

Deliverable

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D3.3 Production Tools

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Abstract: This deliverable describes the hardware and software components delivered for Pilot 1 and Pilot 2 resulting from the work done in T3.3 – Production Tools. The document contains two sections – one dedicated to off-line production tools and the other focused on live VR tools.

REVISION HISTORY

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Disclaimer

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1. INTRODUCTION

ImmersiaTV offers tools for the production of omnidirectional content. In order to achieve functionalities required for both Pilot 1 (immersive experience of the pre-recorded content) and Pilot 2 (streaming of live events) the toolkit comprises of two different set of tools:

- Off-line production tools (**Adobe Premiere Pro Plug-In**)
- Live production tools (**Cinegy Live VR**)

Both of them are described in the following chapters.

2. OFF-LINE PRODUCTION TOOLS

The aim of ImmersiaTV is to develop a range of off-line production tools in order to simplify omnidirectional video editing and post-production of these kind of contents. We have chosen to work above Adobe Premiere Pro given that is a very standardized application, well known by most of the people in the post production collective, so the the learning curve is not very pronounced. We profit the bases of this program and build some extensions to add extra features for creating immersive scenes. Our applications enable content synchronization between the diverse elements on the scene and also between different devices (TV, smartphones, HMD). The idea is to combine both, 360 and traditional video clips, into a single production pipeline inside an Adobe Premiere Pro sequence. By adding portals into an omnidirectional scene, our off-line production tools enable creative content professionals to intuitively create and deliver new content suitable adopting this innovative approach.

1.1. Functionality

The ImmersiaTV integrated workflow requires the development of a set of tools and procedures that extend the established production process, to enable new forms of immersive storytelling. Our offline production tools consist in an Adobe Premiere Pro package composed of several plugins that provide an interface to define scenes for immersive and directive video displayed in multiple devices. This package contains one effect that helps to manipulate omnidirectional video, another effect for insertions (portals) of flat videos or images on the scene, some transitions effects and a personalized panel to export all the data in an understandable format for delivering and playing the content.

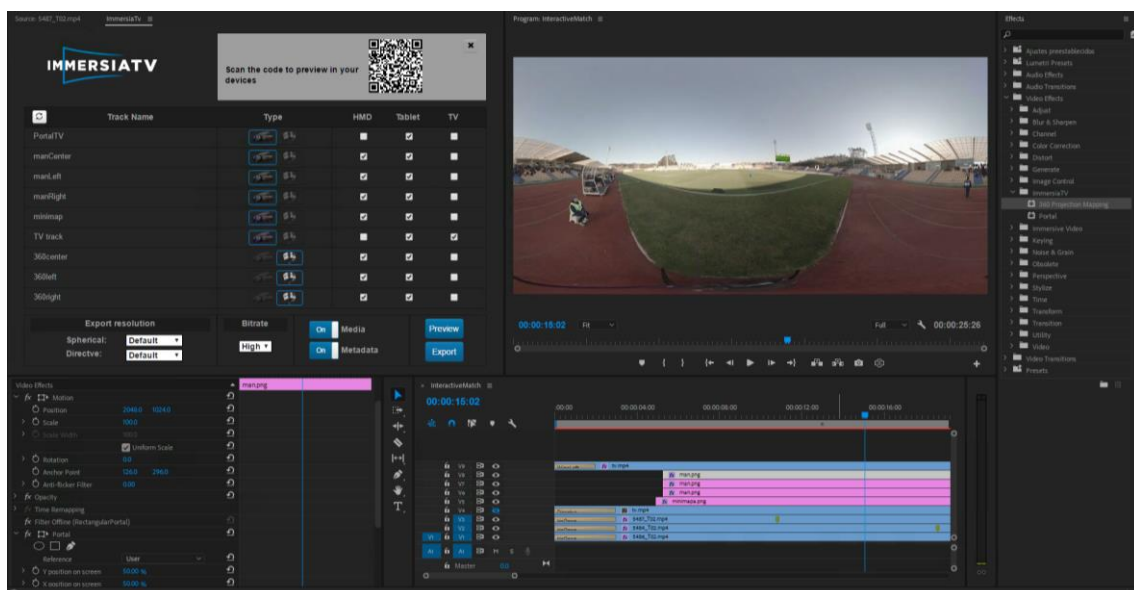


Figure 1 Interface of ImmersiaTV plugins for Adobe Premiere Pro

1.1.1. 360 projection mapping

The base of an immersive scene is an omnidirectional video, but there are different ways of representing this content in a 2D space. The most used is the equirectangular projection due that is easy to scan the image and see what it looks like, but is not the optimal in terms of coding because in the transformation from a sphere to a plain a lot of distortion is added on the poles and some pixels are overrepresented. Others like cubic or pyramidal representations are better in terms of coding and efficiency but are difficult to interpret at a glance. Adobe Premiere Pro only supports equirectangular projection. With our plugin effect '360 Projection Mapping' we have added support to cubic projection mapping. It performs a real time transformation from cubic to equirectangular projection to preview the video in Adobe Premiere Pro in a more understandable way.

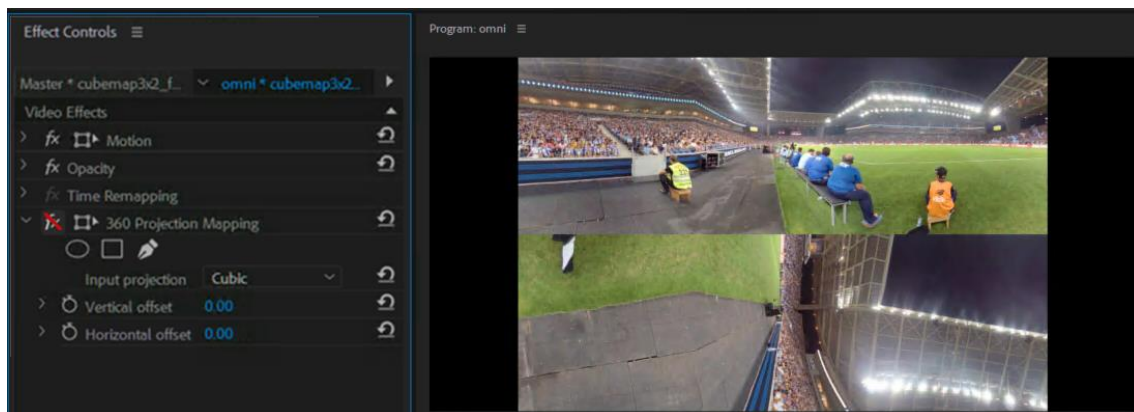


Figure 2 Cubemap projection input with 360 projection Mapping deactivated

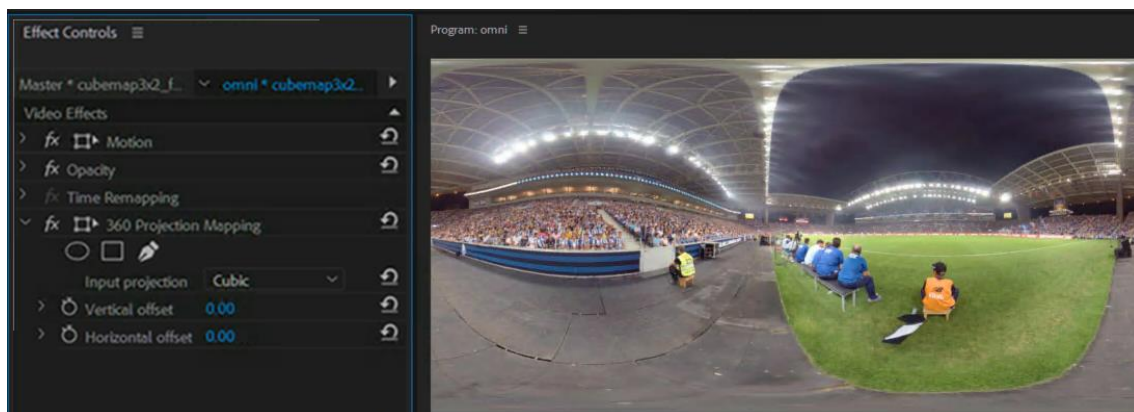


Figure 3 Cubemap projection input with 360 projection Mapping activated (transform to equirectangular preview)

The plugin allows also to change the horizontal and vertical offset to correct directions in the 3D space so playing with this parameters, the producer can change the point of interest and also modify or correct the calibration of the cameras due to a bad positioning on the capture step.

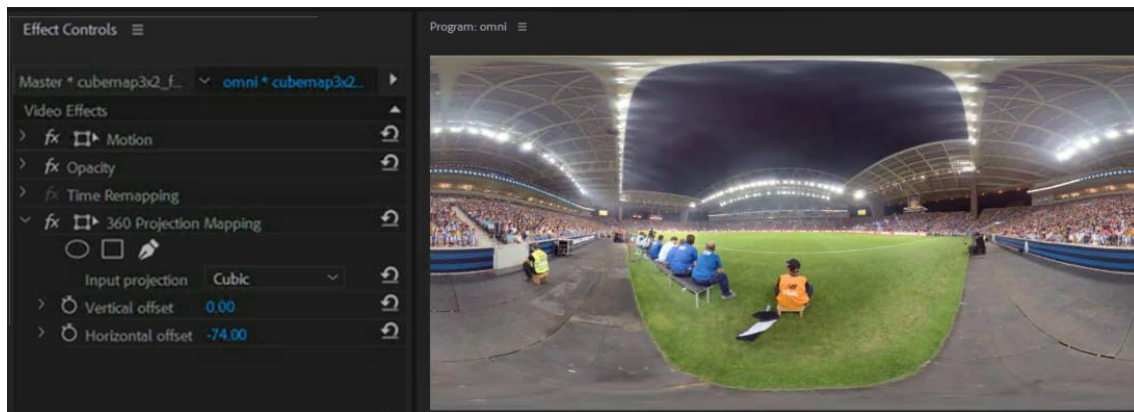


Figure 4 Previous capture after applying horizontal offset to change the point of interest.

1.1.2. Portal plugin

The plugin that allows the content creator to introduce elements of interactivity is the 'Portal effect'. It is a video filter plugin that creates a dynamic video insert, allowing viewers to influence the content shown (show/hide elements, switch views). It can be a rectangular insert from directional camera or static graphic. The effect is applied to a clip.



Figure 5 Directive track with Portal effect deactivated

Portals can be inserts on the 3D world (world reference) or overlays on the screen (user reference).

The world reference portals can be positioned everywhere on the 3D scene, always looking at the camera. Its position is based in XYZ polar coordinates mapped on a 2D preview, being (0,0) the center of the 2D composition. This values are based on degrees. Vertical position allows values on the range (-90,90) and Horizontal position on the range (-180,180) to cover all the range of the sphere. The distance position (Z) is computed depending on the track position on the sequence as we explain a few lines below.

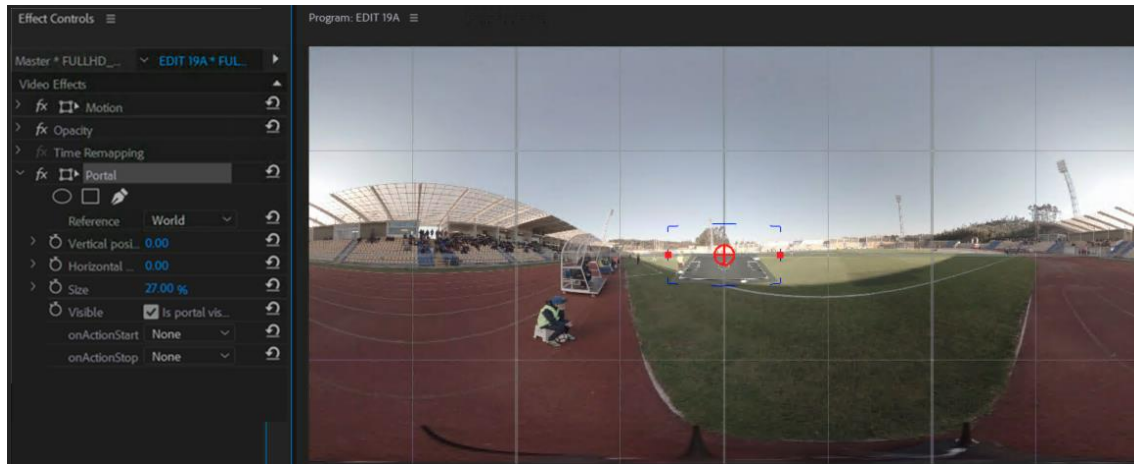


Figure 6 Directive track with Portal effect in World reference edition mode.

The user reference portals are positioned in a 2D world because they are overlaid on the screen. As screen sizes can be different on each device, we used relative values for its position on the screen. These values are percentages being (0,0) the upper-left corner and (100,100) the lower-right corner.



Figure 7 Directive track with Portal effect in User reference edition mode.

The editor can define its size and position (also varying in time) using the Effect Controls Panel and it also allows defining some interactions between elements using the onActionStart field and selecting the target element. That way, when clicking on this portal, i.e., pressing it on a tablet or staring at it on an HMD, the player shows or hides another element on the scene.

PPro tracks act like layers in the composition and a top layer covers the ones at its back. That means the tracks on the bottom must be the omnidirectional videos, then the world reference portals and finally the user reference ones. We use this layers concept to generate the export metadata, using the tracks position and type to compute the sizes and distances to avoid collisions between elements. With this purpose we defined three distance zones. User reference portals are located at distance 0.3 from the camera and always follow its position, world reference are located between 0.31 and 0.8 and are static in the 3D world, and 360 videos from 0.81 to 1.

The effect is integrated with Adobe Premiere Pro built-in preview, which facilitates a fine-tuning of the multi-device experience. PPRO also includes an internal VR preview where you can navigate across the 360 scene. The problem we found is that the VR preview is a 2D projection

of the scene, so the user reference portals are treated as a world reference ones and do not follow the camera. Also there was no way to test interactivity options, that's why we added our own preview mode explained in detail in the section 1.1.4 of this document.



Figure 8 Differences between PPRO VR preview (left) and ImmersiaTV preview with User reference portals (right)

1.1.3. Transitions

For smooth opening and closing of portals and switching between omnidirectional videos, a set of basic transitions compatible with the end-user player was implemented. This transitions are Dissolve, Iris Open/Close, Wipe Open/Close and Wipe Left/Right

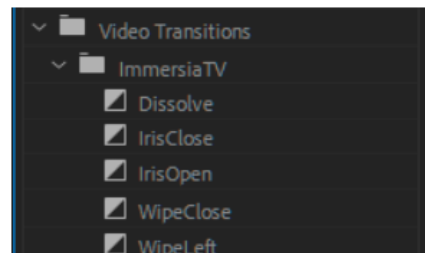


Figure 9 ImmersiaTV Video transitions in effects Panel

- Dissolve

The dissolve effect is when one scene gradually mixed into another. The figure 7 show an example of this transition applied between two clips.

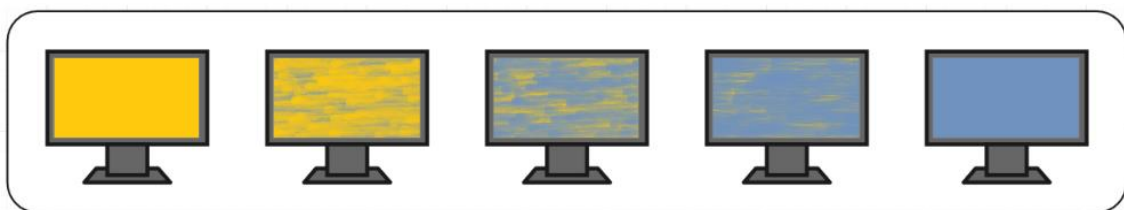


Figure 10 Dissolve transition effect

- Iris Open/Close

The iris transition reproduces the effect of opening (Iris Open) or closing (Iris Close) the iris of a camera lens. In figure 8 it can see an example of Iris Open effect applied between two scenes.



Figure 11 Iris Open transition effect

- Wipe Open/Close

The wipe effect replaces one scene to another moving the preceding scene out of the way. In wipe open, that effect starts in the center of screen how it can see in figure 9, and in wipe close this effect starts on the two extremes of screen.

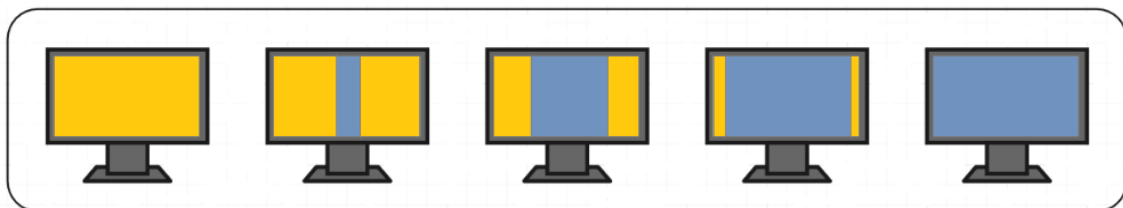


Figure 12 Wipe Open transition effect

- Wipe Left/Right

In a wipe left, the effect starts on the left side of screen how it is show the figure 10 and in a wipe right the transition effect starts in the other side of screen.



Figure 13 Wipe Left transition effect

1.1.4. ImmersiaTV export panel

This panel is the most important piece because generates the data that allows understanding between the production and delivery modules. It lists all the video tracks on the active sequence and allows to select their type (directive/spherical) and target devices (HMD/Tablet/TV). This make it possible to extend the standard Adobe Premiere Pro editing process (in which video tracks are generally mixed together in a sequence) to edit videos in a common sequence but targeting different devices for rendering. With this approach it is possible to define different content to be rendered on different devices, but to keep a common timeline for all of them. The aim is to mix omnidirectional, traditional video footage and images into an appealing multi-device end user experience.

This panel also allows to easily export the final project to the format (media files and metadata) that represents the multi-device content, for delivery and multi-device audience consumption. It is possible to define output quality (resolution and bitrate) for spherical and directive(TV) videos, while we use a fixed low resolution (426x240) for the portals given his reduced size on

the scene. After defining this parameters, a single click on export button and all the tracks are rendered, and metadata is generated.

The panel also includes external preview functionality to allow a quick check of the composition status. In its preview the user reference portals are attached to the screen instead of fixed in the 3D world as happens in the Adobe Premiere Pro internal preview, and it is also possible to test interactivity. This preview is generated each time user clicks the Preview button. It performs PNG captures of each track at the selected time in the timeline. This captures are then published together, with its own metadata file, in an http server build using Node.js libraries (export, http, chokidar...). Then another library (qrcode.js) takes the address of the ImmersiaTV preview player, also published in this server, and generates a QR code. That one allows to preview the composition directly on mobile devices, just scanning the code.

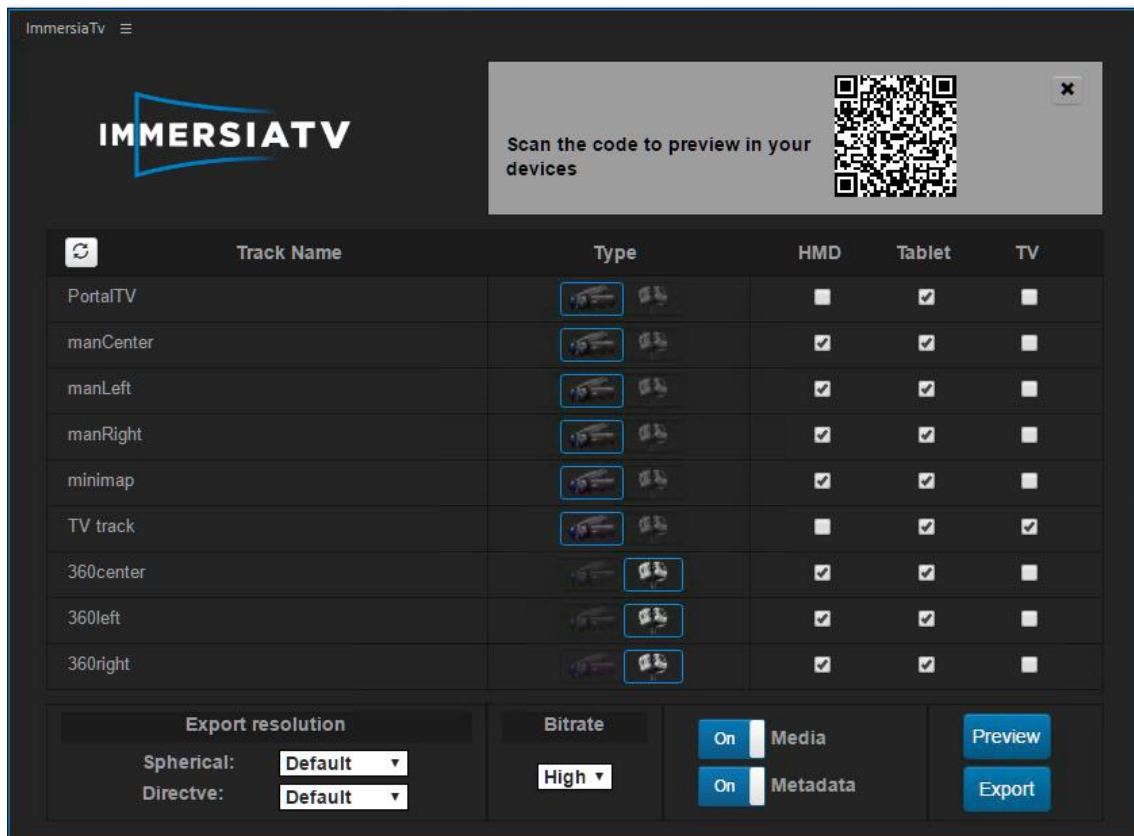


Figure 14 ImmersiaTV Export panel

1.2. File repository

The last release version of the plugin (0.22) has been uploaded to the next server:

ftp://ftp.immersiatv.eu/releases/0.22/premiere_pro_extension/

The immersiaTV package comes in a .zxp compressed file together with a python script to install it in an easy way and a changeLog file to see the changes introduced in each version. Also an install manual is provided to make it even easier.

1.3. Installation guide

The immersiaTV installer is python script, so we will need to install python version 2.7. The immersia.zip file has to be located in the same directory as immersiaInstaller.py. Then just running this command in the command line terminal it will be installed.

```
python immersiaInstaller.py --install
```

This script also allow to list current extensions and their versions using this command.

```
python immersiaInstaller.py --list
```

And of course the script also includes the call to uninstal the package:

```
python immersiaInstaller.py --remove
```

1.4. Code documentation

The code documentation is, at this stage, with the released software, in form of readme and change log files. More detailed documentation will be added on next iterations.

3. LIVE PRODUCTION TOOLS

The applications Cinegy Live VR and Cinegy Transport form a package for live omnidirectional video editing and broadcast. These applications enable creative content professionals to intuitively compose an immersive storyline to be delivered to several target devices. Live editors can combine an omnidirectional scene with portals that provide additional visual information and interaction points to the viewer. Additionally, omnidirectional scene content can be dynamically manipulated during the live broadcast.

1.5. Functionality

The ImmersiaTV integrated workflow required the development of a set of tools and procedures that extend the established production process, in order to enable new forms of immersive storytelling.

The live production process starts with defining the omnidirectional scenes configuration via Cinegy Live VR. Each scene can contain a number of portals and alternate primary video sources. Each portal provides a source of additional visual information and interaction point to the viewer. A Portal can be a rectangular insert from a directional camera, a spherical insert from omnidirectional video or a static graphic. The editor can define its size, position and type of interaction. Alternate video sources allow the end-user to interact with scene objects and influence the content shown (show/hide elements, switch views, etc).

The next step is to configure a set of available visual sources to be used within the live production process. Each source defines either a live stream from a directional camera, or a spherical live stream from an omnidirectional camera or a static image.

The final step in the live production is the actual live broadcast session where pre-configured scenes and live stream sources are creatively combined by the operator to produce a dynamic live storyline. Changes made to the scene by the software operator will be reflected on the viewer side. There is also an option to provide limited interactivity available for the viewer to interact with the scene (for example, selecting one of the alternate video streams) while there are no changes pushed by the operator.

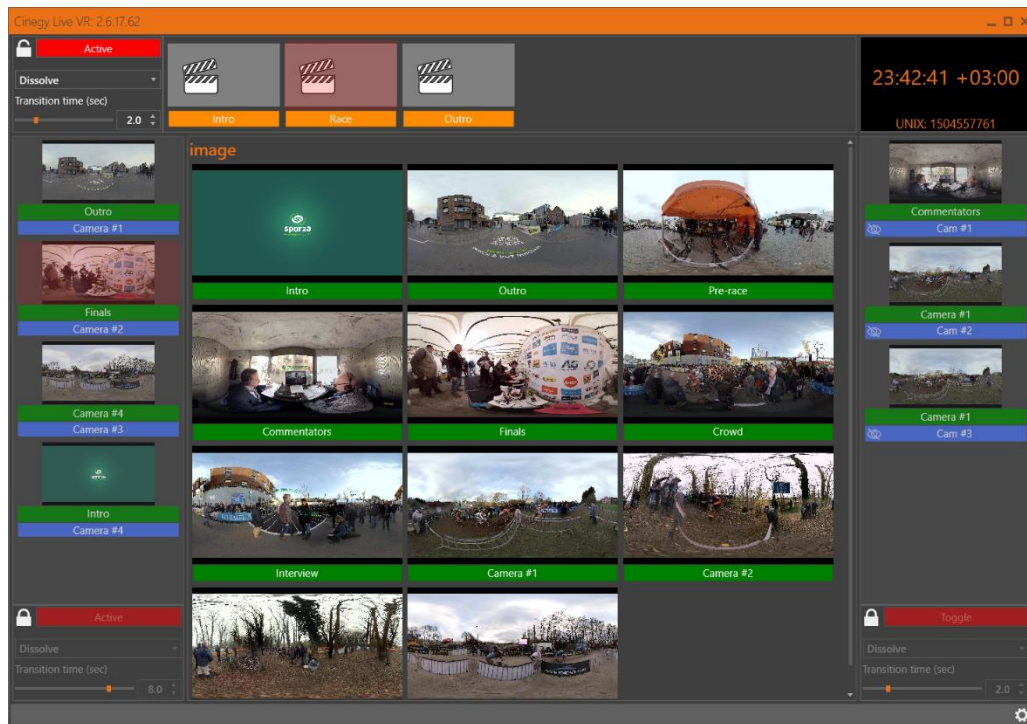


Figure 15 Interface of ImmersiaTV Live VR

Cinegy Transport is a service that acts as a live stream transformation tool providing different versions: synchronized stream with other live sources, proxy preview for displaying in Cinegy Live interface, MPEG-DASH output for the viewers, etc. Cinegy Transport service does not provide any user facing interface and runs in the background.

1.6. File repository

<ftp://ftp.immersiatv.eu/releases/Cinegy/2.6.16>

1.7. Installation guide

Both Cinegy Live VR and Cinegy Transport comes with a standard Windows OS installer. To install the corresponding application users should follow installation wizard steps. Once installed Cinegy Transport does not require any configuration. Cinegy Live VR after the installation requires operator to define scenes and live sources as described above.

1.8. Code documentation

The code documentation is, at this stage, with the released software, in form of readme and change log files. More detailed documentation will be added on next iterations.