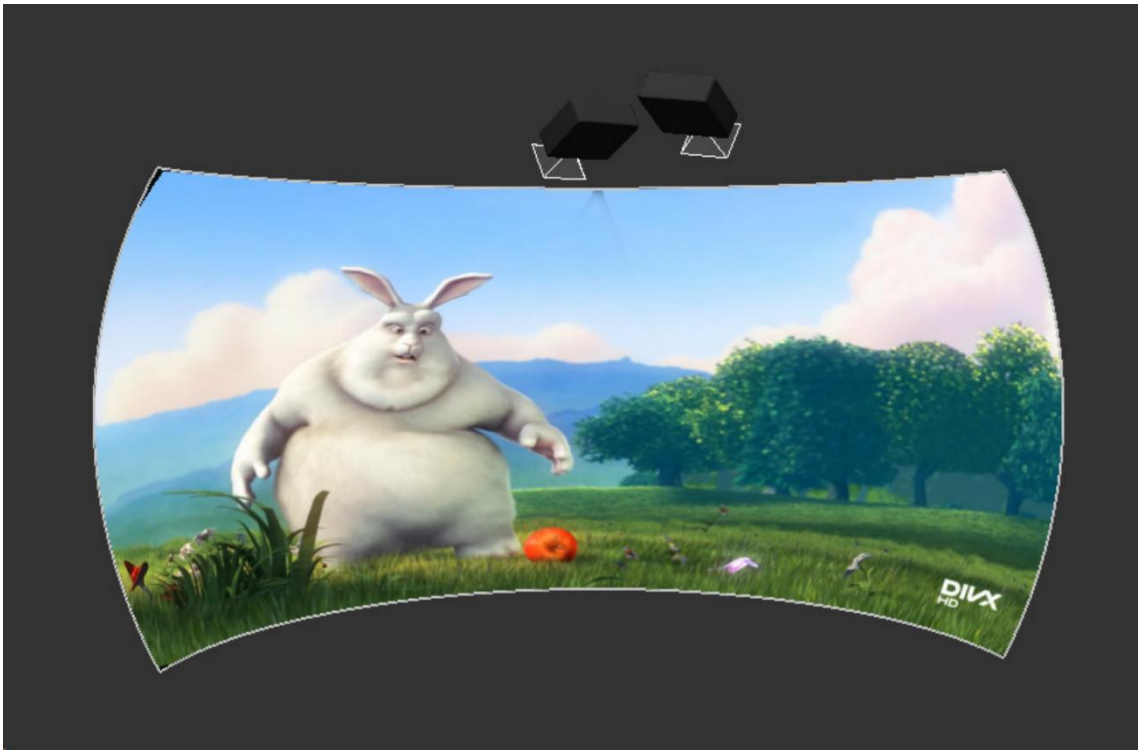
Immersive Player PRO v4.4
User Guide

1 Introduction

Immersive Player PRO is the ultimate medial player which includes geometric correction and soft-edge blending software package.

It is the only software that seamlessly integrates into the Windows 7/8/10 desktop and provides media playback with image geometric correction and soft-edge blending using the PC GPU. No additional hardware is needed for projection on regular and irregular projection screens (cylindrical screens, full and partial domes and any other shaped projection surface).



Immersive Player PRO utilizes Immersive Display core components for image geometric correction and soft-edge blending configuration and presentation. With a simple user interface and using the system mouse and keyboard the projected output image can be mapped on any kind of projection screen. Overlaps and soft edge blending between projected images can be adjusted using the fine-grained controls and gamma functions. A color correction per projector can be applied to match the color profiles among different projectors.

Immersive Player PRO supports camera calibration files. A camera can be used to automatically calculate the geometrical correction and soft-edge blending.

Using a standard HD webcam, users can create perfect and seamless multi projector setups.

Immersive Player PRO supports up to 16 projectors per PC, which can be configured in different horizontal and vertical stacking.

Immersive Player PRO is designed for home and professional environments. Applications include:

- Home Entertainment System
- Conference rooms
- Video Playback
- Live Digital Motion Graphics

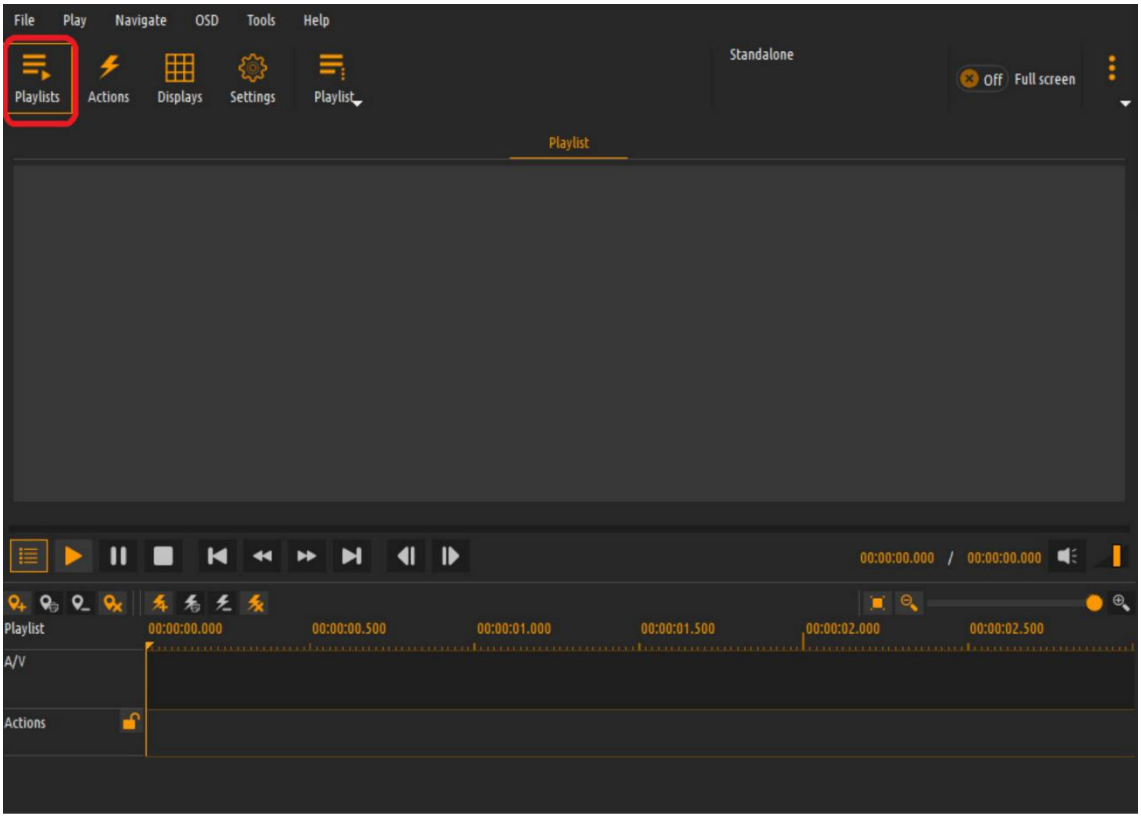
2 System requirements

The following is the required minimal configuration:

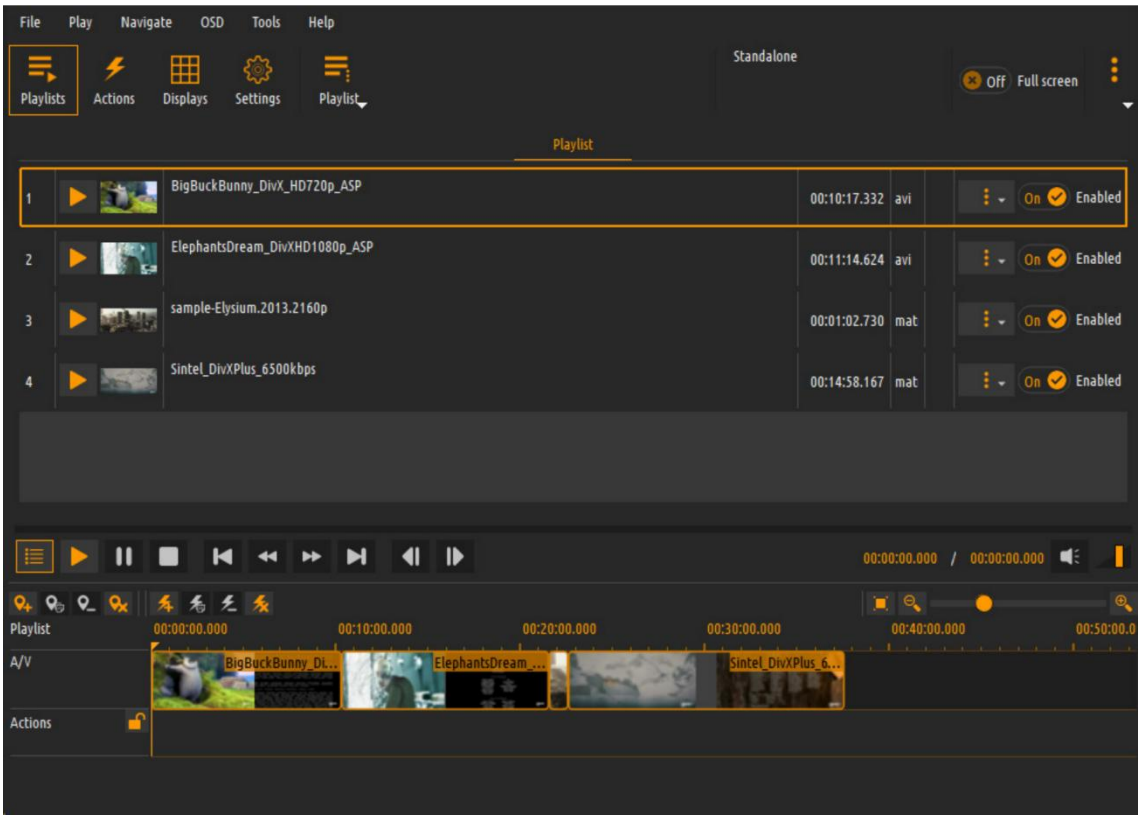
- PC with 2.0 Ghz or higher processor (32bit or 64 bit)
- 2 Gb or more RAM
- A moderate graphics card (NVIDIA or AMD/ATI)
- For creating a wide multi projector display in windows 7, Windows 8 or Windows 10 desktops, the following products are required:
    - NVIDIA surround 2D support for NVIDIA graphical cards
    - ATI Eyefinity support for ATI graphical card
    - Or Matrox DialHead2GO or TrippleHead2GO external hardware box
    - Or Nvidia Quadro graphics card with mosaic mode
- A common HD webcam (Ex: Logitech Webcam PRO 9000, Logitech HD Pro Webcam C920, etc.)

3 Quick Setup Guide

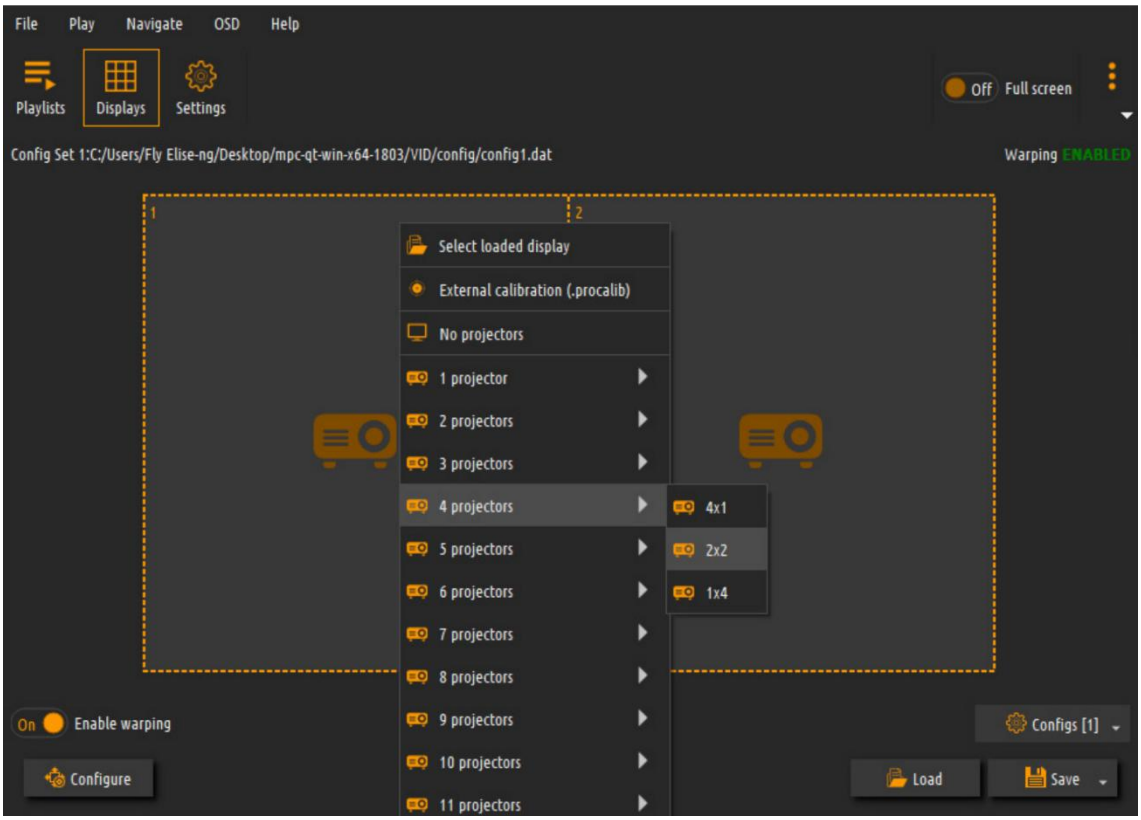
Start Immersive Player PRO and select the click the Playlists button



Drag a number of video files into the playlist window. This will create and populate the currently selected playlist.

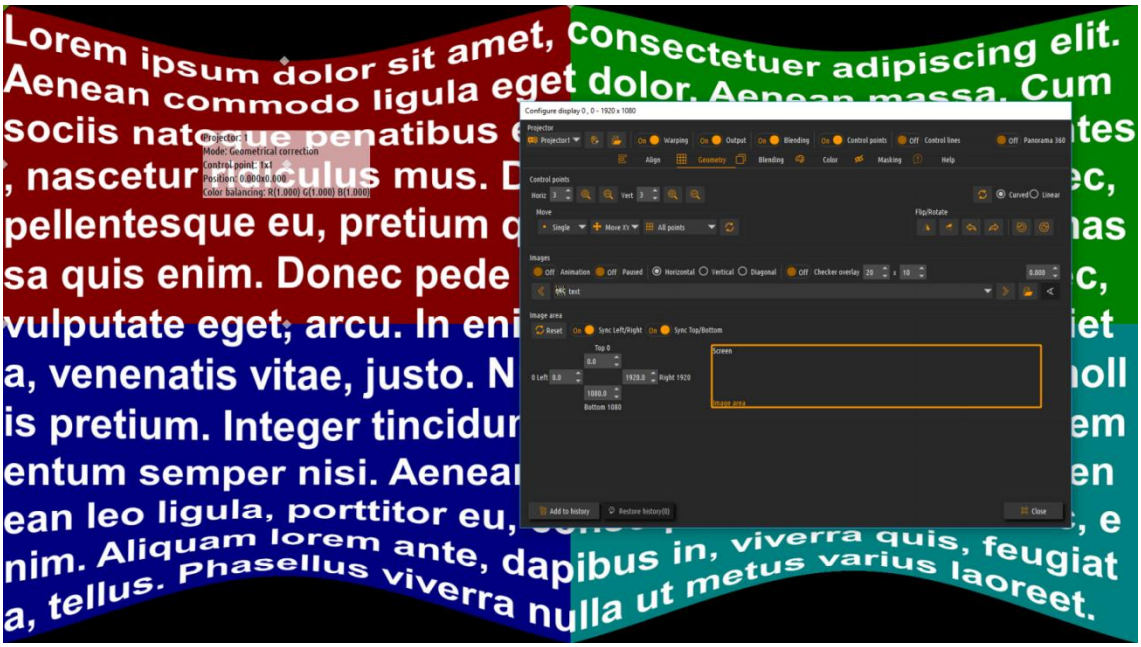


Click on the Displays button and select the desired projector configuration per detected display.



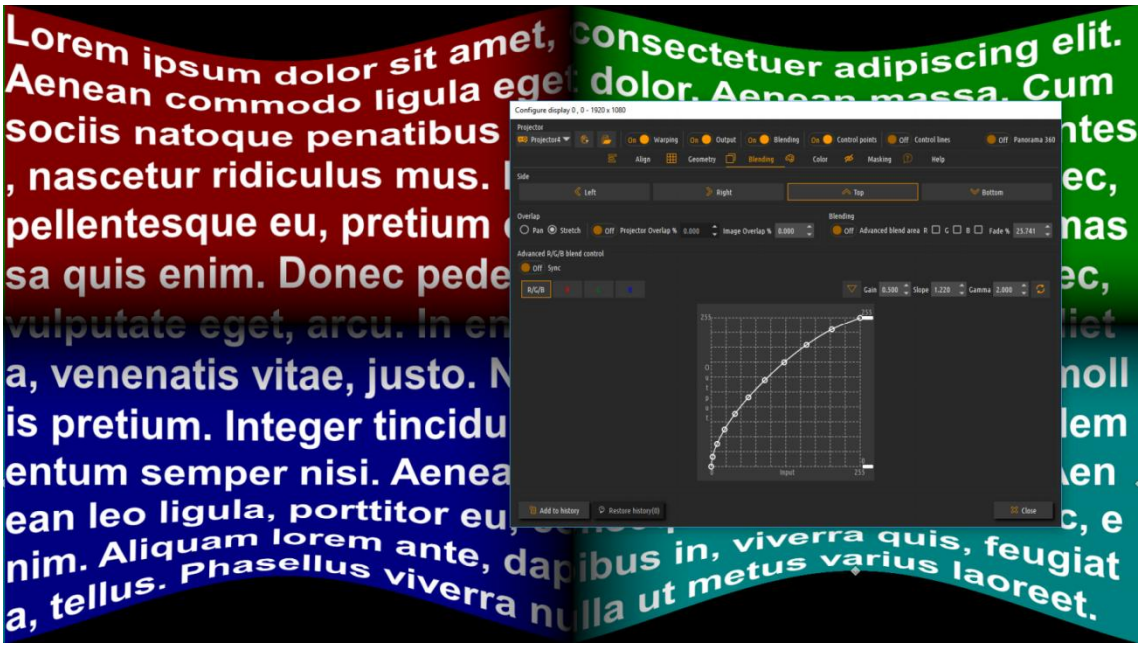
Press the Configure button to edit the geometrical correction and soft-edge blending. A configuration screen will be opened where the user can user the control points to map the projected output on the projection screen, define the overlap and configure the soft edge blending depending on the configuration mode.

In the geometrical correction mode, user can use the mouse of keyboard to move the green control points on the screen until the projected image is mapped on the projection screen.



After the image is mapped to the screen the overlapped regions can be defined and the soft-edge blending can be configured. Using the “F10” keyboard key, user can switch between geometrical correction and soft-edge blending mode. The default soft-edge blending mode is the “simple” mode where the edge-blending region follows the contour of the edge of the screen. In most cased this mode is enough to configure the soft-edge blending.

In the “simple” edge blending mode user can drag the red control points for every edge to adjust the soft-edge blending region. Using the mouse scroll button the gamma values for all tree components(R/G/B) can be adjusted per region).

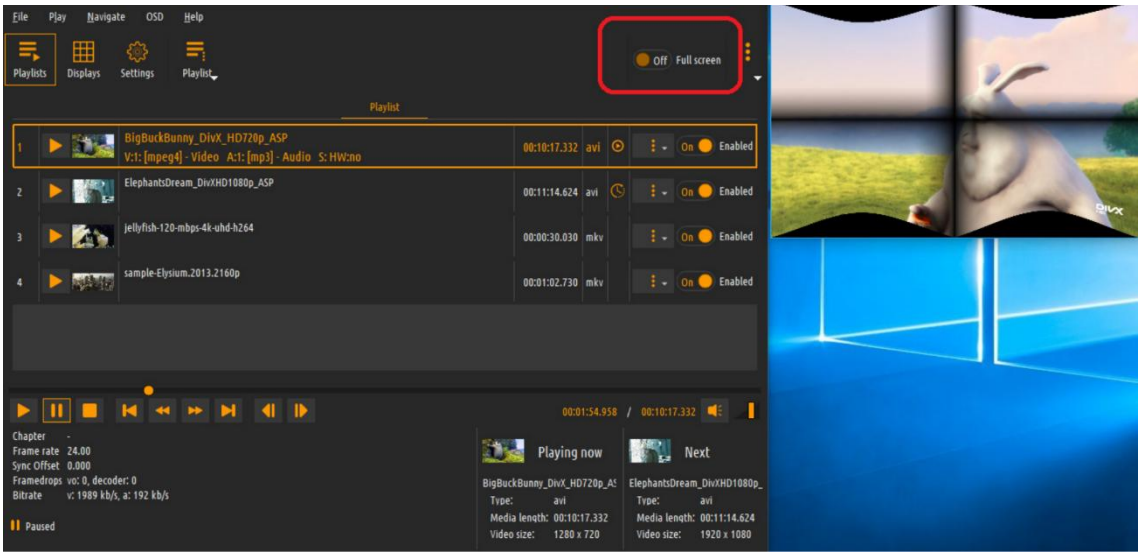


4 - For more complex setup with irregular projection screens user can switch to advanced blending mode using the advanced configuration dialog. In the "advanced" blending mode user can define more control points per edge and move the blue control points independently to match the contour of the projection screen and the overlap region. Using the "F12" user can switch between the blending regions. Using the mouse scroll button the gamma values for all tree components(R/G/B) can be adjusted per region).

Finally, by pressing the "D" key, the advanced configuration dialog can be show or hidden. From the advanced configuration dialog user can fine-tune the gamma values independently for all tree components(R/G/B).

After the configuration is finished, user can press the "Esc" key to exit the configuration screen. The configuration can be saved using the "Save/Save As" button on the control and configuration dialog. This configuration will be used the next time when Immersive Player PRO is started again.

Press Play to start the selected play item.

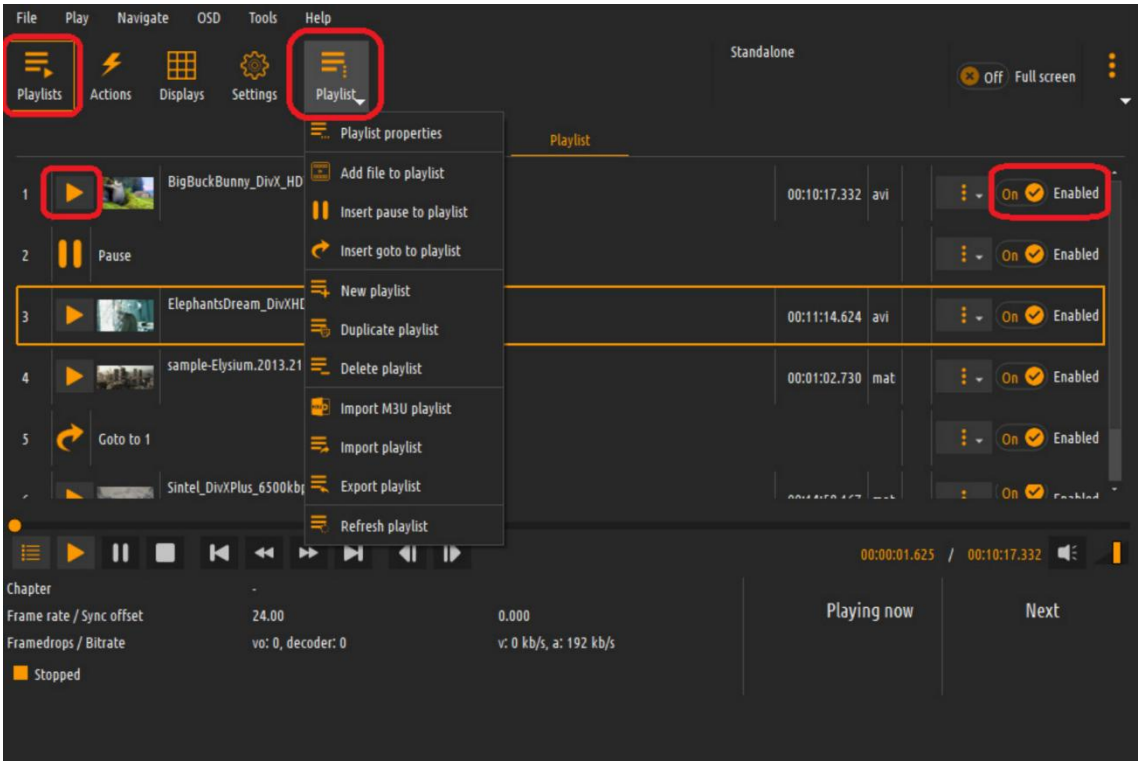


Pressing the “Full Screen” button, Immersive Player PRO will be minimized on the system tray and the video will be shown on the configured display.
Use the F key to toggle the full screen mode.

4 User interface

The graphical user interface is composed of several pages. Each page can be selected using the toolbar buttons

4.1 Playlist page



In the Playlists page users can define one or more playlists and add and manipulate the play items of the playlist. In this page additional Playlist button is visible with a menu to manipulate the playlists.

Play items can be added to the playlist by dragging and dropping video or images files from the PC to the playlist window. Also media files can be added using the Add file to playlist menu.

Each play item can be enabled or disabled. Disabled play items will not be played back.

Play items can be deleted using the play item sub menu button.

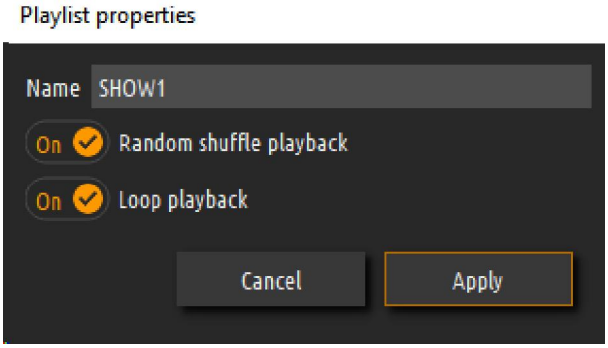
Depending on the play item type, the meta-data and the thumbnail for the play item can be updated using the play item submenu.

Drag and drop a play item in the playlist to re-arrange the play items.
The software supports the fooling types of play item content:

- Local audio/video
- Network steamed audio/video
- Youtube and other online video platforms
- DirectShow capture devices

Next to the above types of content, the software supports 2 additional control play items: Pause and Goto.
The Pause play item will make sure that when the playback reaches this play item, the playback will be paused and user action is required to continue the playback, using either Unpause or PlayNext button.
The Goto play item can be configured with the index of another play item, or a random play item. When the playback reaches this play item, the playback jump to the configured play item and will continue from that play item.
Using the Pause and Goto play items, users can create complex playlist scenarios in combination with the "Enable/Disable option per play item.

The playlist can be configured for a random playback and/or loop playback.



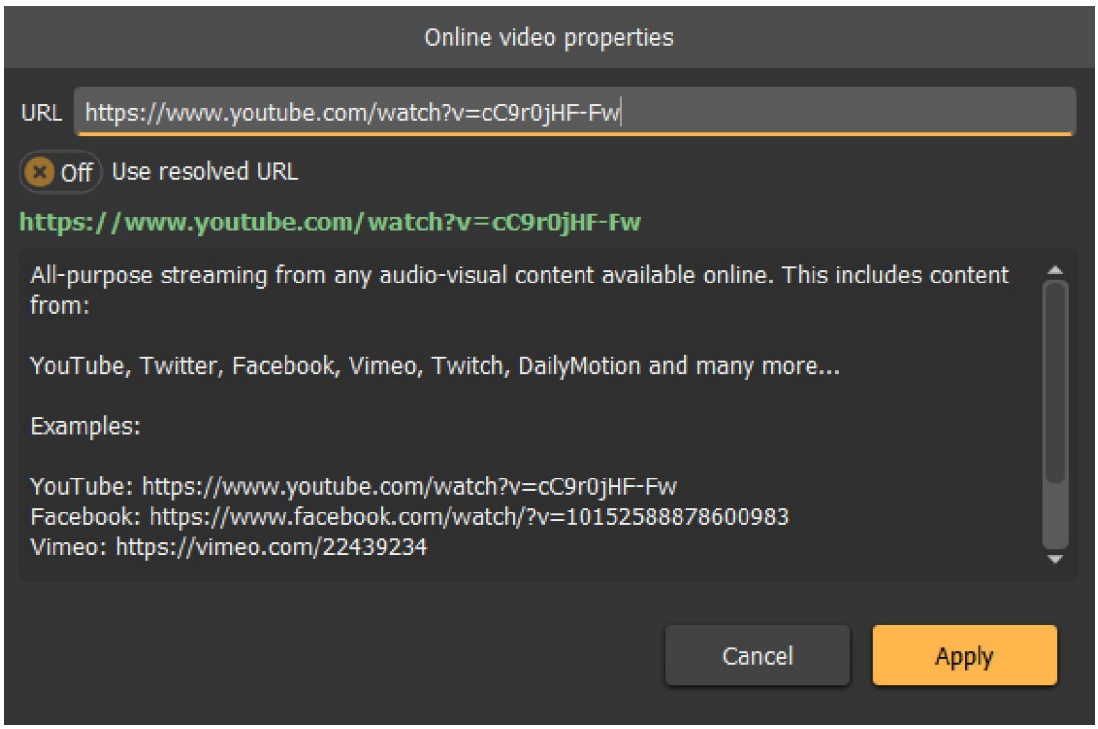
In the random playback, the next play item will be selected randomly. In the loop playback, the playlist will continue with the first play item when the last playlist item is selected.

The software supports multiple playlist. Users can define more than one playlist and dynamically switch from one to another play list when needed.

All play lists and play items are saved automatically when the software exits.

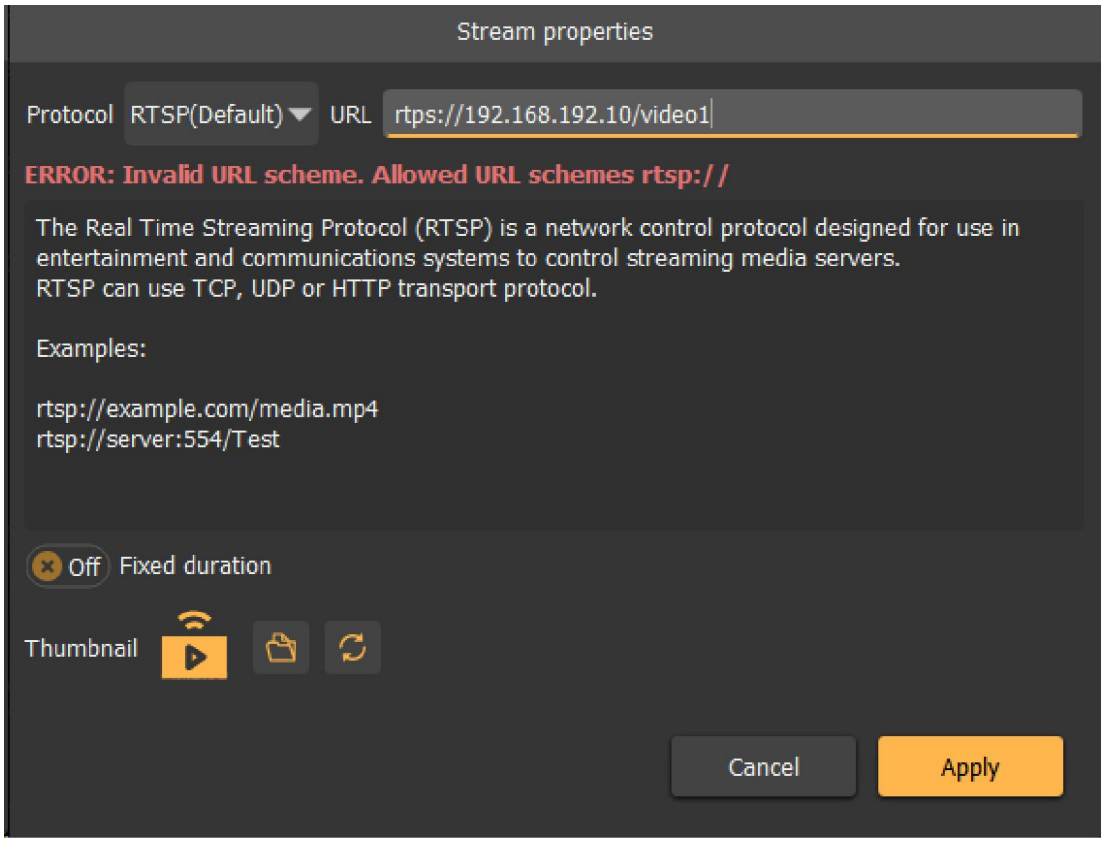
4.1.1 Play item properties

Online video/audio play item is a play item that plays a video from YouTube or other online video platforms. The software supports all major online video platforms.



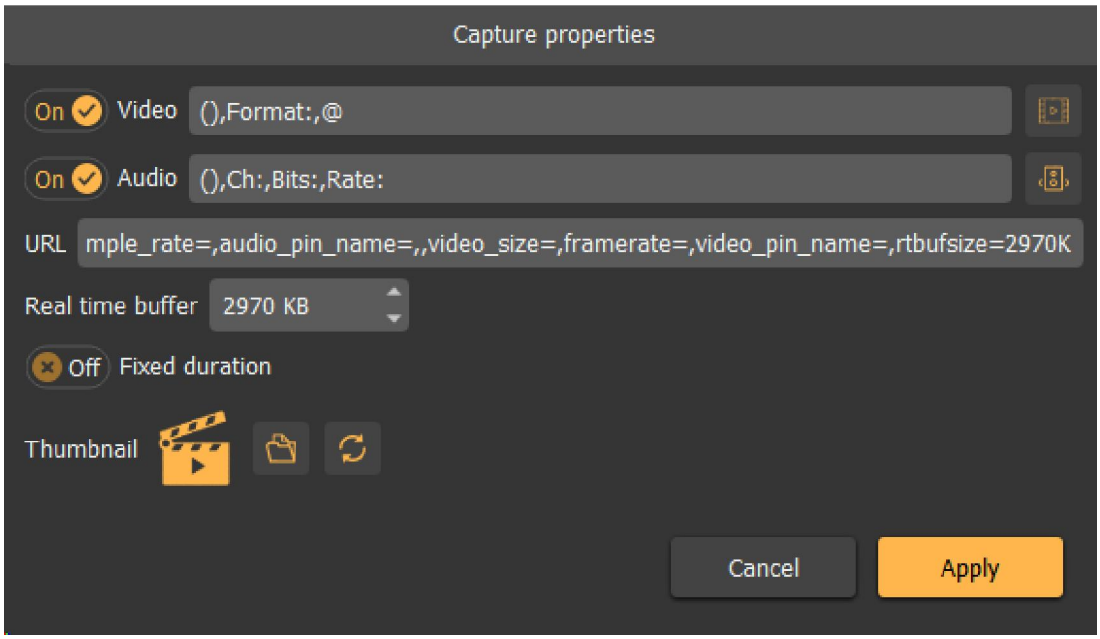
Enter the complete online URL in the URL field. If the checkbox Use resolved URL is NOT selected, the software will check the video platform website for the resolved video URL. This can introduce some startup delays. When selected, the URL will be resolved only the first playback time.

Streaming video/audio play item is a play item that plays the content from any content serving server.

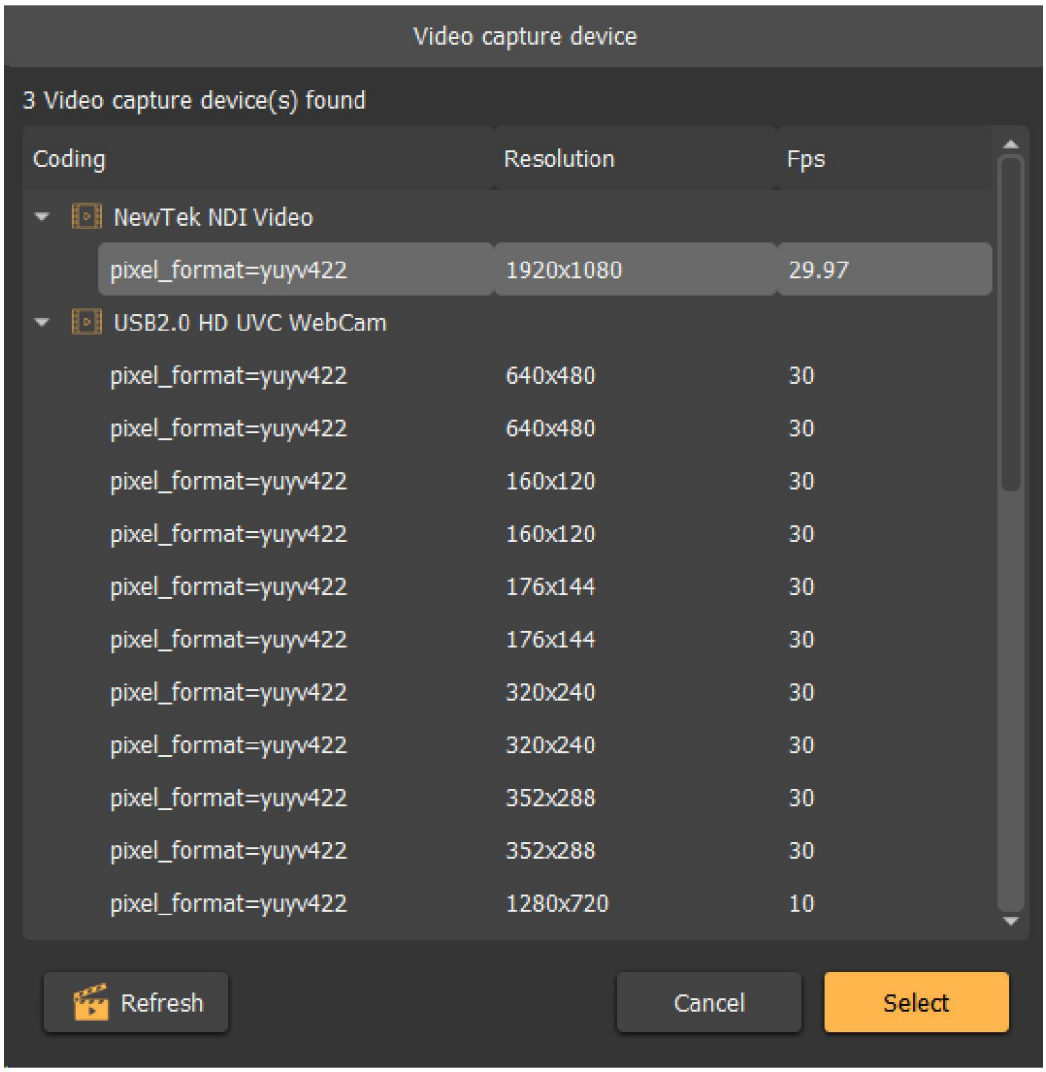


The following streaming protocols are supported: RTSP, RTP, HTTP(S) and UDP. By default, the streaming play item has infinite duration. The duration can be set to fixed duration if this is needed.
The default thumbnail for the streaming play item can be selected from a custom image.

Capture video/audio play item can play a content from any DirectShow device. This can include any web camera video capture devices link Black Magic or any NDI enabled DirectShow input. See the HOWTO document for more info.



The video and audio capture pins (connectors) can be selected separately.



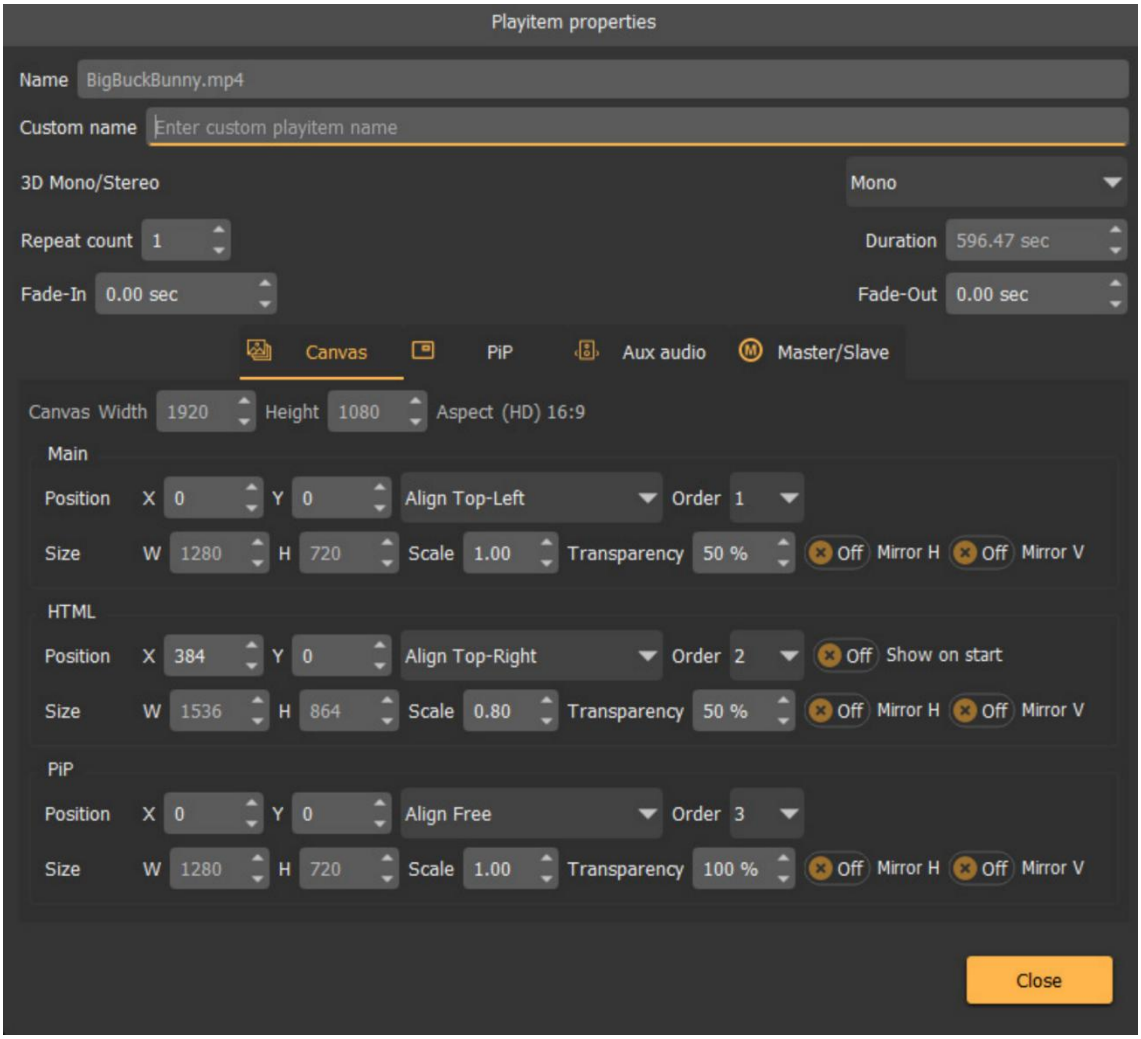
By default, the capture play item has infinite duration. The duration can be set to fixed duration if this is needed.
The default thumbnail for the capture play item can be selected from a custom image.

Every type of play item has a set of standard properties:

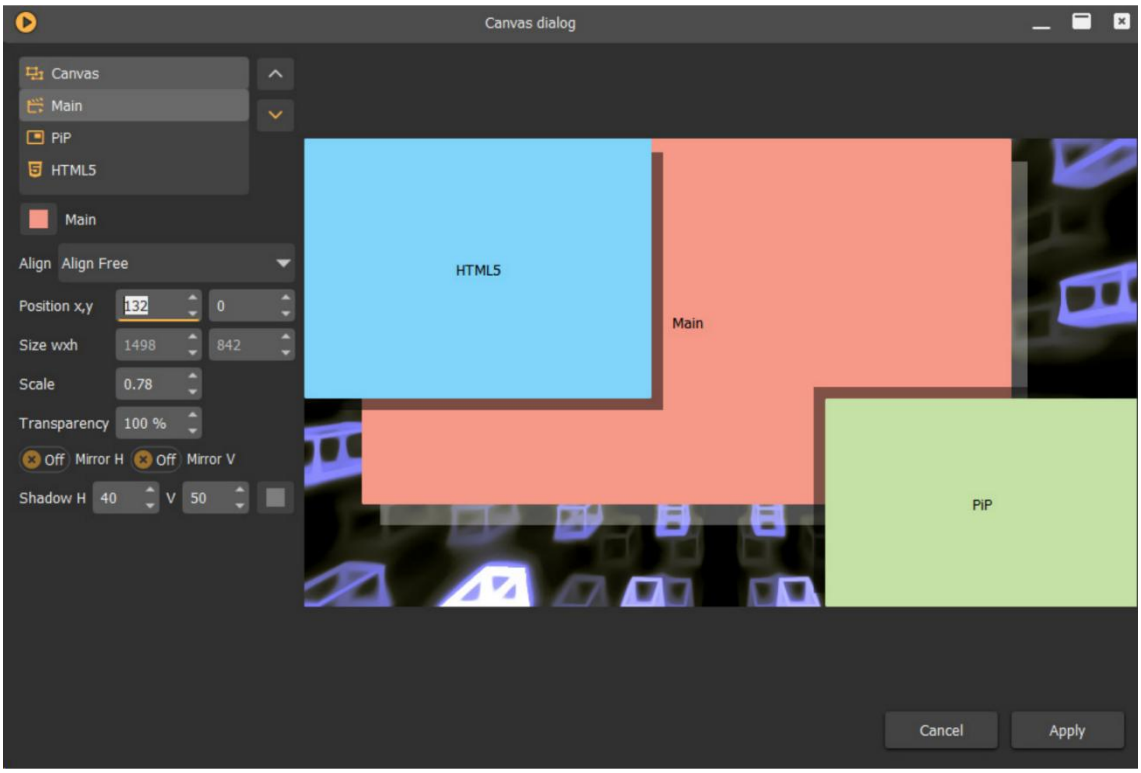
- Canvas
- PiP (Picture-In-Picture) stream
- Additional audio AUX streams
- Master/Slave properties

4.1.1.1 Canvas

When the canvas is enabled for the playlist, the main play item, the Pip as well as the HTML view (if enabled) can be composed on the canvas. Each one can be separately positioned and scaled on the canvas. Additionally, the z-order of the rendering can be changed as well as the transparency.

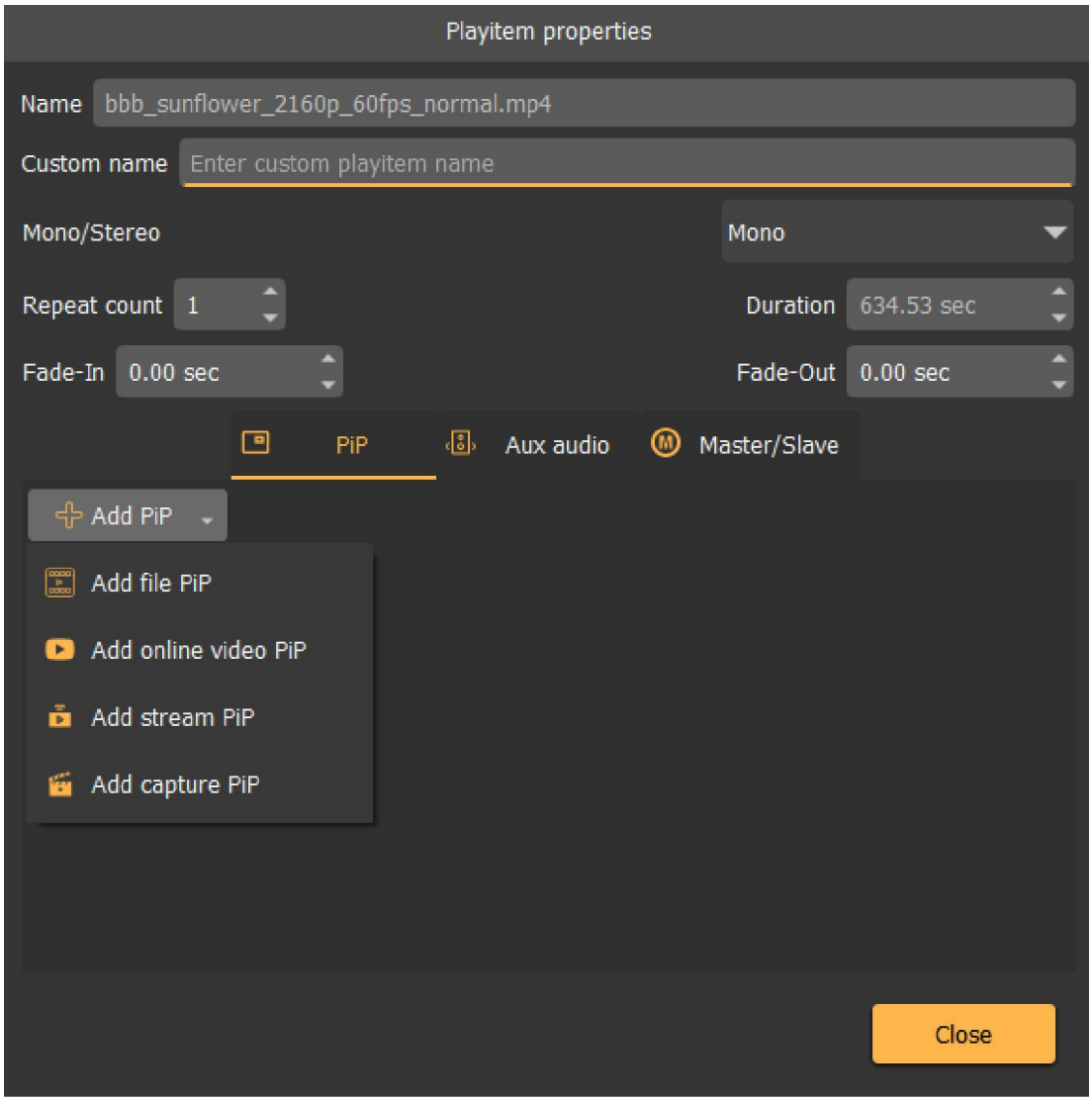


Open the canvas editing dialog to edit each canvas item separately.

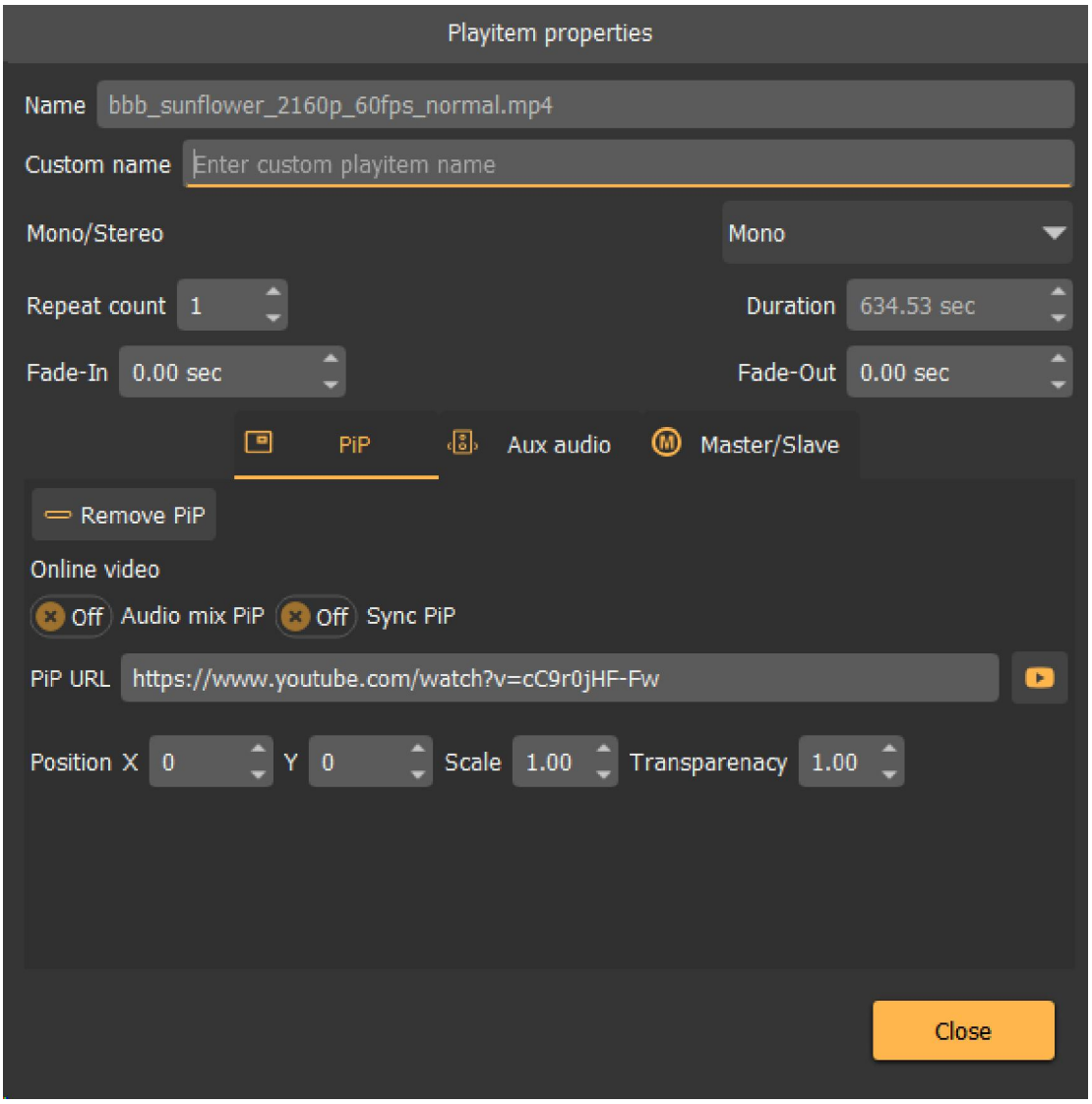


4.1.1.2 PiP (Picture in Picture)

The PiP can be any of the supported content type

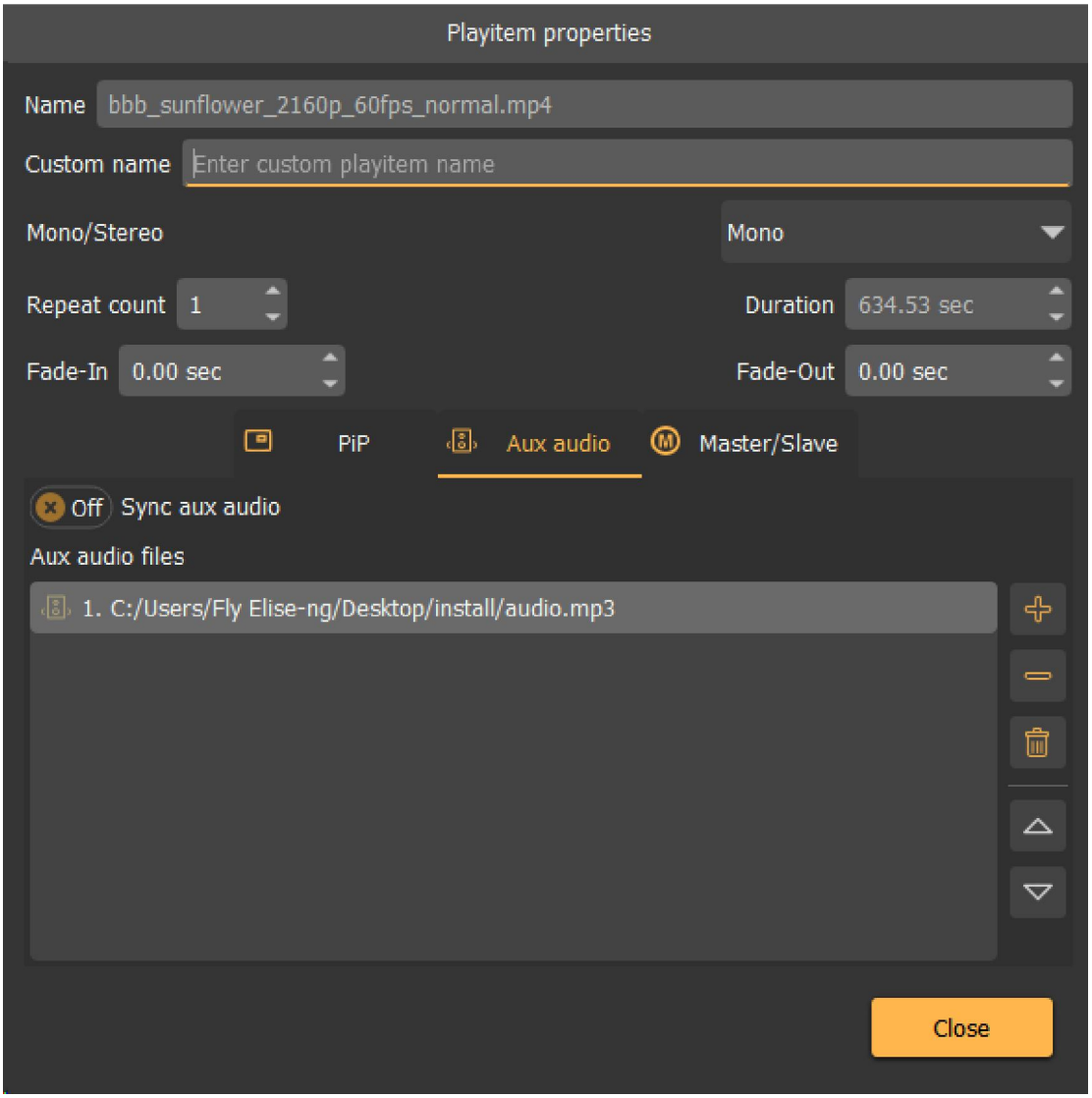


The position, scale and the transparency of the PiP can be adjusted separately



4.1.1.3 AUX

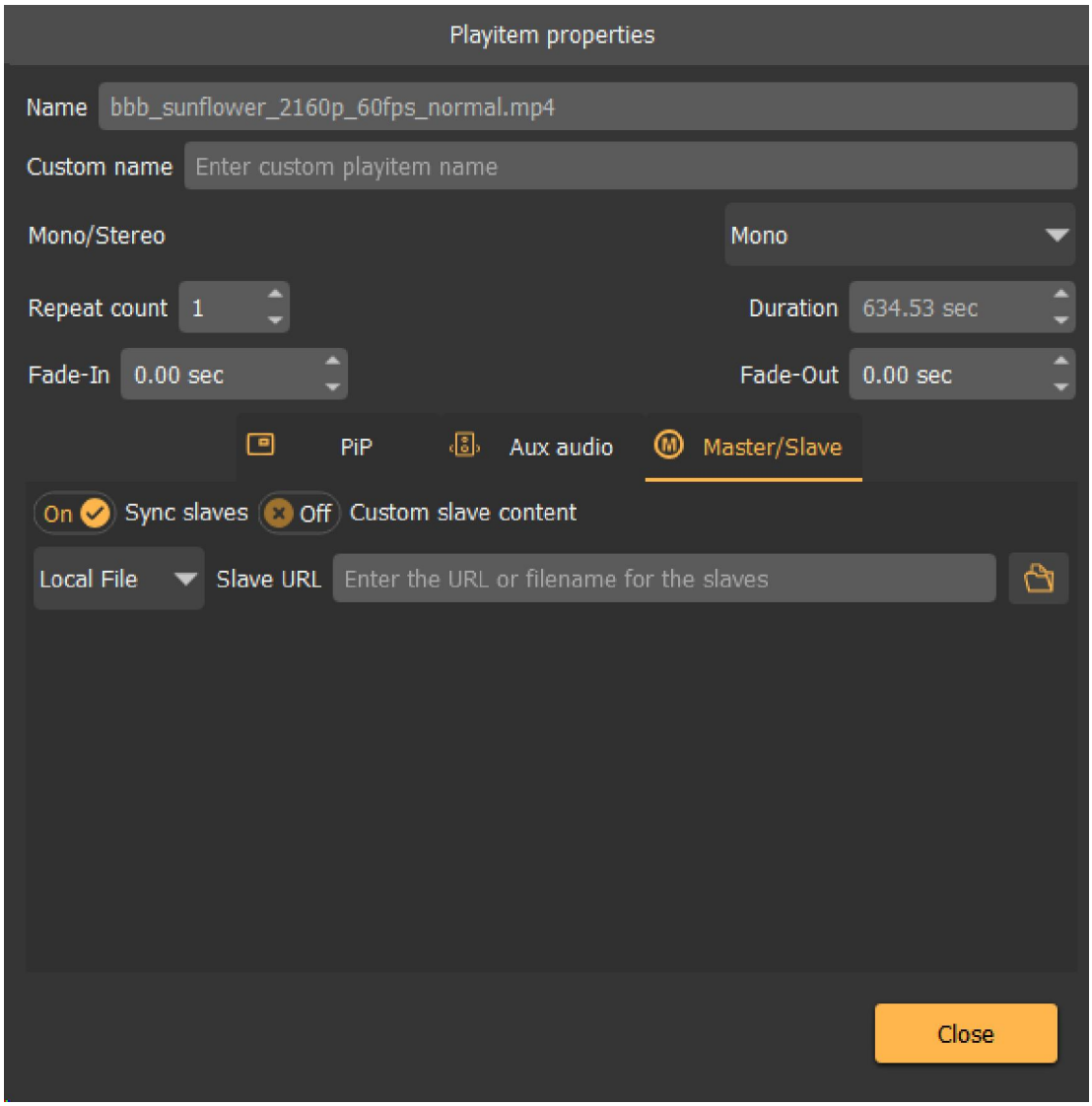
Each play item can be assigned up to 32 independent auxiliary audio streams. Each AUX audio stream can be assigned to the same or to a separate audio device.



The AUX streams can be time synchronized with the mains play item or can be played back independently.

4.1.1.4 Master/Slave

The maser/slave play item tab provides control on the content that the slave will play when this play item is played back on the master.

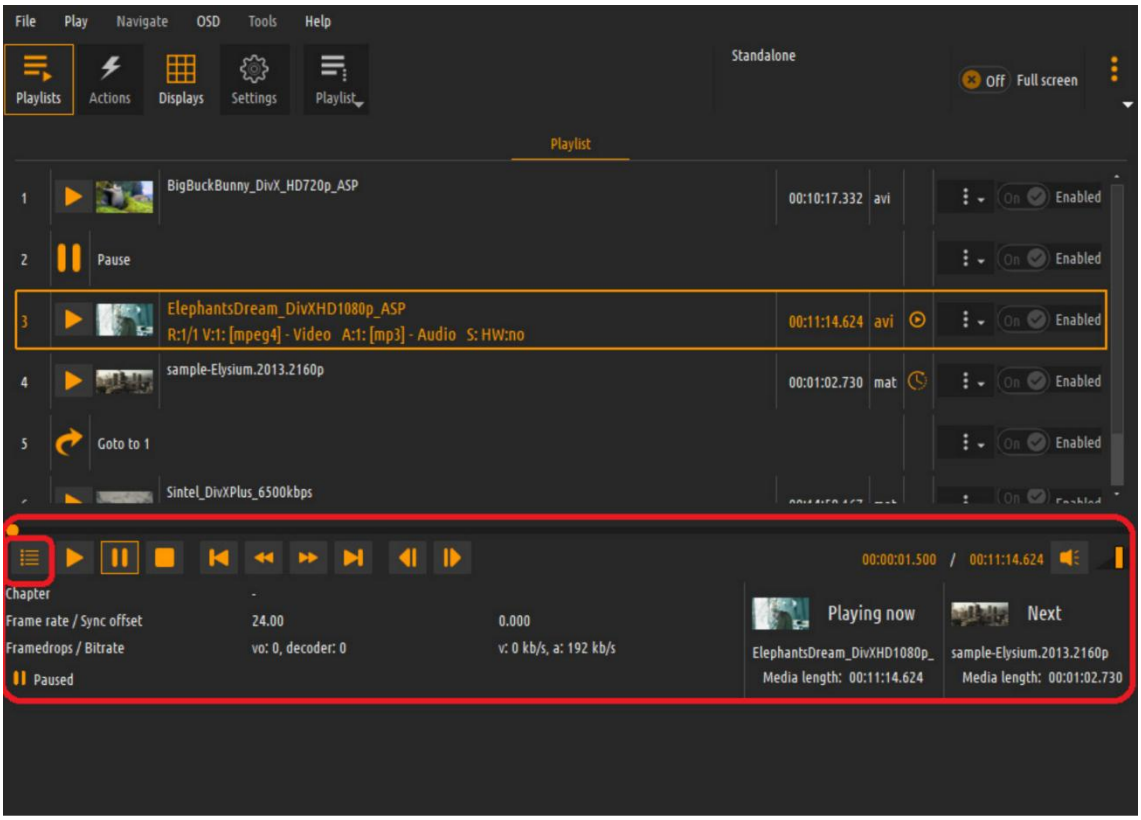


Users can select to play the master/slave content synchronously. By default, the slave will play the same ply item content as the master. However, users can override this and provide an alternative content that the slave plays.

Each play item can be configured to play a number of times, before the control goes to another play item.

4.1.2 Timeline

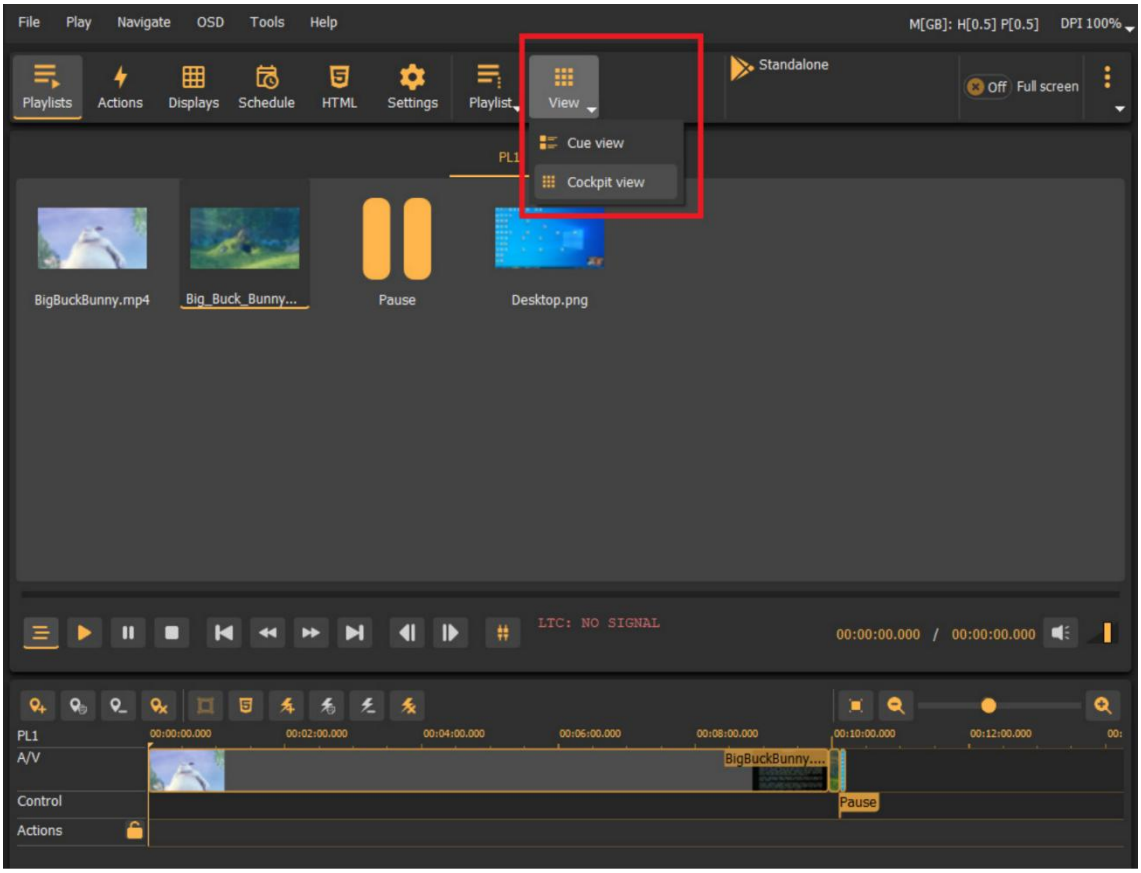
The bottom part of the Playlist page can show either the Player Control with the information of the currently played item and the next queued play item, or a timeline of the selected play list.
Users can toggle the visibility of the timeline using the timeline button.



In the Player Control view, use the controls to Pause/Play/Stop the playback as well as to jump to the previous or next play item.

Timeline mode shows the complete timeline of the selected playlist.
See the timeline section later in this document.

4.2 Playlist cue and cockpit view mode



Two view modes are available, cue mode and cockpit mode.

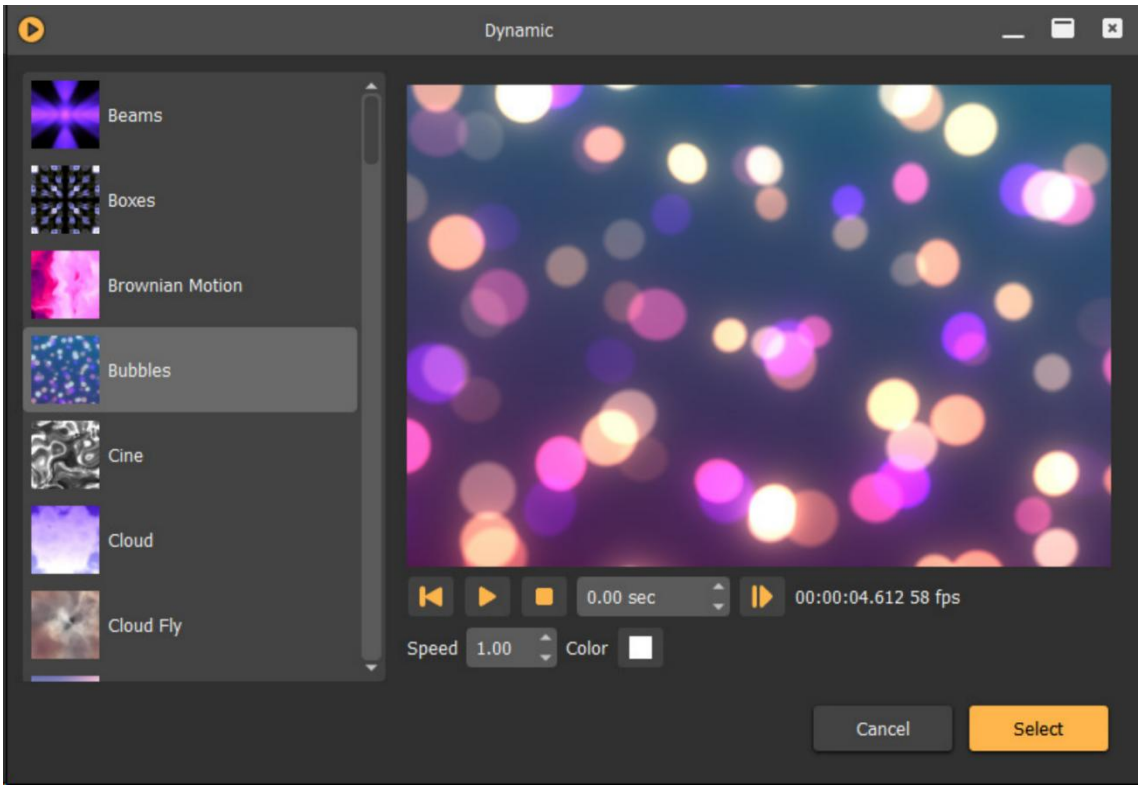
The cue mode shows the ordered play items in the playlist. This is the default view.

By selecting the cockpit view mode, the play items are arranged in large tiles. Double clicking on the tile will start the playback of the play item.

The cockpit mode is most usable in interactive setups where the users decides on which play item is to be started and played.

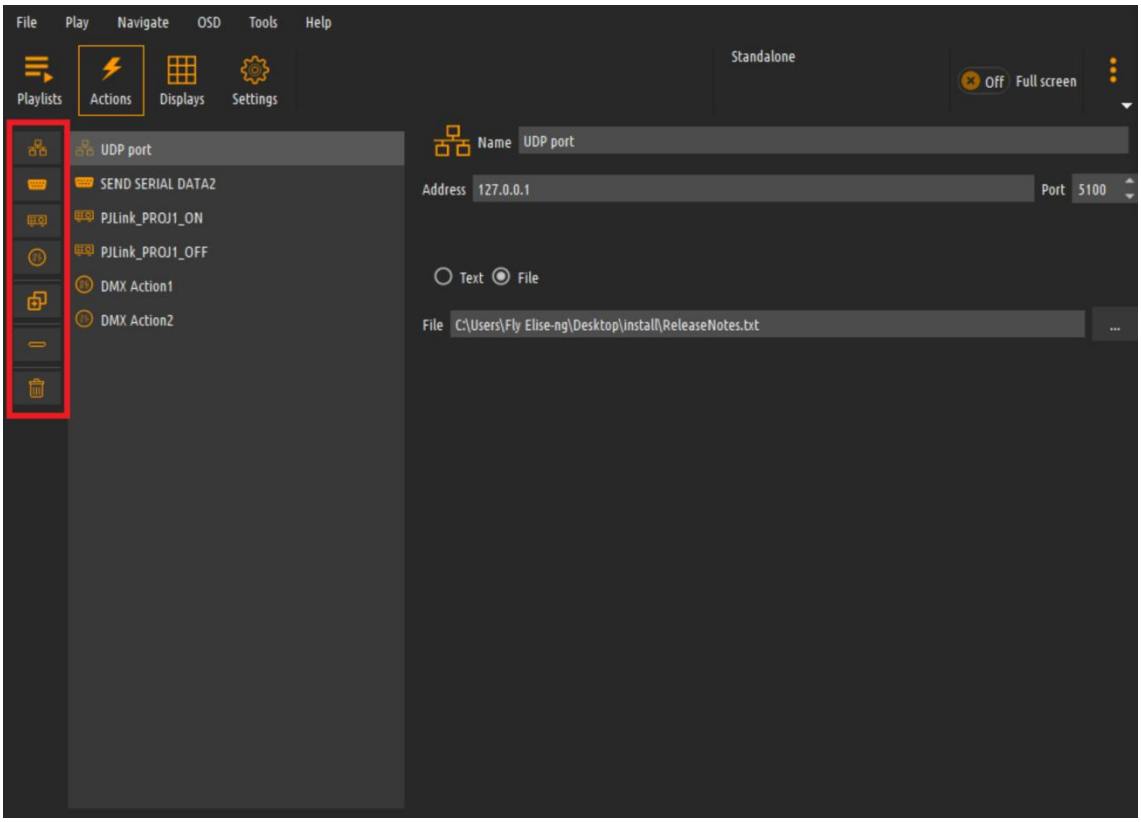
4.3 Dynamic (Procedural) video

The Immersive Player PRO software comes with a set of 50+ procedural video content sources. This source can be used as a default background (when no video is played back) or as a background of the Canvas when the canvas mode is enabled.



In addition, there is an encoding tool under the tools menu to encode a dynamic (procedural) video and optional audio steam. The encoded content can be used as a playitem in any playlist.

4.4 Actions page



Note: The use of actions requires the Ultimate License.

The actions page allows definition of show control actions that can be put on the timeline.

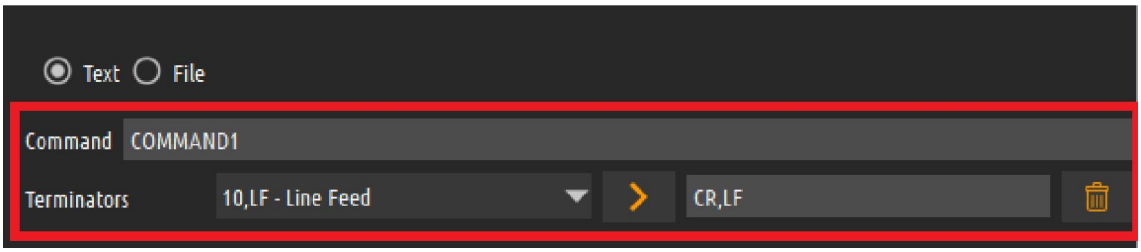
The software supports the following types of show control actions: UDP, Serial Port, PJLink and DMX actions.

The buttons on the left side can be used to add and remove/delete actions.

4.4.1 UPD Action

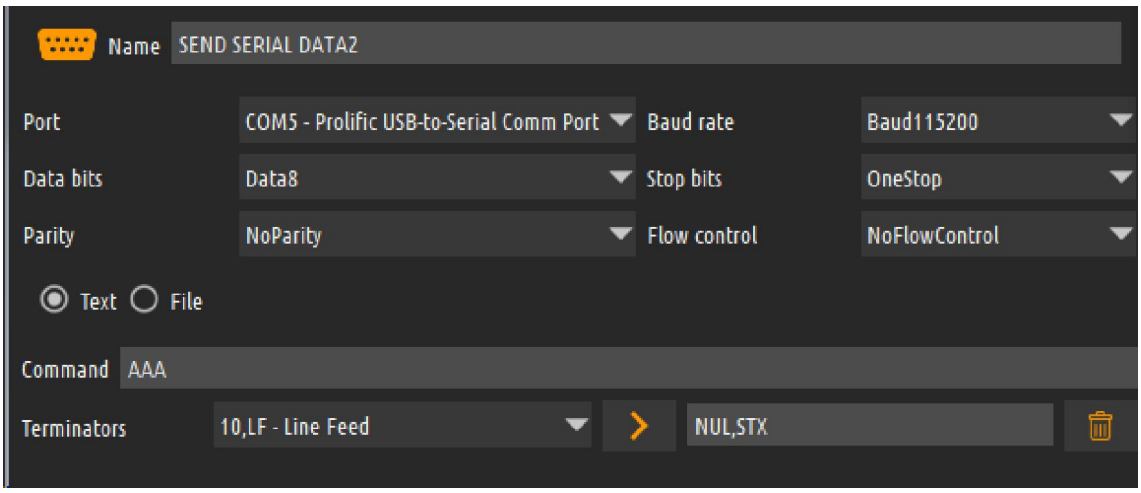
The UDP actions are action that send a data to a specified IP address and UDP port. The data to be sent can be specified as a text data or as a binary or text file content.

When a test command is specified, the user can enter the any text. Any non-printable characters can be added to the end of the data if the receiving part requires terminating characters. A list of all non-printable characters are available in the combo box. The list of the non-printable characters and be cleared using the delete button.



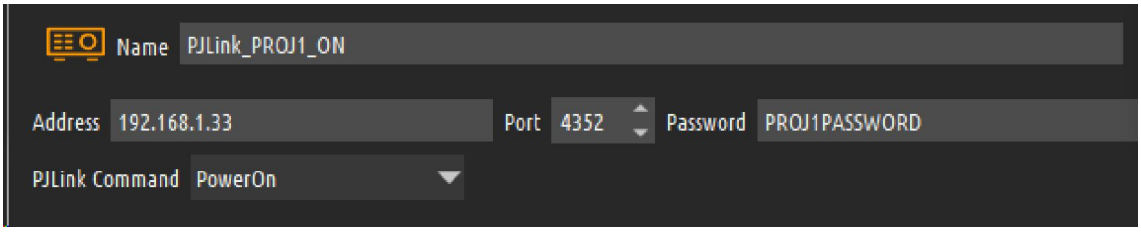
4.4.2 Serial Port Action

The Serial port actions are similar to the UDP actions.
The specified data or the content of the file is send to a serial port.



User can select a COM port specify the parameters of the COM port for the data sending.

4.4.3 PJLink Action



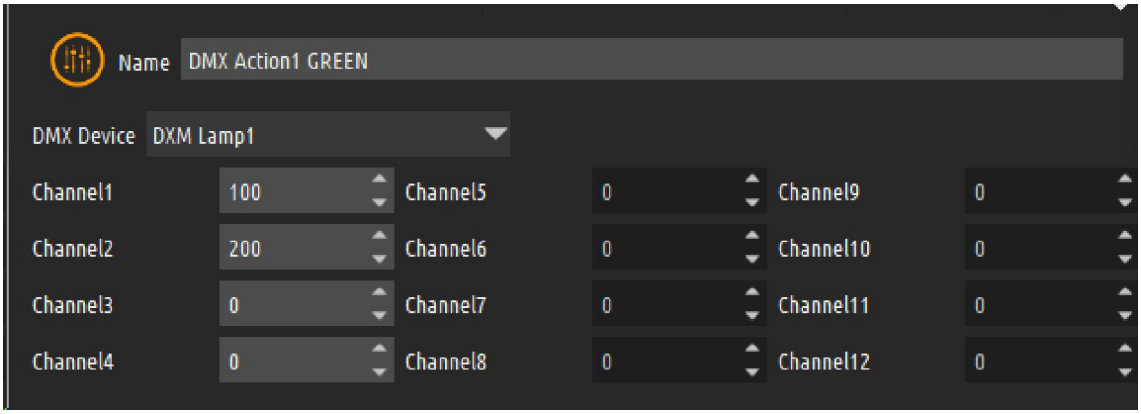
PJLink is a standard interface implemented by the major projector manufacturers to control the projectors remotely.

User can specify the IP address and the port of the projector. The standard PJLink port is 4352.
Additionally, if the projector is setup with the password, the PJLink password can be specified.
The software supports the following PJLink commands:

PowerOn, PowerOff, MuteAudio, MuteVideo, MuteAudioVideo, UnMuteAudio, UnMuteVideo, UnMuteAudioVideo, InputRGB, InputVideo, InputDigital, InputStorage and InputNetwork.

Some of the commands require an additional parameter that can be specified when the command is selected.

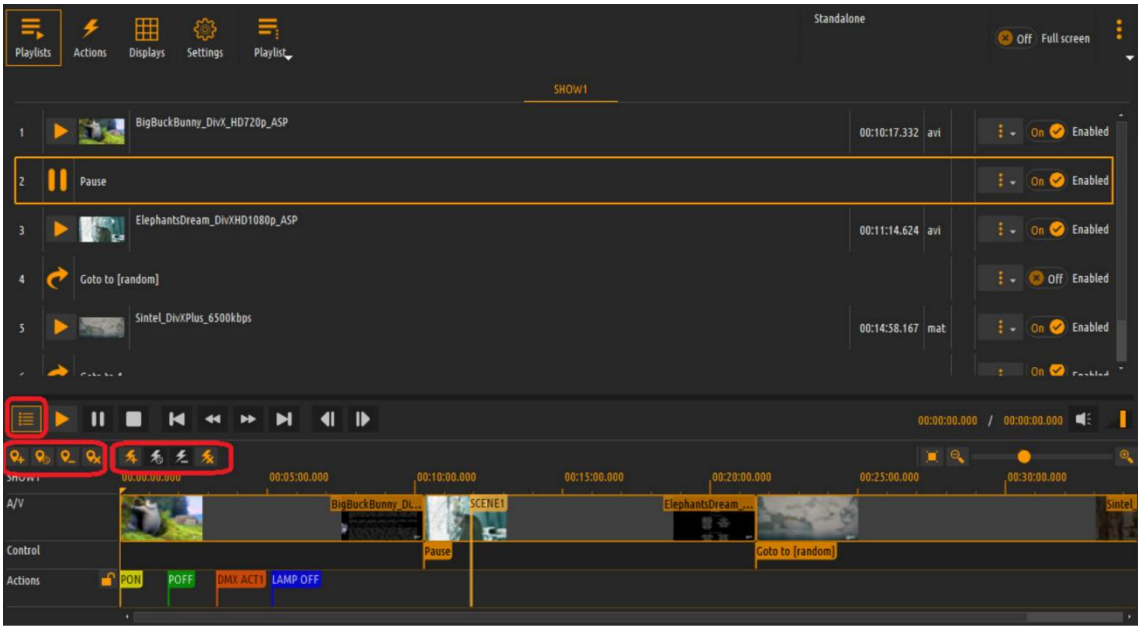
4.4.4 DMX Action



The DMX action is an action on one of the specified DMX devices. Depending on the number of channels specified by a DMX device, the user can enter the values for the specified channels. The values are in the range of 0-255. Check the specific DMX device specification for the allowed channel values.
The channel values are applied instantaneously when the action is executed.

4.5 Timeline

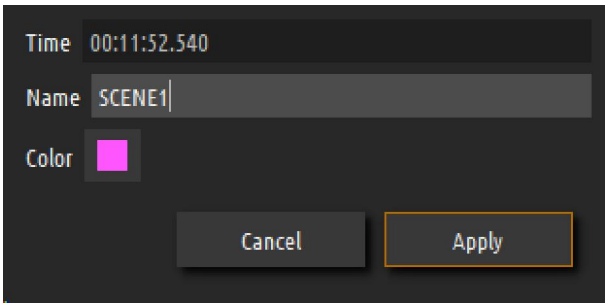
The timeline is additional view of the selected playlist which shows all playtimes on the time axis. User can switch between the timeline view and the info view using the timeline button next to the play button.



The playlist items are shown on the first track. The optional control play items (Goto and Pause) are shown on the second track. The first and the second tracks are locked and the items cannot be moved on those tracks.
The last track is the action track. On this track user can put one or more list of actions to be executed when the playback time reaches the action.
Double clicking on any item on the timeline opens the item editing dialog.

The timeline offers the following additional features:

Markers – users can add markers on the timeline to mark a scene of a time code on the timeline. Markers are only for visualization and purposes. Users can move markets freely on the timeline.
Double clicking on the marker opens the marker properties dialog where the name and the color of the marker can be specified.
Use the mouse to drag the marker flag on the timeline.

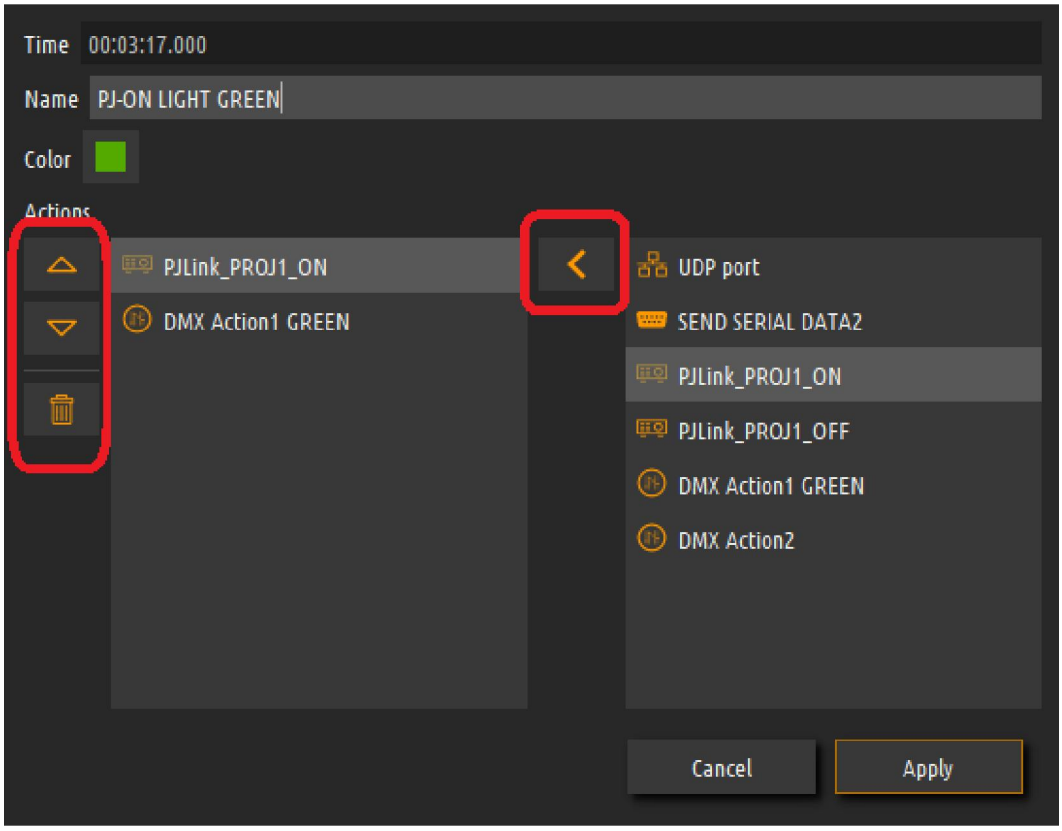


Actions:

Note: The use of actions requires the Ultimate License.

An actions list can be added to the timeline by pressing the “Add action button on the top of the timeline. This will put an actions flag on the actions track.

Double click the flag to open the actions list dialog to add the actions to be executed.



The right list contains all the actions defined in the action screen. Actions can be added to the actions list on the left.

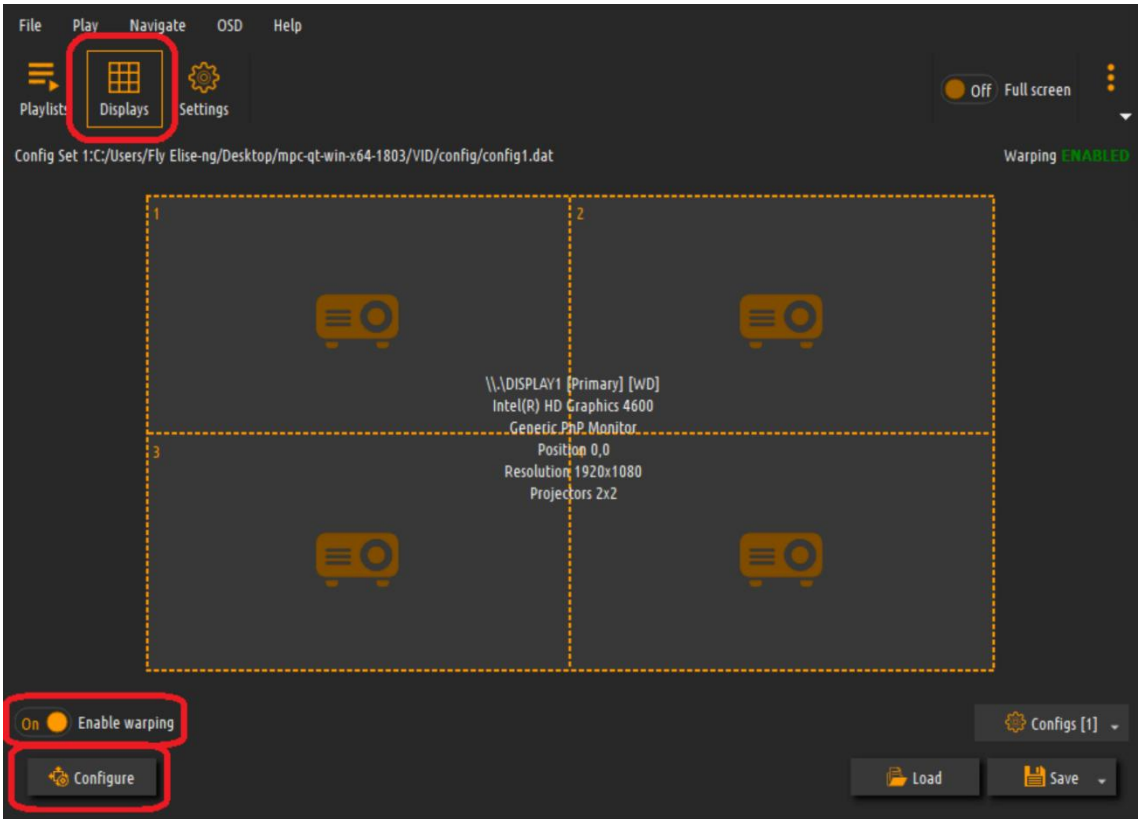
The order of the actions can be changed as well.

When the playback time reaches the time specified in the action list, all the actions in the list will be executed sequentially.

Use the mouse to drag the action flag on the timeline:

- Mouse Left: Set the timeline time position
- Mouse Wheel: Scroll the timeline
- CTRL + Mouse Wheel: ZoomIn/ZoomOut timeline
- CTRL + Mouse Left: Drag Timeline or drag item

4.6 Displays page



The displays page shows the detected displays on the system. Every time Immersive Player PRO is started, it detects all displays present on the system. Every display is presented with a button containing information about the display system name (known to Windows OS), the resolution and the number of projectors connected to this display. Initially there are no projectors configured to the displays.

By clicking on the display button a popup menu will be presented with all supported projector configurations.

The following projector configurations (horizontal x vertical) can be selected from the drop-down menu:

- None (No projectors connected)
- External calibration (Load .procalib files from Immersive Calibration PRO)
- All possible (horizontal x vertical) projector configuration with up to 16 projectors

Displays changes

When multiple windows displays are used (or multiple graphical cards) Windows sometimes enumerates and names the displays in an arbitrary order. Because Immersive Player PRO stores the warping and blending configuration per display, when Windows enumerates displays differently, the previously configured display can be renamed differently or can swap position with another display.
When the option “Check for display change” is selected, Immersive Player PRO will detect any changes in the displays configuration since the last time the settings have been saved. If changes are detected, the displays tab will be cored red. Pressing the Left or Right mouse button on the display will open the context menu. The first item in the context many will open the previously saved displays configuration and the users can select (takeover) the previously saved configuration.

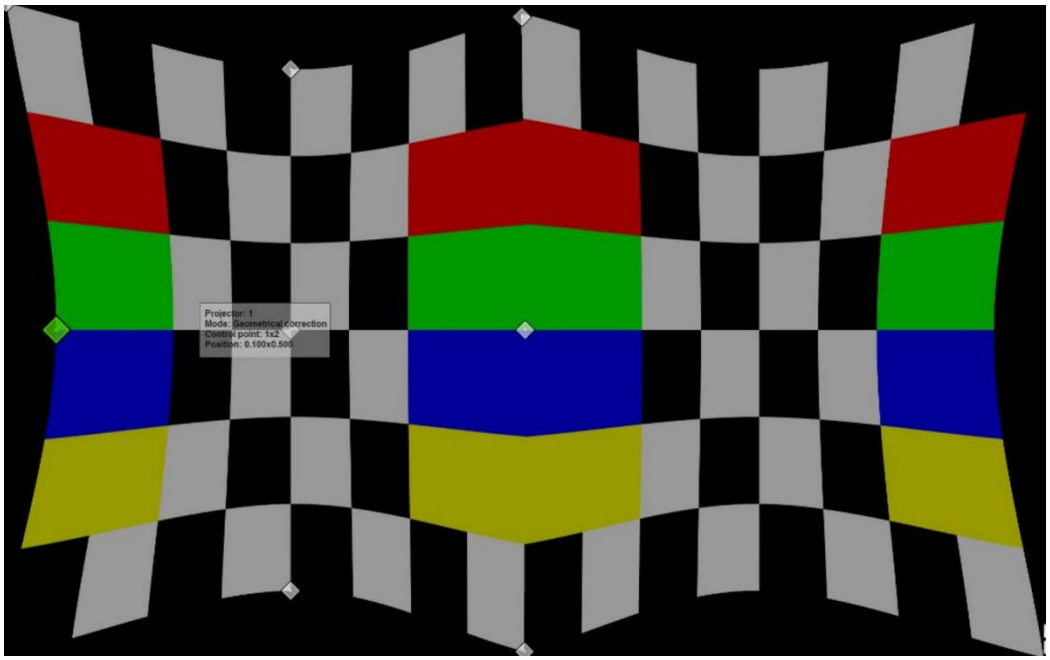
After selecting the projector configuration, click the “Configure” button to open the warping and blending configuration screen.

4.6.1 Geometrical corrections and soft--edge blending window

Geometrical corrections and soft-edge blending window provides a warping mesh of control points. By adjusting the position of the control points, the projected display can be mapped on any kind of planar or curved surface.
Depending on the projector configuration, a number of independent meshes are available (one per projector). The control points can be moved by mouse or by using keyboard shortcuts.
The number of horizontal and vertical control points can be selected from the advanced setup dialog or using keyboard shortcuts. Up to 50 control points can be selected.
Three editing modes are available:

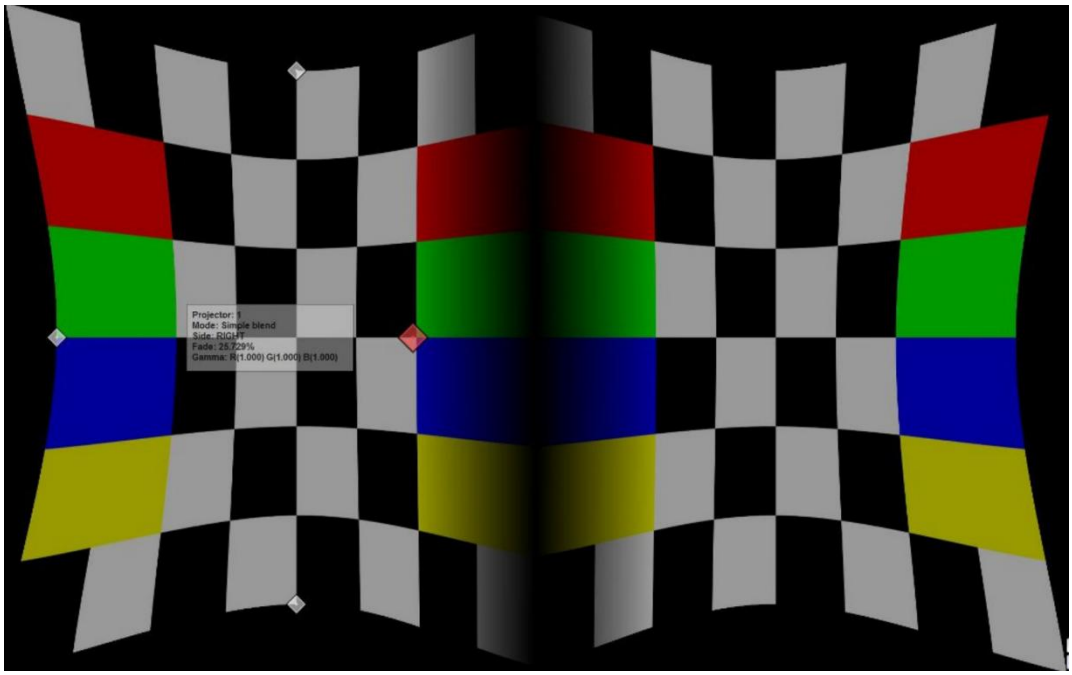
- Geometrical correction
- Simple edge blending
- Advanced edge blending

In geometrical correction mode the image can be mapped on any projection surface by dragging the green control points with the mouse or using keyboard shortcuts.



User can switch between geometrical correction and edge-blending mode using the “F10” key.

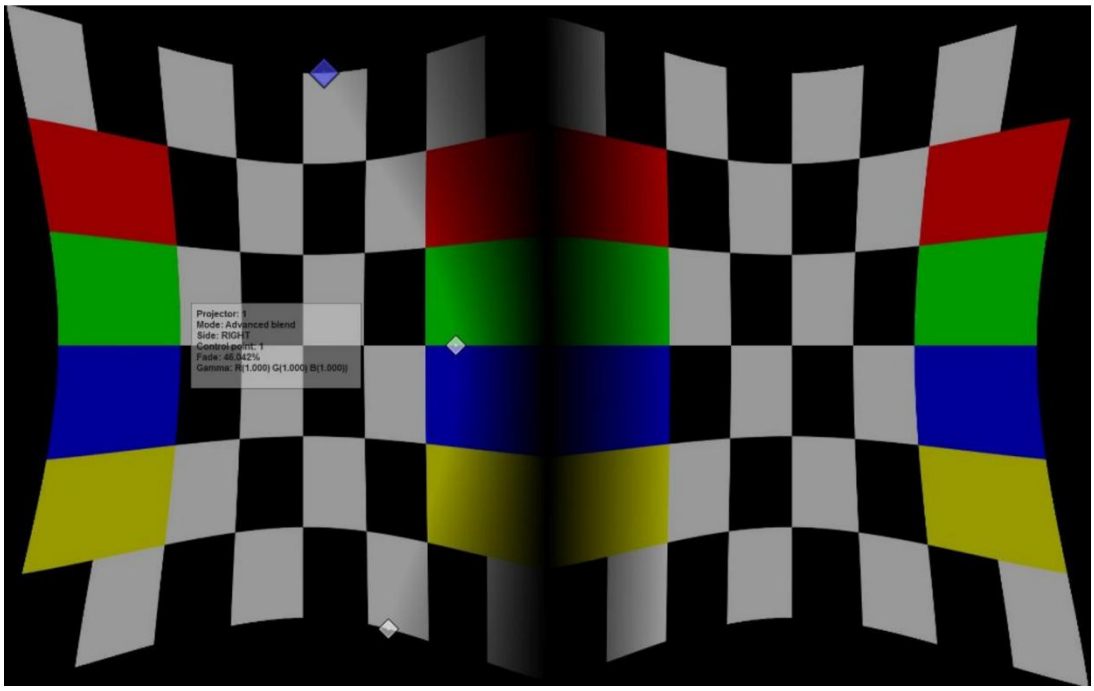
In simple edge blending mode, one control point is available per edge. User can drag the red control points to adjust the blending regions for each edge. Using the mouse scroll button the gamma value can be adjusted per control point.



Using the advanced configuration dialog user can enable the advanced blending mode.

In advanced blending mode one or more control points can be defined per edge. The blue control points can me moved independently to realize the most complex edge-blending configurations.

Using the mouse scroll button the gamma value can be adjusted per control point.


Projector: 1
Mode: Advanced blend
Side: RIGHT
Control point: 1
Fade: 46.842%
Gamma: R(1.000) G(1.000) B(1.000)

4.6.2 Keyboard and mouse control

Keyboard shortcuts

Modifiers		Key	Action
		D	Show/Hide advanced configuration dialog
		C	Center the configuration dialog on the projector
		I	Show Hide information window
		Esc	Close configuration dialog and window
		F5	Increase the number of horizontal control points
		F6	Decrease the number of horizontal control points
		F7	Increase the number of vertical control points
		F8	Decrease the number of vertical control points
		N	Select next geometrical correction grid
		Left	Select left control point
		Right	Select right control point
		Up	Select up control point
		Down	Select down control point
Ctrl		Left	Move control point left by 1 pixel
Ctrl		Right	Move control point right by 1 pixel
Ctrl		Up	Move control point up by 1 pixel
Ctrl		Down	Move control point down by 1 pixel
Ctrl	Shift	Left	Move control point left by 10 pixels
Ctrl	Shift	Right	Move control point right by 10 pixels
Ctrl	Shift	Up	Move control point up by 10 pixels
Ctrl	Shift	Down	Move control point down by 10 pixels
		F10	Toggle between geometrical correction and soft edge blending editing
		F11	Toggle between simple and advanced soft edge blending grid
		F12	Select next soft edge blending grid
Ctrl	Shift	Q	Reset all geometrical correction and soft edge blending grids
Ctrl		Q	Reset all geometrical correction and soft edge blending grids to the whole display area

Mouse operations

In geometrical correction mode:

- Drag control point with LEFT mouse button normal drag
- Drag control point with RIGHT mouse button fine grained drag
- Key combinations: “H” – drag all points in the same horizontal line
- Key combinations: “V” – drag all points in the same vertical line
- Key combinations: “A” – drag all points in the grid
- CTRL + S + MIDDLE mouse – Select a region to select all control points in the region
- CTRL + D + MIDDLE mouse – Select a region to de-select all control points in the region
- RIGHT mouse double-click – Select and De-select a control point

In soft edge blending correction mode:

- Drag control point with LEFT mouse button normal drag
- Drag control point with RIGHT mouse button fine grained drag

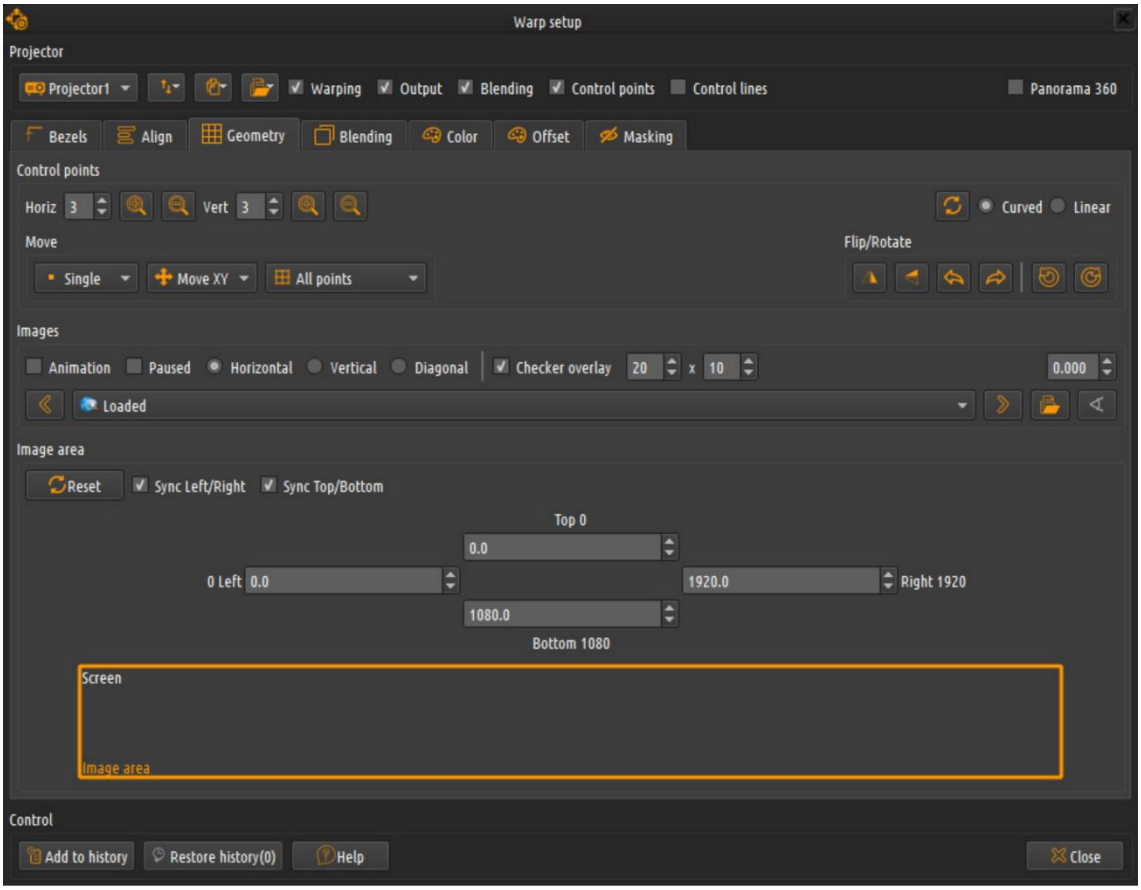
- Mouse wheel: Increase/Decrease the Red, Green and Blue gamma value of the soft edge blending point
- Mouse wheel + Key R – Increase/Decrease the Red gamma value of the soft edge blending point
- Mouse wheel + Key G – Increase/Decrease the Green gamma value of the soft edge blending point
- Mouse wheel + Key B – Increase/Decrease the Blue gamma value of the soft edge blending point

The list of all keyboard and mouse shortcuts keys can be shown in the calibration screen using the “Help” button. A new window will be shown next to the calibration configuration dialog.

4.6.3 Advanced configuration dialog

Pressing the “D” key can toggle the visibility of the advanced configuration dialog.

Geometrical correction tab

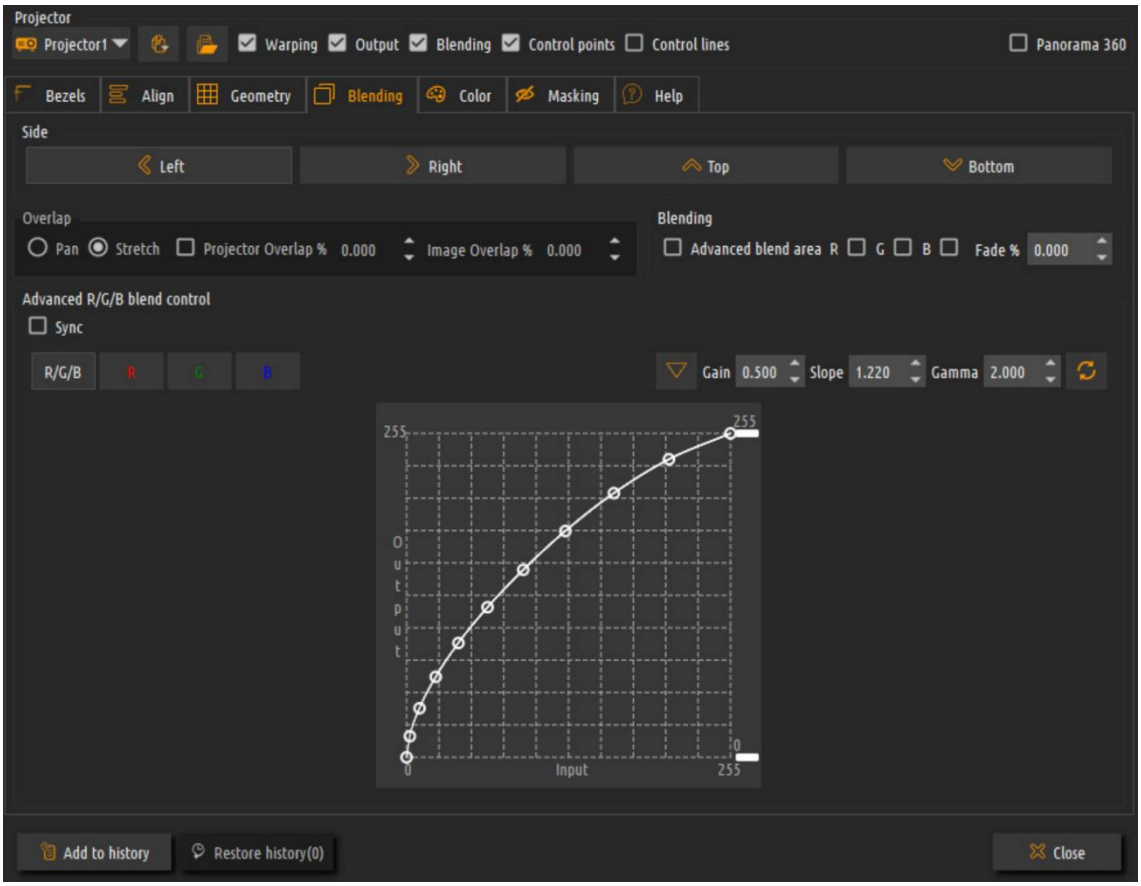


In the geometrical correction tab, the user can:

- Select the projector to be edited
- Enable/disable the projector output
- Show/hide the control points
- Show/hide the lines between the control points
- Select the number of horizontal and vertical control points
- Double or halve the number of horizontal and vertical control points
- Select the curved or linear geometrical correction
- Select to move single control point, all control points in the horizontal or vertical line, selected points or all control points on the grid

- Select to lock the movement in X, Y or XY directions
- Select to move only the edges control points and let the program interpolate the other control points
- Enable or disable the horizontal, vertical or diagonal animation lines for perfect geometrical correction
- Add additional checker grid overlay on top of the background image. Configure the number of horizontal and vertical checker boxes.
- Control for image mirroring, flipping and rotation
- Select the background image from the list of the built-in image of customer provided images in the images folder
- Load a background image from any location form the hard disk.
- Create a perspective images as background
- Adjust the image mapping on the screen for perfect aspect ratio.

Soft-edge blending tab



In the soft-edge blending tab user can:

- Select to edit Left, Right, Top or Bottom edge of the projector to edit the overlap or the fade (blend) area.
- Select between pan or stretch overlap mode
- Adjust the overlap region per edge
- Toggle between simple and advanced soft edge blending mode
- Adjust the fade region per edge (available only in simple edge-blending mode)
- Adjust the fade ramp per component R/G/B or for all components simultaneously.
- Use a parametric formula to configure the fade ramp based on 3 parameters (gain, slope, gamma).
- Manually fine-tune the fade ramp using the advanced fade controls.
- Select the masking bitmap that can be applied to the projectors.

Note: When putting the cursor on top of an adjustable field, a small window will be opened with one or two horizontal sliders. The first slider is for normal change of the value. The bottom slider is for very fine change of the value.

This is a very convenient input method that allows the users quick and fine adjustment of the blending parameters.

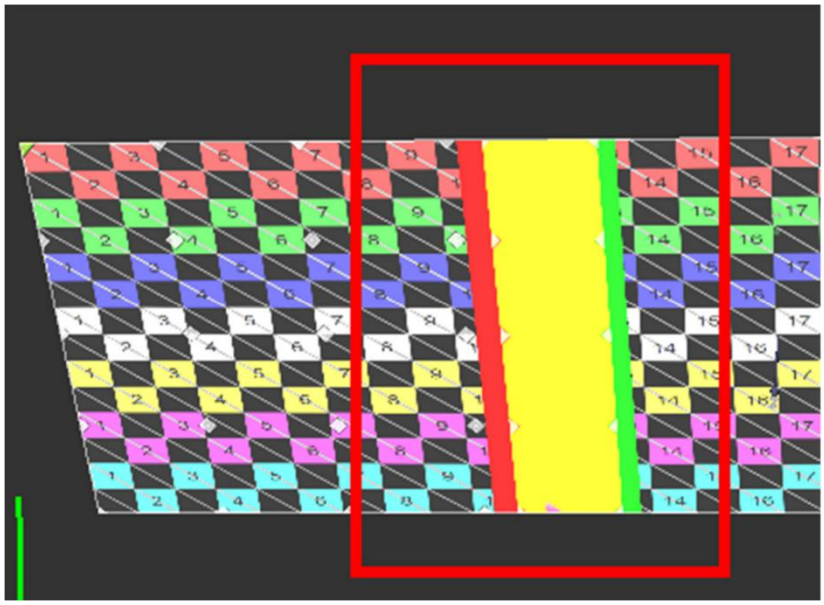
The overlap can be configured either as a projector overlap or as an image overlap. When the check box next to projector overlap is checked, the user can enter the projector overlap in percentages. This value should match the actual overlap of the projected images on the projection screen. When overlap is configured for that edge, the projected image will contain also part of the image projected from the adjacent projector. Both images must be matched on the projected screen. When using projector overlap, the overlap of the adjacent projector is automatically updated and the image overlap is automatically calculated.

Using the projector overlap is the preferred way of calibrating the overlap and produces the best results for manual calibration.

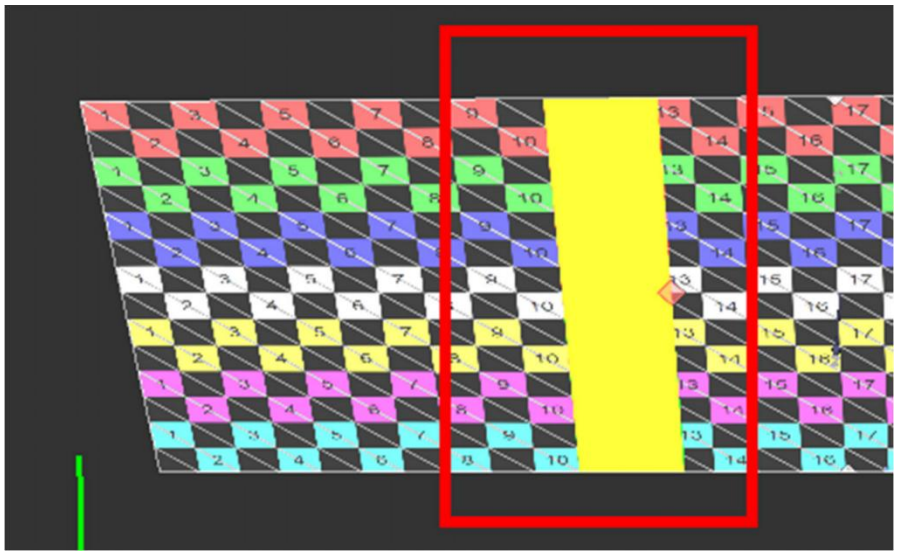
Note that, due to the limitations of the graphical system, the overlap region should be set only to projectors connected to the same display. For projectors connected to other display, the output of the displays has to be configured in such a way that both displays show an overlapping image.

Fade is configured as percentage of the total projector image. This is a region whiting which the color intensity of the individual Red, Green and Blue components will fade to black for achieving seamless soft edge blending.

The width of the fade region is very important for achieving good soft edge blending results. Before setting the fade ramp of the fade regions per projector users can select the red color of the of the fade region of the left part of the overlapped edge and select green color on the neighboring projector on the same overlap edge. A combination of green and red color will produce yellow color on the screen. Using the fade regions control points users should adjust the fade region per projector so that no red of green areas are visible outside of the yellow regions.



Fade regions wider than the actual projector overlap.

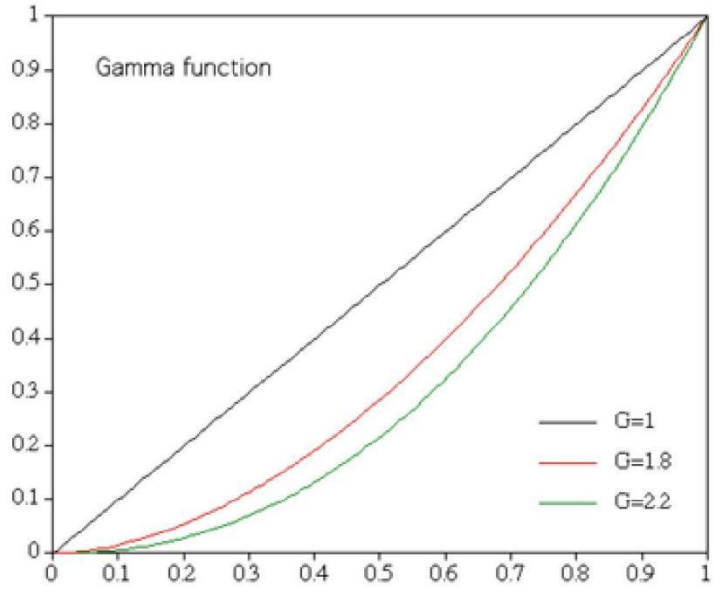


Once this alignment is completed, the fade regions color should be turned off and users can proceed to configure the fade out parameters.

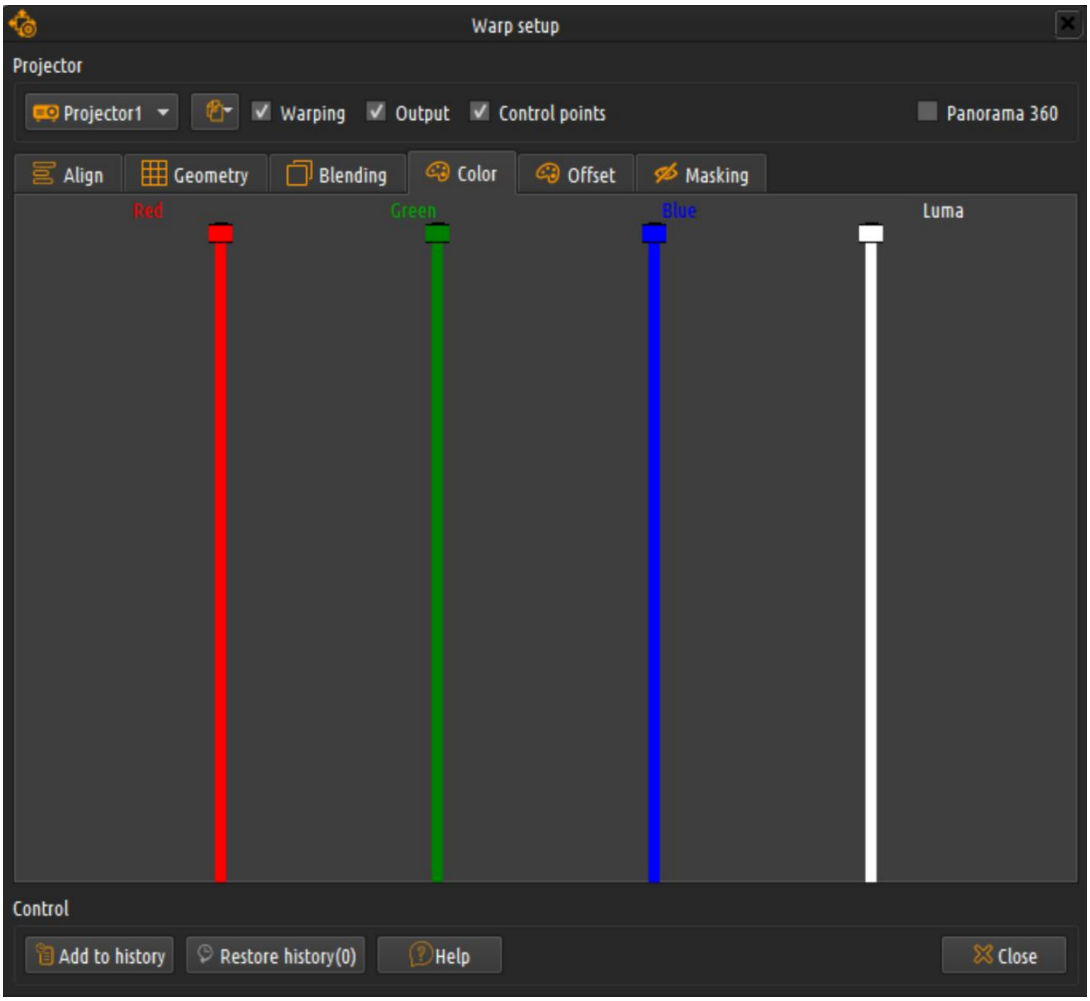
This region can be configured using a parametric formula or manually. In manual mode this region is divided in 10 segments. The intensity of the color components and the beginning of the segments can be adjusted with the vertical sliders. The values inside the segments are interpolated.

In parametric formula mode the three parameters (gain, slope and gamma) can be used to create the desired fade function profile. The gain and the slope parameters determine the shape of the fade curve while gamma determines how fast the color will fade to black. The parametric formula can be adjusted per Red, Green and Blue color components or for all components together (Luma).

The following figure shows three gamma functions depending on the gamma value.

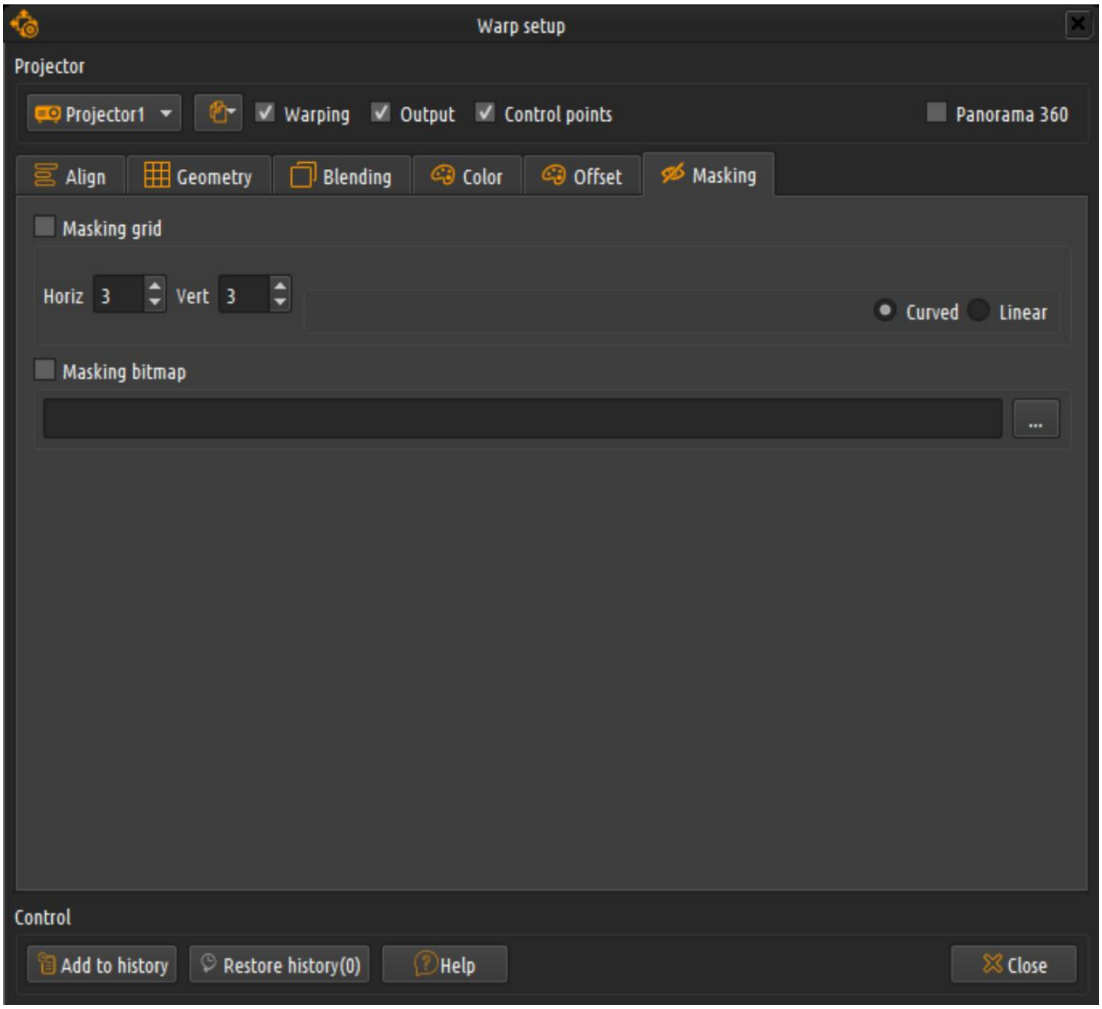


Color balancing tab



In the color-balancing tab the user can adjust the color profile per projector in order to achieve color uniformity among projected images.

Masking tab



In the masking tab the user can select different masking options per projector or for the whole display.

When a part of the projected image has to be masked for whatever reasons the users can use the masking controls. Masking can be defined in two ways: An interactive masking grid per projector or a masking bitmap per display.

In the masking grid mode, user can use the grid control points in the similar way as with geometrical correction grids. The shape of the grid will determine which part of the image will be visible and which parts will become invisible and will be masked.

User can select the number of the horizontal and vertical grid control points as well as the mode of the grid: curved edges or linear edges.

In the masking bitmap mode, the user can select an existing black & white .bmp or .png file. The file can be prepared offline using a paint program.

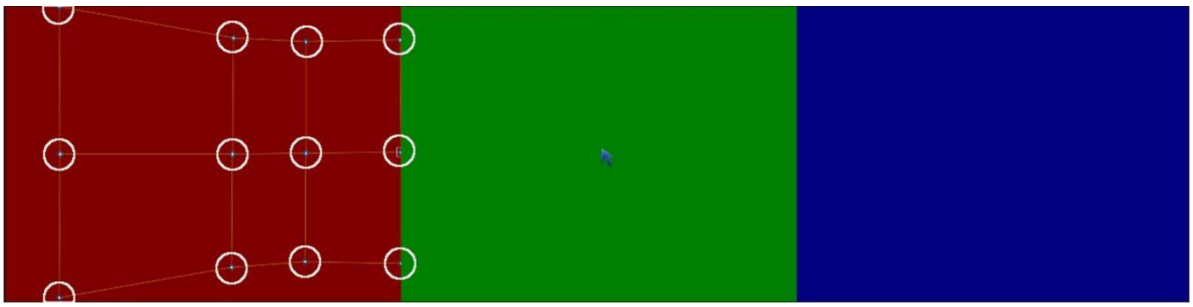
The black parts of the image will determine which part of the projected image will be masked and will not be displayed.

Only one masking control can be selected at a time. When no masking control is selected the masking will not be applied.

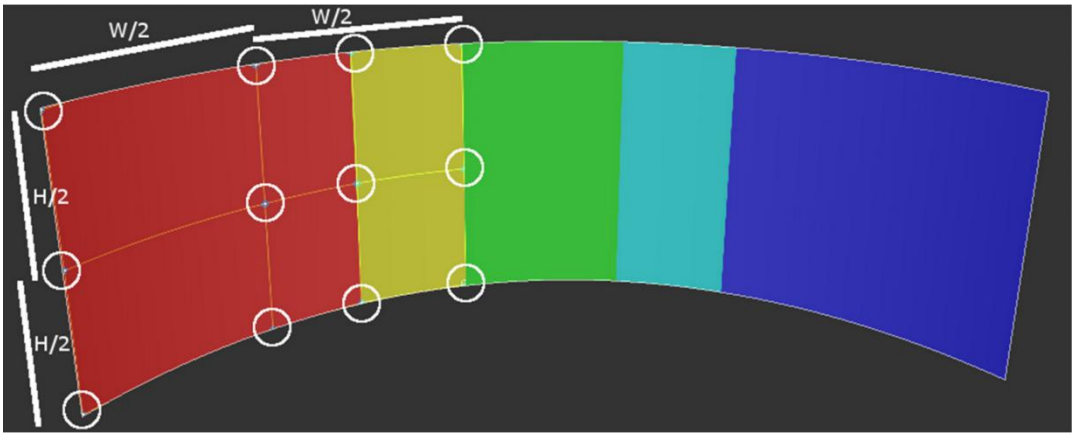
Align tab

Using the Align tab user can use the align grid to indicate the position of the projected image on the screen as well as indicate the overlap regions on the screen with other projectors. By pressing the “Automap” button, Immersive Player PRO will calculate the geometrical correction, the overlap region and the edge blend region to produce the combined mapped image on the screen. This function is a utility function to map the projected image on the screen as accurate as possible using the align grid before the user can continue with the fine-tuning of the geometrical correction and the soft-edge blending.

The users have to position the grid points on the projector so that the points will be shown on the edges of the screen and the edges of the overlapping regions with other projector.
If the projector has one overlapping edge the grid contains only point for the screen edges and the one overlapping edge region. For projectors that have overlapping edges with more projectors (horizontally or vertically) the grid will contain points for all the overlapping regions.
The “colors” background image can be selected during mapping of the align grid for the best identification of the overlap regions.

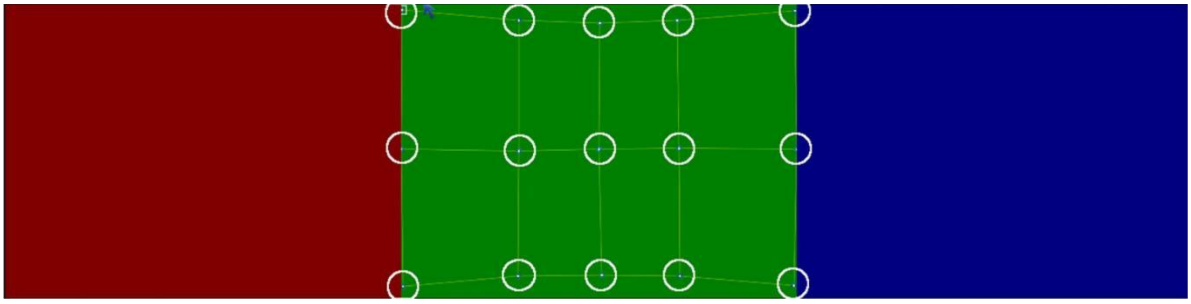


Left projector align points

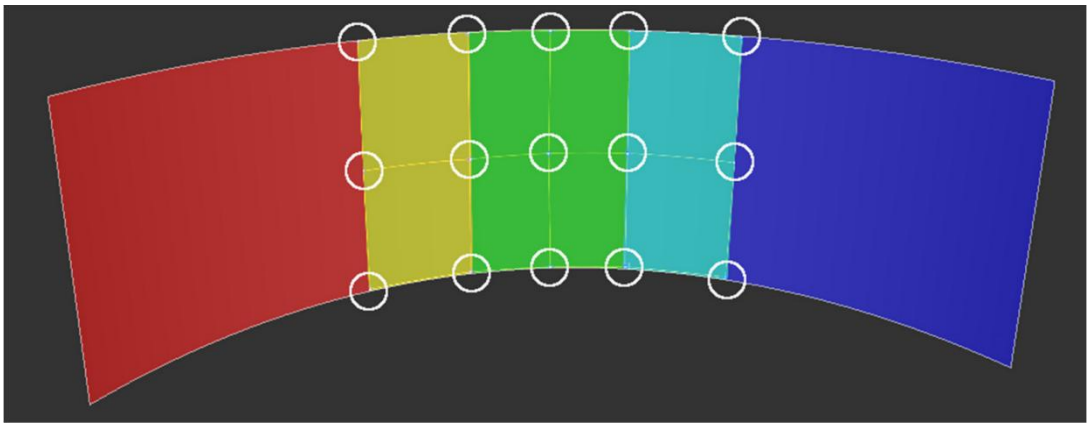


Left projector align points on the screen

A left projector in 3x1 projector configuration the first column of align grid points should be mapped to the left edge of the screen. The second column of the align grid should be mapped in the middle of the projected image on the screen for this projector. The third column should be mapped on the left edge of the overlap between the left and the center projector. The forth column should be mapped on the right edge of the overlap between the left and the center projector.



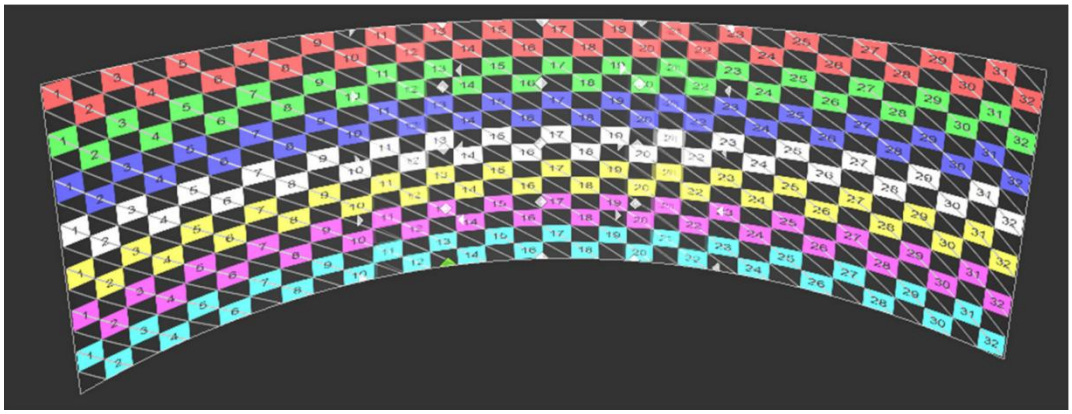
Center projector align points



Center projector align points on the screen

Similar to the left projector the center projector has align grid points for the both overlaps with the left and the right projector. The most left columns of the align grid should be aligned with the overlap region with the left projector. The rightest columns of the align grid should be aligned with the overlap region with the right projector.

The align grid mapping for the right projector is similar to the left projector. After pressing the “Automap” button the warping approximation will be calculated and applied.



Only small adjustments of the geometrical correction and the edge blending are needed to get the perfect multi projector projection.

4.6.4 Button bar

The button bar contains the following buttons:

- Configure: Starts the geometrical correction and soft-edge blending configuration window if one or more displays are configured with projectors configuration.
- Configs: Opens a sub menu to select one of the 8 available configurations. Users can setup and configure each configuration separately. The warping and blending configurations will be saved per configuration set. The default keyboard shortcuts CTRL+SHIFT+1/2/3/4/…/8 can be used to immediately switch between different configuration sets.
- Load: Opens a load dialog to load another configuration file
- Save: Saves the current configuration.
- Save As: Opens a save dialog to save the configuration file with a different file name.

4.6.5 Config sets

Immersive Player PRO allows the user to configure multiple configurations that can be loaded at once and can be switched instantaneously. This can be used to have different warping and blending settings for brighter scenes and another blending configurations wit darker scene. Also the user can create one config set with _multi.procalib and another config with _single.procalib for warping multi-view and single view scenes respectively.
The users can switch between one of the 8 possible configurations sets using the default keyboard shortcuts (CTRL+SHIFT+1/2/3/4/…/8). If the game of the screen is warped, the warping will change instantaneously according to the selected configuration.

4.6.6 External camera assisted calibration

The manual geometric correction and soft-edge blending can be completely automated by using a standard off-the-shelves webcam. A HD webcam is

recommended for the best results (Ex: Logitech Webcam PRO 9000, Logitech HD Pro Webcam C920, etc.)

The external program ImmersiveCalibration PRO should be used to perform the automatic calculation of the geometric correction and soft-edge blending. After ImmersiveCalibration PRO has finished, the calculation results should be saved to a file "*.procalib".

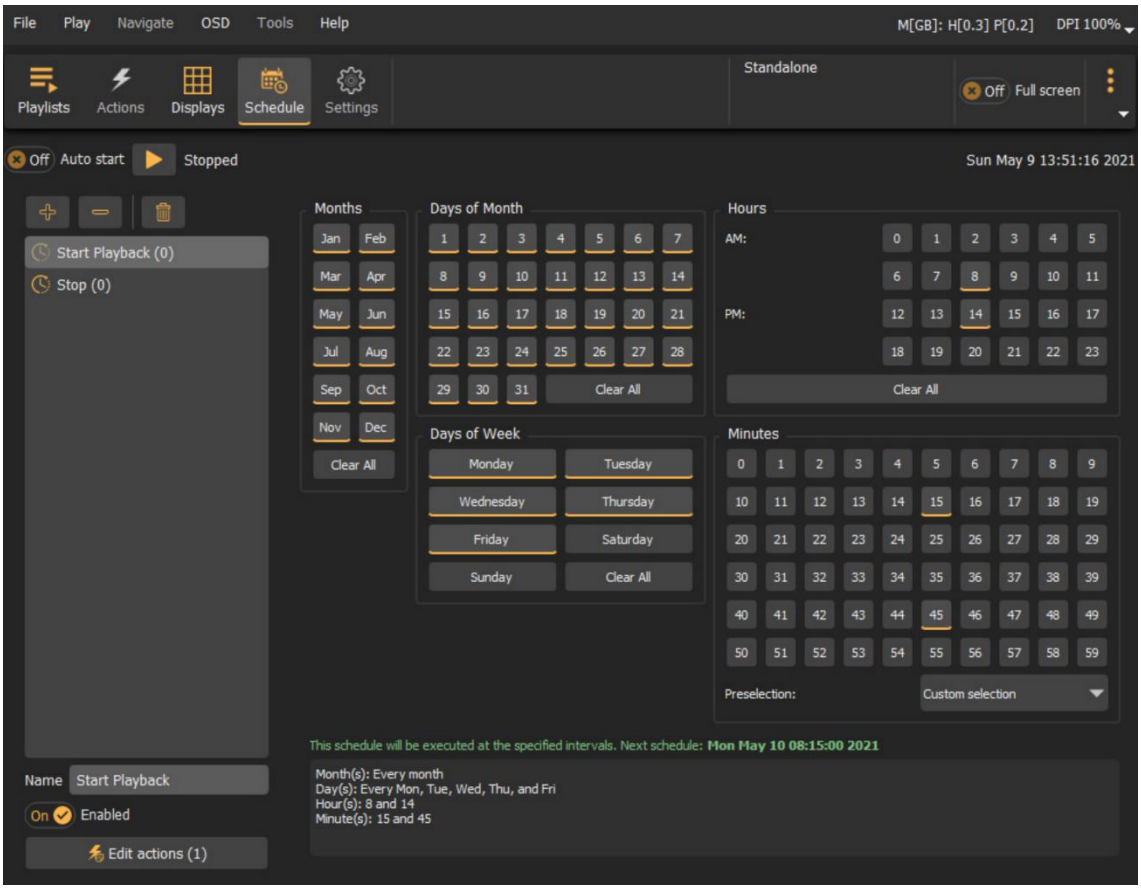
Immersive Player PRO can import this file by selecting "External calibration" menu from the projectors calibration drop-down menu of the display.

After the external calibration file is loaded, users cannot perform further manual geometrical correction. Users can still manually adjust (fine-tune) the soft-edge blending parameters and the black offset parameters.

Note: "Ultimate" licensing option is required to be able to use Immersive Calibration PRO files in Immersive Player PRO

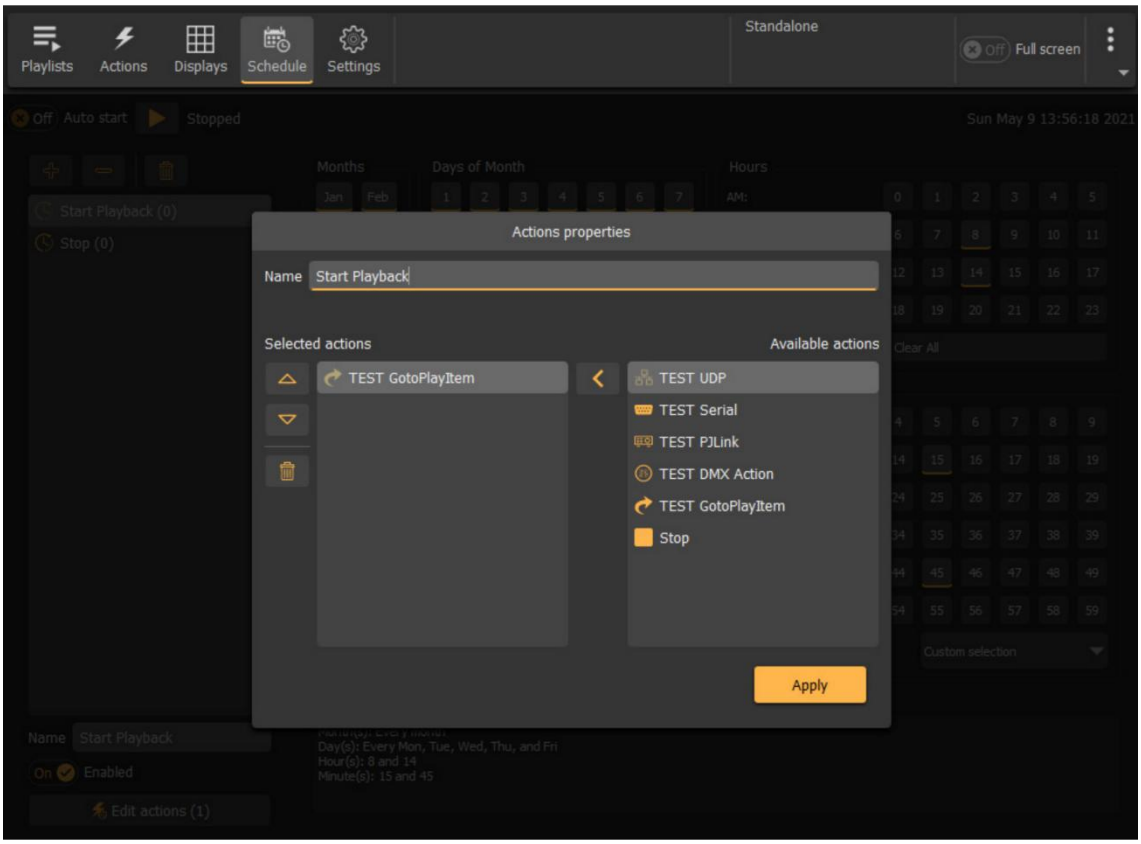
4.7 Schedullee page

The schedule page offers an extensive scheduling of actions based on configurable timing moments and schedules.



Multiple schedules can be defined and configured using the extensive scheduling possibilities based on fixed or repetitive timing events.

Each schedule can be assigned a set of actions to be executing when the schedule will be triggered.

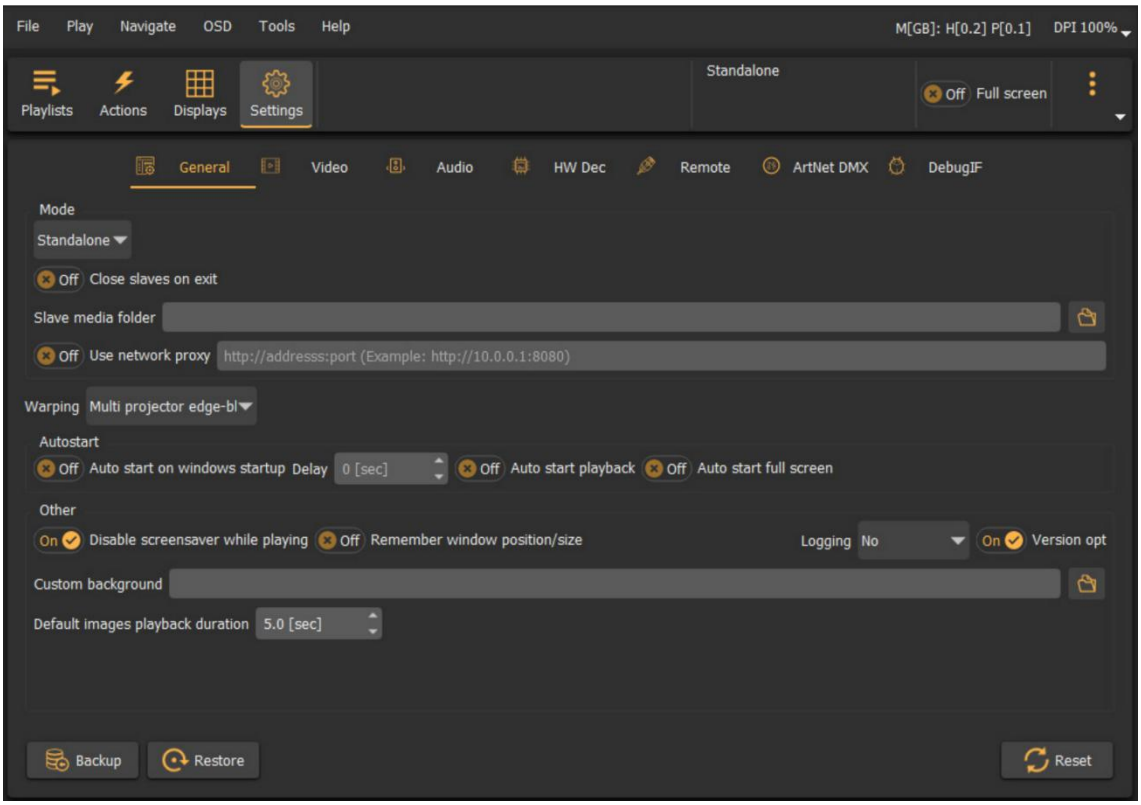


All actions defined in the Action tab are available for selection. Those include UDP, Serial, PJLink, DMX as well as Play/Stop actions.
This allows a huge flexibility for define fully unattended and automated shows.

4.8 Settings page

The settings page contains Tabs for configuring Immersive Player PRO.
The settings including the warping and blending configuration can be backed up and restored using the corresponding Backup/Restore buttons.

4.8.1 General



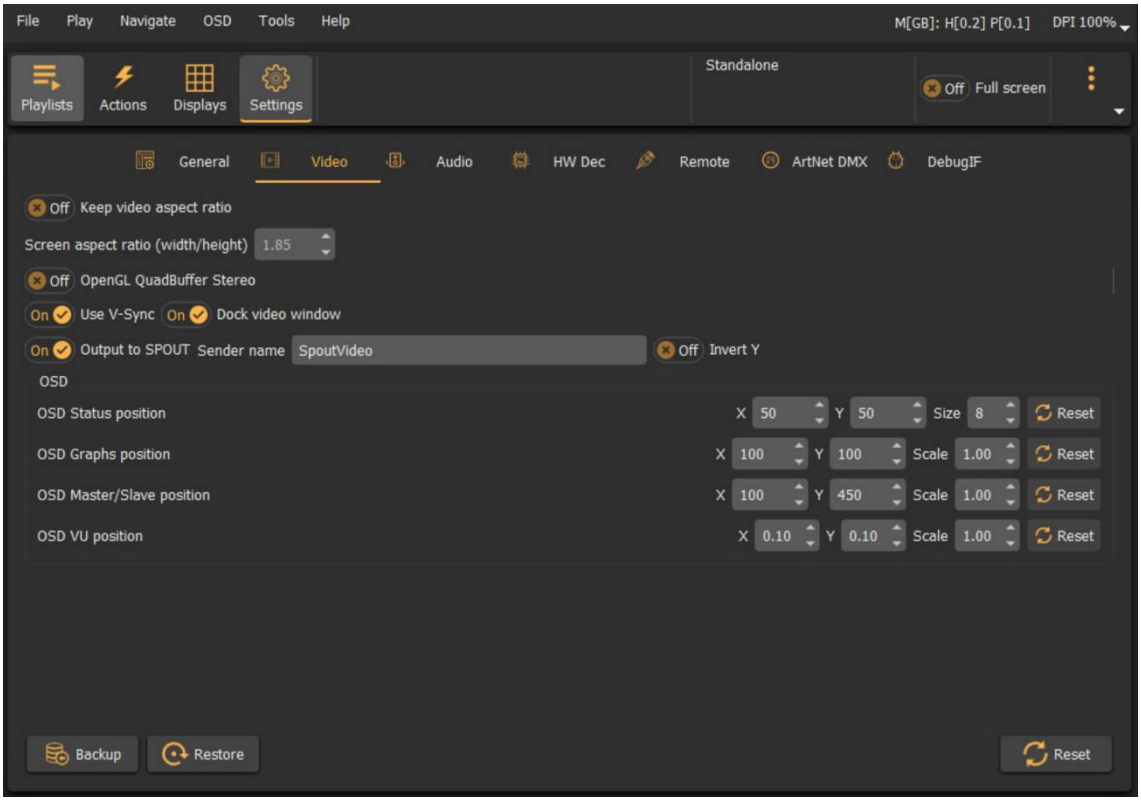
In this tab user can define if the software should be started automatically when the PC starts and if the show (full screen playback) should start automatically. Also users can specify if the screen saver should be disabled during playback. When using still images, users can specify the duration of the still image on the screen. When duration is infinite, the user needs to press PlayNext to continue with the next image in the slideshow.

The warping can be configured in “Multi-projector warping & edge-blending” or “Projector mapping” mode.

The player can be configured as a standalone player (on a single PC) or as a master/slave synchronized player running on multiple PCs.
Check the master/slave chapter for setting up the master/slave mode.

The low level logging produced by the vide player and decoders can be enabled by using one of the Logging option. Depending on the logging level, this can produce a log of log entries in the log file. This options should be enabled only when requested by the support team to collect some more logging info.

4.8.2 Video



In the Video Tab user can define how the input video is mapped to the projection screen.

If Keep video aspect ratio is disabled, the complete video content will be mapped to the screen independent of the video aspect ratio. This can cause video stretching if the screen aspect ratio is not the same as the video aspect ratio.

When Keep video aspect ratio is enabled, users can specify the screen aspect ratio. In that case the software will add black bands (if necessary) to the video content to make sure that the vide aspect ratio is preserved.

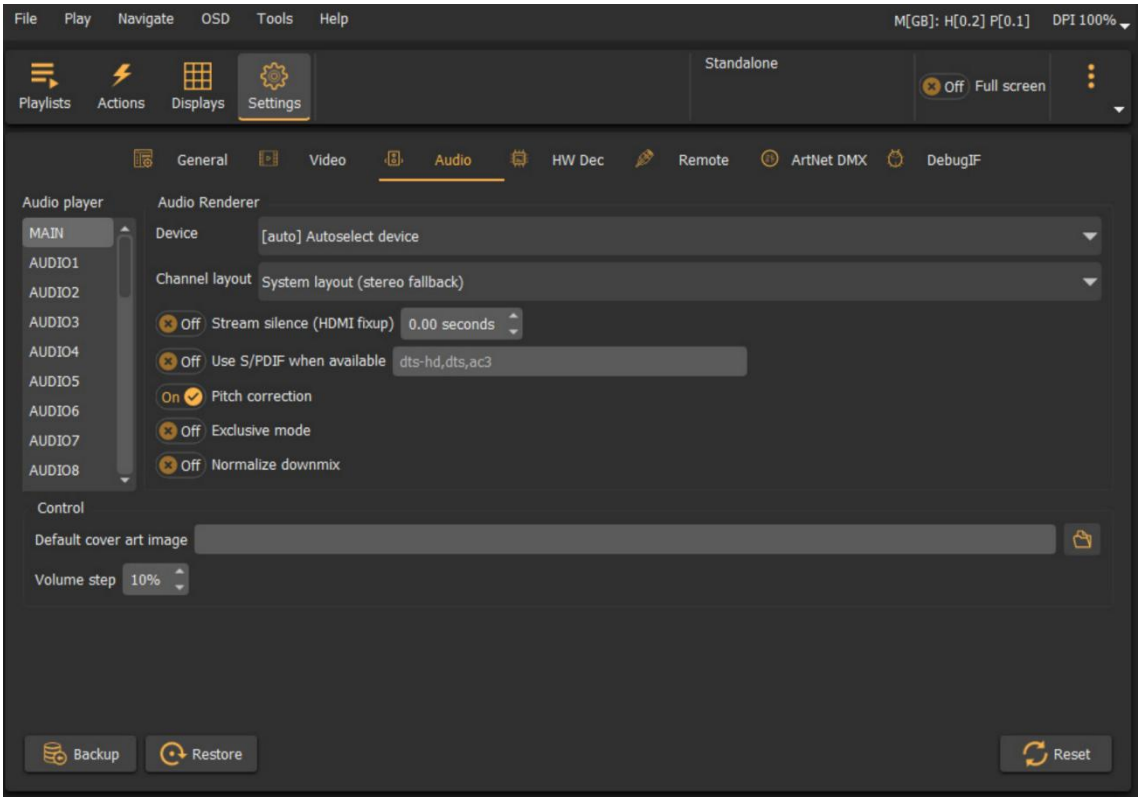
The best practice is to author the video to be the same aspect ratio as the projection screen aspect ratio.

For dome projection and dome master content, the screen aspect ratio can be set to 1, because the dome master content has aspect ratio of 1.

For side-by side stereo playback on systems with QuadBuffer support, the OpenGL QuadBuffer stereo mode must be enabled. Then for each play item users can select the side by side mode from the play item properties.

In the video tab user can also define and reset the position of the OSD on top of the video window. The OS position can also be adjusted using the Video window keyboard shortcuts.

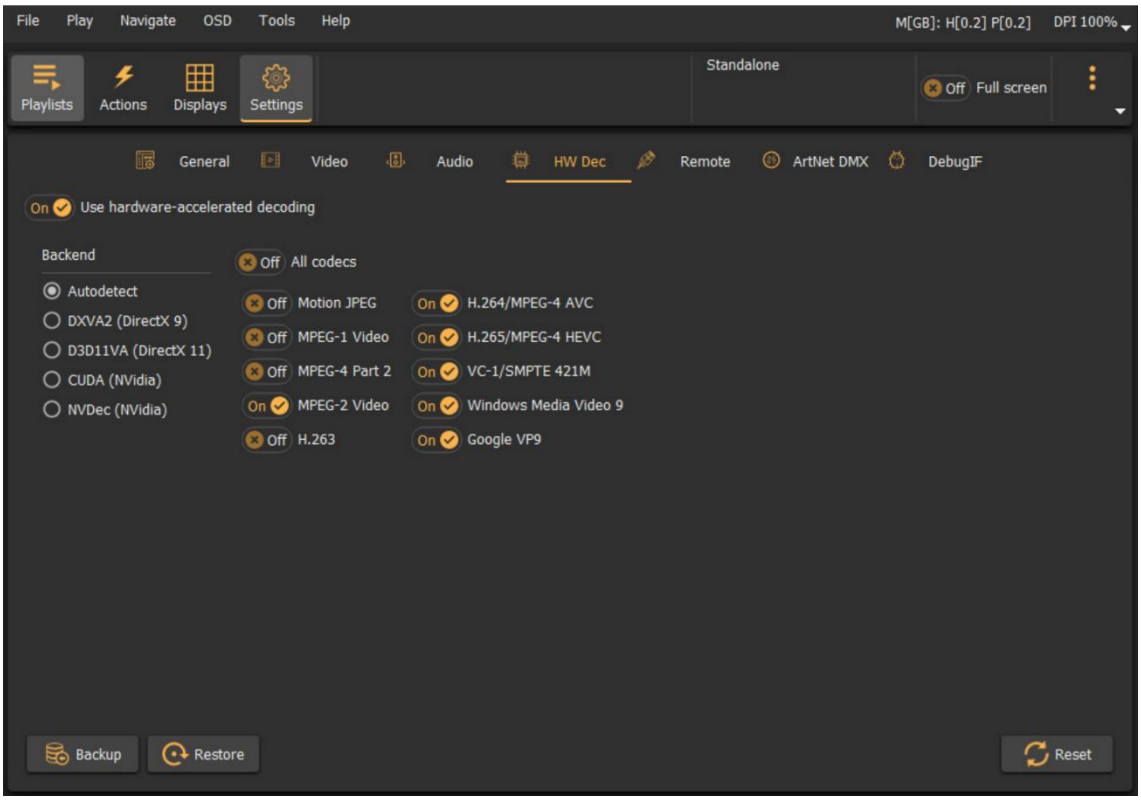
4.8.3 Audio



In the Audio Tab users can select which Audio device will be used for audio rendering, as well as which channel output configuration.

The player supports up to 32 auxiliary audio streams for each play item. Each auxiliary audio stream can be mapped to a separate audio device. This allows creating true multi-channel audio using single or multiple audio devices.

4.8.4 HW Dec



The software has built in support for different Hardware decoding acceleration interfaces. Depending of the used GPU one or more acceleration interfaces can be available. Jot all interfaces support all codecs for decoding.

Select the desired hardware acceleration and enable the codes to be used for that acceleration.

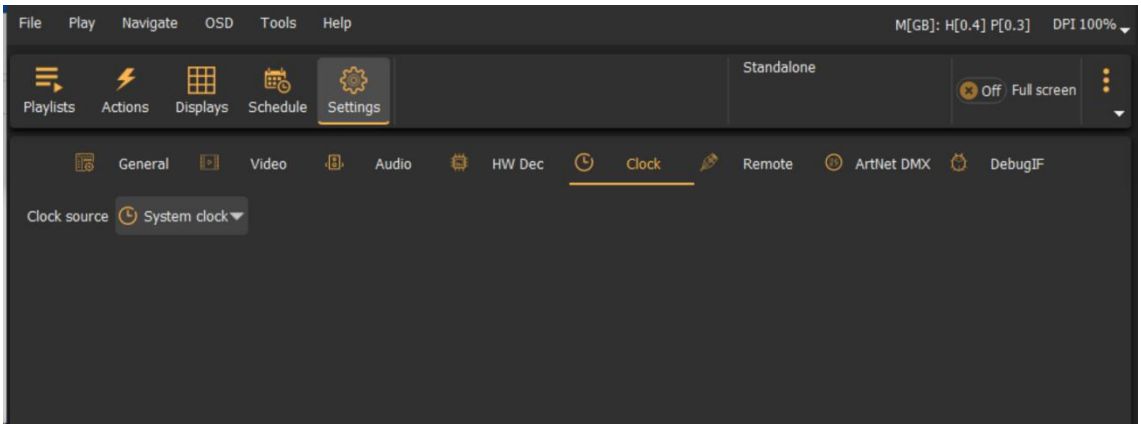
The selected hardware decoder will be shown in the currently selected play item.

When the hardware acceleration is not available or not supported, the software will degrade to software decoding.

4.8.5 Clock

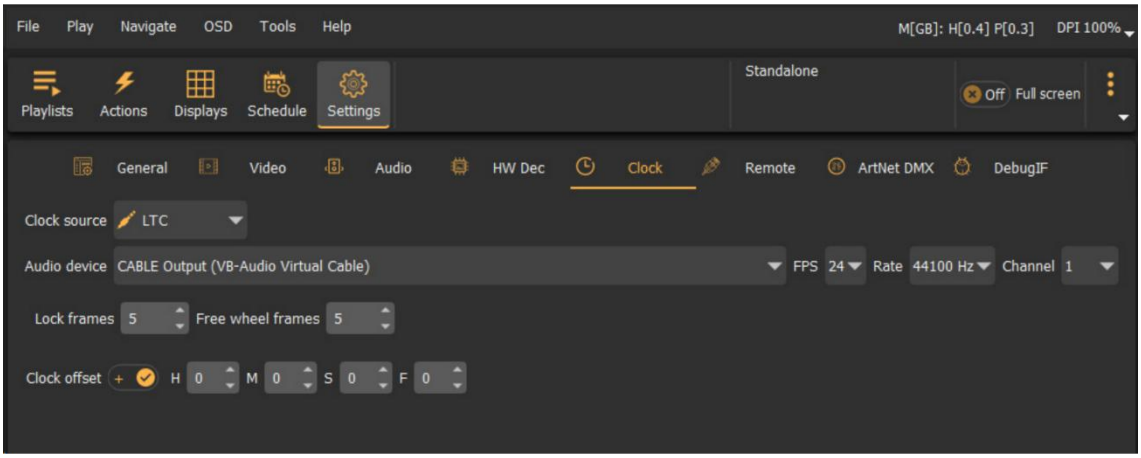
The software supports 3 clock sources for medial playback: The System Clock, LTC Clock and MIDI Clock.

System Clock



The system clock is provided by the media playback engine. If the media contains audio stream, the clock is provided by the high precision audio playback device. In case when the media does not contain audio stream, then the timeline clock is provided by the video presentation time stamps of the decoded video stream.
The System Clock is the default clock sources and does not require any external clock source.

LTC Clock

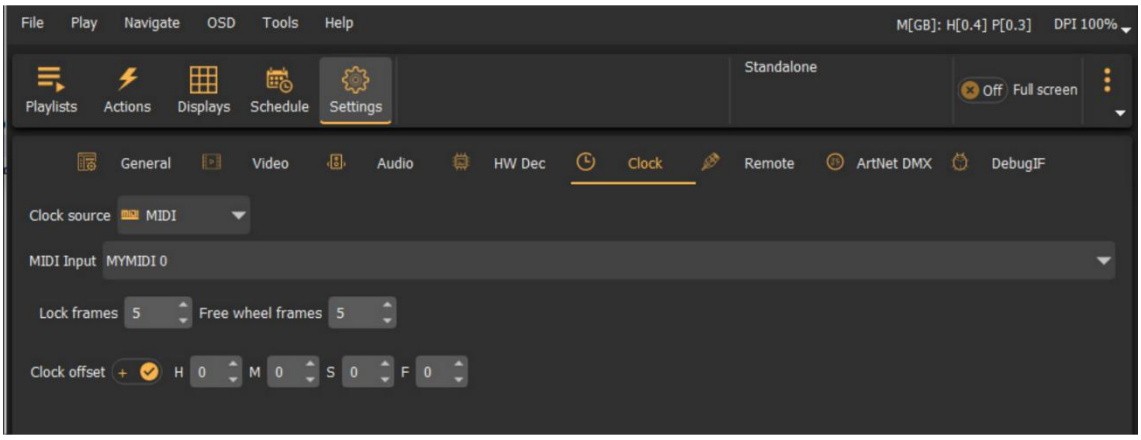


Linear timecode (LTC) is an external time code provider. Although the LTC signal is digital in structure, the transmission is traditionally via an analogue line. LTC is encoded with the required framerate, sample rate, bit depth and duration, to the SMPTE 12M specification. The data block for each frame has 80 bits. These include 26 bits to carry the SMPTE time, and 32 that can carry optional user data. The final 16 bits of the block comprise a fixed bit-pattern

'sync word' that an LTC reader uses to define the frame boundary, play direction, and bit-rate of the sync tone.
More info can be found here:
https://en.wikipedia.org/wiki/Linear_timecode

The users can select the audio device (and the input channel) that receives the LTC data, and configure the expected LTC frame rate (FPS) as well as the sample rate. Those have to match the source LTC generators settings.

MIDI Clock



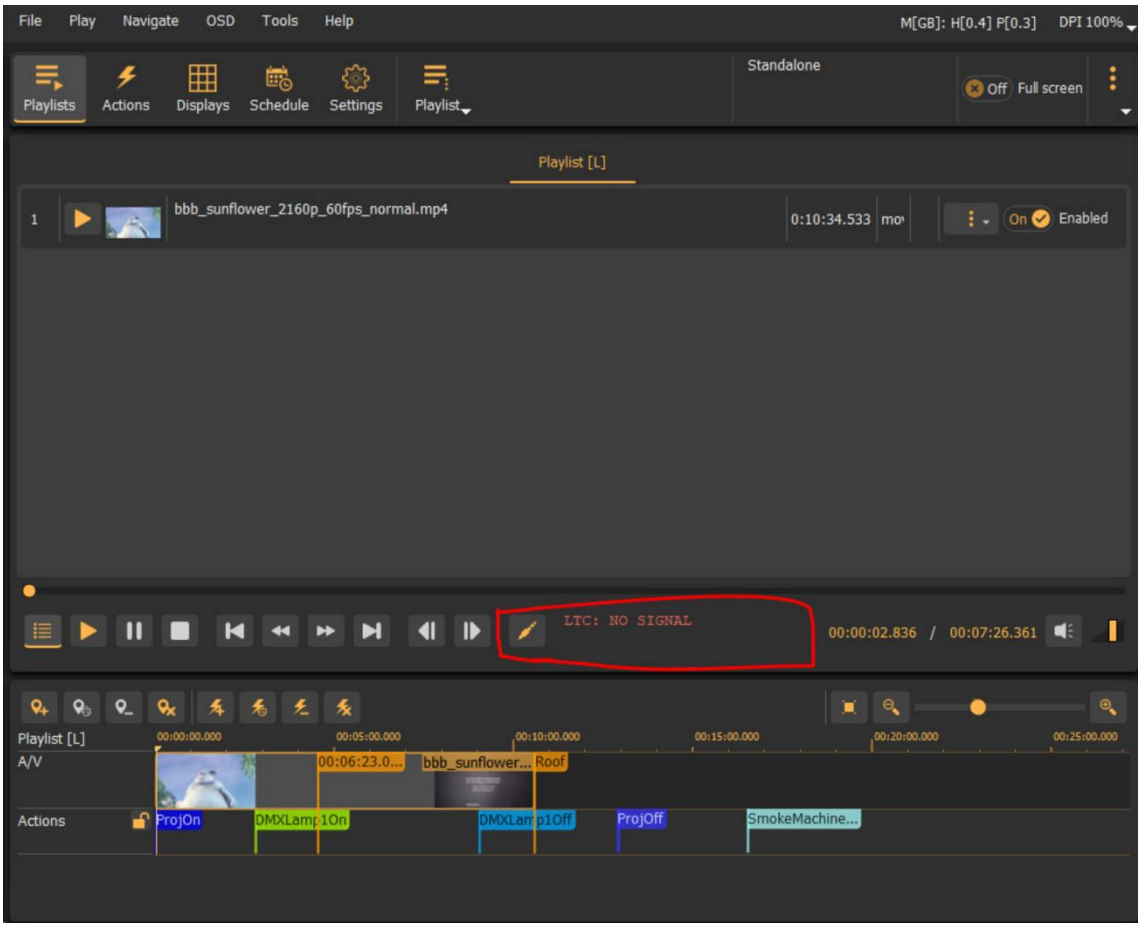
MIDI Time Code uses absolute time in its messages (the actual time on the clock in hours, minutes, seconds, frames, and sub frames). This data can then be translated into SMPTE messages.
The MIDI Clock receiver supports the following framerates: 24 fps, 29 fps and 30 fps. All frame rates are no-drop framerates).

The users can select the MIDI device connected to the PC which will be used to receive the MIDI time code. There must be an external MIDI Clock generator available that will generate the timecode.

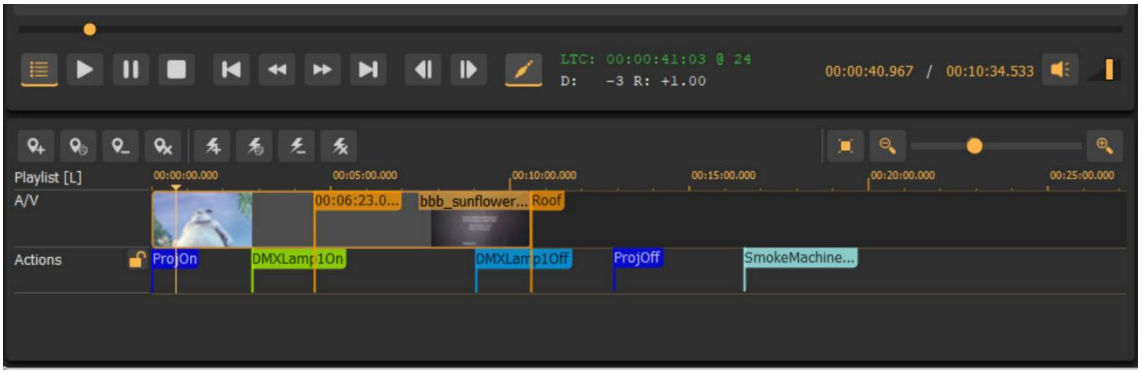
In both LTC Clock and MIDI Clock modes, the users can specify the number of successive received time frames before the player will lock to the external clock. Also a number of free wheel frames can be specified before the player disconnects from the exte4rnal clock if the clock source is lost or not detected. Both settings can be used to configure the system for instable LTC or MIDI Clock sources.

Additionally, a positive or a negative time offset can be applied to the received LTC or MIDI Clock for different show control scenarios.

LTC or MIDI Clock is selected, the timeline will show the LTC/MIDI lock button.



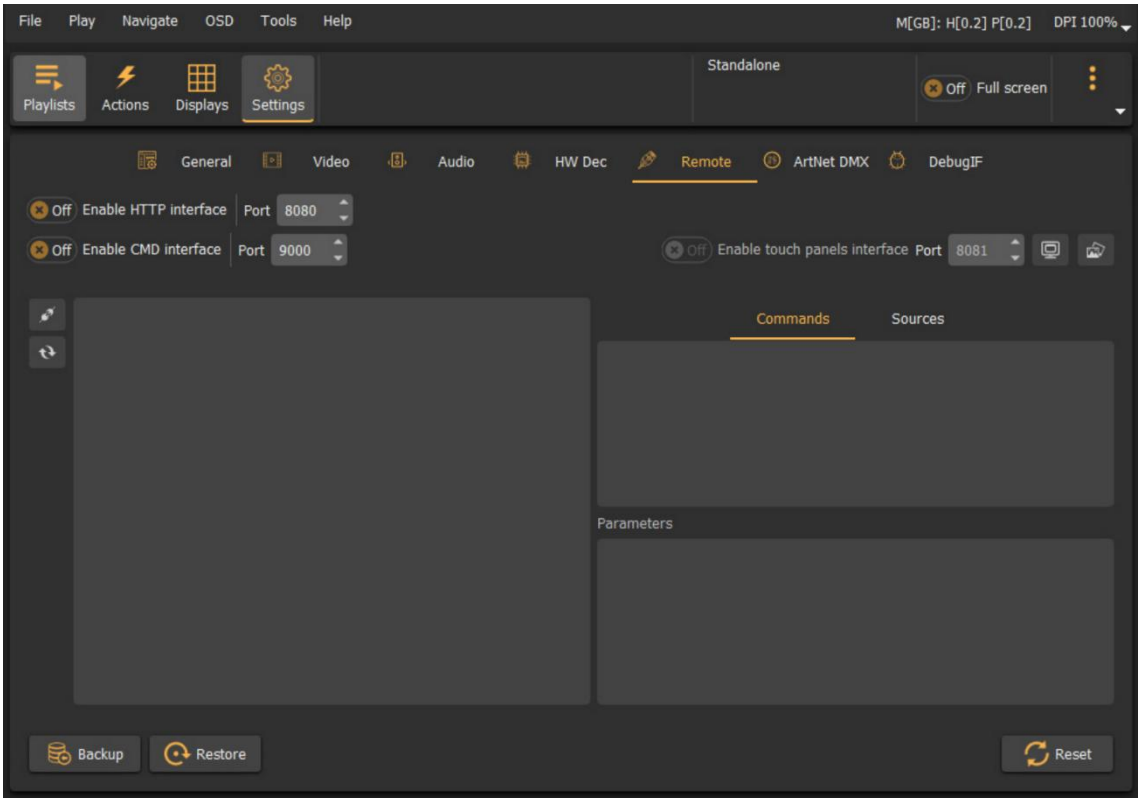
Pressing the button, will try to lock the player timeline top the external LTC/MIDI timecode and the playback engine will follow this time code automatically.



LTC and MIDI Clock sources can be used in advanced show setups where a master external clock distributes the time code to different devices which should be synchronized by the same time code for the same show.

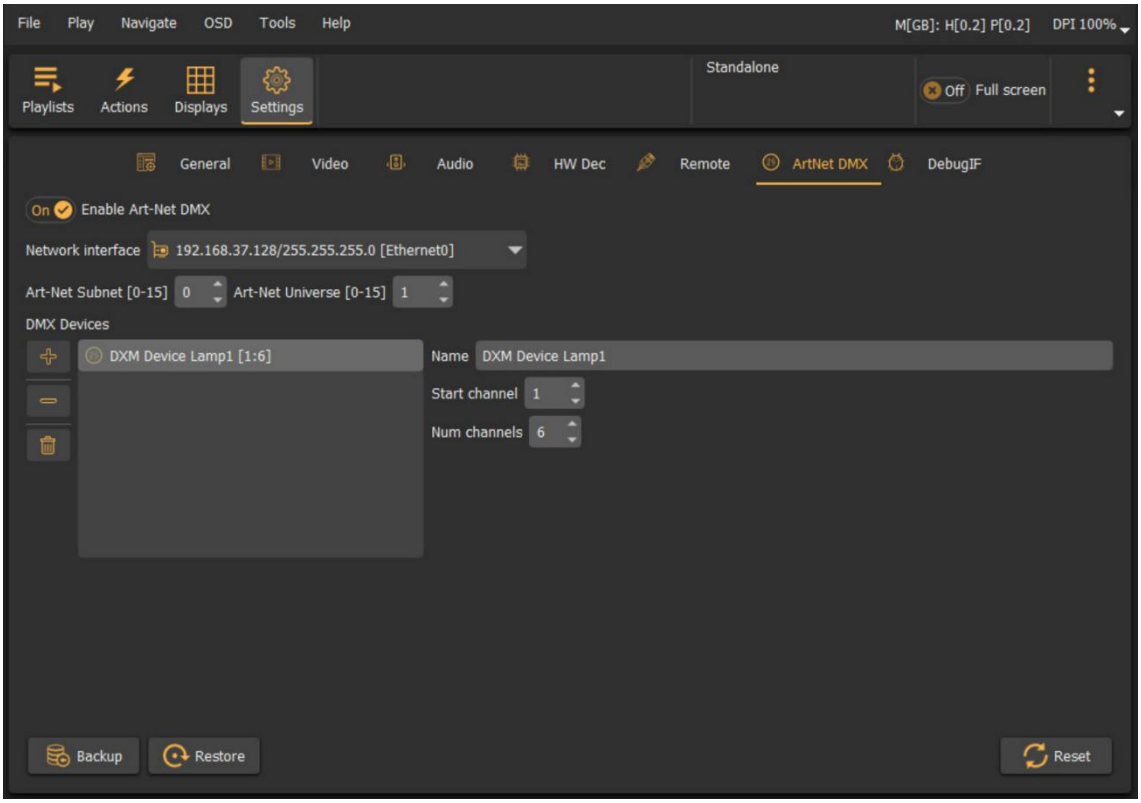
Note: In master/slave mode, the TLC and the MIDI timecode will be received only by the master player. The slave players will be synchronized on a sub-frame accurate time code by an internal master/slave clock synchronization.

4.8.6 Remote



In this Tab users can enable or disable one of the Remote control interfaces: HTTP or TCP/CMD interface. For each interface a port can be defined to which the interface is available.
Note: Depending on the licenses, one or more interfaces can be enabled. See the licensing options and the licensing types.

4.8.7 ArtNet DMX



In this tab the user can enable/disable the ArtNet DXM show control functionality. When enabled, user can configure the network interface to be used to send ArtNet commands as well as the Subnet and Universe of the target DXM devices.

DMX devices include DMX controlled lamps, smoke machines and variety of other show devices that have a DMX interface.

Devices can be added to the list of known DMX devices. Each device can be configured to use one or more channel. The start channel and the number of channels determine the range of channels used by the device.

Devices with maximum of 12 channels are supported.

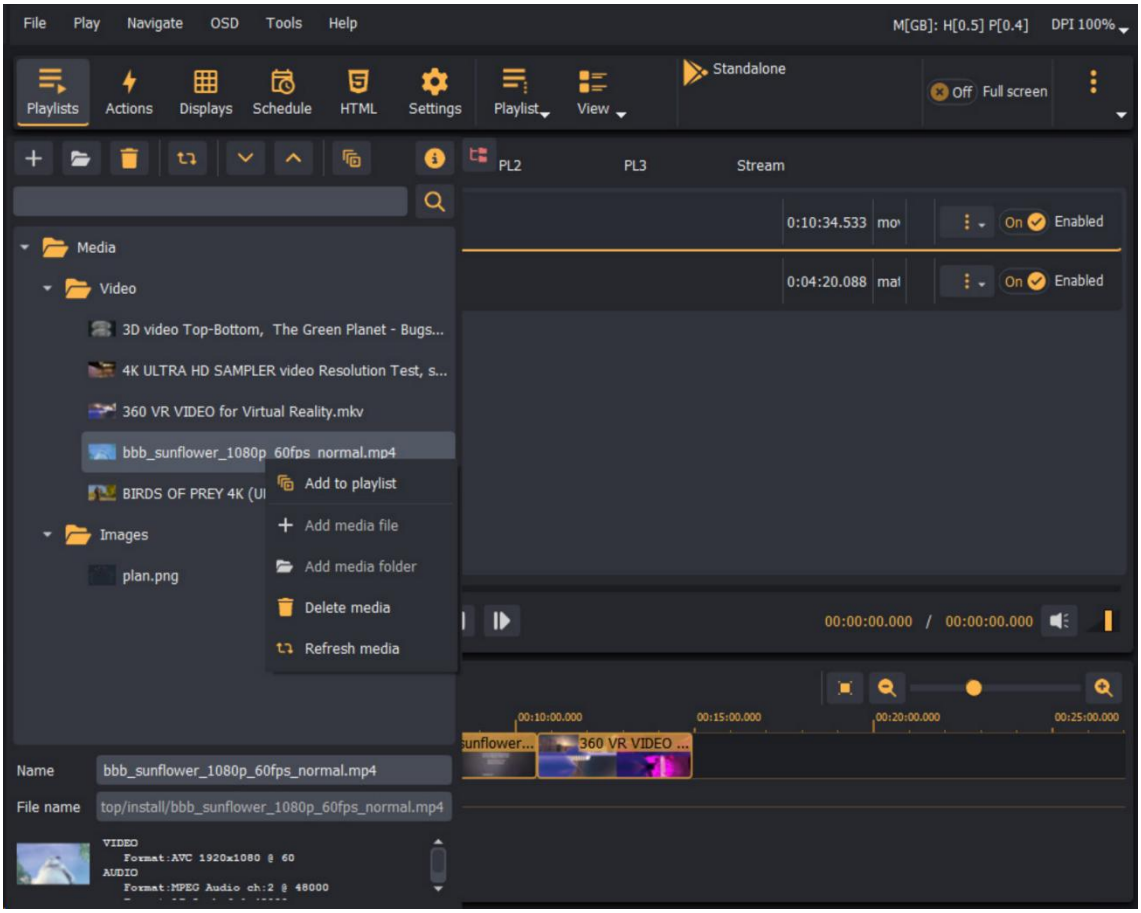
The DXM devices specified here can be used on the Actions editor to define the actions that can be put on the timeline.

4.9 Media manager

Media manager window is a separate sliding window. It allows to add and organize all the media items in a hierarchical form.

Just drag and drop media items (video, audio or images) from windows explorer in the media window. Create and new virtual folders and drag and drop media items inside the media window to organize your media.

Media items from the media window can be appended to the active playlist. A single media item or the complete folder can be appended to the currently active playlist.



All media items can be renamed and the search text box can be used to search and filter the media window for media items that match the search pattern.

5 Video window

The Video window is shows the video content of the current play item.

Next to the main content, this video window can show:

- The VU meters for the main audio stream
- OSD info of the current play item
- Timing info for the decoding and rendering context
- Timing info for the master/slave synchronizing context

The VU, OSD and the timing info can be enabled from the main menu as well as using a key combination.

The following tables shows the keys combinations for the controlling the video window and the visibility, position and size of the additional OSD and info.

F	Toggle full screen mode
ESC	Exit full screen mode
S	Toggle the play item status OSD

A	Toggle the audio VU meters
G	Toggle the decoding and rendering timing
M	Toggle the master/slave timing
SHIFT+CTRL + ARROWS	Move the decoding and rendering timing OSD
SHIFT+CTRL + MINUS/PLUS	Scale the decoding and rendering timing OSD
SHIFT+CTRL + R	Reset the decoding and rendering timing OSD position and size
SHIFT+ALT + ARROWS	Move the audio VU meters OSD
SHIFT+ALT + MINUS/PLUS	Scale the audio VU meters OSD
SHIFT+ALT + R	Reset the audio VU meters OSD position and size
CTRL + ARROWS	Move the master/slave OSD
CTRL + MINUS/PLUS	Scale the master/slave OSD
CTRL + R	Reset the master/slave OSD position and size
SHIFT + ARROWS	Move the play item status OSD
SHIFT + MINUS/PLUS	Scale the play item status OSD
SHIFT + R	Reset the play item status OSD position and size

6 Master/Slave playback mode

One of the most important feature is the possibility for real-time, synchronized, frame accurate distributed playback of media over multiple decoding and rendering PCs.

It is not uncommon now days that the media content with size of 8K, 16K and larger are used to create large high definition displays using multiple projectors.

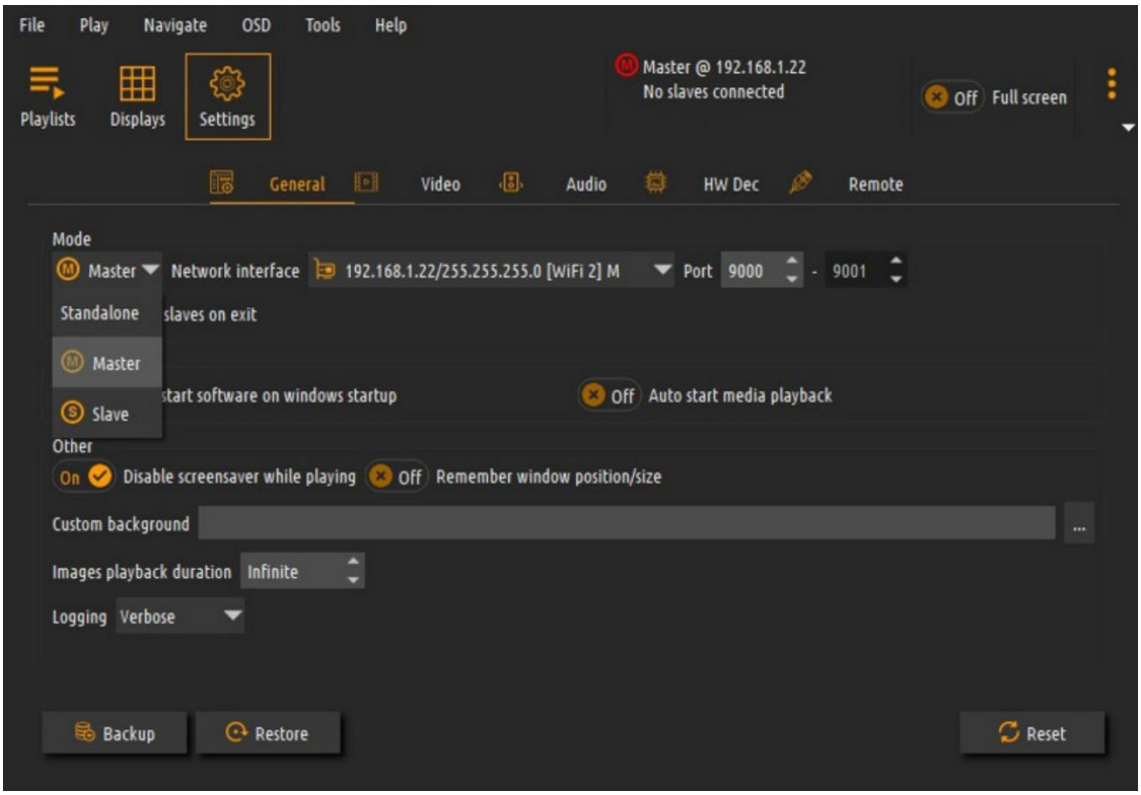
Decoding such a large encoded media on a single PC is usually not possible due to the hardware limitations. The CPU based decoding of content of 8K or larger cannot be done with real-time requirements, especially when using frame rates of 60 fps or more.

The available HW decoders available in the graphics cards hardware lack the support for high resolution content and cannot provide decoding for such content.

As a result, the obvious option is to split (crop) the media content in smaller sizes and to play each part on a separate PC and synchronize the playback over all the PCs involved into playback of the complete media content. Small and less powerful “off-the- shelves” PCs can be used to distribute the decoding and playback of the large media. For example, several networked Intel NUC PCs (or similar) can be used to decode and playback part of the content (pieces of 2K or 4) on each PC.

Here it comes Immersive Player PRO Master/Slave mode.

Each instance of Immersive Player PRO can be configured as a Master or Slave in a clustered synchronized media decoding and playback.



The Master instance is responsible for distributing the media playback state as well and distribute and synchronize the time codes among the connected Slave instances.

The Master instance contains and manages the playlists and play items of the media show to be played.

The Slave instances are locked to the Master. One or more Slave instances can be locked to the same Master. The Slave instanced do not contain and manage playlist and play items. They are just following the Master instance playback state.

PCs running Immersive Player PRO Master and Slave instances are connected in a local network. A separate wired 100Mb/s or 1Gb/s network is preferred to ensure quick and accurate synchronization of the playback state and the playback time codes. The software uses UDP multicast mode to send and distribute the synchronization from the master to the slave instances. The UDP ports can be configured in the Settings page.

Make sure no firewall on the Master and Slave PCs is blocking the configured port for UDP multicast traffic.

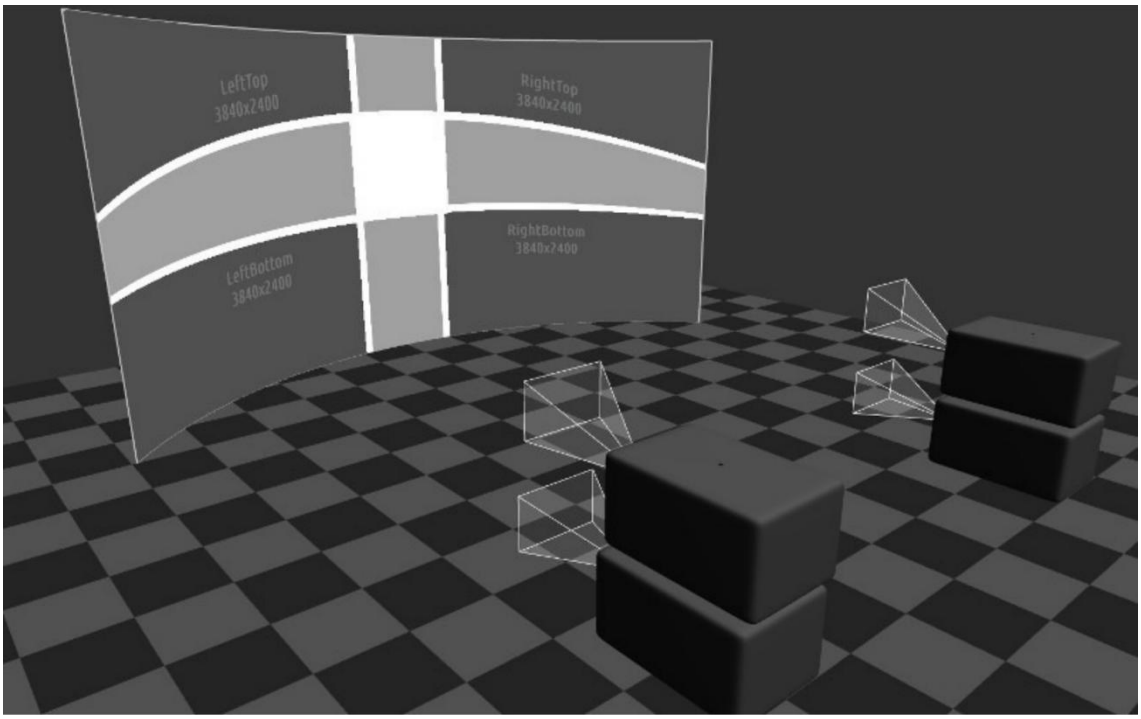
The Master instance maintains the accurate playback time clock and distributes the clock to all Slave instances. The Slave instances use the same clock to follow the playback state of the Master instance. This allow frame accurate synchronization of the Master and Slaves playback state and the playback time. Even with 60 Hz and 120 Hz playback, the timelines of the Master and Slave are accurately synchronized.

This synchronized distributed playback can be used in huge video wall setups like this one. The large video media can be split in multiple sections and each smaller section can be played back on one PC connected to one or more displays.

Similar distributed media playback can be used in a multi-projection setup. For the purpose of this document, we will use a 4 projection setup on a curved projection screen. The projectors are 4K projectors and the content we will prepare and play is 8K.

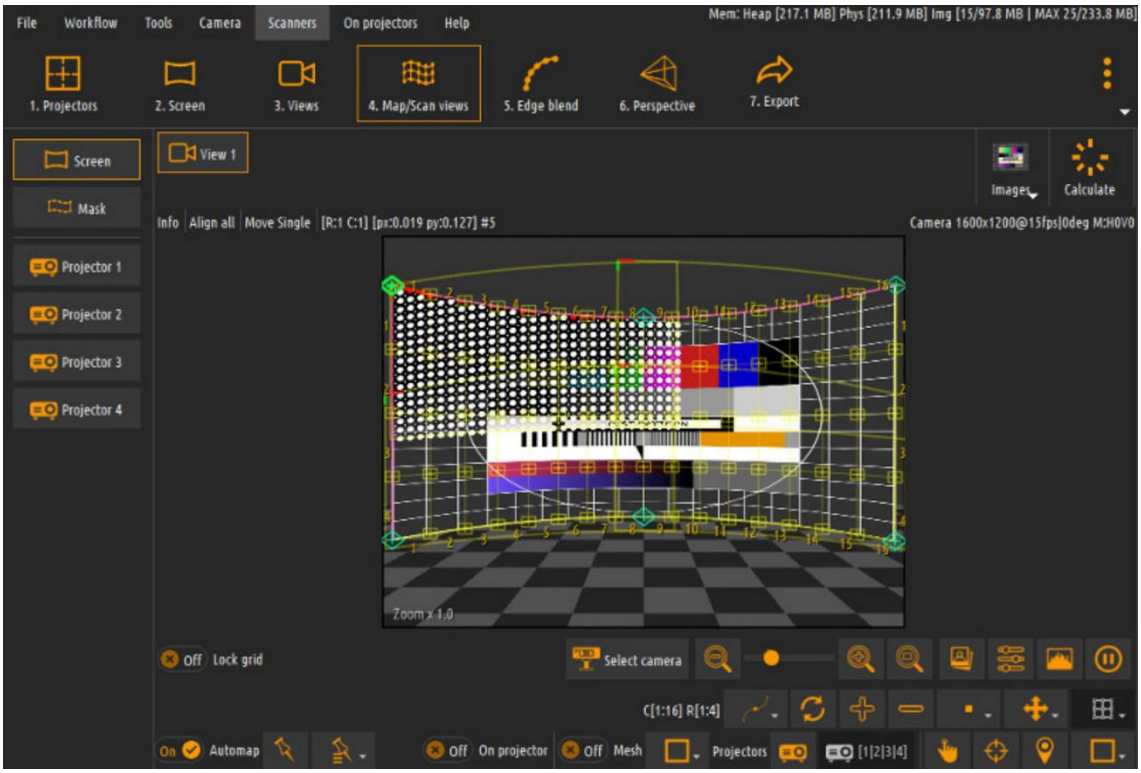
The content will be split and played back on 4 PCs, each running Immersive Player PRO.

Each PC is connected to one 4K projector.

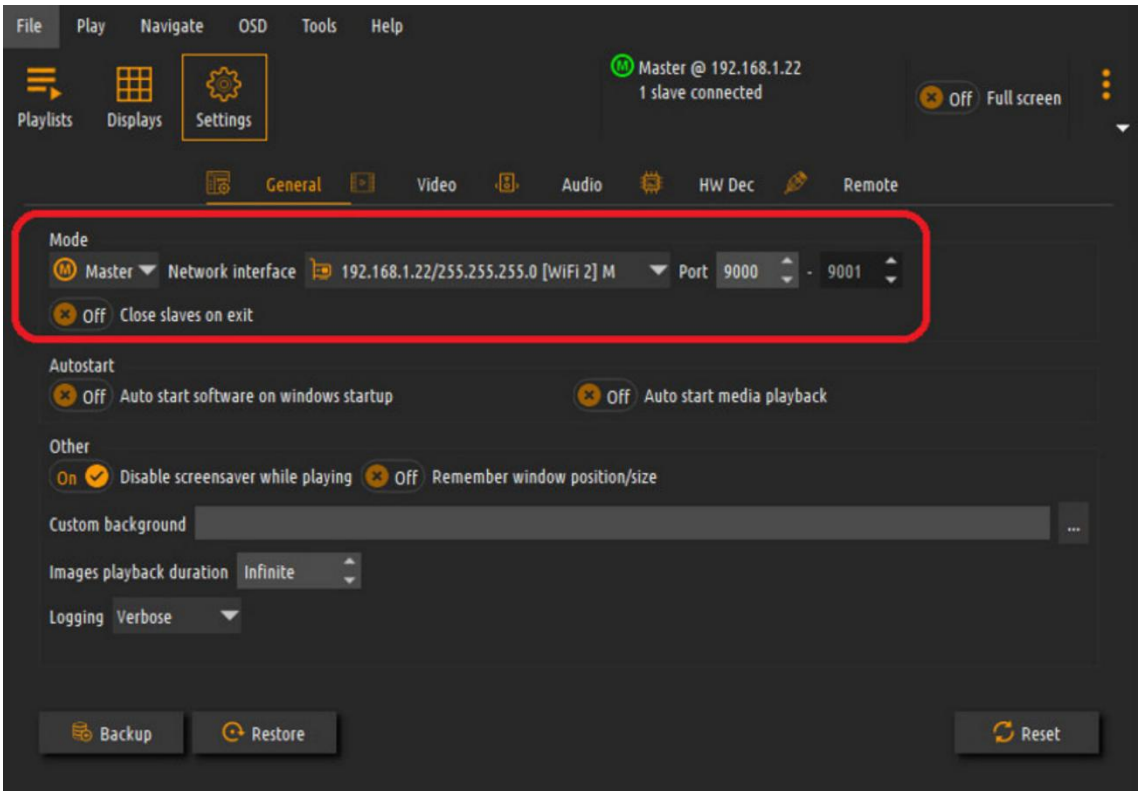


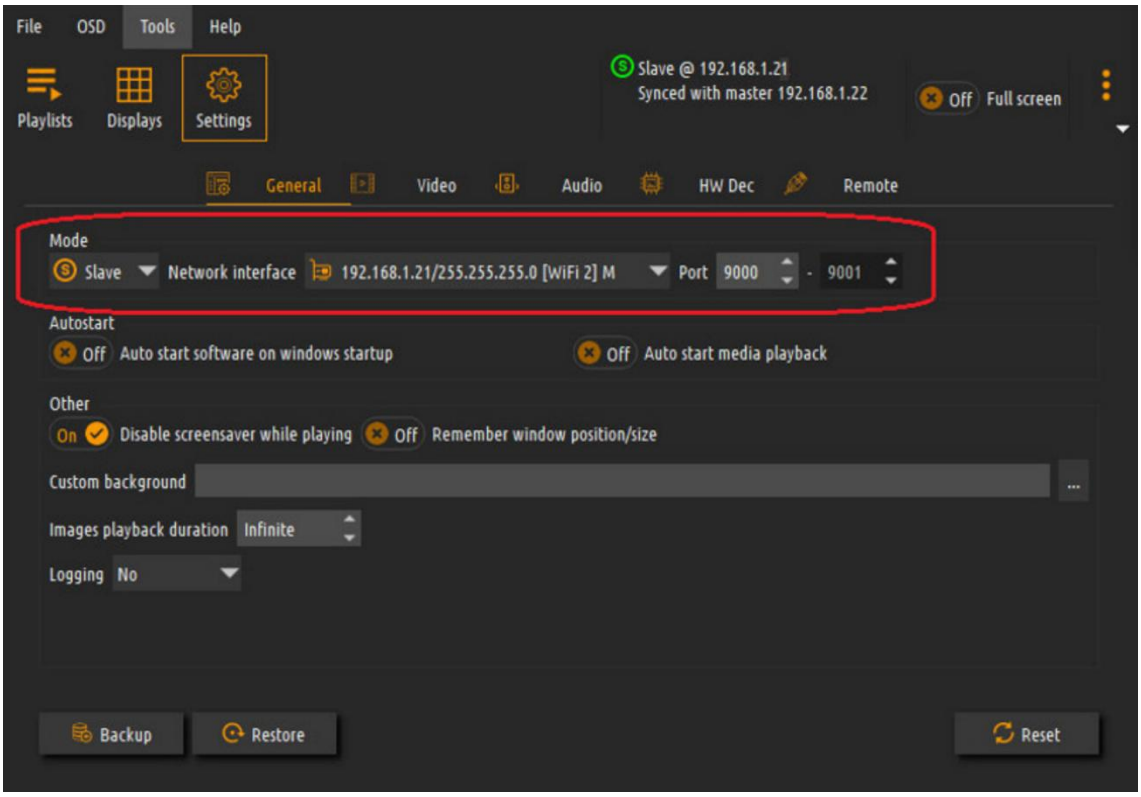
On order to auto-align this projector setup we will use Immersive Calibration PRO with a single web cam to auto align the projection and export the alignment data.

Immersive Calibration PRO exports one _single.procalib file for each PC, as well as one MediaSplit.split for splitting the single media file. This split file describes how the media should be split in 4 pieces, each piece to be played back on each PC.

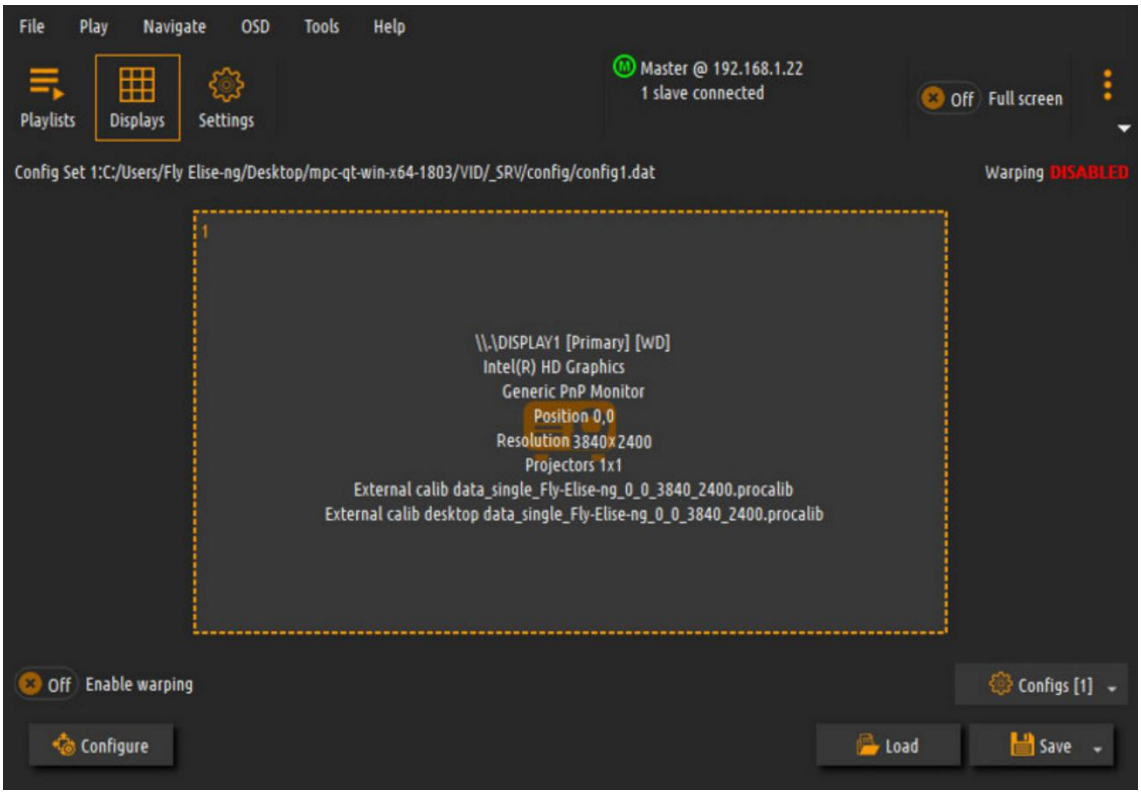


Each of the 4 PCs runs Immersive Player PRO. One of the PC is configured as a Master player and the rest of the 3 PC are configured as Slave Player.





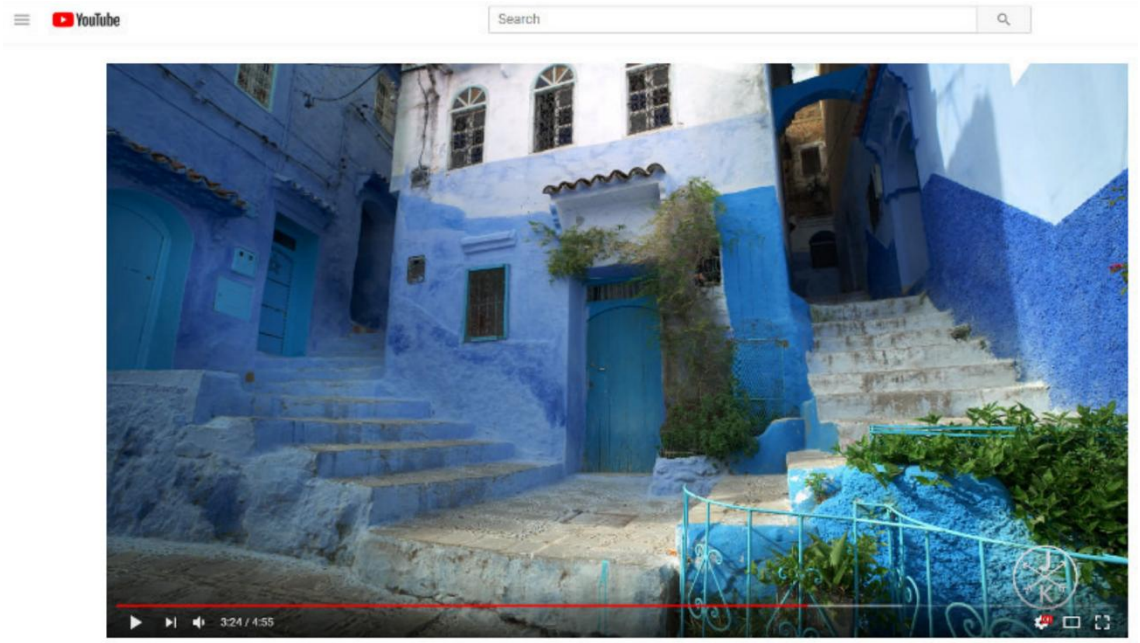
Now copy the corresponding exported _single.procalib file on each PC and load it into Immersive Player PRO display.



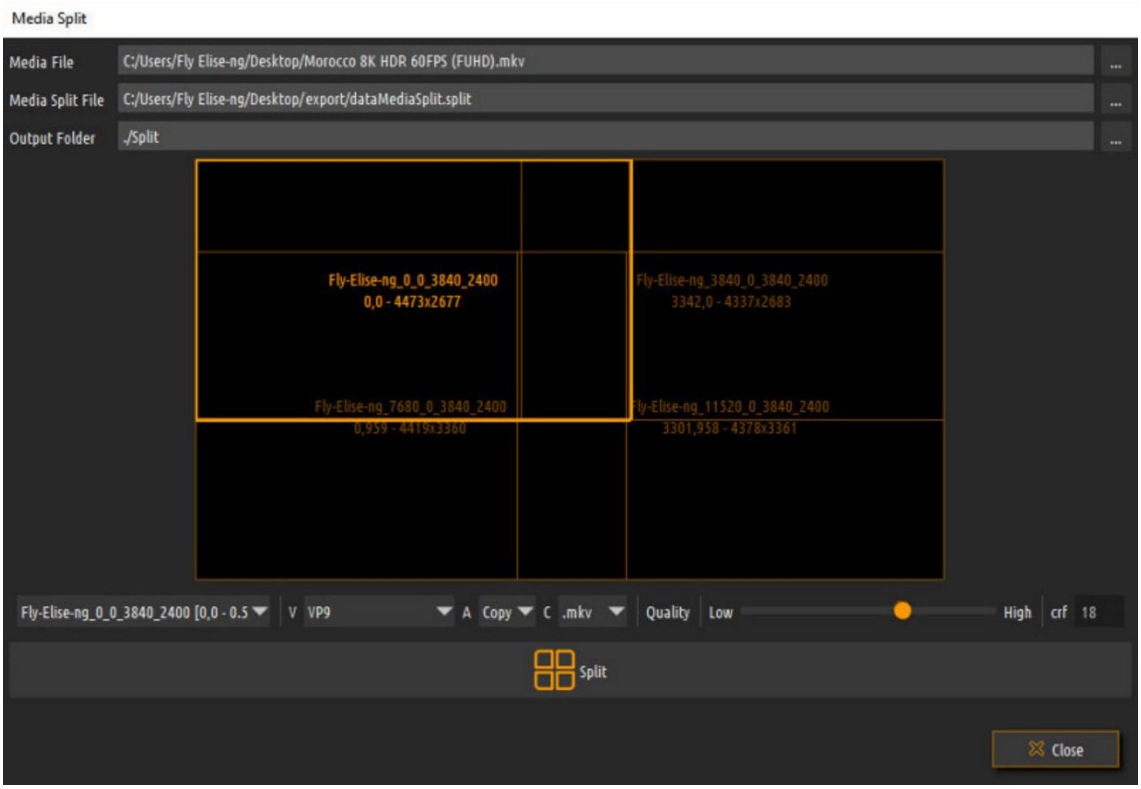
Now it is the time to split the media into 4 parts and distribute and playback those parts on the 4 PCs.

For the purpose of this blog we will use this 8K demo video from youtube

https://www.youtube.com/watch?v=hVvEISFw9w0



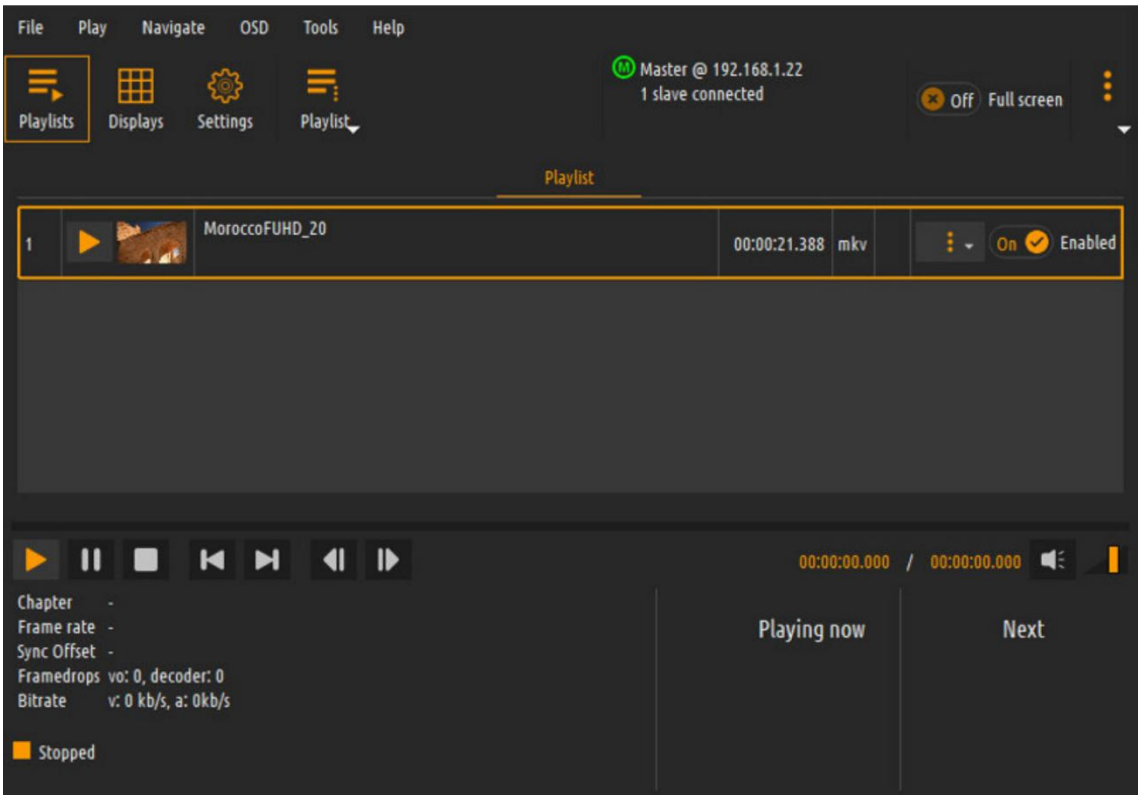
Immersive Player PRO includes tools to load a single media file and split the file in multiple files based on the exported MediaSplit file during the calibration. Based on the MediaSplit.split file, the software will produce 4 media files that are cropped exactly to match the projector coverage on the projection screen and match the needed geometrical correction and blending.



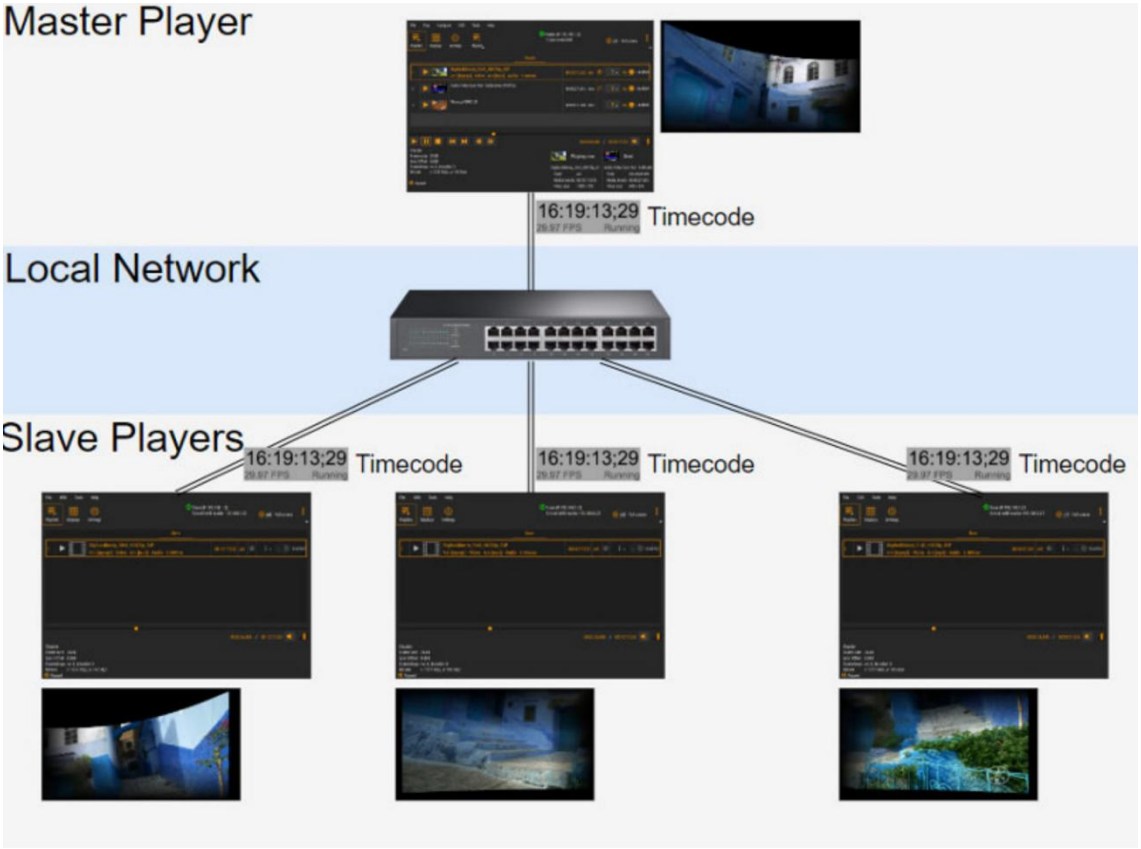
Each split media file will be placed in a separate folder with the same name as the name of the remote PC display. Copy the split media files to the corresponding Master and Slave PCs. Use the same folder name (Ex: C:\Media\) on the Master and Slave PC.

Open the Master Immersive Player PRO and create a playlist by adding a play item from the split media.

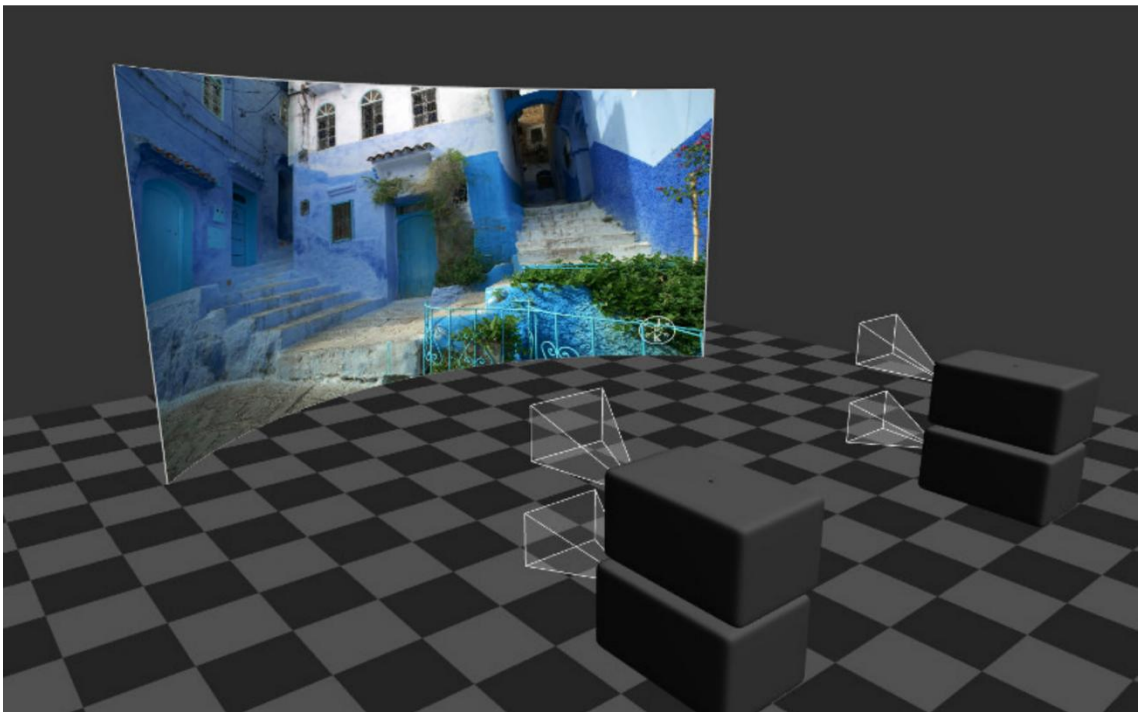
Start the Slave Immersive Player PRO. No additional action is required on the Slaves. They will connect and lock/sync with the master.



Press Play and the Master and the Slave instances of Immersive Player PRO will start playing back their part of the large 8K media.

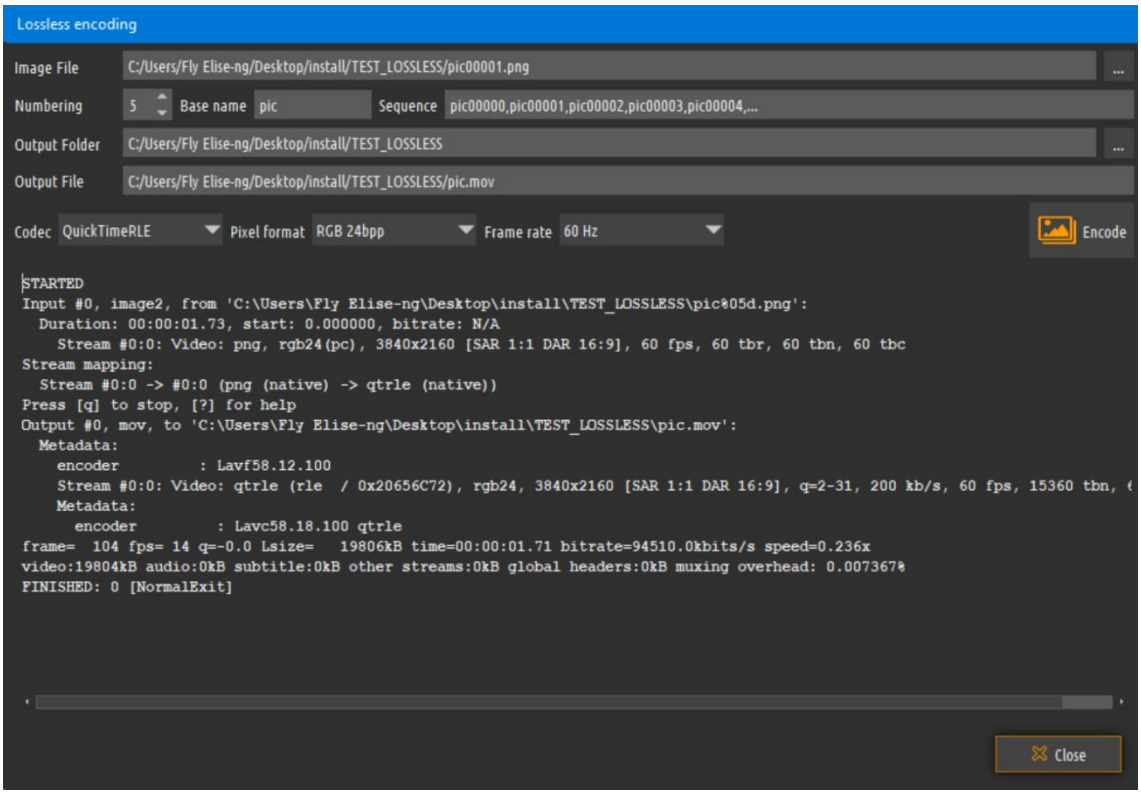


The final image on the projection screen is perfectly aligned and edge blended 8K video.



7 Lossless encoding and playback

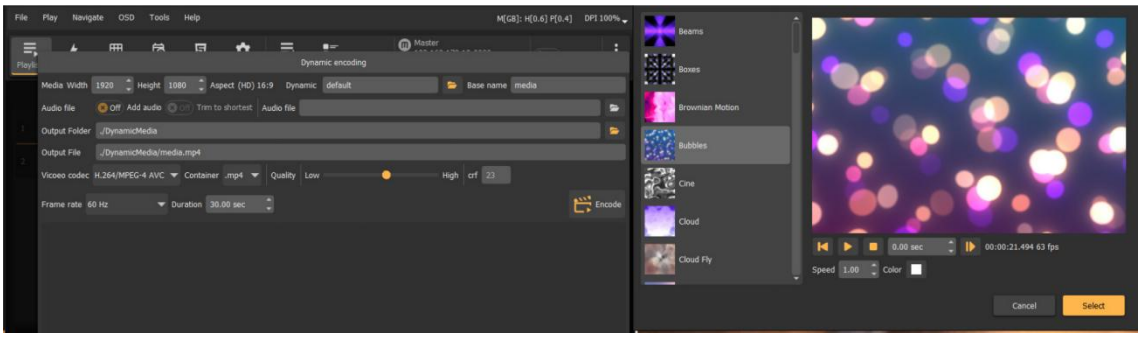
A lot of high quality content is delivered as a set of lossless encoded or raw format images. Playback of such a content requires encoding of the list of images in a lossless encoded stream with the correct framerate and the image pixel type.
Immersive Player PRO provides a tool for lossless encoding of raw images.
The Menu/Tools/Lossless media screen can be used to select the raw images, select the framerate and pixel format and start the lossless encoding.



The lossless encoding also supports encoding 2 separate sets of images in a side by side content for active or passive stereo playback.
After the lossless encoding is completed, the resulting media file can be imported in one of the Immersive Player PRO playlists.

8 Lossless encoding and playback

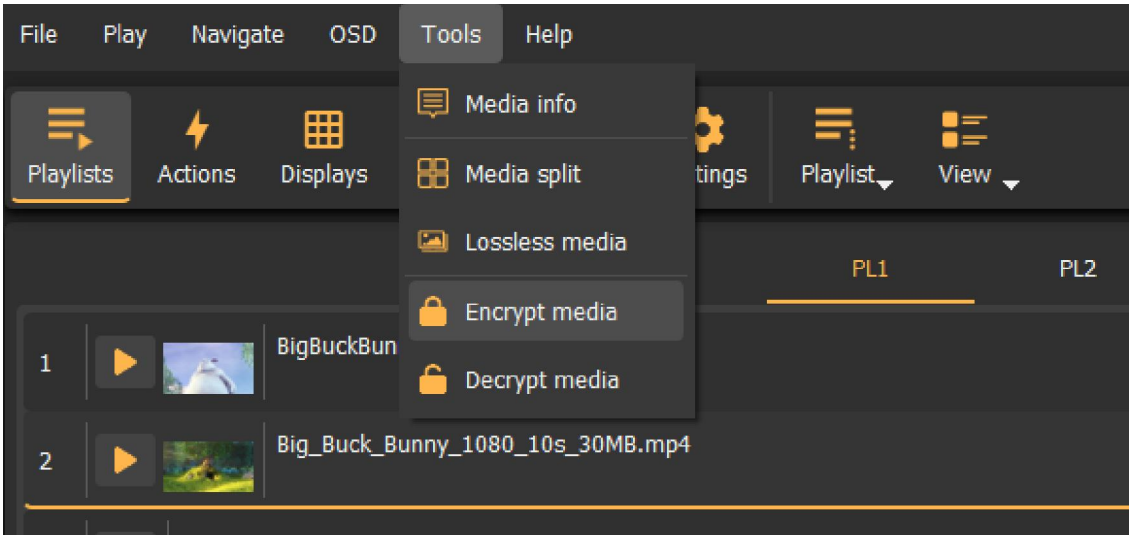
Immersive Player PRO provides a tool for encoding the dynamic (procedural) content as a video/audio stream. The Menu/Tools/Dynamic encoding screen can be used to select the dynamic (procedural) content, select the framerate and codec format and start the medic encoding.

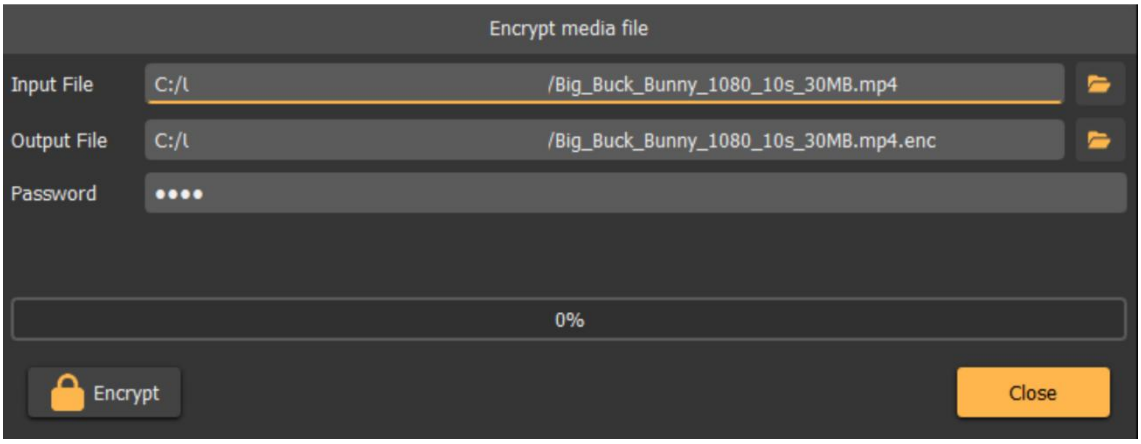


After the dynamic content encoding is completed, the resulting media file can be imported in one of the Immersive Player PRO playlists.

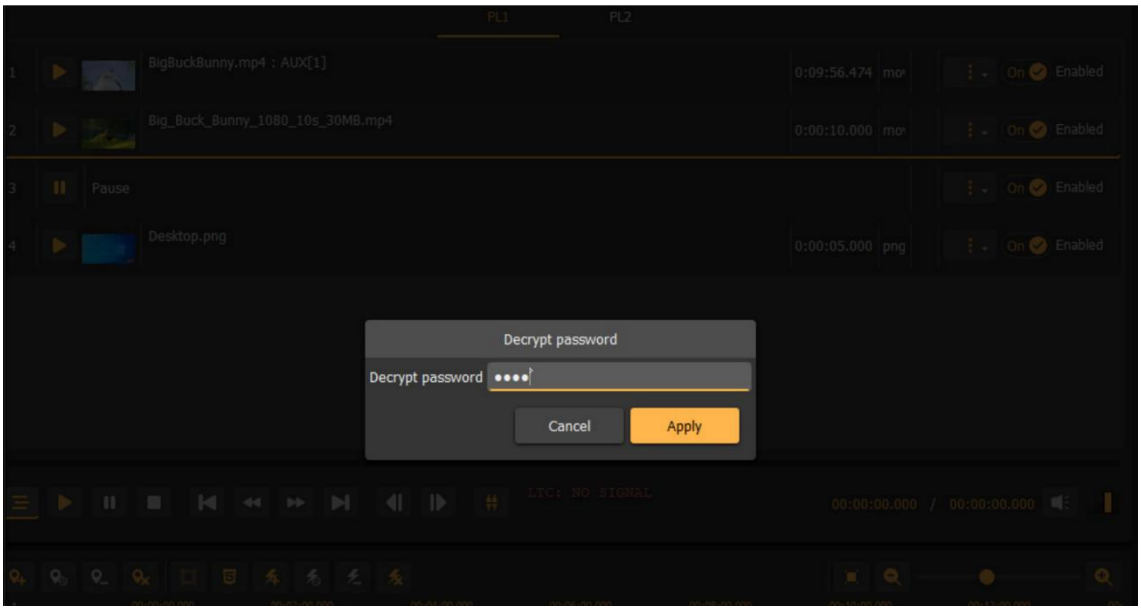
9 Media encryption and decryption

In order to protect the media from steeling and unauthorized use, Immersive Player PRO supports media encryption and on-the-fly decryption during playback. Using the tools menu, the media can be encrypted before adding it to the playlist. The original unencrypted content can be removed from the PC.

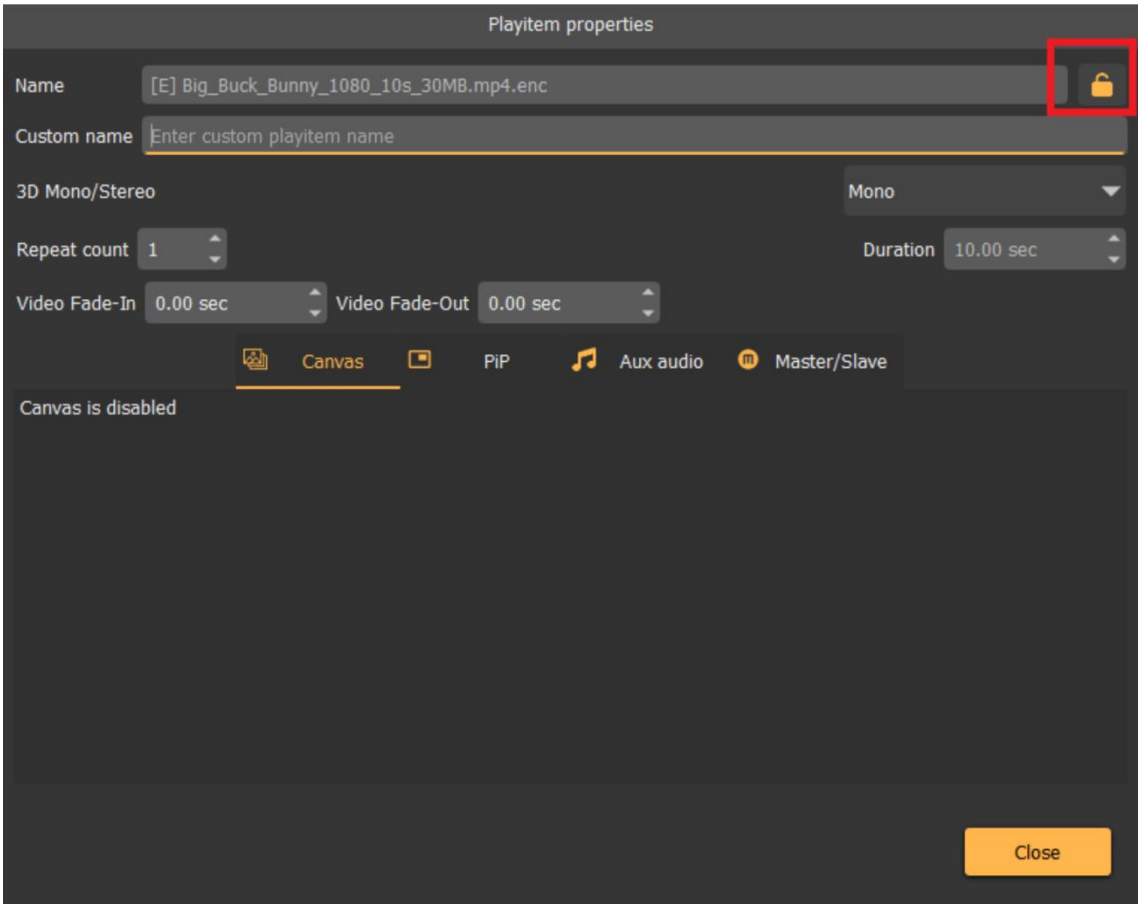




After adding the media to the playlist the decryption password can be entered for on-the-fly decryption.



The decryption password can also be entered in the play item properties window



10 HTTP interface

The HTTP interface is a simple control and info interface for controlling the playlist and the play items, as well as the playback state.
All requests are based on the HTTP GET request and are divided in the following entry points: /playlists, /playitem, /player, /control

10.1 playlists

Command	http://<ipaddress:port>/playlists?select=index
Description	Make the playlist with index active. Index is from 1 to the max number of playlists

10.2 playitem

Command	http://<ipaddress:port>/playitem?play=index
Description	Starts to play the play item with index. Index is from 1 to the max number of play items in the currently selected playlist

Command	http://<ipaddress:port>/playitem?select=index
Description	Selects the play item with index, to be the currently selected play item. Index is from 1 to the max number of play items in the currently selected playlist

Command	http://<ipaddress:port>/playitem?enable=index&enabled=[true|false]
Description	Enables or disables the play item with index. Index is from 1 to the max number of play items in the currently selected playlist

10.3 player

Command	http://<ipaddress:port>/player?play

Description	Start the playback from the selected play item

Command	http://<ipaddress:port>/player?stop
Description	Stops the playback

Command	http://<ipaddress:port>/player?pause
Description	Pauses the active playback

Command	http://<ipaddress:port>/player?previous
Description	Jumps to the previous play item

Command	http://<ipaddress:port>/player?next
Description	Jumps to the next play item

Command	http://<ipaddress:port>/player?goto=position
Description	Seeks the currently played item to a position. Position is a relative position between 0 and 1. 0.5 seeks to the middle of the play item.

Command	http://<ipaddress:port>/player?volume=value
Description	Sets the player volume to value. Value is a relative volume between 0 and 1. 0.5 means 50% volume.

Command	http://<ipaddress:port>/player?mute=[true|false]
Description	Mutes or unmutes the player audio.

Command	http://<ipaddress:port>/player?fullScreen=[true|false]
Description	Enables and disables the full screen playback.

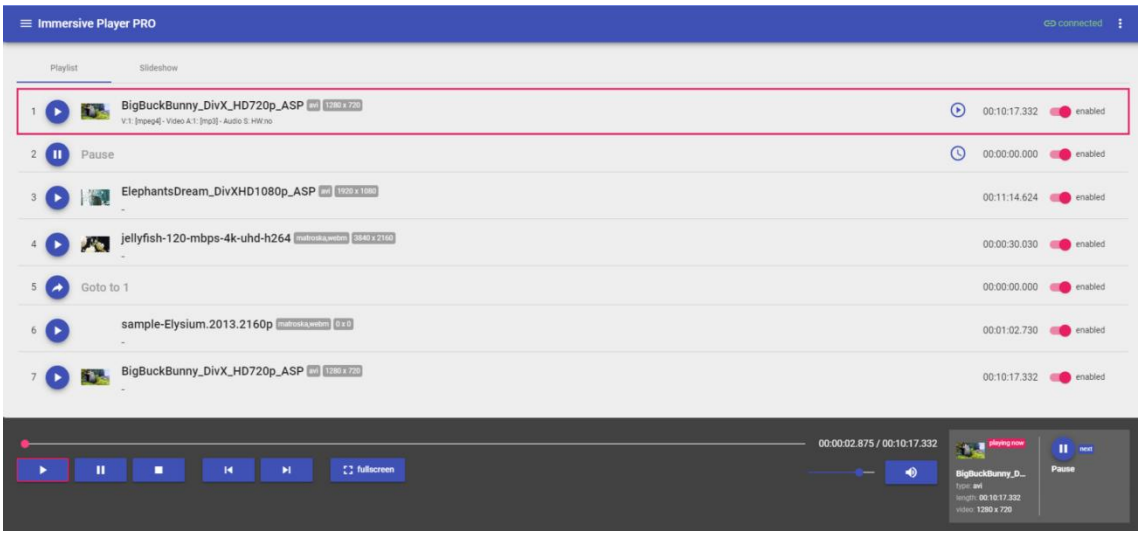
10.4 control

Command	http://<ipaddress:port>/control?quit
Description	Quits Immersive Player PRO software.

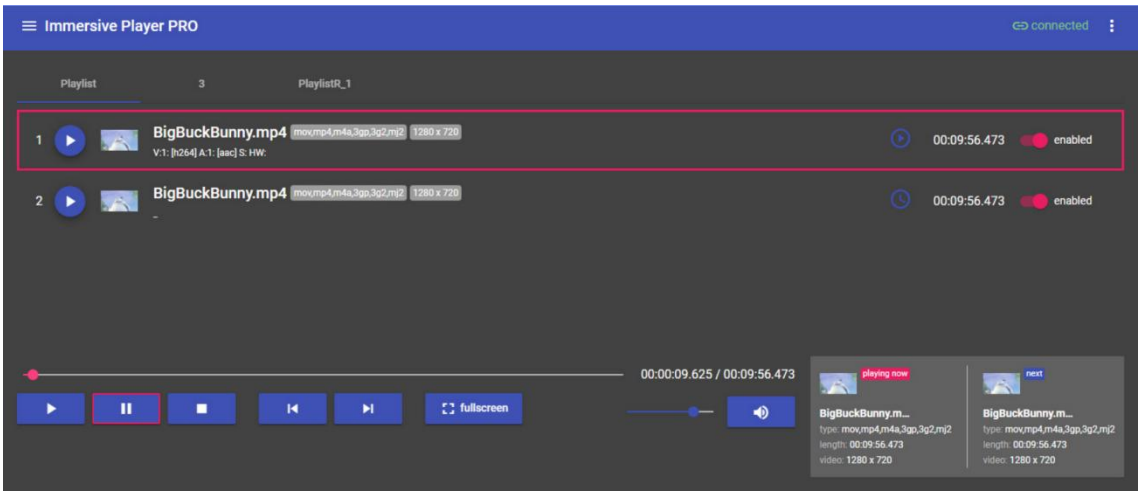
Command	http://<ipaddress:port>/control?restart
Description	Initiates a PC restart

Command	http://<ipaddress:port>/control?swutdown
Description	Initiates a PC shutdown

When the HTTP interfaces is enabled, a browser can be pointed to the PC IP address and the selected port.
A responsive web interface will be shown to control the playlist and the playback.



Using the Settings/Remote page, user can select bright or dark theme for the HTTP interface



11CMDNET Interface

CMDNET is a TCP based interface with clear - text commands and responses. This interface allows simple integration of the software with any (show) control software that supports text based TCP control interface.

The CMDNET server waits for requests and then services them as it receives them, in the order they are received. It responds to each request indicating whether the request was carried out, and sometimes to provide requested information. The CMDNET server will only send a message to the client in response to a request. Exactly one message is sent by the CMDNET server to the client in response to each request.

All commands and responses are sent in plain ASCII-encoded text. No data is sent in binary form.
Each command has the following structure:

<COMMAND_NAME> <PAREMETER>;

The command name comes first, followed by an optional command parameter (zero or one). The command and the parameter are separated by a “space” character. A semicolon always ends the command.

Each command is processed by the CMDNET server and response is produced.
The response has the following structure:

<RESULT_CODE>:<RESULT_INFO>;

The result code comes first, followed by result information. The result code and the result info are separated by a “:” character. A semicolon always ends the response.
The result code is one of OK or ERR. OK indicates successful command execution. ERR indicates failure to execute the command.

The following is a list of the supported commands:

11.1 HELP

Description	Lists all available CMDNET commands
Command	HELP;
Response	OK:HELP,PAUSE,UNPAUSE,STOP,PLAYSELECTED, PLAYNEXT,PLAYPREVIOUS,PLAY,QUIT;

11.2 PAUSE

Description	Pauses the current playback.
Command	PAUSE;
Response	OK:PAUSE;

11.3 UNPAUSE

Description	Un pauses the current playback.
Command	UNPAUSE;
Response	OK:UNPAUSE;

11.4 SELECTPLAYLIST

Description	Selects a specific playlist. The play list index is provided as an argument. Index is 1 based index of the available playlists
Command	SELECTPLAYLIST <playlistindex>;
Response	OK:SELECTPLAYLIST <playlistindex>;

11.5 SELECTPLAYITEM

Description	Selects a specific play item in the current playlist. The play item index is provided as an argument. Index is 1 based index of the available play items.
Command	SELECTPLAYITEM <playitemindex>;

Response	OK:SELECTPLAYITEM <playitemindex>;

11.6 LOADM3U

Description	Loads a .m3u playlist file and replaces the content of the current playlist with the content of the .m3u fule.
Command	LOADM3U <filename>;
Response	OK:LOADM3U;

11.7 STOP

Description	Stops the current playback.
Command	STOP;
Response	OK:STOP;

11.8 PLAYSELECTED

Description	Starts the playback from the currently selected playlist/ playitem
Command	PLAYSELECTED;
Response	OK:PLAYSELECTED;

11.9 PLAYNEXT

Description	Starts the playback from the next play item in the selected playlist
Command	PLAYNEXT;
Response	OK:PLAYNEXT;

11.10 PLAYPREVIOUS

Description	Starts the playback from the previous play item in the selected playlist

Command	PLAYPREVIOUS;
Response	OK:PLAYPREVIOUS;

11.11 PLAY

Description	Starts the playback from a specific play item. The play item index is provided as an argument. Index is 1 based index of the play item in the currently selected playlist
Command	PLAY <playitemindex>;
Response	OK:PLAY <playitemindex>; ERR:INVALID PARAMETER

11.12 MUTE

Description	Mute the Audio.
Command	MUTE;
Response	OK:MUTE;

11.13 UNMUTE

Description	Unmute the Audio.
Command	UNMUTE;
Response	OK:UNMUTE;

11.14VOLUMEUP

Description	Increase the audio volume.
Command	VOLUMEUP;
Response	OK:VOLUMEUP;

11.15VOLUMEDOWN

Description	Decrease the audio volume.

Command	VOLUMEDOWN;
Response	OK:VOLUMEDOWN;

11.16SETVOLUME

Description	Sets the audio volume. Values between 0 and 130
Command	SETVOLUME <volume>;
Response	OK:SETVOLUME <volume>; ERR:INVALID PARAMETER

11.17 FULLSCREEN

Description	Enable/Disable full screen playback.
Command	FULLSCREEN on; enable full screen playback FULLSCREEN off; disable full screen playback
Response	OK:FULLSCREEN;

11.18 LOCKTOEXTERNALCLOCK

Description	Enable/Disable locking to external clock.
Command	LOCKTOEXTERNALCLOCK on; lock to TLC/MIDI clock LOCKTOEXTERNALCLOCK off; unlock from TLC/MIDI clock
Response	OK: LOCKTOEXTERNALCLOCK;

11.19 INFO

Description	Enable/Disable playback info notifications.
Command	INFO on; enable playback info INFO off; disable playback info
Response	OK:INFO;

11.20 INFO notifications

When the playback info notification is enabled, the software sends the following playback notification messages:

Description	When the playback state changes to stopped.
Command	INFO:STOPPED:<playlistindex>;

Description	When the playback state changes to paused.
Command	INFO:PAUSED:<playlistindex>:<playitemindex>;

Description	When the playback state changes to playing.
Command	INFO:PLAYING:<playlistindex>:<playitemindex>;

11.21SHOWHTML

Description	Show/Hide the HTML view.
Command	SHOWHTML on; Show HTML view SHOWHTML off; Hide HTML view
Response	OK: SHOWHTML;

11.22 NAVIGATEHTML

Description	Loads the url into the HTML view.
Command	NAVIGATEHTML <url>;
Response	OK: NAVIGATEHTML;

11.23QUIT

Description	Quits and closes the warping software.
Command	QUIT;
Response	OK:QUIT;

11.24SHUTDOWN

Description	Shuts down the PC.
Command	SHUTDOWN;
Response	OK:SHUTDOWN;

11.25 RESTART

Description	Restarts the PC.
Command	RESTART;
Response	OK: RESTART;

12OSC Interface

Open Sound Control (OSC) is a data transport specification (an encoding) for real-time message communication among applications and/or hardware.
OSC's address space is entirely user-defined, thereby allowing it to be both lightweight and endlessly customizable and extensible to the user's specific needs. OSC messages are differentiated from one another by a URI-style symbolic naming scheme allowing for hierarchical organization of the address space.
https://opensoundcontrol.stanford.edu/

Immersive Player PRO supports remote control of the most important functions using well defined set of OSC message. The OSC support can be enabled and configured in the Settings/Remote screen. Note: An Advanced license is required to enable the OSC support.

The following is a set off supported OSC messages. The type letter before the parameters indicates the expected parameter type Supported types are s (string), i (integer) and f (float).

Control	
/control/quit	Quits and closes the warping software.
/control/restart	Restarts the PC.
/control/shutdown	Quits and closes the warping software.
Player	
/player/play	Starts the playback from the currently selected playlist/playitem.
/player/goto f:time	Seeks into the currently active playitem. Time is a float based time in seconds from the beginning of the playitem.
/player/pause i:value	Pause/Unpause the current playback. Set value to 1 for pause. Set value 0 for unpause.
/player/stop	Stops the current playback.
/player/previous	Starts the playback from the previous play item in the selected playlist.
/player/next	Starts the playback from the next play item in the selected playlist.

/player/volume i:value	Sets the audio volume. Values between 0 and 130.
/player/mute i:value	Mute the Audio. Set value to 1 for mute. Set value 0 for unmute.
/player/fullscreen i:value	Enable/Disable full screen playback. Set value to 1 to enable fullscreen. Set value 0 to disable fullscreen.
/player/locktoexternalclock i:value	Enable/Disable locking to external clock. Set value to 1 to enable external clock lock. Set value 0 to disable external clock lock.
Playlist	
/paylist/select i:index	Selects a specific playlist. The play list index is provided as an argument. Index is 1 based index of the available playlists.
Playitem	
/playitem/play i:index	Starts the playback from a specific play item. The play item index is provided as an argument. Index is 1 based index of the play item in the currently selected playlist.
/playitem/select i:index	Selects a specific play item in the current playlist. The play item index is provided as an argument. Index is 1 based index of the available play items.
/playitem/enable	Enable a specific play item. The play item index is provided as an argument. Index is 1 based index of the play item in the currently selected playlist.
/playitem/disable	Disable a specific play item. The play item index is provided as an argument. Index is 1 based index of the play item in the currently selected playlist…….