

r21.4 Changelog

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| r21.4 Release - 91837
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Release day - 27th July 2022

New Features

DSOF-18115 Mesh projection mapping for Renderstream

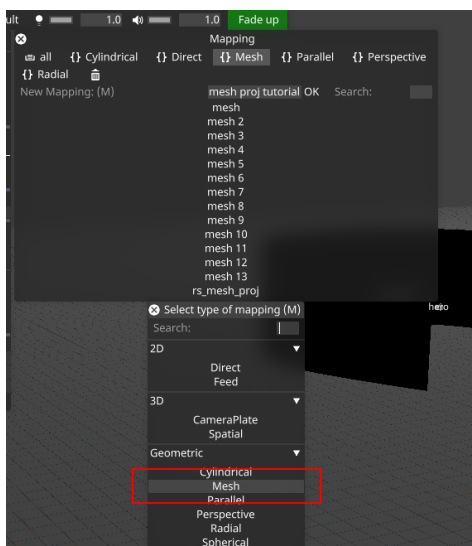
The “Mesh” projection is a mapping which projects 3D content from an eye point onto the entire mesh of a screen. It is a perspective projection which automatically adjusts its rotation centre and field of view to match the extent of the mesh. It is particularly useful for large-canvas installations or out-of-frustum content in an XR setup.

The main advantages of mesh over perspective mappings are:

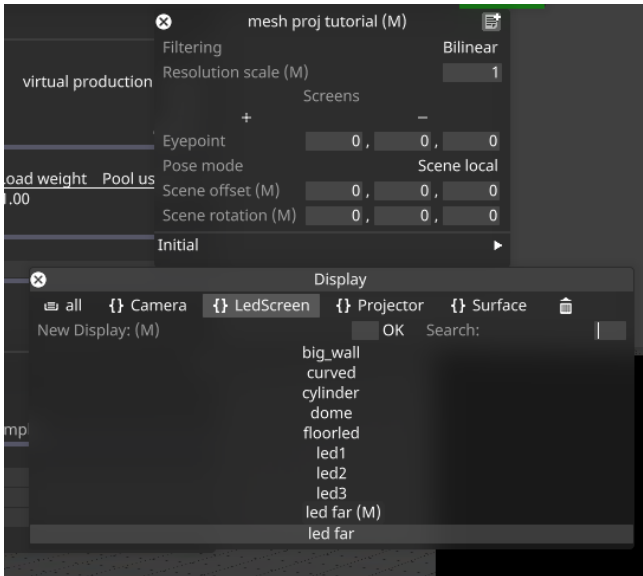
- The rotation and field of view automatically adjust to the mesh extent, making it easier to set up a projection encompassing a single screen
- When using Renderstream, the UV-space pixels are streamed, removing the additional bandwidth required to stream rendered pixels which get cut off when projected onto the mesh.

To set up a mesh projection:

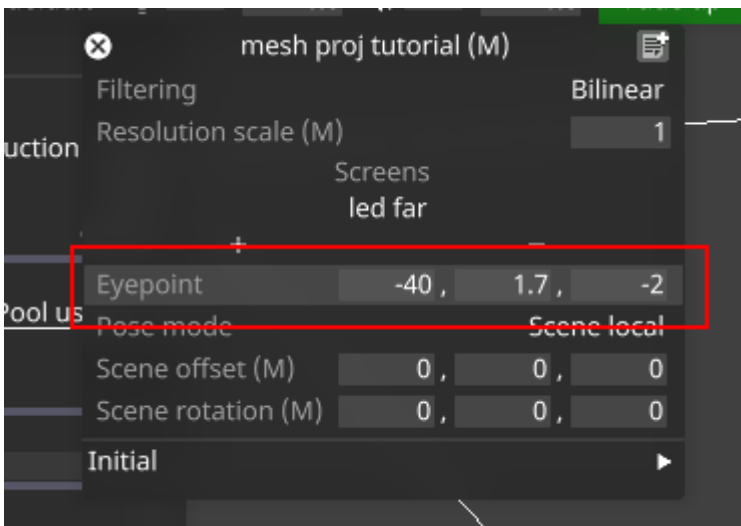
1. Create and set up a 3D content layer (e.g. a Notch or RenderStream layer).
2. Create a new Mesh mapping and select this in the content layer.



- Assign screens to the mapping. In this instance, we are adding a simple Rectangular LED screen with a resolution of 1920 x 1080.

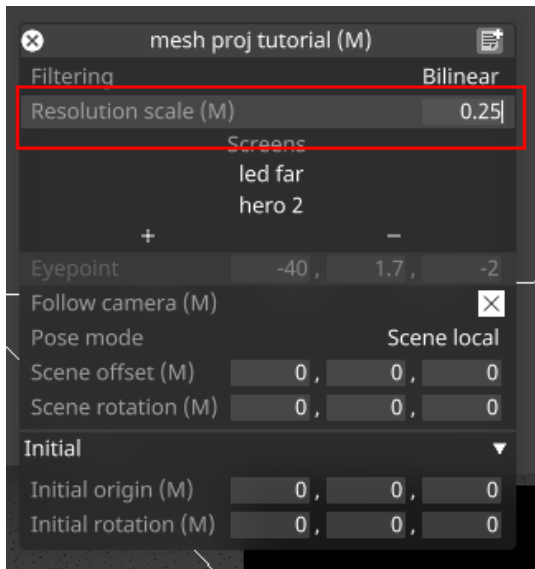


- Adjust the eyepoint if necessary. The view frustum from the eye point is shown when screens are present and gives a reference to position the eye point.

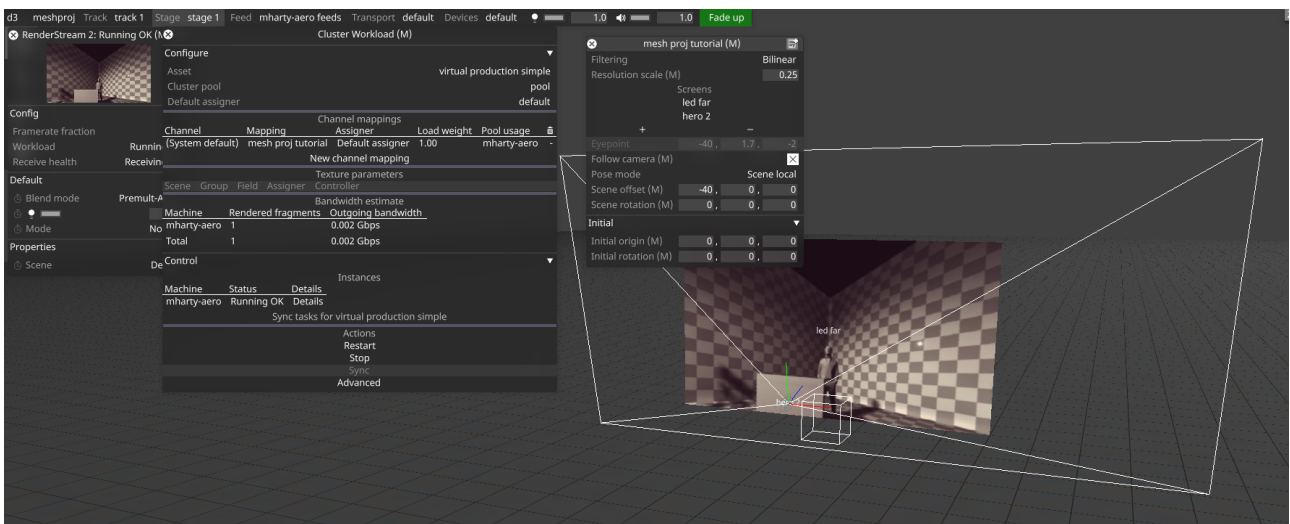


- Adjust the offset of the 3D scene if desired by adjusting the same fields used to do this in for spatial mapping, i.e. "Initial origin", "Initial rotation", "Scene offset", "Scene rotation", and "Pose mode".

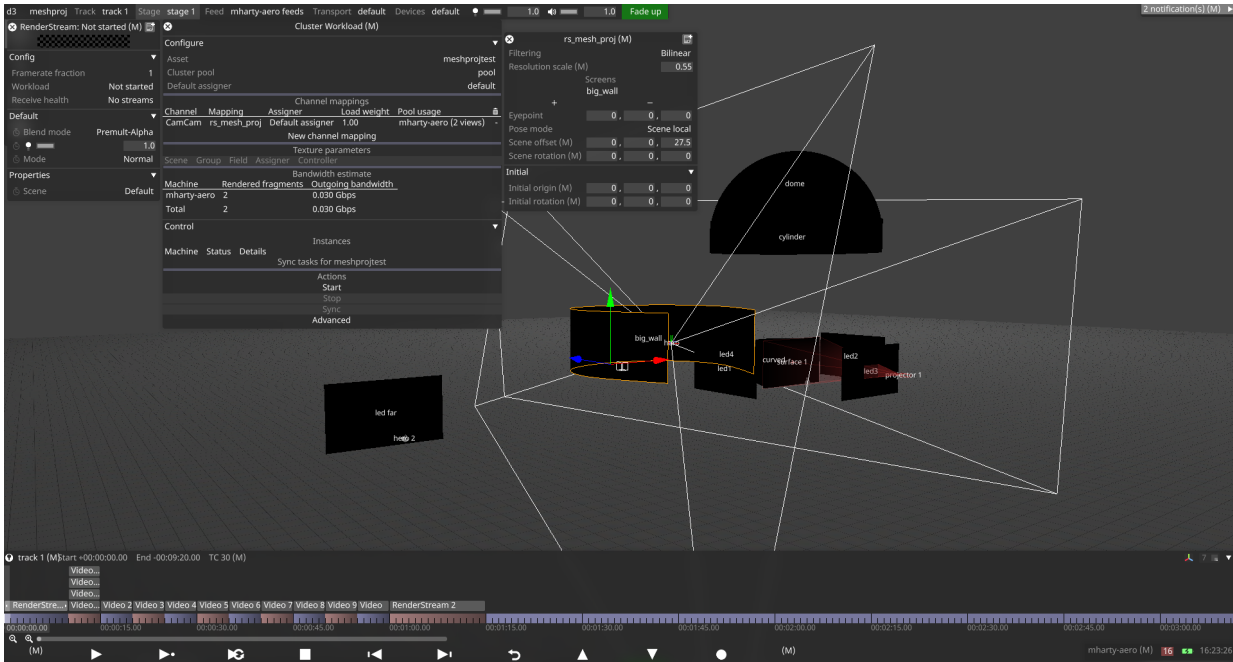
- Set the resolution scale if desired. The content will render at the screen resolution, multiplied by this scale factor. In more complex setups, each viewpoint will provide a render at the resolution scale multiplied by the resolution of the region of the screen the viewpoint covers.



- The mapping setup is complete, and we can see our content:
 - An example of a RenderStream layer rendering a Notch block to the screen via a Mesh mapping:



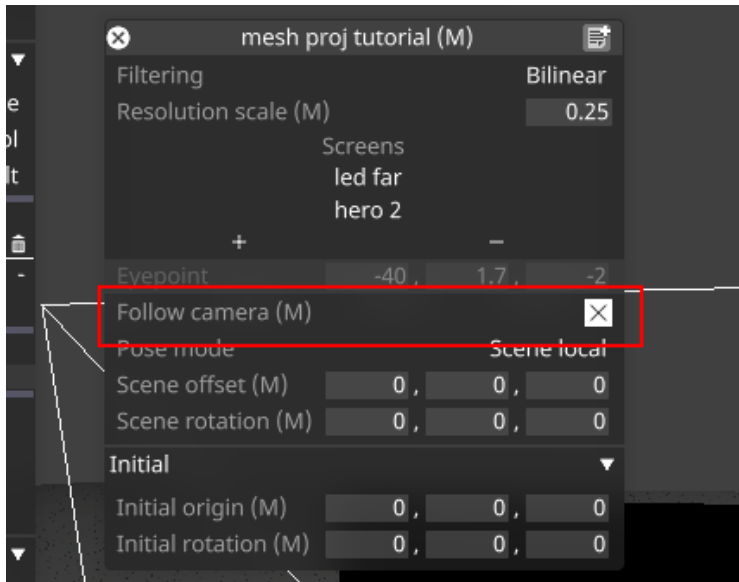
- A more complex wraparound screen (highlighted) with an eyepoint positioned within its bounds generating two viewpoints via RenderStream instancing forcing UV splits:



To set up a dynamic eye point which moves around the stage:

It is possible to set up a dynamic, moving eye point rather than keeping the position fixed. There are various ways this can be done, including:

- Parent the mapping to any object in the stage to make the eye point follow that object (offset by the values specified in the eye point field)
- Add a camera to the list of screens for the mapping. Content will not render to the camera. However a new field will appear in the Mesh mapping editor below the eyepoint field called "Follow camera". If this field is ticked, the eye point will follow the camera position.



- Similarly, an MR set can be added to the list of screens in the mapping. The mapping will then render to the screens of the MR set, and the eye point will follow the active camera of the MR set if “Follow camera” is ticked.

To split the content over multiple machines:

- For Renderstream layers, the content can be split across multiple render nodes as usual by adding multiple machines to the pool. The content for each screen in the mesh mapping will be rendered on a separate machine if available. If more render nodes are available than screens, the content will be split into fragments automatically to spread the load across machines.
- For other layers, the rendering load can be split across machines using “active screen regions” to define separate areas of each screen to render per machine.
- If active screen regions are used in combination with a Renderstream layer, machines will only subscribe to streams which are required for the active regions on that machine. For example, if you are rendering content to a screen with 4 rx and 4 vx machines, you can add the rx machines to the Renderstream pool to split the screen into 4 fragments and set corresponding active regions on the vx machines to receive one stream per machine. *Be aware that setting overlap on the Renderstream layer may result in more streams being received per machine.*

Scene Origin - DSOF-21037

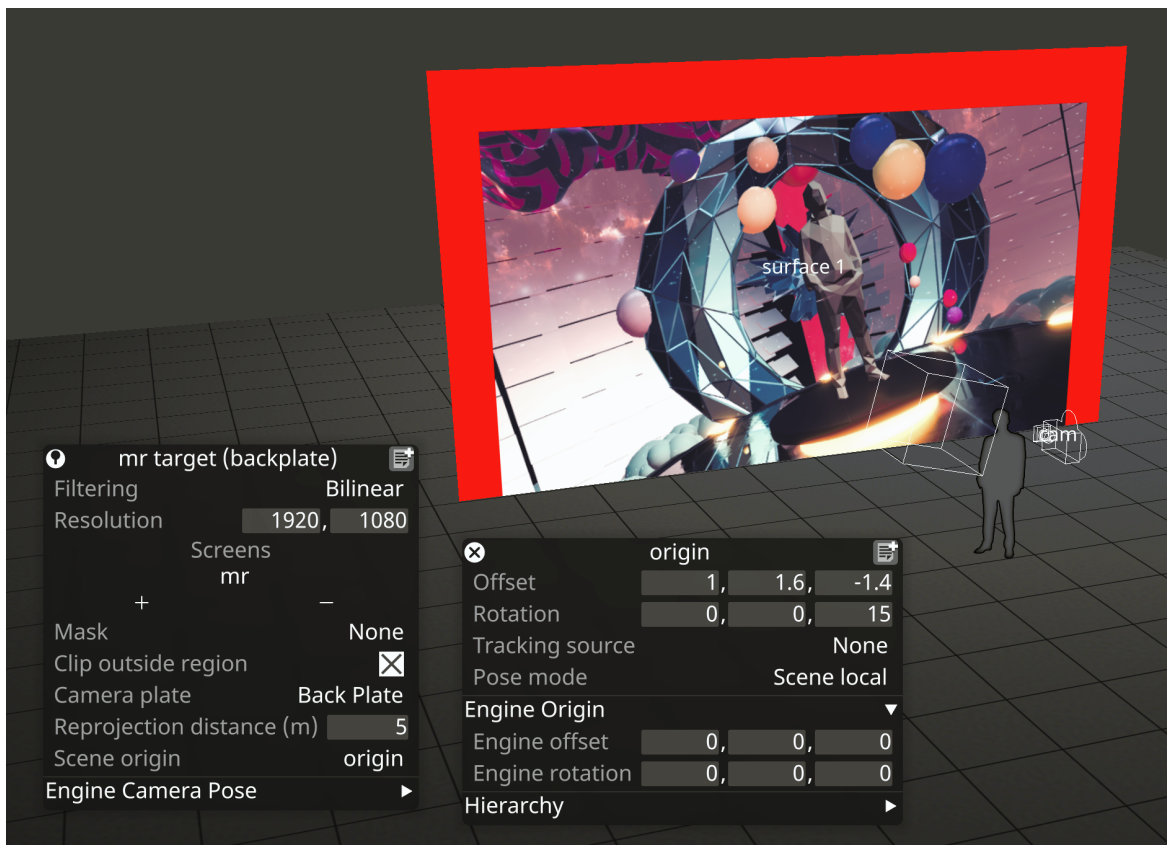
A SceneOrigin can be used to modify the zero-point of a 3D scene. It represents an offset between the virtual world of the render engine and the real world represented in Designer. SceneOrigins can be shared between mappings, and can be saved and recalled as a way of managing scouted locations for different shots.

To create a SceneOrigin:

1. Set up some 3D content with a supported 3D mapping (e.g. Spatial or Mesh)
2. Create a new resource in the 'Scene Origin' field of the mapping

To modify the origin:

- Change the offset/rotation values to modify the location of the scene origin in d3 space
- Change the Engine offset/rotation values to modify the location of the scene origin in render engine space
- Attach a tracking source to make the origin follow a tracked object in Designer space
- Change the pose mode to change the method used to place the camera into the 3D scene:
 - Scene global: place the origin of the 3D scene within Designer's stage, rotating around the scene origin
 - Scene local: place the origin of the 3D scene within Designer's stage, rotating around the chosen location
 - Camera parent: place a virtual parent transform of the camera. Designer stage position has no meaning in this mode.

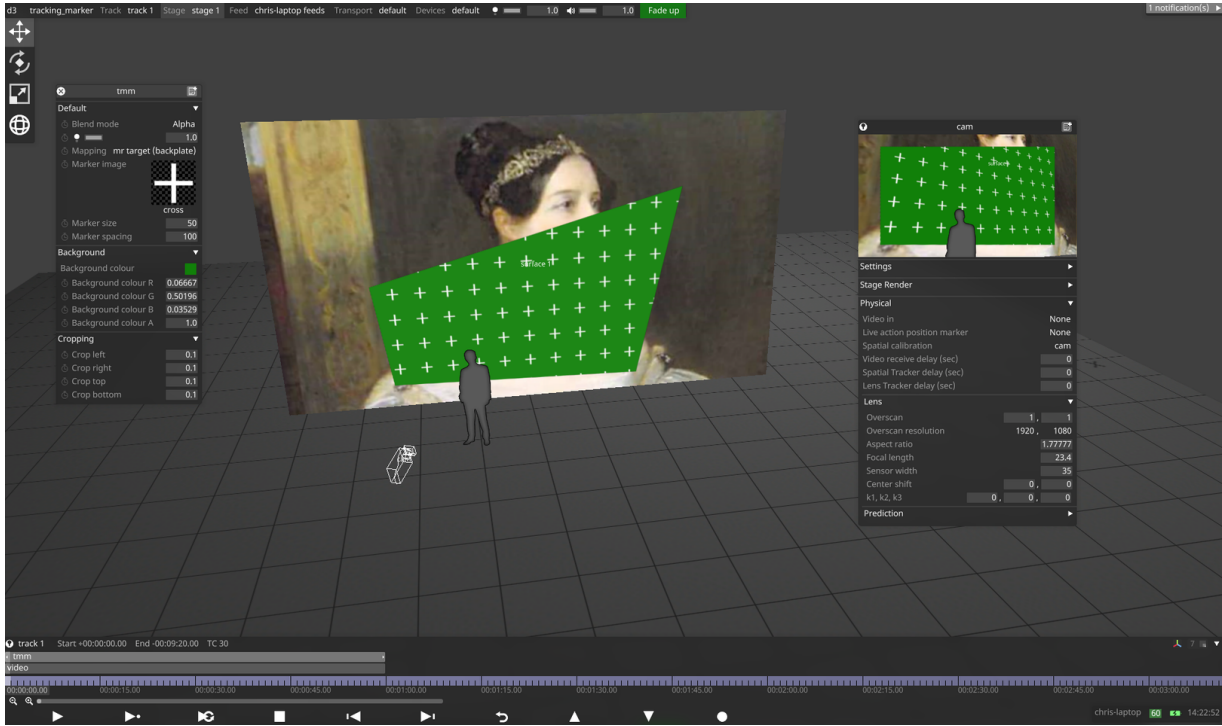


Tracking Marker Module - DSOF-20500

The tracking marker module generates a repeating pattern of markers on a coloured or transparent background. It is useful for virtual production workflows where some scenes require a green screen, either just within the camera frustum or on the whole of the LED screen. It can be used for both 2D and 3D mappings, and the markers will appear fixed to the screens in both cases.

To use the tracking marker module:

1. Add a TrackingMarker layer to the timeline:
 - a. Select the mapping:
 - i. To cover an entire screen or fixed portion with markers, choose a Direct mapping
 - ii. To display markers within the camera frustum only, choose a CameraPlate or Spatial mapping
 - iii. Other 2D or 3D mappings can also be selected for different workflows
2. Change the marker image, size and spacing if required.
3. Add a background colour if required. Note that the default is transparent, so alpha will need to be increased to see any colours.
4. Use the cropping settings to apply the markers to only a portion of the screen or frustum. The numbers define the distance cropped from each edge, with 0 being no cropping, 0.5 being the middle of the image and 1 being the opposite side.



Improvements

- DSOF-20383 Persist feed view settings

When working in FeedView, we enable the option to change the layout of the feeds and machines. In previous releases, when Designer is restarted, the settings go back to their original state. The view settings in the feed are now stored after a restart.

- DSOF-20279 Ability to delete/rename files in file explorer while d3 is open

In the video file editor, we have added an “unlock” toggle option to enable users to remove or rename files on the disk, making it more straightforward to clean up old media files.

- DSOF-19845 Identification of Matrox or Deltacast capture card on d3manager dropdown

We have enabled users to be able to identify whether their machine is running with a capture card manufactured by Matrox or Deltacast. This is located in the d3manager “help” dropdown as “Capture Card Vendor”. Within this view, we have also included machine type, serial number, backplane model and VFC card load.

- DSOF-19830 Identification of Matrox or Deltacast capture card on vx OLED

In addition to the above, we have also enabled users to be able to identify whether their machine is running with a capture card manufactured by Matrox or Deltacast on the front OLED display located in the machine field. The two options are (Ma) for Matrox and (De) for Deltacast.

- DSOF-19019 Support for TCD protocol for EzTrack lens data

We have enabled support for the TCD protocol from EzTrack to enable the delivery of intrinsic lens data to be used for green screen and AR workflows.

- DSOF-14079 API - implement Transport Control API

Transport controls are available via HTTP REST API. Details can be found in the OpenAPI documentation accessed from d3manager in Help -> Open API Documentation. Note that the d3 HTTP APIs will be unified, expanded and formally released in r22 as APIs version 2.

Improvements

- DSOF-21134 Improve how generate_api_docs.py ignores temporary swagger files
- DSOF-21038 Remove the option to choose between relative and absolute time in strobe and radar modules

We have removed the option to choose between relative and absolute time in the strobe and radar modules, and have kept the option where the strobe timing was relative to the beginning of the layer.

- DSOF-20815 Enable Machine and Machine Feed editor widgets to be opened directly from Feed View

We have enabled both the Machine Editor widget and Machine Feeds editor widget to be opened in the Feed View. This can be completed by right-clicking on the machine name, in which case the Machine Editor widget will open, or right-clicking on the machine name feed, in which case the Machine Feeds editor widget will open.

- DSOF-20780 Add support for alignment in Text Layer

We have added both vertical and horizontal alignment in the Text Layer.

- DSOF-20764 Create UnusedMediaDomain

The UnusedMediaDomain has been created to cache files that exist on machines but are not mapped anywhere. It also contains a method to delete all but one copy of unused media across the d3 session.

- DSOF-20694 Notify the user that a ShotRecorder's Timecode source needs to be set within the TransportManager
- DSOF-20667 Add separators for Designer licences versus RenderStream licences in d3manager

We have added more visual separation between Designer and RenderStream licences reported in the d3 License section of d3 manager (accessed via d3 manager / help / d3 License)

- DSOF-20592 Add shortcut to be able to specify the name of a new layer when duplicating (CTRL + SHIFT + D)

We have added a shortcut to be able to specify the name of a new track layer and/or layer stack layers. When creating a layer, select it and press CTRL + SHIFT + D. There will be a rename box pop-up to allow renaming the layer from the default name.

- DSOF-20502 FeedWarp button to limit all points to be inside the image borders

We have created a "Restrict To Bounds" button when using FeedWarp to limit all or selected control points to within the image borders. This can be found when right-clicking on FeedRect, select "Edit Warp" and the "Restrict to Bounds" button can be found. Clicking this button will restrict all points to values between 0 and 1. If a user right-clicked on a control point, clicking the "Restrict to Bounds" button in this instance will restrict all selected points to values between 0 and 1.

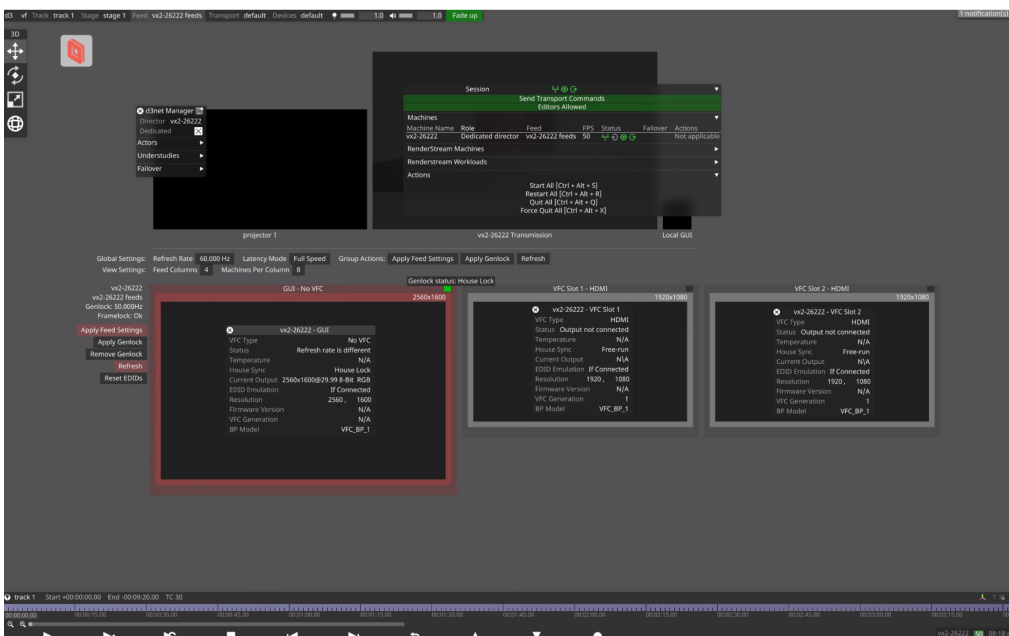
- DSOF-20418 Show layer/track name in RenderStream workload UI

We have added the Layer (Track) name option in the RenderStream workload UI to help distinguish between layers with the same asset and pool.



- DSOF-20376 Allow GUI heads to be genlocked if they are the only output head on the machine, and reflect this status in the GUI

We have enabled dedicated director machines to have their GUI heads genlocked from within Designer, even if the VFCs of this machine are not connected or emulated. The previous workflow was to make sure that the VFC cards are all emulated even when they are not connected.



- DSOF-19868 Move display management buttons from feed visualiser to machine editor in Feed View

We have moved the following buttons from the feed view to a new Display Management separator located in the machine editor:

- Apply Feeds
 - Apply Genlock - greyed out when no genlock is present, when already applied, or on a Solo
 - Remove Genlock - greyed out when no genlock is present, when already applied, or on a Solo
 - Refresh - greyed out for AMD machines i.e. vx series
 - Reset EDIDS
 - Bit Depth Selection - only bit depths that are supported by the machine type are available
- DSOF-19481 Improve AR calibration tool by allowing multiple alignment objects

In previous releases, it was only possible to use one alignment object when doing an AR calibration. As the AR calibration tool also requires at least 6 reference points per alignment object, it meant that only complex surfaces could be used as alignment objects, rather than flat LED or projection surfaces.

In r21.4 we have made it so that users can use as many alignment objects as are needed in order to align the camera, and therefore be able to use two LED or projection surfaces as an example.

- DSOF-18251 Right-click options for moving layers to top/bottom

To aid compositing in a layer stack, we have added the option to moving layers to the top or bottom of the stack. This can be completed by right-clicking on a layer, layers, or group layer / move to top OR move to bottom right-click on a layer, layers or group layer

- DSOF-17002 Create the ability to drag a section break on the timeline with mouse

We have enabled the ability to drag a section break on the timeline with a mouse. If a user hovers the mouse pointer over a section break, the mouse pointer changes to reflect that the section break can be moved.

Press ALT + drag the mouse to adjust the position of the section break only on the timeline, and CTRL + ALT + drag the mouse to adjust the position of the section break with the tag and note on the timeline.

- DSOF-17001 Creation of keyboard shortcuts for snapping layer(s) length to section break:

We have created the following keyboard shortcuts for snapping layer(s) to section break:

1. Ctrl + < extend the Start of the selected layers to last section break
2. Ctrl + > trim the Start of the selected layers to next section break
3. Alt + < trim the End of the selected layers to last section break
4. Alt + > extend the End of the selected layers to next section break
5. Ctrl + Alt + </> move the selected layers to last/next section break (length remain the same)

- DSOF-14667 When applying feeds on an actor from a director, the status of the feed application process should be viewable from the director

In a multi-machine setup - in this instance 1 director and 1 actor - when applying feed settings on the actor, the director GUI will show "Applying Feed Settings..." in the machine status area in the feed view. The output icon will also change to blue for status "busy" with "Applying Feed Settings" in the tooltip. The status will return to its previous state and the text in the feed view will disappear once the remote machine has finished applying feeds.

- DSOF-10297 Allow colour depth selection per output and per machine

We have created an additional field in the machine editor in the display management separator called "Machine bit depth". Within this field, there's the option to use the project bit depth as set in the d3 project editor or in the global buttons in the feed view, or to override the project bit depth selection for

that machine with 8 bit or 10 bit specifically. Machines not capable of supporting 10 bit will only present 8 bit as an option.

In the event that a machine is set to a type that supports 10 bit, has Project Bit Depth or 10 bit selected, and then the machine type is changed to one that does not support 10 bit, then the selection will show "invalid" until it is changed to a valid selection.

- DSOF-7493 "Insert Time" function now remembers the last typed value

In previous releases, inserting time to the timeline is something that has to be completed over multiple sections, layers and so on. We have enabled it so that the Insert Time field remembers the last value entered.

- DSOF-2134 Output Port selection and multi-edit of resolution

We have enabled the bulk editing of VFC output settings for multiple machines. The settings that can be changed in bulk are EDID Emulation, Split Mode (when supported), Timing Mode and Output Resolution.

- DSOF-20111 Send screen pose data dynamically over Renderstream for Mesh Projection
- DSOF-20026 Add resolution scale factor to Mesh Projection
- DSOF-19975 Include roll angle in perspective matrix for Mesh Projection
- DSOF-19751 Use RenderStream splitting logic to define UV splits for Mesh Projection
- DSOF-19674 Implement overlap for Mesh Projection
- DSOF-19673 Implement padding for Mesh Projection
- DSOF-19672 Implement SLC splitting for Mesh Projection
- DSOF-18671 Warp rendered video to mesh in RenderStream sender
- DSOF-18670 Calculate perspective data for Mesh Projection
- DSOF-18114 Implement basic UV splitting for Mesh Projection
- DSOF-18113 Synchronise surface mesh over RenderStream for Mesh Projection
- DSOF-18112 Create mapping for Mesh Projection

Fixes

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- DSOF-21268 - Fixed a RenderStream Access Violation
- DSOF-21251 Invalid access to DmxDisplay System error on launch
- DSOF-21249 Errors when >1 camera added to spatial map for Renderstream layer
- DSOF-21248 renderstream includes discarded frames in the total 'sent' when calculating receive health.
- DSOF-21247 RenderStream workloads fail with "Send Frame error: 16"
- DSOF-21214 sanitise_xml.py script fails the build if test result file contains certain unicode characters
- DSOF-21195 Assigning a camera to the input of a video_in.mov freezes d3 and displays an Access Violation in the console
- DSOF-21181 Invalid access to RenderStreamSystem error on launch
- DSOF-21175 Assigning/removing media that has been removed by the Media Distribution widget displays an AV
- DSOF-21173 Trying to open a Manual Observation with an Alignment Object assigned displays a 'not defined' error and will not open the widget
- DSOF-21148 - Fixed an issue where d3service shutdown blocked for 8 minutes waiting for rsync.exe to be cleanly closed
- DSOF-21131 - Fixed an Access Violation when opening project if enableActiveRegions set
- DSOF-21061 - Fixed an issue when using the All VFC Devices widget, changing the Spilt would cause the VFC SDI QUAD 4k feed resolution to increase
- DSOF-21059 - Fixed an issue where all VFC Devices widget displayed an out bounds error when the Spilt mode is changed to Quad 4k
- DSOF-21046 - Fixed an Access Violation during "Apply Genlock"
- DSOF-21000 - Fixed LUT Files sync failing between machines when doing Colour Calibration
- DSOF-20970 - Fixed an issue where right-clicking a Port within the All VFC Devices widget opened VFCPortConfig widget

- DSOF-20969 - Fixed an issue where all VFC Devices widget did not remove Ports when changing Split Mode that removes them
- DSOF-20968 - Fixed an issue where the All VFC Devices widget named newly added Ports "VFCPortConfig"
- DSOF-20967 - Fixed All VFC Devices widget not automatically resizing when changing Split Mode
- DSOF-20965 - Fixed All VFC Devices widget showing Split Mode for all VFC types
- DSOF-20963 - Fixed All VFC Devices widget does respecting non-editable fields
- DSOF-20946 - Fixed an issue where update the mesh while RenderStream is running resulted in a wrong overlapping.
- DSOF-20931- Fixed an Access Violation when using Sockpuppet : Strobe Layer
- DSOF-20874 - Fixed Display Management separator in the machine editor not opening
- DSOF-20863 - Fixed an issue where local RenderStream streams may not appear in the Receive Health indicator
- DSOF-20829 - Improved the speed of API calls
- DSOF-20817 - Fixed a Notch Sockpuppet Access Violation on releasing mapping
- DSOF-20816 - Fixed an issue where the node status error would be displayed when starting an Actor while Machine Editor widget is open
- DSOF-20813 - Fixed d3 failing to run when no network connections are active
- DSOF-20809 "D3StateEditor" objects has no attribute "Contents" error when starting a blank project
- DSOF-20802 - Fixed an Access Violation when creating either TimecodeTransportMidiBeatClock or TimecodeTransportTapTempo within a ShotRecorder
- DSOF-20801 - Fixed an issue where driver info of Fixture Instance defaults to "None" every time the machine reboot.
- DSOF-20781 - Moved Text Layer into Generative
- DSOF-20762 - Fixed an issue where, on exit, d3 always logs "saving all resources: done." even if nothing was saved
- DSOF-20751 - Fixed a buffer lock access error when setting a camera to Lux mode

- DSOF-20748 - Fixed an issue where video inputs could not be mapped in quick editor
- DSOF-20746 - Fixed audio output patches in the audio layer only showing up to 12 patches
- DSOF-20745 - Fixed an issue where layers within groups did not correspond with moving to the top or bottom options
- DSOF-20737 - Fixed an error when clicking on “Details” to get log for RenderStream workload
- DSOF-20728 - Fixed an issue where refreshing an Editor showed a “NoneType” object having no attribute “canClose”
- DSOF-20721 - Fixed an Access Violation when scrolling versions number in “Manage Old Media”
- DSOF-20708 - Fixed an Access Violation when unpatching a Video layer from Sockpuppet after it has had its mapping set to None
- DSOF-20681- RenderStream: fixed incorrect options length for Workload Transport Formats
- DSOF-20671 - Fixed D3State menu taking up two rows
- DSOF-20661 - Fixed an Access Violation when creating a Fixture in a DMX Light
- DSOF-20660 - Fixed an issue where exceptions during project sync could lead to data loss
- DSOF-20646 - RenderStream: Fixed an issue where Creating Channel Instances before adding a map would cause an Access Violation
- DSOF-20642 - Web: Fixed a pathing error due to suffix when reloading URL for local file via Interact widget
- DSOF-20638 - Fixed playback framerate issues
- DSOF-20634 - Feed Warp: Fixed DeformStackItem accessing reserved but unallocated memory
- DSOF-20620 - Improved Spatial calibration when running two observations
- DSOF-20610 - Improved SmartGroup functionality
- DSOF-20593 - Fixed Clip information text not updating on versioning toggle
- DSOF-20587 - Fixed an Error when undoing added RenderStream layers
- DSOF-20570 - Fixed an issue where could freeze when applying feed settings
- DSOF-20554 - LumaKeyedVideoIn: Fixed a zero-sized texture being used error
- DSOF-20528 - TestPattern module is now Generative
- DSOF-20527 - Fixed feed output shifting one pixel to the left when set SMPTE timing
- DSOF-20516 - Removed a misleading log entry "Replaced existing hook for Subsystem"

- DSOF-20512 - Fixed SmartGroup Versioning changes affecting assets not in the SmartGroup
- DSOF-20510 - Fixed an issue where waveform scope has graphical artefacts when Scope is resized to be too small
- DSOF-20507 RenderStream: Fixed an Access Violation when attempting to start a workload with the Manual splitting strategy
- DSOF-20504 - Fixed Data Rate reporting
- DSOF-20484 - Objectview: added "found" filter to hide all missing assets
- DSOF-20474 -- Fixed an error after unmapping a placeholder clip
- DSOF-20469- Fixed nginx.exe not starting when running through Visual Studio
- DSOF-20455 - It's no longer possible to open multiple Receive Health widgets for a single Workload
- DSOF-20439 - Improved CameraVideoIn subsystem
- DSOF-20432 - Fixed being unable to use the same video on placeholder clip of different videoin
- DSOF-20427 - Workload editor, Advanced window improvements
- DSOF-20423 - Fixed NotchLC decoding having redundant allocations
- DSOF-20402 - Fixed Clip Duration not updating correctly when toggling between versions
- DSOF-20347 - Clicking on frame replay OFF/ON no longer creates output in the widget
- DSOF-20332 - Fixed the SockPuppet bank windows not resizing
- DSOF-20331 Fixed the SockPuppet Bank Editor not showing the bank lists
- DSOF-20312 - Debug info now available if Rivermax does not initialise
- DSOF-20307 - Fixed a rawTracking.Received error when viewing camera not in stage
- DSOF-20290 - vx4+ - Fixed an issue where applying feeds settings in d3 results in breaking the genlock
- DSOF-20288 - Fixed cycle being detected when undoing the deletion or addition of a manual observation
- DSOF-20287 - Reverse proxy improvements
- DSOF-20276 - TextModule: Fixed an issue where inputs could not be adjusted with a mouse scroll

- DSOF-20259 - RenderStream: Fixed an issue where received health showed the status of machines which are not subscribed to the stream, resulting in “no frames received yet” status
- DSOF-20255 - Fixed an Access Violation when clicking on a video-in preview after removing a live source input
- DSOF-20252 - Fixed an issue where duplicating a GreenScreen added the copy name twice to the “Greens screens” list
- DSOF-20250 - Fixed a pathing error thrown when selecting a local HTML file with whitespace in its path
- DSOF-20238 - Fixed 9-point feed warp selection being rendered incorrectly on outputs
- DSOF-20228 - Fixed audio devices list in Audio Patch not having vertical scroll
- DSOF-20187 - Fixed UserInfoProcessMessageHandler
- DSOF-20180 - Fixed an issue where setting fractional resolutions in surfaces breaks the mapping resolutions
- DSOF-20175 - Fixed an issue where DMX surfaces are incorrectly highlighted in red on the stage
- DSOF-20158 - Fixed directory changes within symbolic link / directory junction not being detected
- DSOF-20116 - Fixed spherical mapping wireframe being misaligned from actual content projection
- DSOF-20103 - Fixed an issue where tearing could occur when having no GUI enabled or emulated
- DSOF-20089 - Fixed an issue where only half of each stream rendered when split into two fragments
- DSOF-20079 - Fixed an issue where virtual lineup layer did not work when a live camera is used
- DSOF-20062 - Fixed an issue where the feed mapping mirror flip buttons caused whole rectangle to turn black
- DSOF-20055 - Fixed an issue where option switches set in Advanced Project Settings did not sync to other machines on initial launch
- DSOF-20052 - Fixed an issue when holding the output of a single projector while Dynamic Blend is enabled froze the GUI and made every other output turn black

- DSOF-20028 - Fixed content roll jumping between 90 degree offsets
- DSOF-19950 - Fixed an issue where scrubbing through the timeline while paused caused video layers to flicker black
- DSOF-19948 - Fixed an Access Violation when changing surface type
- DSOF-19910 - Fixed the perspective matrix being incorrect when eye point is above screen
- DSOF-19698 - Fixed an issue where if Colour Management was disabled or set to Gamma, LUTs had a popup window which is totally empty of controls
- DSOF-19668 - ACES: Improved CDL tooltip
- DSOF-19362 - Fixed an issue where the Pause All feature of graphs caused machine FPS to be reported as 0 (or frozen at last value)
- DSOF-19262 - Fixed a Topological Sort and Access Violation when attempting to undo alignment point in manual observations
- DSOF-19226 - Fixed an issue where DMX Lights were not immediately affected by TargetObject
- DSOF-19168 - fixed an issue where using CTRL+Z to undo a manual observation created an "!!!! Operation: topological sort found cycle; please send console to support" error
- DSOF-19100 - Fixed an issue where delecting a Chroma Source within a Luma Keyed Input resulted in "Unable to create video capture stream"
- DSOF-18542 - Fixed an Access Violation when layer editor for Notch layer is open across multiple machines
- DSOF-18362 - Fixed an issue where rear projected surfaces did not dynamically blend properly
- DSOF-17496 - Fixed an issue where the d3 network widget would get hidden by d3 state editor
- DSOF-17197 - Changing content version doesn't work with Smart Groups
- DSOF-12262 - Fixed population masks being ignored by DSE
- DSOF-11582 - Fixed setName not limiting strings passed to DirectX SetPrivateData
- DSOF-7081 - Fixed an issue where the fuplicate quantiser title text overlapped with metronome controls
- DSOF-4981 - Added mechanism for using consistent VFC output resolutions when mixing passthrough (DisplayPort/HDMI) and quad VFC cards (Quad SDI/Quad DVI)



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