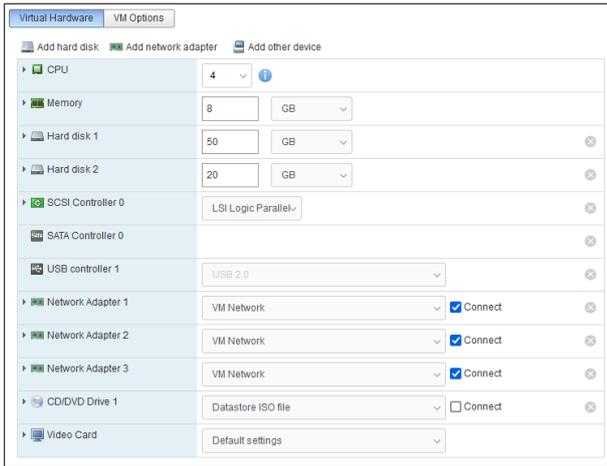
3. Run the newly created virtual machine.

> ➢ The ubuntu server setup wizard appears.

**4.** Select your language and your keyboard layout.
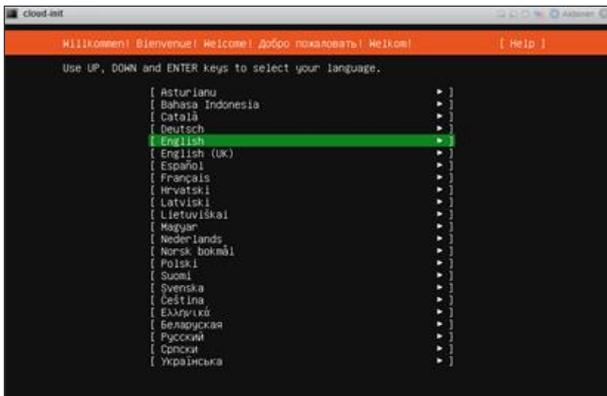
5. Configure the connected network adapters that are available in the virtual machine.

(!) We strongly recommend to define a static IP address at least for the main interface! This is the main IP address through which the entire cluster can be reached.

(!) We recommend **not** to define different nameservers for each interface within this dialog. Following best practices, define a main DNS server for the first interface and configure the remaining settings through the MCU.
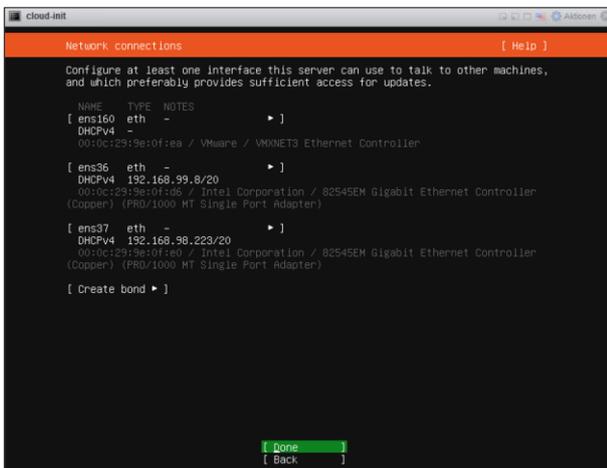
6. Set up the system partitions and decide where to install Ubuntu. Select the hard disk on which ubuntu should be installed, or create several partitions and select one of them for the ubuntu setup. The selection for the docker installation will prompt at the end of the installation process.
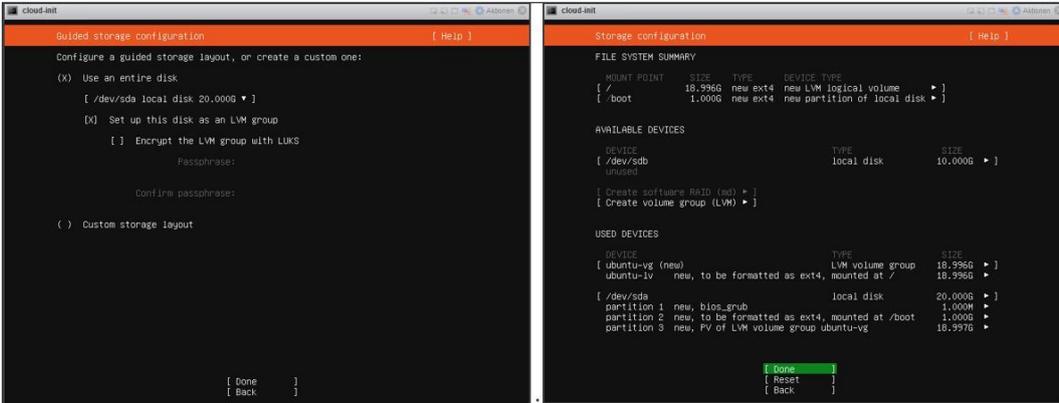

7. Enter the Ubuntu user credentials, i.e. the name and the password of the Linux user for which the cluster is to be installed.
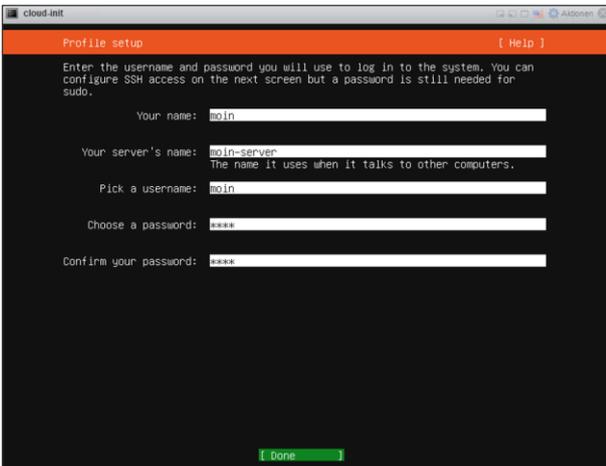
8. Click **Done**.
   - ➢ The setup installs the ubuntu operating system. This may take several minutes.
   - ➢ At the end of the installation process, the system reboots automatically. If the message "Failed unmounting /cdrom." appears, then just press ENTER to restart the system.
9. After the first reboot, the system prompts with the docker and k8s installation wizard.

   ⚠ Do not press any key until the screen below appears (the prompt for the user login data may occur in the meantime).
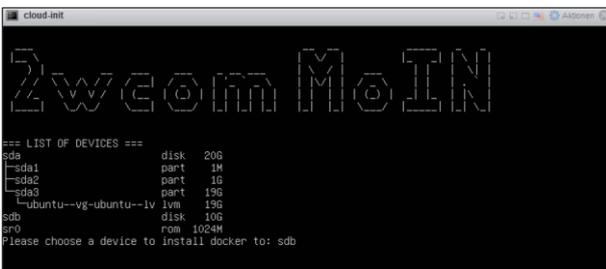
10. From the list of devices, select the device where the installer should install the docker service (for example: disk two / sdb).

11. Define the interface names (for example: Current interface name on host = ens160, new name after installation = ctrl).

12. Define the interface to be used for the cluster setup. Enter the number of the interface you want to use for the k8s cluster master IP (if unclear, choose 1).

➢ The docker / k8s installation starts. This may take several minutes.

13. At the end of the setup, press ENTER to get back to the prompt where the user login data can be entered.

➢ The setup is complete and the MoIN is installed successfully.

14. To test the MoIN software, enter the IP of the virtual machine in a web browser to open the control panel (MCU) of the MoIN. It may take up to 5 minutes until the services in the background are started and the MCU is accessible in the web browser.

✓ You have installed the MoIN software. Continue with 3.3 MoIN software commissioning.

3.2 Option 2: MoIN standalone setup

General requirements:

- A linux server running at least Ubuntu 18.04 or higher
- Docker version 20.10 or higher
- Minimum of 4 GB memory (RAM)
- The Ports 9000 and 38081 will be used per default
- The linux "make" package (install with "apt install make")

To install the MoIN a standalone setup:

1. Download the latest .tar.gz file for the MoIN standalone version:
   https://download.2wcom.com/products/MoIN_HSND/

2. Extract the tarball file on your server: "tar -zxvf MoIN-Standalone-dev.tar.gz"

```
drwxr-xr-x 3 moin moin 4096 Feb  7 09:49 ./
drwxr-x--- 7 moin moin 4096 Feb  7 09:48 ../
-rw-r--r-- 1 moin moin 1933 Feb  7 09:41 docker-compose.yml
-rw-r--r-- 1 moin moin  821 Feb  7 09:49 .env
-rw-r--r-- 1 moin moin  816 Feb  7 09:41 .env.example
-rw-r--r-- 1 moin moin  587 Feb  7 09:41 Makefile
-rw-r--r-- 1 moin moin  687 Feb  7 09:41 Readme.md
drwxr-xr-x 2 moin moin 4096 Feb  7 09:41 src/
moin@moin-standalone:~/MoIN-Standalone$
```

3. Execute the "make setup" makefile command to deploy the MoIN standalone stack.

4. Customize the .env file to your needs. The most important values are:

   – SYSTEM_IP: The IP of the control interface of the server. The MoIN will be accessible on this address.

   – HTTP_PORT: The port to access the MoIN in the web browser (80 as default)

   – MAX_ENCODERS: Number of encoders available

   – MAX_DECODERS: Number of decoders available

   – CTRL_NET_INTERFACE: Name of the control interface

   – DATA{n}_NET_INTERFACE: Name of the data interfaces

```
# Automatic values (only adjust manually if absolutely necessary!)
SERIAL_NUMBER=29d32455b72e56e7f6142dd7fe72f81854c1752afad21a180eb4f694593cd753
MOIN_HASH=eb3f2d302a9ab08b944e0b025eab2046
APP_KEY=fbf205b5e674daa18a0b3748c3f2b806
MOIN_CONTAINER_IMAGE=moin-container:dev
MOIN_LICENSE_HANDLER_IMAGE=moin-license-handler:dev

# Custom MoIN env vars (adapt to your needs / environment)
DEVICE_NAME=moin-server
HTTP_PORT=80
SNMP_PORT=8081
DATA_PORT=8082
MAX_ENCODERS=8
MAX_DECODERS=8
CTRL_NET_INTERFACE=ens160
DATA1_NET_INTERFACE=ens192
DATA2_NET_INTERFACE=none
DATA3_NET_INTERFACE=none
DATA4_NET_INTERFACE=none
DATA5_NET_INTERFACE=none
DATA6_NET_INTERFACE=none
DATA7_NET_INTERFACE=none
DATA8_NET_INTERFACE=none
DATA9_NET_INTERFACE=none

# IMPORTANT: Change this IP address to your system / ctrl IP!
SYSTEM_IP=192.168.101.150
```

5. Run "make up" to start the MoIN stack.

✓ You have completed the installation. To access the MoIN server, open the IP address of the host system in a browser.

3.3   MoIN software commissioning

After a successful installation, continue with the software commissioning to make sure the software is installed correctly and to license you installation.

3.3.1 Licensing the installation of the MoIN cloud-init version

Add a license to your installation. You may use the software without a license, but the audio services will mute for 10 seconds every 10 minutes.

To add a license:

1. In a browser window, open the Master Control Unit (MCU) of the MoIN software by accessing: http://**<IP-of-your-MoIN>**/moin-mcu
2. Log in using the default login data: admin / admin.

3. Navigate to the page **License**.
4. Copy the serial number (64 characters).
5. Send your serial number to your 2wcom sales representative and receive a license file that contains your specific numbers of encoders, decoders, and the licensing period.
6. Upload the license file on the page **License**.
✓ Your installation is now licensed. The information about your license is shown in the block **License information**.

License information

ID	Your license ID.
Number of encoders	Number of encoders that you can allocate to your MoIN containers.
	NOTE: If you use more encoders than allowed by your license, the audio services will mute for 10 sec every 10 min.
Number of decoders	Number of decoders that you can allocate to your MoIN containers.
	NOTE: If you use more decoders than allowed by your license, the audio services will mute for 10 sec every 10 min.
Validity duration	The time and date at which your license will expire.
	NOTE: If your license expires, the audio services will mute for 10 sec every 10 min.
License volume	The duration for which your license is valid.
License state	The state of your license: inactive, active, expired.
	The license state is "inactive" right after uploading if it is not validated yet. The validation may take up to a few minutes.

3.3.2 Licensing the installation of the MoIN standalone version

Add a license to your installation. You may use the software without a license, but the audio services will mute for 10 seconds every 10 minutes.

To add a license:

1. In a browser window, open the license handler on port 38081: http://{SYSTEM_IP}:38081

2. Log in using the default login data: admin / admin.

3. Copy the serial number (64 characters).

4. Send your serial number to your 2wcom sales representative and receive a license file that contains your specific numbers of encoders, decoders, and the licensing period.

5. Upload the license file on the license handler.

✓ Your installation is now licensed. The information about your license is shown in the block **License information**.

License information

ID	Your license ID.
Number of encoders	Number of encoders that you can allocate to your MoIN containers.
	NOTE: If you use more encoders than allowed by your license, the audio services will mute for 10 sec every 10 min.
Number of decoders	Number of decoders that you can allocate to your MoIN containers.
	NOTE: If you use more decoders than allowed by your license, the audio services will mute for 10 sec every 10 min.
Validity duration	The time and date at which your license will expire.
	NOTE: If your license expires, the audio services will mute for 10 sec every 10 min.
License volume	The duration for which your license is valid.
License state	The state of your license: inactive, active, expired.
	The license state is "inactive" right after uploading if it is not validated yet. The validation may take up to a few minutes.

4 MCU Operation

The MCU (Master Control Unit) is a service that provides network abstraction. It eases the handling of the individual containers and displays them with a clear overview. Using the MCU, you can create, organize and manage your containers, as well as configure settings that affect all containers.

Open the MCU of the MoIN software by typing the following in the address bar of your browser: http://**<IP-of-your-MoIN>**/moin-mcu

Contents

4.1 Creating a new container

You can set up a MoIN container using standard or custom settings.
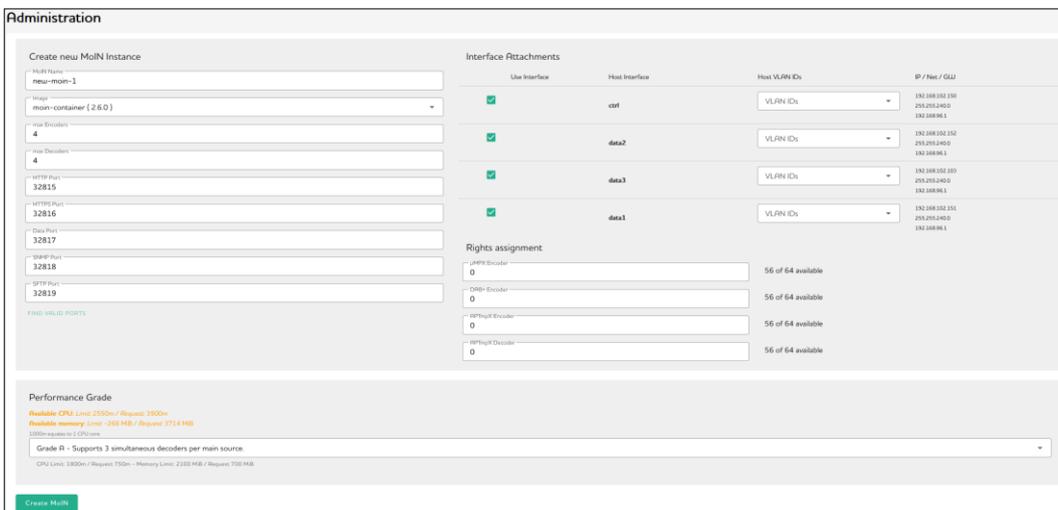
Prerequisite: You have already set up the network. This is usually done during installation.

To create a new container:

1. Navigate to the **Administration** page.
2. In the **Create new MoIN Instance** block, fill out the parameters with your setup:

MoIN Name	Enter the name of the container for better reference.
Image	Select the image (preset) to use for the new container.
max Encoders	Enter the number of encoders for the new container.
max Decoders	Enter the number of decoders for the new container.

HTTP Port	Enter a port for HTTP or use the one that has been entered automatically.
HTTPs Port	Enter a port for HTTPs or use the one that has been entered automatically.
Data Port	Enter a port for Data transmission or use the one that has been entered automatically.
SNMP Port	Enter a port for SNMP or use the one that has been entered automatically.
SFTP Port	Enter a port for SFTP or use the one that has been entered automatically.

3. In the **Interface Attachments** block, select the network interfaces and VLANs for the new container to use.

4. In the **Rights Assignment** block, enter the number of rights licenses that you want to assign to the new container.

5. In the **Performance Grade** block, select the performance grade for the container. This adjusts the container to the CPU power of your server.

   – Grade A supports 3 simultaneous decoders per main source.

   – Grade B supports 1 simultaneous decoder per main source.

   – Grade C supports only backups that are active when needed.

6. Alternatively, use a custom performance grade and define your own limits at your own risk. Fill out the following parameters:

CPU Limit	Enter the CPU limit for the container. This is the maximum that the container can use. 1000 milli-CPU equates 1 CPU core.
CPU Request	Enter the CPU request for the container. This is the CPU power that the container usually needs. 1000 milli-CPU equates 1 CPU core.
Memory Limit	Enter the memory limit for the container. If the memory limit is exceeded, the container restarts. This keeps the other containers from restarting as well in case of a memory leak.
Memory Request	Enter the memory request for the container. This is the memory that the container usually need.

7. Click **Create MoIN**.

✓ Your MoIN container is being created. Access the container via the **Overview** page.

> If the status for available CPU and available memory turns yellow, then the MoIN container will probably not run reliably.
>
> If the status for available CPU and available memory turns red, then the MoIN container will not be able to start. In this case, you cannot create the container.

4.2 Viewing the status of your containers

You can view the status of the containers on the page **Overview**.
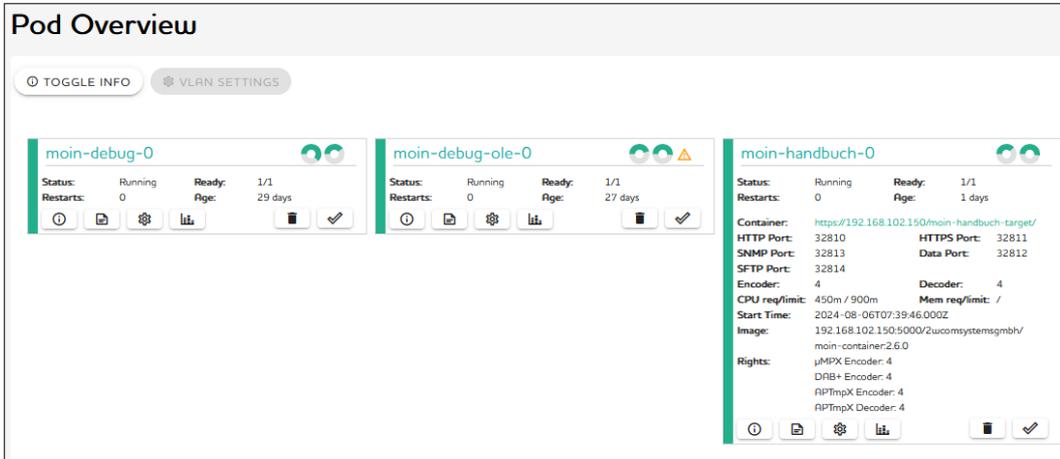
The following list describes the information that you can view on this page:

Status	Green: running
	Yellow: starting
	Red: not running
Ready	The numbers of containers that are running in this cluster.
Restarts	Number of restarts. If the container restarted at least once, then this field is highlighted.
Age	Time that has passed since the container was created.
⬤⬤	These icons visualise the CPU and memory usage of the container.
⚠	This icon appears on containers that use more encoders or decoders than covered by your license. In this case, mute insertion is active.
ⓘ	Click on this icon to extend the information on a container. To toggle the information on all containers, click **toggle info**.
Container	Link to the container that you can share with other persons to give them access.
Ports	Information on the ports that the container uses for HTTP, Data, and SNMP.
Encoder	Number of encoders that are assigned to this container.
Decoder	Number of decoders that are assigned to this container.
CPU req/limit	Requested CPU and CPU limit.
Mem req/limit	Requested Memory and memory limit.
Start time	Time and date the container last started.
Image	Image on which the container runs.
🗎	Click on this icon to view the pod events.
⚙	Click on this icon to view and modify the VLAN settings.
📊	Click on this icon to view and modify the performance grade.
🗑	Click on this icon to delete the container.
✓	Click on this icon to select a container in order to configure the settings of multiple conteiners at once.

4.3　Managing image and bundle versions

You can manually update the image of individual resources and the complete application stack via a bundle update.
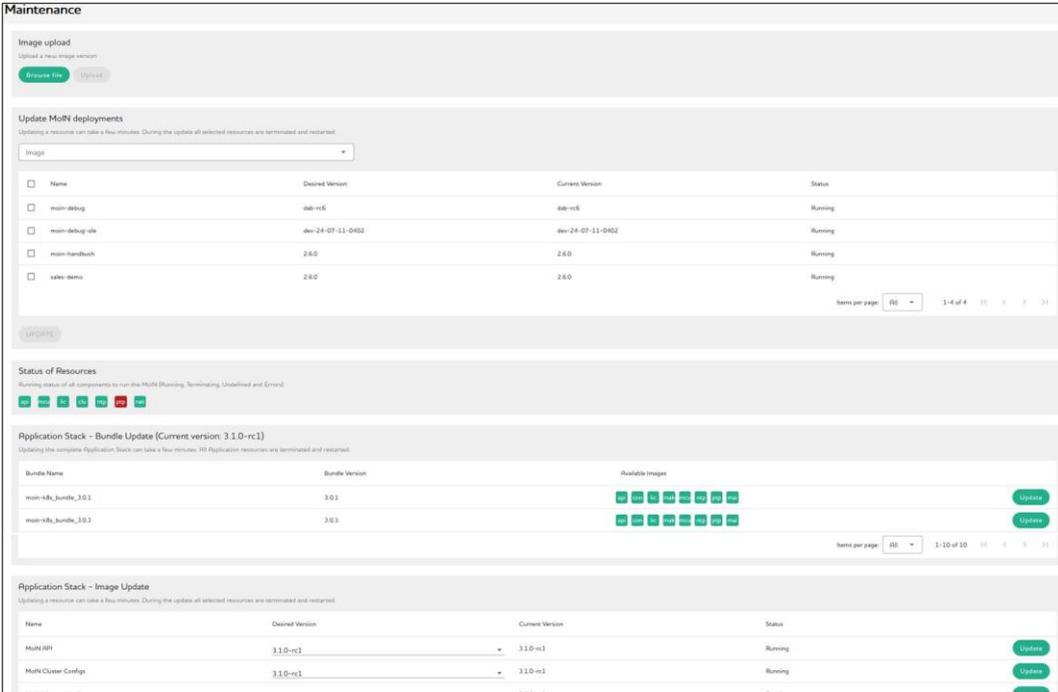
To update the image of individual containers:

1. Navigate to the **Maintenance** page.
2. In the block Image upload, upload the new image.
3. In the block Update MoIN deployments, select the image from the drop-down menu.
4. Select the containers that you want to update from the list.
5. Select **Update**.
✓ Updating a container may take a few minutes. During the update, all selected containers are terminated and restarted.

To update the complete application stack:

1. Navigate to the **Maintenance** page.
2. Select the bundle that you want to update.
3. Select **Update**.
✓ Updating the complete Application Stack can take a few minutes. All Application resources are terminated and restarted.

4.4 Configuring the network settings

The MoIN has several Ethernet interfaces: 1 for configuration and the others for data exchange. They were defined during the installation process. You can configure the interfaces for data transmission and set up VLANs.

To configure the ethernet interfaces:

1. Navigate to the page **Network**.
2. Configure the parameters for the DNS Server, Ctrl and Data interfaces.

> The necessary address settings depend on the individual network and should be assigned by the responsible network administrator, if applicable.

3. Click **Save**.
✓ The ethernet interfaces are now configured.

Parameters

Primary	Enter the IP address of the primary domain name server (DNS).
Secondary	Enter the IP address of the secondary domain name server (DNS).
Routing	Enable the Routing, which enables the DNS server to send and answer the requests over different [Data] interfaces.
VLAN	Enable VLAN and enter a VLAN ID (1-4095).
Priority	Assign a priority (1-7) to this stream to add a priority code point (PCP) according to the IEEE 802.1Q specification. Select 0 to disable the priority and use best-effort delivery.
DHCP	Enable dynamic host configuration protocol (DHCP) which enables the device to get an IP address automatically.
IP Address	If DHCP is disabled, then assign an IP address to the interface.
Subnetmask	Enter the subnetmask for the IP address.
Gateway	Enter the address of the local system that is used for the internet access (e.g. the router).
DNS Server	Enter the IP address of the DNS server used.
Speed	Set the network connection speed in Mbps or select **Auto**.

4.5 Synchronizing date and time via NTP

The MoIN can automatically synchronize its date and time with an external NTP (Network Time Protocol) server. The configurable parameters on this page may differ depending on the activated rights.

1. Navigate to the page **NTP**.
2. Configure the parameters.
3. Click **Save**.
✓ You have synchronized the date and time with an external NTP server.

Parameters

1. NTP Server	Enter the IP address or network name of the first NTP server to be used.
2. NTP Server	Enter the IP addresses or network names of the second NTP server to be used.
Update	Start the synchronization with the NTP server.
Stop	Stop the synchronization with the NTP server.
Min./max. polling interval	Enter the minimum and maximum interval for the NTP service to sync with the NTP server.

> ⓘ After successful synchronization, the status is shown on the same page. Three important values are delay, offset and jitter. The delay value gives information about how long the synchronization requests take. This depends on the distance to the server. The offset value gives information about how much the intern time differs from the server time. The jitter value gives information about the fluctuation of the offset (e.g. if the offset fluctuates between +1 ms and -1 ms, the jitter is 2 ms)

4.6   Synchronizing date and time via PTP

The MoIN can automatically synchronize its date and time with a PTP (Precision Time Protocol) server. Precise synchronization of time across devices on a network is critical to avoid audio distortion or loss of quality. By using a PTP server, audio codecs can ensure that they are operating with the same timebase, allowing them to maintain a consistent audio stream. By keeping all devices synchronized to the same PTP server, audio codecs can ensure that their output remains high-quality and reliable.

PTP servers work by providing a precise time reference that is distributed across a network. Audio codecs connected to the same network can then use this reference to synchronize their clocks, ensuring that audio signals are transmitted and received in perfect sync.

To connect to a PTP server:

1. Navigate to the page **PTP**.

2. Select the host network interface from the dropdown menu.

3. Select whether your PTP server is hardware-based or software-based.

4. Click **Deploy**.

✓ You have synchronized the date and time with a PTP server. The status information is shown in the block **PTP Server Configuration**. To make any changes, change the settings and click **Update**. To stop the synchronization, click **Stop**.

5   Container Operation

The MCU can create various containers that serve as codecs. Each container operates isolated from the others. This allows the administrator to give other people access to single containers. These people are then able to operate a container without interfering with the main system.

Contents

5.1   Operation via web interface

Each container has an integrated web interface. You can make all configurations and operations using a web browser.

To access the web interface:

1. Enter the container's IP address into a web browser or click on the container in the MCU's Overview page.
2. Log in using the default log-in data: admin / admin.
✓ The main page of the container appears.

Note the following rules when operating a container via web interface:

* If you want to keep any changes made in the configuration of the device, click the corresponding **Save** button.
The changes in each block must be saved individually. If you changed data in several blocks or tabs, click the **Save** button under each block to save all changed data. Otherwise, any unsaved block will be reset to the previously saved status when leaving the page.

* If you do not want to keep the changes, leave the page without saving or reload the page.

* Use a decimal point as the decimal separator in numbers in the input fields (i.e. "6.5" for "six and a half").

5.2   Input Source Settings

5.2.1 Creating input source configurations for TS/IP

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
TS/IP	TS/IP – Transport stream over IP using UDP/RTP, Unicast/Multicast (prerequisite: *TS Decoder* right)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.
7. Create a demux configuration that uses this input source configuration as a source. (See 5.2.3 Creating demux configurations)
✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Name	Enter the name of the stream for better reference.
IP type	Select Unicast/Multicast.
Multicast IP	Enter the IP for Multicast, if selected as IP type.
Port	Sender UDP port (the same as set in the encoder settings for output streaming)

IP interface	Select the interface for the input signal.
Protocol	Select the MPEG2 transport stream encapsulation.
Packet reorder/ dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms. **NOTE:** The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz.
RIST	Enable RIST to recover lost packets by resending them.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 5.4.6 Setting Up a Buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2). If you do not want to use this offset, enter "0".
Dual streaming	If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.

5.2.2 Creating input source configurations for TS/SRT

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
DVB SRT TS/SRT	TS/SRT – Transport stream over IP using SRT (prerequisite: *TS Decoder* and *SRT Decoder* rights)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.
7. Create a demux configuration that uses this input source configuration as a source. (See 5.2.3 Creating demux configurations)
✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Name	Enter the name of the stream for better reference.
Mode	Select whether you want to use SRT in listener or caller mode.
Port	Specify the port number for SRT connection.
IP interface	Select the interface for the input signal.
Latency	Define the time interval for the latency before the MoIN starts to decode the signal distributed via SRT protocol.
Encryption	If the input stream is protected by AES encryption, enable end-to-end encryption.

| Maximum reorder tolerance | Enter the maximum number of packets that should be reordered. |
| Passphrase | Enter the password used to secure the SRT stream. |

5.2.3   Creating demux configurations

To use an input source configuration that is TS-based, you must first create a corresponding demux configuration.

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the tab of a TS-based input source.
3. In the block **Demux Configurations**, select the tab **Audio** to use the audio and optionally the ancillary data of a stream. Select the tab **Data** to only use the ancillary data of a stream.
4. To create a new demux configuration, click ⊕.
5. To configure the demux configuration, click **Edit**.
6. Configure the parameters.
7. Click **Save**.
✓   You have created a demux configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

TS source	Select the source for the demultiplexer configuration profile in the dropdown menu.
Configuration mode	Select the configuration mode.
	• **Manual/PID:** Enter the specific audio PID and a name for better reference.
	• **Service from list (fixed PID):** Refresh the service list. Select the service and audio track.
	• **Service from list (auto PID):** Refresh the service list. Select the service. This mode is used for services that switch to another audio track at times. In that case, the MoIN automatically switches to the new audio PID.
Encapsulation mode	Select an encapsulation mode: Multiprotocol Encapsulation or Packetized Elementary Stream.
Audio sync mode	Select the audio sync mode: Buffer level: synchronization with the rate of the incoming data PCR: synchronization with the PCR PID. This is more precise.
Decoder type	Predefine the codec type for the decoder by choosing the audio codec or selecting "Automatic" from the dropdown menu.
Buffer [ms]	Enter a value for the audio buffer.
Gain	Enter a value for the gain of this input source.
Ancillary data decoding	If the input stream of the decoder contains ancillary data, the MoIN can forward them to the corresponding outputs. If ancillary data are enabled, private data cannot be enabled.
GPIO tunneling	Enable or disable GPIO tunneling for GPIO switch between encoder and decoder.
Private data	If private data is enabled, enter the data PID and select the configuration mode from the dropdown menu. If private data are enabled, ancillary data cannot be enabled.

5.2.4 Creating input source configurations for Elementary Streams (UDP/RTP)

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
Elementary Streams	RTP Elementary stream over IP using Unicast/Multicast	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.

✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Name	Enter the name of the stream for better reference.
IP type	Select Unicast/Multicast.
Multicast IP	Enter the IP for Multicast, if selected as IP type.
Port	Sender UDP port (the same as set in the encoder settings for output streaming)
IP interface	Select the interface for the input signal.
Protocol	Select the MPEG2 transport stream encapsulation.
Packet reorder/ dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms.
RIST	Enable RIST to recover lost packets by resending them.
Decoder type	Predefine the codec type for the decoder by choosing the audio codec or selecting "Automatic" from the dropdown menu.
Synchronous Playout/SFN	Enable Synchronous Playout using SFN or enter a buffer size [ms].
Buffer [ms]	Enter a value for audio buffer.
Gain	Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main - backup).
Ancillary data decoding	If the input stream of the decoder contains ancillary data, the MoIN can forward them to the [DTE] outputs.
GPIO tunneling	Enable GPIO Tunneling for GPIO switch between encoder and decoder.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 5.4.6 Setting Up a Buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is

then 5006 (5004 + 2).
If you do not want to use this offset, enter "0".

Dual streaming	If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.

If the right *Ravenna* is activated, then you can configure the settings automatically by using the Ravenna protocol. For this function, first configure the SAP service. Available streams will then be displayed in the dropdown menu **available streams**. Copy the settings into the input fields by clicking **Copy/use selected stream settings**.

5.2.5 Creating input source configurations for Livewire

(!) This option is only available if the right *Livewire* is enabled.

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
Livewire	IP Streaming over Livewire (optional: "Livewire" right)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.
✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Livewire Source	In this menu, available advertised Livewire streams will be displayed and can be selected for automatic configuration. To enter the Livewire settings manually, select **Manual**.
Source Channel	Enter a number (16 bit, in the range of 0…65535) describing a stream/channel.
Source Port	Specify the port number for Livewire connection.
Source Interface	Select the [Data] interface for Livewire connection.
Gain	Specify gain for the Livewire source.

5.2.6 Creating input source configurations for SRT

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
SRT	Elementary stream over IP using SRT (optional: "SRT Decoder" right)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.

✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Name	Enter the name of the stream for better reference.
Mode	Select whether you want to use SRT in listener or caller mode.
Port	Specify the port number for SRT connection.
IP interface	Select the interface for the input signal.
Latency	Define the time interval for the latency before the MoIN starts to decode the signal distributed via SRT protocol.
Maximum reorder tolerance	Enter the maximum number of packets that should be reordered.
Encryption	If the input stream is protected by AES encryption, enable end-to-end encryption.
Passphrase	Enter the password used to secure the SRT stream.
Decoder profile	Select the codec profile from the dropdown menu.
Buffer [ms]	Enter a value for audio buffer.
Gain	Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main - backup).
Ancillary data output	If the input stream of the decoder contains ancillary data, the MoIN can forward them to the [DTE] outputs.

5.2.7 Creating input source configurations for SIP

This option is only available if the right *EBU Tech 3326* is enabled.

The MoIN supports Audio IP streaming using SIP (Session Initiation Protocol). You can use an SIP connection for bidirectional data flows between encoder and decoder: either directly or via the [Data] interfaces or over a server (registrar).

Input Source	Description	Source Interface
SIP	Stream over IP using SIP – Session Initiation Protocol (optional: "EBU Tech 3326" right)	[Audio IN] [Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.

✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Registrar	Enter the Internet domain name of a SIP server if you want the connection to be established over a SIP server.
Proxy	If **Use proxy** is enabled, specify the IP address.
Phone number	Enter your phone number for registration with a SIP server.
Display name	Assign a name to the SIP server for better reference.
Username	Enter your username for registration with a SIP server.
Password	Enter your password for registration with a SIP server.
Interface	For different accounts, you can use different [Data] interfaces or the same interface to set up the connection.
Packet reorder / dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms.
Expires	Enter the interval in seconds for the registration renewal.
Connection timeout	Enter the interval in seconds for disconnection if there is no incoming audio signal.
Mono mix mode	Choose Left, Right or Downmix (send audio stream).
RTP port	If **Auto-configure RTP port** is disabled, specify the port number.
RIST	Enable RIST to recover lost packets by resending them. You can enter a limit for the bandwidth used by the stream including re-sent packets.
Buffer	Enter a value for audio buffer.

5.2.8 Creating input source configurations for Icecast

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
Icecast	Stream over IP using TCP (Icecast/Shoutcast)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.

4. To set up the new configuration profile, click **Edit**.

5. Configure the parameters.

6. Click **Save**.

✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Name	Assign a name to the Icecast server for better reference.
URL	Enter the URL of an Icecast server in the local network or the internet, e.g. "192.168.99.131" or "www.backup-audio.com".
IP Interface	Select the [Data] interface for the audio stream input.
Buffer	Enter a value for audio buffer.
Ancillary data	To add ancillary serial data to the stream, activate the switch.
GPIO tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder.

5.2.9 Creating input source configurations for internal storage (File)

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
🎵 File	Files from internal storage	Internal storage (eMMC, optional SSD)

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.

2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.

3. To create a configuration profile, click ⊕.

4. To set up the new configuration profile, click **Edit**.

5. Configure the parameters.

6. Click **Save**.

✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

Parameters

Name	Assign a name to the configuration profile for better reference.
File	Select an audio file in the dropdown menu.
Buffer	Enter a value for audio buffer.
Gain	Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main - backup).

5.2.10 Creating input source configurations for audio interfaces

You can create an input source configuration and use it for encoding and decoding.

Input Source	Description	Source Interface
AES67	Digital (AES67) audio	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
3. To create a configuration profile, click ⊕.
4. To set up the new configuration profile, click **Edit**.
5. Configure the parameters.
6. Click **Save**.
✓ You have created an input source configuration. Continue with 5.3.2 Assigning input source and codec profile to an encoder.

5.3   Encoder settings

The following steps are necessary to operate the MoIN as an encoder:

- Creating input source configurations
- Creating codec profiles
- Assigning input source and codec profile to an encoder
- Setting up encoder outputs
- Configuring ancillary data inputs

If the corresponding rights are activated, you can also do the following:

- Creating an HLS stream
- Configuring the TS Multiplexer

5.3.1 Creating Codec Profiles

You can create codec profiles to assign to the different encoders of the MoIN.

1. Navigate to the page **Codec**.
2. Click on the tab **Profiles**.
3. To create a new codec profile, click ⊕.
4. To set up the new codec profile, click **Edit**.
    ➢ A dialog window opens.
5. Configure the parameters.
6. Click **Save**.
✓ You have created and edited a codec profile.

Parameters

Name	Assign a name to the codec profile for better reference.
Encoder format	Select the encoder format. Different settings are configurable depending on the selected encoder format.
Frame size	Select the required frame size.
Audio mode	Select the audio mode in the dropdown menu.
Sampling rate	Set up sampling rate in the dropdown menu. The sampling rate for Livewire can only be configured for 48 kHz. For some 2wcom devices, the sampling rate is set to 192,000 Hz.

Sampling width	Set up sampling width in the dropdown menu in the range of 16-24 bits depending on the selected encoder format.
Endianness	Select the endianness (order of bytes).
Bitrate	Select the bit rate in the dropdown menu depending on the chosen audio mode. For some encoder formats, this field shows the calculated bitrate depending on the selected settings.
GPIO Tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder.

5.3.2 Assigning input source and codec profile to an encoder

The MoIN is equipped with parallel encoders that can operate at the same time. One input can be the source for several encoders.

Prerequisite: You have already created configuration profiles for the input sources you want to use.

1. Navigate to the page **Codec**.
2. Click on the tab **Encoder**.
3. In the block **Source/Profile Assignment**, assign an input source configuration to each encoder by selecting it in the dropdown menu **Input source**. Alternatively, drag/drop the input source configuration into this field.
4. Select the source for ancillary data from the dropdown menu **Ancillary Source**.
5. Assign a codec profile to each encoder by selecting it from the dropdown menu **Profile**. Alternatively, drag/drop the codec profile into this field.
6. Click **Save**.
✓ You have activated and configured the encoders.

> The MoIN can also operate as a **transcoder** and change the codec format of an input audio stream. For transcoding, assign the corresponding input stream to the encoder and configure the format of the output stream. This function is currently limited to PCM only.

5.3.3 Setting up encoder outputs

5.3.3.1 Setting up an Elementary Stream output

You can activate and configure output streams for each encoder.

To set up a converter output:
1. Navigate to the page **Codec**.
2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
3. Click ⊕ to create a new encoder output.
4. To set up the new output, click **Edit**.
5. Edit the parameters of the output settings.
6. Click **Save**.
✓ You have set up an encoder output.

Parameters

Activation	To activate this output, set the switch to **ON**.
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference.

Domain Name / IP	Define the domain name or IP address of the destination.
Port	Specify the port number of the destination.
QoS DSCP	Select the quality of service (QoS). The selected packet will be prioritized.
Multicast TTL	TTL (Time to Live) for multicast packets.
IP interface	Select the interface for the output.
Mode	Select the mode of the output stream in the dropdown menu: RTP or UDP. **NOTE:** Besides UDP/RTP, RTCP packets are also generated for the encoder output and are sent in intervals of 5 s. UDP/RTP allows reordering packets by means of sequence numbers.
RTCP output	Enable or disable the Real-Time Control Protocol (RTCP) output for monitoring and control of the stream.
Maximum payload size	Select the size limit for the payload. To set no limit, select **Maximum**.
Send Delay	Set up the send delay, which the encoder should wait in order to send Audio over IP as an offset stream for redundancy
RIST	Enable RIST to recover lost packets by resending them. You can enter a limit for the bandwidth used by the stream including re-sent packets.
Synchronous Playout / SFN	Enable SFN and enter the global delay to ensure synchronous playout.
Stream4Sure	Enable this function to allow the decoder to use this stream as one of up to 4 IP streams for Stream4Sure.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 5.4.6 Setting Up a Buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2). If you do not want to use this offset, enter "0".
Dual streaming	If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.

5.3.3.2 Setting up an SRT output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
3. Click ⊕ to create a new encoder output.
4. To set up the new output, click **Edit**.
5. Edit the parameters of the output settings.
6. Click **Save**.
✓ You have set up an encoder output.

Parameters

Activation	To activate this output, set the switch to **ON**.
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference.

Mode	Choose between "Caller" and "Listener" mode.
Host	Enter the host domain of the SRT destination.
Auto-configure source port	Activate automatic configuration of the source port.
Source port	If auto-configuration is disabled, enter the source port number manually.
Destination port	Enter the port number of the destination.
IP interface	Select the [data] interface for the output.
Latency	Define the time interval for the latency before the MoIN starts to output the SRT stream.
Encryption	The type of AES encryption determines the length of the key (passphrase). AES-182 uses a 16-character passphrase (128 bit), AES-192 uses a 14-character (192 bit) and AES-256 uses a 32-character (256 bit) passphrase.
Passphrase	Define a password used to secure the SRT stream.

5.3.3.3 Setting up an Icecast Source Client output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
3. Click ⊕ to create a new encoder output.
4. To set up the new output, click **Edit**.
5. Edit the parameters of the output settings.
6. Click **Save**.
✓ You have set up an encoder output.

Parameters

Activation	To activate this output, set the switch to **ON**.
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference.
Domain Name / IP	Define the domain name or IP address of the destination.
Port	Specify the port number of the destination.
IP interface	Select the [data] interface for the output.
Mountpoint	Specify the mountpoint of the stream in the domain.
User	Enter the username for using the domain.
Password	Enter the password for using the domain.

5.3.3.4 Setting up an Icecast Server output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
3. Click ⊕ to create a new encoder output.

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4. To set up the new output, click **Edit**.
5. Edit the parameters of the output settings.
6. Click **Save**.
✓ You have set up an encoder output.

Parameters

Activation	To activate this output, set the switch to **ON**.
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference. This name will be used as the icy name as well.
Port	Specify the port number of the destination.
IP interface	Select the [Data] interface to be used for the output.
TLS/SSL encryption	Enable TLS/SSL encryption.
Burst on connect	Enable bust on connect and enter the number of burst frames to load the buffer and ensure error-free connection.
Ancillary data	To add ancillary serial data to the stream, activate the switch.
GPIO tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder.

5.3.4 Configuring PAD Data

The PAD (Program-Associated Data) feature allows broadcasters to transmit supplementary metadata alongside the audio stream. This data includes dynamic text labels and images that can be displayed on digital radio receivers, such as DAB or HD Radio. This function is typically used to show information like song titles, artist names, or promotional content. The PAD Data page allows you to configure the datarate, text messages (DLS), and slideshow content.

To configure the PAD data:

1. Navigate to the **PAD Data** page.
2. Select the tab of the encoder for which you want to configure PAD data.
3. In the **General Settings** block:
   – Set the max. datarate. This controls the amount of bandwidth allocated for PAD data.
   – Select the appropriate character set from the drop-down menu.

4. In the **Dynamic Labels / Text Messages** block, configure the DLS settings:
   – In the **Default DLS** field, input the default text message that will be transmitted to radio receivers.
   – Use the **DLS Update** drop-down menu to determine how the DLS should be updated.
     Default DLS: This option consistently uses the text entered in the Default DLS field.
     DLS (Download File): Select this option to update the DLS by downloading a file from a specified path.
     DLS (SFTP Update): Select this option to retrieve the DLS from a remote server via SFTP.

5. In the **Slideshow** block, manage images that will be transmitted alongside the audio stream:
   - To upload a new image, select **Browse / Drop file** or drag the image file into the upload box. Ensure that the image is in .png or .jpg format. Select **Upload** to add the image to the slideshow.
   - The file details are displayed in the table, including the filename, trigger time (when the slide will appear), expiry time (when the slide will stop appearing), upload time, and size of the image.

6. Select **Save**.
   ✓ The PAD data is now transmitted to compatible receivers, displaying real-time dynamic content as configured. You can view the PAD data on the **PAD Data** status page.

5.3.5 Configuring ancillary data inputs

Ancillary data are any additional information that is included in the audio stream alongside the audio data itself. This data can include metadata such as track title, artist name, album art, and other descriptive information about the audio content. Ancillary data can also include technical details such as timecode and synchronization data.
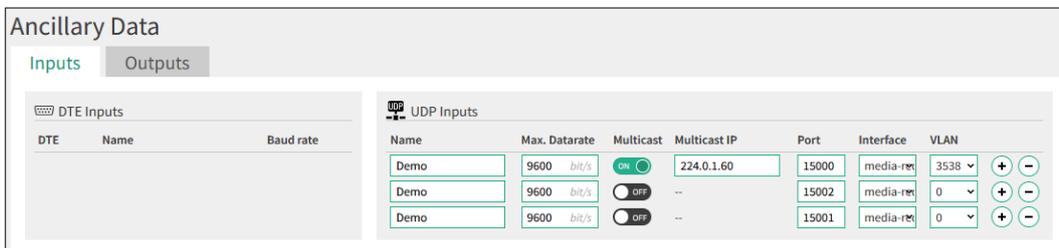
To configure the ancillary data inputs:

1. Navigate to the page **Ancillary Data**.
2. To add UDP inputs for ancillary data, click ⊕.
3. Configure the parameters for the UDP inputs.
4. Click **Save**.
5. Navigate to the page **Codec**.
6. In the tab **Encoder**, add an ancillary source to the input source. Alternatively, select the **Pipe** function to use ancillary data that already exist in the input source.
7. Click **Save**.
   ✓ The ancillary data are now added to the stream. You can see an overview of the ancillary data inputs and outputs on the status page **Ancillary Data**.

Parameters

Name	Enter a name for the input for better reference.
Max. Datarate	Enter the maximum data rate that is allowed for this input. The TS encoder uses this parameter to determine the data rate to reserve for private data when using the ancillary source with "Auto calculate required TS bit rate".
Multicast	Choose whether to use multicast.
Multicast IP	Enter the multicast IP.
Port	Specify the port for ancillary data via UDP.
Interface	Select the IP interface to be used.
VLAN	If the selected IP interface is an interface with VLANs, then select the VLAN to be used. This allows you to separate the ancillary data from other network traffic for better performance and security.

5.3.6 Setting up the DAB Submux

With the DAB Submux function, you can configure and manage multiple audio streams for DAB transmission. Input sources that are assigned to an encoder can be combined into a single DAB multiplex for broadcast.

Setting up a DAB Submux With Payload Content

- **Prerequisite:** You have already assigned input sources and codec profiles to the encoders.
- **Prerequisite:** The *DAB+ Encoder* right is activated.

To set up the DAB submux:

1. Navigate to the **DAB Submux** page.
2. To create a new submux, select **+**.
   - ➢ A new tab with submux settings appears.
3. In the General block, configure the stream parameters:

Mode	Select the mode for DAB transmission.
Delay	Set the transmission delay to ensure proper synchronization.
DCP Packet Spreading	Specify the percentage of packet spreading to balance the network load.
DCP FEC Level	Select the FEC level for enhanced error resilience.

4. To add a new subchannel to the Submux payload content, click **Add Subchannel**.
5. To add encoder audio to the stream, select an available encoder from the **Payload** dropdown menu. Alternatively, drag and drop the encoder from the **Encoder audio** tab.
6. For each subchannel, enter a name and subchannel ID. Select a protection type and protection level.
7. Select **Save**.
- ✓ You have configured the submux settings. You can now set up submux outputs.

Setting up Submux Outputs

You can define how the submux will be transmitted to external systems. Each DAB multiplex output can be configured with a primary transmission path and an optional redundant path for reliability.

- **Prerequisite:** You have already set up a DAB submux with payload content.

To set up a submux output:

1. Navigate to the **DAB Submux** page and select the tab of the submux for which you want to set up an output.
2. To create a new output, click ⊕.
3. To configure the output, click **Edit**.
   - ➢ The settings window opens.
4. Configure the parameters:

Name	Enter a name to identify the output.
IP	Enter the IP address where the DAB submux stream will be sent.
Port	Enter the port number for the DAB output.
IP Interface	Select the IP interface to transmit the submux.
Send delay	Specify the percentage of packet spreading to balance the network load.
Redundancy Group	Select the FEC level for enhanced error resilience.

5. Select **Save**.

6. Activate the output by enabling the **Active** switch.

✓ The MoIN now outputs submux streams.

5.3.7 Configuring the TS Multiplexer

The MoIN can output up to 8 multiplexed streams over IP at the same time. One multiplexed stream can contain up to 16 programs. To each program, you can add up to 16 payload contents. You can use the IP interfaces [Data] redundantly for the same stream content and the same destination or send different stream contents to the same or different destinations.

5.3.7.1 Setting up a Multiplex with payload content

Prerequisite: You have already configured the input sources.

Prerequisite: You have already assigned input sources and codec profiles to the encoders.

To set up a multiplexed stream with payload:

1. Navigate to the page **TS Multiplexer**.

2. To create a new Multiplex, click **+**.

   ➢ A new tab with TS settings appears.

3. To add a new service to the TS payload content, click **Add Service**.

4. To add encoder audio to the stream, select an available encoder in the dropdown menu **Payload**. Alternatively, drag/drop the corresponding encoder from the tab **Encoder audio**.

5. To add another payload to the content, click **Add Payload**.

6. To add private data to the stream, select the corresponding input source in the dropdown menu **Payload**. Alternatively, drag/drop the input from the tab **Data**.

7. Specify the service ID, service name, service provider name, PMT PID, PCR PID, and PID for the corresponding program.

8. Select between the modes PES (program elementary stream) and MPE (multiprotocol encapsulation). If MPE is selected, enter the destination PID, destination port and the protocol.

9. In the block **General**, configure the parameters.

10. Click **Save**.

✓ You have set up a multiplexed stream. Continue with 5.3.7.2 Setting up Multiplex outputs.

Parameters

Encoding standard	Select the encoding format: DVB or ATSC.
MPEG TS tables	Select MPEG TS tables as needed for the multiplexing process.
Auto-calculate required TS bit rate	Enable this option to automatically calculate the required Transport stream bit rate based on the selected settings.
Bit rate	If auto-calculated TS bit rate is disabled, enter the bit rate manually.
Audio bitrate priority	Select a priority for the audio bitrate: low latency or low bitrate overhead.
Private data mode	Set the mode for handling private data within the multiplexed stream: Elementary stream (ES) or TS adaption.
Network ID	Enter the network ID to identify the network where the multiplexed data will be transmitted.
Original Network ID	Enter the original network ID to indicates the network in which the TS stream was originally created.

Transport Stream ID	Assign a Transport Stream ID to identify the specific Transport Stream being used.
Network name	Enter the name of the network where the multiplexed data will be transmitted.
Audio PID removal on bad input	Enable or disable the removal of PIDs in case the input is bad.

5.3.7.2 Setting up Multiplex outputs

For each TS Multiplex, you can create and save up to 32 destination streams.

To set up Multiplex outputs:

1. Navigate to the page **TS Multiplexer**.
2. In the block Multiplexer Outputs, click on the tab of the output you want to set up.
3. To create a new output, click ⊕.
4. To configure the output, click **Edit**.
   ➢ A dialog window opens.
5. Configure the parameters.
6. Click **Save**.
✓ The MoIN now outputs multiplexed streams.

TS/IP output parameters

⚠ This option is only available if the right *TS Encoder* is activated.

Activation	Enable this output stream.
Name	Enter the name of the stream for better reference.
Domain name/IP	Enter the IP of the destination.
Port	Specify the port number of the destination.
Multicast TTL	TTL (Time to Live) for multicast packets.
IP interface	Select the [Data] interface for the output.
Mode	Select the mode of the output stream in the dropdown menu: RTP or UDP. **NOTE:** Besides the RTP, the RTCP packets are also generated for the encoder output and are sent in 5 s intervals. RTP allows reordering packets by means of sequence numbers.
RTCP output	Enable or disable Real-Time Control Protocol (RTCP) output, which is used for monitoring and controlling the stream.
Send delay	Enter the send delay, that the encoder should wait in order to send Audio over IP as an offset stream for redundancy (for more information, see 5.4.6 Setting Up a Buffer).
RIST	Enable RIST to recover lost packets by resending them.
Bandwidth limiting	If RIST is enabled, set a bandwidth limit to control the data rate of the TS stream.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay (for more information, see 5.4.6 Setting Up a Buffer). **NOTE:** Enable Pro-MPEG FEC in the corresponding decoder.
FEC column (L)/ FEC row (D) port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 2006 (5004 + 2). If you do not want to use this offset, enter "0".
Dual Streaming	Enable or disable dual streaming. If dual streaming is enabled, the menu will expand. Set up the connection for dual streaming in the expanded menu. For the Ethernet input, you

can select the same or a different source.
NOTE: Enable dual streaming in the corresponding decoder.

TS/SRT output parameters

This option is only available if the rights *TS Encoder* and *SRT Encoder* are activated.

Activation	Enable this output stream.
Name	Enter the name of the stream for better reference.
Mode	Select either caller or listener mode.
Host	Enter the host domain of the SRT destination.
Auto-configure source port	Activate automatic configuration of the source port.
Source port	If auto-configuration is disabled, enter the source port number manually (relevant for e.g. firewall)
Destination port	Enter the port number of the destination.
IP interface	Select the [Data] interface for the output
Latency	Define the time interval for the latency before the MoIN starts to output the SRT stream.
Encryption	Enable SRT encryption. The type of AES encryption determines the length of the key (passphrase). AES-128 uses a 16-character (128-bit) passphrase, AES-192 uses a 24-character (192-bit) and AES-256 uses a 32-character (256-bit) passphrase.
Passphrase	Define a password used to secure the SRT stream. **NOTE:** The same encryption key should be set for this input TS in the corresponding decoder.

5.3.8 Generating an HLS stream

This option is only available if the right *HLS Connections* is enabled.

The MoIN can encode the same signal multiple times in different qualities and create an HLS stream that automatically changes its audio quality depending on the circumstances.

To create an HLS stream:

1. Assign input sources and profiles to the encoders. The same source must be encoded in different qualities.

2. Navigate to the page **HLS**.
3. To create a new tab for the HLS stream, click **+**.
4. Configure the parameters of the HLS stream.

5. Click **Save**.
✓ The encoder now generates a HLS stream. Information on active HLS streams are displayed on the page **Overview**.

Parameters

HLS stream name	Enter the name of the stream for better reference.
Input source	Select the input source in the dropdown menu. Alternatively, drag/drop the input source from the block **Input sources** into this field.
Playlist name	Enter the playlist name that will appear in the playlist url.
Playlist url	Use this URL to listen to the stream. Some web browsers need a plug-in to listen to the stream.
Enable stream	Activate the HLS stream.
HLS encoder	Activate the encoders that should feed into the HLS stream. Only the encoders that use the selected input source are listed in this block.

5.3.9 Setting up a Dolby® encoder

> (!) This option is only available if the right *Dolby encoder* is enabled.

The Dolby encoder allows different signals to be encoded so that speech is always equally loud regardless of the content—even though different kinds of content (such as sporting events, news, and commercials) all have different dynamic ranges. You can choose between "Dolby Digital" and "Dolby Digital Plus" as the encoder format.

To set up a Dolby encoder

1. Navigate to the page **Codec**.
2. Create and configure a codec profile.
3. Set Dolby Digital as the **Encoder Format**.
   - ➢ Dolby settings appear.
4. Configure the Dolby-related parameters.
5. Click **Save**.
6. Assign the codec profile and an input source to an encoder.
7. Configure and activate an encoder output for this encoder.
- ✓ You have set up a Dolby encoder.

Parameters

Encoder Mode	Choose between "Dolby Digital" and "Dolby Digital Plus".
Dialog Normalization	Select a value between -1 and -31 dB to set the average audio output of the decoder to a preset level. This aids in matching audio volume between program sources. Dialog Normalization is only used if **Leveler Bypass** is enabled.
Line Mode Profile / RF Mode Profile	Set the profiles to affect the DRC (Dynamic Range Control). This information is essential to allow decoders to decode the signal individually.
Dolby Surround Mode	Indicate whether the input signal is Dolby surround encoded or not. Alternatively, select "Not indicated".
Leveler Bypass	Disable Leveler Bypass to use real-time loudness leveling.
Loudness Target Regulation	Select a preset for loudness target regulation, or configure target loudness, peak limit and dialog intelligence manually. • ATSC: -24LKFS, -2.0dBTP, on. Typically used in North America. • EBU: -23LKFS, -3.0dBTP, off. Typically used in Europe.

5.4 Decoder settings

The following steps are necessary to operate the MoIN as a decoder:

- Creating input source configurations
- Assigning source streams to a decoder
- Configuring ancillary data outputs
- Defining switch criteria

If the required rights are activated, you can also do the following:

- Setting up dual streaming
- Setting up Stream4Sure

5.4.1 Assigning Source Streams to a Decoder

For each audio output, you can activate up to 4 input streams for decoding and assign one of them to the "Main Source". The remaining streams are alternative backups for decoding. The decoder receives and processes all enabled input sources from the encoder but only outputs the highest-priority audio signal that is error-free. The priorities of the streams are as follows: main source, backup 1, backup 2, backup 3.
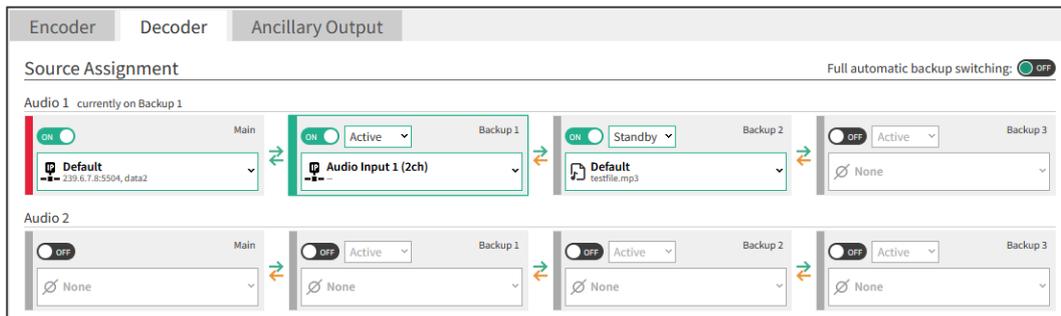
Prerequisite: You have already created input source configurations (see 5.2 Input Source Settings).

To assign source streams to a decoder:

1. Navigate to the Codec page.
2. Click on the tab **Decoder** tab.
3. Under **Source Assignment**, activate an input signal in the **Main** column by setting the switch to **ON**.
4. To assign an input source configuration to the main source, select it in the dropdown menu. Alternatively, drag and drop the input source configuration into the field.
5. Assign up to 3 backup sources following the same principle.
6. Choose between **Active** or **Standby** mode for your backup sources. This setting determines how the decoder handles these sources.
   When a backup source is set to Active mode, the decoder continuously processes it. This ensures that the backup source is readily available for immediate use. It offers quick switching to the backup source when required.
   In Standby mode, the decoder still receives the backup source, but it remains in a dormant state, consuming fewer system resources. The decoder will only start processing the standby source when it's needed. While Standby mode conserves resources, it may introduce a slight delay when switching to the standby source due to the initial processing time.
7. Optionally, disable **Full automatic backup switching** to gain more control over the source switching. Click on the arrows between the sources to prevent a backup from automatically switching back to the input of higher priority, even if it improves in quality. This prevents unwanted back-and-forth switching between unstable sources.
8. Click **Save**.
✓ The decoder now processes the main and backup sources. Continue with defining switch criteria for the main and backup sources (see 5.4.3 Defining Switch Criteria).

> ⚠ You can decode and play files from the internal storage. This option is recommended as an advanced redundancy for backup sources in case of input failure.

> ⚠ You can use XLR audio inputs as a backup source fed from an external device or for a loopback test.

5.4.2 Configuring ancillary data outputs

Ancillary data are any additional information that is included in the audio stream alongside the audio data itself. This data can include metadata such as track title, artist name, album art, and other descriptive information about the audio content. Ancillary data can also include technical details such as timecode and synchronization data. You can configure primary and secondary outputs. The secondary output is used for TS private data parallel to ancillary data output.
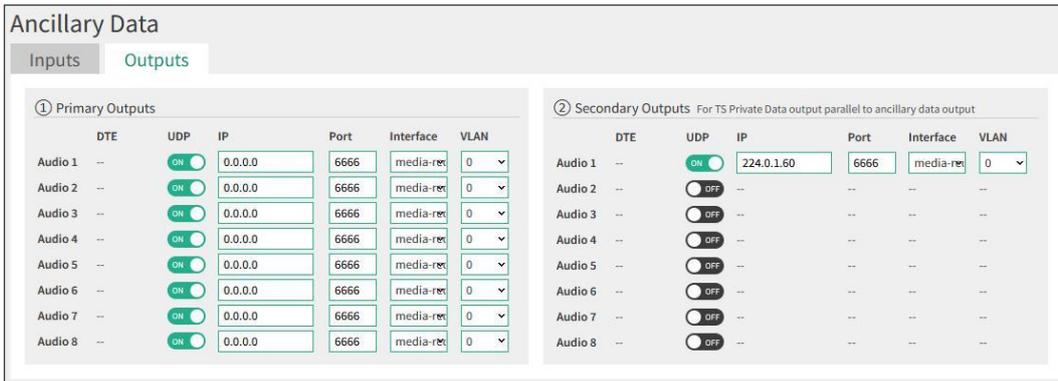
To configure the ancillary data outputs:

1. Navigate to the page **Ancillary Data**.
2. To add UDP outputs for ancillary data, click ⊕.
3. Configure the parameters for the UDP outputs. Note that the MoIN outputs the ancillary data of the correspondingly numbered, currently active main or backup source that is configured on the page **Codec**.
4. Click **Save**.

✓ The ancillary data are now added to the stream.

Parameters

UDP	Toggle to enable or disable the ancillary data output.
IP	Enter the IP address. This can be a multicast IP.
Port	Specify the port for ancillary data via UDP.
Interface	Select the IP interface to be used.
VLAN	If the selected IP interface is an interface with VLANs, then select the VLAN to be used. This allows you to separate the ancillary data from other network traffic for better performance and security.

5.4.3 Defining Switch Criteria

The MoIN decoder can automatically switch between alternative sources as a redundancy solution in case of failure. The decoder receives and processes all enabled input sources from the encoder but only outputs the audio signal of the highest priority that is error-free (main source – backup 1/2/3). Additionally to the global switch criteria, you can define switch criteria for individual sources that override the global switch criteria.

You can enable the following switch criteria for input sources. The availability of switch criteria depends on the selected input source.

No input data	The MoIN will switch to the next input source if no signal is available in the activated IP input [Data].
Packet jitter	The MoIN will switch to the next input source if the packet jitter exceeds the set value.
Packet loss	The MoIN will switch to the next input source if packet errors are detected in the input signal over the activated IP input [Data].
No decoder output	The MoIN will switch to the next input source if the decoder does not output any data.
Audio silence detection	The input source will be switched to the next backup source if silence in the audio signal of the input stream is detected.
AES/EBU no signal	The input source will be switched to the next backup source if no signal is detected in the active input.
RF Level	The MoIN will switch to the next input source if the frequency is below the set value.
C/N	The MoIN will switch to the next input source if the carrier-to-noise ratio falls below the set value.
TS Sync	The MoIN will switch to the next input source if the transport stream is not synchronized.

To define global switch criteria for each audio input type:

1. Navigate to the page **Switch Criteria**.
2. Click on the tab of the input source for which you want to define switch criteria.
3. If any of the listed criteria should be monitored, enable the corresponding switch.
4. In the field **Value**, enter the threshold above or below which the input source should be switched.
5. For each enabled criterion, define the delay time **T1** for switching release. After this delay time, the input source switches to the next backup source.
6. For each enabled criterion, define the delay time **T2** for switching end. After this delay time, the input source switches back to the previous source, if its signal is good.
7. Click **Save**.
✓ The MoIN now automatically switches to the next good input source. For some switch criteria, you can set an alarm (see 5.8.1 Setting Up Alarms).

To define individual switch criteria for a specific input source:

1. Navigate to the page Codec.
2. Click **Edit** on the input source for which you want to define individual switch criteria.
3. Select the **Switch criteria** tab.
4. Toggle the switch **Override global switch criteria**.
5. Define the individual switch criteria.
6. Click **Save**.
✓ The switch criteria for this input source now override the global switch criteria.

> On the page Codec, the switch criteria scope (SCS) of an input source is indicated with ⊕ for global and with ⑧ for individual.

5.4.4 Setting Up Dual Streaming

Dual streaming is the simultaneous transmission and reception of 2 identical IP streams that come from the same encoder. This allows a seamless exchange of IP packets in case of errors: If the main stream drops packets, then the decoder immediately replaces them using the packets from the second stream. Ideally, the two streams use different networks, so one stream is still available in case of the other network failing.

Alternatively, it is possible to send both streams over the same network, with one stream being slightly delayed by setting up a send delay for it. Lost packets in the primary stream can be replaced in case of a

burst error by using a dejitter buffer. The downside of using one network for both streams is that both streams will be affected in case of the network failing.

To set up dual streaming:

1. Set up dual streaming in the input source settings. For more information, see 5.2 Input Source Settings.
2. To use the input source, select it in the source assignment.
✓ Dual streaming is now enabled in the MoIN.

5.4.5 Setting Up Stream4Sure

> ⚠ This option is only available if the right *Stream4Sure* is enabled.

Stream4Sure is a solution developed by 2wcom that allows the decoder to receive up to 4 IP streams of different coding and quality. The decoder can check the main stream for lost packets and precisely repair any lost samples by seamlessly copying them from the backup streams.

Prerequisite: An encoder sends up to 4 IP streams with Stream4Sure enabled to your MoIN.

To set up Stream4Sure:

1. Enable Stream4Sure in the input source settings of up to 4 IP streams. For more information, see 5.2 Input Source Settings.
2. To use the input sources for a decoder, assign them to the main and backup sources.
✓ Stream4Sure is now enabled in the MoIN.

> ⚠ The number of streams used for Stream4Sure reduces the number of other backup sources that can be used.

5.4.6 Setting Up a Buffer

The MoIN is equipped with an audio buffer and a dejitter delay for IP.

The audio buffer is a delay buffer for decoded audio. It saves decoded audio to output it in case of failure. The MoIN can use this time buffer, for example, to switch to the backup source or external source.

The dejitter delay for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets and to compensate jitter.

When using the MoIN, there are different stages where delay is introduced during processing for security (e.g. FEC or dejitter delay). For uninhibited operation, make sure that delay settings are in a save range.

For a basic setup, delay is calculated in the following matter:

Encoder processing delay + transmission delay on IP network + decoder processing delay

Encoder delay is typically < 5 ms. Transmission delay on the IP network can vary by a large degree, depending on the network. Decoder processing delay needs to be broken down into multiple stages:

Dejitter/Reorder or FEC output delay + additional delay + decoder processing delay

If no FEC is used, you can use a dejitter/reorder buffer which will add delay in the length it is set up to. If FEC is used, there is a minimum delay that is required for safe operation (in the length of two full FEC matrices). Any delay on top of that is used for additional dejittering reordering of the input stream, as the FEC also includes this task as well. If the user setting is too small, it is overwritten internally to ensure safe operation. The current active setting to each decoder can always be viewed on the page **Overview** in the

block "Details – Decoder". You can use the additional delay setting to further delay the output up to 1000 ms. The decoder will also have a small delay of < 5 ms.

Recommended default buffer configuration: Packet reorder delay: 100 ms, Audio delay: 100 ms

The minimal needed additional buffer sizes depend on the selected FEC Mode (Row x Col):

FEC Mode (2 x matrix size) Codec (Packets/s)	1x4 (8)	4x4 (32)	5x5 (50)	10x10 (200)
PCM (250)	0.03	0.13	0.20	0.80
MPEG1 Layer-2 (42)	0.19	0.76	1.19	4.76
MP3 (42)	0.19	0.76	1.19	4.76
AAC LC (47)	0.17	0.68	1.06	4.25
AAC HE v1 (24)	0.33	1.33	2.08	8.33
AAC HE v2 (24)	0.33	1.33	2.08	8.33

5.4.7 Setting up a Dolby® decoder

! This option is only available if the right *Dolby decoder* is enabled.

You can set up a Dolby decoder to receive a Dolby Digital stream. The MoIN reproduces the program audio according to the metadata parameters set by the program creator, and according to settings for speaker configuration and dynamic range that you chose.

To set up a Dolby decoder:

1. Navigate to the page **Codec**.
2. Create an input source configuration for elementary streams.
3. Configure the parameters for this input source. Select **Dolby Digital** as the **Decoder type**.
   ➢ Dolby-related parameters appear.
4. Configure the Dolby-related parameters.
5. Click **Save**.
6. Assign the input source configuration to a decoder.
7. Click **Save**.
✓ You have set up a Dolby decoder.

Parameters

| Stereo Mode	Select either Stereo or Dolby Surround. Alternatively, select Auto for the decoder to recognize the stereo mode automatically.

DRC Mode	Select the compression profile to affect the DRC (Dynamic Range Control). This information is essential to allow the decoder to decode the signal individually.
DRC Scale Factor Low	Enter the factor for low-level signal boost compression scaling.
DRC Scale Factor High	Enter the factor for high-level signal cut compression scaling.

5.5 Interface Settings

Since the MoIN is not a physical device, it does not have physical interfaces, except for network interfaces. You can virtually configure these network interfaces in the web interface of the MoIN to use virtual inputs and outputs for signals that usually require a physical interface.

5.5.1 Configuring AES67 inputs

Since the MoIN is not a physical device, it does not have physical interfaces, except for network interfaces. You can virtually configure these network interfaces in the web interface of the MoIN to use virtual inputs for signals that usually require a physical interface. Every AES67 input source configuration is defined by one AES67 input: Audio input 1 is defined by AES67 input 1 and so forth.
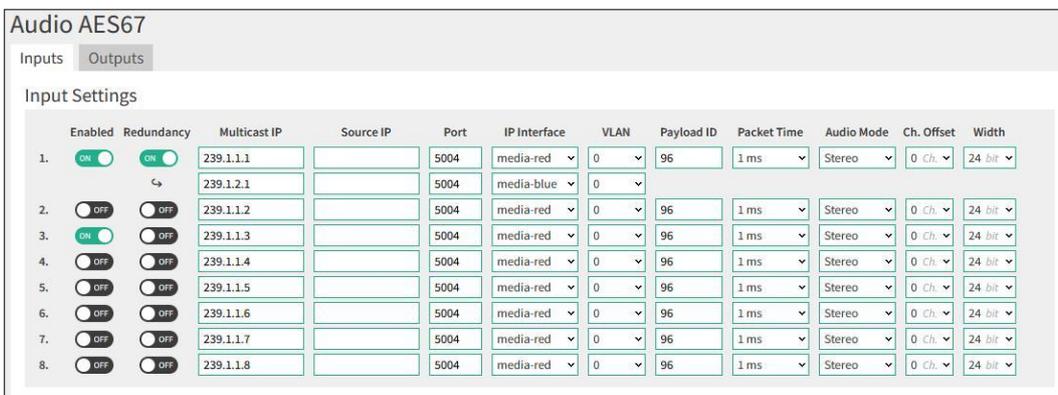
To configure AES67 inputs:

1. Navigate to the page **Audio AES67**.
2. Click on the tab **Inputs**.
3. Configure the parameters. Note that every AES67 input source configuration is defined by one AES67 input: Audio input 1 is defined by AES67 input 1 and so forth.
4. Click **Save**.
✓ You have configured the AES67 inputs.

Parameters

Enable	Enable the input for the corresponding input source configuration (numbered).
Redundancy	Choose whether to receive a redundant stream in case of failure.
Multicast IP	Enter the IP address for multicast.
Source IP	Enter the IP address of the device that sends the stream.
Port	Enter the port number that is used to receive the stream.
IP Interface	Select the IP interface that is used to receive the stream.
Payload ID	Enter the payload ID to identify the type of audio data being received.
Packet Time	Select the packet time.
Audio Mode	Select the number of channels: Stereo/Mono.

| Ch. Offset | Select the channel offset. The channel offset refers to the location of the audio data for a particular channel within a multi-channel audio stream. |
| Width | Select the sampling width. |

5.5.2 Configuring AES67 outputs

Since the MoIN is not a physical device, it does not have physical interfaces, except for network interfaces. You can virtually configure these network interfaces in the web interface of the MoIN to use virtual outputs for signals that usually require a physical interface. Every decoder output is defined by one AES67 output and will be sent as an AES67 stream: Decoder output 1 is defined by AES67 output 1 and so forth.

To configure AES67 outputs:

1. Navigate to the page **Audio AES67**.

2. Click on the tab **Outputs**.

3. Configure the parameters. Note that every decoder output is defined by one AES67 output: Decoder output 1 is defined by AES67 output 1 and so forth

4. Click **Save**.

✓ You have configured AES67 outputs.

Parameters

Enable	Enable the output for the corresponding decoder (numbered).
Redundancy	Choose whether to send a redundant stream in case the first one stream fails.
Multicast IP	Enter the IP address that the audio data will be sent to. The audio data will be sent to all devices on the network that are listening on this multicast IP address.
Port	the port number that the audio data will be sent to. It is important to ensure that the same port number is used on all devices on the network to ensure that the audio data is correctly received.
IP Interface	Select the IP interface that the data will be sent from.
VLAN	Select a VLAN to segment the network traffic for the AES67 output onto a specific VLAN. This allows you to separate the audio data from other network traffic for better performance and security.
Clock Source	Select the source of the clock that is used for synchronization of the audio data.
Delay	Introduce a delay in the audio data to compensate for network latency. The delay can be adjusted to ensure that the audio data is correctly synchronized with other devices on the network.
Payload ID	Enter the payload ID to identify the type of audio data being sent.

Packet Time	Select the packet time.
Audio Mode	Select the number of channels: Stereo/Mono.
Width	Select the sampling width.
QoS DSCP	Select the quality of service (QoS). The selected packet will be prioritized.
TTL	Set the Time-To-Live (TTL) for the packets. The TTL determines how many hops the audio data packets can make on the network before they are discarded.
UDP Only	Choose whether the audio data is sent using the UDP protocol only. If enabled, the audio data will only be sent using UDP, and other protocols will not be used.
Empty Packets	Choose whether empty packets are sent along with the other packets. Empty packets can be used to ensure that the network buffer is always full and to reduce the risk of audio dropouts.

5.6 Network Settings

5.6.1 TCP/IP: Configuring the Ethernet Interfaces

The MoIN has several Ethernet interfaces. By default, the ctrl interface is for configuration and the others are for data exchange. The interfaces were set up during installation and can be configured in the MoIN MCU. In the MoIN container, you can configure DNS, SFTP, and proxy server settings.

To configure TCP/IP settings:

1. Navigate to the **TCP/IP** page.
2. Enter the IP address of the primary and secondary domain name servers (DNS).
3. Enable the SFTP service for this MoIN container. Enabling the SFTP server provides access to the /media directory within the MoIN container's Linux file system.
4. Enable the use of a proxy server and enter the host IP address. The proxy server will only be used for Icecast input streams.
5. In the **Streaming Data** block, nable data exchange on the ctrl interface. By default, the ctrl interface is only used for configuration purposes.

✓ You have configured the TCP/IP settings. All the other settings must be made in the MoIN MCU.

5.6.2 SNMP: Configuring Access Data for External Requests

You can configure access data (read community/write community) that is necessary for external SNMP requests to the MoIN.

SNMP (Simple Network Management Protocol) is a protocol used for managing and monitoring network devices. SNMP requests can be used to retrieve information such as the MoIN's current settings and performance metrics. This information can be used to diagnose problems and optimize network performance. SNMP requests can also be used to configure the MoIN remotely, allowing administrators to adjust settings.

> For the SNMP manager tool to operate correctly, it requires the specific MIB files. These MIB files must be compiled by your SNMP manager tool. You can save the MIB files in the block **MIB File**.

1. Navigate to the page **External APIs**.
2. Click on the tab **SNMP**.
3. Select the protocol version in the block **SNMP Protocol**.
4. Configure the parameters in the block **Read/Write Community** or **SNMP3 / Security**. The parameters differ depending on the selected protocol version.
5. Click **Save**.
✓ You have configured the access data for external SNMP requests.

Parameters

Read Community	Enter SNMP access data for the external read-only SNMP access to the device.
Write Community	Enter SNMP access data for the external write SNMP access to the device.
Read/Write user	Enter user name and password for the external write SNMP access to the device.
Read/Write user	Enter user name and password for the external read-only SNMP access to the device.
Security protocols	Select an authentication protocol and a privacy protocol.

5.6.3 SNMP: Configuring Trap Managers

As part of the monitoring function, the device can send SNMP traps to the defined IP addresses of the SNMP managers. SNMP traps are messages that are sent from a network device to a central management system when a specific event or condition occurs. SNMP traps are used as a means of notifying network administrators of important events, such as errors or performance issues, allowing them to take corrective action as needed. You can also readout the settings via SNMP Get.

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> ⚠ For the SNMP manager tool to operate correctly, it requires the specific MIB files. These MIB files must be compiled by your SNMP manager tool. You can save the MIB files in the block **MIB File**.

1. Navigate to the page **External APIs**.
2. Click on the tab **SNMP**.
3. Select the protocol version in the block **SNMP Protocol**.
4. Select the location of the table indices in the block **Trap Configuration**: OID or OID plus additional index.
5. Configure the parameters in the block **Trap Manager**.
6. Click **Save**.
✓ You have configured the trap managers. If you changed the location of table indices, the MoIN must reboot. Each enabled trap is sent once at startup for initialization.

Parameters

Version	Select the format version of the SNMP traps.
IP or Domain Name	Enter the IP address or domain name of the trap receiver.
Port	Enter the port number.

5.6.4 Ember+: Configuring Access for Monitoring

As part of the monitoring and remote-control function, the device is capable to be controlled via the Ember+ protocol.

1. Navigate to the page **External APIs**.
2. Click on the tab **Ember+**.
3. Configure the parameters in the block **Settings**.
4. Click **Save**.
✓ You have configured the Ember+ access.

Parameters

Mode	Select the mode from the dropdown menu.
Timeout	Enter the value for interval in seconds for a timeout.
Port	Enter the port number for the connection.

5.7 Audio over IP Settings

5.7.1 Setting up a SIP connection

> This option is only available if the right *EBU Tech 3326* is enabled.

The MoIN supports audio IP streaming using SIP (Session Initiation Protocol). You can use a SIP connection for the encoder output and decoder input directly over the [Data] interfaces or over server (registrar). For a direct SIP connection, no registrar entry is necessary.

To set up a SIP connection:

1. Create an input source configuration for SIP.
2. Assign the SIP input source configuration to an audio output of the decoder.
3. Navigate to the page **SIP**.
4. In the field **Port**: Enter the local SIP port number for the MoIN. Enter "0" for a direct SIP connection.
5. In the field **Call acceptance mode per audio channel**: Select a mode for the case that more than one SIP account is assigned to one of the four possible audio channel input priorities (Main – Backup1/2/3).

- **Multiple**: Multiple calls will be accepted. The highest priority call will feed the audio output.
- **First Call, First Serve**: Multiple calls will be accepted. The first accepted call will feed the audio output, even if a higher-priority call is coming in. Once the first call hangs up, the active call with the highest priority will feed the audio output.
- **Single**: Only one active call per audio channel is accepted. Other incoming calls will be rejected.

6. Click **Save**.

✓ You have set up a SIP connection.

> In the modes "Multiple" and "First Call, First Serve", all incoming calls will receive the same audio from the corresponding audio input. For example, if a SIP account is assigned to one of the four input priorities of audio output 2, then it will answer with the audio of audio input 2.

5.7.2 Adding SIP phonebook entries

> This option is only available if the right *EBU Tech 3326* is enabled.

You can preconfigure up to 450 entries in the SIP phonebook. You can use SIP phonebook entries to quickly establish connections via SIP dial.

To add and configure phonebook entries:

1. Navigate to the page **SIP Phonebook**.
2. If no entries are available, then click **Create first entry**. If there are already one or more entries available, then click ⊕
3. Click **Edit**.

> A dialog window opens.

4. Configure the parameters.

5. Click **Save**.

✓ You have added and configured a new SIP phonebook entry. To use phonebook entries, see 5.7.3 Establishing connections via SIP dial.

Parameters

Name	Enter the name of the contact.
Connect	Enter the username/address of the connecting device (registered second user agent). For direct connections to different SIP ports, add ":" and the corresponding SIP destination port number.
Encoder/Decoder Profile	Select the codec profile in the dropdown menu. To select different profiles for encoder and decoder, click on the arrow next to the field to expand the menu. **Encoder Profile** defines the audio format that the MoIN (encoder) sends. **Decoder Profile** defines the audio format that the external encoder device sends.
Delay	Set up the send delay which the encoder should wait in order to send audio over SIP (For more information, see 5.4.6 Setting Up a Buffer).
Port	This setting is only applicable if you connect a remote encoder directly via the IP address. Enter the UDP/RTP port of the sender/destination. Enter "0" for an automatic port.
Reconnect Count	Set the number of reconnections.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 5.4.6 Setting Up a Buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2). If you do not want to use this offset, enter "0".

5.7.3 Establishing connections via SIP dial

! This option is only available if the right *EBU Tech 3326* is enabled.

Prerequisite: You have already assigned and activated a SIP input source configuration to a decoder audio output(see 5.4.1 Assigning Source Streams to a Decoder.

Prerequisite: You have already added SIP contacts and assigned codec profiles to the SIP phonebook entries (see 5.7.2 Adding SIP phonebook entries).

To establish a connection and start data transmission:

1. Navigate to the page **Easy2Connect**.

2. The contacts from the SIP phonebook are listed in the block **Phonebook**. Select an entry for data transfer and click the 📞 button next to it.

> The selected contact appears in the block **Call** and is now ready for connection.

3. To establish the connection, click the 📞 button in the block **Call**.

4. To hang up on the connection, click the 📞 button in the block **Call**.

5. For a quick dial, manually change the encoder configuration in the field **Encoder/Decoder Profile** and enter the dial number into the field **Connect**. For manual access to the connection settings for the decoder, disable the switch **Use default settings**.

✓ You have established a connection via SIP dial.

> ⚠ To see the details of the currently active SIP connection for the decoder and of the current data transfer, click on the tab **Details/Overview**.
> - Green: SIP connection is active
> - Orange: SIP connection is not active. SIP registration was successful.
> - Red: SIP connection is not active. SIP registration has failed.

> ⚠ To reset the counters, click **Reset** in the block **Counters**.

5.7.4 Setting Up SAP

> ⚠ This function is only available if the *Ravenna* right is activated.

The MoIN supports SAP (Session Announcement Protocol) for stream announcement.

Prerequisite: You are logged in as an admin.

To set up the SAP connection:

1. Navigate to the page **SAP**.
2. Configure the parameters.
3. Click **Save**.
✓ You have set up the SAP connection.

Parameters

Mode	To enable SAP, select the service mode. "Client/Server" is recommended.
Announce interval	Enter the time interval between sending SAP announcement.
Multicast loop	Multicast loop to makes the MoIN receive its own SAP announcements. The default setting is OFF.
Receive address and port	Set the multicast address and port to receive SAP announcements.
Ethernet port	Select the [Data] interface for transmission of SAP announcements in the dropdown menu.
Bandwidth limit	To avoid overhead, set a bandwidth limit for SAP announcements.
Destination address and port	Set the destination multicast address and port for SAP announcements.

5.7.5 Configuring Livewire Settings

> ⚠ This option is only available if the right *Livewire* is enabled.

Livewire is an audio-over-IP system used for routing and distributing broadcast-quality audio. The livewire routing protocol is used to route audio as well as GPIO ports.

Prerequisite: You are logged in as an admin.

To configure livewire settings:

1. Navigate to the page **Livewire**.
2. Enable **Routing Protocol**.
3. Configure the parameters.
4. Click **Save**.

✓ You have configured the livewire settings.

Parameters

Hardware identification	Enter the hardware ID.
Ethernet	Select the [Data] interface to be used.
GPIO	Assign names to [GPO 1-5] and [GPO 6-8].
Advertisement	Enter the ports for Livewire Advertising and for its configuration.

5.7.6 Monitoring Audio via Live Listening

 This option is only available if the right *Live Listening* is enabled.

Live Listening is a function for audio monitoring via web interface or any web stream client. Live Listening enables you to listen "live" to any of the audio input sources as well as the audio outputs directly over the web interface. The MoIN is equipped with an adjustable bit rate encoder that can encode the input audio signal in five different formats. You can manually set up the parameters for audio encoding depending on the bandwidth available for data distribution.

Prerequisite: You have already configured the input sources and assigned them to the encoder and decoder.

To set up audio monitoring via Live Listening:

1. Navigate to the page **Live Listening**.
2. Configure the parameters.
3. Set the switch **Activation** to **ON**.
4. Click **Save**.
5. In the banner, select an available audio source from the dropdown menu **Live Source**.

6. To change the playback volume, click the green volume levels.

7. To start streaming, click the play button.

✓ The MoIN now plays the audio over the web interface.

Parameters

Port	Enter the port number for streaming. The URL for Icecast streaming is "`IP address of the device:streaming port`". The standard port for live streaming is 8000. Example: `http://192.168.12.23:8000`.
Encoder Format	Select an audio format for streaming.
Audio Mode	Select a stereo or mono audio mode.
Sampling Rate	Select a sampling rate for streaming.
Bitrate	Select a bit rate for the selected audio format quality.

5.8 System Settings

5.8.1 Setting Up Alarms

You can set several alarms that trigger in case of defined events. You can monitor the following:

LAN Link	Alarm is triggered in case of an error in Ethernet data communication.
PTP clock status	Alarm is triggered if PTP signal is not present.
AES/EBU No Signal	Alarm is triggered if no decoded digital audio is available in the audio input.
Silence Detection	Alarm is triggered if the device detects silence in the left and/or right channel of the audio output.
No Input Data	Alarm is triggered if no input data is detected.

To set up alarms:

1. Navigate to the page **Alarm**.

2. For each alarm, configure the corresponding parameters.

3. Click **Save**.

✓ Enabled alarms will now be saved in a log entry and signaled over SNMP, LED or GPO if triggered.

Parameters

Enable	Enable or disable an alarm.
Priority	Select the priority of the alarm message.
Values	Enter the value below or above which the alarm triggers.
T1	Set the delay time for alarm trigger.
T2	Set the delay time for alarm end.
SNMP, LED, GPO	Enable the corresponding switch if the alarm should be signaled by SNMP traps, an LED or GPO switch.

5.8.2 Entering container information

For better identification of the MoIN container, you can enter container-specific data that will be displayed in the banner and can be displayed in the browser tab title.

1. Navigate to the page **Global**.
2. Configure the parameters in the block **System info**.
3. Click **Save**.
✓ The saved information is now displayed in the banner.

Parameters

Name	Enter the name of the container for better reference.
Location	Enter the location of the container.
Description	Enter further important information on the container.

5.8.3 Setting Up Session Timeout

Session timeout is a security feature that automatically logs out the user after a period of inactivity. You can define the period of inactivity or disable session timeout.

1. Navigate to the page **Global**.
2. In the field **Session timeout**, enter the value in minutes for the period of inactivity necessary to automatically log out the user. Enter "0" to disable this function.
3. Click **Save**.
✓ You will now be automatically logged out after the set period of inactivity.

5.8.4 Changing the Title of the Browser Tab

You can change the title of the browser tab to display the information you need for better reference.

1. Navigate to the page **Global**.
2. In the field **Browser Tab Title**, enter the information you want to display. You can use variables for specific information. Variables will update automatically if the corresponding information changes. View the possible variables by hovering over the input filed.
3. Click **Save**.
✓ The title of the browser now displays the configured information.

5.8.5 Generating and Saving a Settings File

You can download the current settings and save them as a file either to your local storage or to the internal storage of the MoIN. You can use this file later to restore the settings or upload it to another device to copy the settings.

1. Navigate to the page **Global**.
2. In the block **Settings Download**, enter a file name and click **Generate**.
    ➢ A file is being created. This may take a few seconds.
    ➢ The download option with the time and date of file creation appears.
3. Click **Download**.
4. Save the file to a location of your choice.
5. Click **Save**.
✓ You have saved settings to a local file. To upload and activate the settings stored locally, see 5.8.6 Loading Settings from a File.

5.8.6 Loading Settings from a File

You can upload a settings file to restore previous settings or copy the settings from another container. For information on how to generate a settings file, see 5.8.5 Generating and Saving a Settings File.

1. Navigate to the page **Global**.
2. In the block **Settings update**, click **Browse/Drop file**.
3. Select the settings file you want to upload.
4. Click **Upload** to upload the settings file. The file upload may take a while. Do not interrupt this process.
✓ The new settings are now active.

5.8.7 Generating and Downloading a Diagnostic Report

In case of any problems or failures, you can generate and download a diagnostic report to send to 2wcom.

To generate and download a diagnostic report:

1. Navigate to the page **Global**.
2. In the block **Diagnostic Report**, select the time period for which the device captures all activities.
3. Click **Generate**. A file is being created. This may take a while. Do not interrupt this process.
   ➢ The download option with the time and date of file creation appears.
4. Click **Download**.
5. Save the file to a location of your choice.
✓ You have generated and downloaded a diagnostic report.

5.8.8 Rebooting the Device

To reboot the device:

1. Navigate to the page **Global**.
2. In the block **Control**, click **Now** in the field **Reboot Device**.
✓ The device restarts. After the restart, you will have to log in again.

5.8.9 Restoring Factory Settings

Restoring the factory settings will delete all configurations that were made by a user except for the IP address of the CTRL interface. This also applies to the access accounts.

To reset the device to factory settings:

1. Navigate to the page **Global**.
2. In the block **Control**, click **Now** in the field **Load Factory Settings**.
✓ You have restored the factory settings.

5.8.10 Changing Login Data

The default accounts are a read-only access (Guest account), a full access without a permission to manage the user accounts (Manager account), and a full access (Admin account). The user account SFTP service is used only for the access from an external SFTP client for uploading audio files and saving them in the internal storage.

Change the login data after the first login to the web interface.

The default login data for the first login are (case sensitive):

- Guest account: "guest"/ "guest"
- Manager account: "manager"/ "manager"
- Admin account: "admin"/ "admin"
- FTP service: "sftpuser"/ "sftpuser"

To change the login data:
1. Log in as an admin.
2. Change the login data for an account in the corresponding block and repeat the new password.
3. Click **Save**.
✓ You have changed the login data.

5.8.11 Adapting the Access for User Accounts

You can configure the access to certain web interface pages for the manager and guest accounts.

Prerequisite: You are logged in as an admin.

To adapt the access for manager and guest accounts each individual MoIN menu:
1. Navigate to the page **User**.
2. Click on the tab **Menu Access**.
3. Enable or disable the access to the separate menus by setting the corresponding switch to either **ON** or **OFF**.
4. Click **Save**.
✓ The new access configuration is now active.

5.9 Status Information

5.9.1 General Overview

The page **Overview** gives you general information on the status of your MoIN. The appearance of this page might differ depending on the activated rights and settings.

Overview

Status
Uptime:	20 days, 20:07:42	ctrl:	UP, 1 Gbit, 192.168.98.108
media-red:	UP, 1 Gbit, 192.168.100.98	media-blue:	UP, 1 Gbit, 192.168.102.181
data3:	UP, 1 Gbit, 192.168.102.182		

The block **Status** gives general container-specific information as well as information on the ethernet interfaces.

Decoder Status

To get a quick and detailed overview, you can view the current status of the decoder and the incoming data. To view the decoder status, navigate to the page **Overview** and click on the tab **Codec**.

In the block **Decoder**, you can see the status of the currently active decoders:

Green: Enabled
Gray: Disabled
Red: Error

- To view more details on a decoder, click on the corresponding panel.
  - ➢ The **Details** view below the block **Decoder** now displays the status of the decoded audio.
- To reset the counters in the status fields, click **Reset Counters**.

The blocks display the following counters:

IP block	**Missed** indicates packets lost for the corresponding RTP receiver. This is the main error information when neither RIST, FEC, nor dual streaming are active.
FEC block	**Recov.** indicates the number of packets that were recovered by FEC. If dual streaming is active, then the same FEC is used on both IP connections.
	Unrecov. indicates the number of packets that could not be recovered. This is the main error information if FEC is active.
RIST block	**Requested** indicates the number of packets that are lost or late on the receiver side. These packets are requested for retransmission.
	Retransmitted indicates the number of packets that were retransmitted by the sender.
	Unrecovered indicates the number of packets that could not be recovered. This is the main error information if RIST is active.
Dual streaming block	**Unrecovered** indicates the number of packets that could not be recovered. This is the main error information if dual streaming is active.

The following abbreviations may appear in the decoder status overview:

SR	Sampling rate
SW	Sampling width
FEC	Forward error correction
Err	The number of errors in the decoder (e.g. failed samples, no audio, PER)
PER	Packet error rate of the input stream

Encoder Status

To get a quick and detailed overview, you can view the current status of the encoder and the incoming audio data. To view the encoder status, navigate to the page **Overview** and click on the tab **Codec**.

In the block **Encoder**, you can see the status of the currently active encoders.

- To view more details of an encoder, click on the corresponding panel.
  - ➢ The **Details** view below the block **Encoder** now displays the status of the input source, codec profile, and the assigned audio outputs.
- To reset the counters in the status fields, click **Reset Counters**.
- Details of the assigned outputs are displayed in the table. To view the status of an assigned output, select the corresponding tab.
- To change the order of the table columns, drag/drop the column headings.
- To change the column width, hover over the frame line until the cursor changes into a two-headed arrow. Click and move the frame line.

The encoder output displays the following counters:

Lost	Lost indicates the number of lost packets.
RIST/Requested	This indicates the number of packets that the receiver requested for retransmission by the sender.

RIST/Retransmitted   This indicates the number of packets that were retransmitted by the sender. Some requests may not answered due to timing and jitter.

TS Multiplexer status

The Tab **TS Multiplexer** on the page **Overview** gives a detailed overview on the status of the enabled multiplex outputs.

- To see more details on the configured programs in one multiplex, click on the corresponding Multiplex.
- To see more details on the payload of a program, click on the corresponding program.


System Information

The page **Global** gives specific information on the device, such as the uptime and time of the last boot, serial number, activated rights and software version. The current version of your MoIN is the **Bundle Version**.

5.9.2 Internal Storage

You can upload audio files to the internal storage to use them e.g. as a backup input source. You can also upload settings files and firmware files to install later. Generated settings files also appear on the **Storage** page.

If the *Ravenna* right is activated, the **Storage** page also lists downloadable SDP files that contain vital information on the stream.
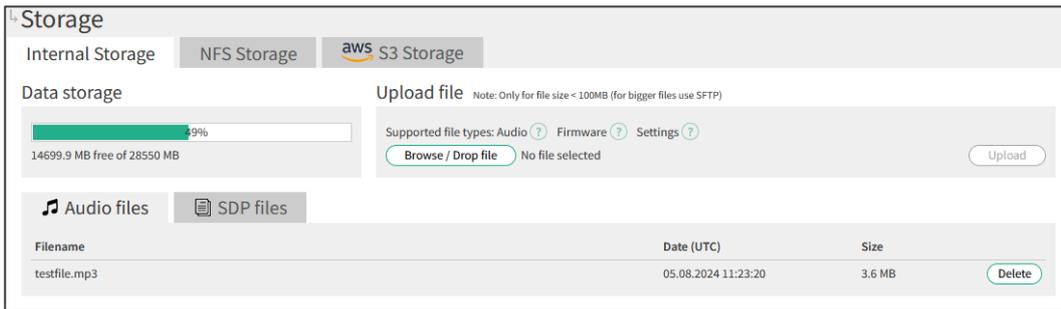

- Prerequisite: You are logged in as an admin.

To upload a file to the internal storage:

1. Navigate to the **Storage** page.

2. In the **Upload file** block, select **Browse/Drop file**.

3. Select the audio file, firmware file, or settings file that you want to upload.

4. Click **Upload**. The upload may take a while. Do not interrupt this process.

   ➢ The uploaded file is now displayed in the corresponding tab.

✓ You have uploaded a file to the internal storage. The percentage of used storage is displayed in the block **Data storage**. You can install an uploaded settings file or firmware file on the **Global** page.

5.9.3 NFS storage status

You can connect to an NFS storage to use audio files as a backup input source. NFS (Network File System) storage is a type of file-level storage protocol that allows remote users to access files over a network as if they were stored locally on their own device. NFS works by allowing a server to share its file system resources with one or more clients over a network. Clients can access the shared files by mounting them as if they were local file systems.
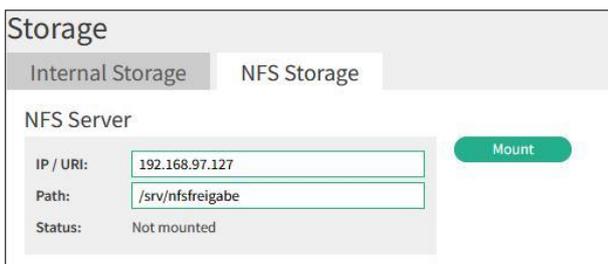
To connect to an NFS storage:

1. Navigate to the page **Storage**.

2. In the tab NFS Storage, enter the IP / URL of the NFS Server.

3. Enter the path on the server that contains the audio files.

4. Click **Mount**.

✓ The MoIN now mounts the files. This process may take a while.

5.9.4 Log

The **event log** is a record of significant system events, such as system restarts and error messages, which are crucial for monitoring the performance of the device. These events have an alarm priority and may require immediate attention or action to resolve issues or ensure proper operation. See also: 5.8.1 Setting Up Alarms.

The **extended log** contains less critical information compared to the event log, and is primarily intended to provide insights into general events. The log entries in the extended log are informational and do not carry alarm priorities, they are volatile and do not persist over restarts.

- To automatically refresh the page and immediately see new entries, toggle the switch **Auto Refresh**.
- To sort the log entries, click on the column header of the parameter by which you want to sort the entries. To reverse the order, click the same header again.
- To search for a specific entry, enter a term into the search bar.
- To save the list to a log file, click **Download**.
- To delete all log entries, click **Clear**. Confirm your decision in the dialog window.

5.9.5 Priority of Alarm Messages

Priority	ID/Code	Definition
Emergency	0	System is unusable
Alert	1	Actions must be taken immediately
Critical	2	Critical condition
Error	3	Error condition
Warning	4	Warning condition
Notice	5	Normal but significant condition
Informational	6	Informative message
Debug	7	Debug-level message

In case of an alarm, an error report with the priority of the error will be sent to the Network Operations Center (NOC). The responsible second-level support will decide by means of this information how urgent the alarming case is and what measures are necessary. The event will be recorded in a log entry.

6 Troubleshooting and Support

More often than not, it is only a small detail that has been overlooked and leads to a problem. Therefore, read the user manual carefully, as this will help you to understand, prevent and eliminate typical problems.

Report failures by email to **support@2wcom.com**.

Support via VPN

To provide fast and efficient support, we often require access to the system or server. For a smooth support process, it is recommended that we have direct access to the system, such as through a VPN connection. This allows us to troubleshoot and resolve issues more effectively. Alternative solutions, such as screen sharing via Microsoft Teams or TeamViewer, may be sufficient for addressing simple questions. However, a complete support case can typically only be partially handled this way, and direct system access via VPN is preferred for more comprehensive troubleshooting.

Generating a Log Archive

To obtain a detailed overview of the system in a support case, you can create an archive that includes the most important system logs and settings. Sensitive data and passwords are **not** included in this archive.

To generate a log archive:

1. Go to the Emergency Script directory: `cd/usr/src/post_setup/_emergency_script/`
2. Generate the archive file: `./generate-logs.sh` (Do not use the sudo command)
3. Locate and download the archive file. The created file will be located in the same directory: `k8s-logs.tar.gz`

✓ Send the downloaded file to 2wcom for troubleshooting.

7   Technical Details

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MoIN Distribution   **MoIN** Studio   **MoIN** Streaming

Audio

Network protocols	EBU TECH 3326, SMPTE ST 2210, AES67, RAVENNA, Livewire+, Dante, Icecast, Shoutcast, Wowza
Algorithms	Linear PCM, G.711, G.722 Opus, Ogg Vorbis MPEG 1/2 Layer 2, 3 MPEG-2/MPEG-4 AAC-LC, MPEG-4 HE-AAC v1 & v2, MPEG-4/MPEG-D xHE-AAC MPEG-4 AAC-LD/ELD/ELDv2 Enhanced aptX (E-aptX)
Optional:	Dolby Digital (AC-3), Dolby Digital Plus (E-AC-3), Dolby E on request. (optional) Bit transparent transmission of AES/EBU input
Sample Rates (kHz)	16, 22.05, 24, 32, 44.1, 48, up to 192

Data

Data	Audio and GPIO transmission, controlling and setup functions
Audio streams (in)	Up to 512
Audio streams (out)	Up to 512
UECP (RDS data)	Linked/ Synchronous to the audio

Performance

Encoder instances	Up to 512 more on request depending on hardware
Decoder instances	Up to 512 more on request depending on hardware

IP

Streaming protocols	ACIP Compliant, Unicast, Multiple Unicast & Multicast EBU Tech 3326, 3368 (SDP, SIP, SIP phonebook) AES 67/Ravenna (SAP, RTSP, PTPv2) HLS, Livewire+, RFC 3550, RFC 3551, RFC 3640, RFC 2250, TS RTP, UDP, RIST and SRT streaming, Icecast / Shoutcast, Wowza
Network protocols	IGMP, ICMP, DHCP, HTTPS, FTPS, SNMP
Transmission robustness	Pro MPEG FEC, RIST, SRT, Dual streaming, Stream4sure, Adaptive bitrate switching, Source switch concept, Management of packet size, buffers, QoS

Your audio. Our solution.

Technical details 2/2

General data

Time synchronization

PTPv2	Network synchronization according to IEEE 1588-2008
NTP	Via UDP or TCP

Control and monitor

Control

Protocols	HTTP/S, FTP, SSH, NMS, SNMP, Ember+, JSON
Configuration	Via web interface, SNMP or Ember+

Monitoring

IP & MPEG parameter	via SNMP
Live listening	via Icecast
Web interface	Silence detection, event logging, IP buffer jitter check
RDS / UECP	Realtime decoder

Alarm

SNMP Traps
Web interface
Log messages

Server dimensions

Server not included (can be chosen by customer)

Processor power (max.)	Dual CPU's, 40 Cores, 80 Threads
Memory	192GB RDIMM
SSD	500 GB+
Network	Quad-port NIC to provide, two ports for media data, two ports for software management / control 10G BASE-T ports for the above

Additional hardware interfaces (on request)

AES/EBU	Digital audio in/out
Madi	Multi channel audio digital interface
Dante	AES67 from Audinate
GPIO	Relays / contact closures

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Your audio. Our solution.

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