DVB for ALL!

# TROPHY

USER MANUAL

# TROPHY

## FFMPEG Multichannel Transcoder

# General information

FFMPEG Multichannel Transcoder designed to digital-to-digital conversion of one format of encoded data (video or audio) to another using FFMPEG solution.
Module are intended for indoor use only.

**Characteristics:**

- LINUX OS.
- Transcoder converts audio or video formats. Device has possibility to transcode up to 14 HDTV services. It can encode in real-time from various hardware and software sources.
- Convenient WEB-interface for setting transcoding parameters.
- Possibility to enter advanced FFMPEG commands using the command-line for video and audio editing: FFMPEG provides a variety of editing features, such as cutting, merging, and trimming video and audio files. Users can also add or remove audio tracks, adjust volume levels, and modify other properties, such as framerate and resolution.

# Device operation

**Safety Requirements**
Transcoder design complies with international safety standards. However, operation with any electric appliances requires caution. We recommend you to ask a qualified master to install the device. If you choose to install it yourself, please read this Operation Manual carefully. Pay special attention to safety requirements below.

**Supply Voltage**
Power supply must be AC 180 V...250V, 50/60 Hz. Make sure your power supply complies with these requirements.

**Overload**
Avoid overloading the supply network by extension cords or adapters. It may cause fire or give you an electric shock.

**Liquid Substances**
Store liquid substances away from the device and make sure no such substances get inside the device.

**Foreign Objects**
Please keep coins and other small objects away from the device to prevent their getting through the vent slots, which may cause serious damage to your device. Getting of insects into the device may also damage the device and, consequently, cause fire.

**Cleaning**
Disconnect the device from power supply before cleaning. Use soft, slightly damp cloth to clean the surface of the casing. Never use any solvents!

**Ventilation**
Make sure the vent slots are open and the location where the device is installed allows free air circulation. Never put the device on a soft surface or cloth. Do not operate and never store the device on the heat or under direct sunlight. Never put any other appliances on top of the device.

**Connected Devices**
Do not connect any unauthorized appliances to the device as it is dangerous and may damage the appliance and this device.

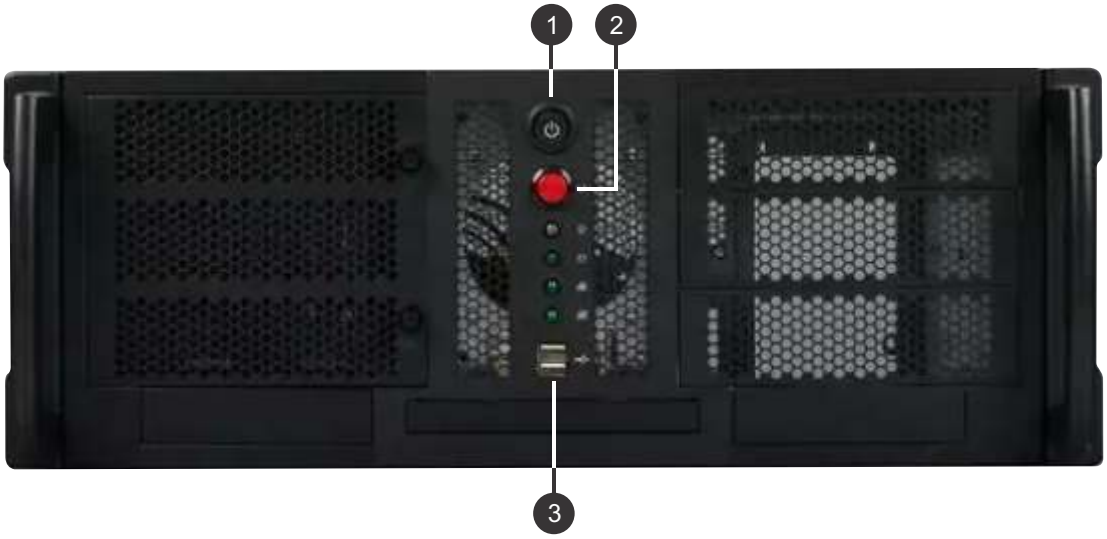
**Location**
Install the device indoors on hard surface. Make sure the device is well protected from direct sunlight or moisture.

WARNING: *Never remove the top or back panel of the device. The device contains no parts and units which can be handled by the user. If necessary, call service center for qualified personnel.*
*Do not leave the operating device unattended. Make sure it is out of reach of children.*
*In the event of a long pause between the watching, disconnect the device from the power supply by pulling the plug out of the socket.*
*In the event of any malfunction (lost image, cracking sound or odor), disconnect the device from the socket immediately and call the service center.*
*Subject to compliance with the instructions, the device life is 3 (Three) years following the manufacture date. Terms and conditions of further operation must be agreed upon by the owner of device and the service company.*

# Specifications

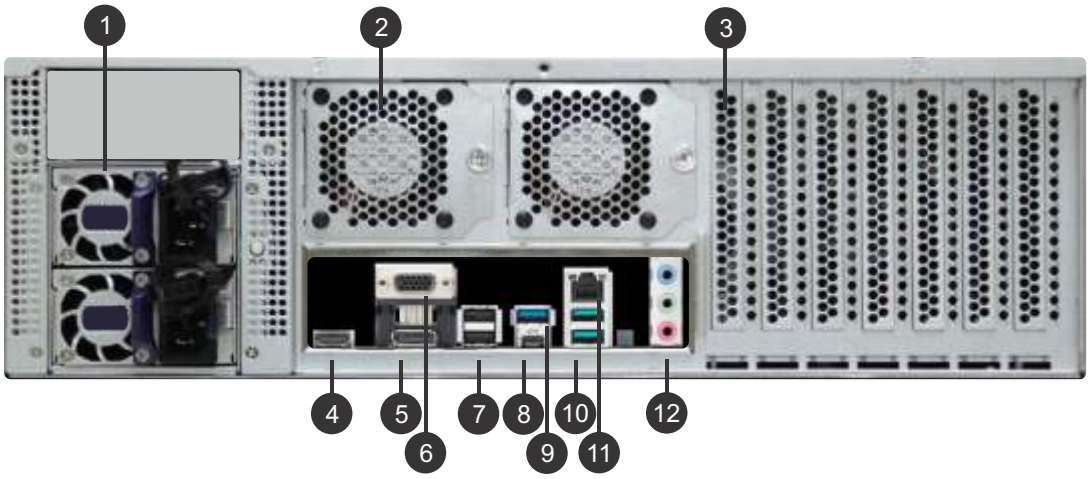
| | |
|---|---|
| **HardWare** | |
| Processor | Intel i9-14900K |
| RAM | 16G DDR5 |
| SSD | 256G |
| **Front panel connectors** | |
| LAN | Realtek Ethernet 2.5Gb |
| HDMI | HDMI 2.0 |
| DisplayPort | DP 2.0 |
| **Rear panel connectors** | |
| USB | 4*3.2USB, 4*2.0USB |
| TypeC | 1*TypeC |
| Mic | 3*3.5mm Jack |
| **Control&Monitoring** | |
| WEB | Web browser control |
| USB Virtual COM-port | USB connector |
| **SoftWare** | |
| OS | Linux / Ubuntu or Debian |
| FFMPEG | Version _____ |
| **Phisical** | |
| Interface language | English |
| Supply voltage | 220VAC |
| Wattage | up to 500W |
| Temperature range | 0...40 C |
| Dimensions | 4U, 465.2 x 430.0 x 176.0 (mm) |
| Gross Weight | 15 kg |

## Front Panel




| | |
|---|---|
| 1 | Power on/off |
| 2 | Reset button |
| 3 | 2*USB2.0 ports |

## Rear Panel




| | | | |
|---|---|---|---|
| 1 | Power supply | 7 | 2*USB2.0 ports |
| 2 | FANs | 8 | USB3.2 Gen2x2 TypeC |
| 3 | 1*PCIe 5.0, 3*PCIe 4.0 slots | 9 | USB3.2 Gen1 port TypeA |
| 4 | HDMI | 10 | 2*USB3.2 Gen2 port TypeA |
| 5 | Display Port | 11 | Realtek 2.5Gb Ethernet |
| 6 | VGA port | 12 | 3*Audio jacks |

# Setting for the Ethernet network interface

NETWORK CONNECTION VIA WINDOWS PC

These steps walk you through setting a Windows PC to a Static IP address, to allow an Ethernet connection with the unit on its default IP address of 10.10.10.20.
Connect your PC to the ETHERNET Port of the Device via Ethernet using a CAT 5E/6 cable.
On your PC, in the Control Panel, open Network and Sharing Center (Network and Internet for Windows 8 and above)
Once you have Network and Sharing Center open, click on "Change adapter settings."
Right Click on your Local Ethernet connection and click on "Properties."
Once the Ethernet Properties are open click on, "Internet Protocol Version 4 (TCP/IPv4)," and click on, "Properties."
In the Properties, select "Use the following IP address" and set the static IP: 10.10.10.10.
Click OK.
You are now ready to connect.

NETWORK CONNECTION VIA MAC OS

These steps walk you through setting a Mac running OS X to a Static IP address, to allow an Ethernet connection with the Device on its default IP address of 10.10.10.20.
Connect your Mac to the ETHERNET of the Device via CAT 5E/6 cable.
From the Apple menu, select System Preferences, then select network.
Select Ethernet.
From the Configure IPv4 menu, select Manually.
Enter the IP address 10.10.10.10.
Enter the Subnet Mask 255.255.255.0.
It is not necessary to enter DNS or Router.
Click Apply.
You are now ready to connect.

INSTALLING MULTIPLE DEVICES

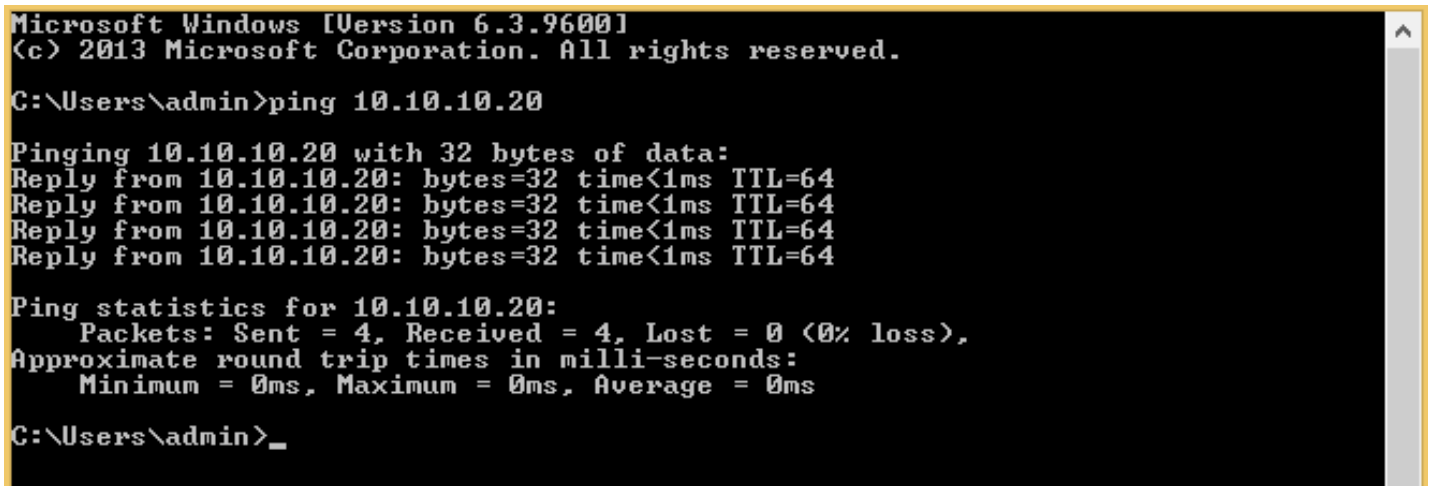
To install multiple Devices on the same network, make sure to CHANGE the IP address of each Device BEFORE you connect them to the same network so there will be no IP Conflicts. Point your web browser to the IP address of the unit (default is 10.10.10.20). Login to the unit, click NETWORK button, change the NETWORK SETTINGS as needed by your application. Save your settings.
As an example, you can set your Device(s) IP addresses to 10.10.10.20, *30, *40, etc. Write down these values or put a sticker on each unit with the new assigned IP address so it will be easy to login to the unit in the future.

# Setting for the Ethernet network interface

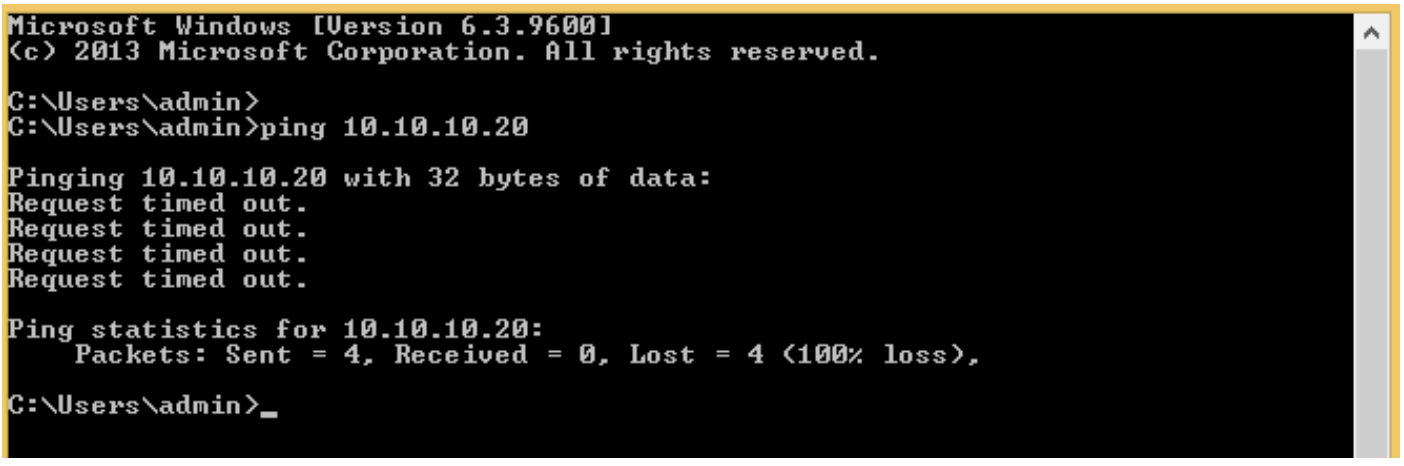
IP address: **10.10.10.20**
Subnet: **255.255.255.0**
Gateway: **10.10.10.1**
Default Username: **admin**
Default password: **admin**
It is recommended to change the password for confidential
(See the page 9, SSH ACCESS TO DEVICE)

To connect to the Web interface, we must first connect directly to the ETHERNET port on the front of the Device using an Ethernet patch cable CAT5e/CAT6 or higher.
Once connected, you can verify the physical connection by ping command. This step is not necessary but helpful to ensure a connection can be established before proceeding.

Open a CMD prompt in windows and use the following command: **ping 10.10.10.20**
If you are connected directly to the Device, you should get a response:




If not, the following message appears in the command prompt. The Device is not pingable, verify that your connections are secure and that your Static IP of your PC is set up correctly. Refer to Setting up a Static IP section of the guide.

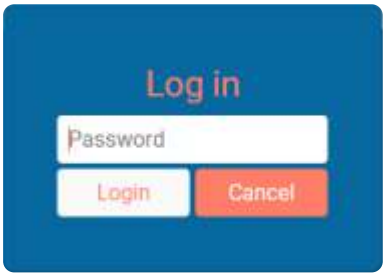


# Login into the WEB-interface

If you can ping the unit successfully, then we can proceed to open your web browser such as Chrome.
In the address bar, enter the default IP of the unit: **10.10.10.20** and press **Enter.**
The **Main Page** prompt appears for the Web interface.


Press **SETTINGS** button to enter **Settings** menu.

Default Password: **admin**

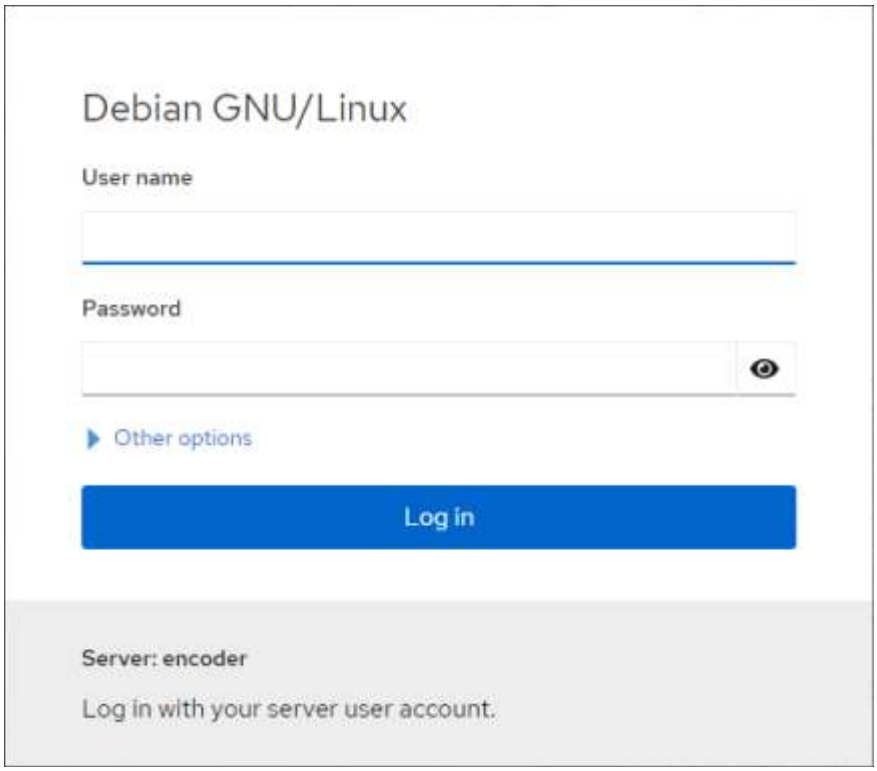



# Configure the device IP-addresses via the Cockpit

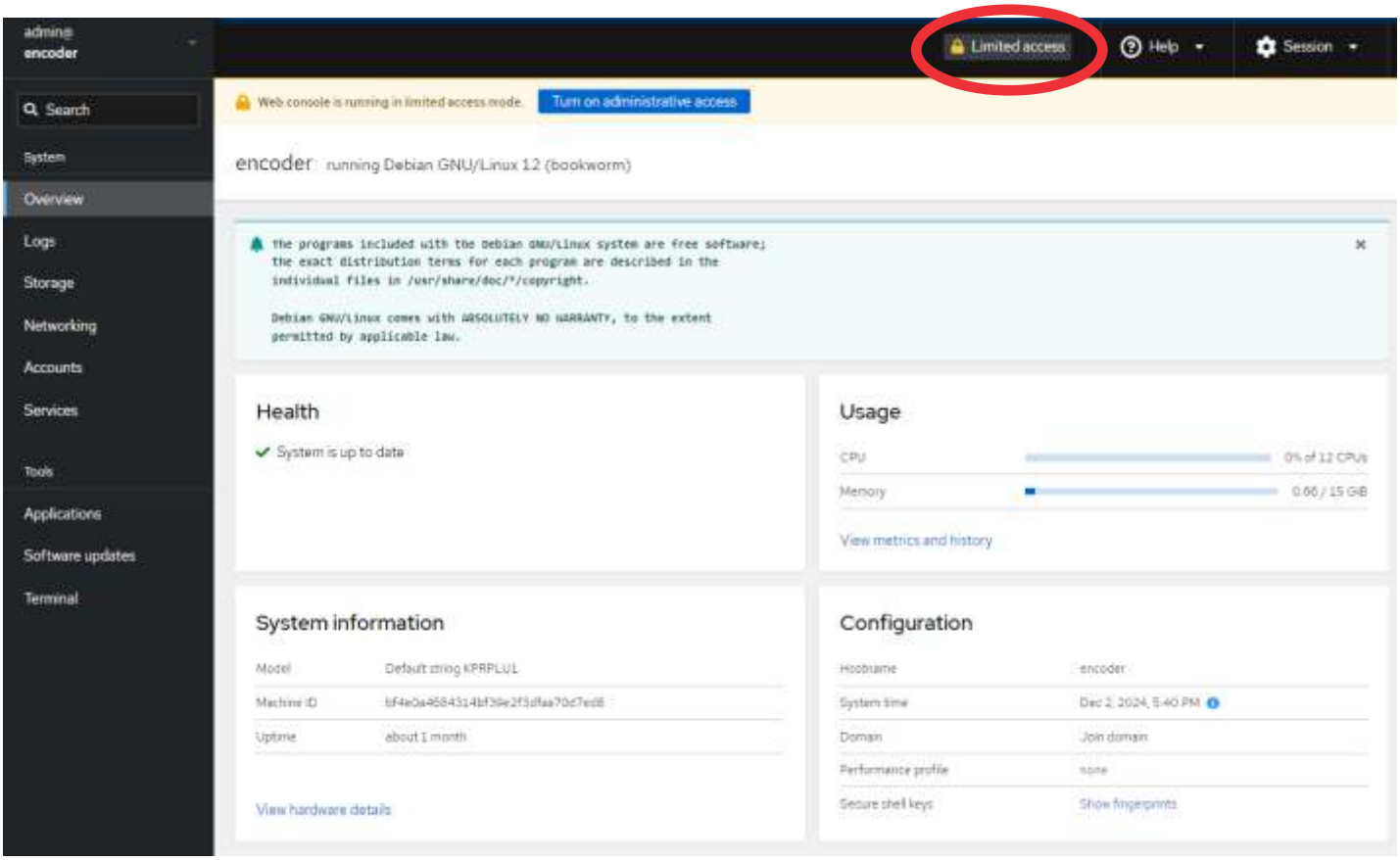
You can configure the device IP-addresses via the Cockpit web-based graphical interface for LINUX servers. See the information on the website: https://cockpit-project.org/

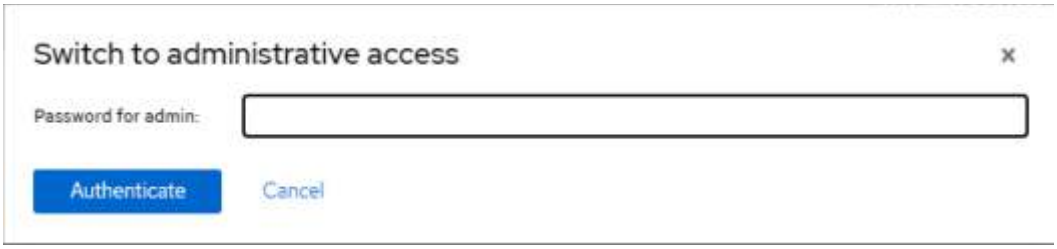
Press the **Cockpit** button.


You will redirect to 9090 port of the device.
Insert User Name and Password of the Linux graphical interface.
User name: **admin**
Password: **putinhujlo2025**



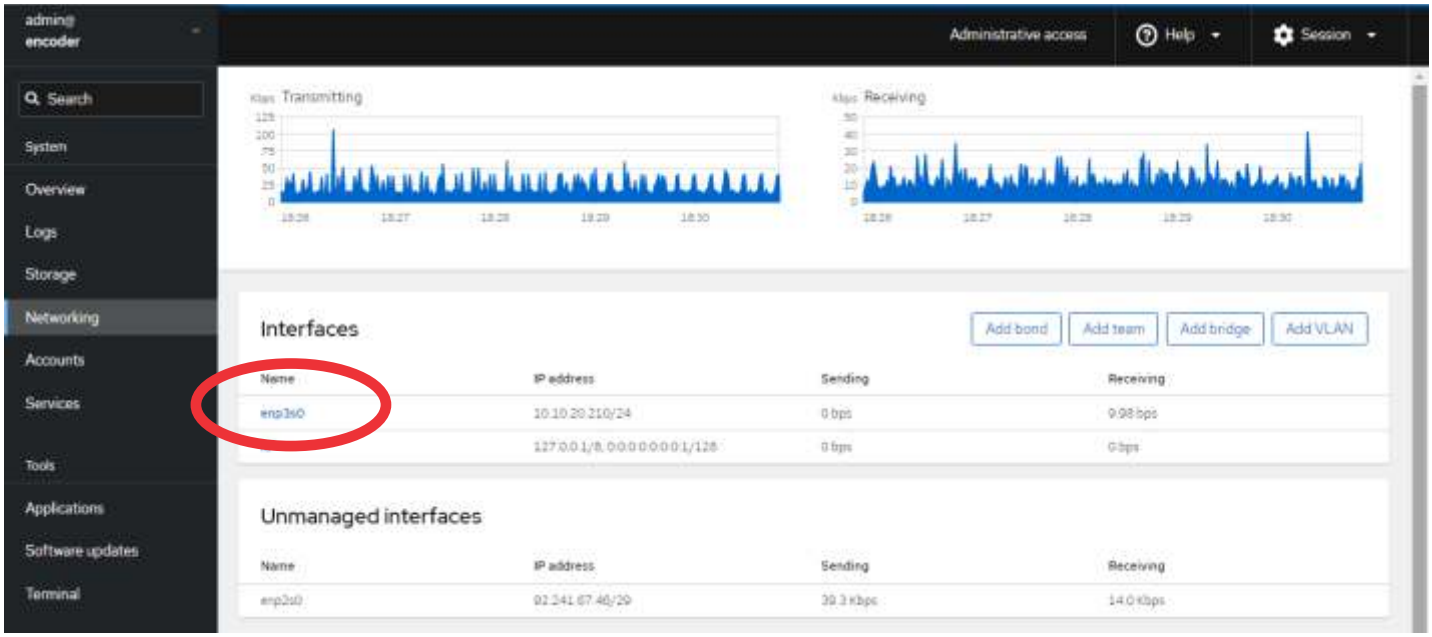
You will see the “Limited access” status if you connection was not secure. Click this message to see the authenticate window:



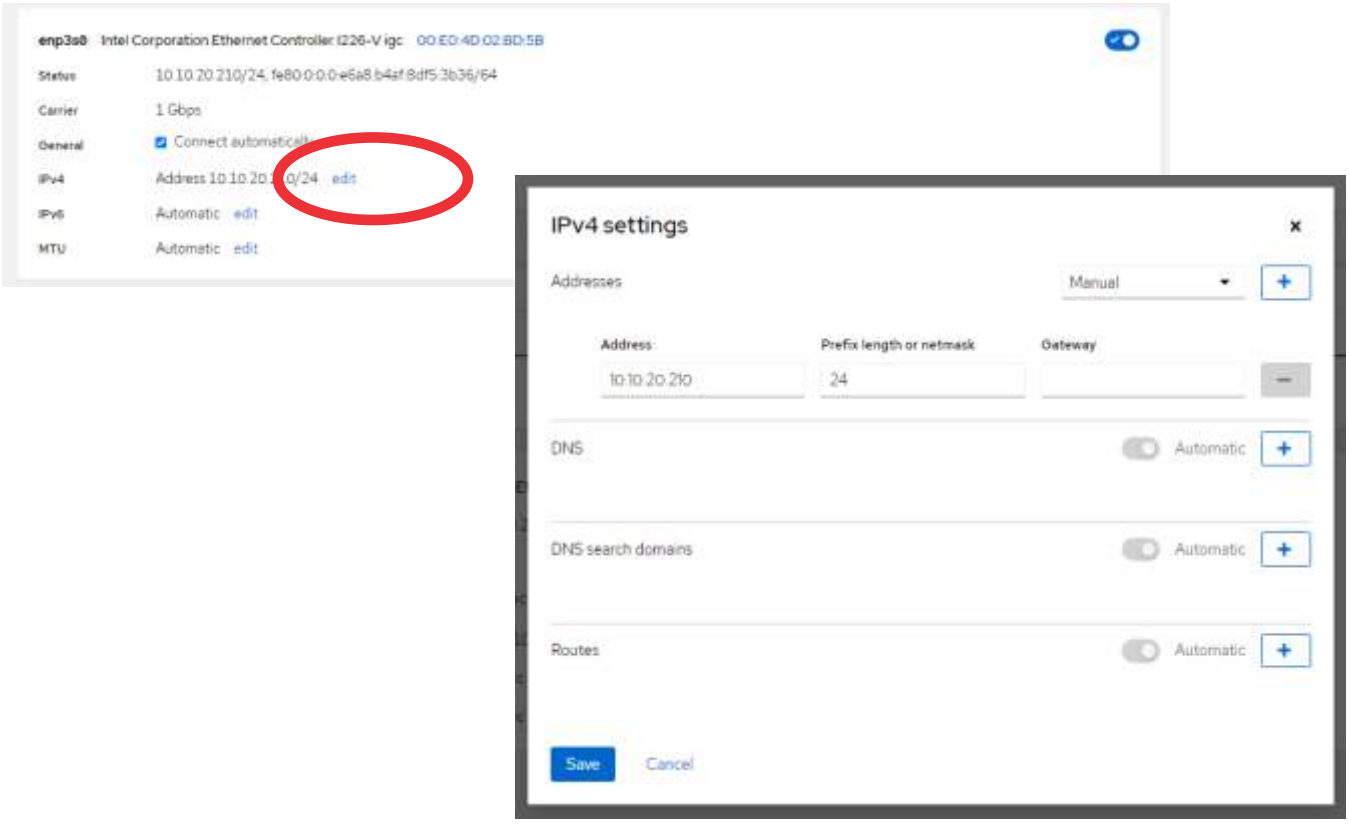




Insert the password: **putinhujlo2025** and press the **Authenticate** button.
You’ll see the “Administrative access” status.

Select **Networking** menu.
Click on the managed Interface, for example **enp3s0**



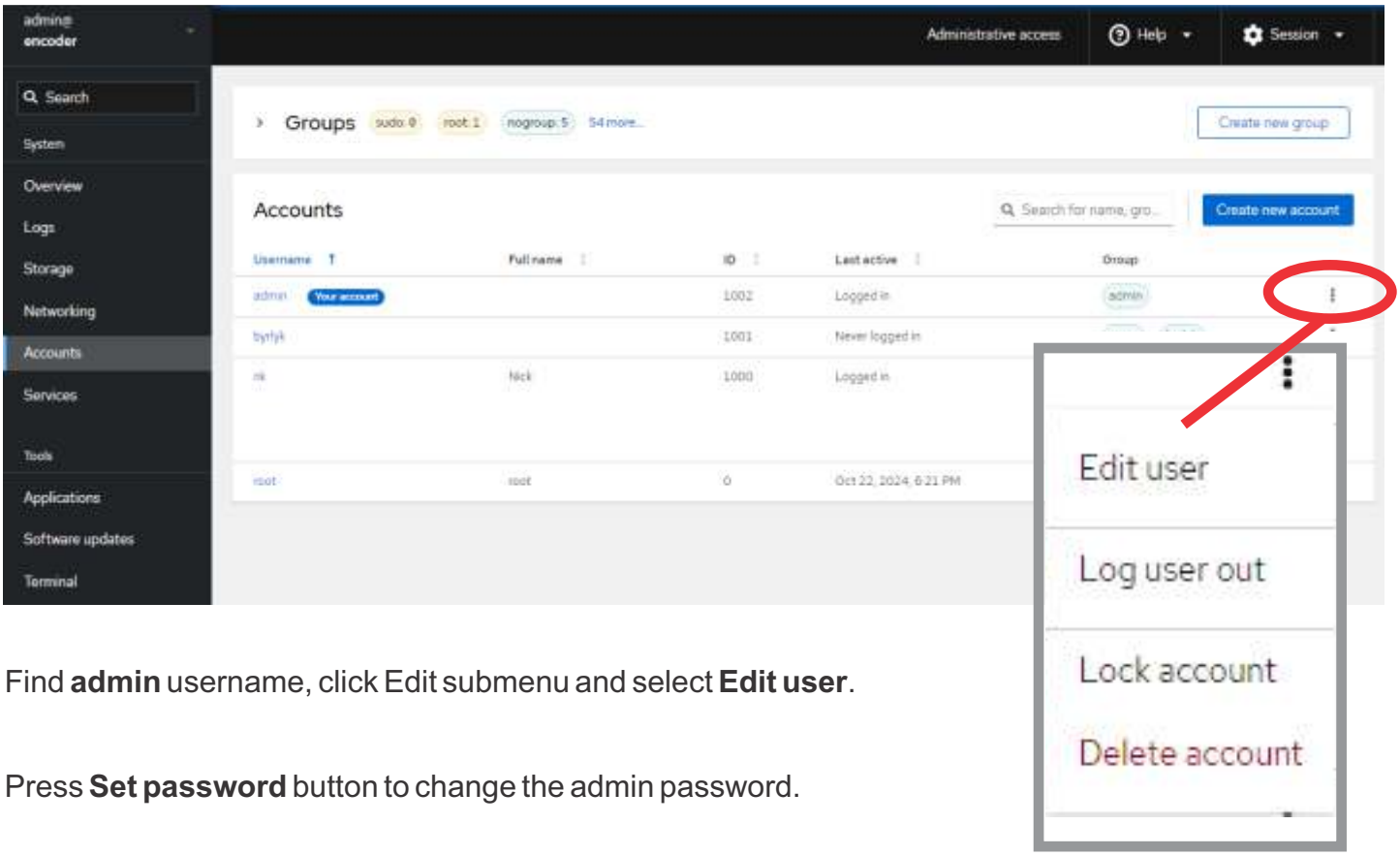

Click **edit** to change the IP address of the interface.



# Change password of the Linux graphical interface

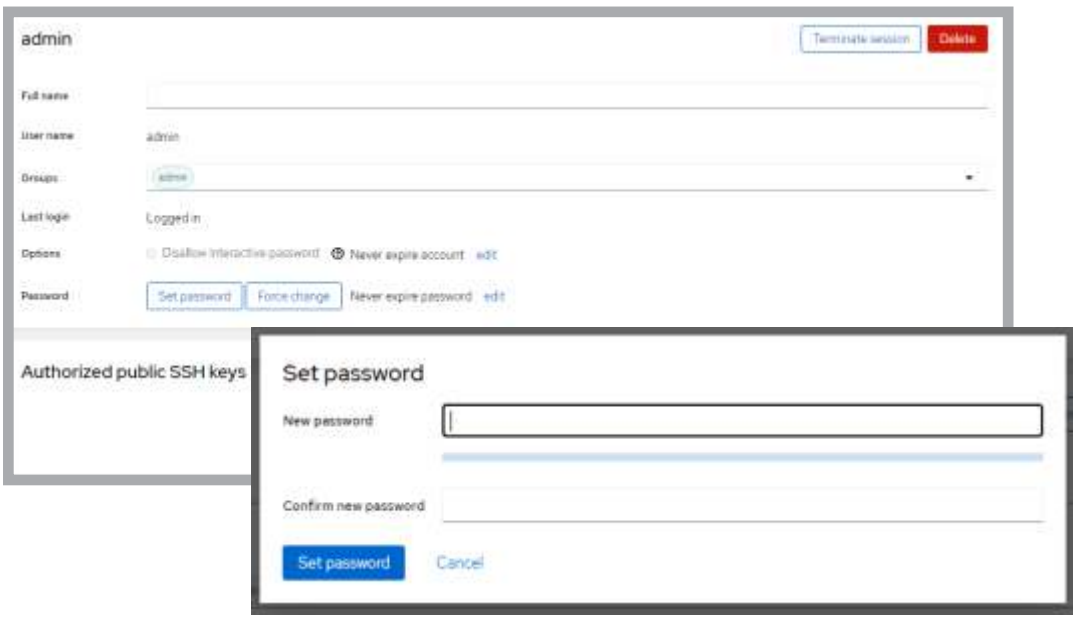
Please note that you must change the admin password to avoid hacking your device.

Select the **Accounts** menu.



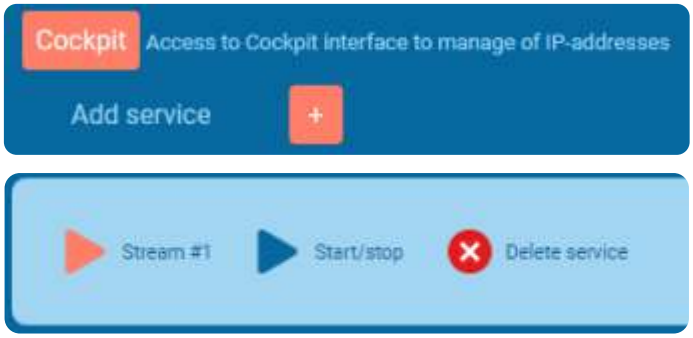

Find **admin** username, click Edit submenu and select **Edit user**.

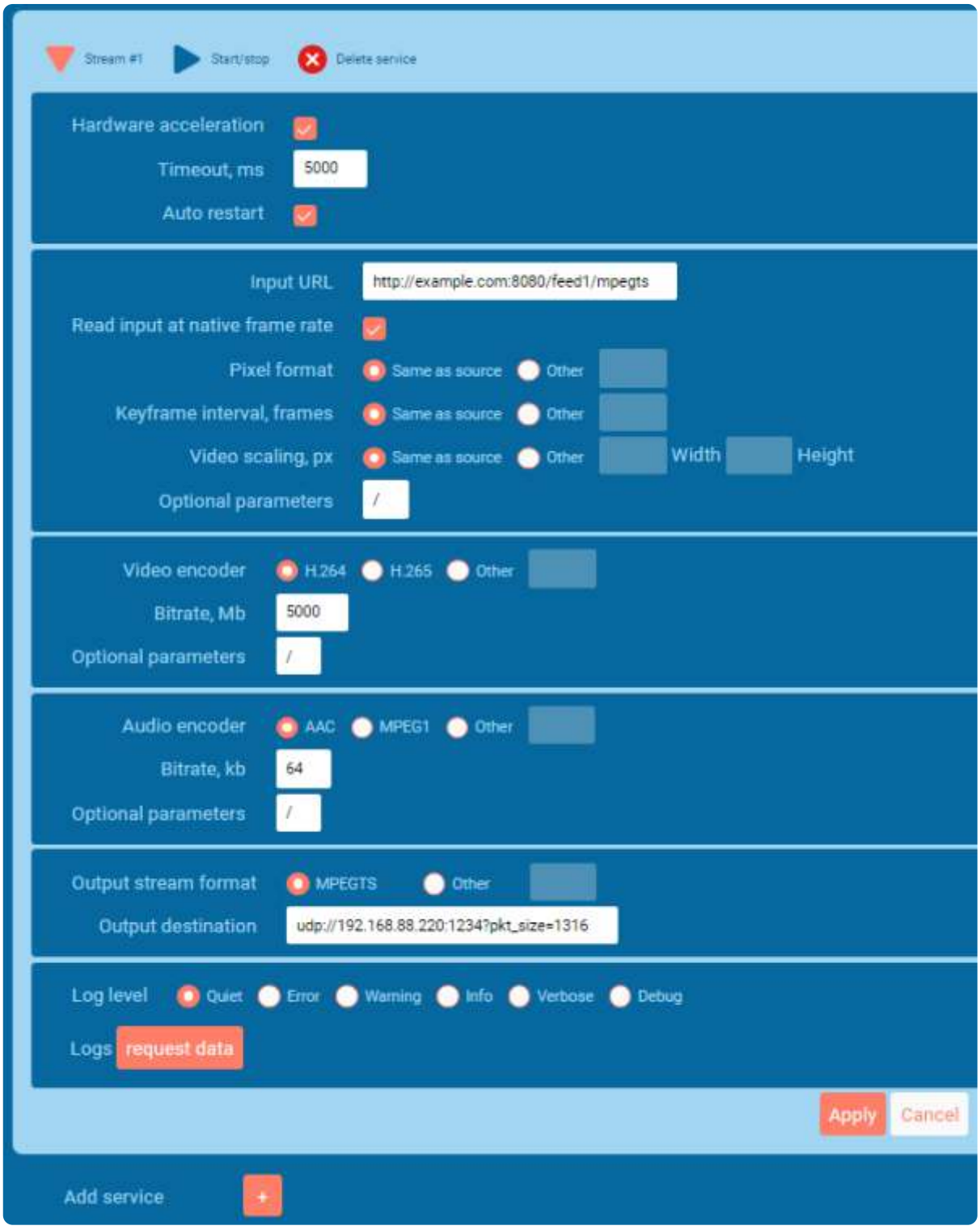
Press **Set password** button to change the admin password.



# Add service

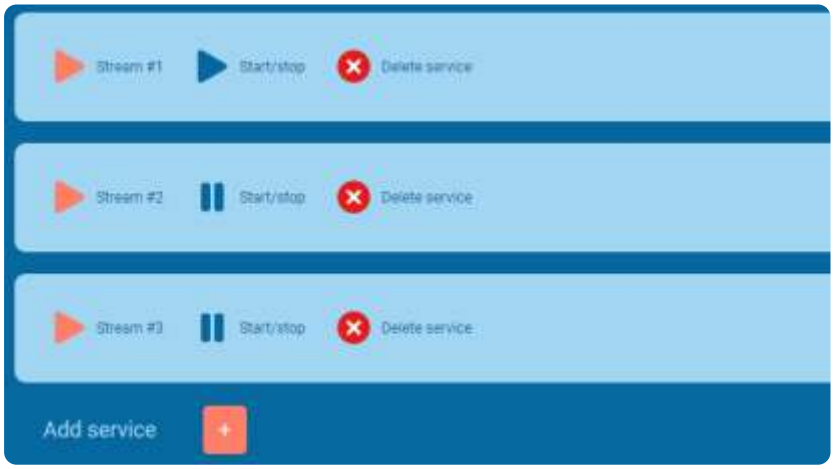
Press **Add service** button to create new transcoding service.
The ▶ and ▼ buttons allows you to expand and collapse the lists of parameters.
Use **Apply** button to save the parameters.
You can start/stop the service using ▶ and ⏸ buttons.
You can delete the service using ✕ button.



## Parameters menu

Select the Service and press ▶ button to expand the list of the service parameters.




## Hardware acceleration

You can use the Graphics Processing Unit (GPU) of the device to transcoding the stream. To do this, select the **Hardware accelerator** option. Note that the WEB-interface does not show the percentage of GPU load. Use LINUX commands to see this parameter.

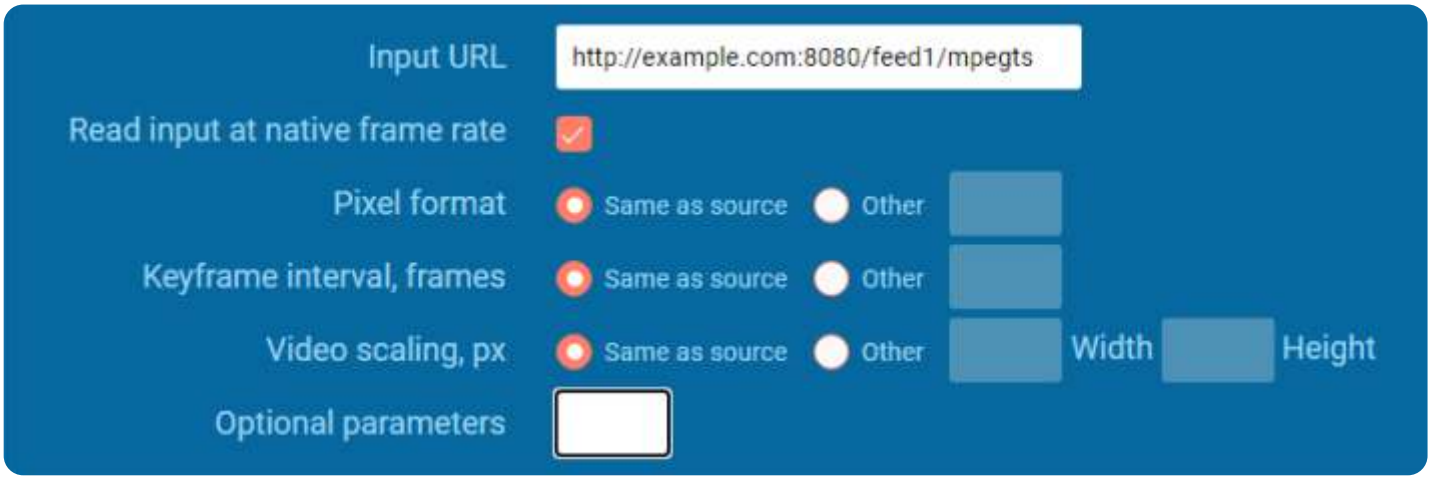

## Timeout and Auto restart

For some reason the service may be missing data. You can set the time to stopping the service by **Timeout**. In this case, the corresponding information will sent to the log.

If the **Auto restart** mode is enabled then in this case the service starts again automatically.

# Input signal parameters

Insert URL of the input SPTS stream. Setup the parameters of the input signal. If you would setup for additional parameters use command line.




This interface is designed to handle the simplest input streams: Unicast, SPTS (Single Program Transport Stream).
To work with more complex input streams, you need to use the Linux command line and enter FFMPEG commands, for example:

- **Working with a Multicast Stream**

To stream multicast using FFmpeg on multiple interfaces, you need to specify the local IP address of the desired network interface for each output stream. This is achieved using the localaddr option within the UDP output URL.
Steps to Stream Multicast on Multiple Interfaces with Ffmpeg:
Identify Network Interfaces:
Determine the IP addresses of the network interfaces you want to use for multicast streaming. You can typically do this using commands like ip addr show (Linux) or ipconfig (Windows).
Construct FFmpeg Command:
For each interface, you will add a separate output stream definition in your FFmpeg command, specifying the localaddr option for each.

```
ffmpeg -I input_source \
-map 0:v:0 -map 0:a:0 -f mpegts "udp://239.1.2.3:1234?localaddr=192.168.1.10" \
-map 0:v:0 -map 0:a:0 -f mpegts "udp://239.1.2.3:1234?localaddr=192.168.2.20"
```

# Input signal parameters

- **Working with MPTS (Multi Program Transport Stream)**

If you are just starting to study FFMPEG and you receive a multiprogram stream from a device with an internal demultiplexer, such as a SAT streamer or IRD, then the easiest way is to configure the streamer so that it outputs UDP Unicast SPTS streams to different ports. In this case, you will be able to work with the transcoder's WEB interface.

If you have experience working with FFMPEG, then you can demultiplex MPTS using the “map” command. Transcoding a Multi-Program Transport Stream (MPTS) with FFmpeg involves demultiplexing the input streams, applying desired transformations (encoding, filtering), and then remultiplexing them into a new MPTS.

**1. Input and Output Specification:**
Specify the input MPTS using the -I option:
ffmpeg -I input.ts ...
Specify the output MPTS filename and format using the -f mpegts option:
... -f mpegts output.ts
**2. Stream Mapping and Selection:**
FFmpeg automatically selects one stream of each type (video, audio, subtitle) by default. To explicitly select and map streams from different programs within the MPTS, use the -map option.
ffmpeg -I input.ts -map 0:v:0 -map 0:a:0 -map 0:v:1 -map 0:a:1 ...
This maps the first video and audio streams from the first input (program 1), and then the second video and audio streams from the first input (program 2).
**3. Program Definition:**
To define programs within the output MPTS, use the -program option. This is crucial for maintaining the structure of the MPTS.
ffmpeg -I input.ts -map 0:0 -map 0:1 -map 1:0 -map 1:1 -program program_num=1:title=ProgOne:st=0:st=1 -program program_num=2:title=ProgTwo:st=2:st=3 -f mpegts output.ts
Here, program_num sets the program ID, title sets the program name, and st specifies the stream indexes within the output that belong to that program.
**4. Transcoding Options:**
Apply desired video and audio encoding options for each stream using -c:v, -c:a, -b:v, -b:a, etc.
ffmpeg -I input.ts -map 0:v:0 -c:v h264 -b:v 2M -map 0:a:0 -c:a aac -b:a 128k ...
Use filters for scaling, deinterlacing, audio normalization, etc., with -vf (video filters) and -af (audio filters).
ffmpeg -I input.ts -map 0:v:0 -vf scale=1280:-1 ...

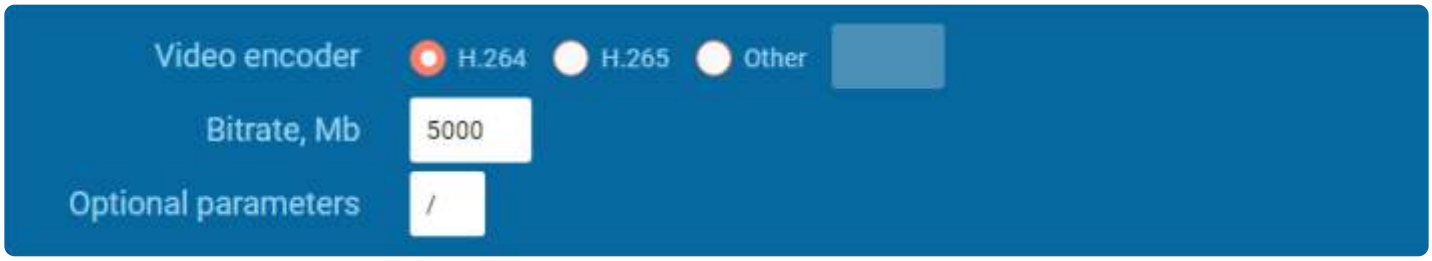
**Example Command** (Conceptual):

```
ffmpeg -I input_mpts.ts \
-map 0:v:0 -map 0:a:0 \
-map 0:v:1 -map 0:a:1 \
-c:v:0 libx264 -b:v:0 2M \
-c:a:0 aac -b:a:0 128k \
-c:v:1 libx264 -b:v:1 1M \
-c:a:1 aac -b:a:1 96k \
-program program_num=1:title="Channel 1":st=0:st=1 \
-program program_num=2:title="Channel 2":st=2:st=3 \
-f mpegts output_transcoded_mpts.ts
```

*This example transcodes two programs from an input MPTS, applying different video and audio encoding settings to each, and then remuxes them into a new MPTS with defined program information. Adjust stream indexes and options according to the specific MPTS structure and desired output.*

## Video encoder parameters

Select H.264 or H.265 encoding. Insert bitrate of the output video. If you would setup for additional mode use command line.




## Audio encoder parameters

Select AAC or MPEG1audio encoding. Insert bitrate of the output audio. If you would setup for additional parameters use command line.

## Output stream parameters

Insert URL of the input stream. Setup the parameters of the input signal. If you would setup for additional parameters use the command line.
Save the changing using **Apply** button.

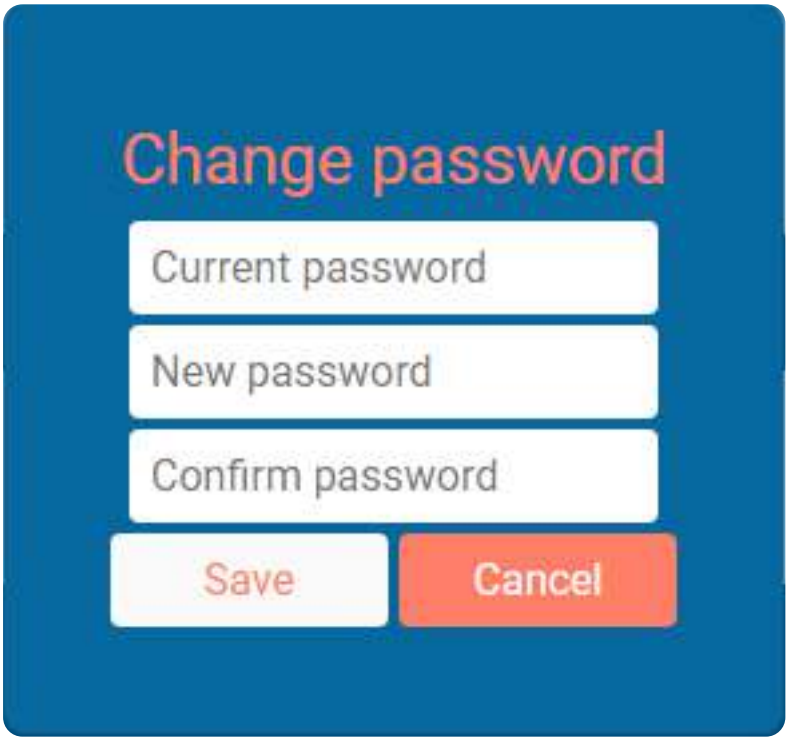

## Logs

In this section you can specify the log level.
Press **Request Data** button to expand the Logging.


**QUIET** are important information messages.
**ERROR** indicates error conditions within an application that hinder the execution of a specific operation. While the application can continue functioning at a reduced level of functionality or performance, ERROR logs signify issues that should be investigated promptly.
**WARNING** indicates that something unexpected has occurred, but the application can continue to function normally for the time being. It is also used to signify conditions that should be promptly addressed before they escalate into problems for the application.
**INFO** captures events in the system that are significant to the application's business purpose. Such events are logged to show that the system is operating normally.
**VERBOSE** enables more messages on the development console that help out when debugging.
**DEBUG** is used for logging messages that aid developers in identifying issues during a debugging session.

# Set new password of the WEB-interface

You can change the Password to confidential
Press **CHANGE PASSWORD** button to access to **Change password** Menu.

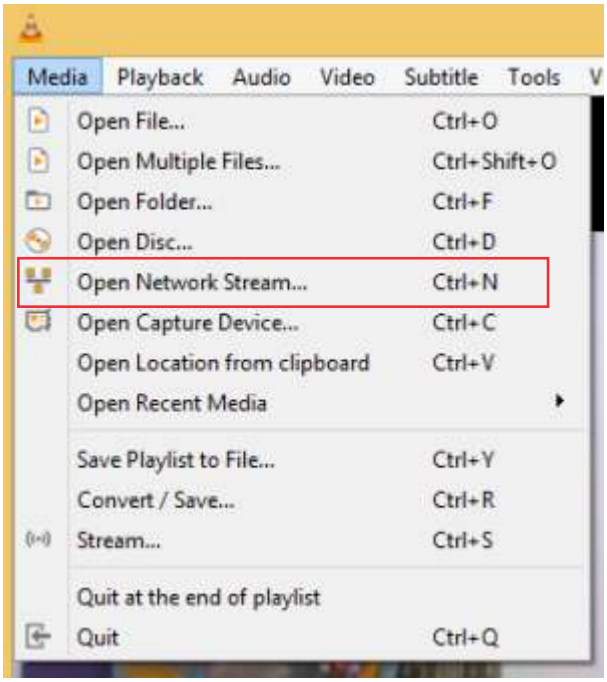



# Receiving of the output stream

Stream generated by the Transcoder can be received by any media player, for example VLC MEDIA PLAYER. You need to do the following:

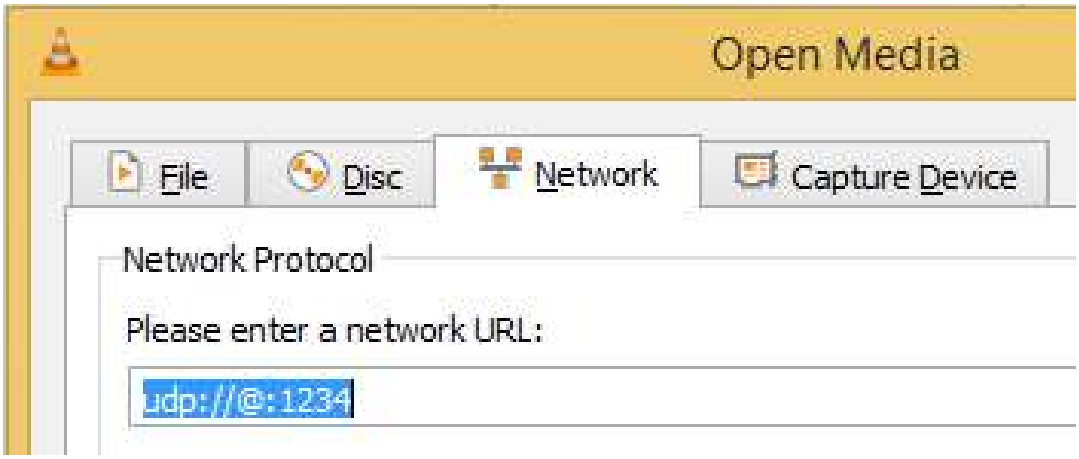
- Make sure that the destination IP address in the Transcoder is set to the address of the computer with VLC-player installed. So, for example, if the computer's IP is 10.10.20.20, then enter 10.10.20.20 in the **Output destination** field and indicate the Destination port - 1234, for example.

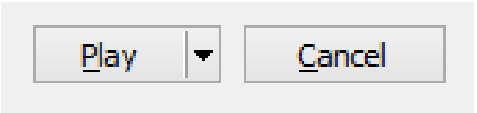

- Launch the VLC-player on the computer. Click **Media** menu and select **Open Network Stream**.




- In the **Network** menu, in the **Enter a network URL** field, enter a string in the format: **udp://@:port**, where port is selected when setting **Destination port**. Those, for our example it will look like **udp://@:1234**

- Click **Play**

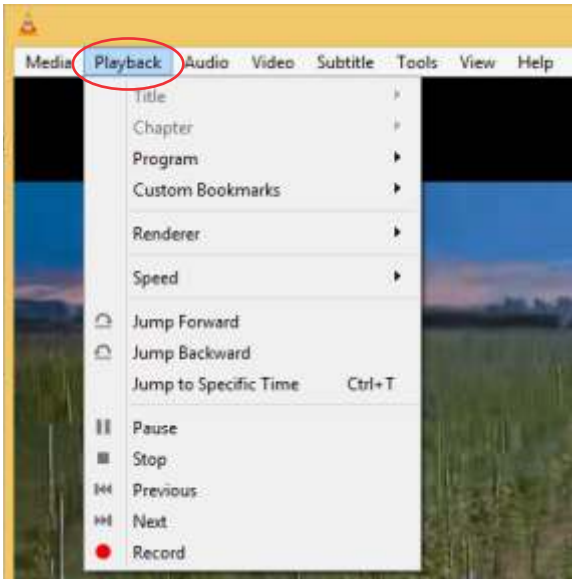


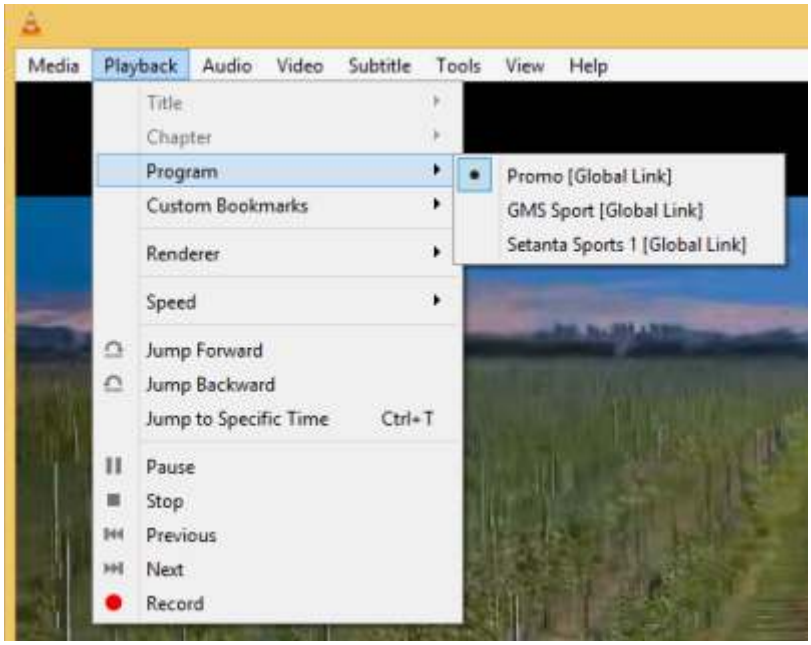
# Receiving of the output stream

- The first available (open) channel in the stream automatically starts playing.

- If the stream is multi-program (MPTS), then to select another program press the **Playback**.




Select **Program** menu and the list of channels in the drop-down list.



# HDMI to UDP Encoder

There are many inexpensive encoders that receives a signal at the HDMI input and generate a Transport Stream on Ethernet output.

For example, the Unisheen company from China offers the BM1000H model.


Below are the main characteristics of this encoder:

Video Input 1x HDMI( 1.4) HDCP

Resolution 1920x1080@60P/50p,1920x1080@60i/50i/1280x720@60p/50p 720x576i/720x480i

Encoding H.265 H.264/AVC Baseline/Main/High Profile Level 4.2

Encoding Output FPS Up to 1080P30

Data Rate 0.16Mbps~32Mbps

Rate Control CBR/VBR

GOP Structure 5-300

Advanced Pretreatment De-interlacing,Image Enhancement, Noise Reduction, Sharpening

Latency Time 100ms

Audio Input 1xHDMI Embeded,1x3.5mm Jack

Encoding AAC/AAC+/AAC++/MP3/MP2/AC3/G.711A/U

Audio Re-sample Rate 44100/48000 Hz

Bit-rate 32K/48K/64K/96K/128K/160K/192K/384K

Sampling precision 24 bit

Ethernet 100M Base-T Full Duplex Protocol srt/utp/http/rtsp/rtmp/udp/onvif

Control interface Website or CGI command or App

Dimension(W×L×H) 54x90x29mm (50x75mm PCBA)

Net Weight 0.1kg

Temperature 0-45(work),-20-80(storage)

Power 9-12V DC 1A

Consumption 1.5w

# SDI inputs of the Transcoder

**DeckLink Duo 2** mini PCIe card can be used to capture of SDI services.
The FFMPEG software includes drivers for this card.

Below are the main characteristics of this card:

## Video Standards

**SD Video Standards**
525i59.94 NTSC, 625i50 PAL

**HD Video Standards**
720p50, 720p59.94, 720p60
1080p23.98, 1080p24, 1080p25,
1080p29.97, 1080p30, 1080p50,
1080p59, 1080p59.94, 1080p60
1080PsF23.98, 1080PsF24,
1080PsF25, 1080PsF29.97, 1080PsF30
1080i50, 1080i59.94, 1080i60

**SDI Compliance**
SMPTE 259M, SMPTE 292M, SMPTE 296M, SMPTE 372M, SMPTE 425M, ITU-R BT.656 and ITU-R BT.601.

**SDI Metadata Support**
RP 188/SMPTE 12M-2 and closed captioning.

**Audio Sampling**
Television standard sample rate of 48 kHz and 24 bit.

**SDI Color Precision**
8, 10, 12-bit RGB 4:4:4 in all modes up to 1080p30 and 8, 10-bit YUV 4:2:2 in all modes. 12-bit RGB 4:4:4 only supported in playback.

**SDI Video Sampling**
4:2:2, 4:4:4

**Color Space**
REC 601, REC 709

**HDR Support**
HDR static metadata packing, HLG and PQ transfer characteristics.