emergent
vision technologies

eCapture Pro
User Manual
Version 0_1_7

eCAPTURE PRO

ECapturePro Getting Started Guide

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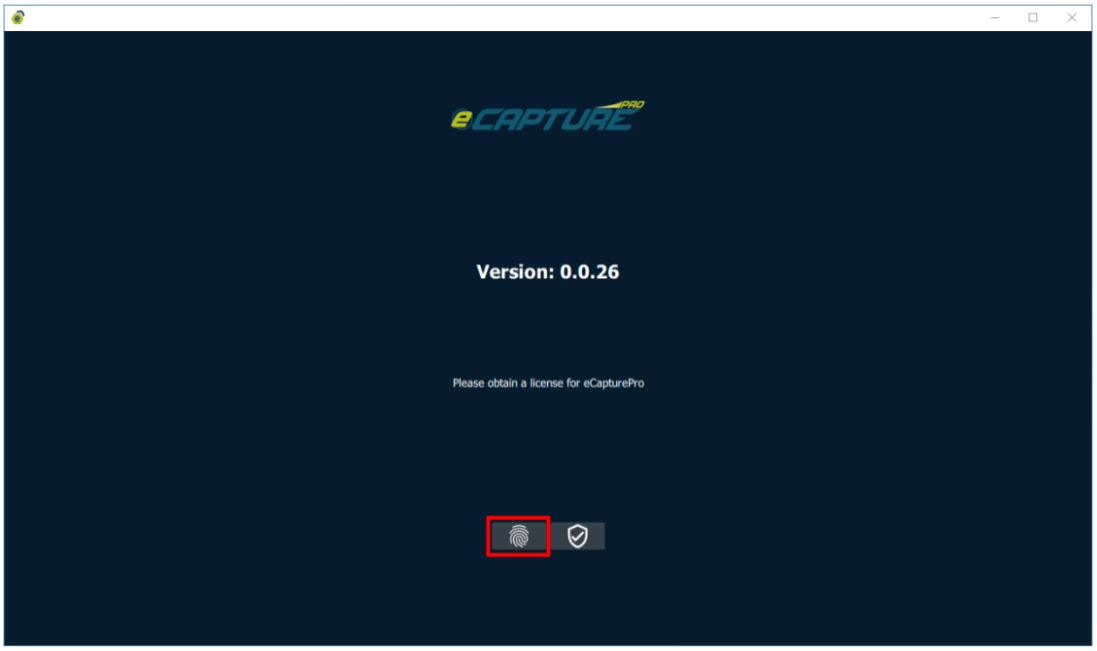
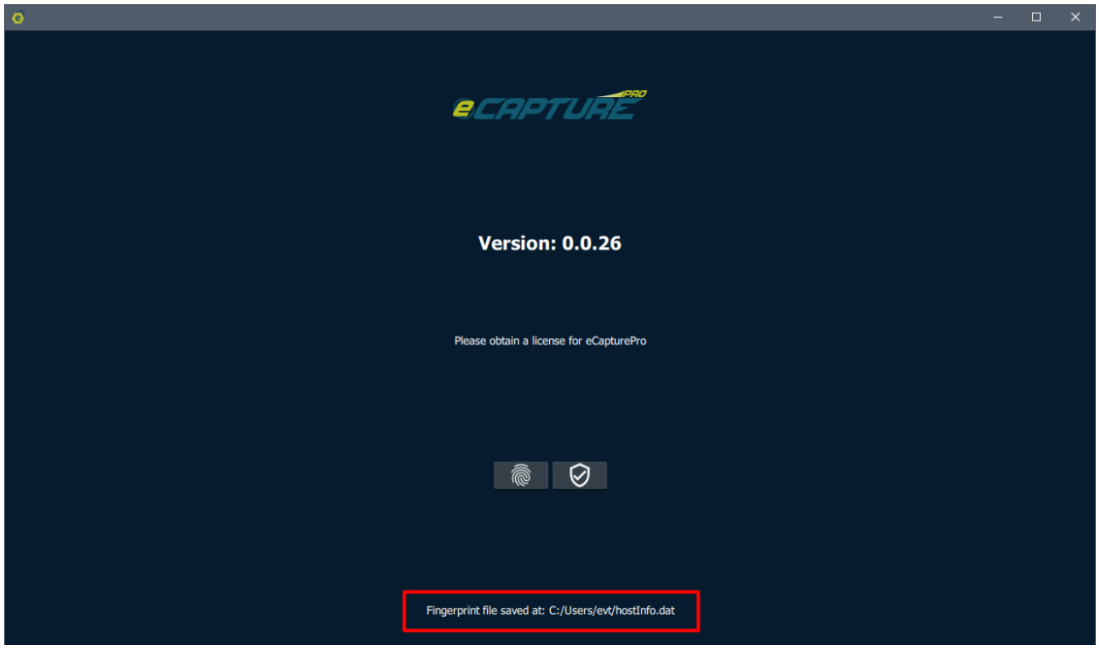
Licensing

Generating a fingerprint file

To fingerprint the system and save the data to a file, click on the fingerprint button.



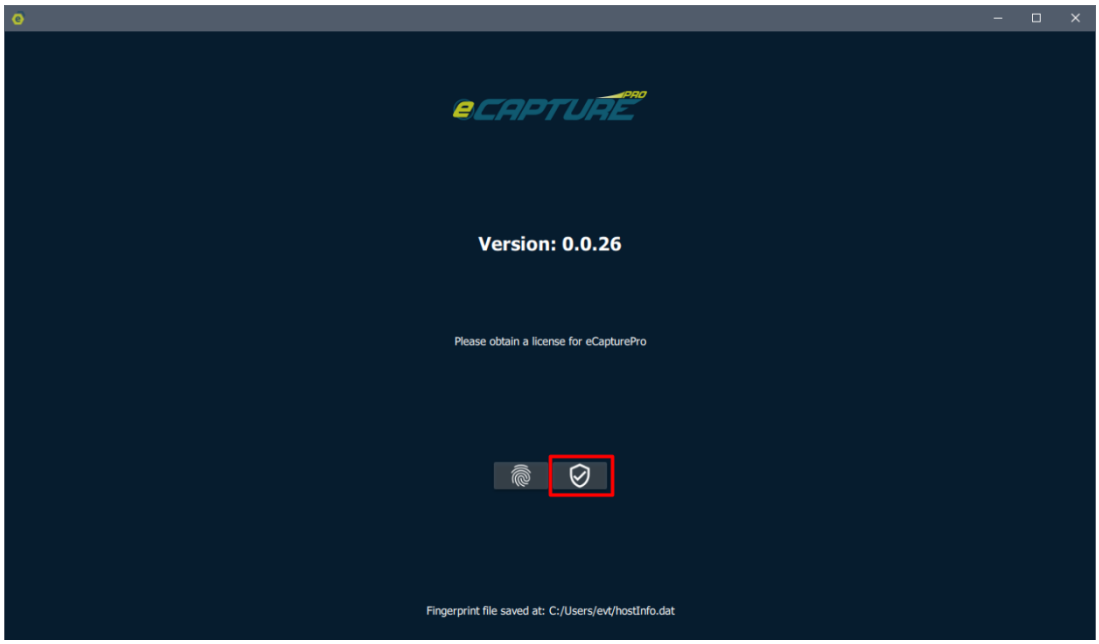
This will bring up a file dialog to choose where the fingerprint file will be saved. After the file is saved the file path will be displayed at the bottom of the screen.



Send this file to Emergent Vision Technologies in order to have a license generated.

Applying a license

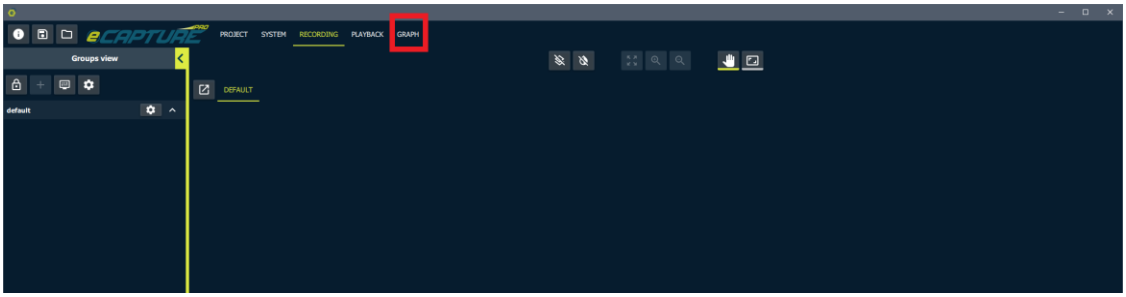
Apply the license file provided by Emergent Vision Technologies.



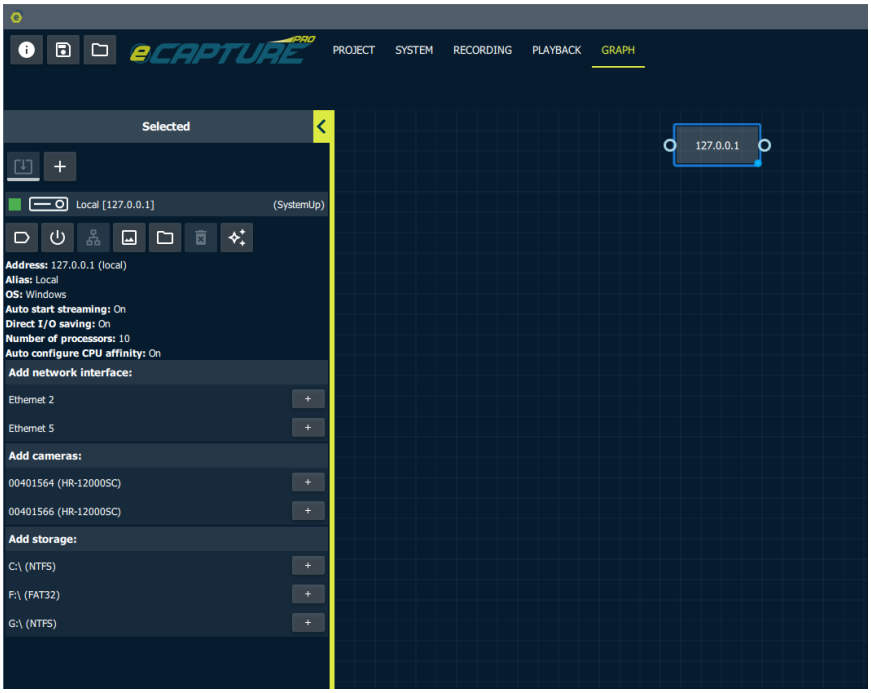
Configuring a system

System Graph

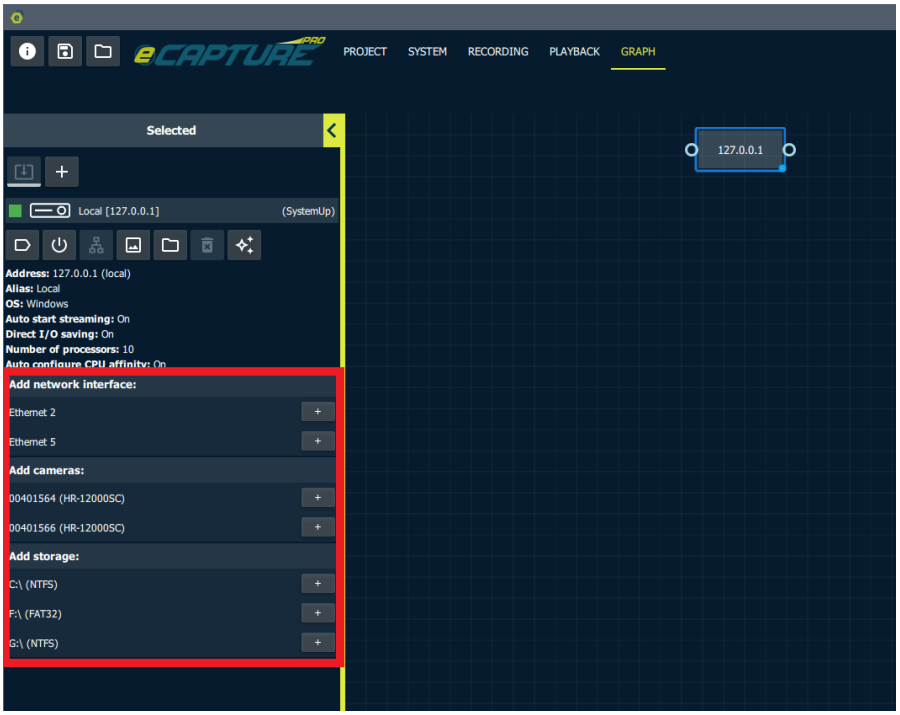
When eCapturePro opens navigate to the **Graph** tab



When you open the Graph tab the only item will be the local server. Highlight the local server by clicking on it.

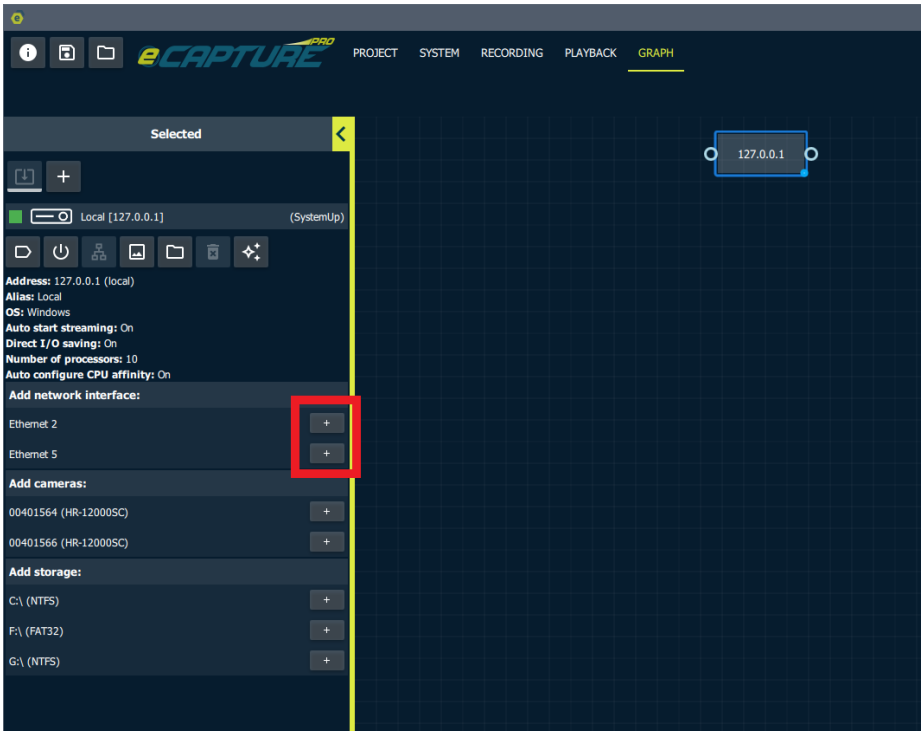


Devices that have been discovered on the system will be displayed in the server context menu.



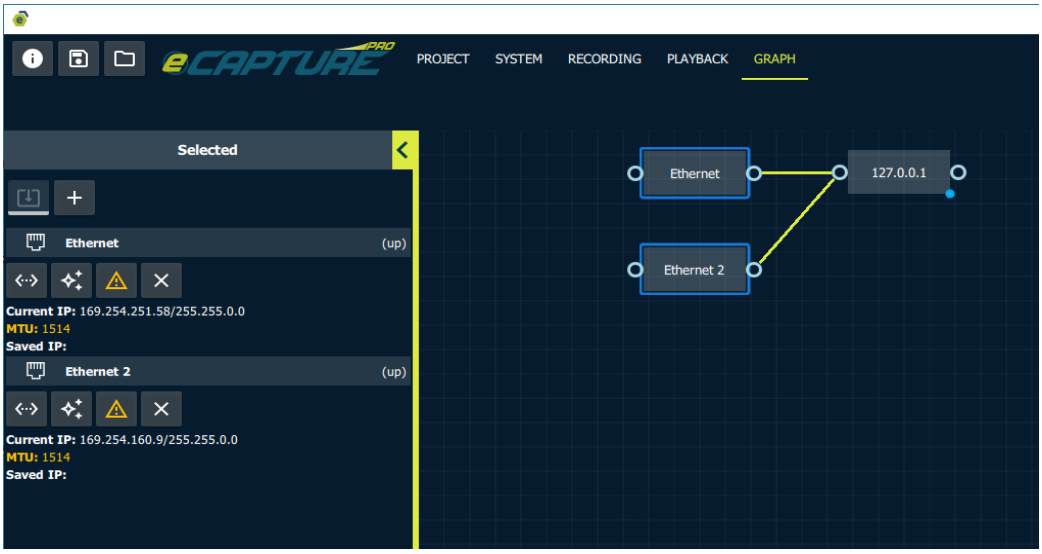
Adding/Configuring Network Interfaces

Add the available network interface devices.

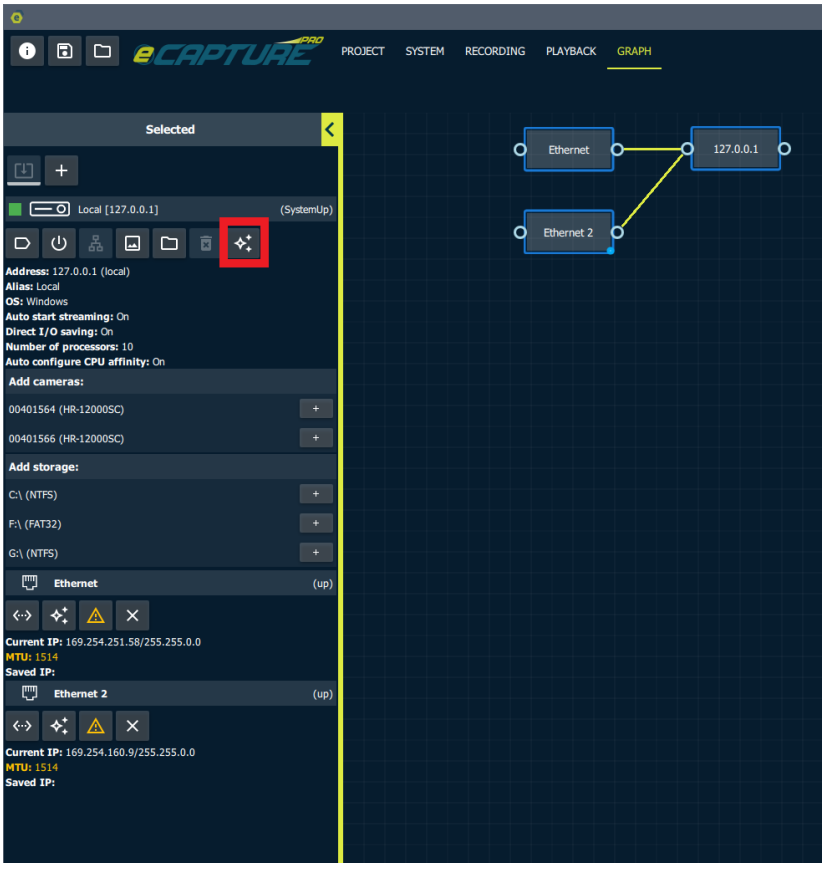


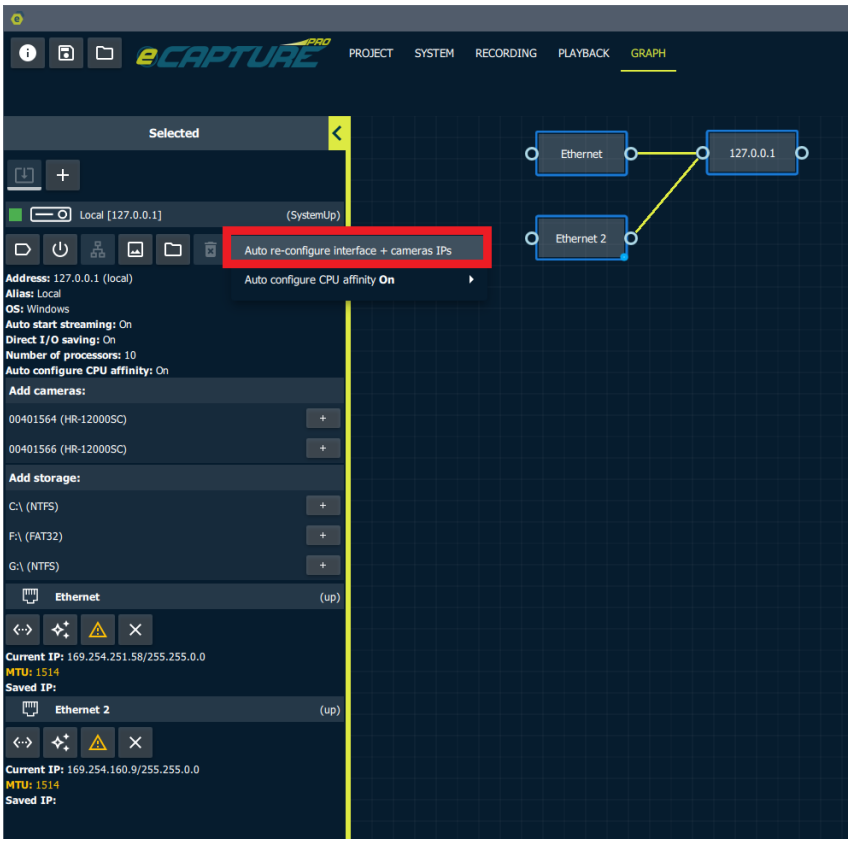
Network interface devices will now show up on the system graph. Select the added devices. It is possible to have multiple devices selected by holding down the **ctrl** button and clicking

multiple. It is also possible to hold down the **ctrl** button and draw a rectangle around all devices you wish to select.

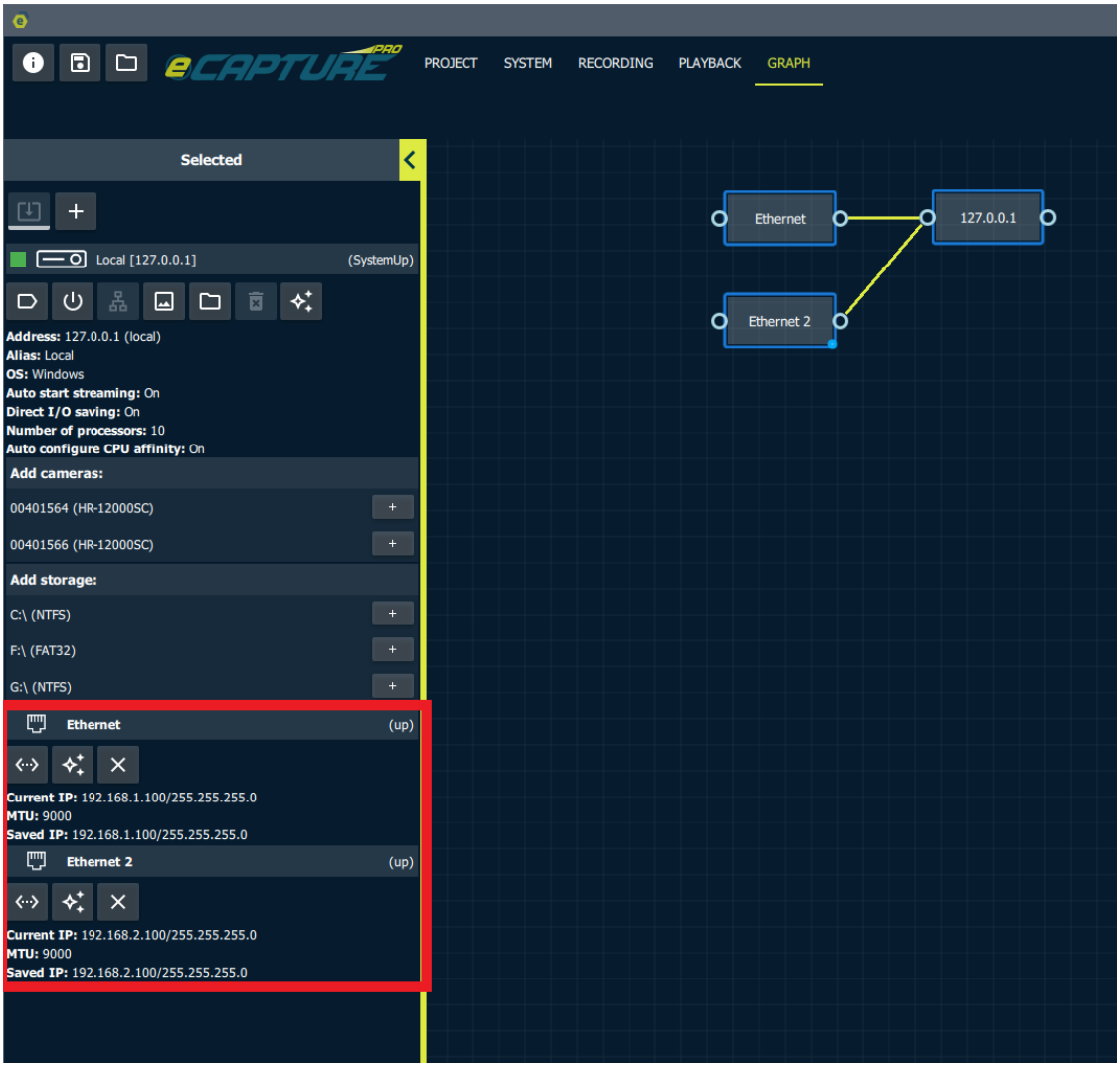


The added network interface devices may not be configured. If they are misconfigured it is recommended to use the network interface auto configuration feature. This feature is available in the the Server node context menu.



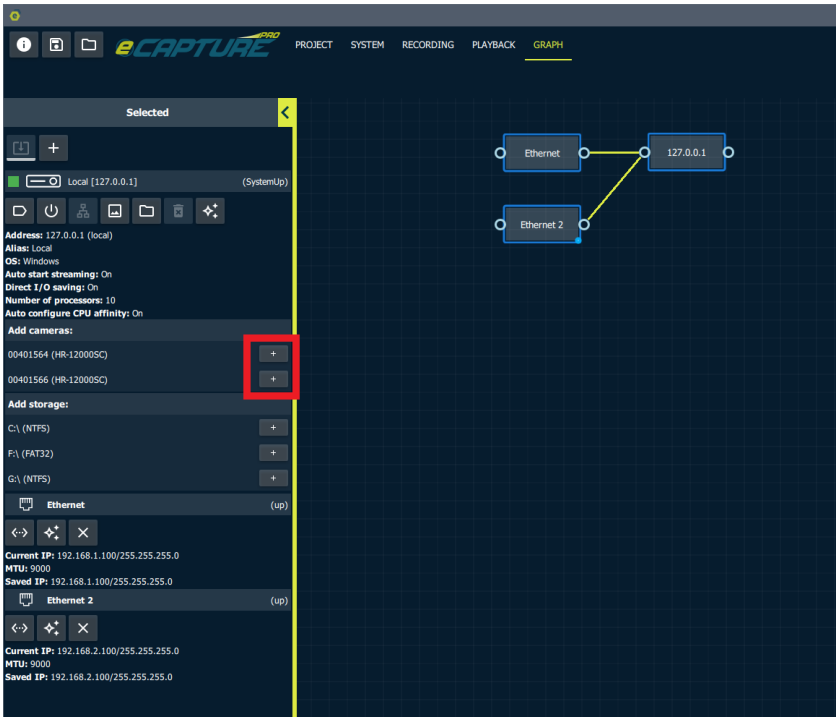


Once the network interface have been configured the amber warnings will be cleared from the network interface device context menus.

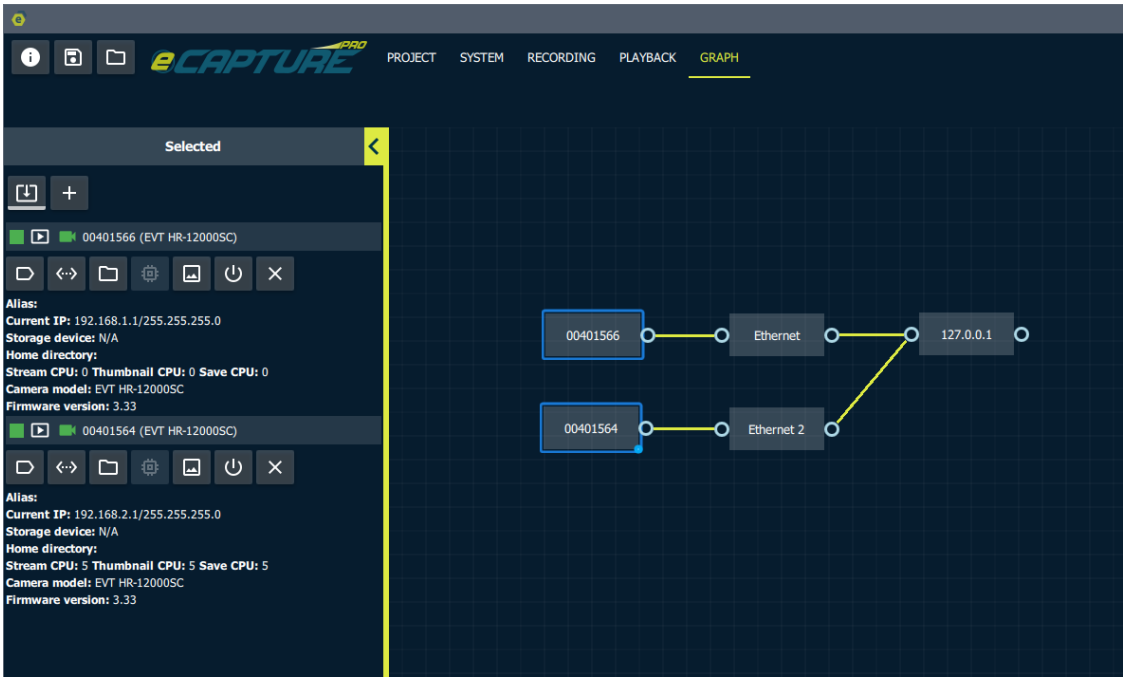


Adding Cameras

Add the discovered cameras to the system.

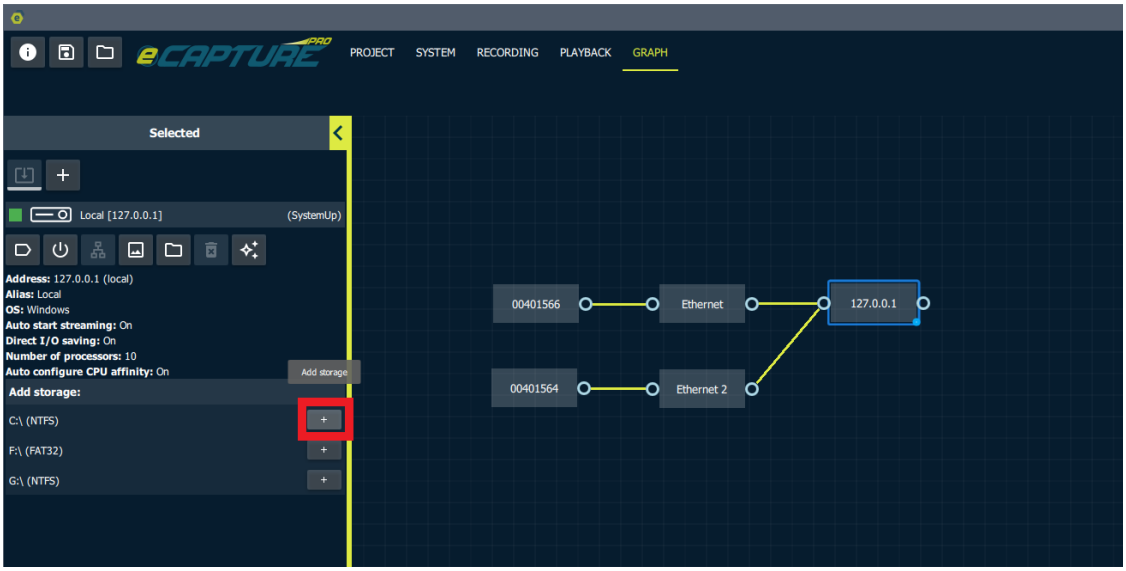


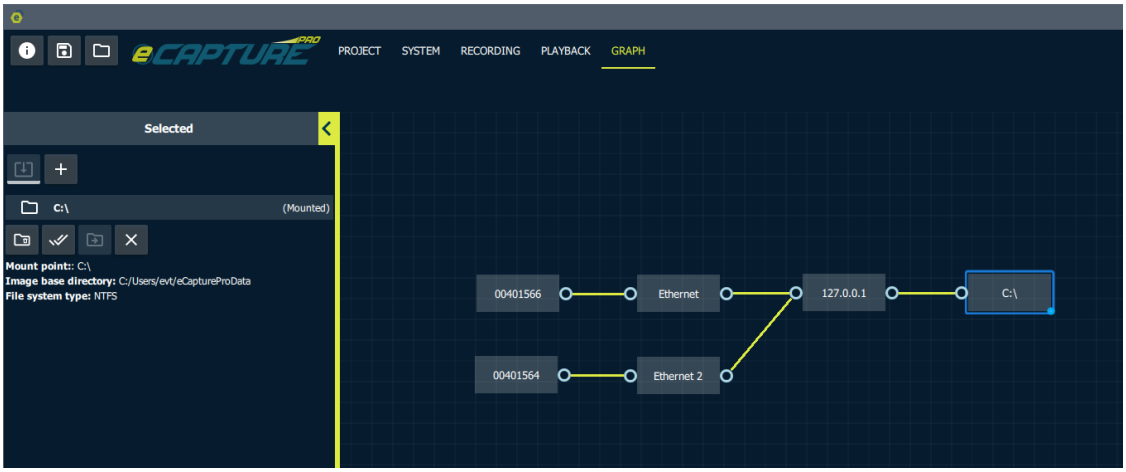
Select the added cameras to view their context menus.



Adding Storage

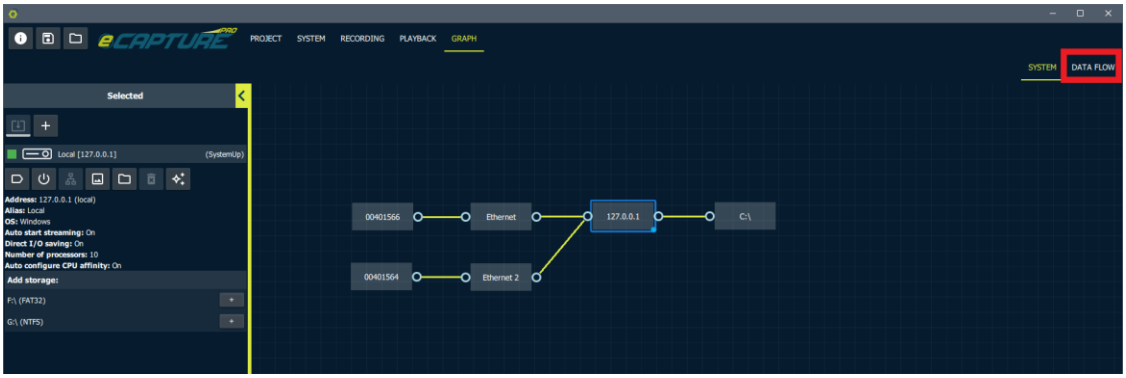
Next add a storage device to the system from the list of discovered storage devices.





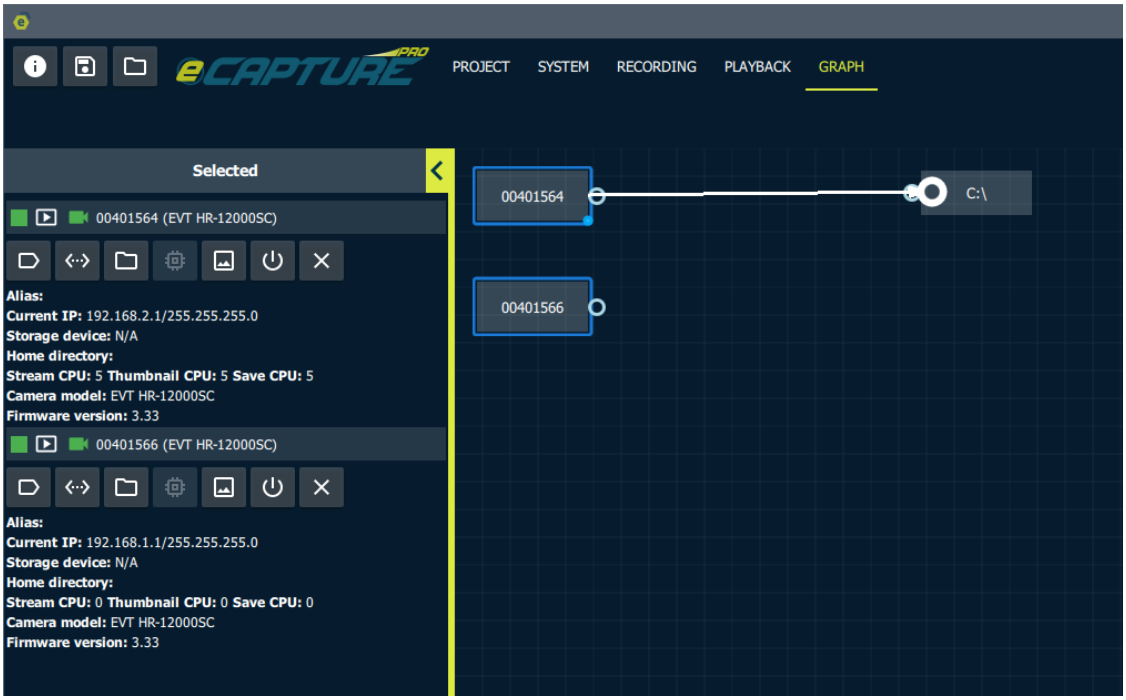
Configuring Data Flow

Now switch to the **Data Flow** graph view. The toggle System/Data view is located in the top right of the screen.

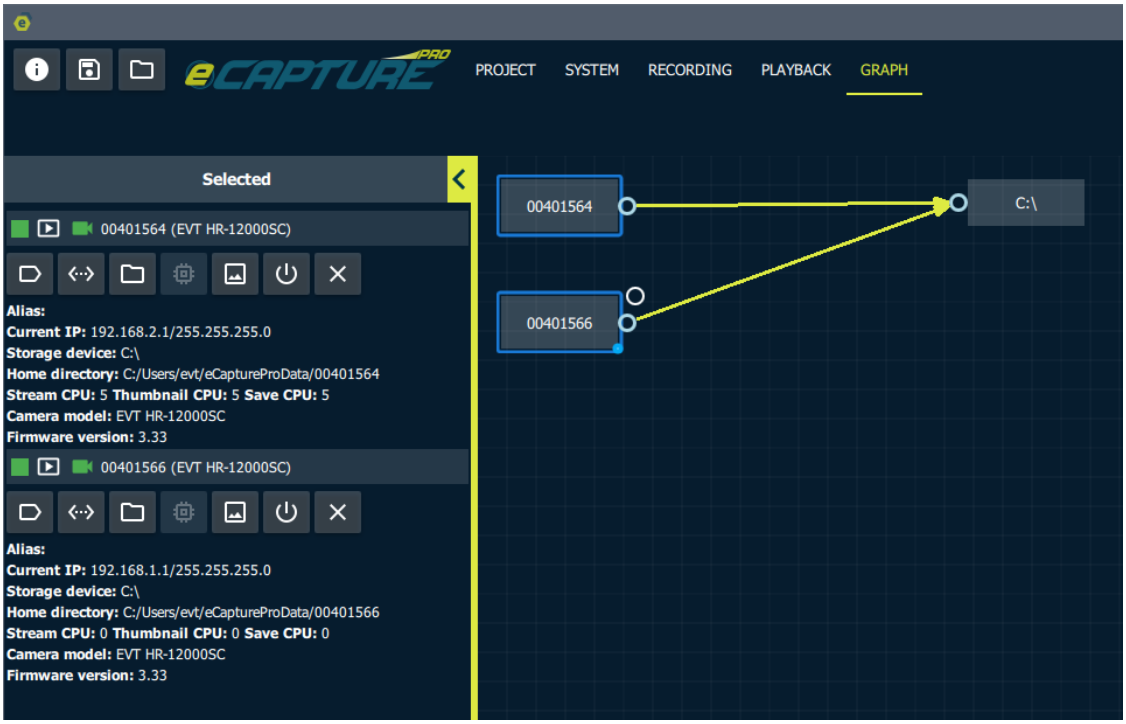


In this view you will see all cameras and storage devices that have been added to the system.

Connect the cameras to a storage device by clicking and holding the small circle next to the camera node, dragging the arrow on top of the storage device node and dropping it.



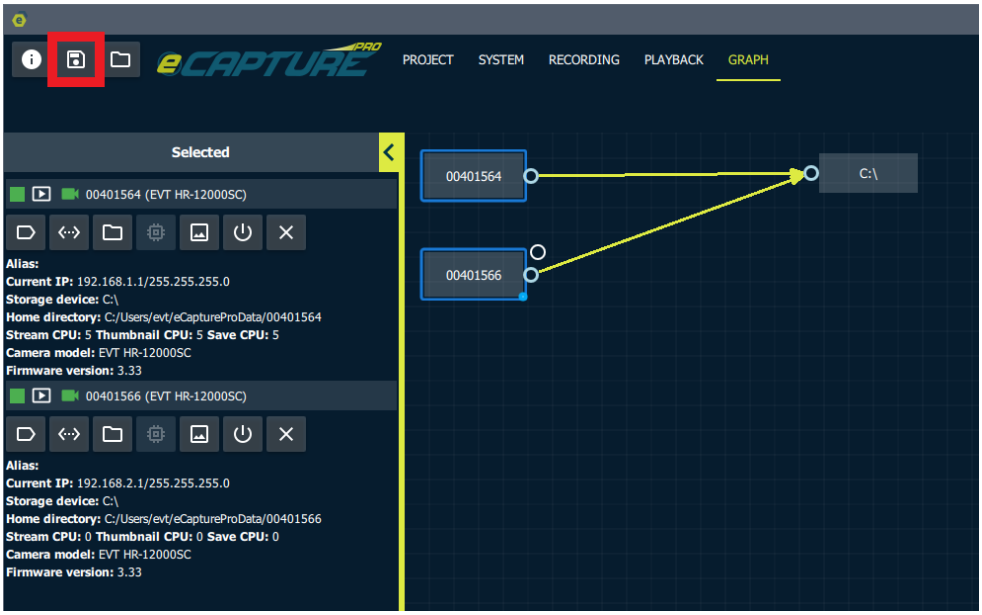
Proceed with connecting the remaining cameras to the storage devices.



The basics are now in place for streaming and recording.

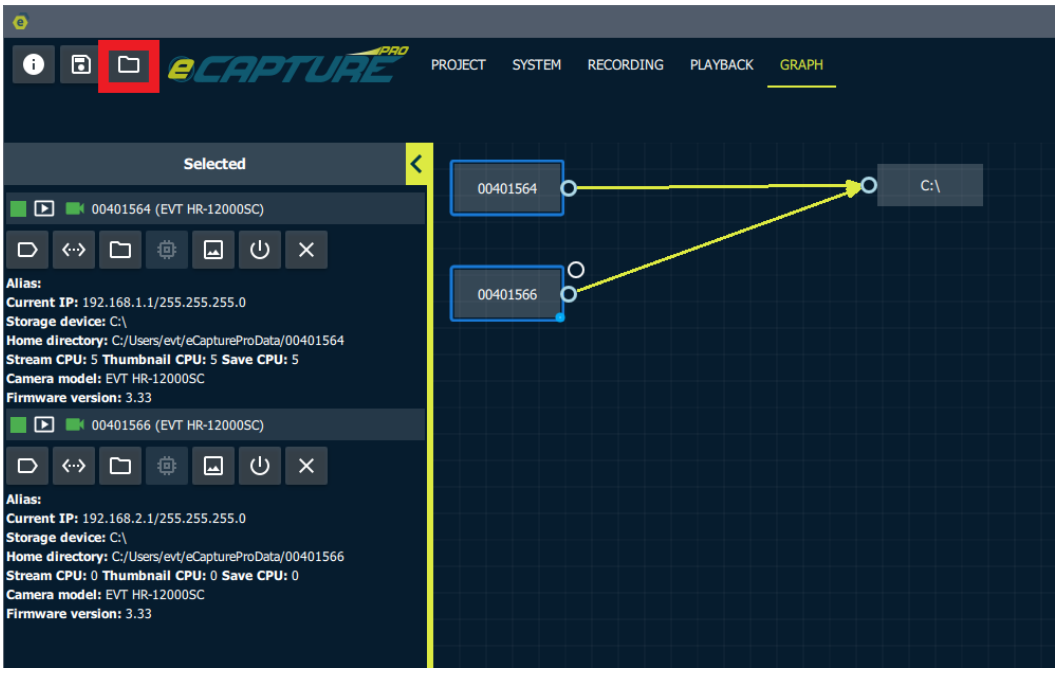
Saving the System Configuration

Save the system configurations so that they will persist across eCapturePro sessions.



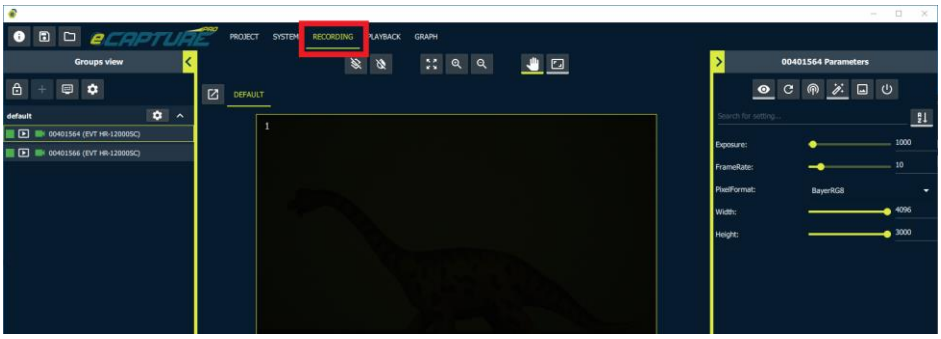
Export the System Configuration

It is a recommended at this point to export the system configurations file and save this file somewhere safe so that the system may be restored to this configuration.

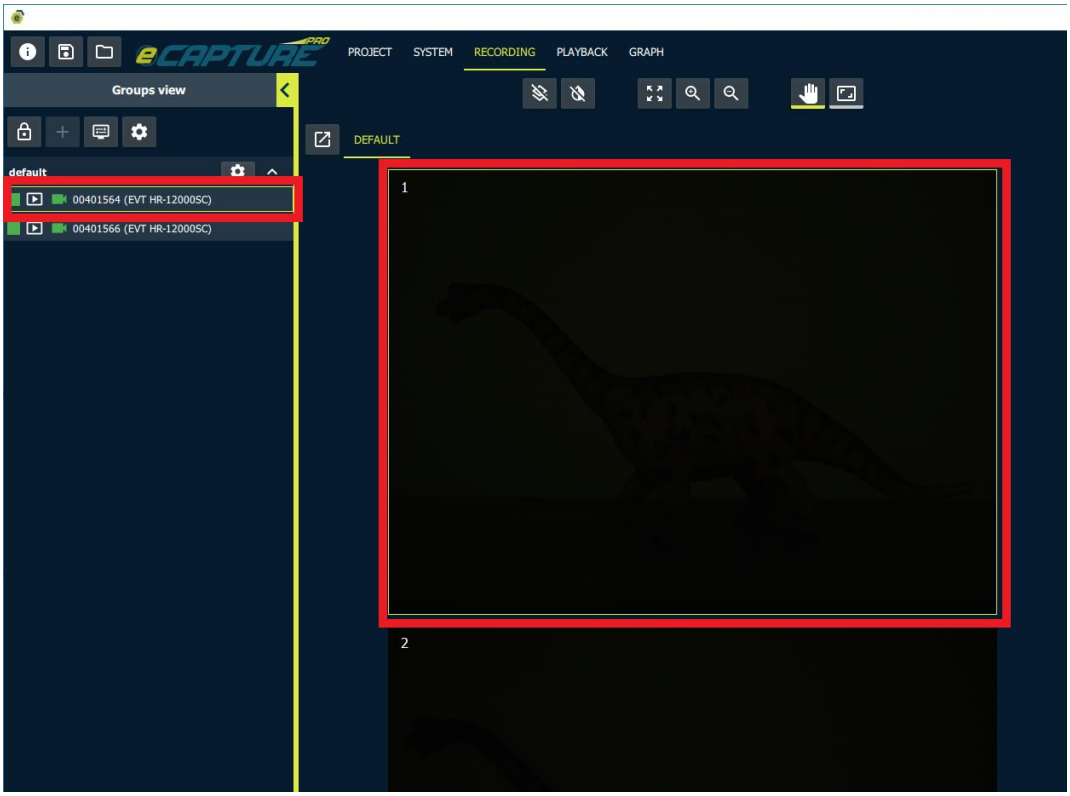


Camera Parameters

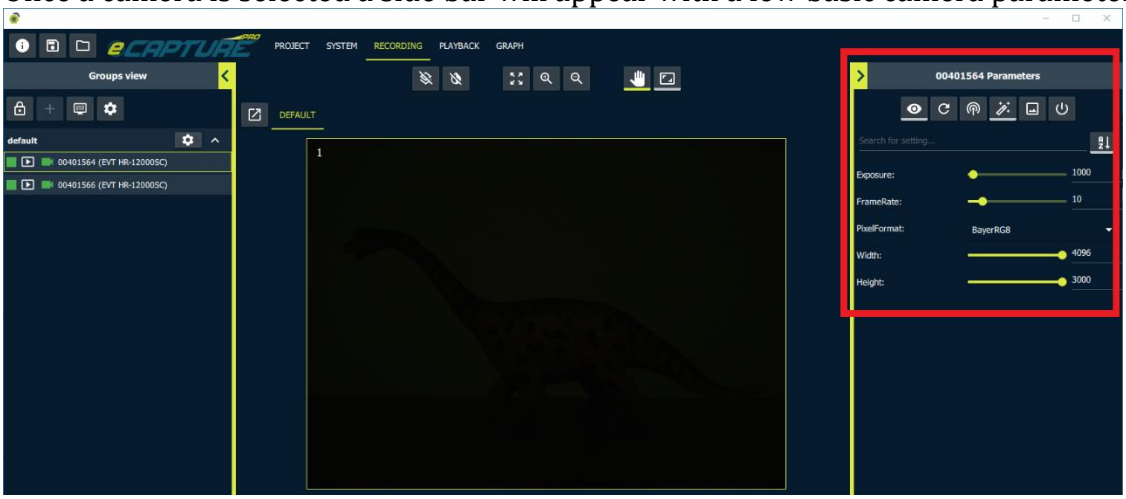
Select the recording tab from the top bar.



Select a camera, either by clicking on it's line item in the Groups View side bar or by clicking on it's live stream display window.



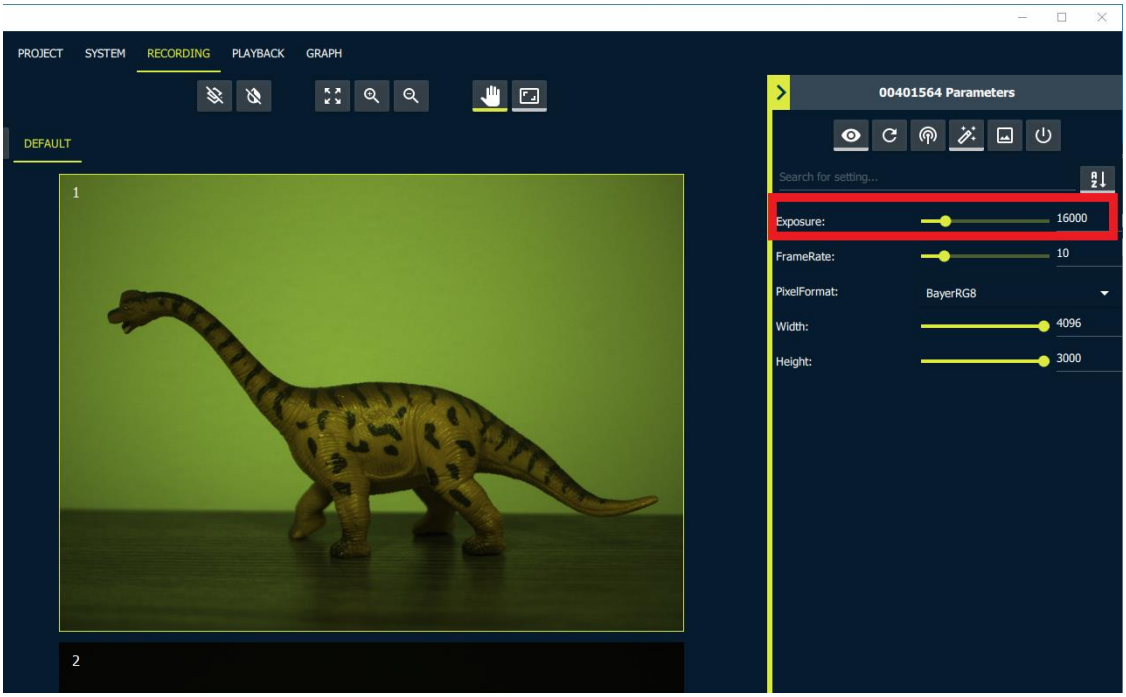
Once a camera is selected a side bar will appear with a few basic camera parameters.



Changing a Camera Parameter

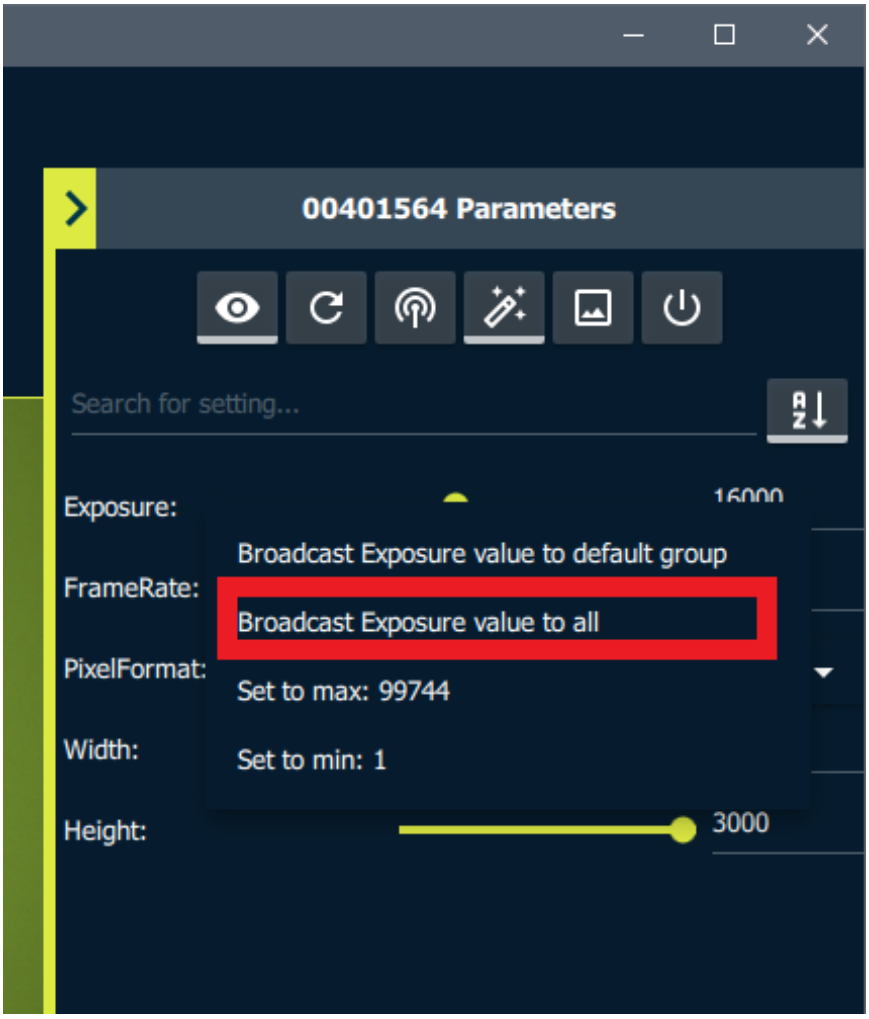
We will use the camera **exposure** parameter as an example for how to change a parameter value

Go ahead and increase the camera exposure until the scene is adequately lit.

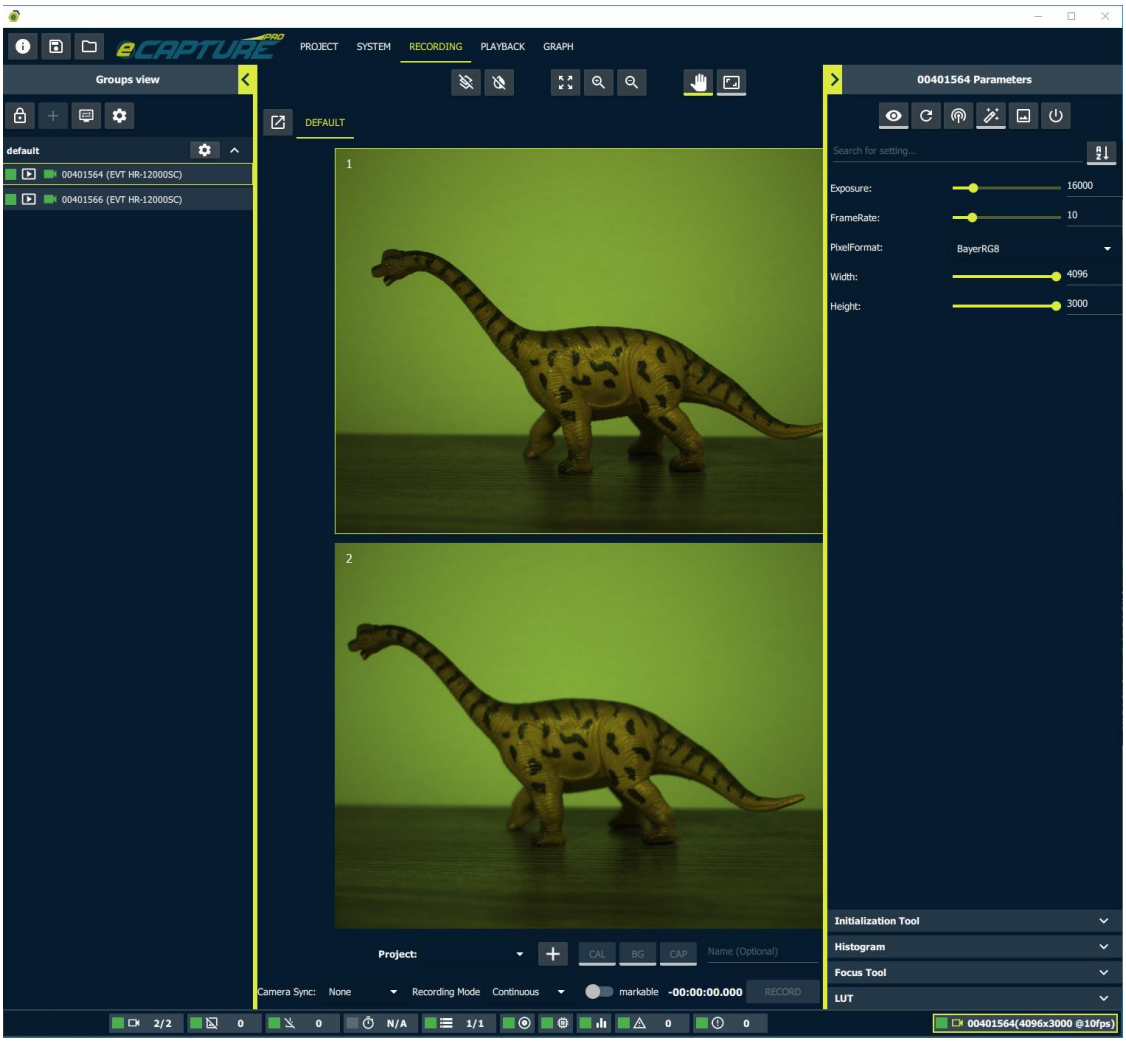


Broadcasting a Camera Parameter

Once you are happy with the exposure, broadcast the parameter to all open cameras by right clicking on the setting and clicking the “Broadcast Exposure Value to all” menu item.



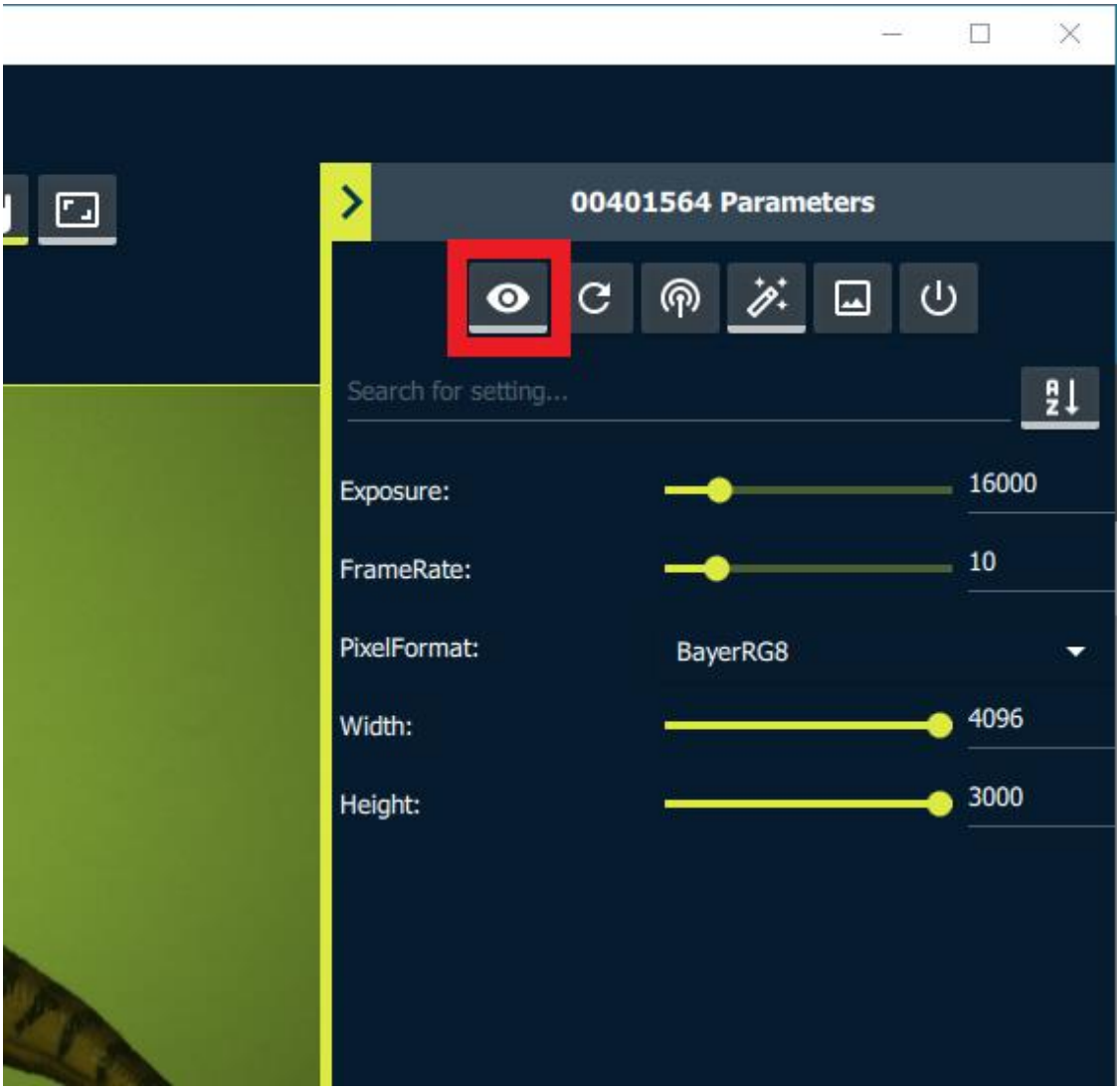
All cameras should now share the same exposure value.



Add Additional Camera Parameters

It is possible to customize the list of visible camera parameters according to your needs.

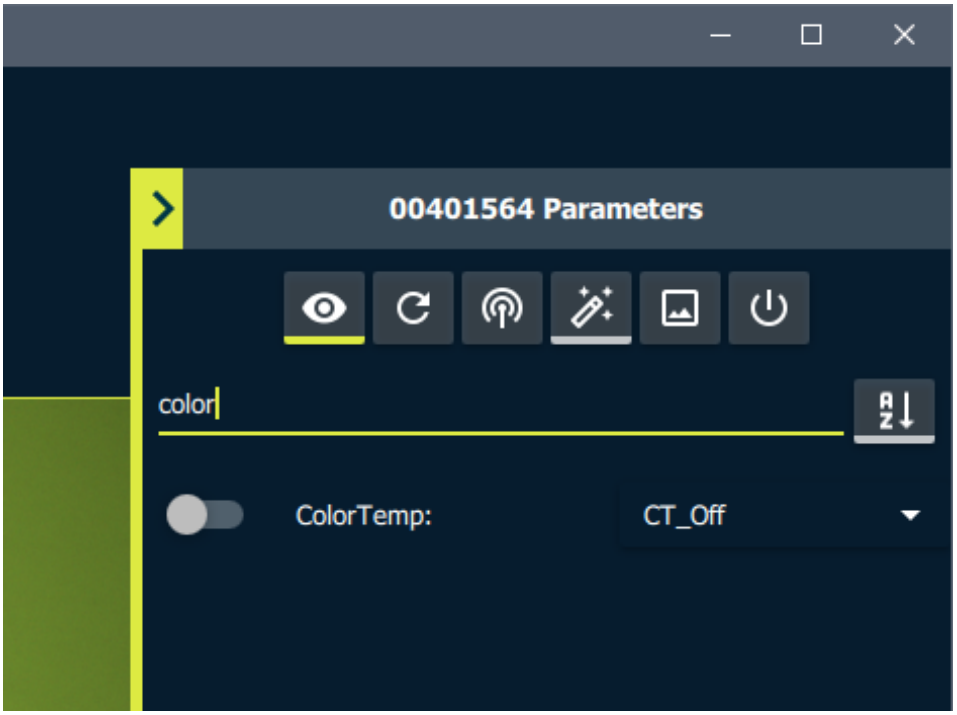
To do so click the eyeball button.



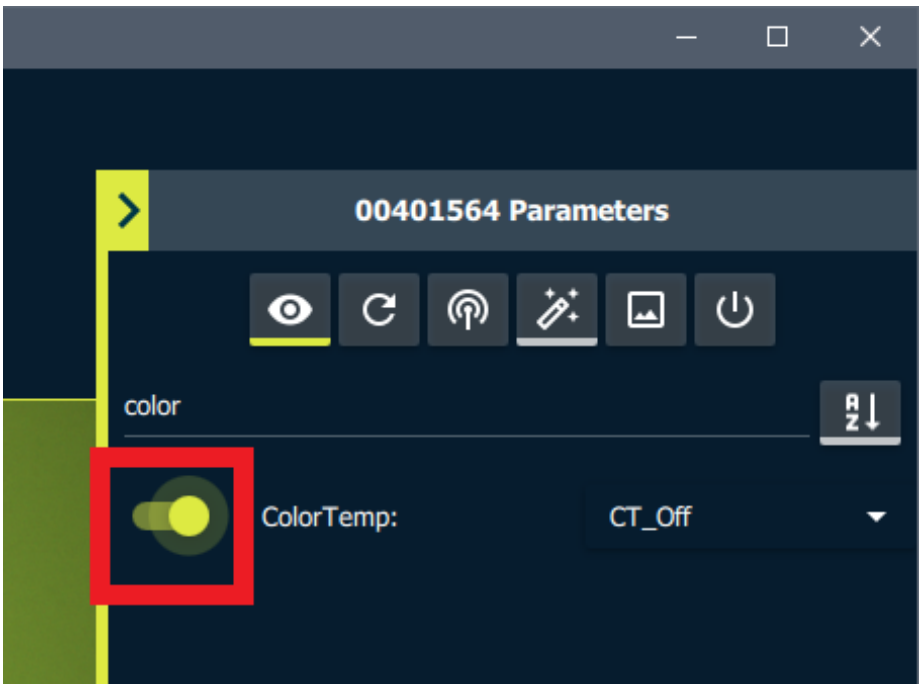
Now all available camera parameters will be visible.

For this example we will be adding the **Color Temperature** setting.

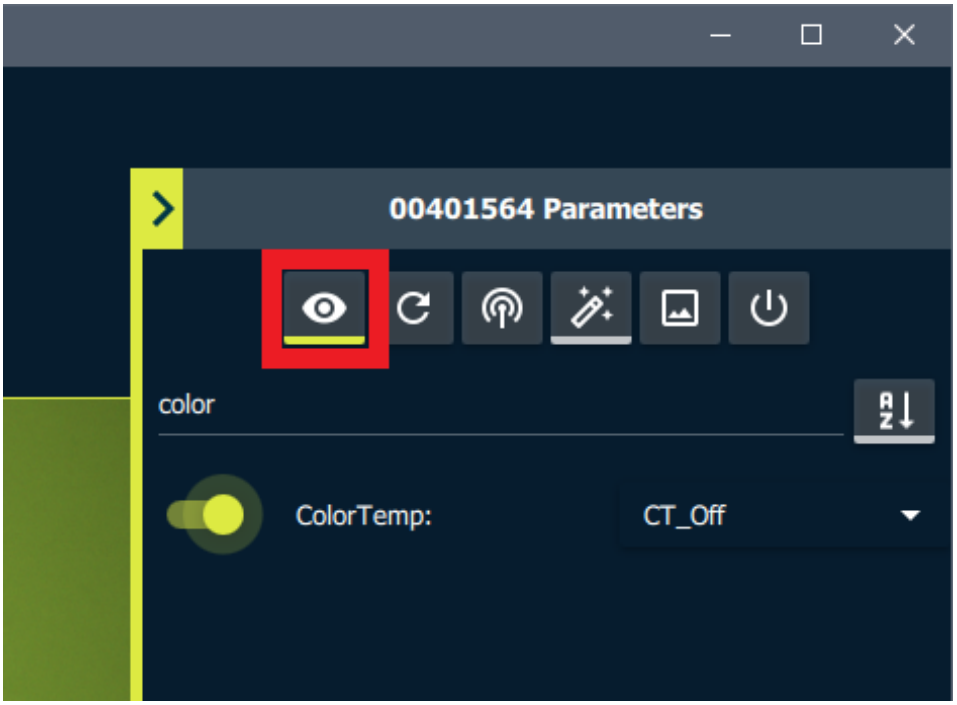
In the search bar search for the word “color”.



Now toggle the visibility switch to the **on** position.

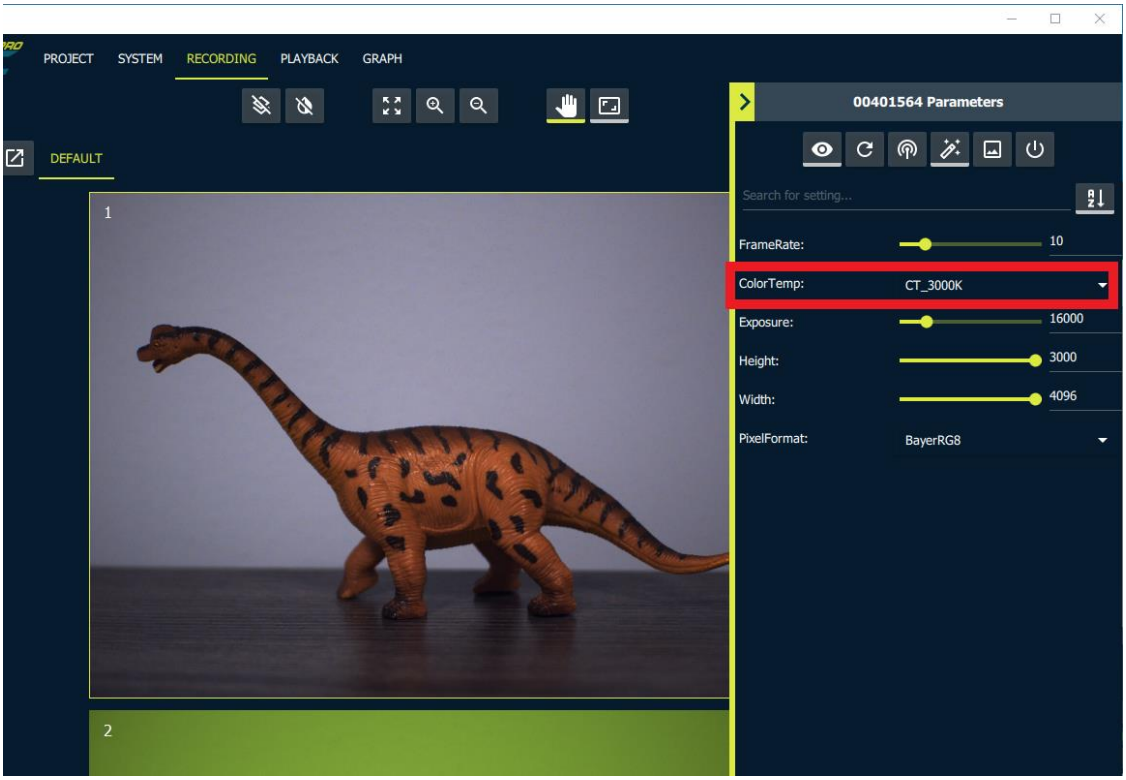


Now return to the regular settings view by clicking the eyeball button again to de-select it.



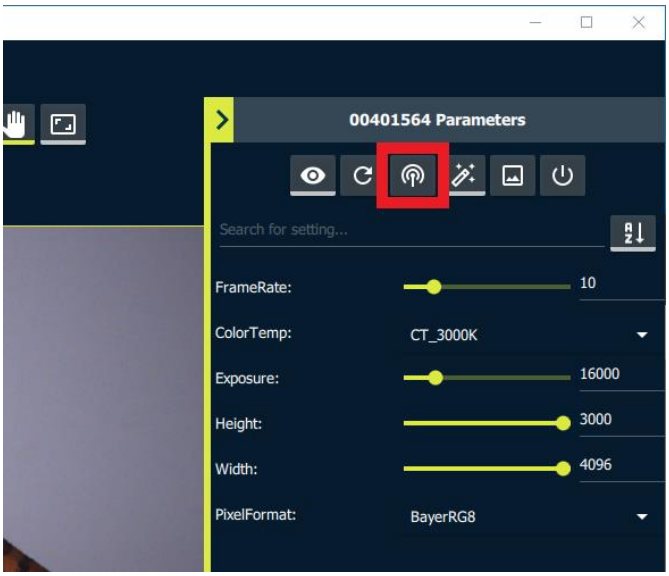
Try a few color temperature options and see what looks best with your current lighting.

The value CT_3000K should work well for a scene lit by indoor office florescent lighting.

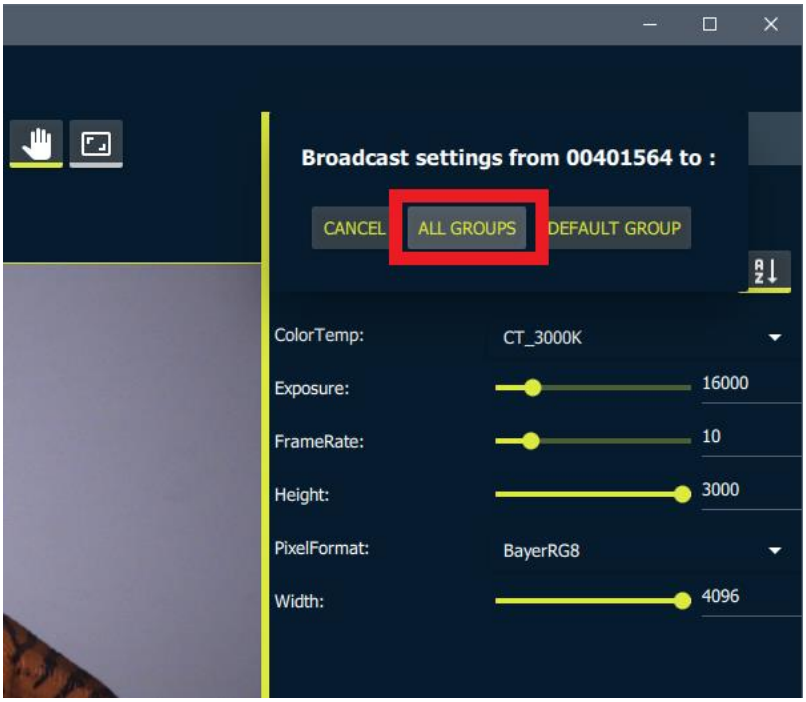


Broadcasting all visible Camera Parameters

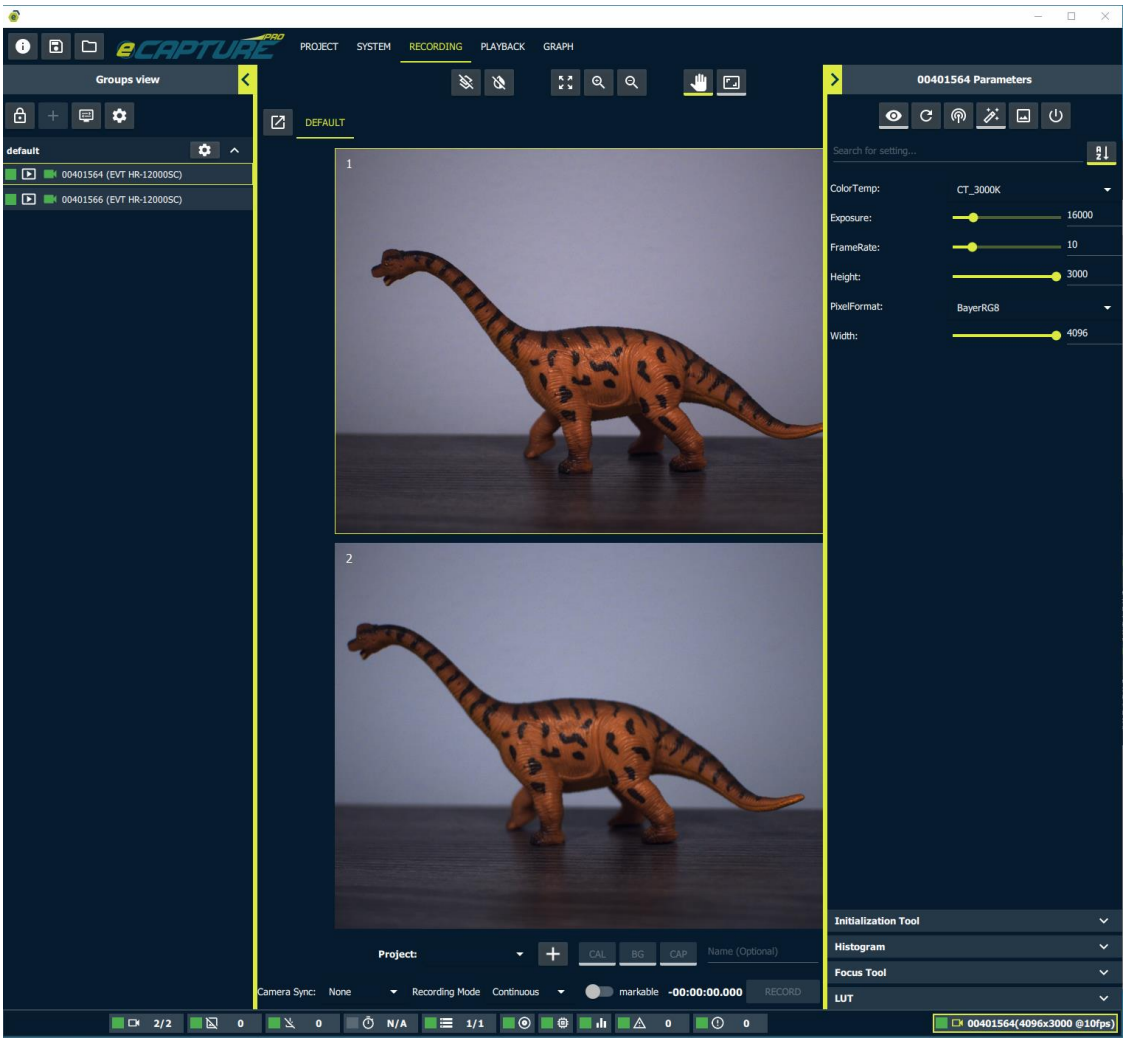
We can now broadcast all visible settings from the current camera to all other open cameras. For this example visible camera settings now include (ColorTemp, Exposure, FrameRate, PixelFormat, Width, Height).



Choose the option broadcast the visible settings to all groups.



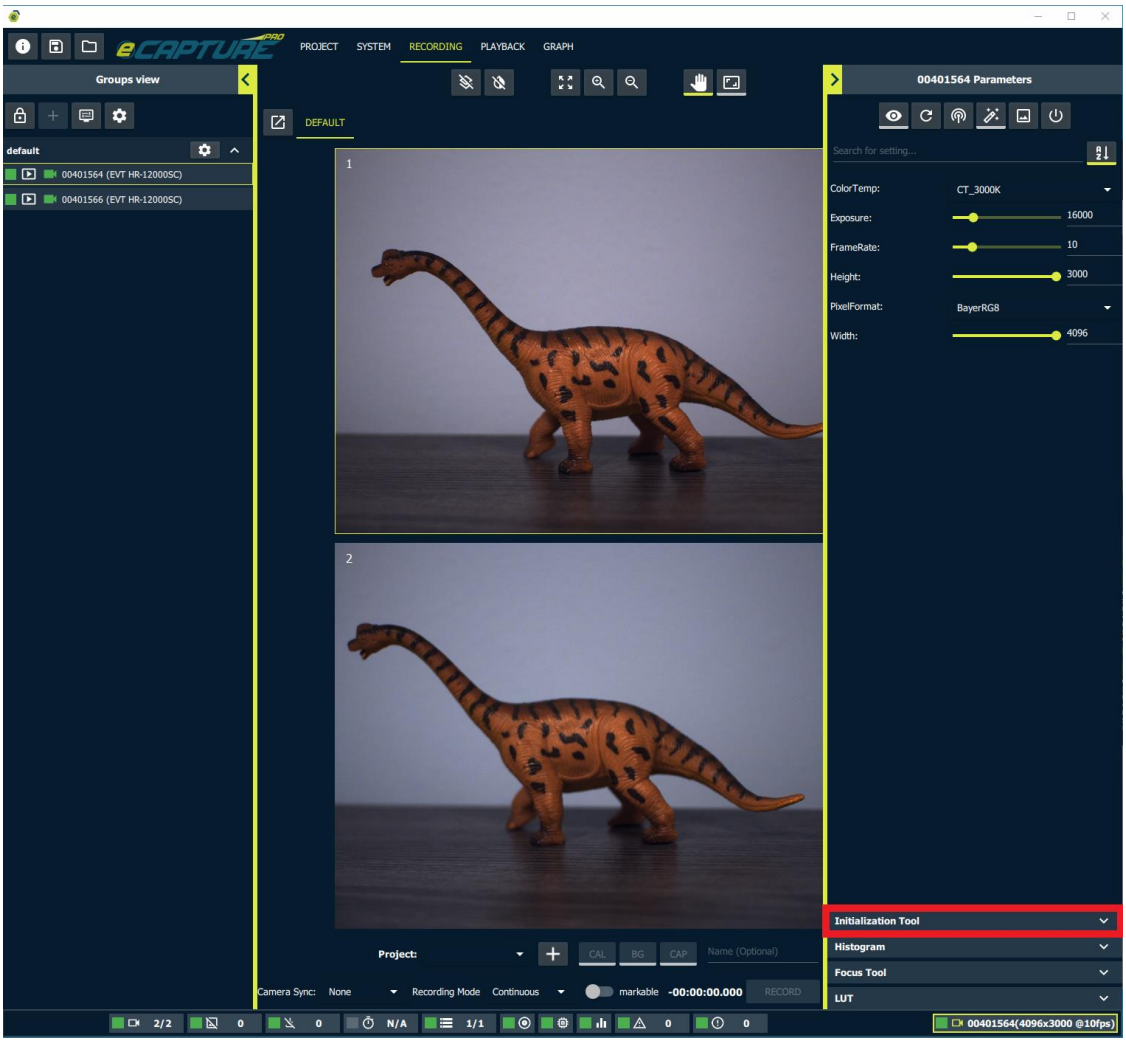
Now all cameras should share the same visible settings.



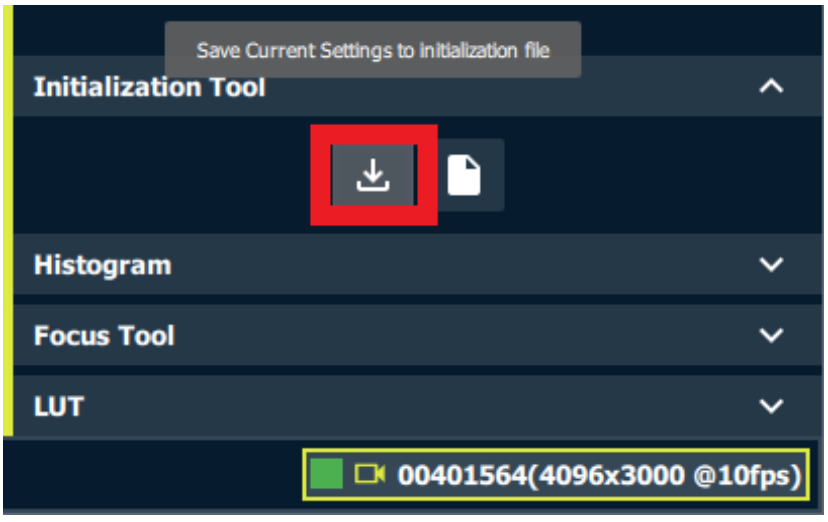
Saving Current Camera Parameter Settings

Once you are happy with the camera settings it may be useful to save the current settings so that they can be applied when the camera opens as well as reverted back to in the future.

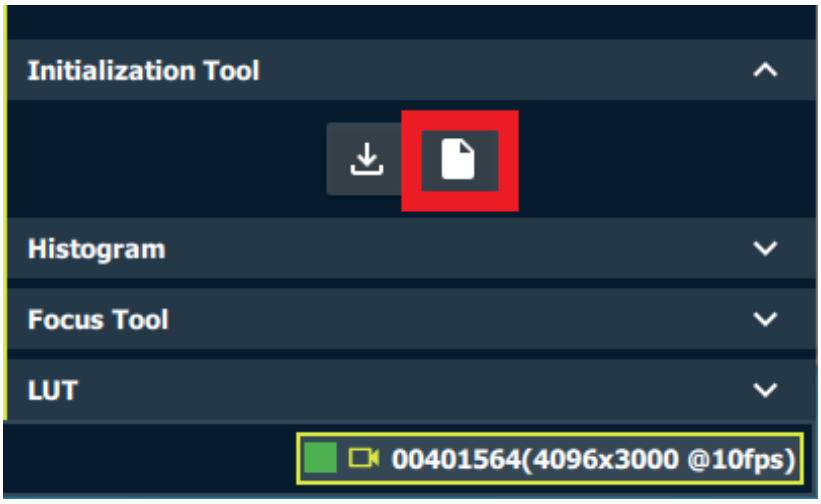
Open the **Initialization Tool**

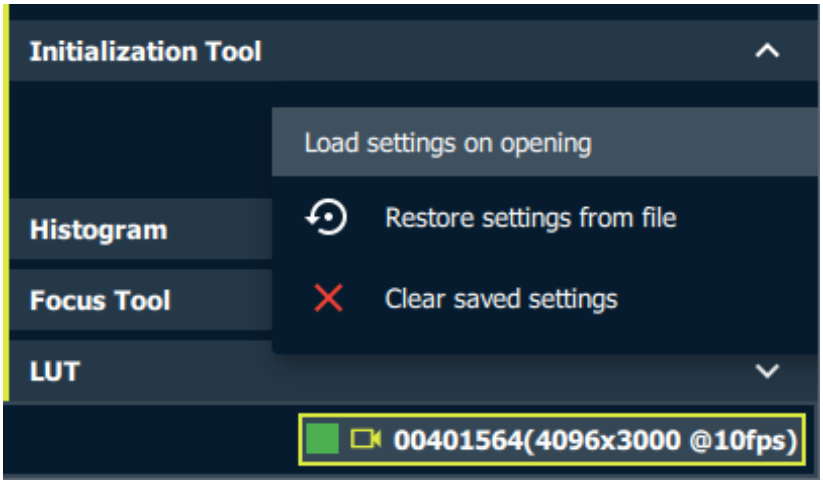


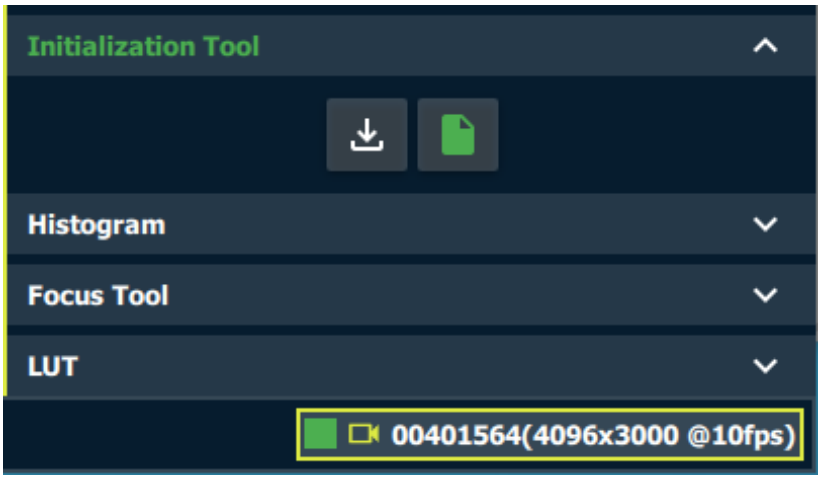
Click the **Save Current Settings** button.



Now the option is available to have the saved settings loaded when the camera opens.

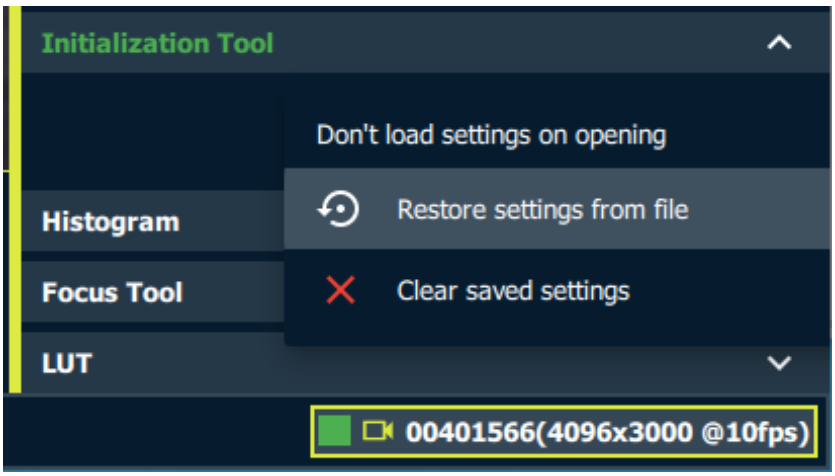






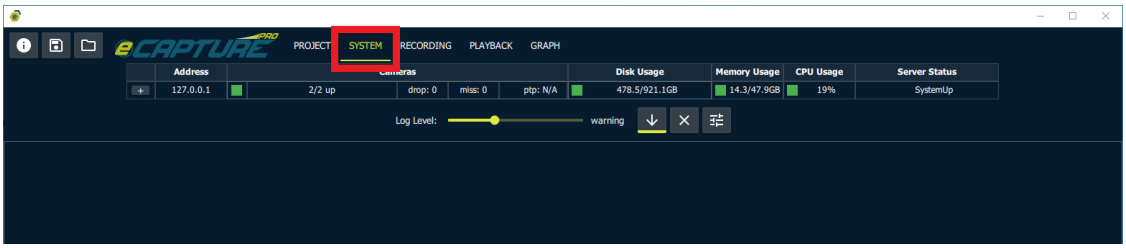
This process must then be repeated for all cameras for which you wish to a load saved settings on opening.

If you want to experiment by changing settings but want to ba able to revert back to the saved settings you can do so with the “Restore Settings From File” option.


Initialization Tool
Don't load settings on opening
Histogram
Restore settings from file
Focus Tool
Clear saved settings
LUT
00401566(4096x3000 @10fps)

System Status

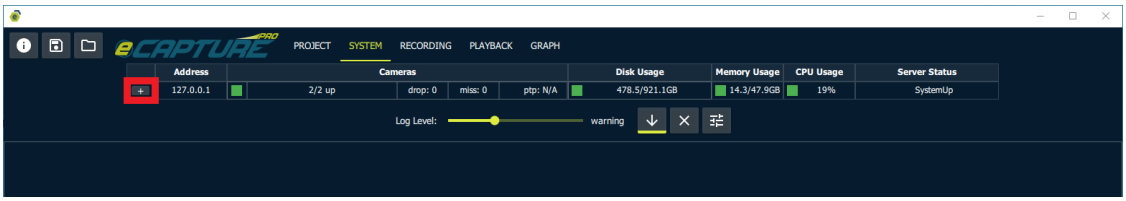
Navigate to the **System** tab.

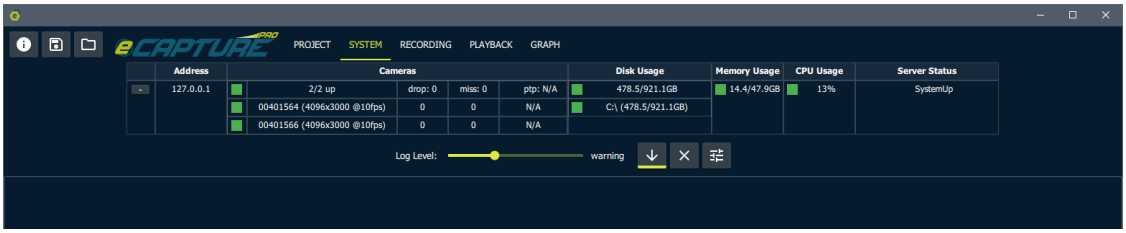


Status Table

Expand the status table row to see the available information.

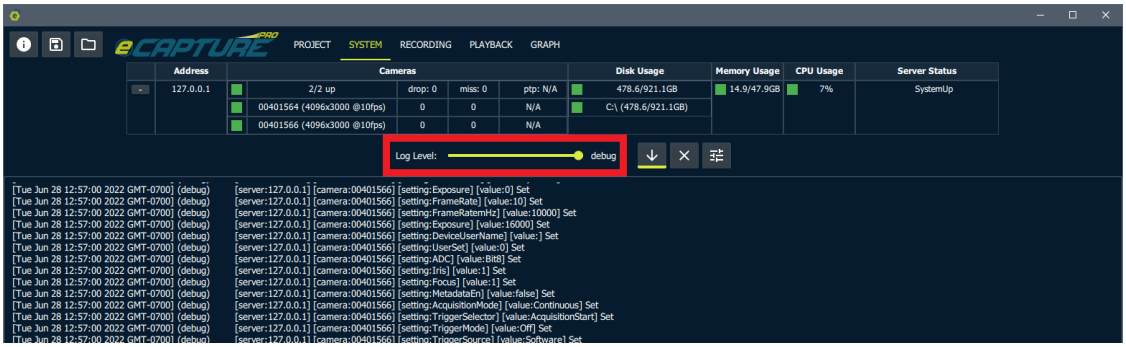
The table includes information for each camera including: dropped frame count, missed save count, resolution, framerate, and ptp offset. As well as other system resource utilization information including storage space, memory usage, and CPU usage.





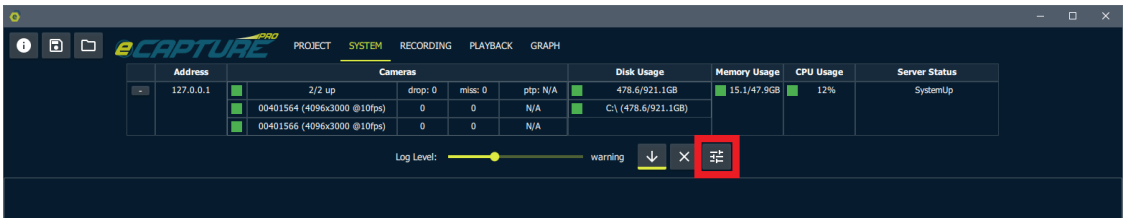
Log View

Under the status table is the log view. We can filter log messages based on the log level. To view a detailed log of the application's activity we can set the log level to debug in order to view all logs of level greater than debug. This includes errors, warnings, info, and debug logs.

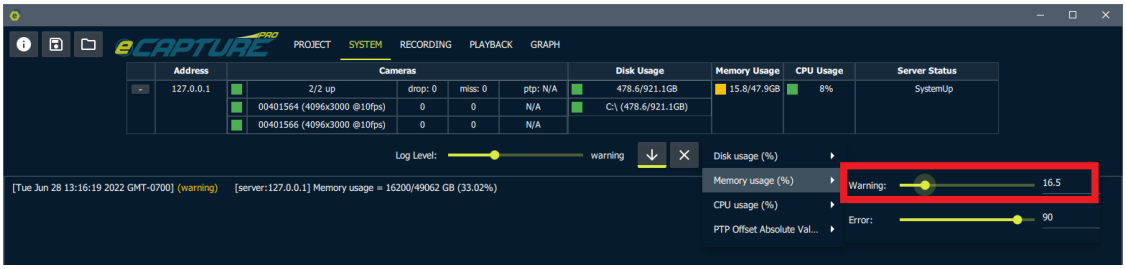


Set the log level back to the default of warning.

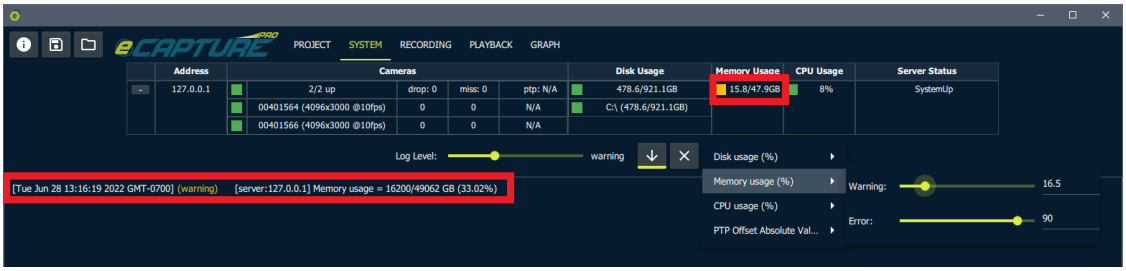
The warning and error thresholds for the system are configurable.



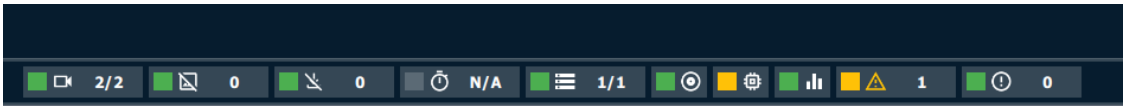
To cause a warning we will set the memory usage warning threshold to bellow the current memory usage.



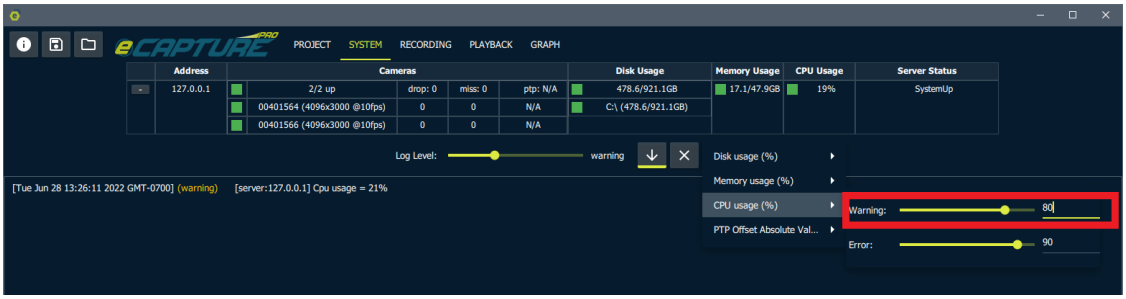
This will result in a memory usage warning message in the log and the memory status indicator will turn yellow.



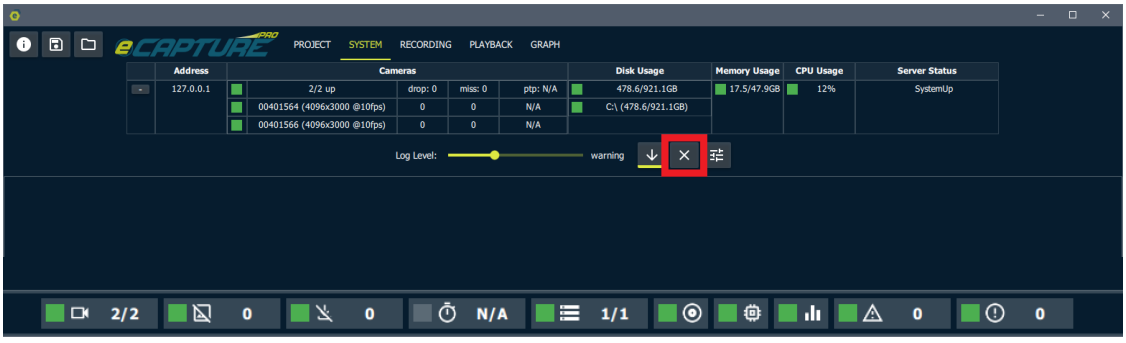
At the very bottom of the application there is a global status bar. This now indicates that the current system memory usage is above the warning threshold. The warning counter has been incremented to indicate that one warning has been logged.



Once the Memory Usage threshold has been returned to 80% the indicators will return to green.



Once the errors and warning have been dealt with we can clear the log which will clear the error and warning count.



Log Files

ECapture Pro Log File Locations:

Linux:

- ECapturePro (GUI) log files: $HOME/.eCapturePro/logs

- ECaptureProServer log files: /tmp/eCaptureProServer.X.log (X varies with log file rotation)

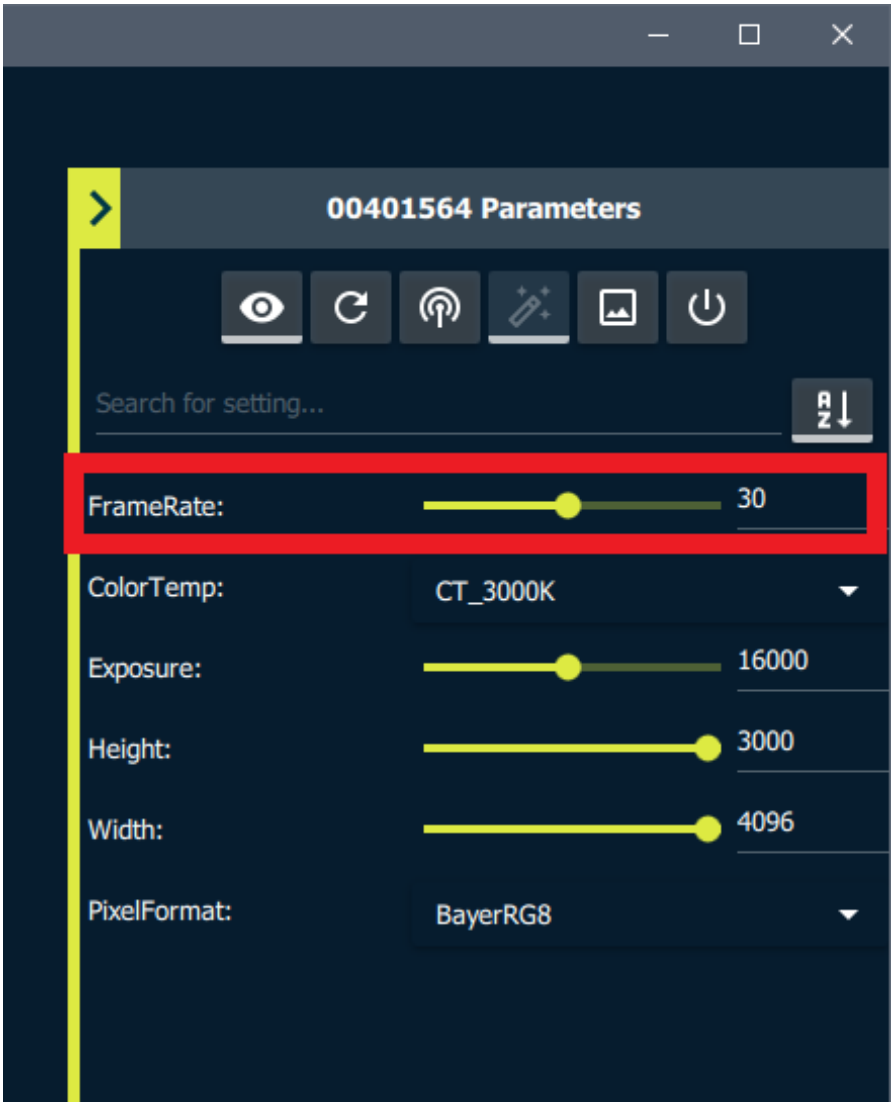
Windows:

- ECapturePro (GUI) log files: %USERPROFILE%/.eCapturePro/logs
- ECaptureProServer log files: %TEMP%/eCaptureProServer.X.log (rotating logs files)
- ECaptureProConfigService (Windows Service) log files: C:/ProgramData/EVT/eCapturePro/eCaptureProConfigService.X.log (X varies with log file rotation)

Recording

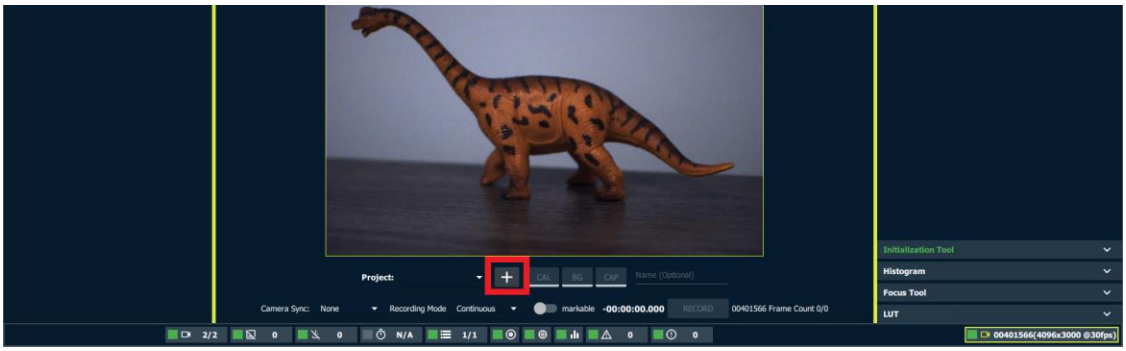
We will create a basic recording.

Configure all cameras to have the same frame rate. In this case we will use 30fps (this will require an exposure time bellow 33000us).



Recording Controls

Create a recoding project.

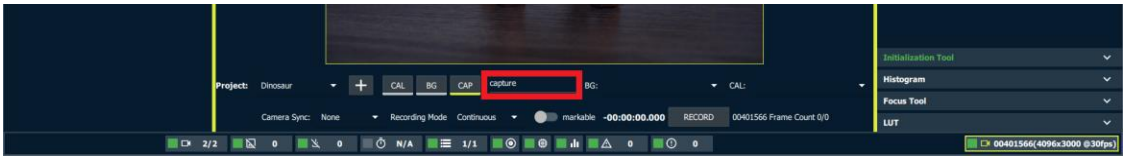


There are three types of Takes available:

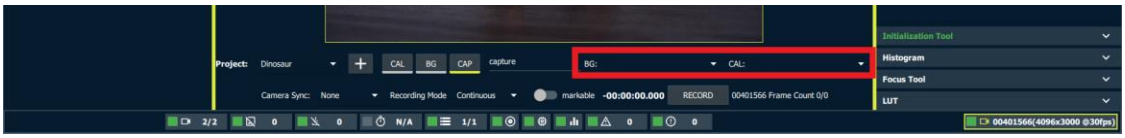
- Calibration (CAL)
- Background (BG)
- Capture (CAP)

For now we will just focus on Capture takes.

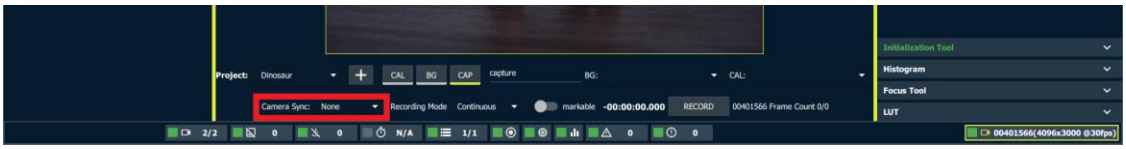
If you wish to, you can provide a meaningful name for the capture. This is optional.



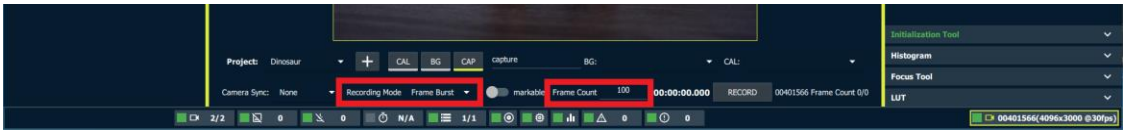
We will leave the BG and CAL dropdowns blank. In a real project this is where you can associate a background and calibration take with the production capture take.



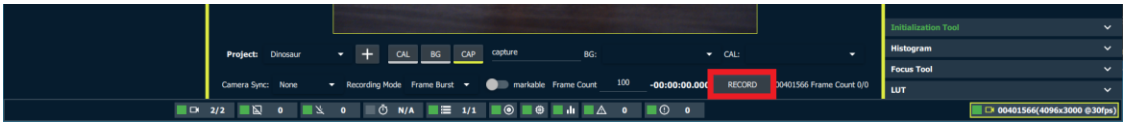
We will leave the camera sync option in the default state of **None** for now. The other options are PTP (Precision Time Protocol) and Hardware (GPIO triggering).



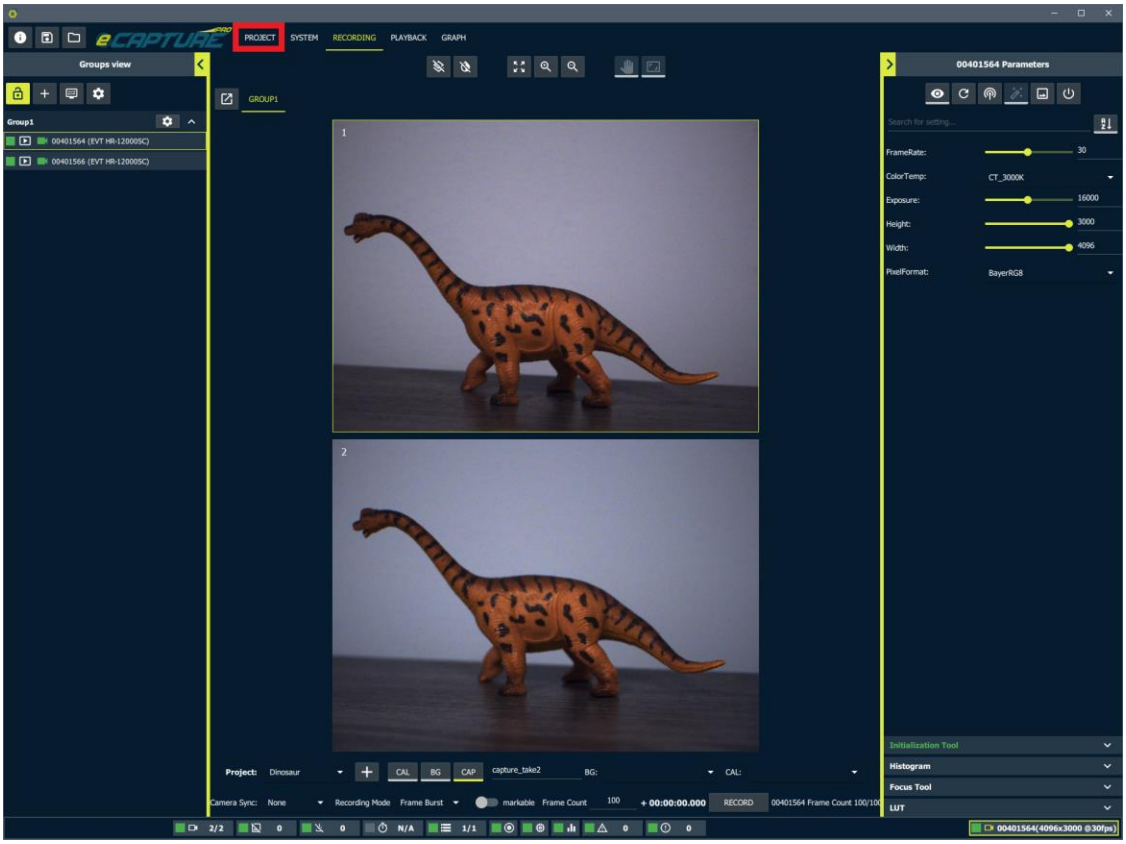
For the recoding mode we will choose Frame Burst with a frame count to 100 images per camera. The other options are Continuous (Record until user clicks stop) and Single frame. Leave the “markable” setting as off.



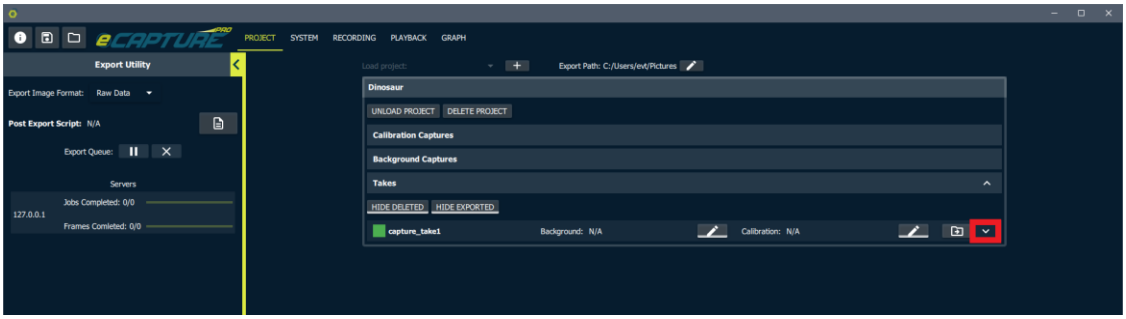
Then click the Record button to capture 100 images from each camera.



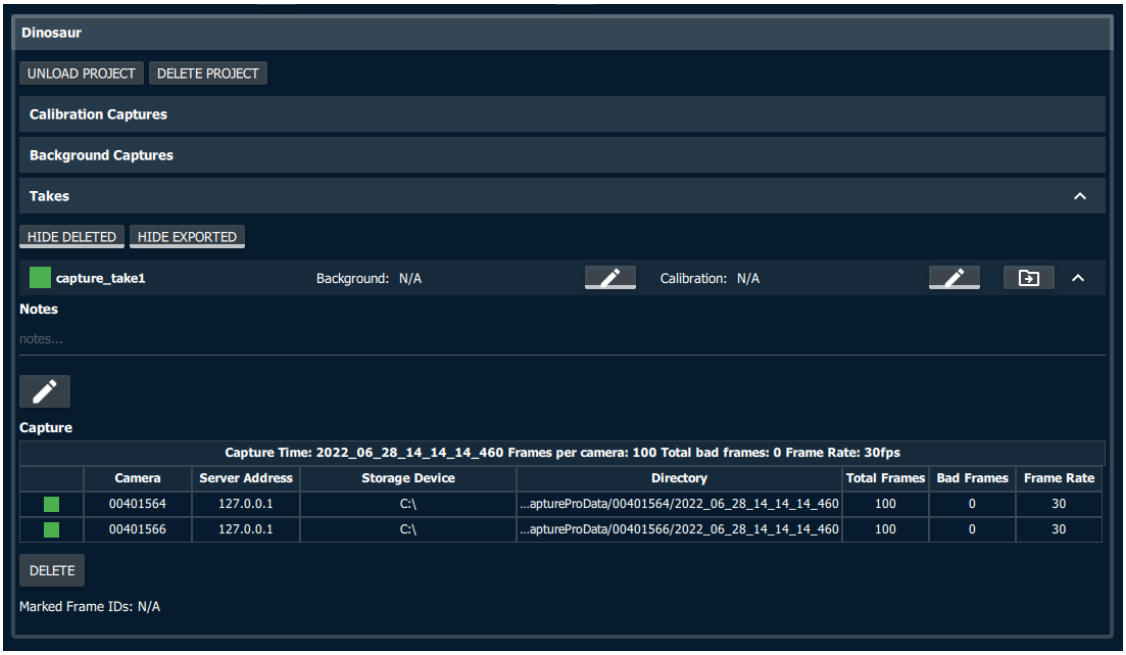
Once the recording has completed, navigate to the Project tab to view the status of the capture.



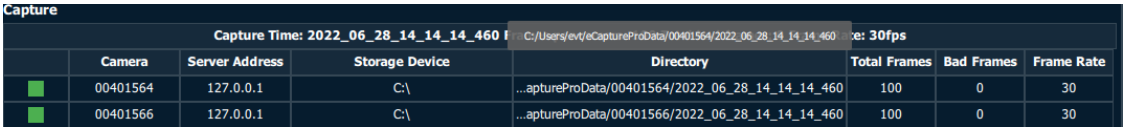
The Project view provides information regarding past recordings. Expand the latest recordings’s panel for a table of camera data.



From the table we can see that each camera successfully captured 100 images at 30fps with no bad images. We can also see the location where the image files are saved.

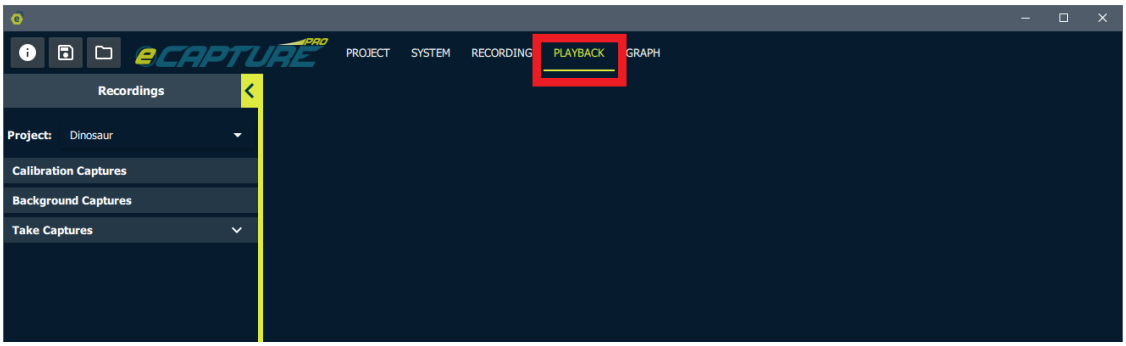


If the path is too long to fit in the table cell, then hover over the cell and the full path will appear in a tool tip.

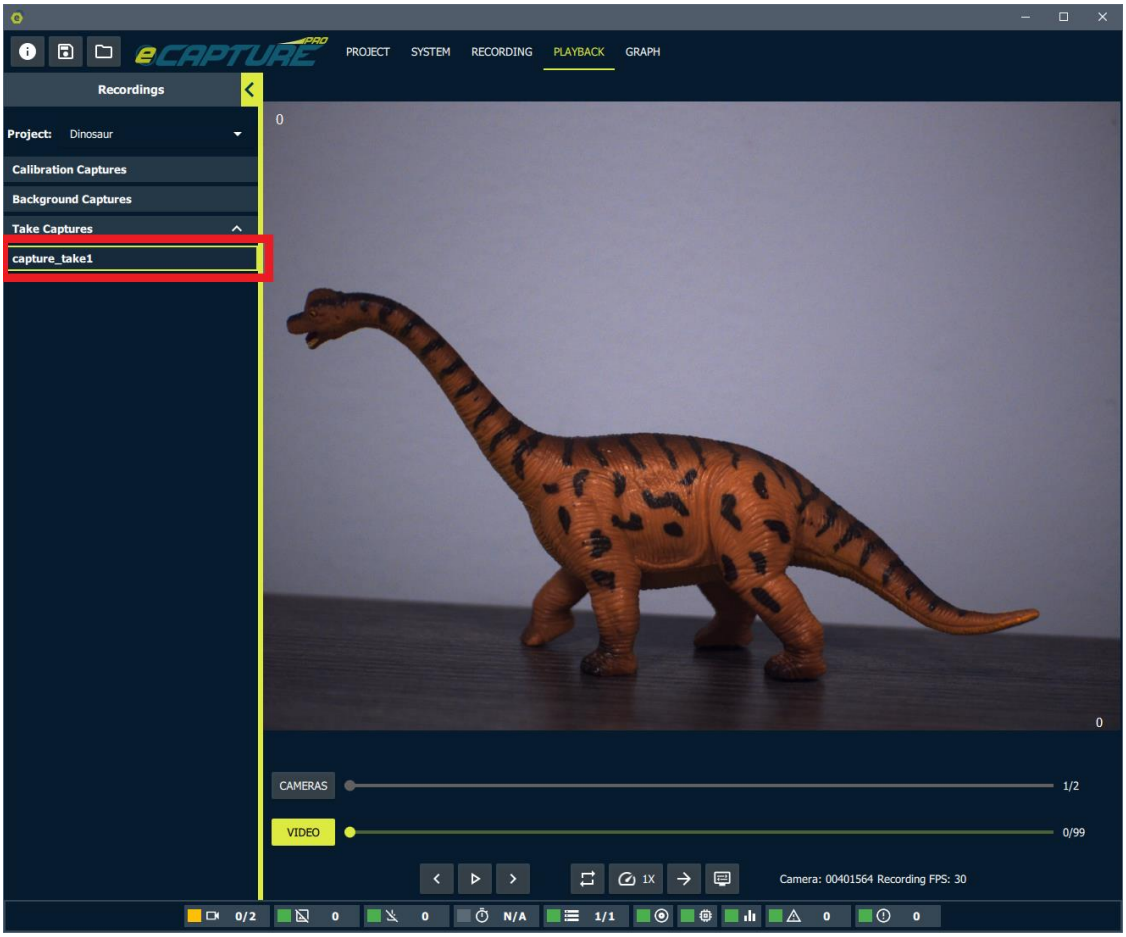


Playback

Navigate to the playback tab

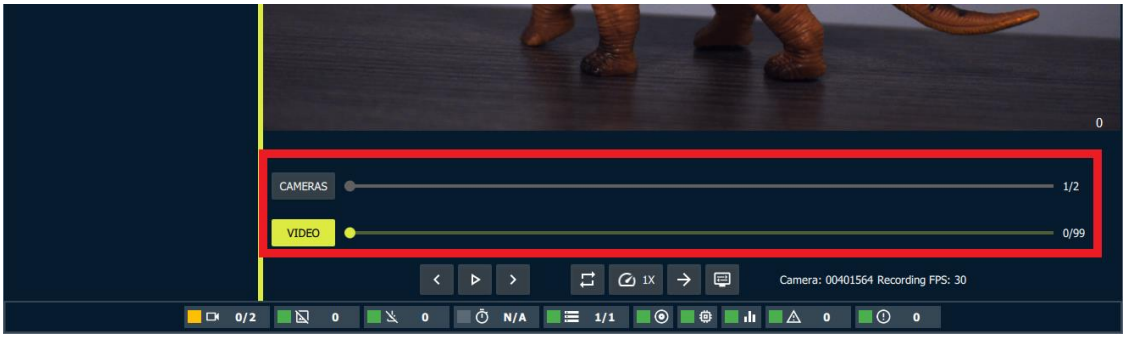


Select the most recent recording.

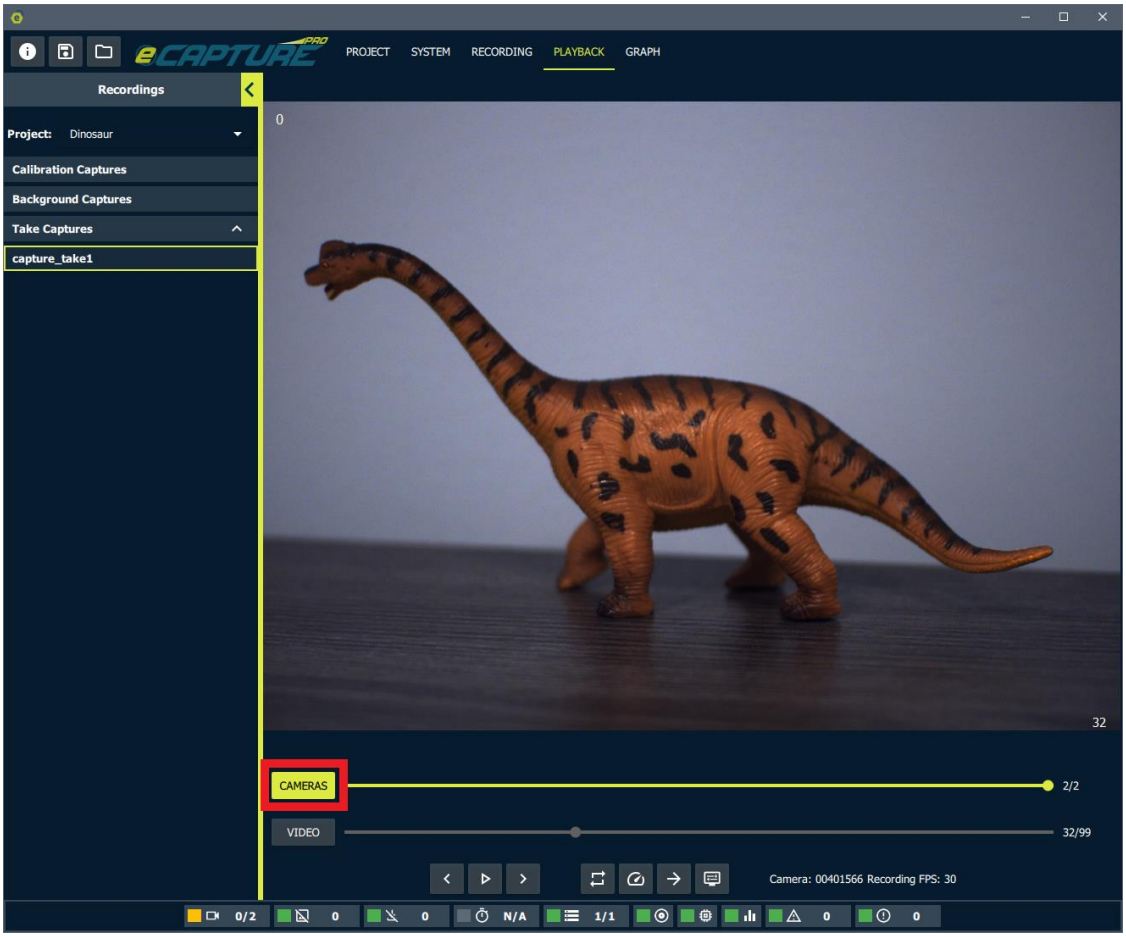


There are two basic modes of playback:

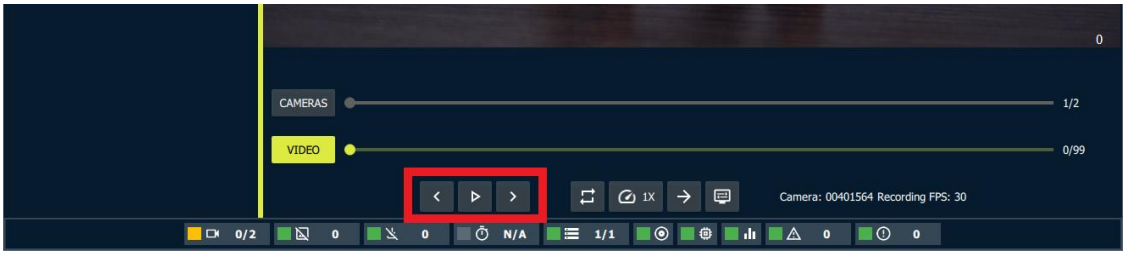
- Video: playback a recording from a single camera
- Cameras: for a given frame, rotate through all cameras that were part of the recording



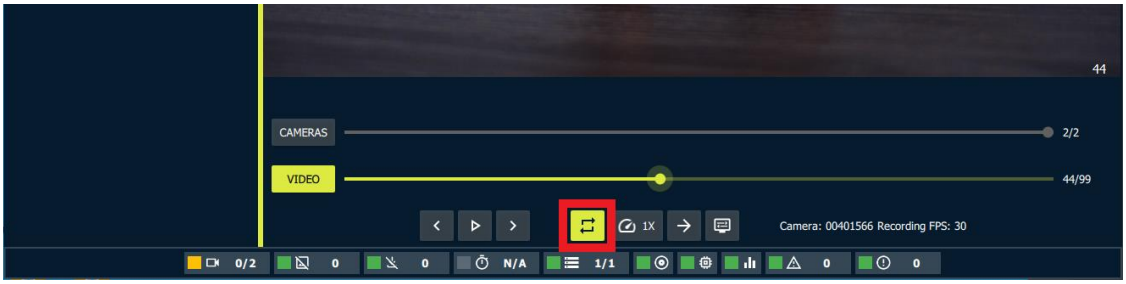
We can pause **video mode** playback at a given frame, switch to **camera mode** and navigate through all cameras that were part of the recording.



The playback controls include play/pause and seek one frame forward/backward buttons.



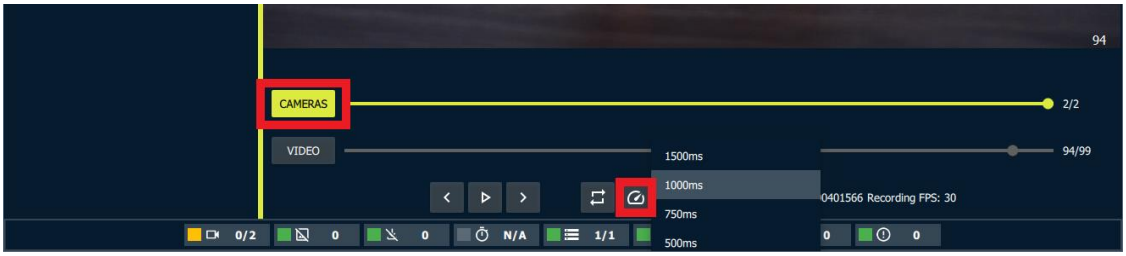
There is also a loop button to have playback loop back to the start once the end of the recording (or camera rotation) is reached.



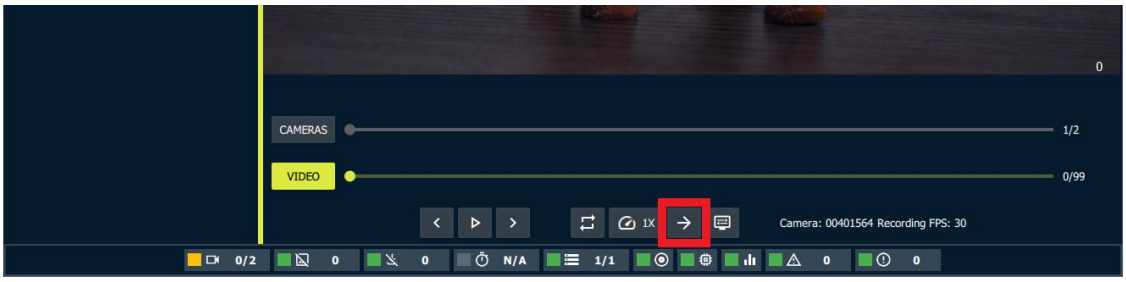
The playback speed can be configured.

In video mode the user can choose the playback speed as a fraction of the recording speed.

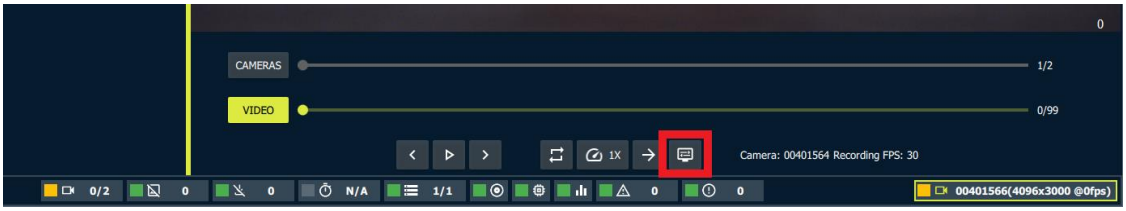
In camera mode the user can choose the time the given frame is shown for a camera until the display jumps to the next camera.

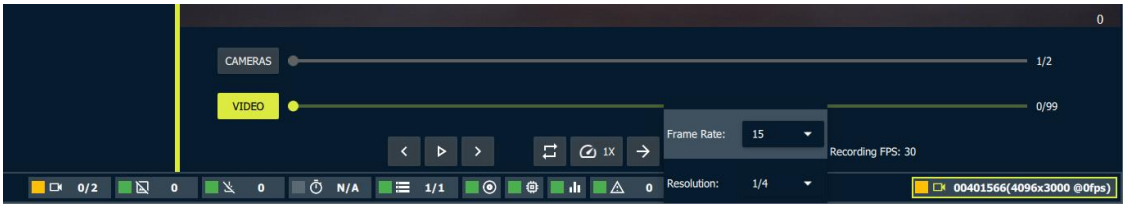


The direction of playback can be reversed with the arrow button.



The display resolution and display frame rate (may differ from recording frame rate) for playback can be set using the playback display settings.



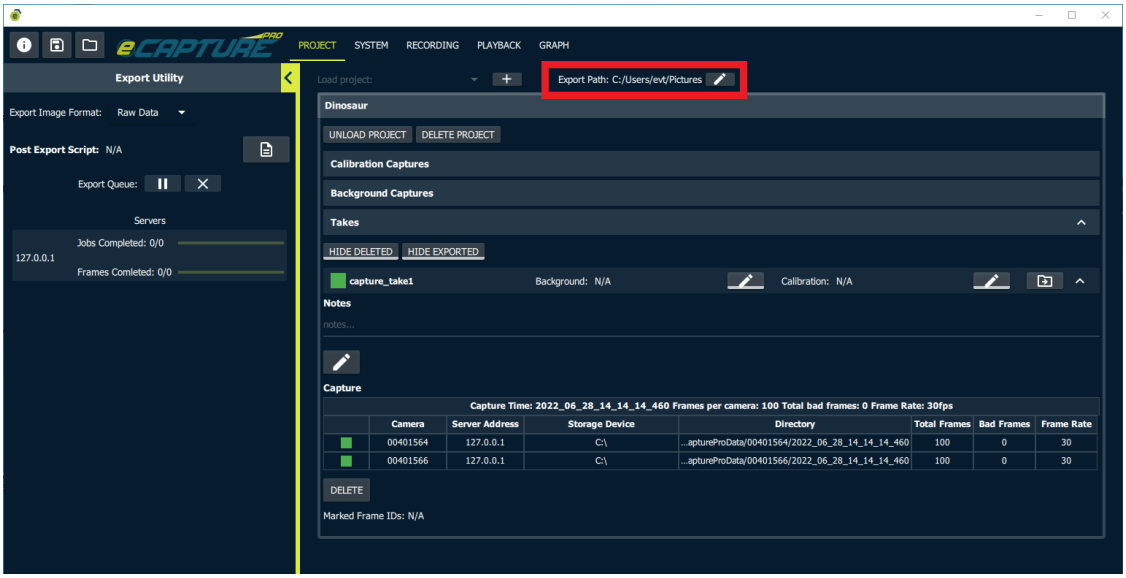


Note that changing the display frame rate and resolution will de-select the currently playing recording so you will have to reselect it to begin playback with the new settings.

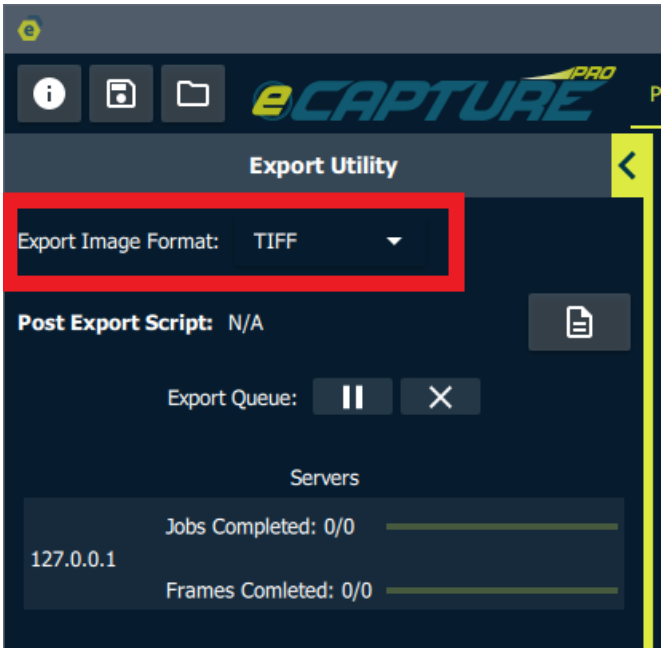
Project Management

When we are satisfied with a recording we may wish to export it to a location and format of our choosing.

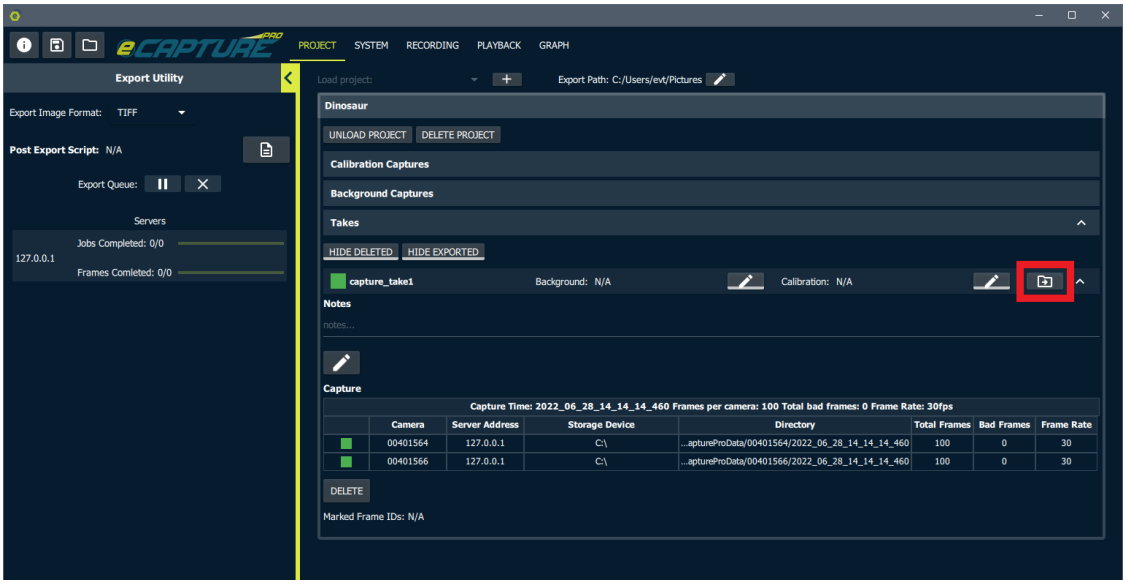
The export location can be chosen at the top of the project management tab. By default it is the system default image folder.



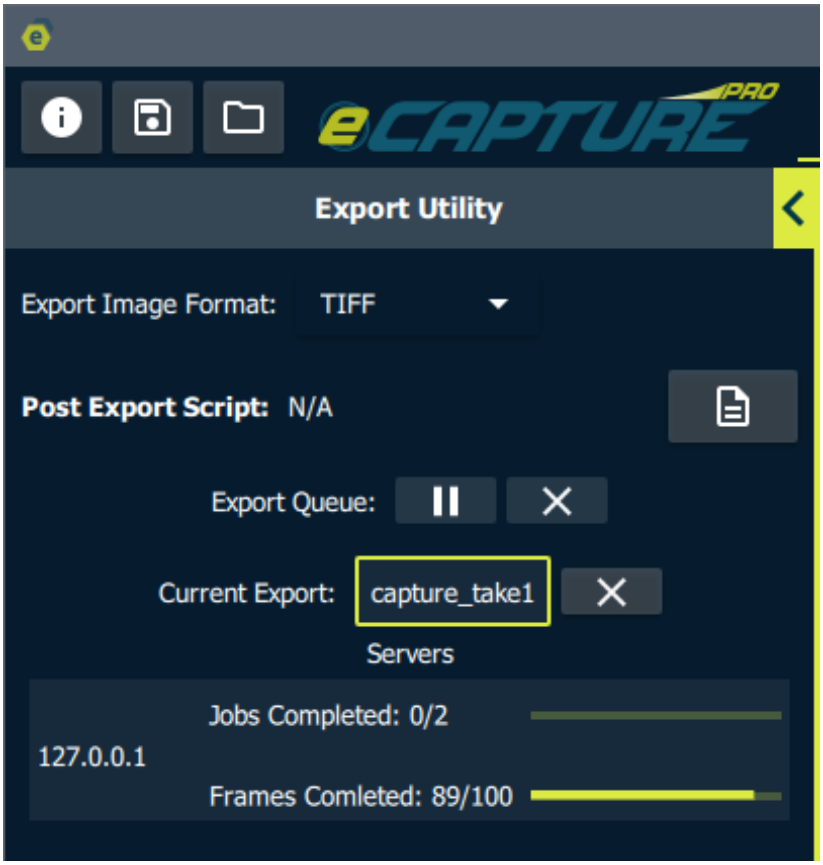
The format may be selected at the top of the Export Utility. Select **TIFF** for images for this example as they do not require any specialized software to view them.



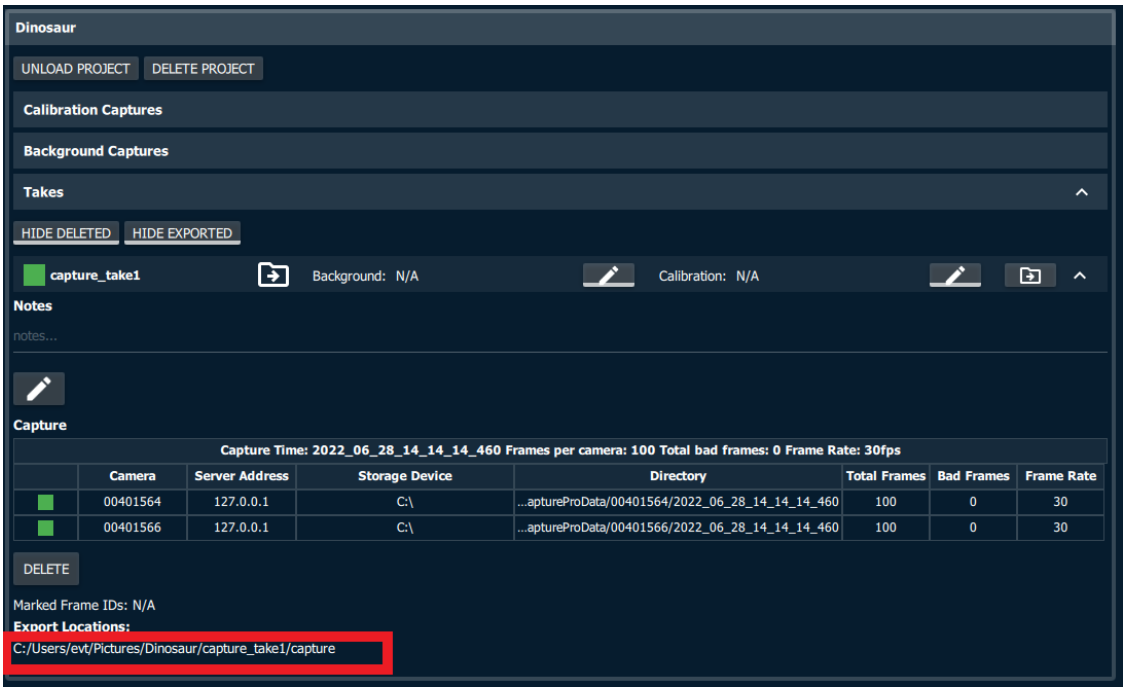
Now click the export button for the most recent recording.



The take will then be en-queued into the export queue. The current status of the export is also displayed.



On completion of the export the final location will be shown in the take panel.

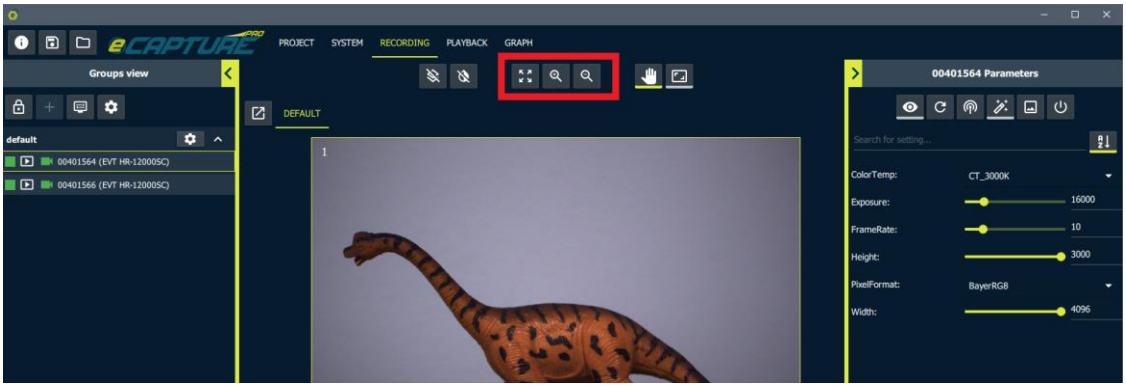

Dinosaur
UNLOAD PROJECT
DELETE PROJECT
Calibration Captures
Background Captures
Takes
HIDE DELETED
HIDE EXPORTED
capture_take1
Background: N/A
Calibration: N/A
Notes
notes...
Capture
Capture Time: 2022_06_28_14_14_14_460 Frames per camera: 100 Total bad frames: 0 Frame Rate: 30fps
Camera
Server Address
Storage Device
Directory
Total Frames
Bad Frames
Frame Rate
00401564
127.0.0.1
C:\
...aptureProData/00401564/2022_06_28_14_14_14_460
100
0
30
00401566
127.0.0.1
C:\
...aptureProData/00401566/2022_06_28_14_14_14_460
100
0
30
DELETE
Marked Frame IDs: N/A
Export Locations:
C:/Users/evt/Pictures/Dinosaur/capture_take1/capture

Appendix

Zoom and Pan Options

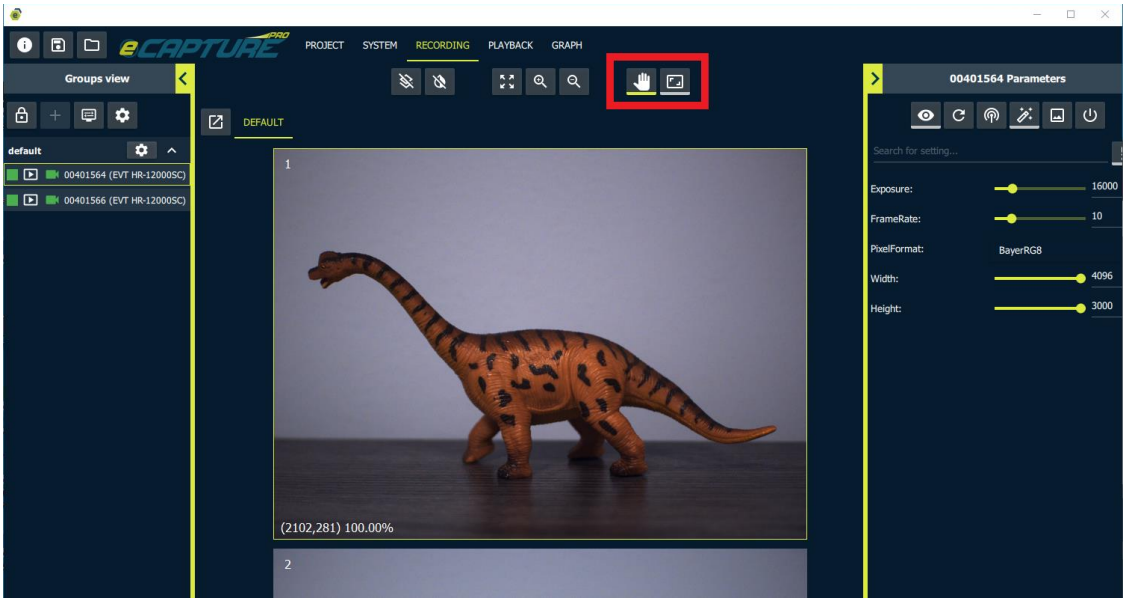
There are a variety of zoom options available.

There are zoom in, zoom out and zoom extents buttons.



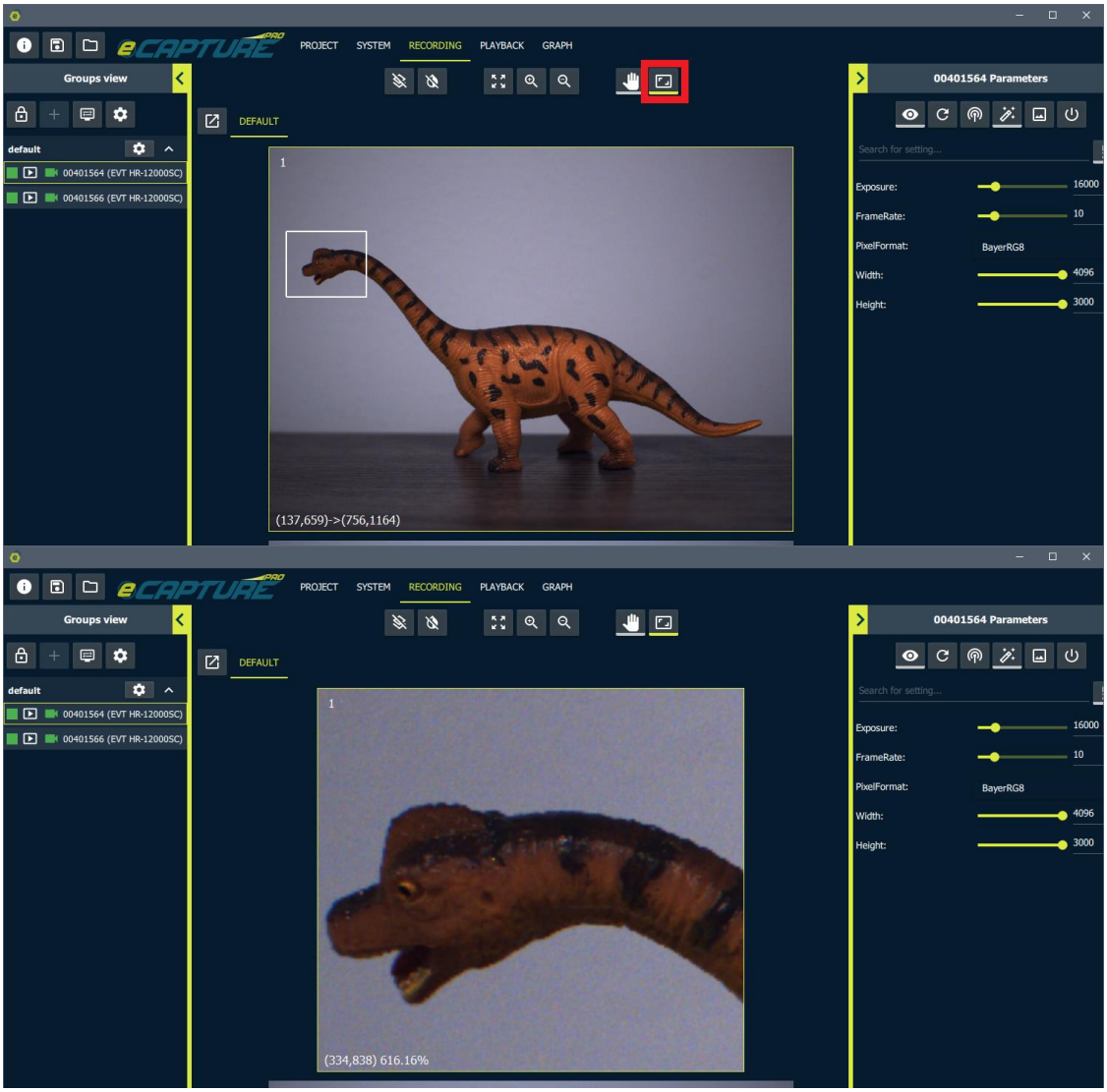
Mouse Left Click and Drag Options

There are options for what action will be preformed when a user clicks and drags on a live stream.



Then the hand icon represents panning around an image that has been zoomed in to.

The rectangle option represents drawing a zoom area on the live stream to zoom in to.



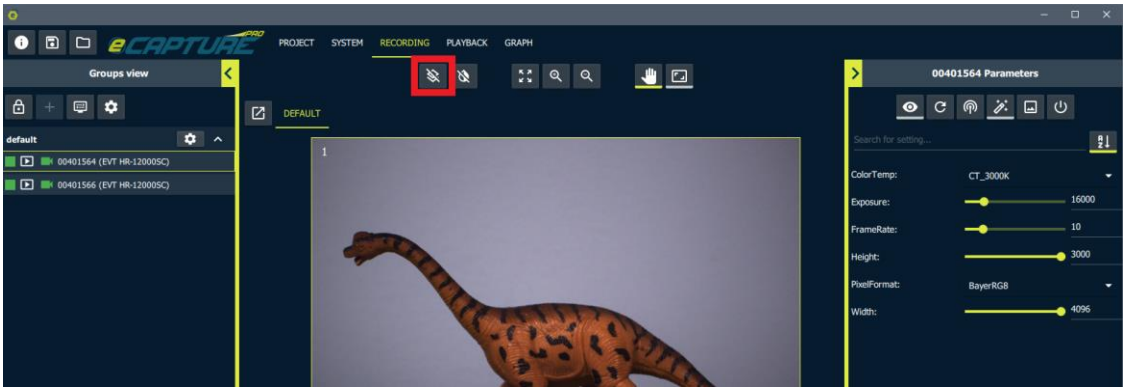
Mouse Scroll Wheel

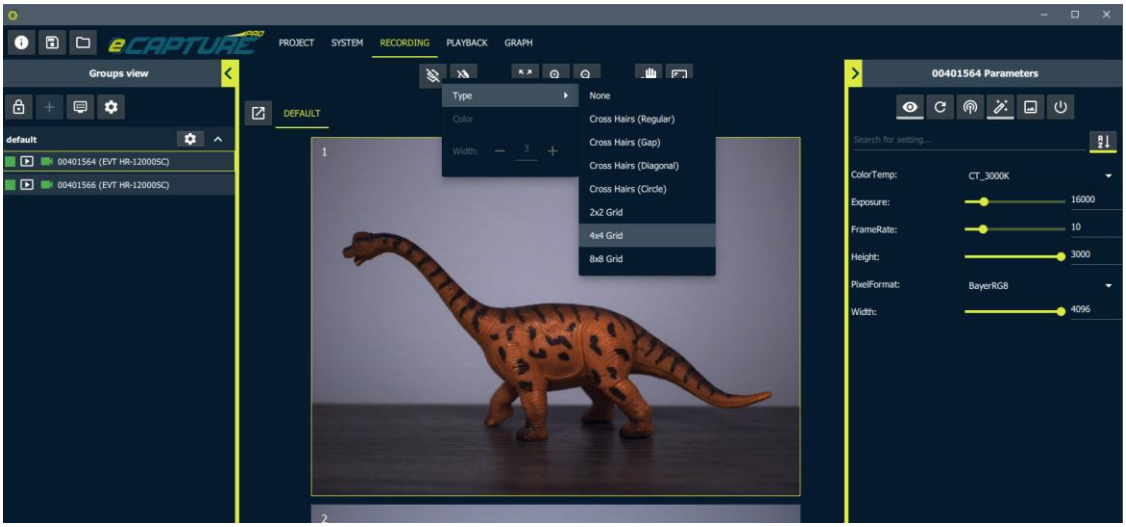
A great option for zooming and panning around live streams is to use the mouse scroll wheel. When the cursor is hovering over a live stream, scrolling forward will zoom in and scrolling backward will zoom out.

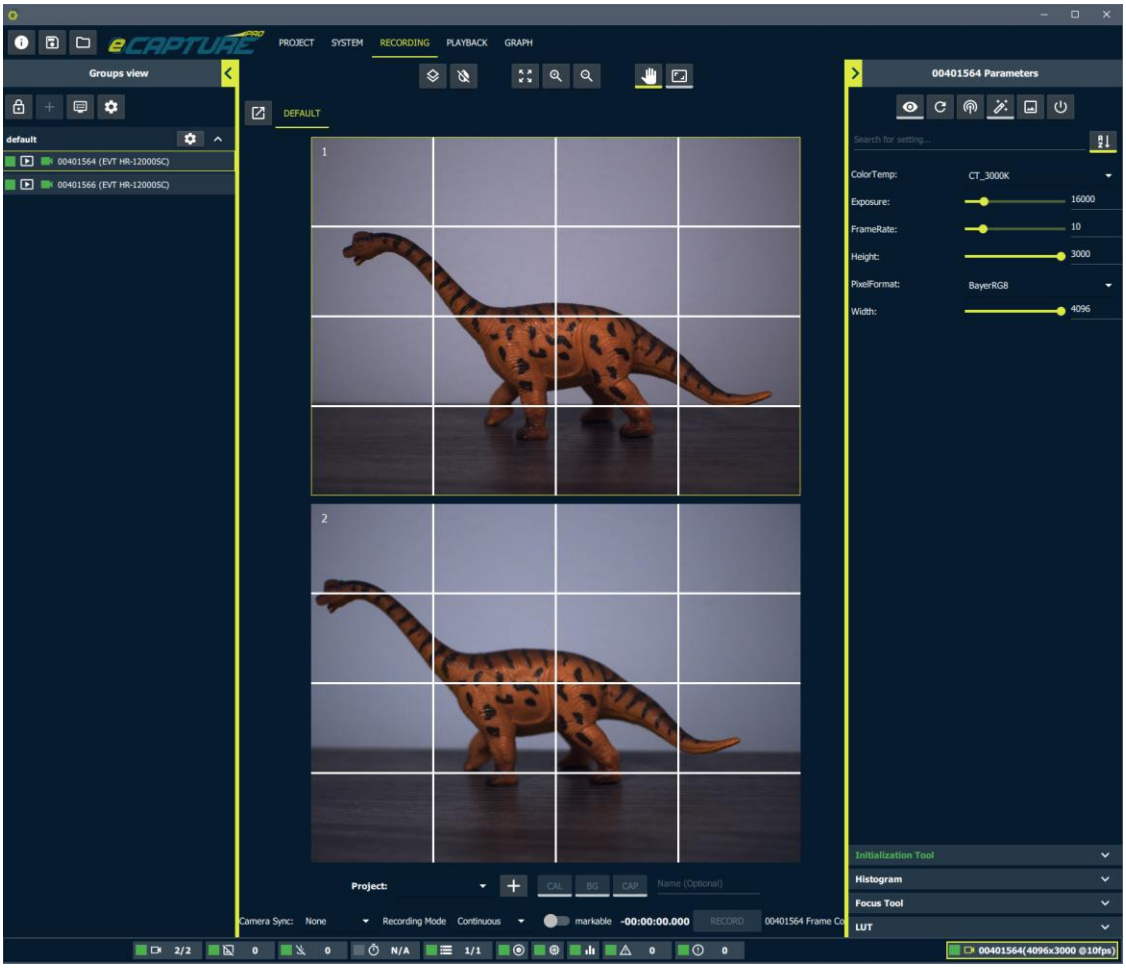
The mouse scroll wheel can also be clicked and held down in order to grab the image and pan around.

Image Overlay

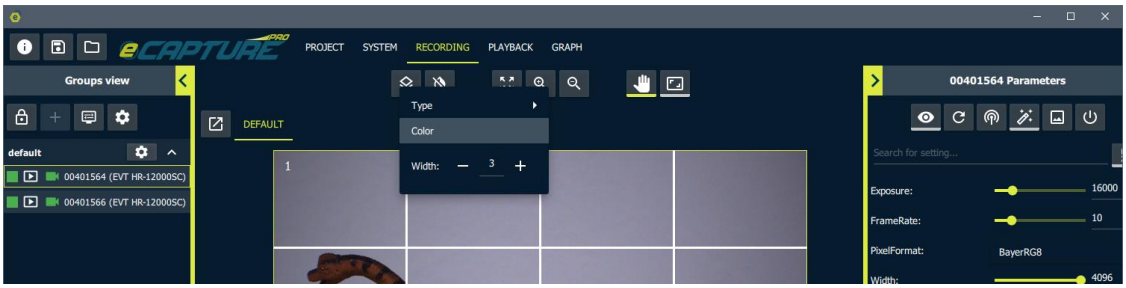
In order to aid in camera alignment a user may wish to have an overlay such as a grid drawn on top of the live stream.

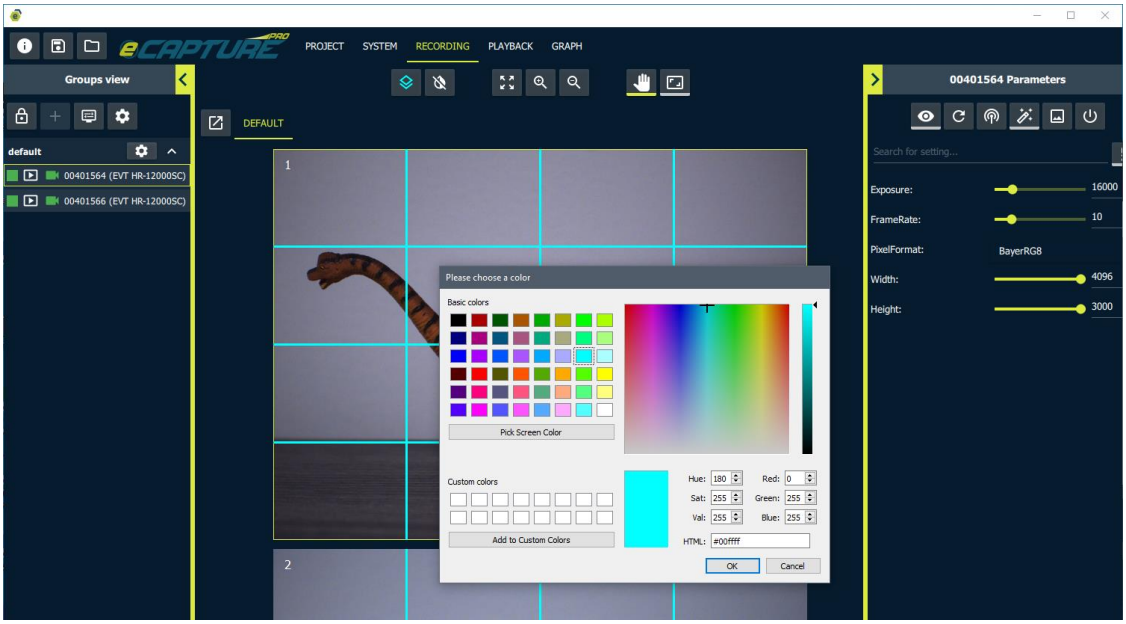






It may also be useful to change the overlay line color and line width in order to help distinguish between the overlay and the background image.





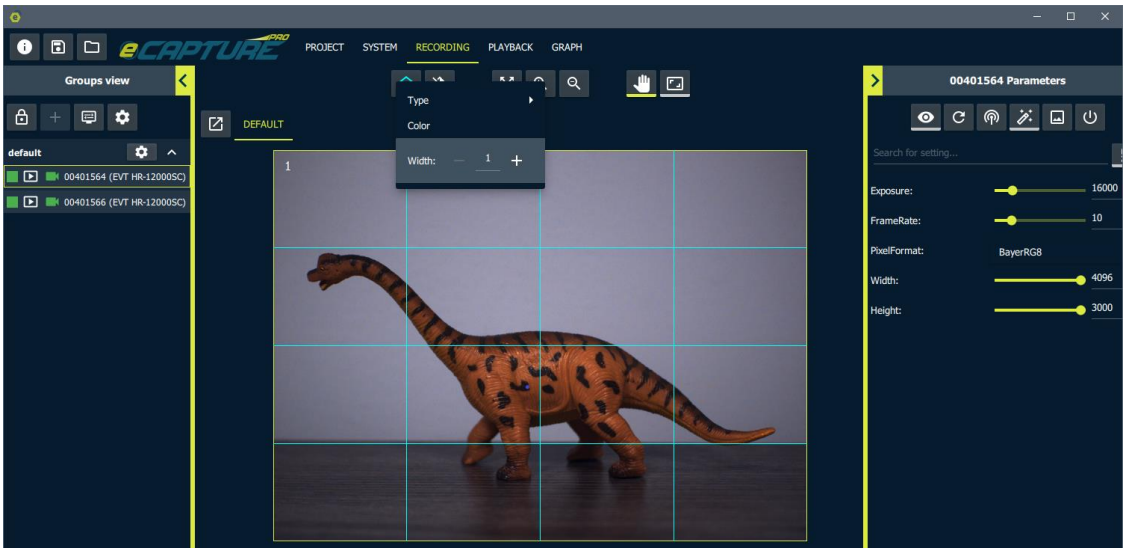
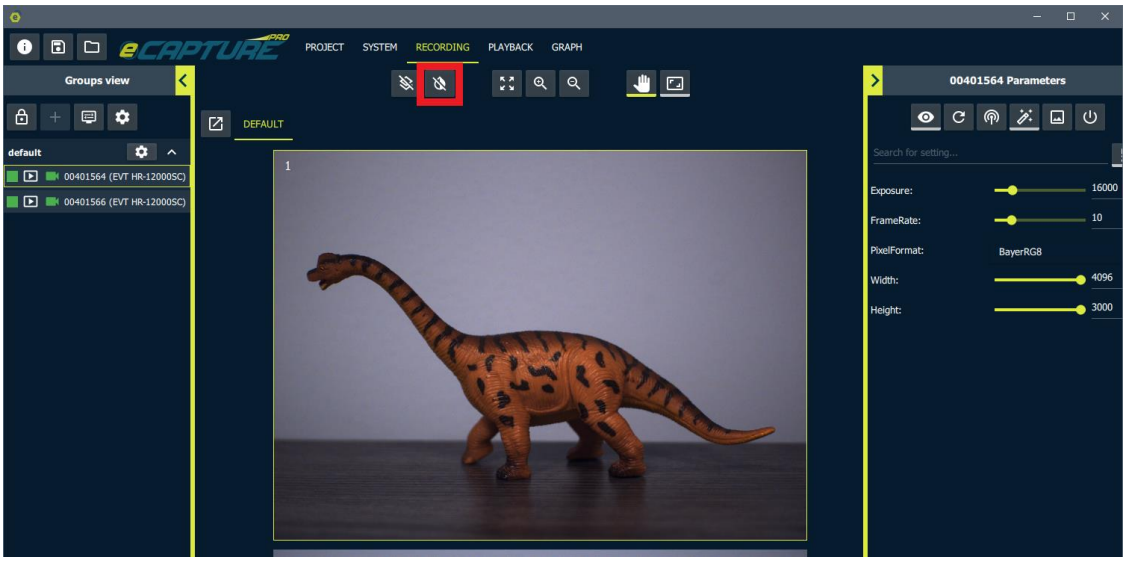
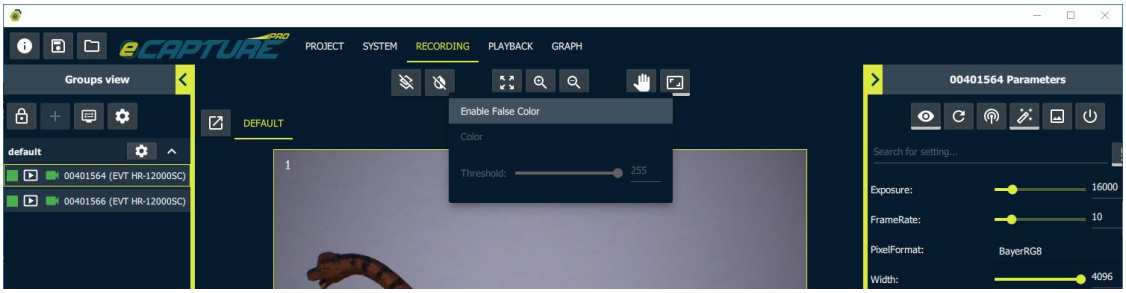


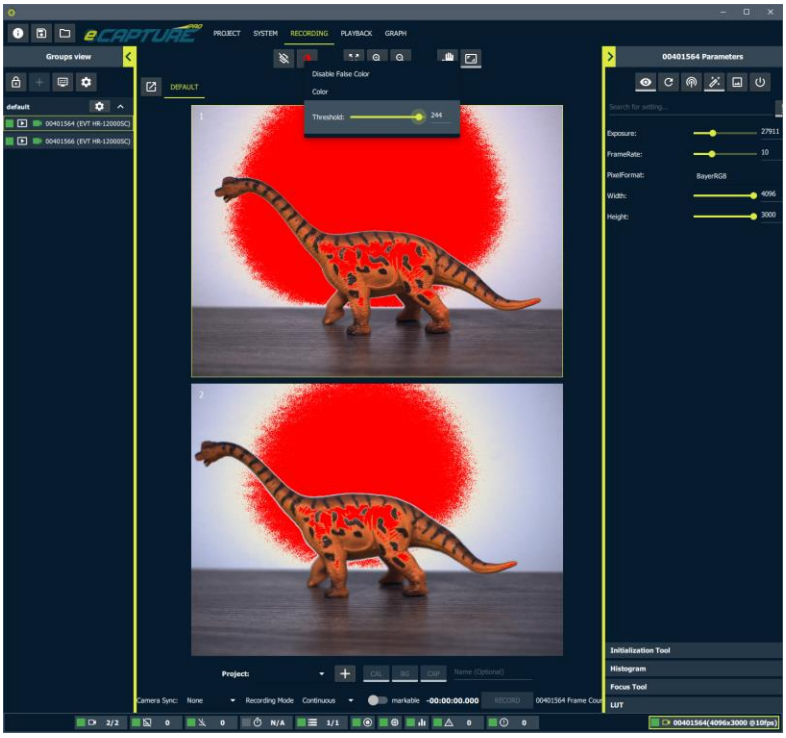
Image False Color

To help identify areas of the image at risk of saturation it may help to apply a false color to pixels above a certain value threshold.

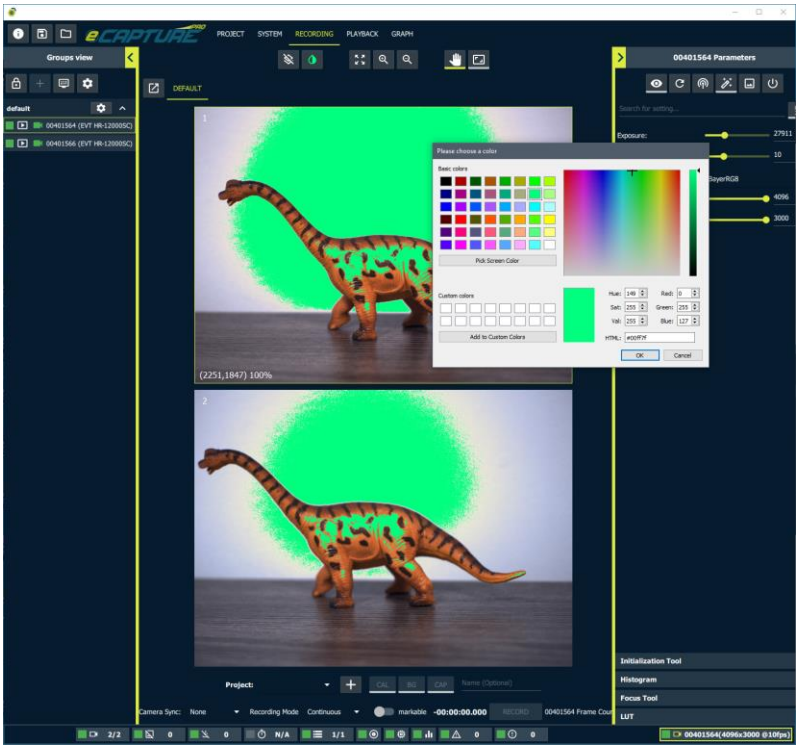




Configure the threshold beyond which pixels will be colored with the false color.

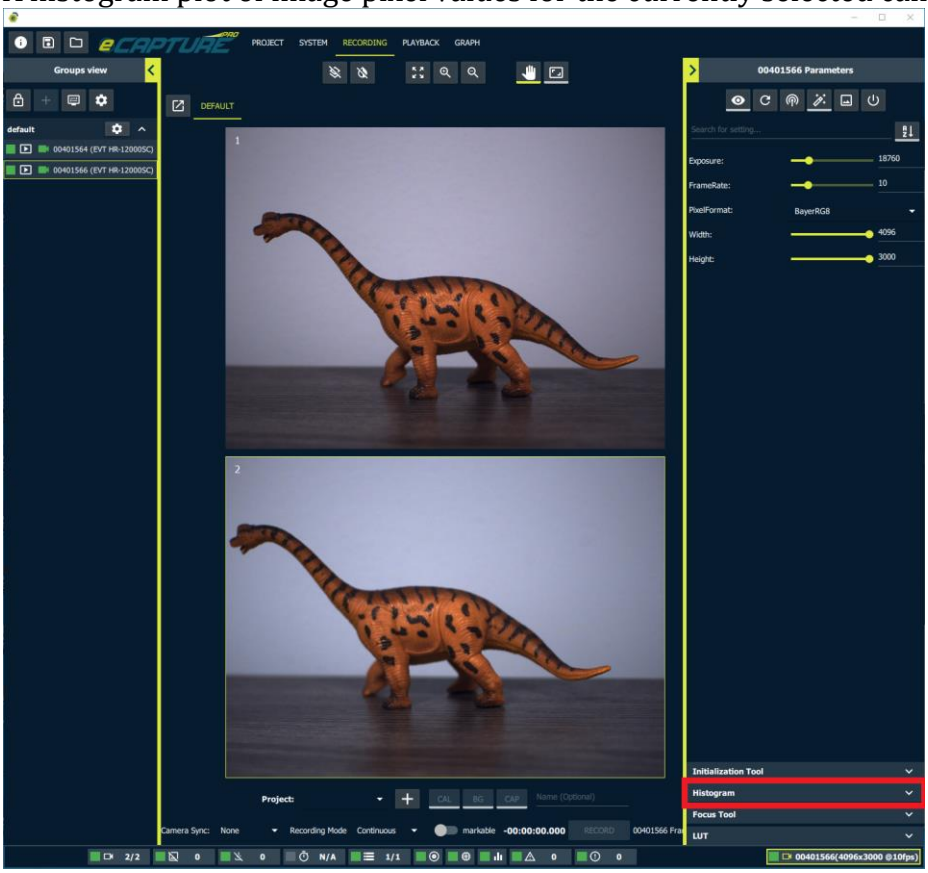


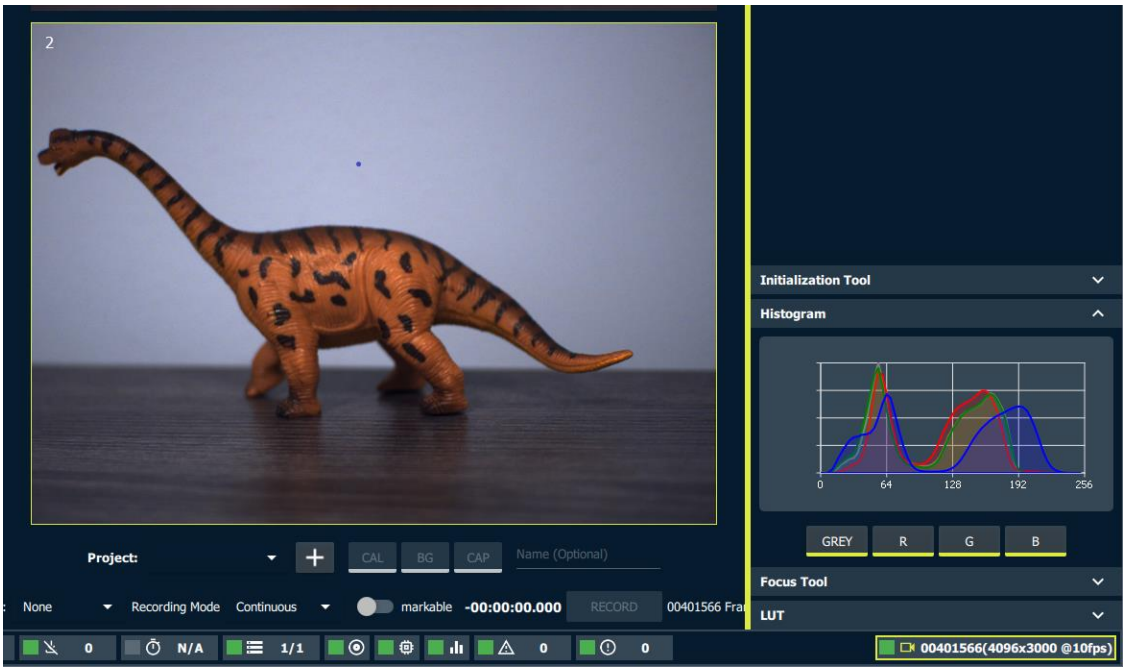
Set the false color to one that contrasts well with the image scene.



Histogram

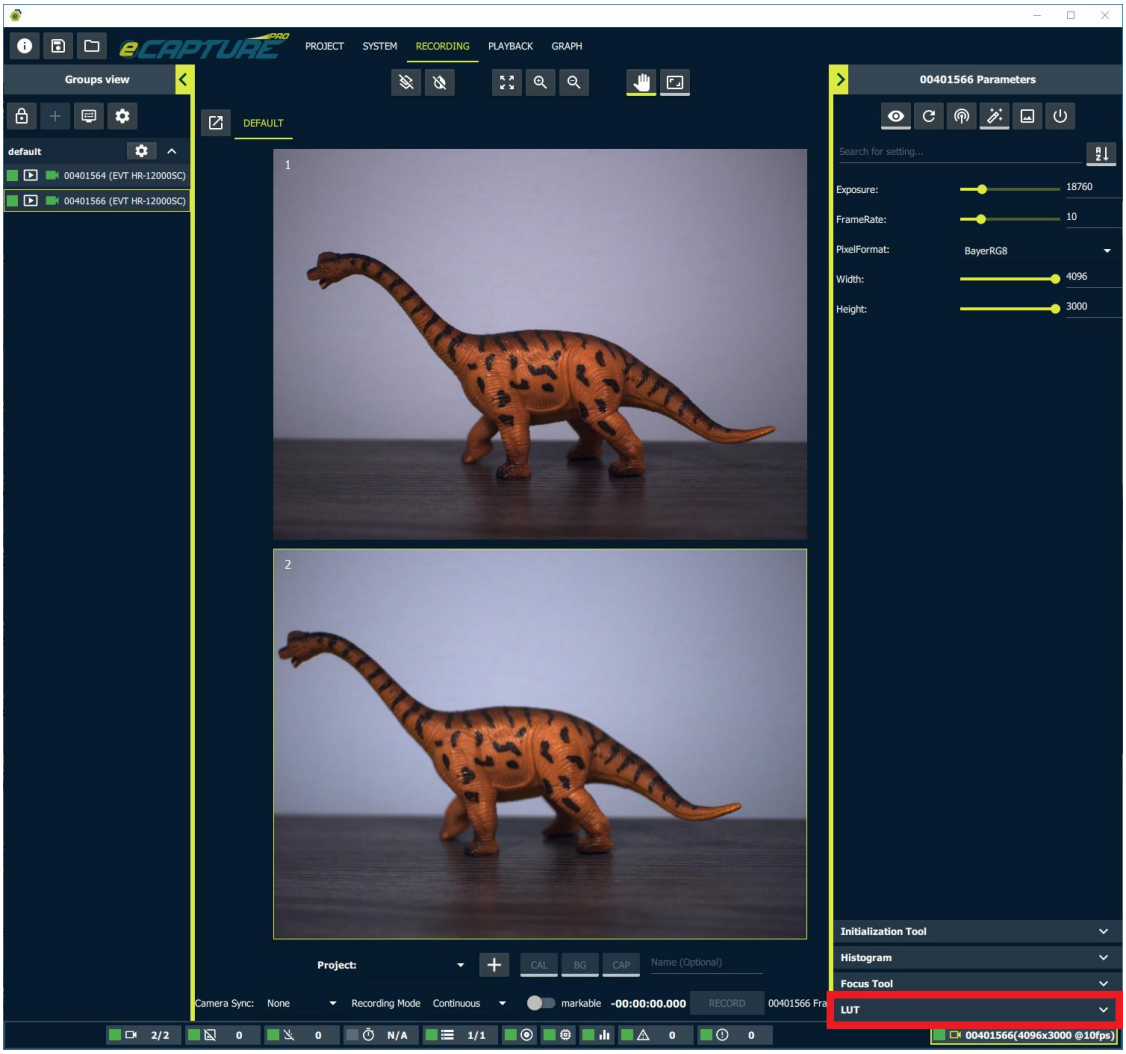
A histogram plot of image pixel values for the currently selected camera is available.





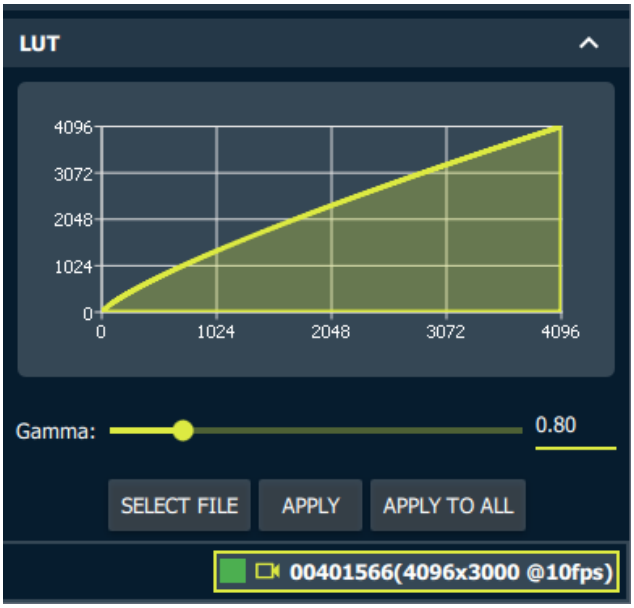
Look Up Table Tool

A Look Up Table (LUT) tool is available to program a look up table onto the camera to be applied to images.

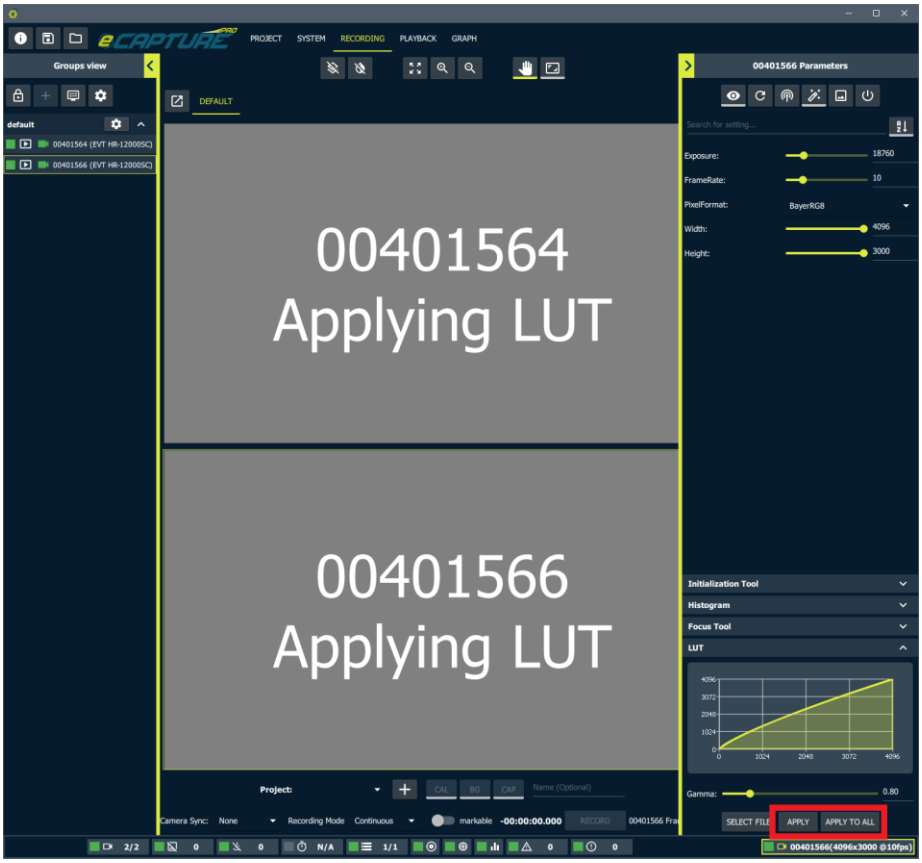


Apply Gamma

This tool includes a feature that allows the user to choose a gamma curve value. The corresponding lookup table entries will be calculated and uploaded to the camera.

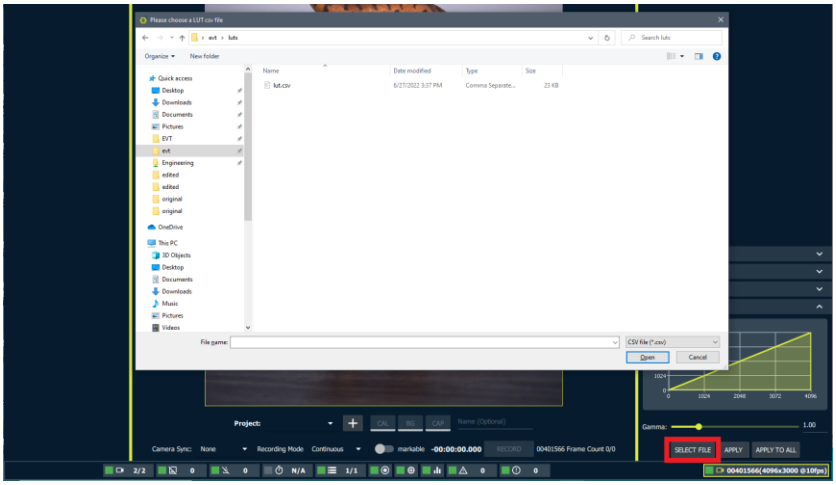


Either choose to apply the LUT to the currently selected camera or all cameras.

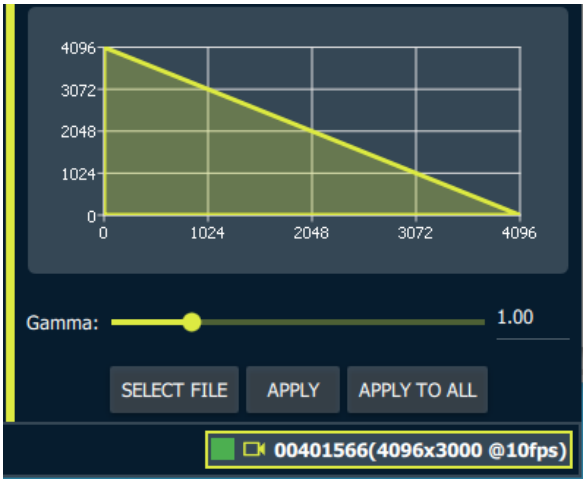


Load Custom LUT from file

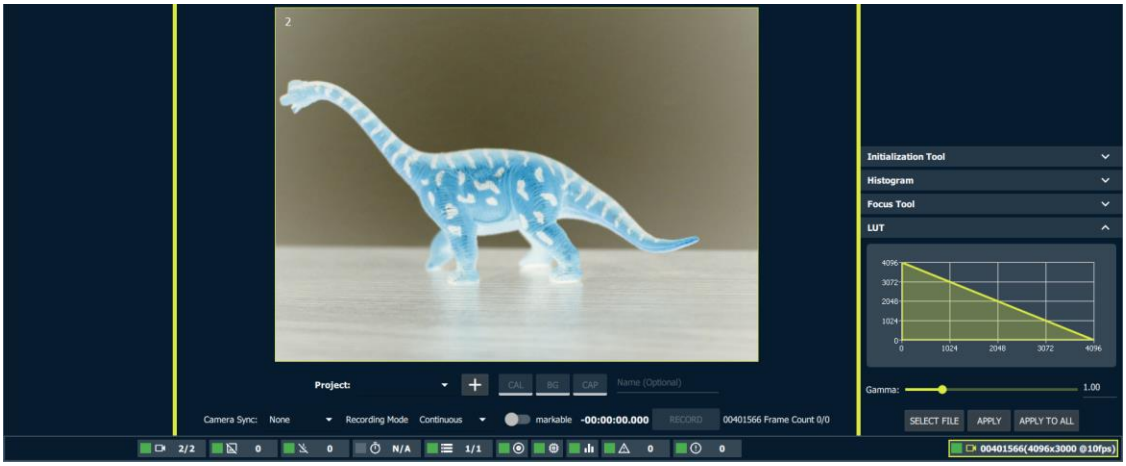
It is also possible to load custom LUT entries from a CSV file. The CSV should contain a single column of entries. The row number will be used as the index.



This CSV contains a single column with 4096 rows (Should be 1024 rows if the camera has a 10bit LUT). The values start at 4095 and decrease by one each row, and reach 0 at the 4096th row. In other words it is a negative.

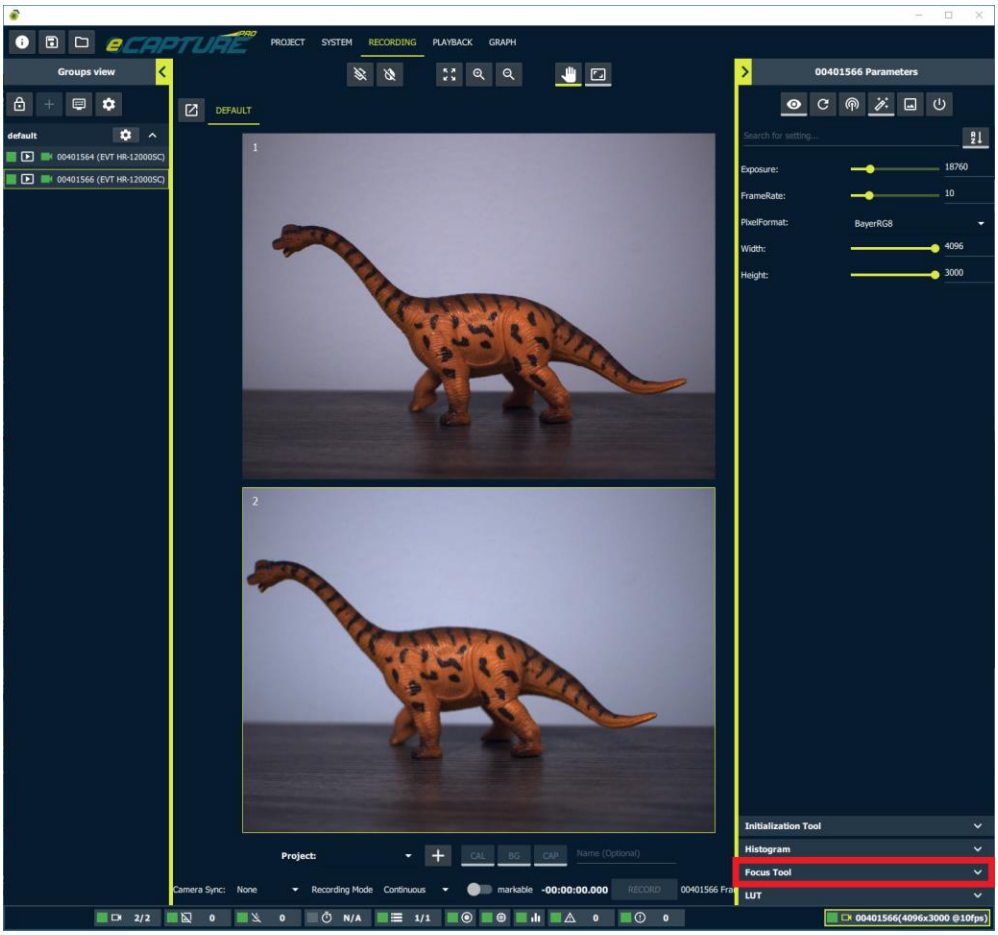


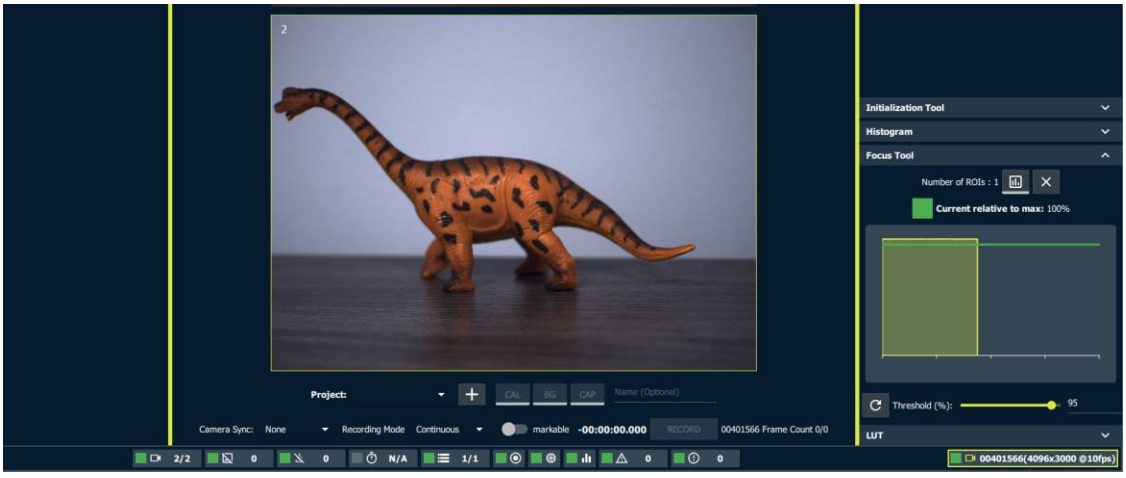
Click apply.



Focus Tool

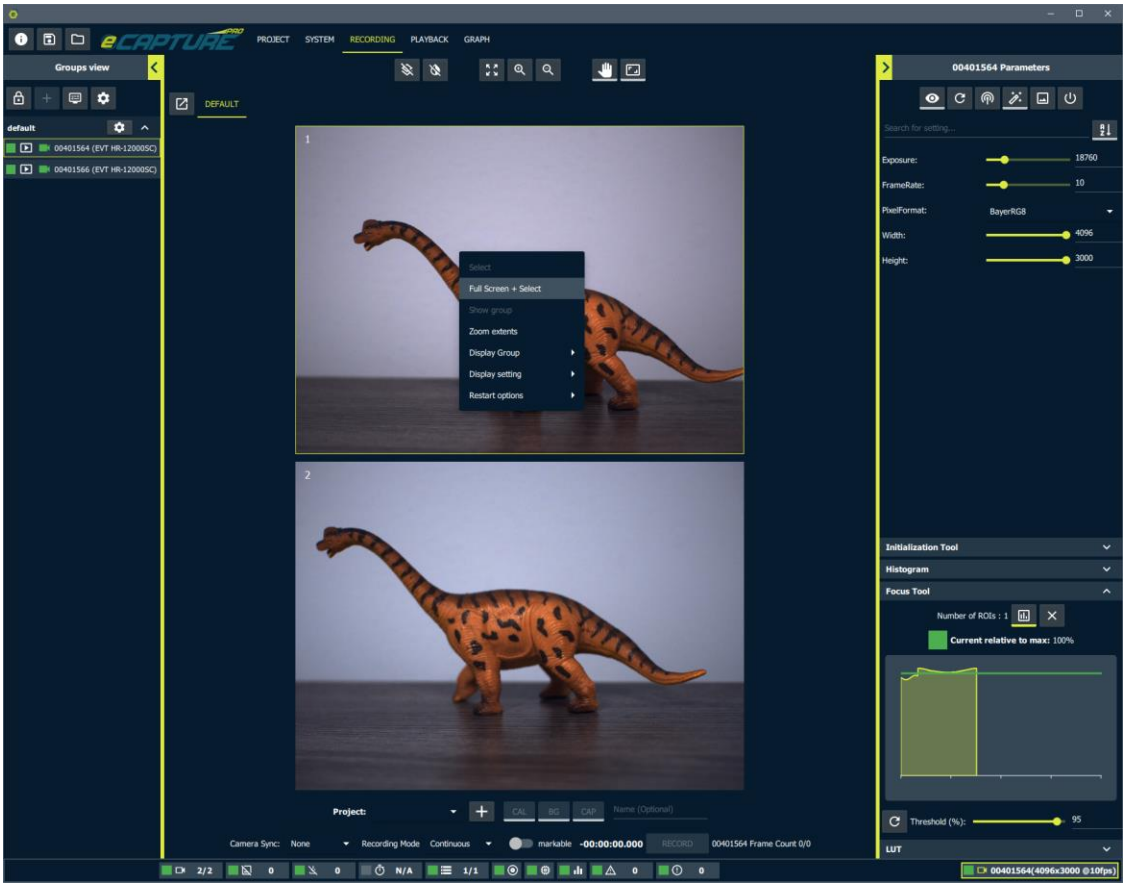
The focus tool is a useful utility to aid in the focusing of lenses.





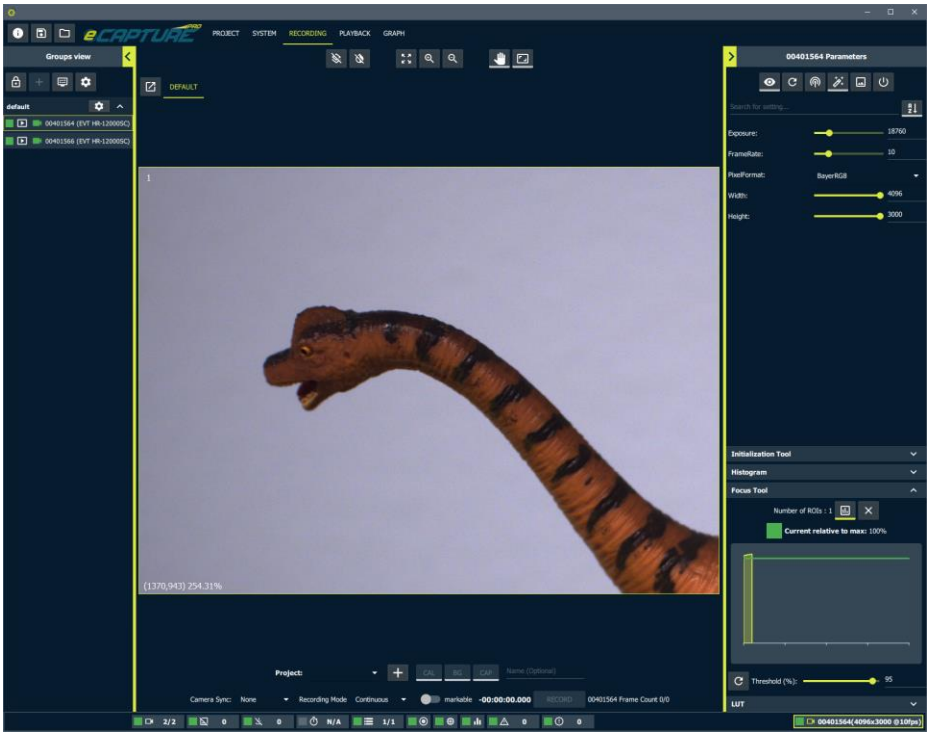
The focus tool calculates relative sharpness using the thumbnail image feed. For this reason it is recommended that the thumbnail resolution be set to full resolution. One way to do

this is to put the camera in full screen mode. To to this right click on the live stream and select “Full Screen + Select”. To exit full screen mode choose “Show Group” from the menu.

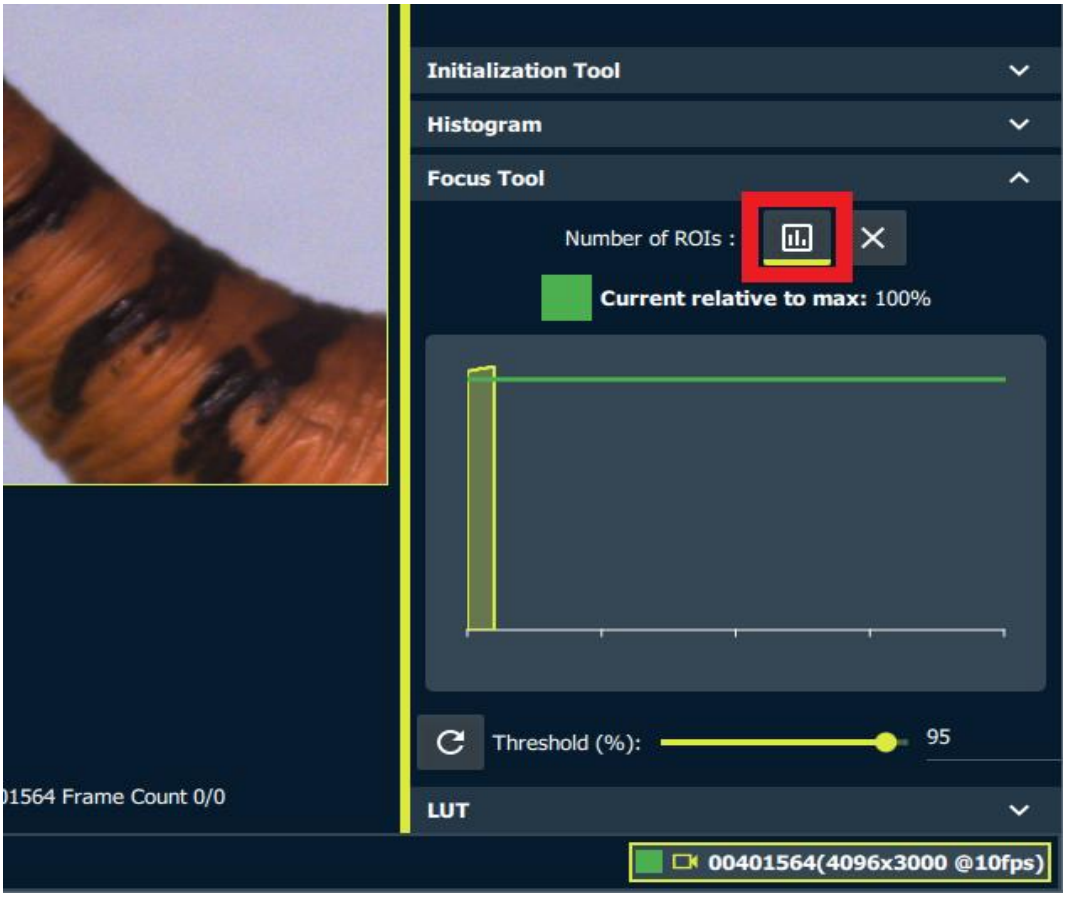


Note that displaying at full resolution is likely to increase the CPU usage. Especially for color images that need to be de-bayered. In some cases this can lead to a choppy live stream display or even dropped frames.

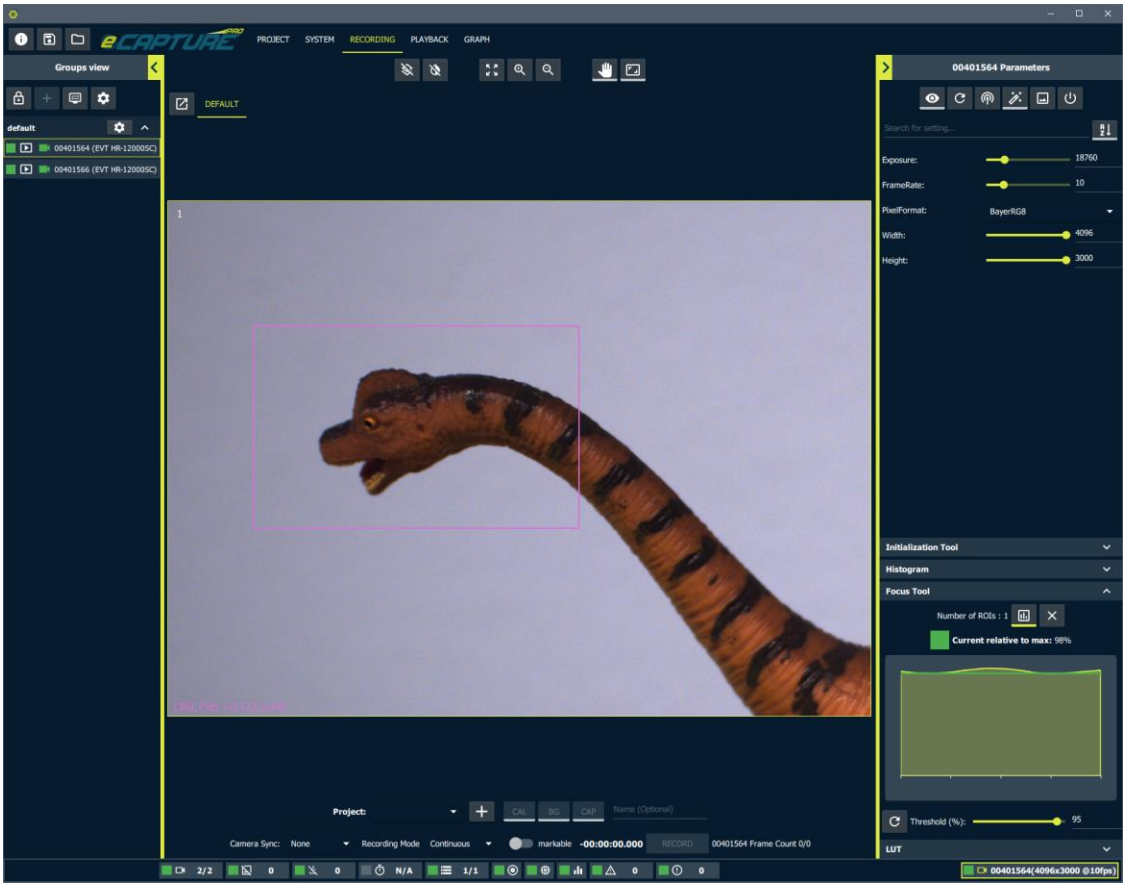
Zoom in on the region of the image you wish to be in focus.



Select the option to draw a region of interest on the live stream.



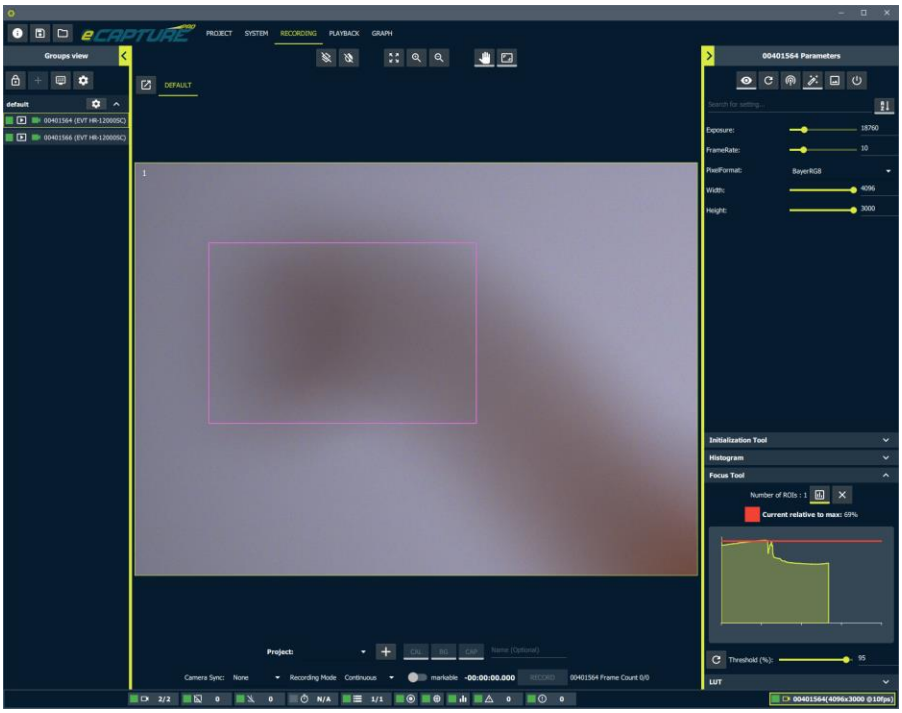
Draw a region of interest around the area you wish to focus on.

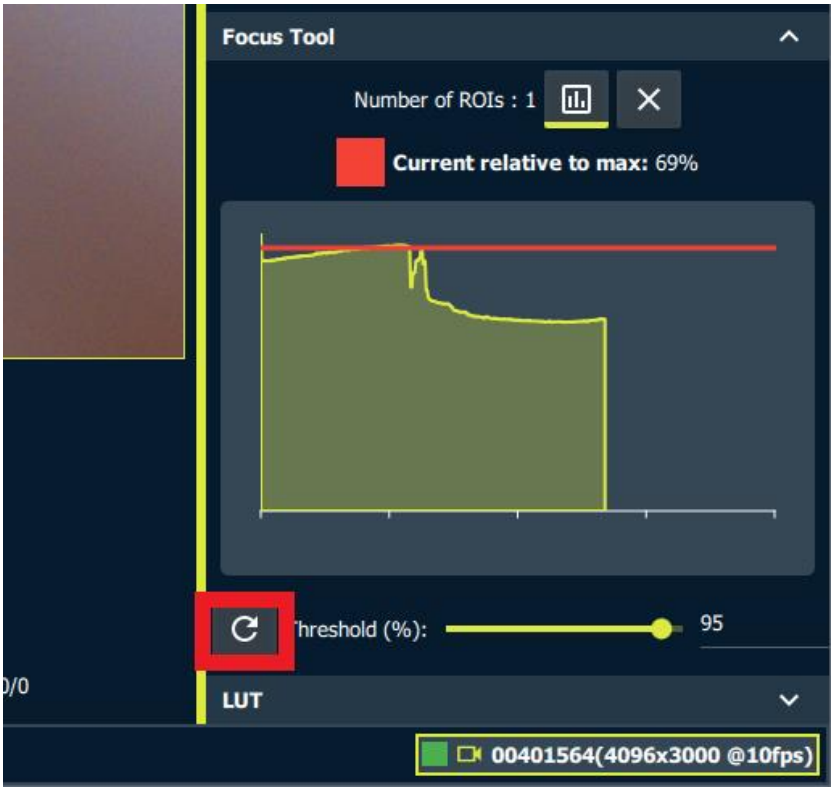


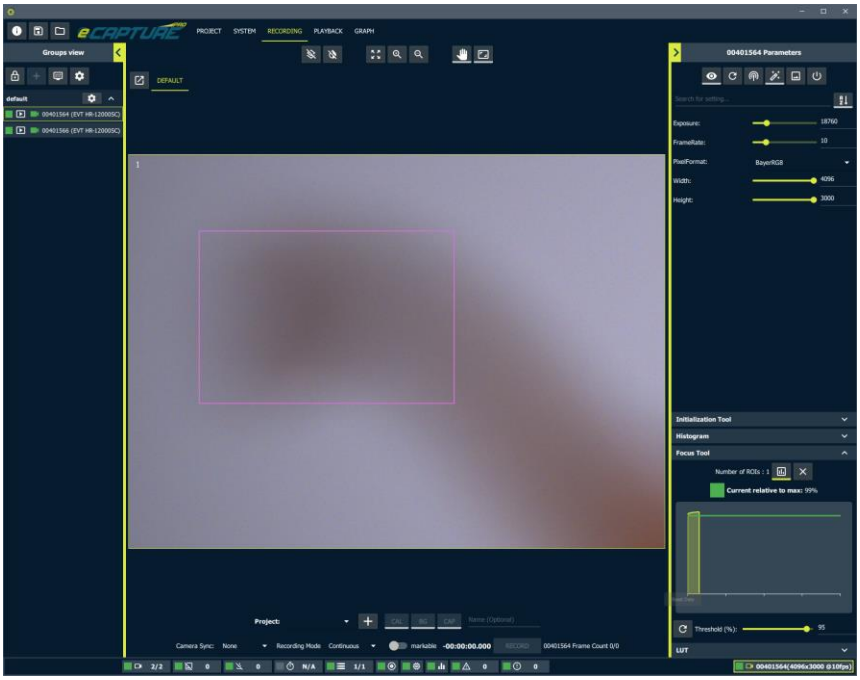
The idea behind the focus tool is to slowly move the lens through its travel while the current sharpness value for the specified region of interest is plotted. Once the lens has been moved through it's entire travel the maximum point on the plot will correspond the lens focus setting where the region was in sharpest focus. You can then move the len back through its travel until the plotted sharpness returns to the the maximum.

Note that the focus tool computed sharpness value is sensitive to the size of the region of interest so it is recommended to reset the focus tool plot history when the selected region of interest is changed.

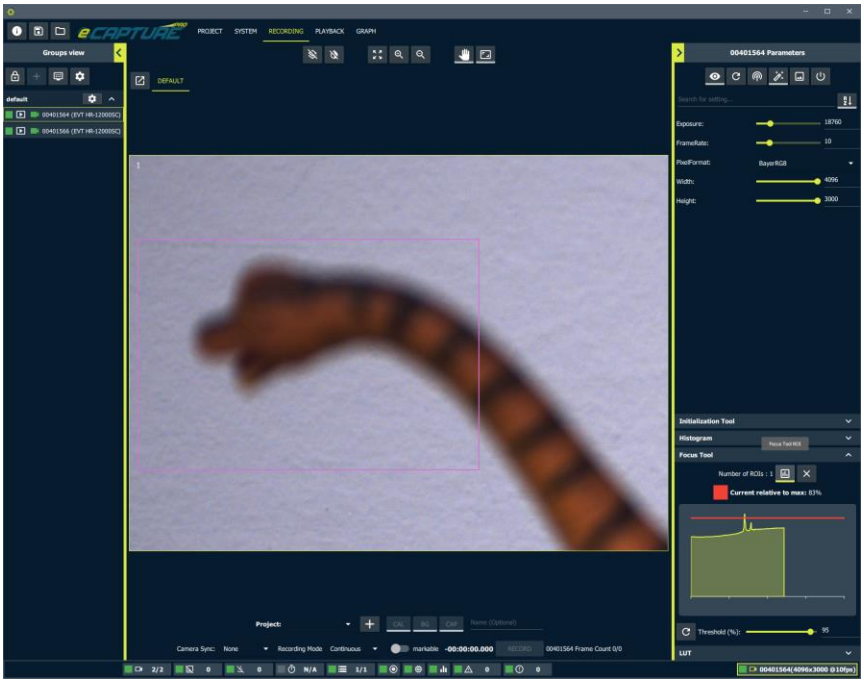
Move the lens to one extreme of it's travel and reset the plot history.

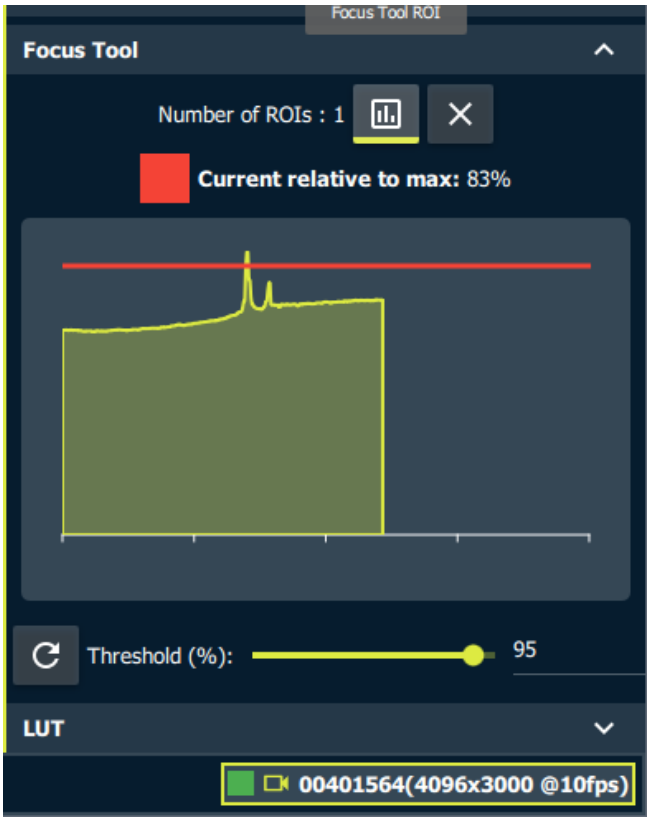

PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Groups view
DEFAULT
00401564 Parameters
Exposure:
FrameRate:
PixelFormat:
Width:
Height:
Initialization Tool
Histogram
Focus Tool
Number of ROIs : 1
Current relative to max: 69%
Threshold (%):
LUT
Project:
Camera Sync:
Recording Mode
Continuous
00401564 Frame Count 0/0


Focus Tool
Number of ROIs : 1
Current relative to max: 69%
Threshold (%):
95
LUT
00401564(4096x3000 @10fps)

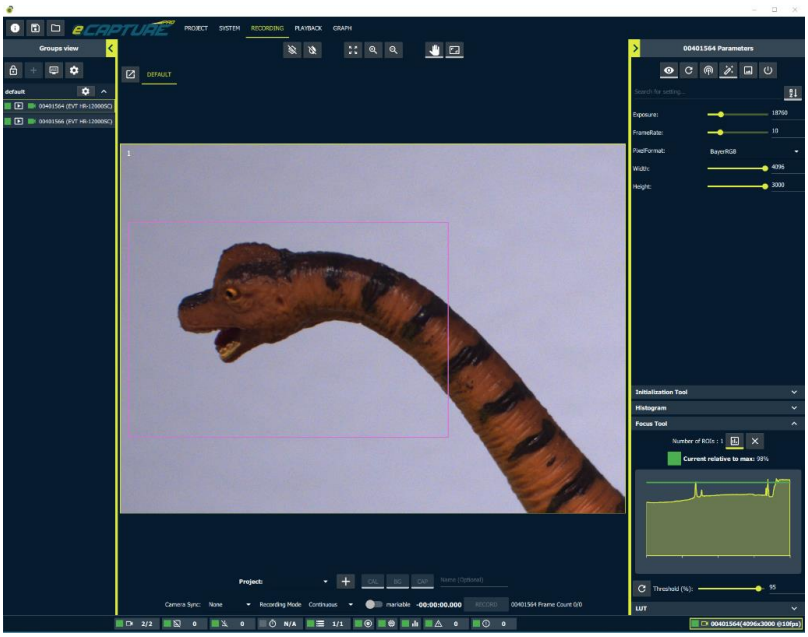


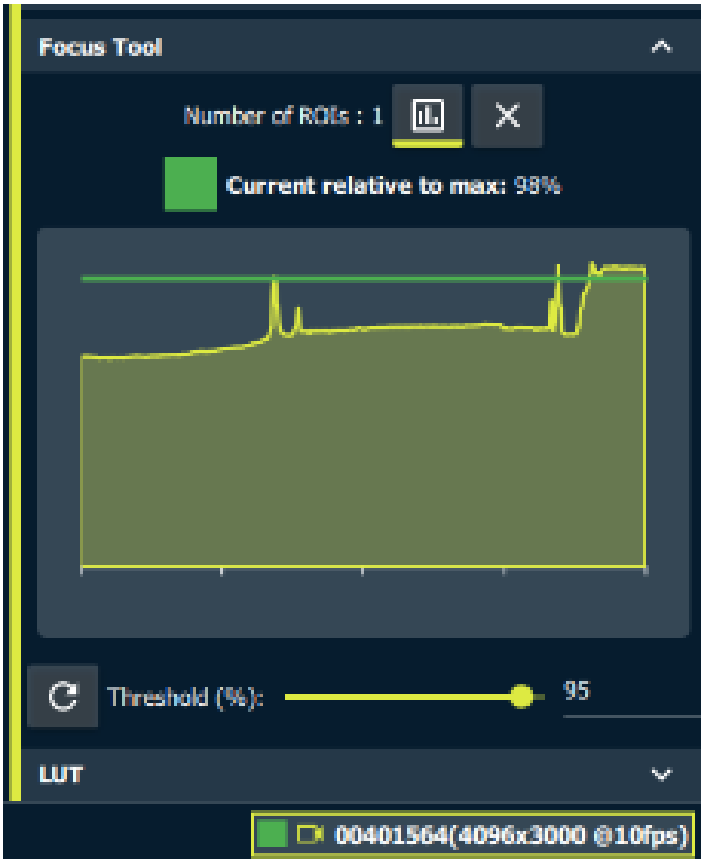
Now slowly move the lens through it's entire focus travel.





The full range of the lens focus has now been plotted. Move the lens back through it's travel until the plotted sharpness value returns to the maximum.


eCAPTURE
PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Groups view
DEFAULT
00401564 Parameters
Exposure:
FrameRate:
PixelFormat:
BayerRG8
Width:
Height:
Initialization Tool
Histogram
Focus Tool
Number of ROIs : 1
Current relative to max: 98%
Threshold (%):
LUT
Project:
Camera Sync:
None
Recording Mode
Continuous
00401564 Frame Count 0/0
00401564(4096x3000 @10fps)


Focus Tool
Number of ROIs : 1
Current relative to max: 98%
Threshold (%):
95
LUT
00401564(4096x3000 @10fps)

Auto Algorithm Region Drawing

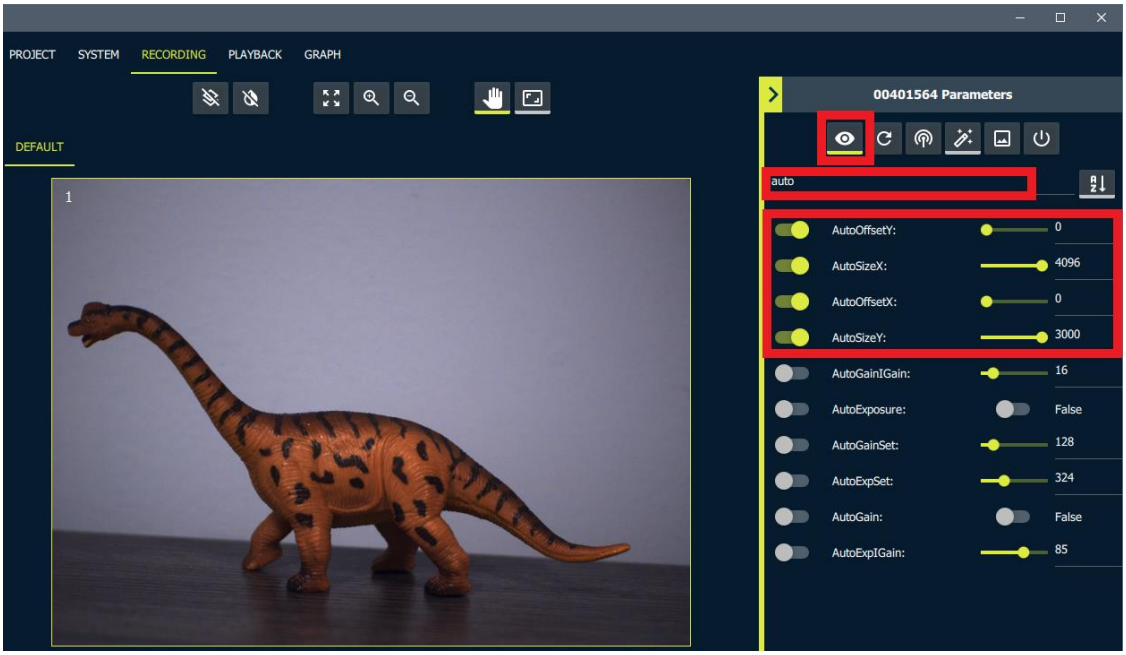
It can be helpful to set an auto algorithm region of interest by drawing the region of interest directly on the live stream. It can also be helpful visualize a previously set region of interest as an overlay on the live stream.

The auto algorithm region of interest applies to the following auto algorithms: Auto Exposure, Auto Gain, and Auto White Balance.

Start by adding the auto algorithm regions settings to the list of visible settings.

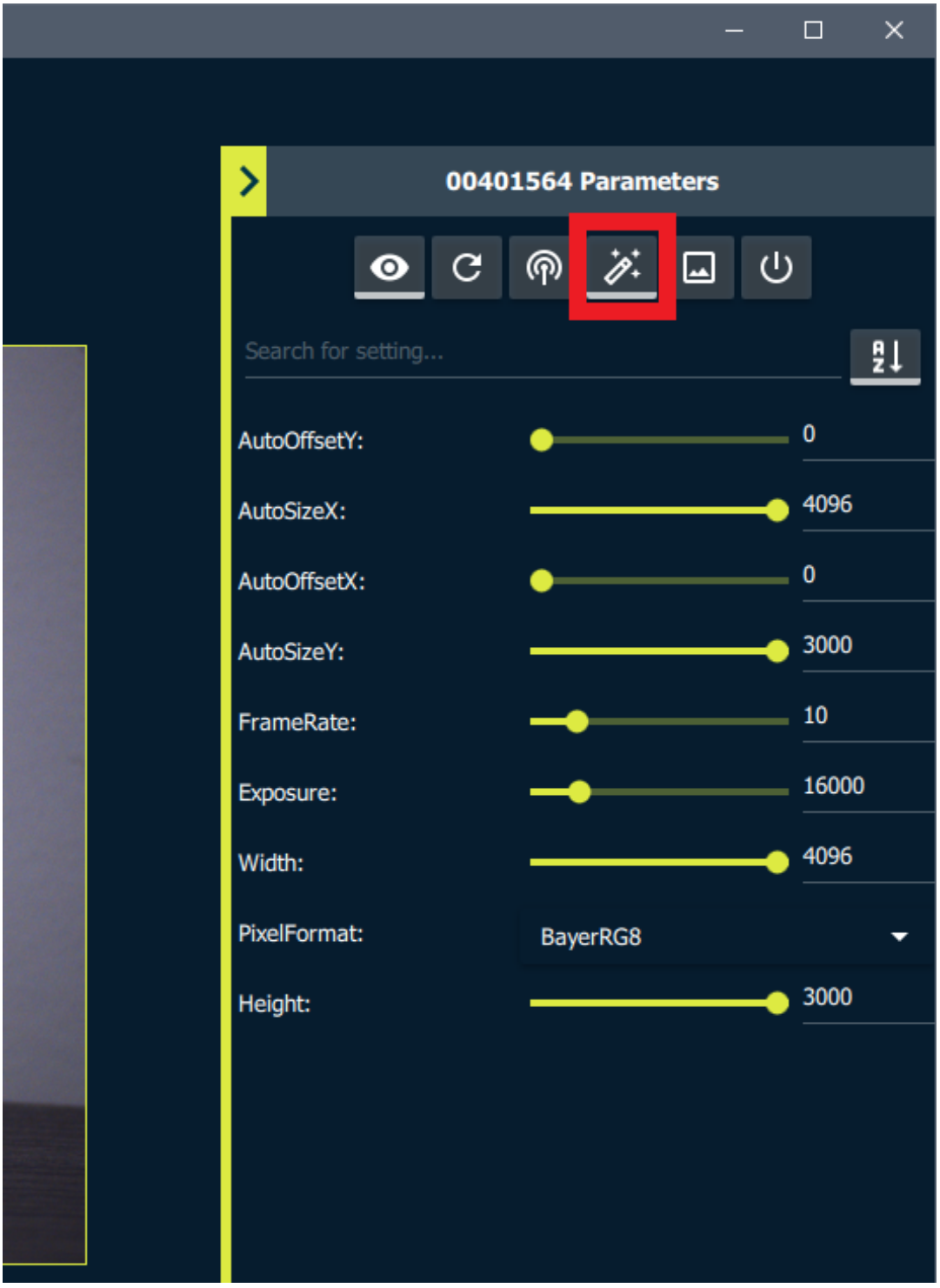
Turn on all the settings selection mode (Eyeball button), search “auto” in the search bar and then add the following settings:

- AutoOffsetY
- AutoOffsetX
- AutoSizeY
- AutoSizeX



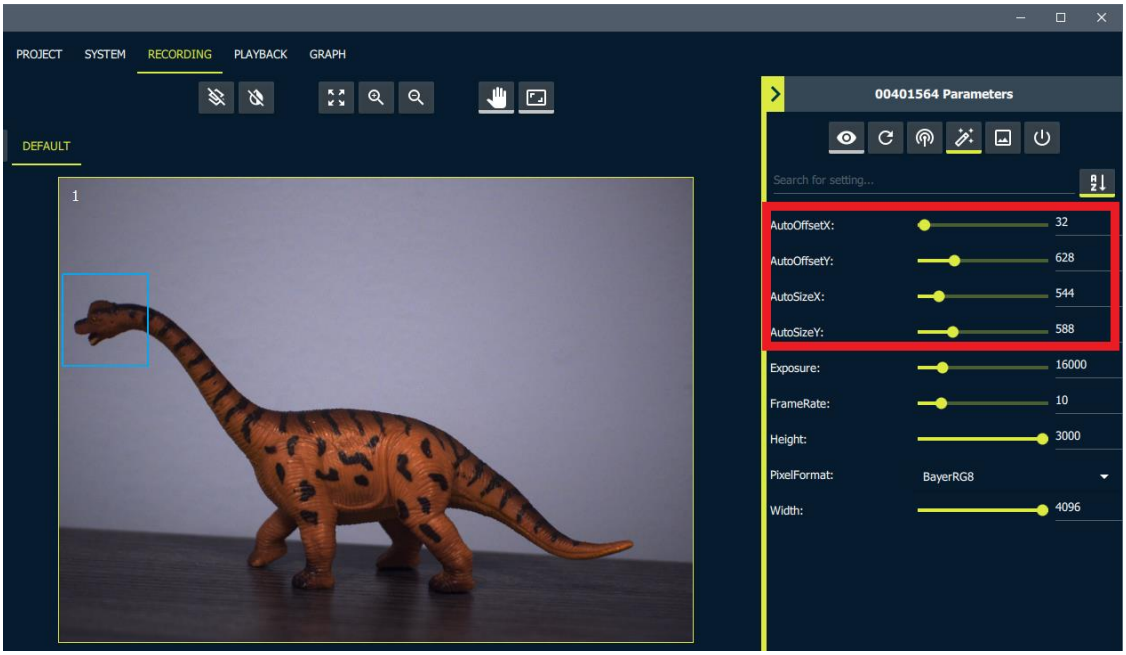
Now return to the regular settings mode (de-select the eyeball button).

Turn on the “Auto Algorithm Region Selection Tool”



Now when we click and drag on the live stream we will be drawing the auto algorithm region of interest. Go ahead and draw a region on the live stream.

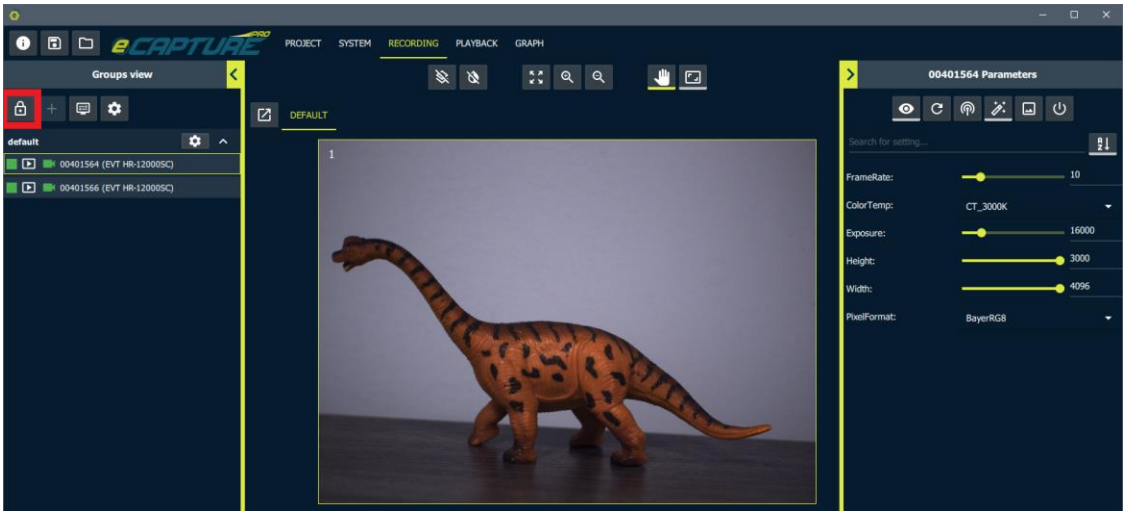
The drawn region is now displayed on the live stream and the auto algorithm region parameters have been applied.


PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
DEFAULT
1
00401564 Parameters
Search for setting...
AutoOffsetX:
32
AutoOffsetY:
628
AutoSizeX:
544
AutoSizeY:
588
Exposure:
16000
FrameRate:
10
Height:
3000
PixelFormat:
BayerRG8
Width:
4096

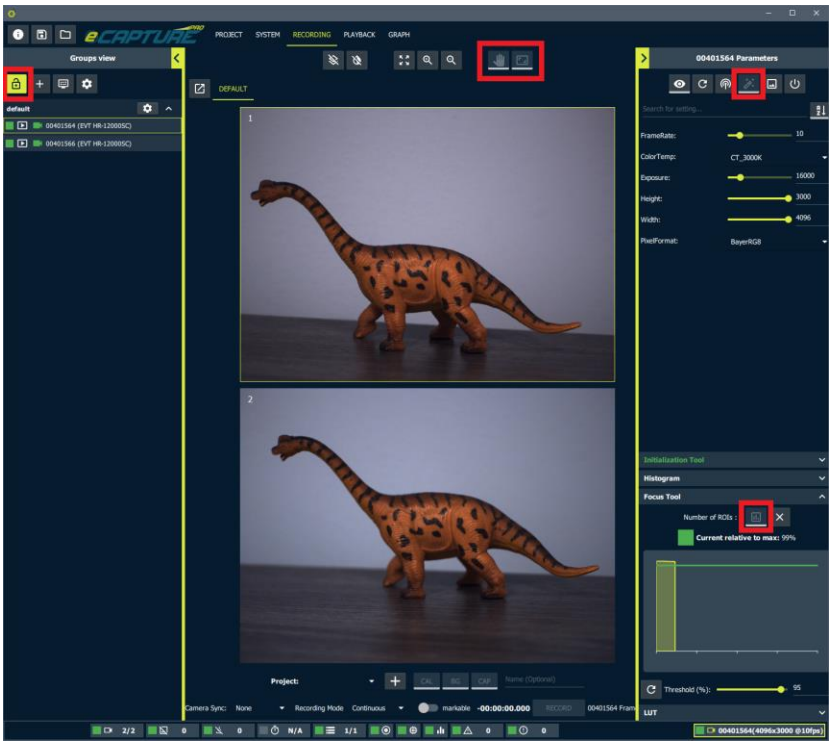
Display Groups

On systems with multiple cameras it can be helpful to group them into separate Display Groups.

First unlock the Display Groups to edit them.

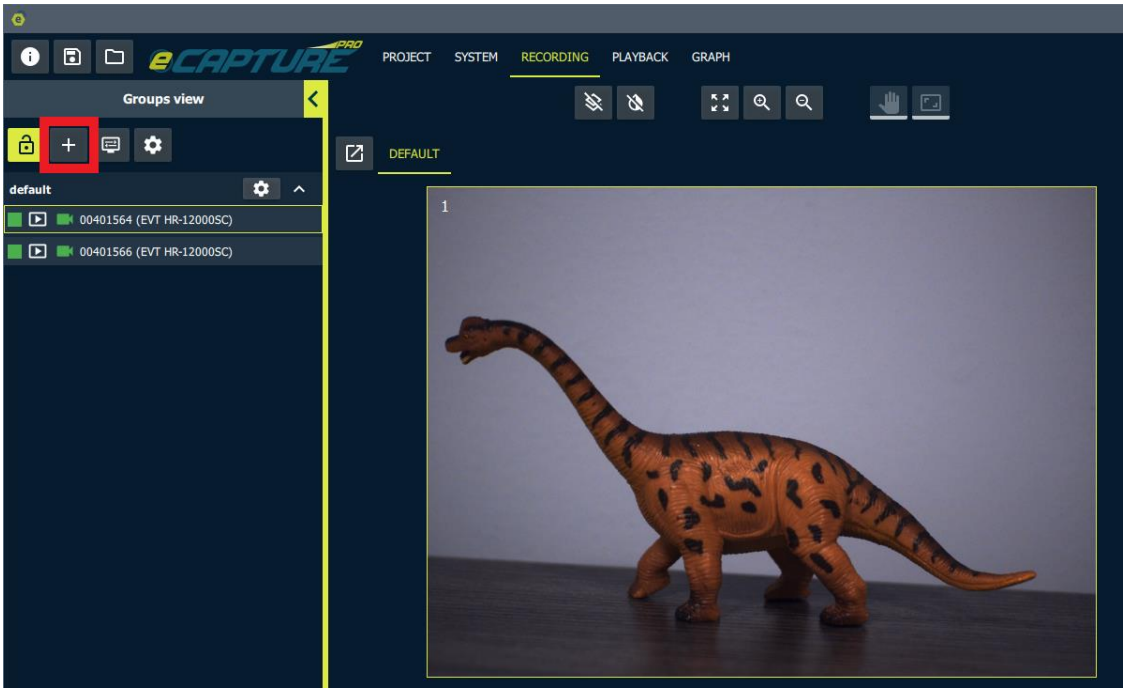


Note that when the Display Groups are unlocked the other options for click and drag on the live stream actions are disabled.

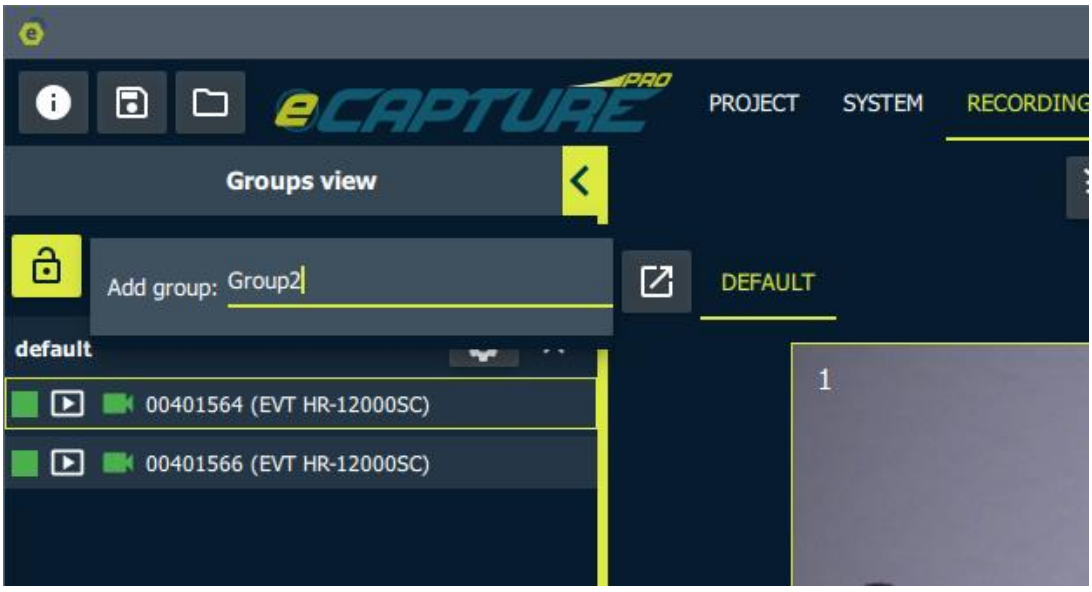


Adding groups

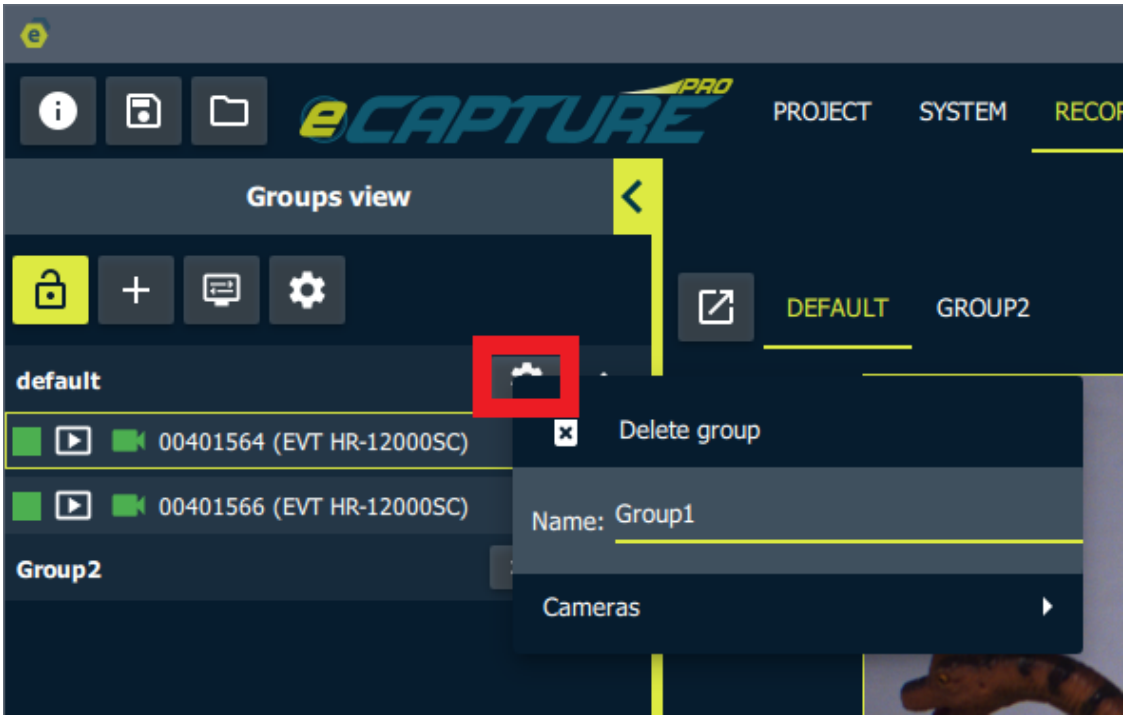
Click the button to add an additional display group



Name the new group



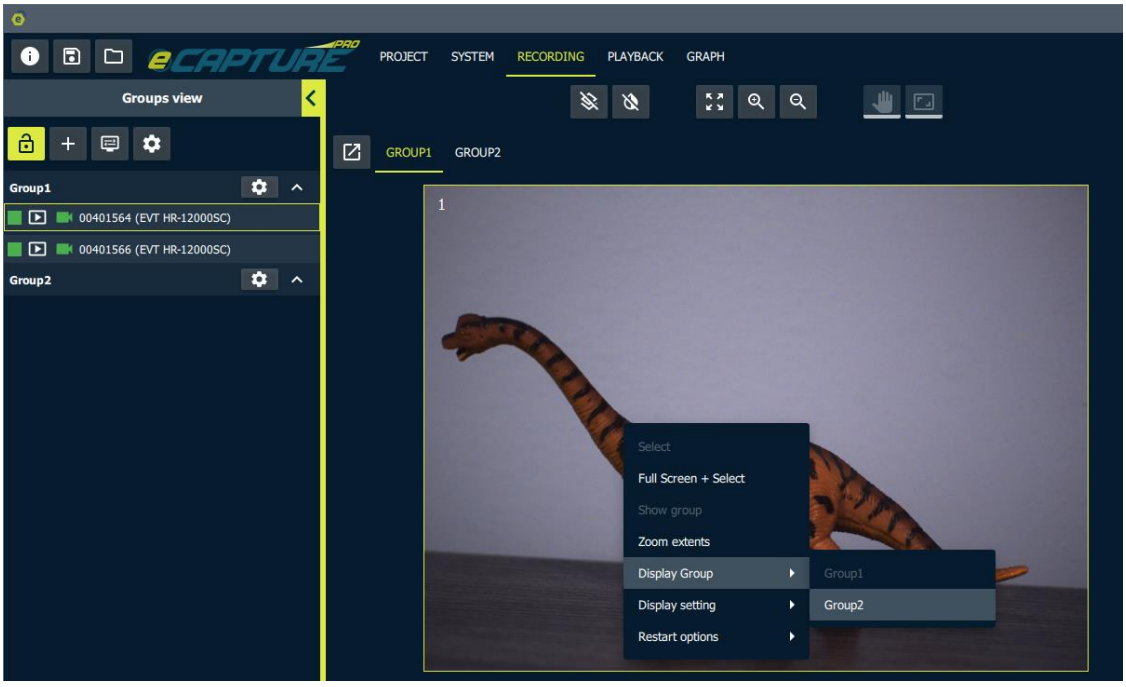
It’s also possible to rename existing groups. Go ahead and rename the “default” group.



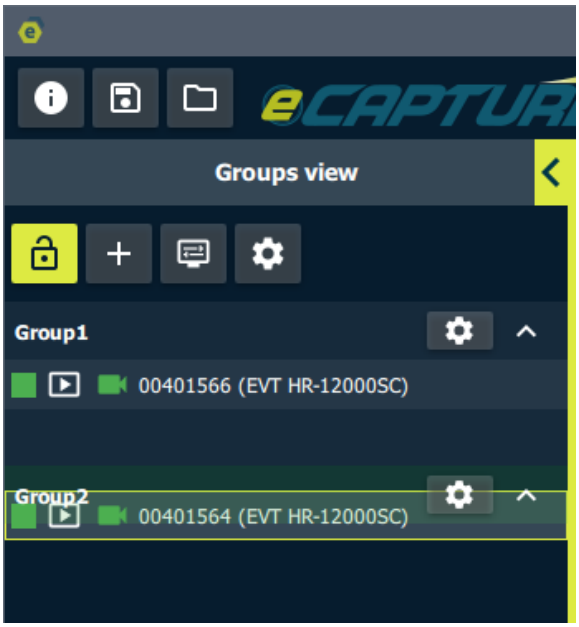
Changing groups

There are two ways to move cameras between groups.

1) **Right click** on the live stream and select a new group.



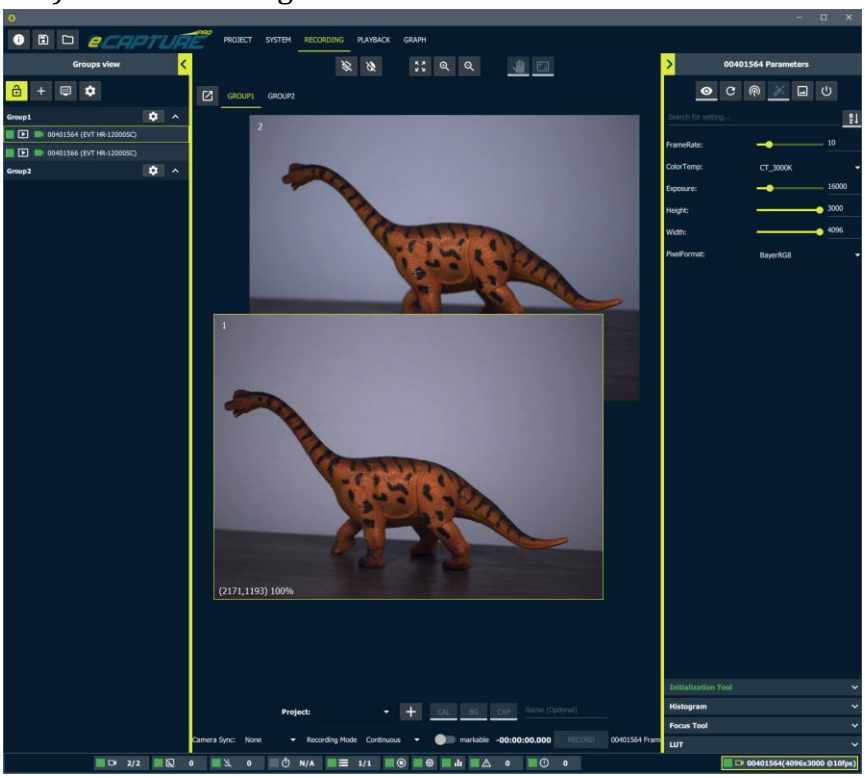
2) Click and drag a camera line item between groups.



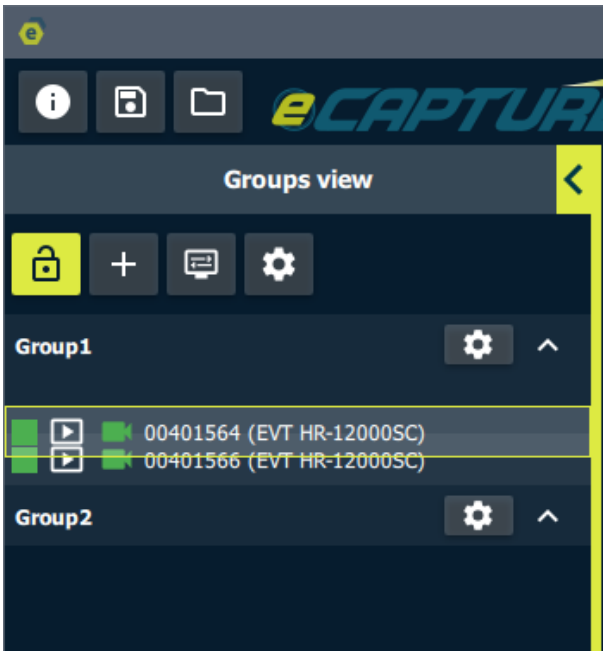
Moving within a group

There are two ways to move cameras within a group.

1) Click and drag the live stream to the desired location.

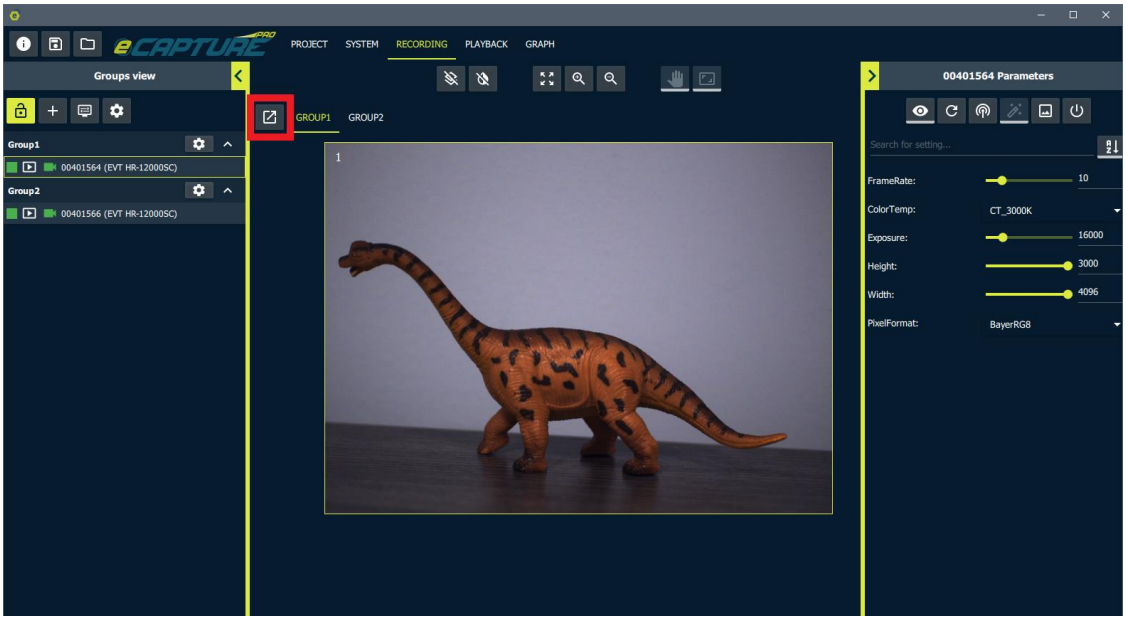


2) Click and drag the camera line item within it's group.

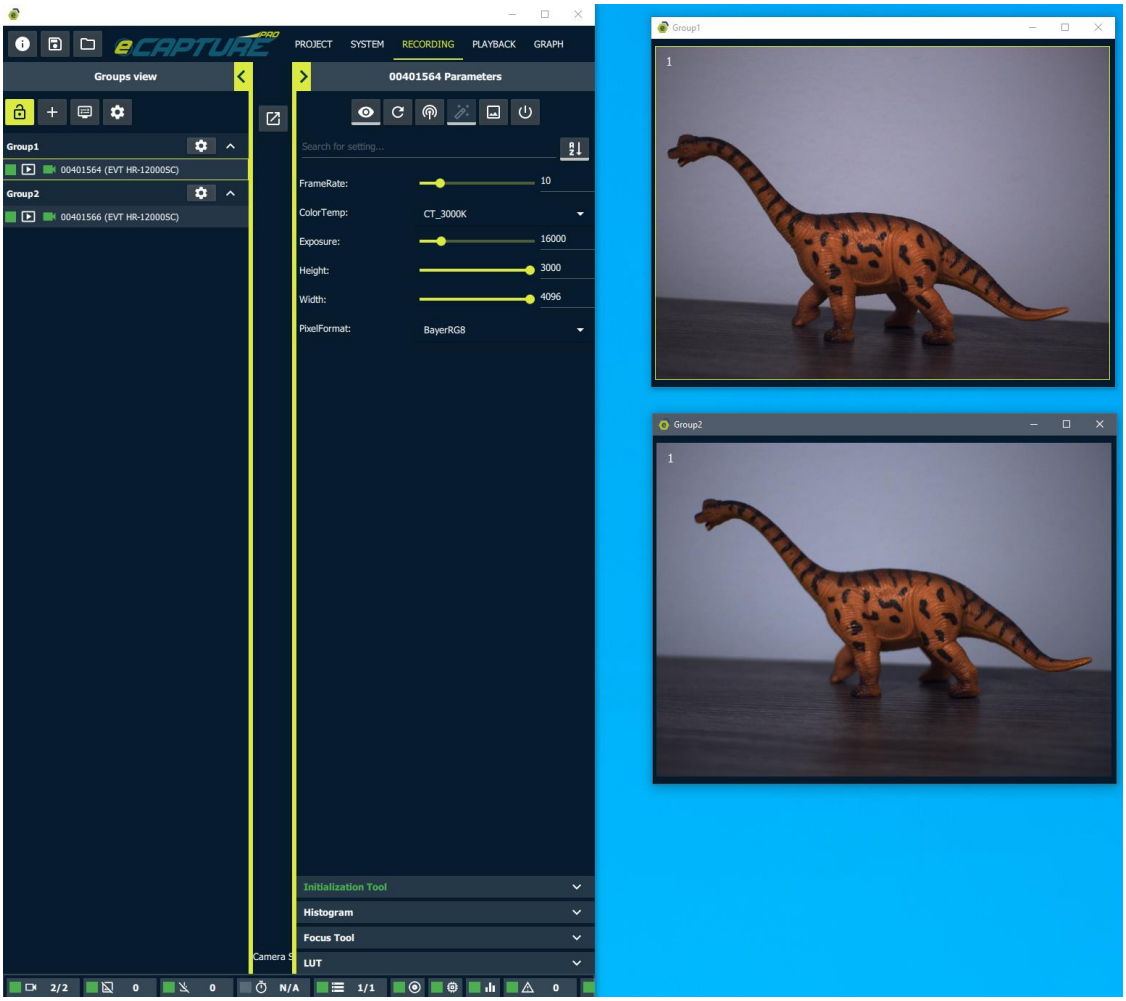


Detaching groups

It may be desireable to view the live streams for multiple groups at the same time. This is possible by detaching one or more of the display groups. Clicking the detach button will open the currently selected display group in a new window.



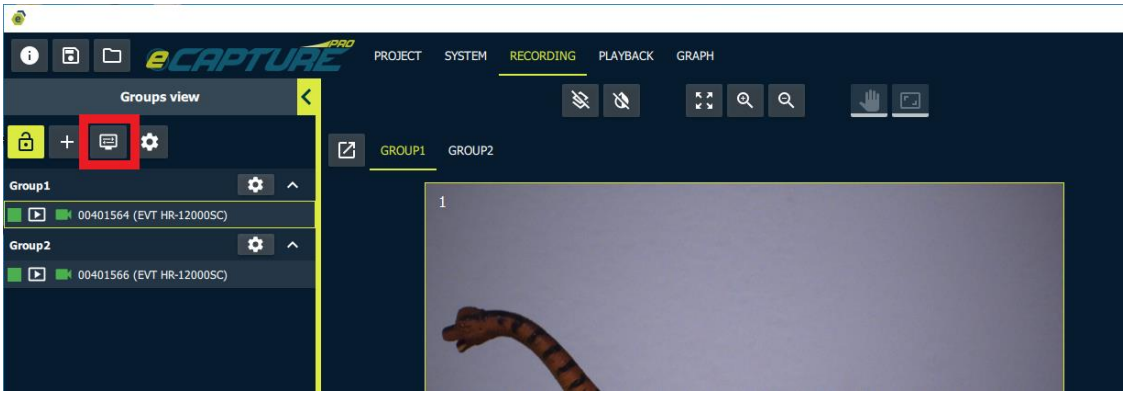
Here are both groups detached.

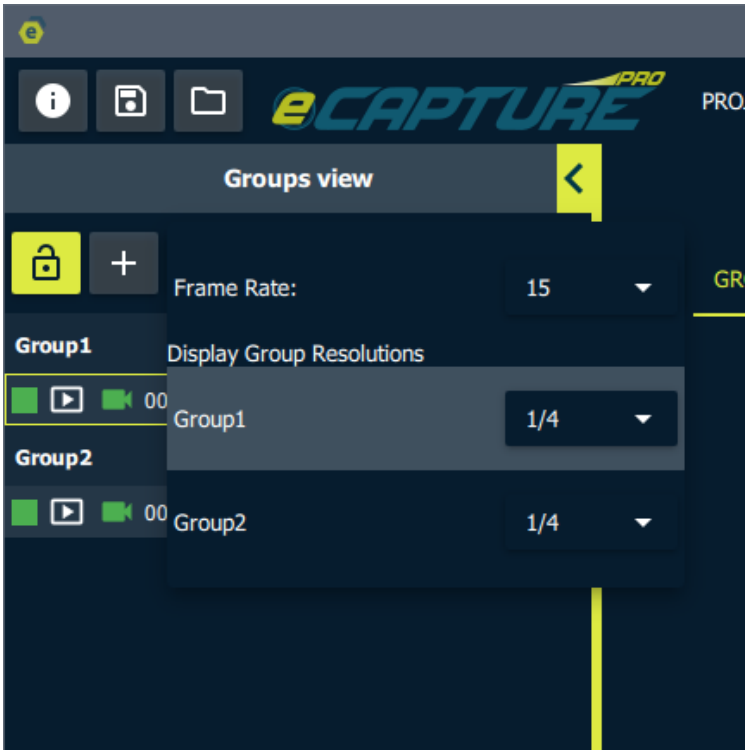


To reattach them just close the detached window.

Thumbnail Resolution and Frame Rate

It is possible to set the display resolution fraction and frame rate. These are independent of the actual camera resolution and frame rate.





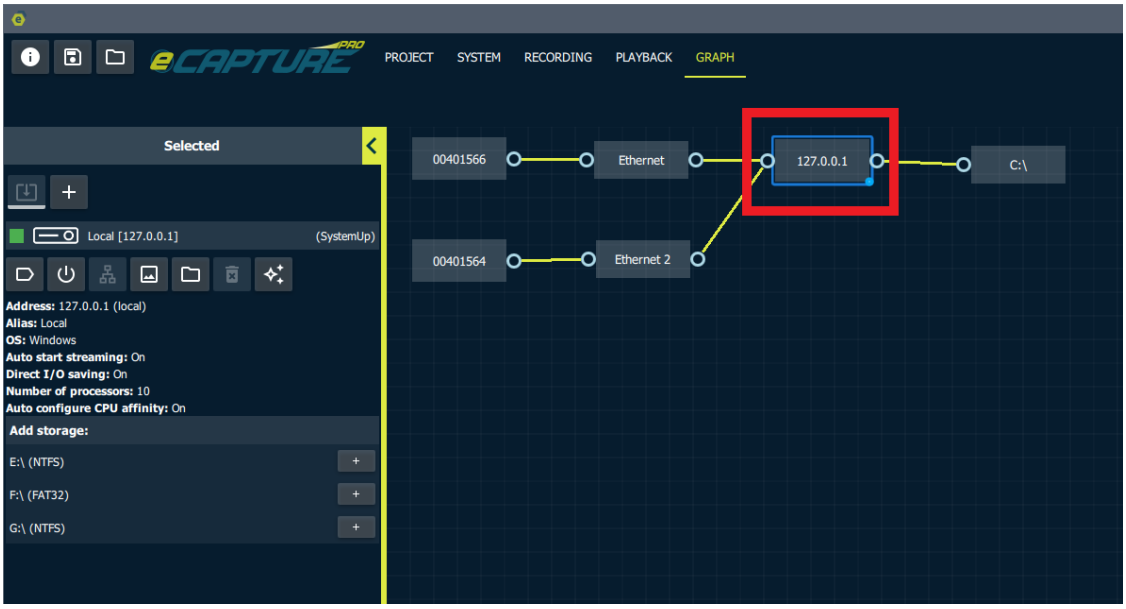
It is recommended to use a reduced display frame rate and resolution in order to reduce CPU usage. This is especially important when you have a large number of cameras. In some cases using a large display resolution with many cameras will lead to dropped frames as a result of high CPU use.

High display resolutions for color cameras are especially resource intensive as the images must be de-bayered before they are displayed.

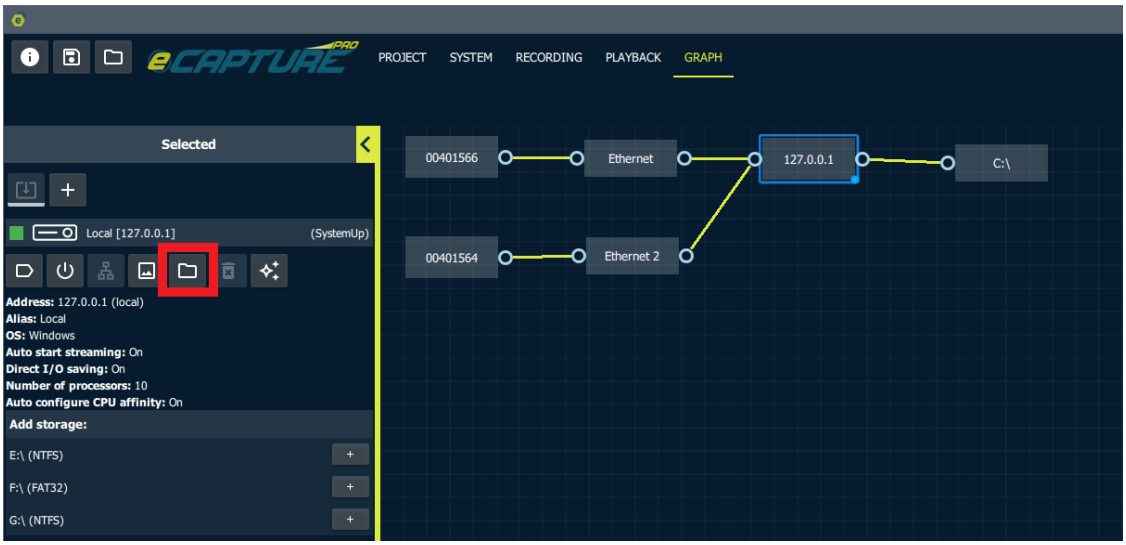
Direct I/O Image Saving

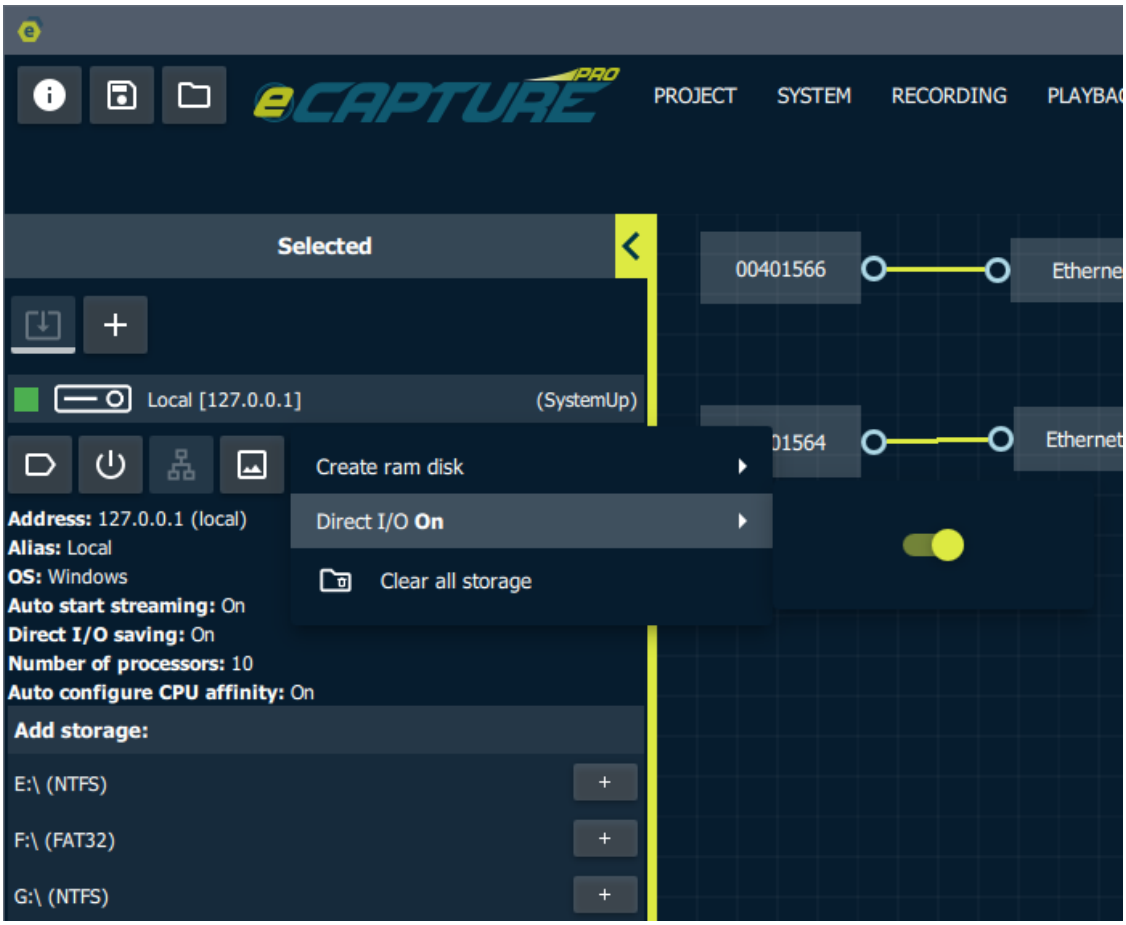
Enabling / Disabling Direct I/O

To Enable/Disable Direct I/O for a server select the server in the System Graph.



The Direct I/O setting is available under Storage Settings





Direct I/O is highly recommended for high bandwidth saving. However in order to use Direct I/O to save images, the size of the image in bytes must be divisible by 512. The size of the image is determined by the height, width and the pixel format.

Image size is calculated as follows: ImageSize = Width * Hight * BytesPerPixel
For example:

- Width = 4096
- Height = 3000
- Pixel Format = BayerRG8 (8 bit per pixel = 1 byte per pixe)

In the above case ImageSize = 4096* 3000 * 1 = 12288000

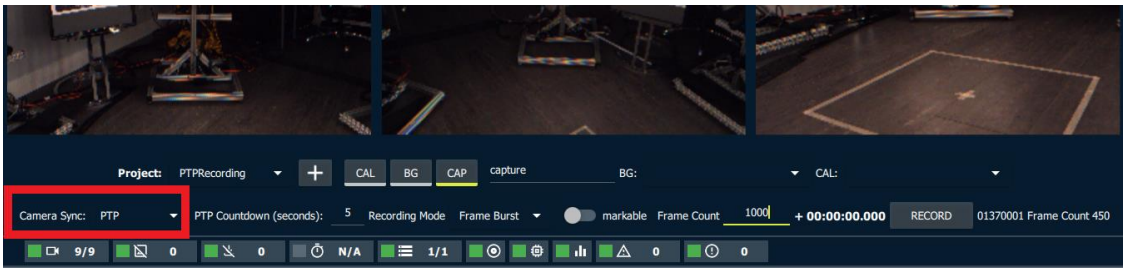
Since 12288000 is divisible by 512 we can use direct I/O.

If your current resolution produces an image size that is not divisible by 512 then you must change the width or height such that the overall image size is divisible by 512.

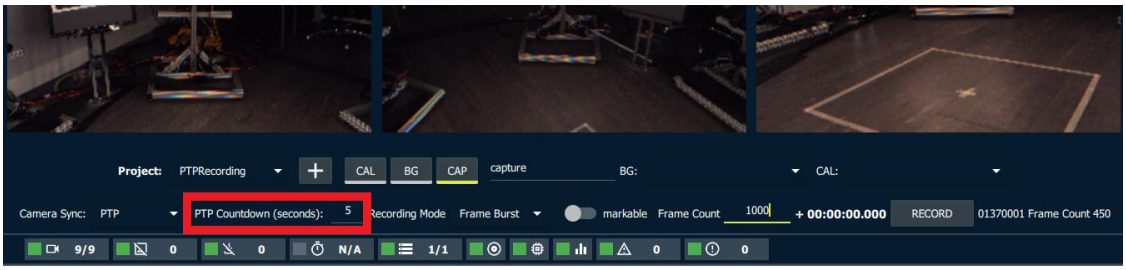
PTP Synchronization

If the cameras are all connected to a common PTP (Precision Time Protocol) clock source such as a PTP enabled ethernet switch then we can use PTP to synchronize image capture between the cameras.

Configure the cameras to synchronize prior to recording by setting the Camera Sync recording setting to PTP.

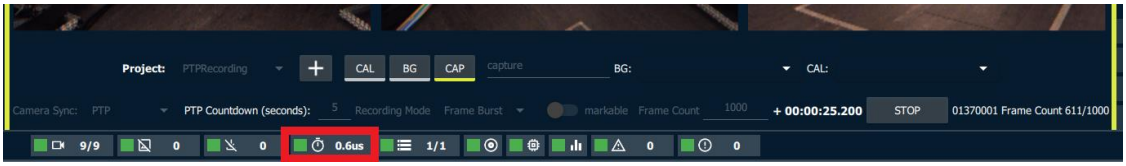


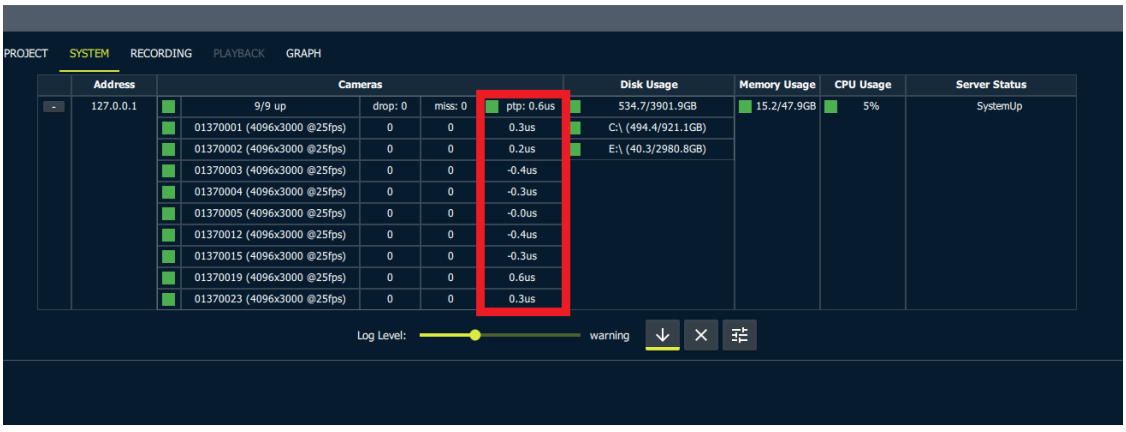
There is also a Ptp Countdown setting. This is used to give the cameras time to synchronize prior to starting recording.



When we click the record button, the countdown from 5 seconds will begin and when the countdown reaches 0 the synchronized recording will begin.

Once the recording has started you will notice that PTP offset information is visible in the global status bar as well as the status table.





Once the recording has been completed the cameras will be returned to regular un-synchronized streaming and the PTP offset information will no longer be present.

Hardware Synchronization

Hardware synchronization is supported via the camera's GPI (General Purpose Input) pins. The options for input pins are:

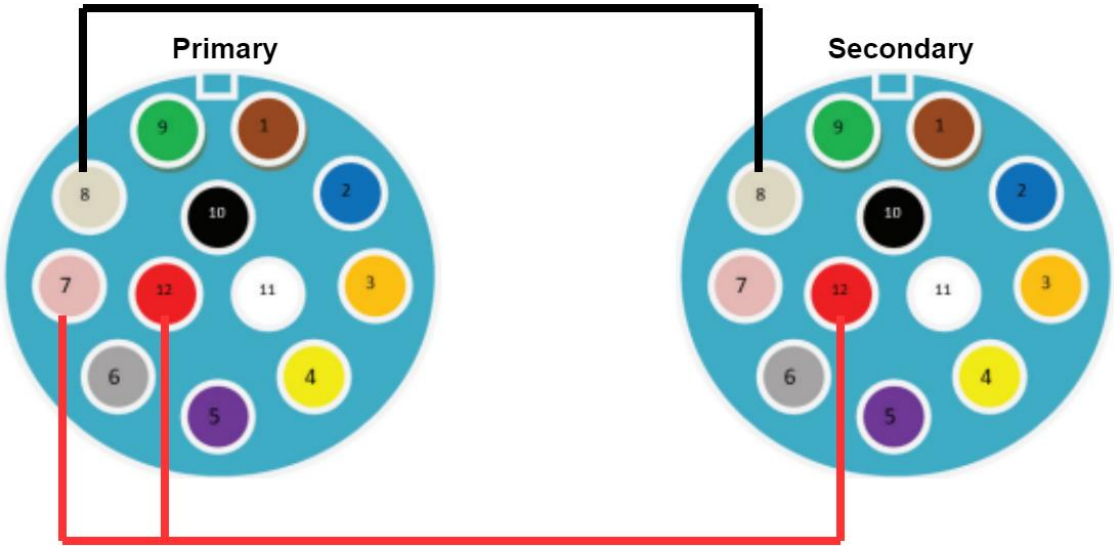
- GPI_2
- GPI_4
- GPI_5

For a demonstration of this we will use GPI_4 to trigger the camera and the Test Generator signal output on GPO_0 (TTL Output) from one camera to trigger both itself and another camera.

This demonstration assumes area scan cameras with firmware 3.xx

Wiring is as follows:

Connect primary and secondary ground. Connect primary GPO_0, primary GPI_4, and secondary GPI_4.

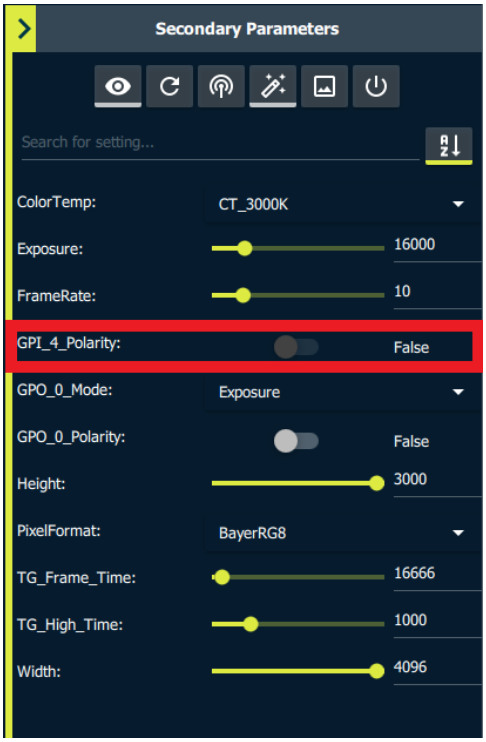


Then add the following settings to the visible settings list:

- GPO_0_Mode
- GPO_0_Polarity
- GPI_4_Polarity
- TG_High_Time
- TG_Low_Time

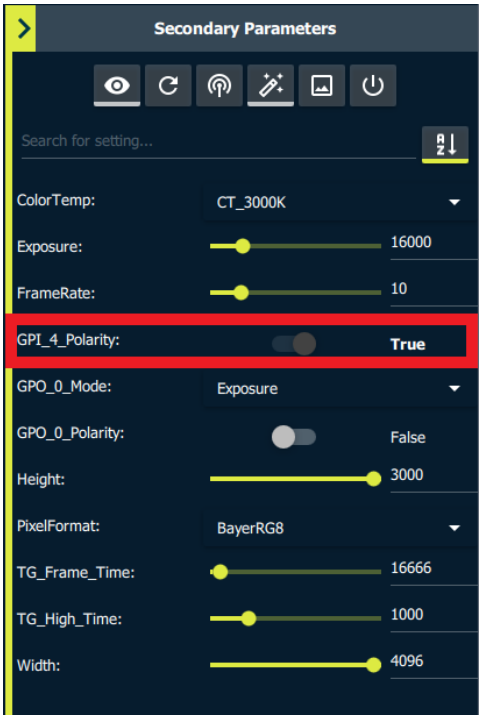
To confirm that the wiring is correct, set the primary camera's GPO_0_Mode to GPO and set GPO_0_Polarity to **False**. Now note the the value of the read-only node GPI_4_Polarity, it should be **False**.

Also note the secondary camera's GPI_4_Polarity, it too should be **False**.



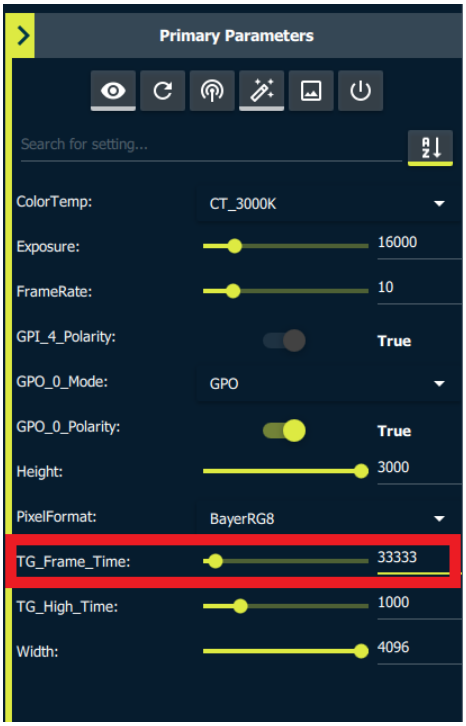
Now change the primary camera's GPO_0_Polarity to **True**. Note that the value of the GPI_4_Polarity should now also change to **True**.

The secondary camera's GPI_4_Polarity should now be **True** too.



We have now confirmed the wiring is correct.

For this hardware trigger synchronization test we will be using the test generator to trigger the camera at 30fps. This means that we will set the primary camera's TG_Frame_Time to 33333 (microseconds).

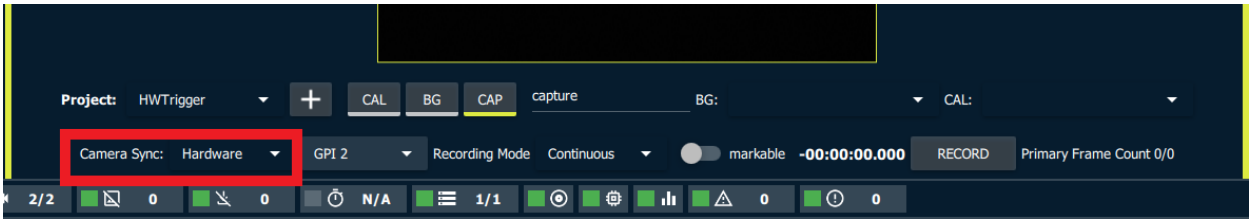


Ensure that both camera's have an exposure time less than 33333 (TG_Frame_Time).

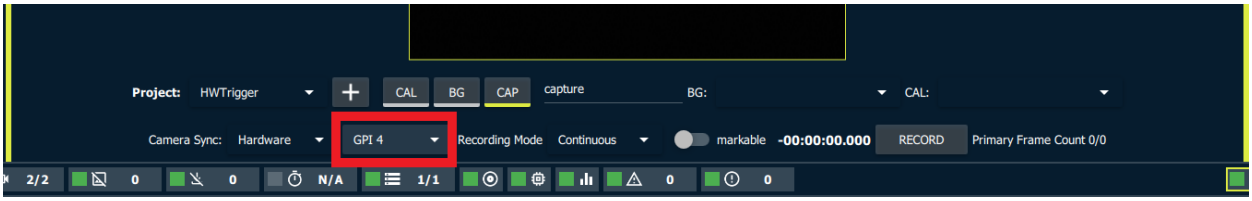
For the primary camera, once we begin recording we will flip the GPO_0_Mode from GPO to Test_Generator so that the Test Generator Pulse signal will be output on GPO_0 and trigger both camera's through their respective GPI_4 pin.

ECapturePro will take care of configuring the GPI_4 pin correctly.

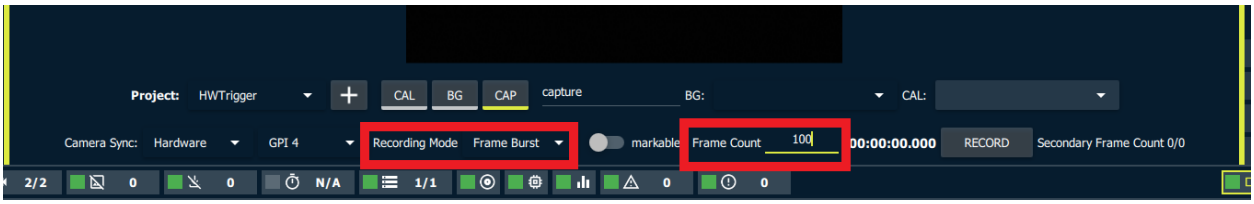
Now in the recording controls set **Camera Sync** to **Hardware**.



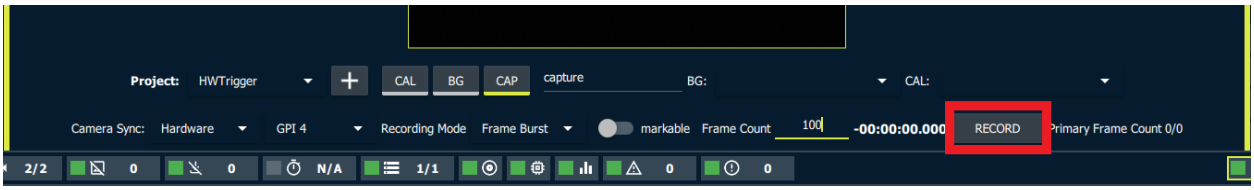
Set the GPI option to **GPI_4**



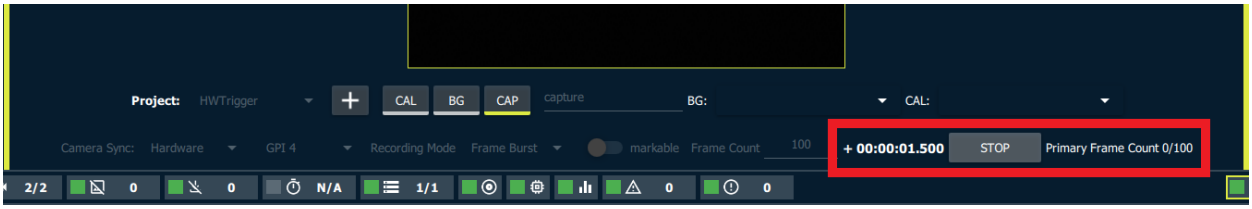
Set the **Recording Mode** to **Frame Burst** and the **Frame Count** to **100**



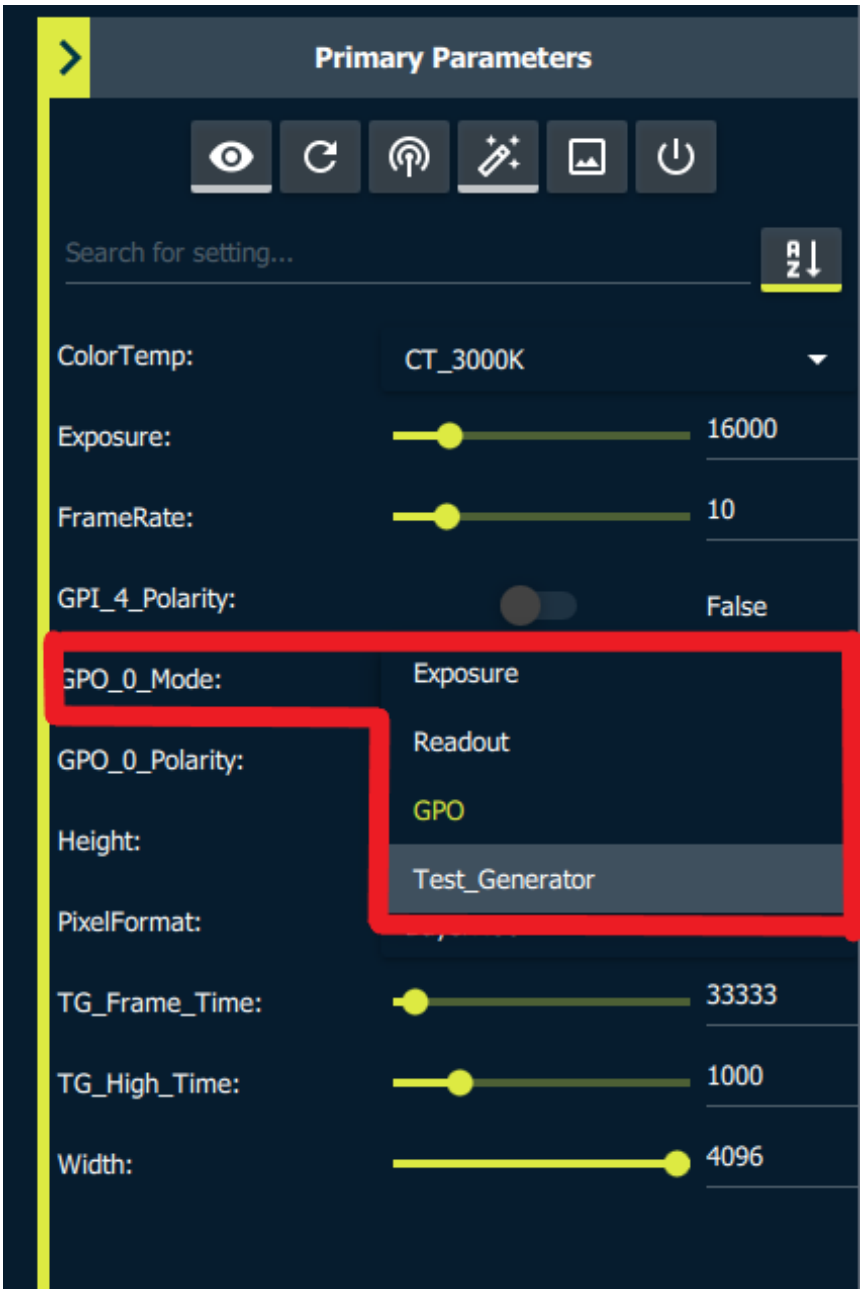
We will now start the recording.



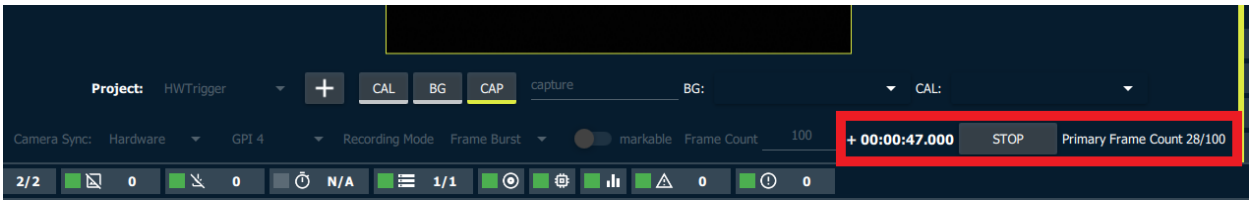
Note that once recording starts we do not expect the cameras to be capturing any images since they are not yet being triggered.



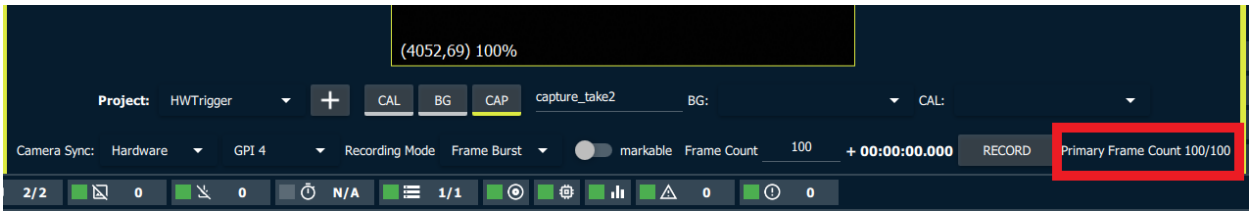
To start triggering both cameras with the primary camera's test generator, set the GPO_0_Mode of the primary camera to Test_Generator.



Both cameras should then start acquiring images.

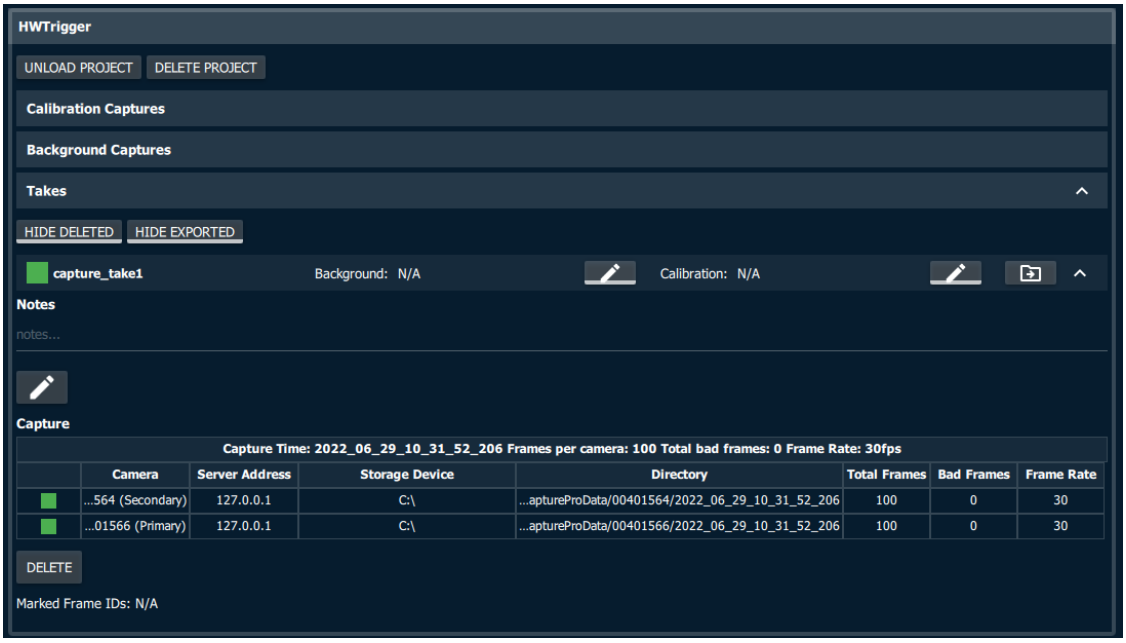


Now the recording will proceed until both cameras have captured 100 images.



After the end of recording is completed the cameras will be put back in “Free Running” (not hardware triggered mode) and will resume streaming.

After the recording has completed view the resulting take in the Project Management tab.

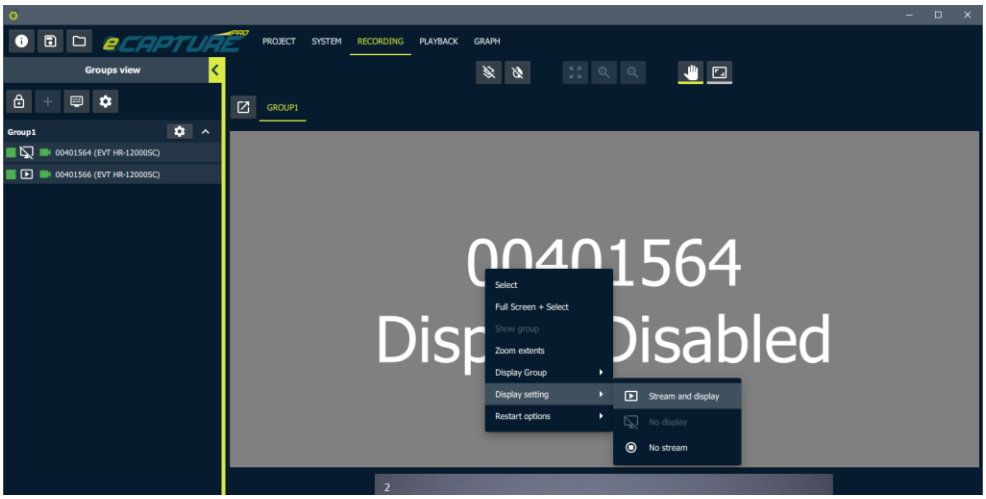


Stream and Display Settings

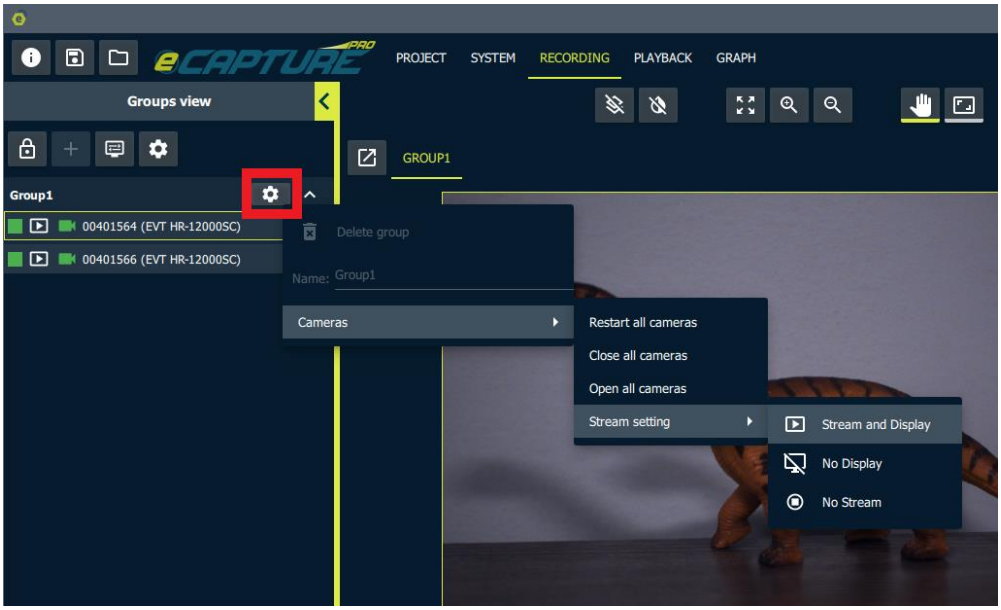
There are three options for stream/display settings:

- Stream and Display
- No Display (But still stream)
- No Stream

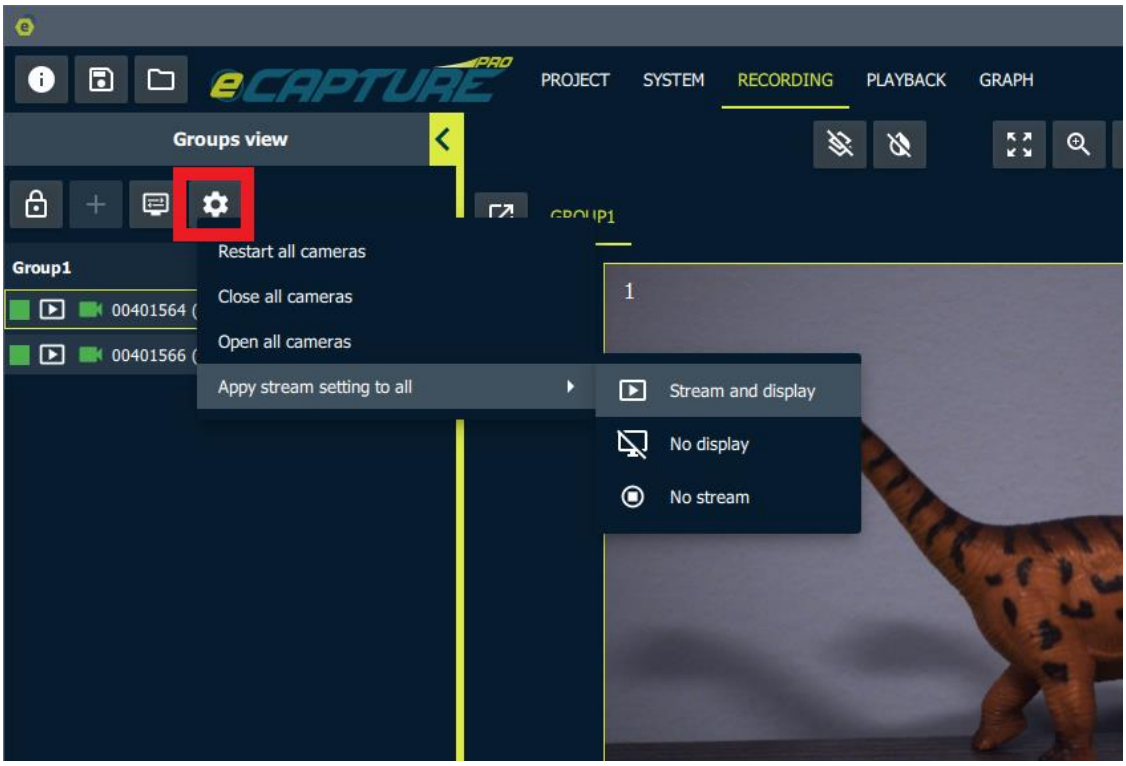
These settings can be applied individually to a camera. This feature can be found by right clicking on a cameras live stream.



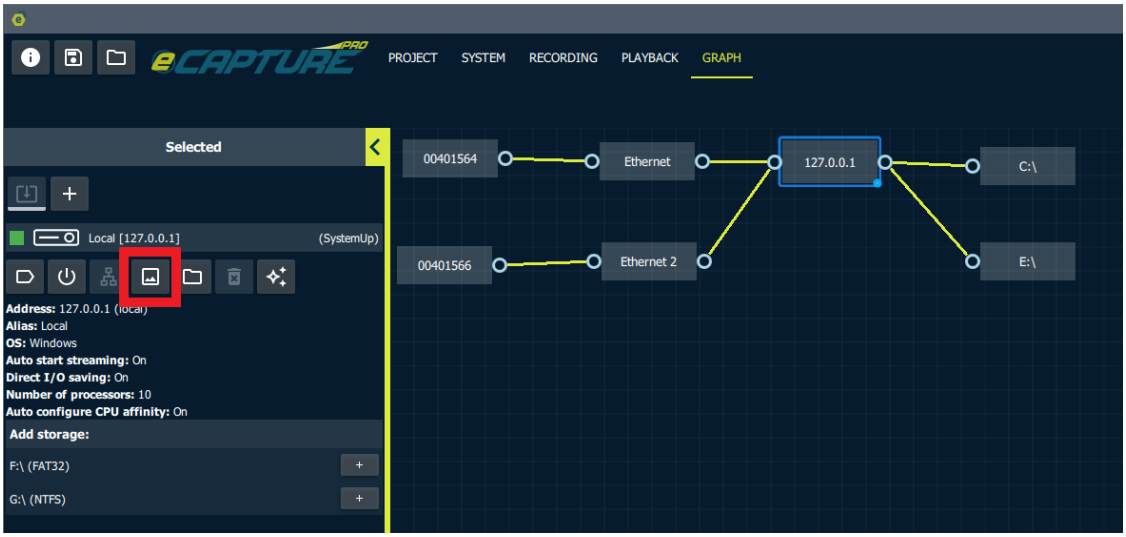
To a group of cameras.



To all cameras.

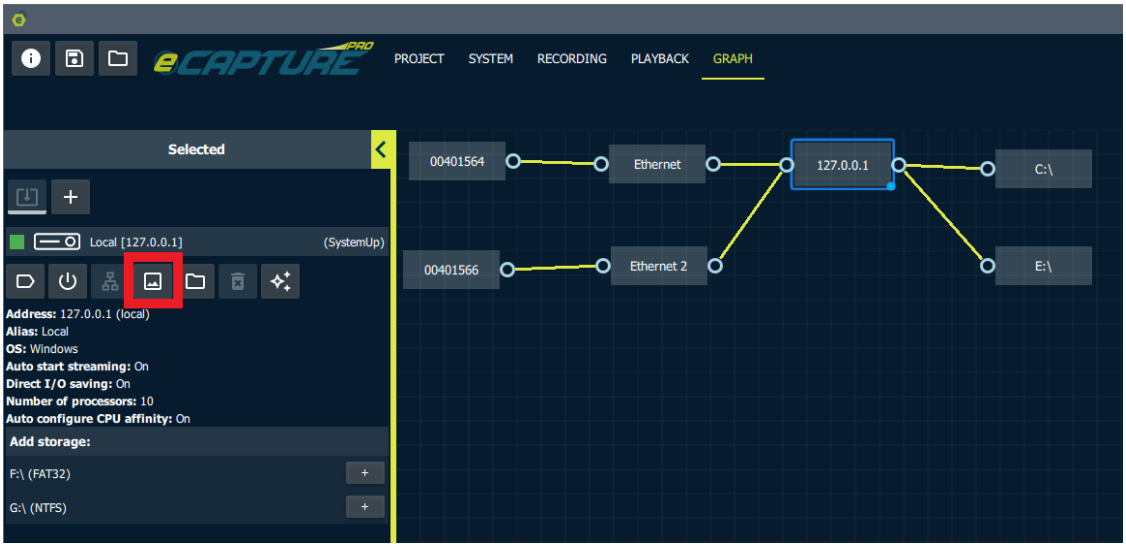


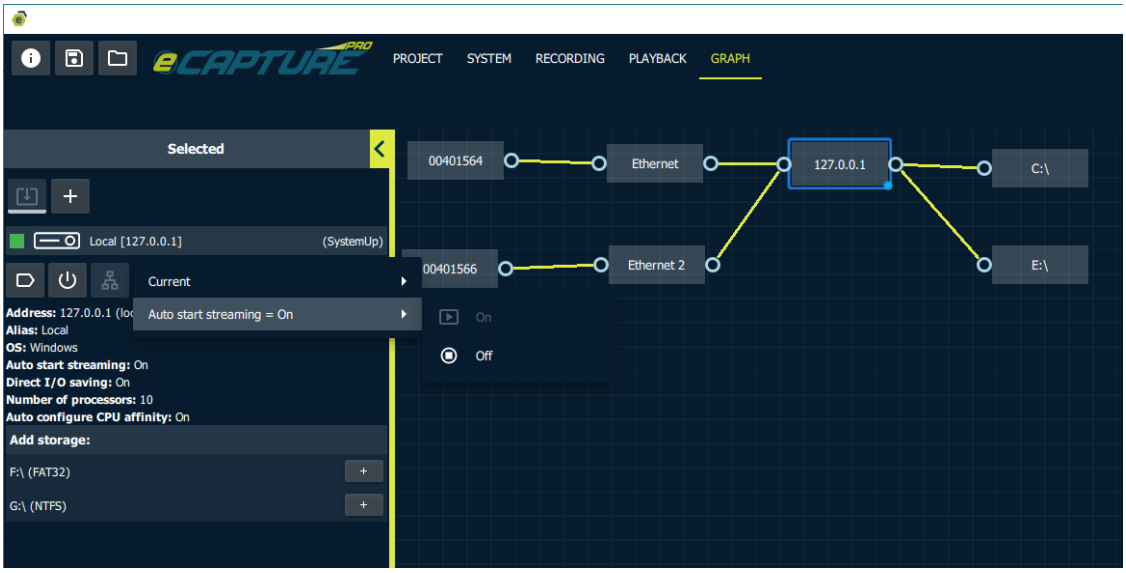
To all cameras withing a server.



Auto Stream Setting

By default when eCapturePro starts all cameras will be configured to stream automatically. This can be disabled on a per server basis by turing off “Auto start streaming”


PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Selected
Local [127.0.0.1]
(SystemUp)
Address: 127.0.0.1 (local)
Alias: Local
OS: Windows
Auto start streaming: On
Direct I/O saving: On
Number of processors: 10
Auto configure CPU affinity: On
Add storage:
F:\ (FAT32)
G:\ (NTFS)
00401564
Ethernet
127.0.0.1
C:\
00401566
Ethernet 2
E:\


PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Selected
Local [127.0.0.1]
(SystemUp)
Current
Auto start streaming = On
On
Off
Address: 127.0.0.1 (lo
Alias: Local
OS: Windows
Auto start streaming: On
Direct I/O saving: On
Number of processors: 10
Auto configure CPU affinity: On
Add storage:
F:\ (FAT32)
G:\ (NTFS)
00401564
Ethernet
127.0.0.1
C:\
00401566
Ethernet 2
E:\

Restarting Cameras

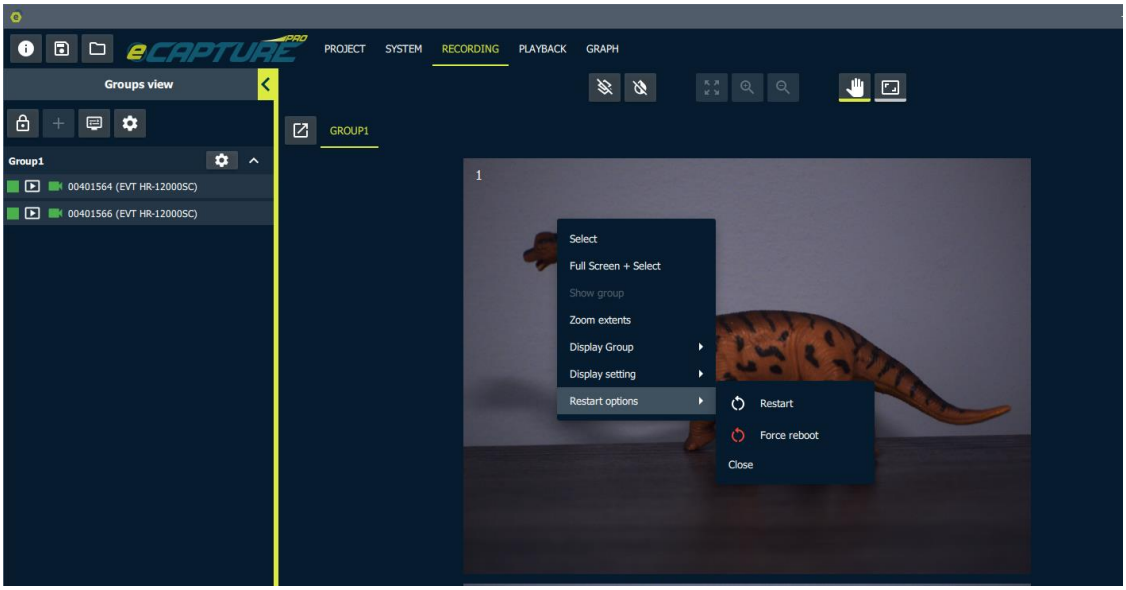
The following actions can be applied to a camera:

- Restart (Close and Open)
- Force Reboot (Force a camera to reboot)
- Close
- Open

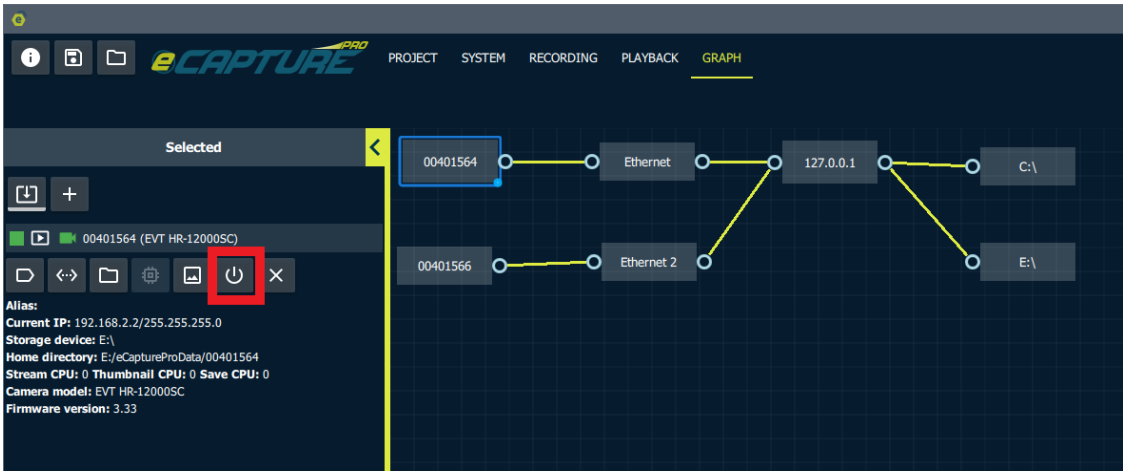
Note: Closed cameras will not take place in recordings.
So if you do not want an individual camera to participate in a recording then close it.

Restart actions can be applied to an individual camera.

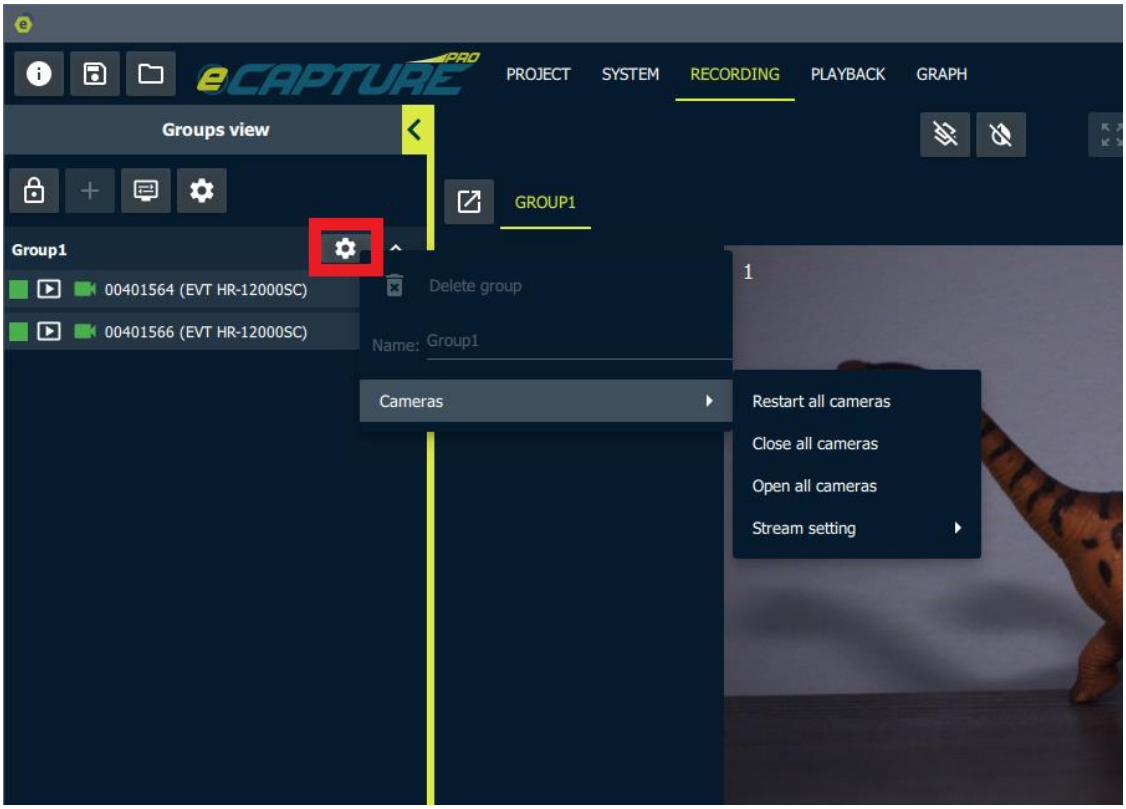
Right click on the live stream.



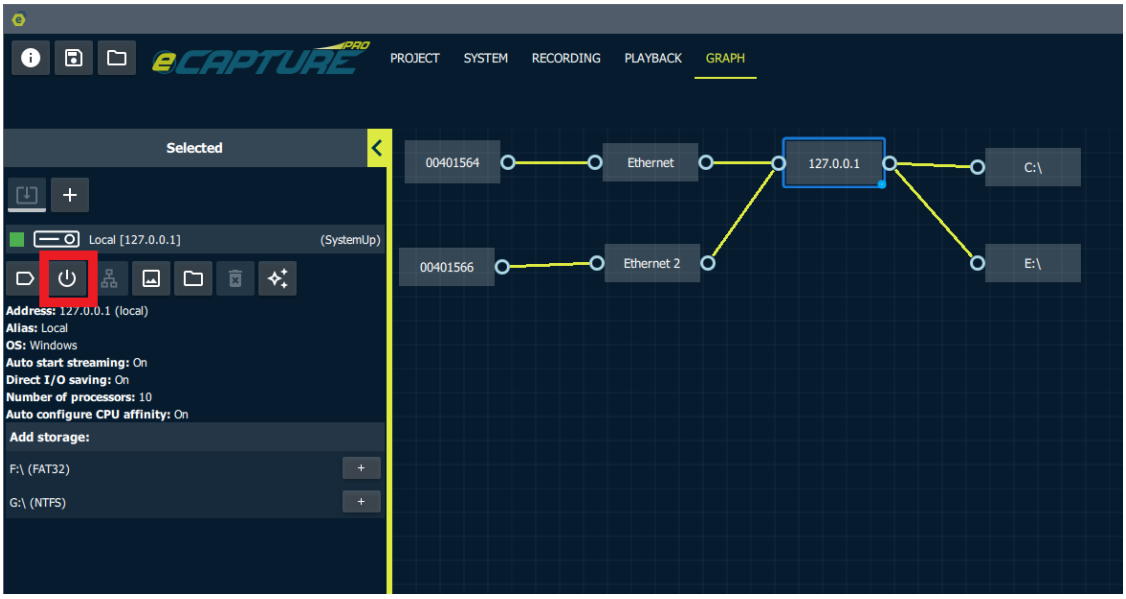
Select camera from the System Graph.



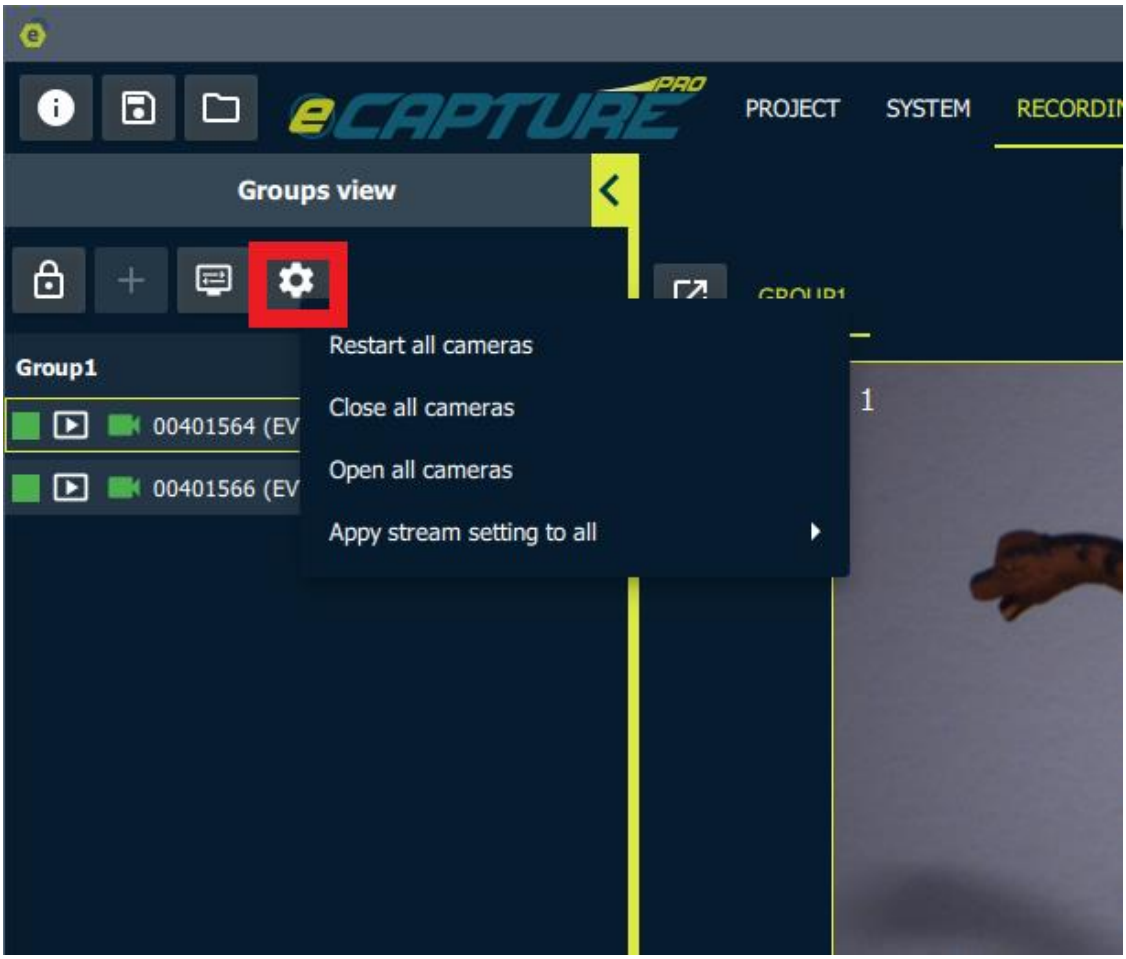
Restart actions can be applied to all cameras in a group.



Restart actions can be applied to all cameras connected to a server.



Restart actions can be applied to all cameras connected to the entire system.



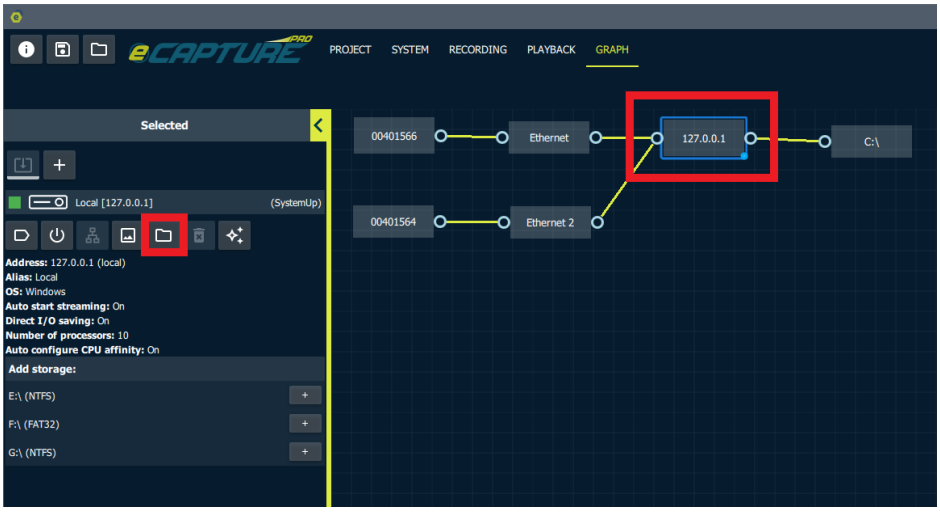
Ram Disks

For testing purposes or for applications that only require saving brief frame bursts a RAM disk can be useful. This is a meant as a temporarily in-memory file system.

Creating

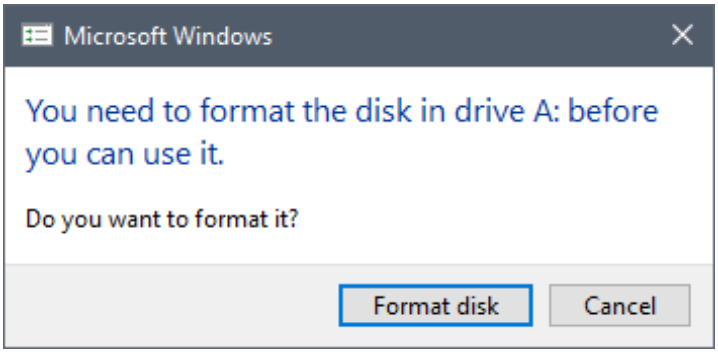
We will create a RAM disk of size 8 GB and map it to A:/

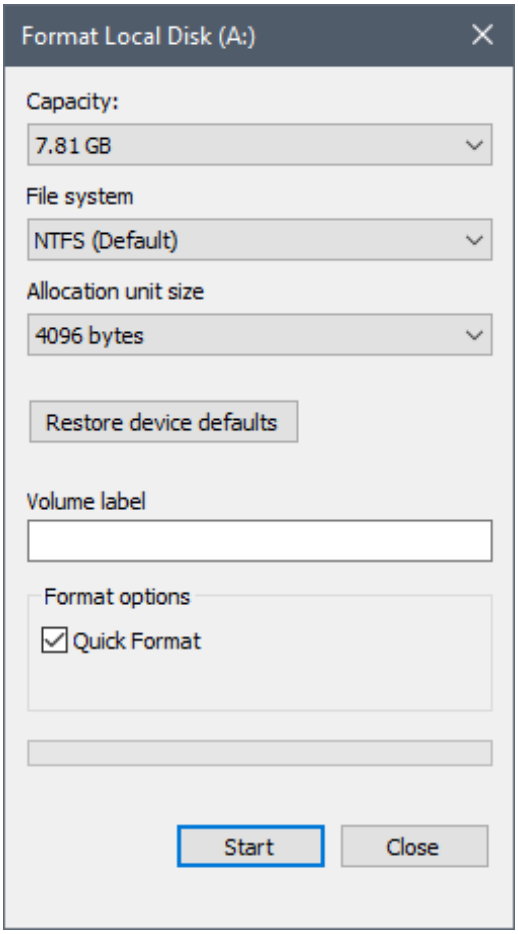
To create a RAM disk select the server in the system graph. Click the Storage Options button.

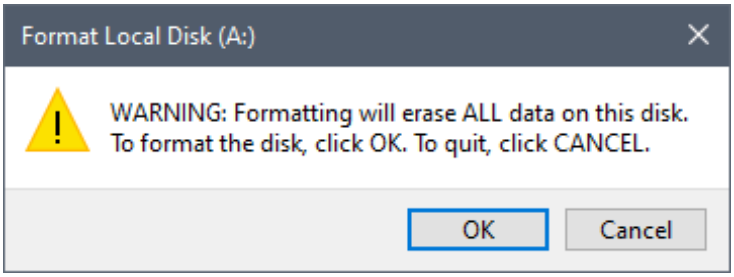


Select **Create Ram Disk**, choose a letter drive to mount the RAM disk file system to and choose a size in MB.

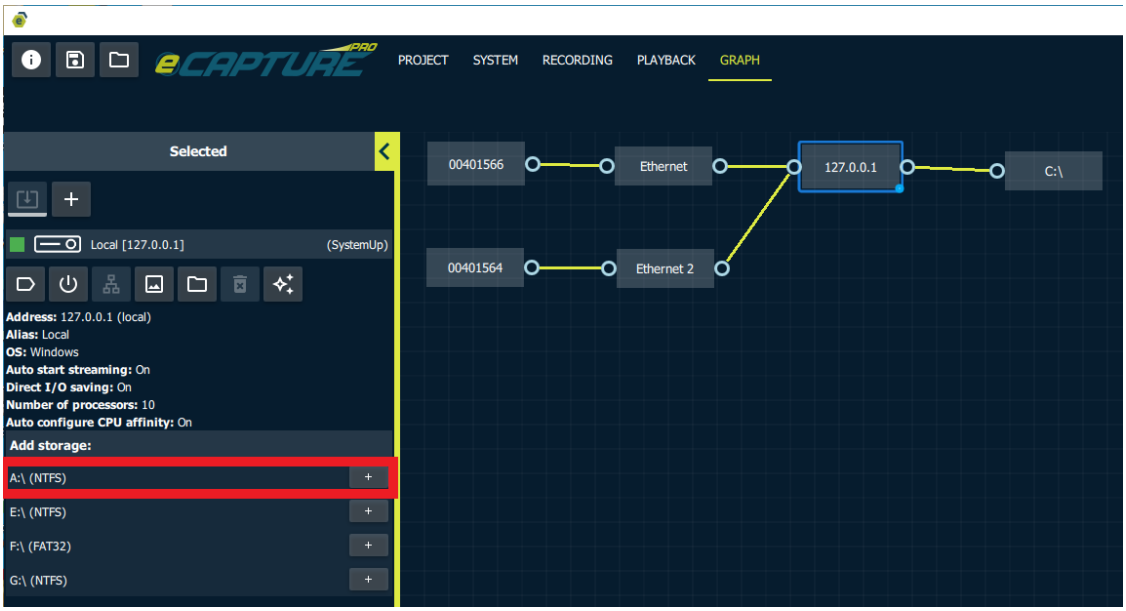
There will now be a series of formatting prompts from the Windows operating system. Choose the default options.



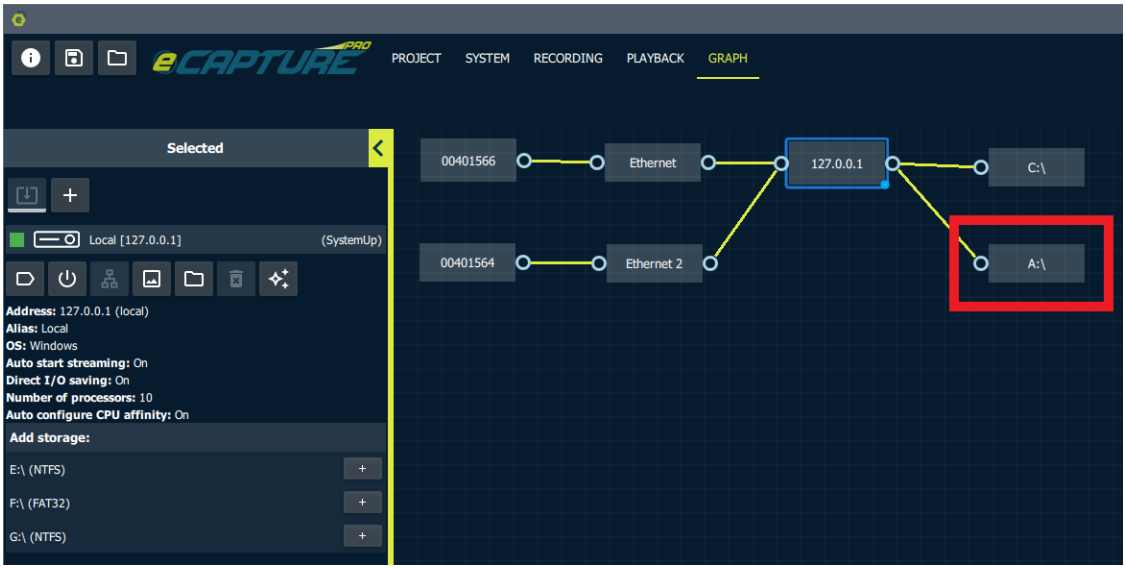




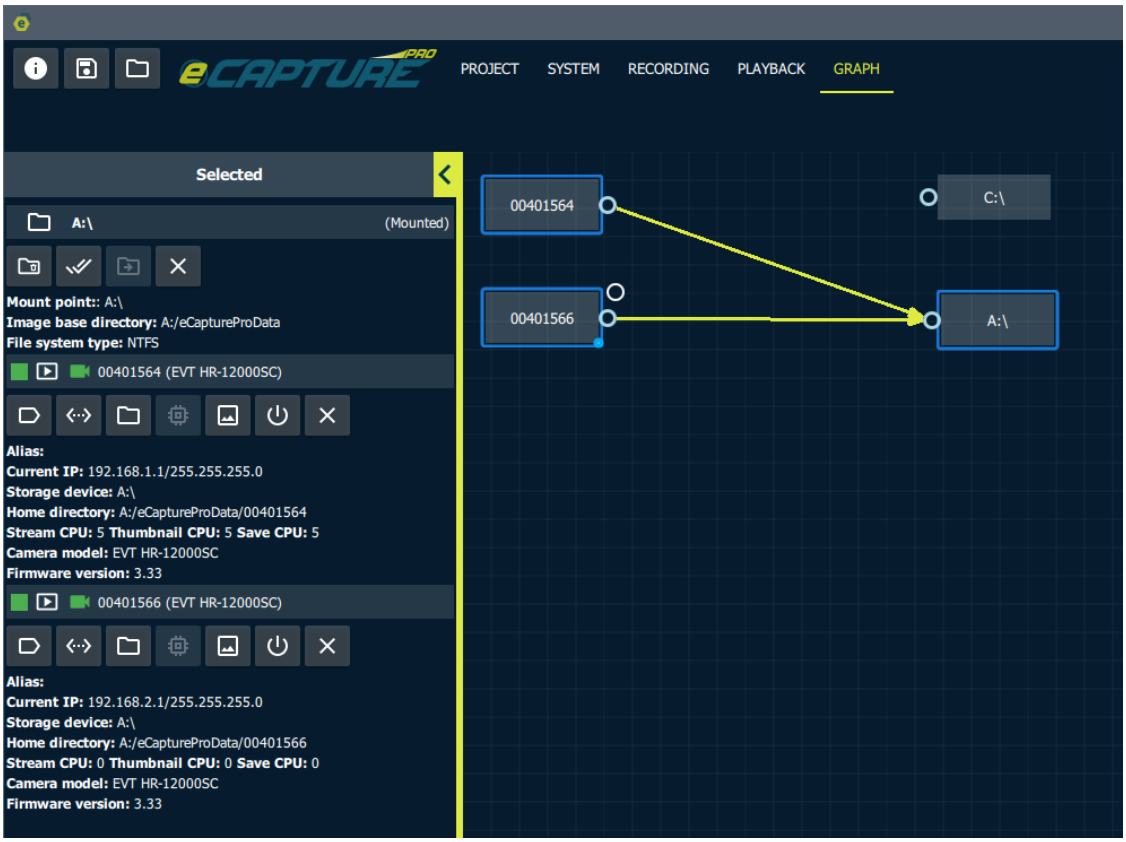
The newly created storage device will now show up in the “Add Storage” list.



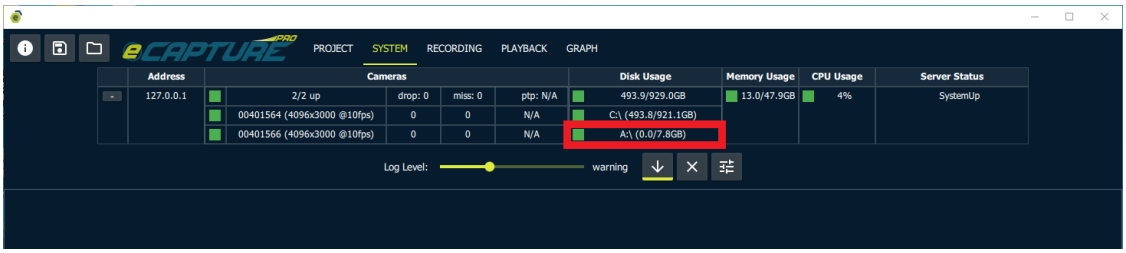
Add the new storage device. It will appear on the System Graph.



You can now connect to the storage device in the **Data Flow** graph.

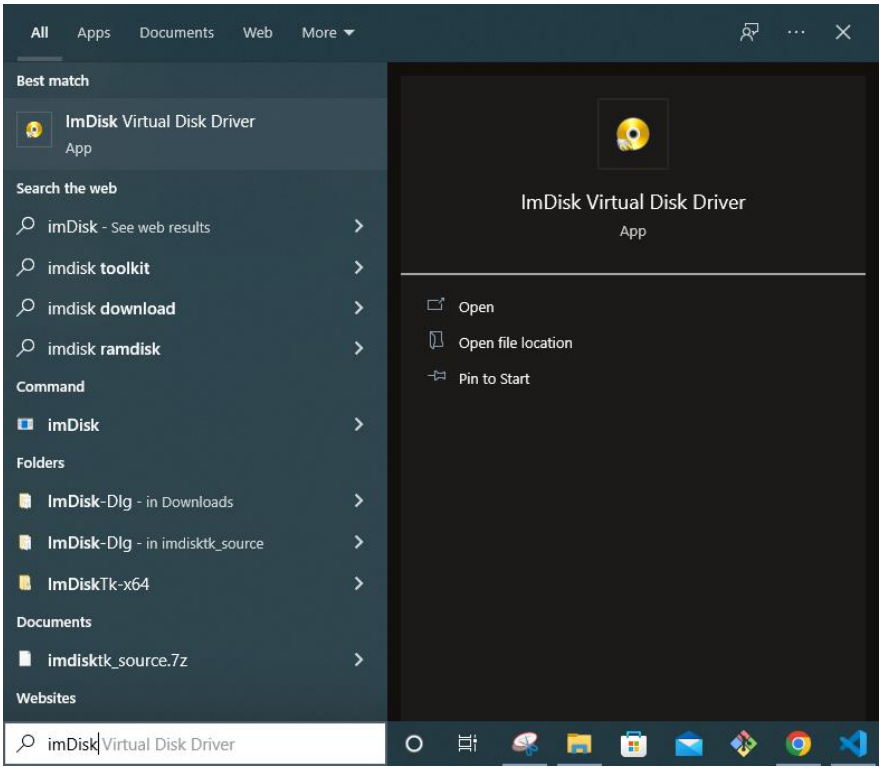


It will also now appear in the status table.

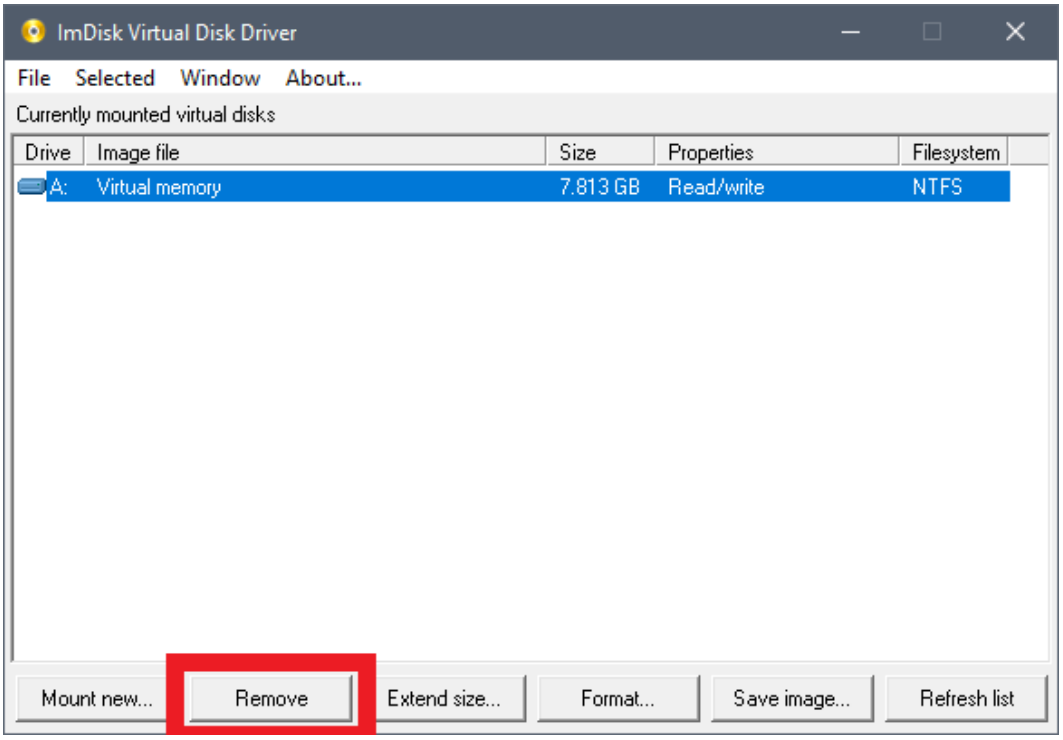


Removing

The RAM disk is created using the ImDisk utility. To remove the RAM Disk, search for “ImDisk Virtual Disk Driver” in the windows search bar.

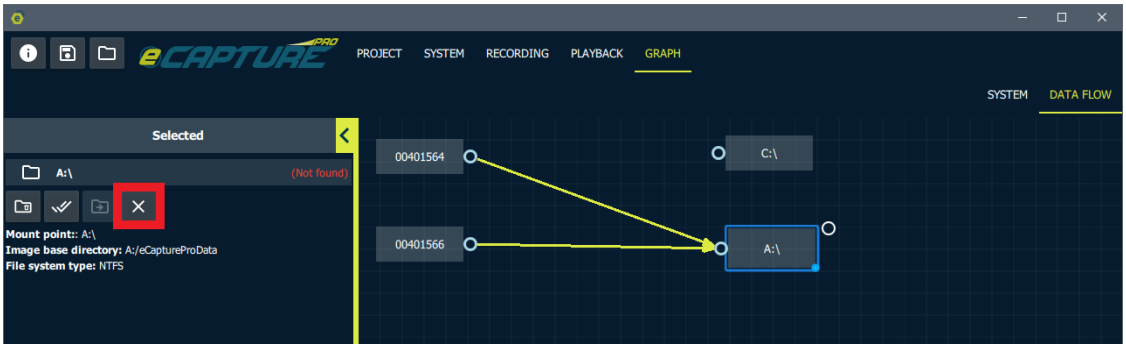


Open the program, select the drive and click remove.



The ram disk will now show up as Not Found.

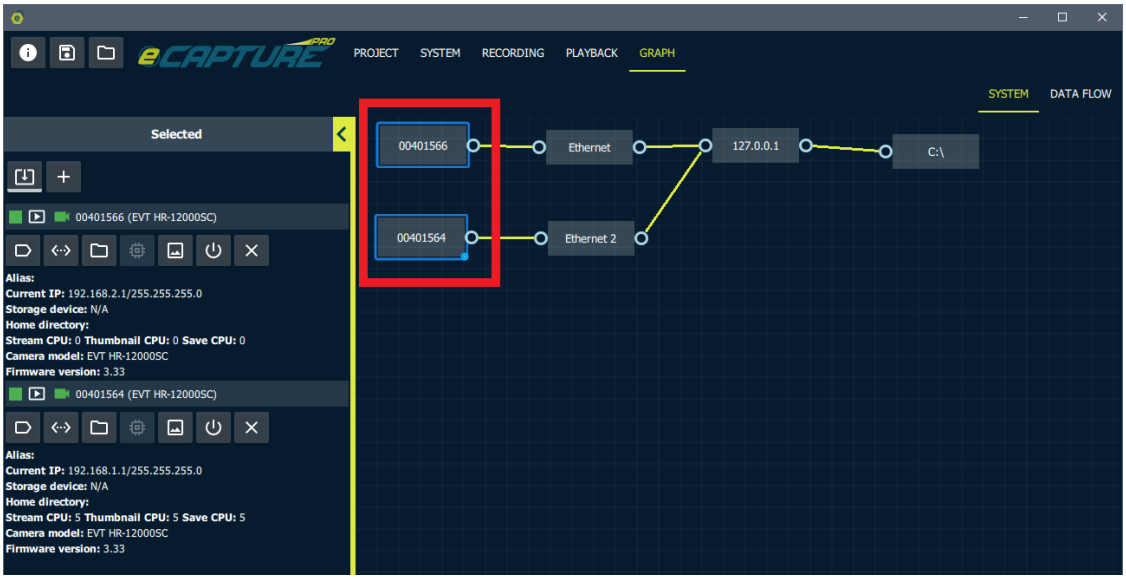
Remove it from the system and connect the cameras to an existing storage device.



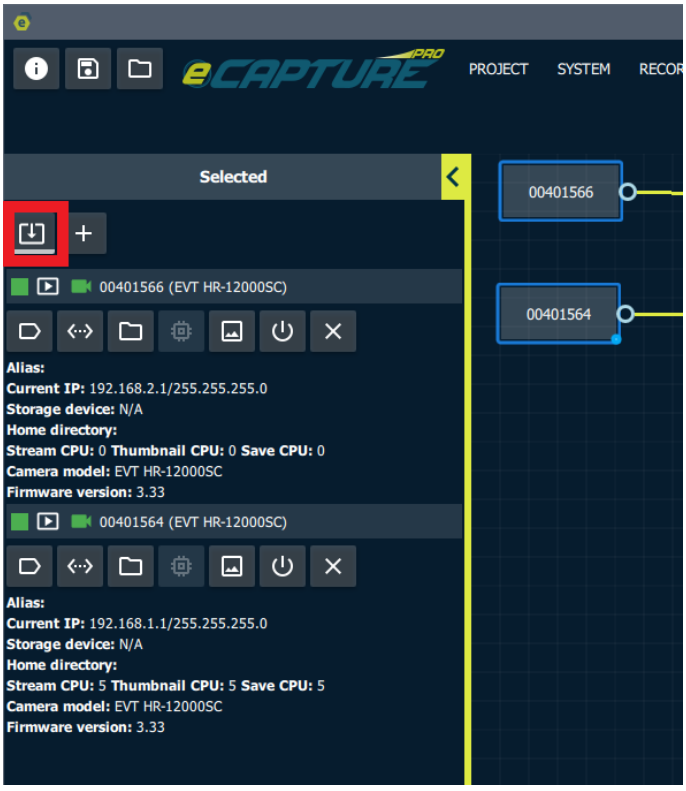
Firmware Update

Select the cameras you wish to update.

The update will be applied to all currently selected cameras

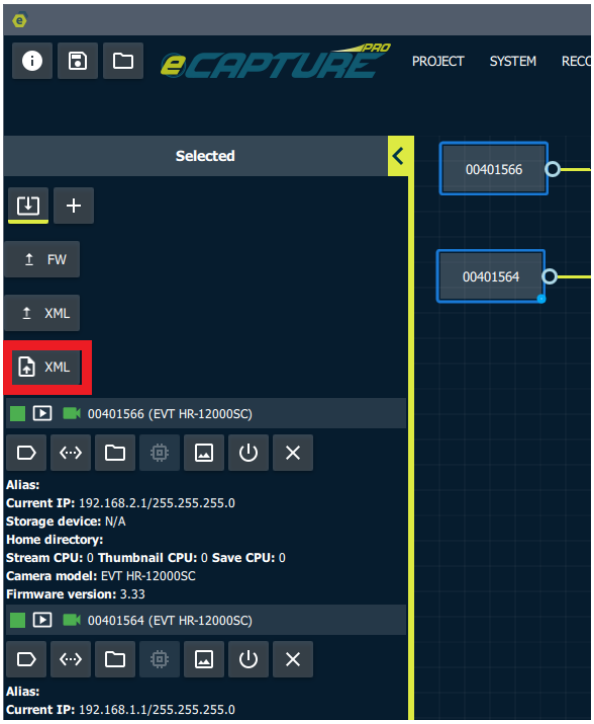


Click the firmware update mode button.

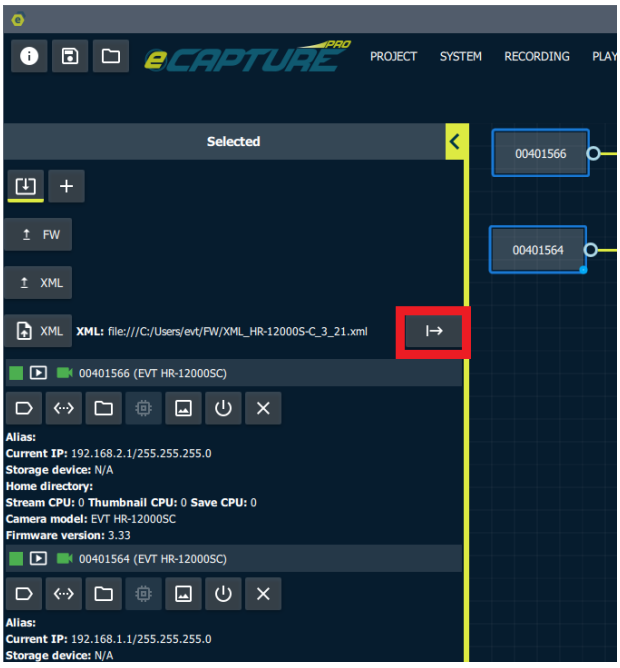


Loading XML

Select an XML file to load.

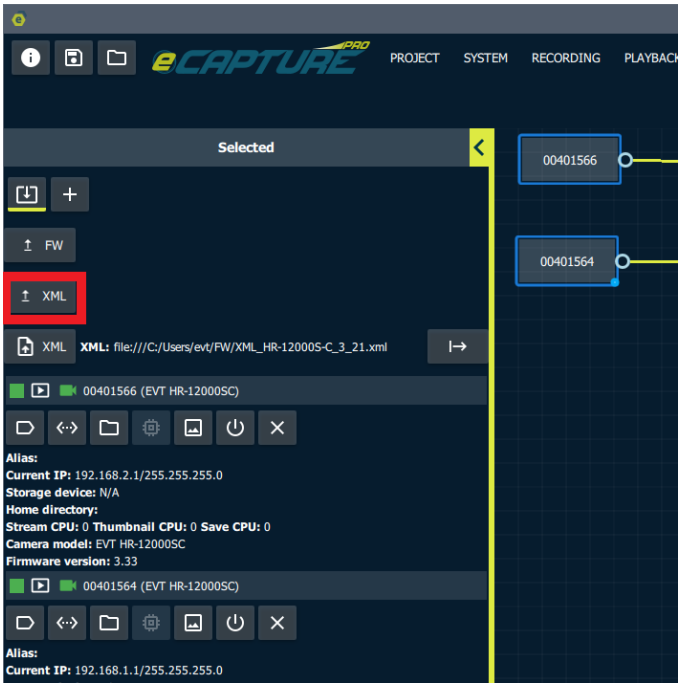


Once a file is selected load the XML onto the selected cameras.

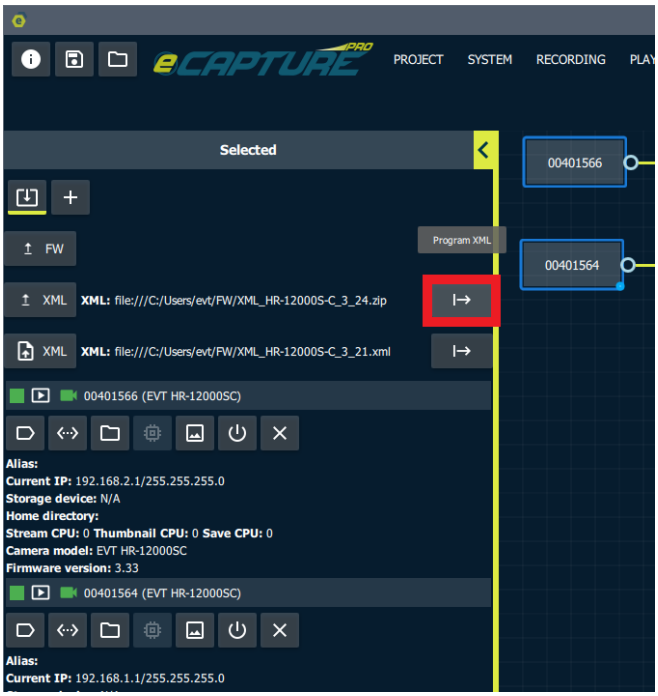


Program XML

Select a zipped XML file to program.

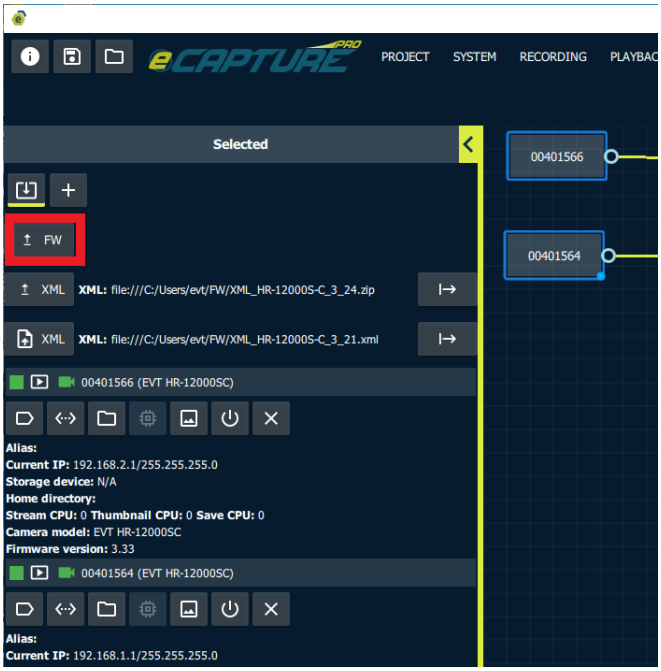


Once a file is selected program the XML onto the selected cameras.

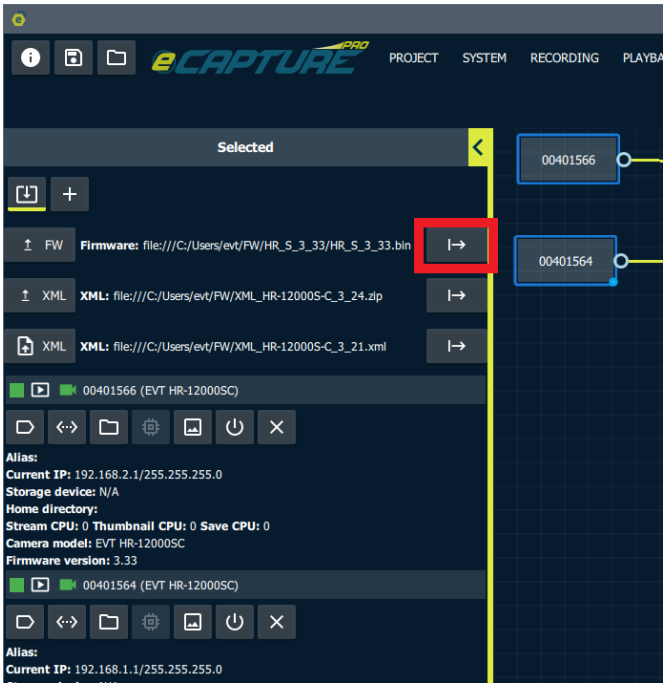


Program Firmware

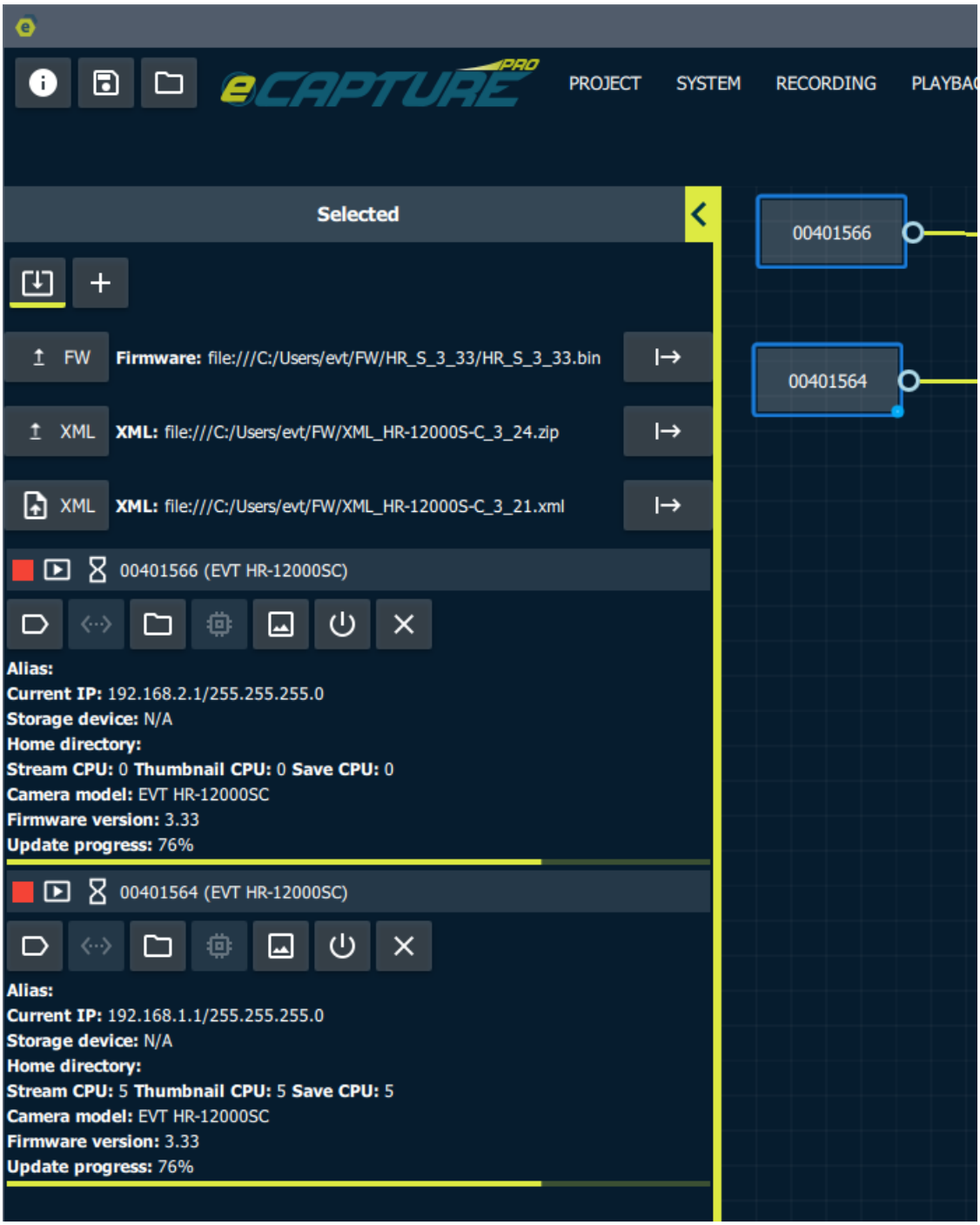
Select a firmware file to program.



Once a file is selected program the firmware onto the selected cameras.

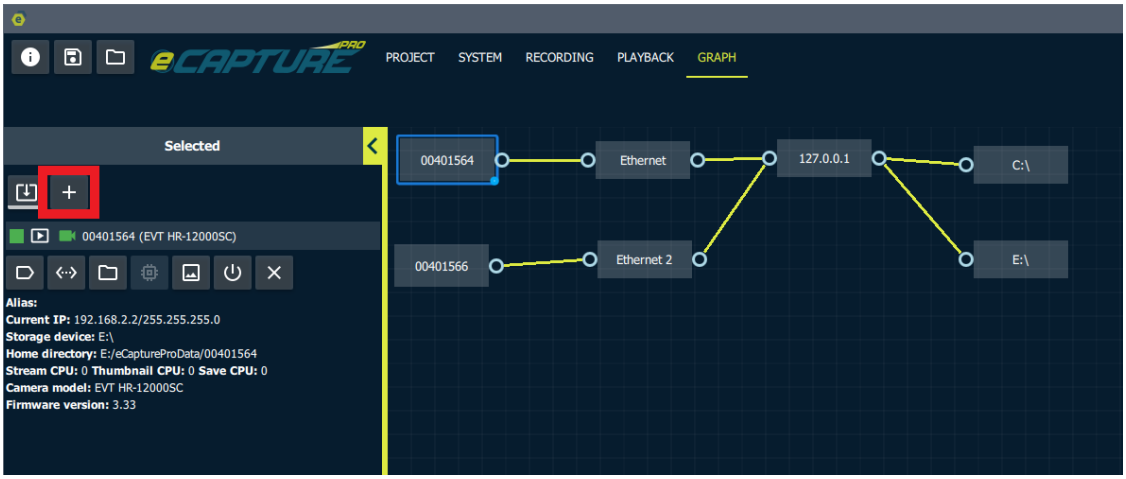


An update for the firmware programming progress will be displayed on the camera context menu.

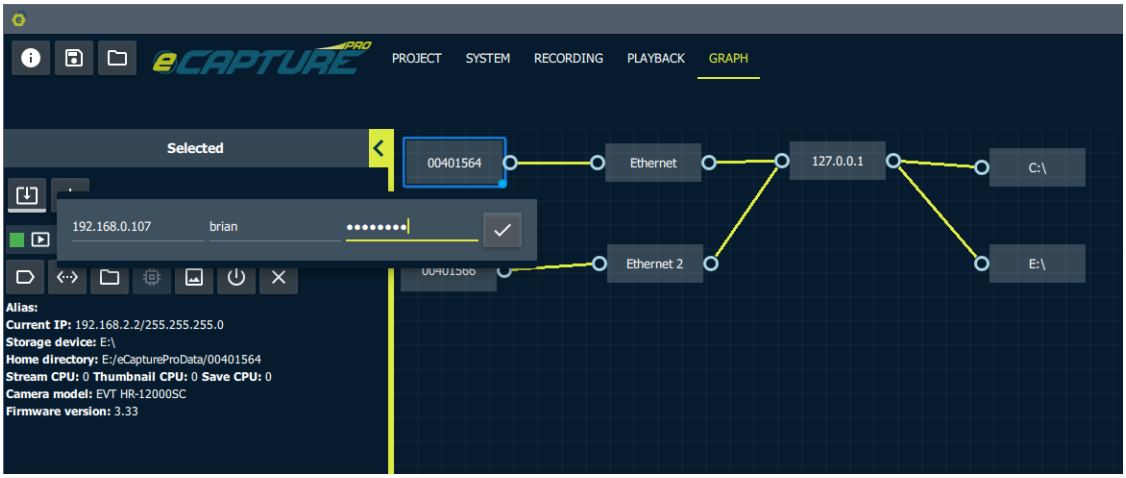

eCAPTURE PRO
PROJECT
SYSTEM
RECORDING
PLAYBA
Selected
00401566
00401564
FW
Firmware: file:///C:/Users/evt/FW/HR_S_3_33/HR_S_3_33.bin
XML
XML: file:///C:/Users/evt/FW/XML_HR-12000S-C_3_24.zip
XML
XML: file:///C:/Users/evt/FW/XML_HR-12000S-C_3_21.xml
00401566 (EVT HR-12000SC)
Alias:
Current IP: 192.168.2.1/255.255.255.0
Storage device: N/A
Home directory:
Stream CPU: 0 Thumbnail CPU: 0 Save CPU: 0
Camera model: EVT HR-12000SC
Firmware version: 3.33
Update progress: 76%
00401564 (EVT HR-12000SC)
Alias:
Current IP: 192.168.1.1/255.255.255.0
Storage device: N/A
Home directory:
Stream CPU: 5 Thumbnail CPU: 5 Save CPU: 5
Camera model: EVT HR-12000SC
Firmware version: 3.33
Update progress: 76%

Remote Capture Servers

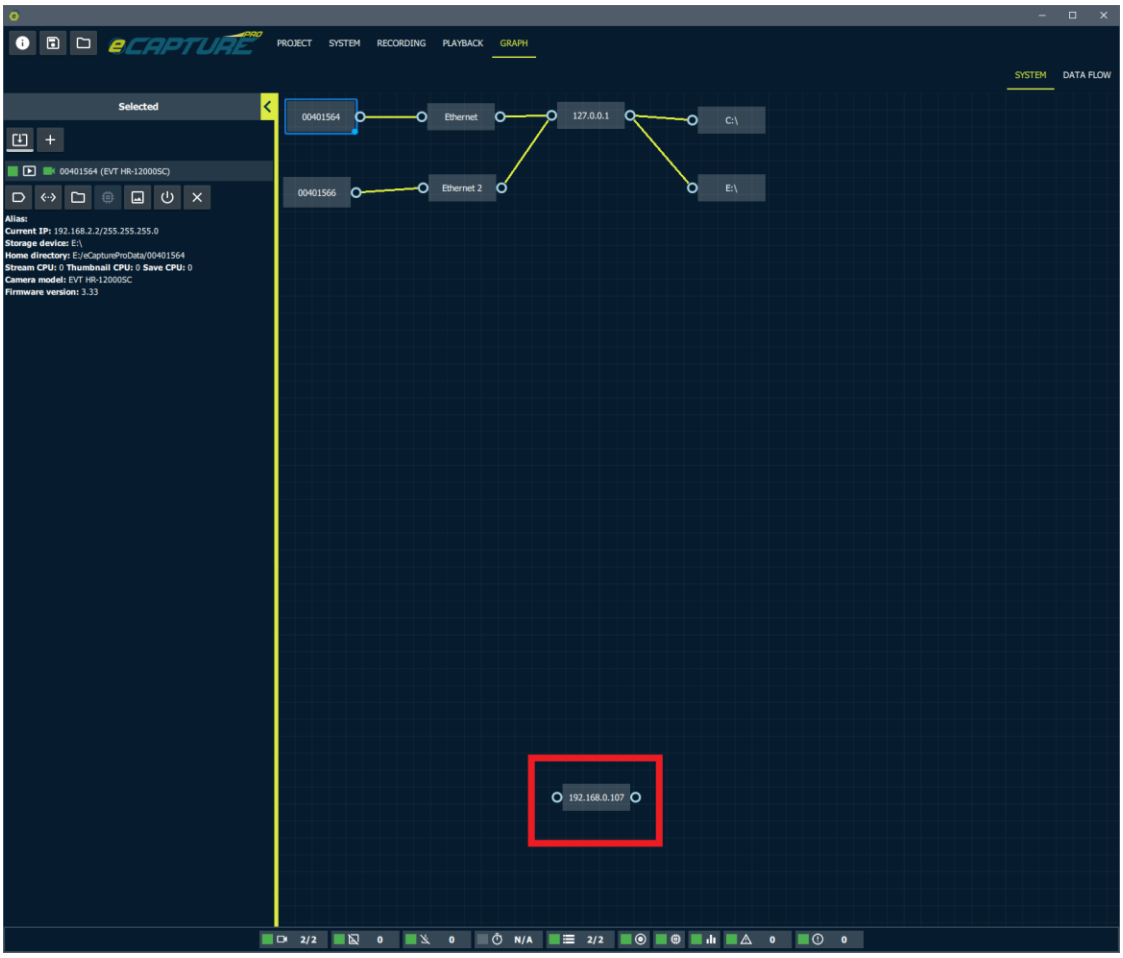
If a compatible version of eCapturePro is installed on a remote machine and the local machine can connect to the remote machine then we can add that remote machine and it's connected cameras to our system.



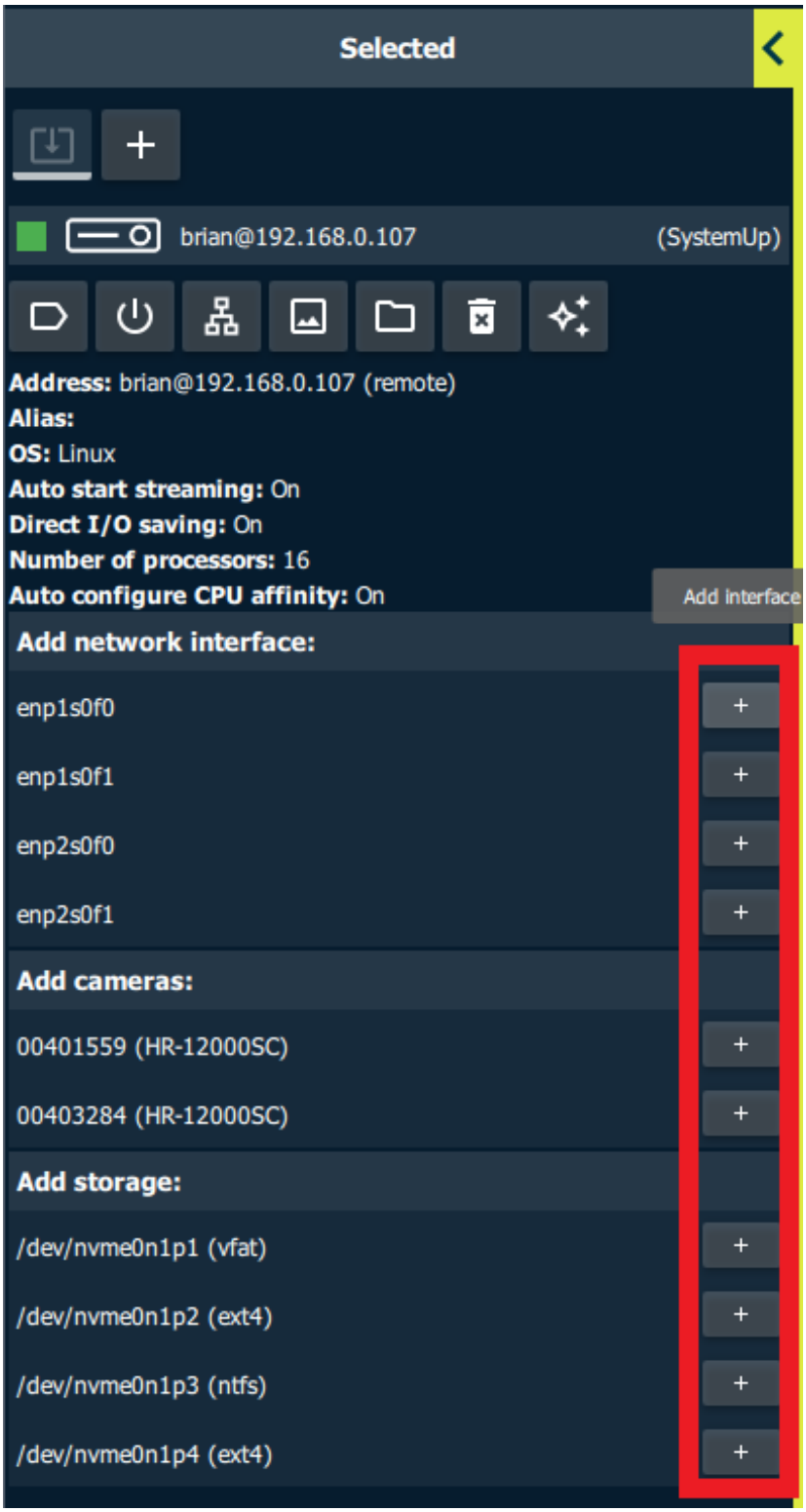
Now enter credentials for the remote machine. The local machine will connect to the remote machine over SSH in order to start the remote capture application. This means that the remote server must allow remote machines to connect to it over SSH.



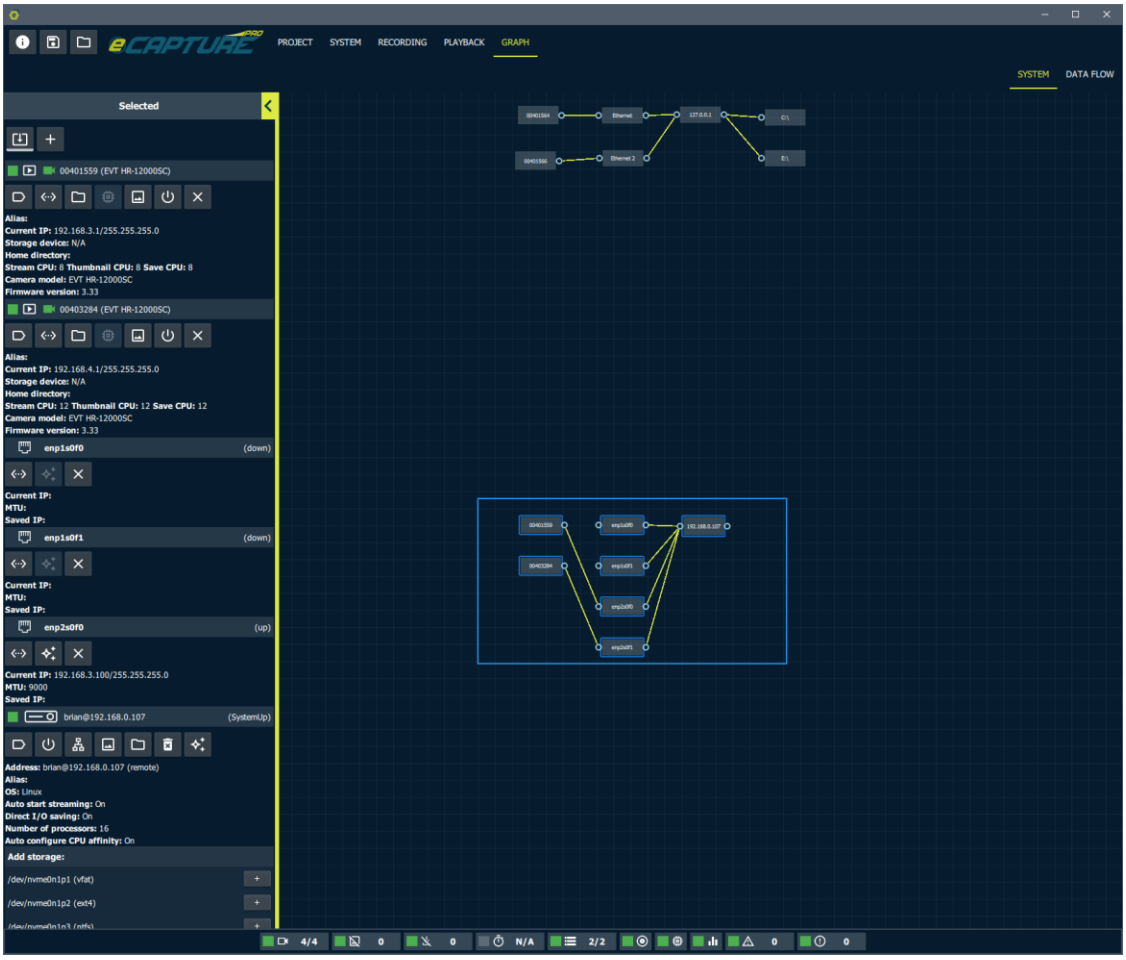
The newly added server will now appear in the system graph. You may need to scroll down or zoom out in the System Graph in order to see the newly added server. You can also right click on the graph grid and select "Fit Graph in View".

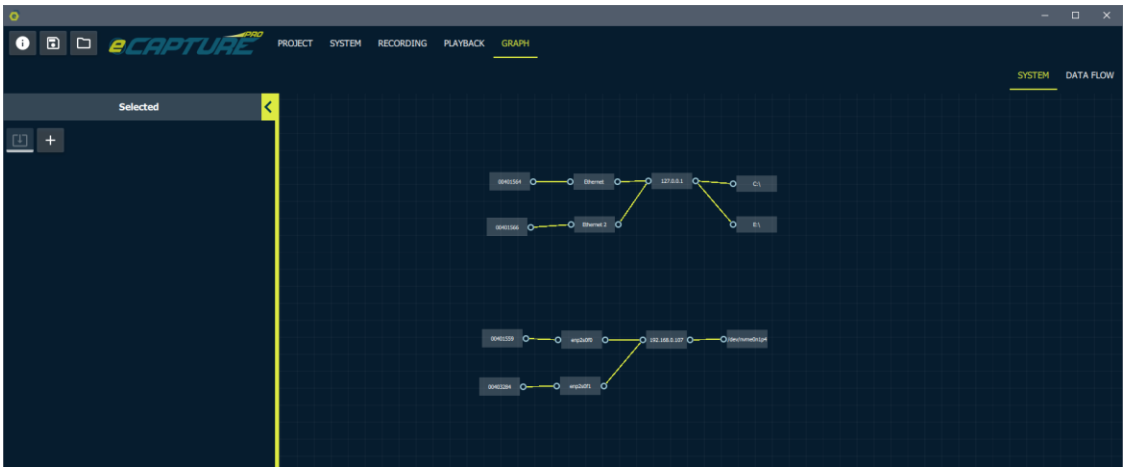


Proceed with constructing the remote system in the same way as the local system was constructed.

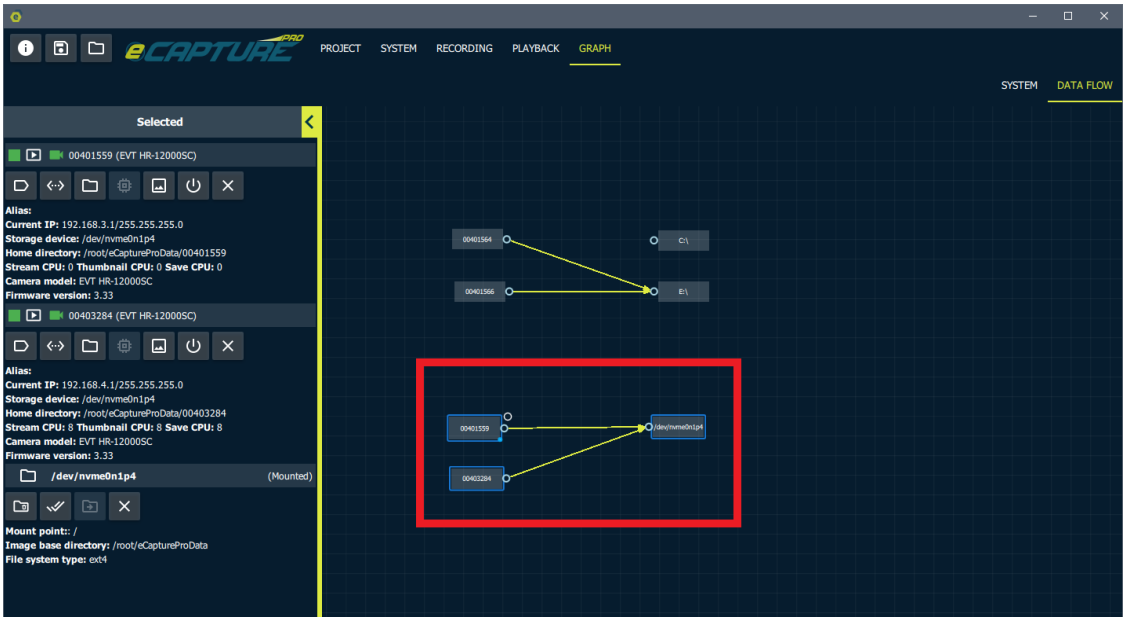


If you wish you can re-arrange the system graph. To move items all at once you can hold the ctrl key and draw a rectangle around all items you wish to move. Then drag them all together.

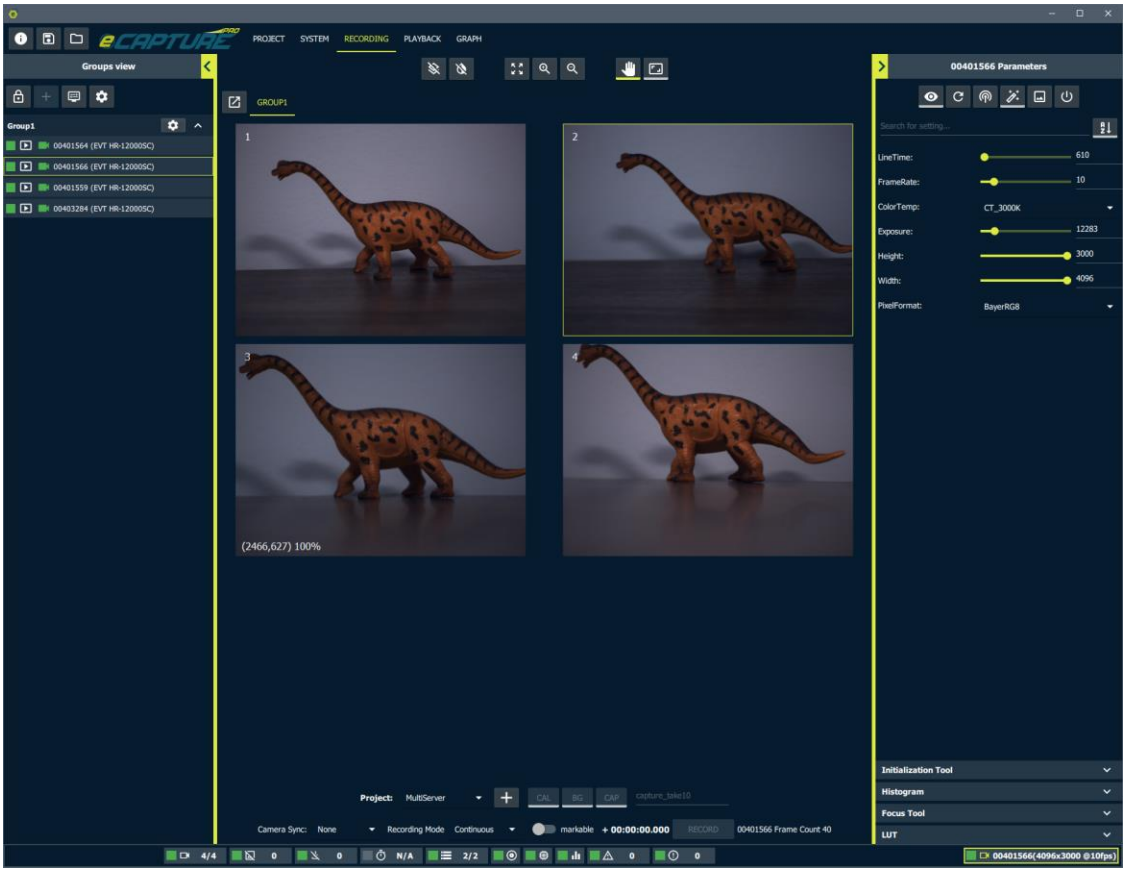




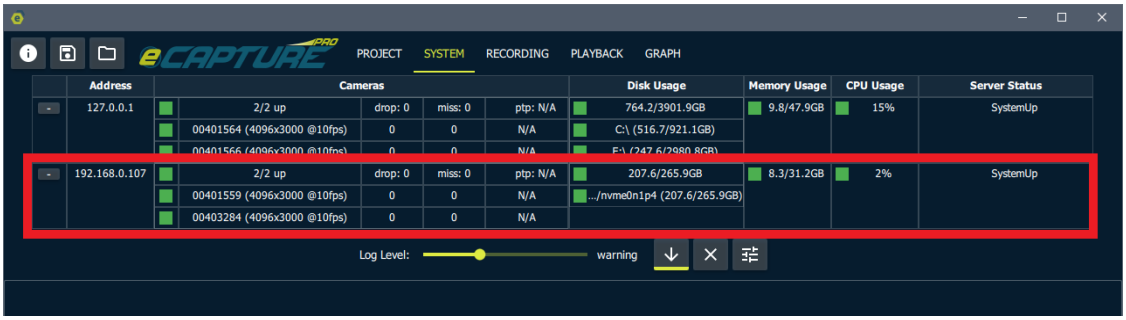
Proceed with connecting the newly added cameras to newly added storage devices in the Data Flow graph.



The cameras from the new server will now appear along with cameras from the existing servers.



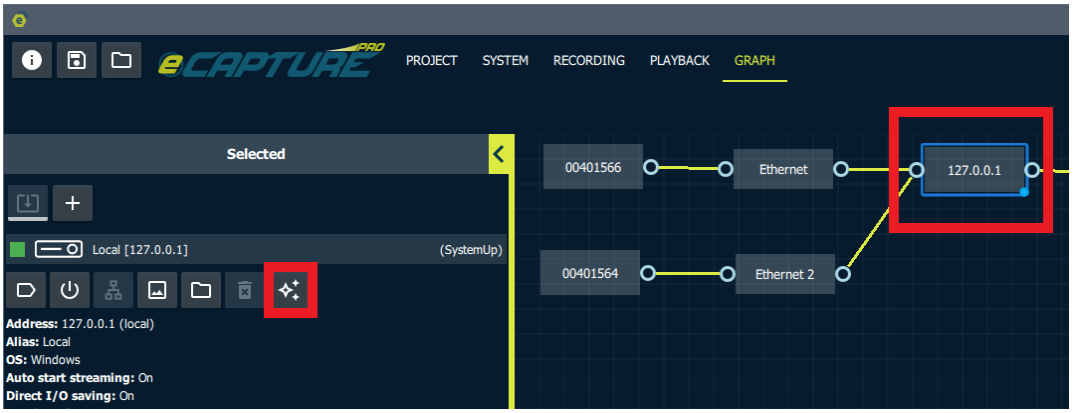
A new expandable row will also be visible in the system status table displaying the status of the newly added system.


eCAPTURE PRO
PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Address
Cameras
Disk Usage
Memory Usage
CPU Usage
Server Status
127.0.0.1
2/2 up
drop: 0
miss: 0
ptp: N/A
764.2/3901.9GB
9.8/47.9GB
15%
SystemUp
00401564 (4096x3000 @10fps)
0
0
N/A
C:\ (516.7/921.1GB)
192.168.0.107
2/2 up
drop: 0
miss: 0
ptp: N/A
207.6/265.9GB
8.3/31.2GB
2%
SystemUp
00401559 (4096x3000 @10fps)
0
0
N/A
.../nvme0n1p4 (207.6/265.9GB)
00403284 (4096x3000 @10fps)
0
0
N/A
Log Level:
warning

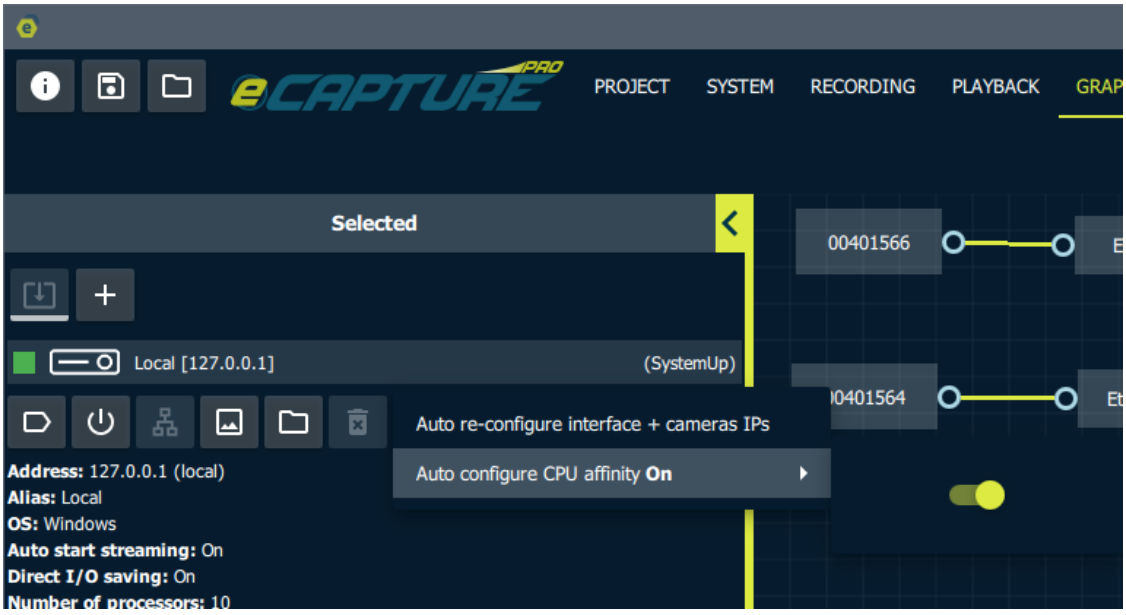
CPU Affinity

For each server we can choose to either automatically configure CPU affinity for all cameras or manually specify CPU affinity per camera.

To view the auto vs manual CPU affinity setting, select the server.

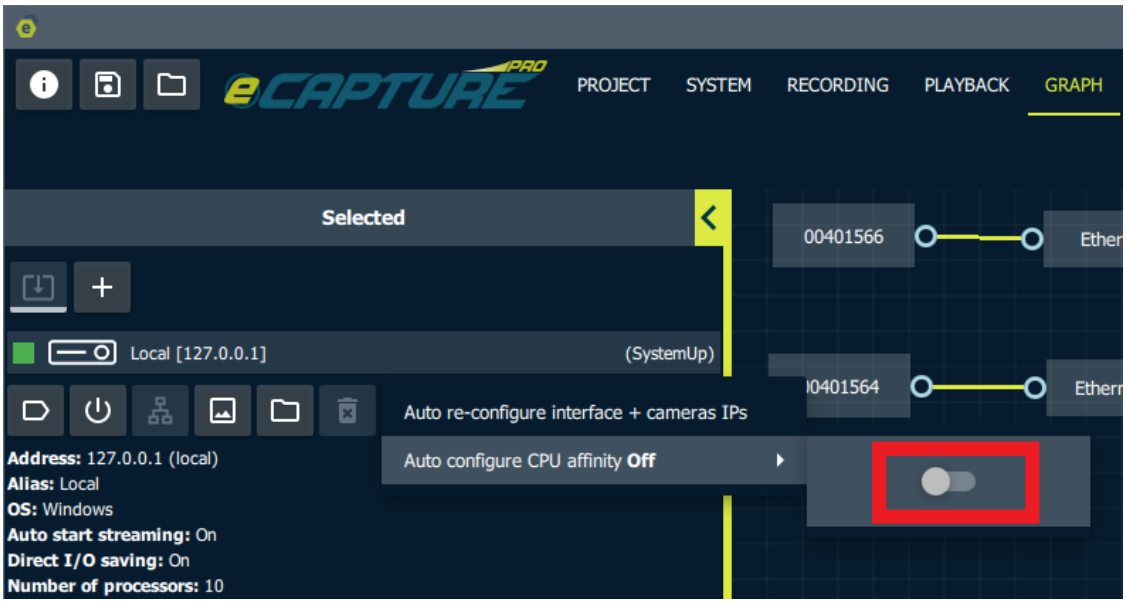


Click the Auto Configuration button to view and set “Auto configure CPU Affinity” setting.

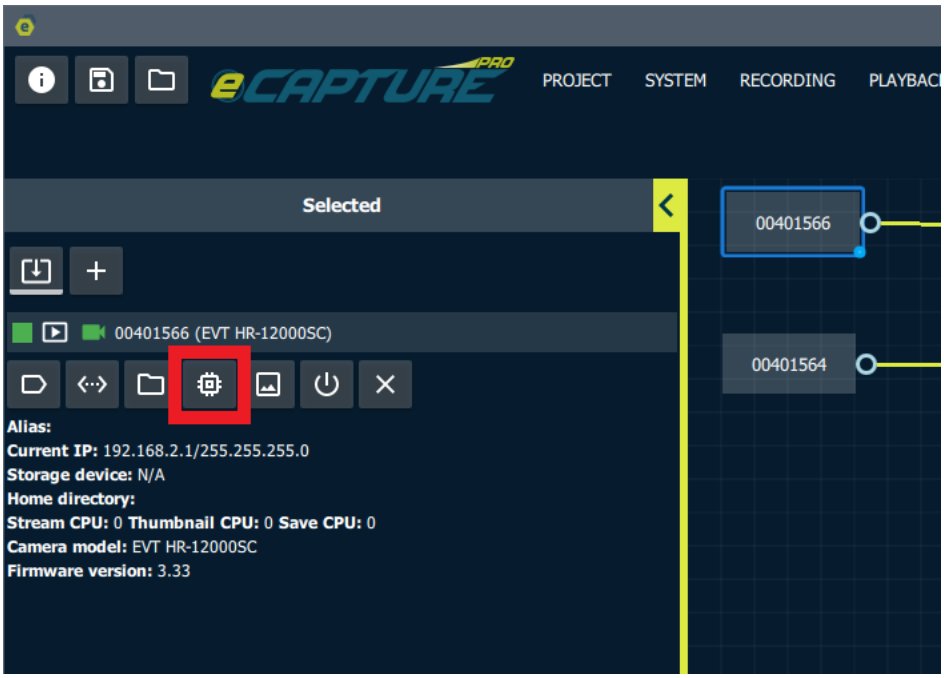


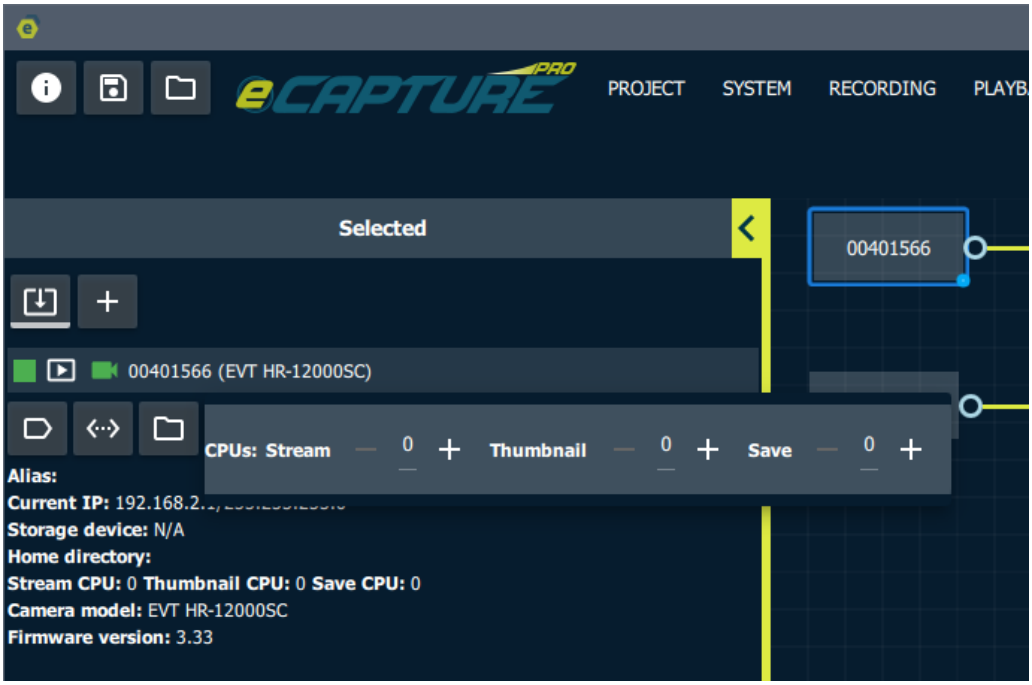
Set Manual CPU Affinity

Turn “Auto configure CPU Affinity” to **Off**.

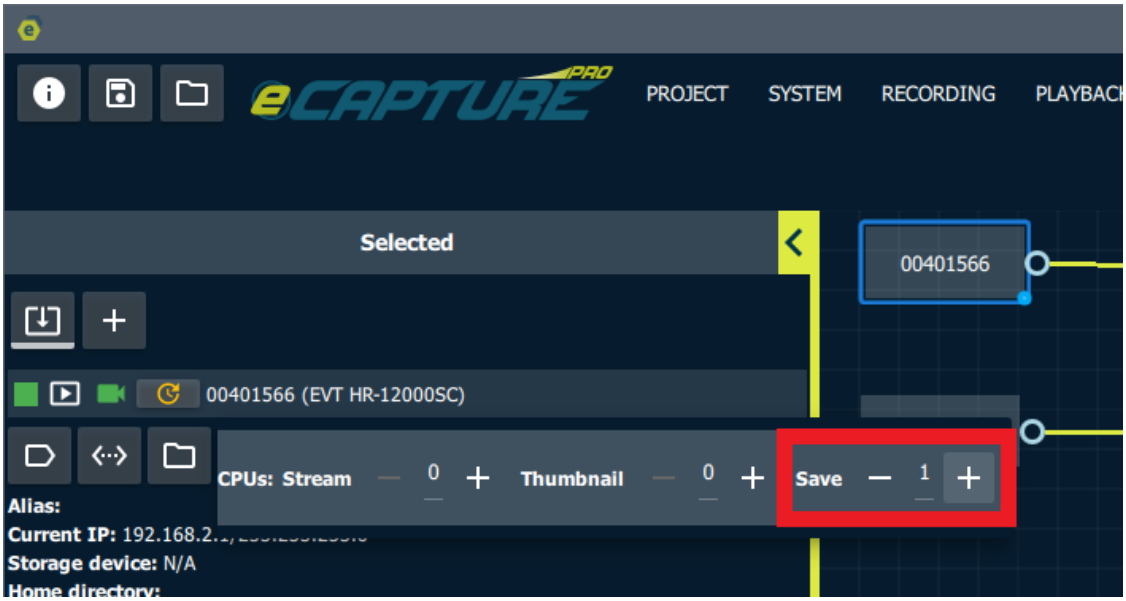


Select a camera for which you wish to manually configure the CPU affinity. And click the CPU affinity button.

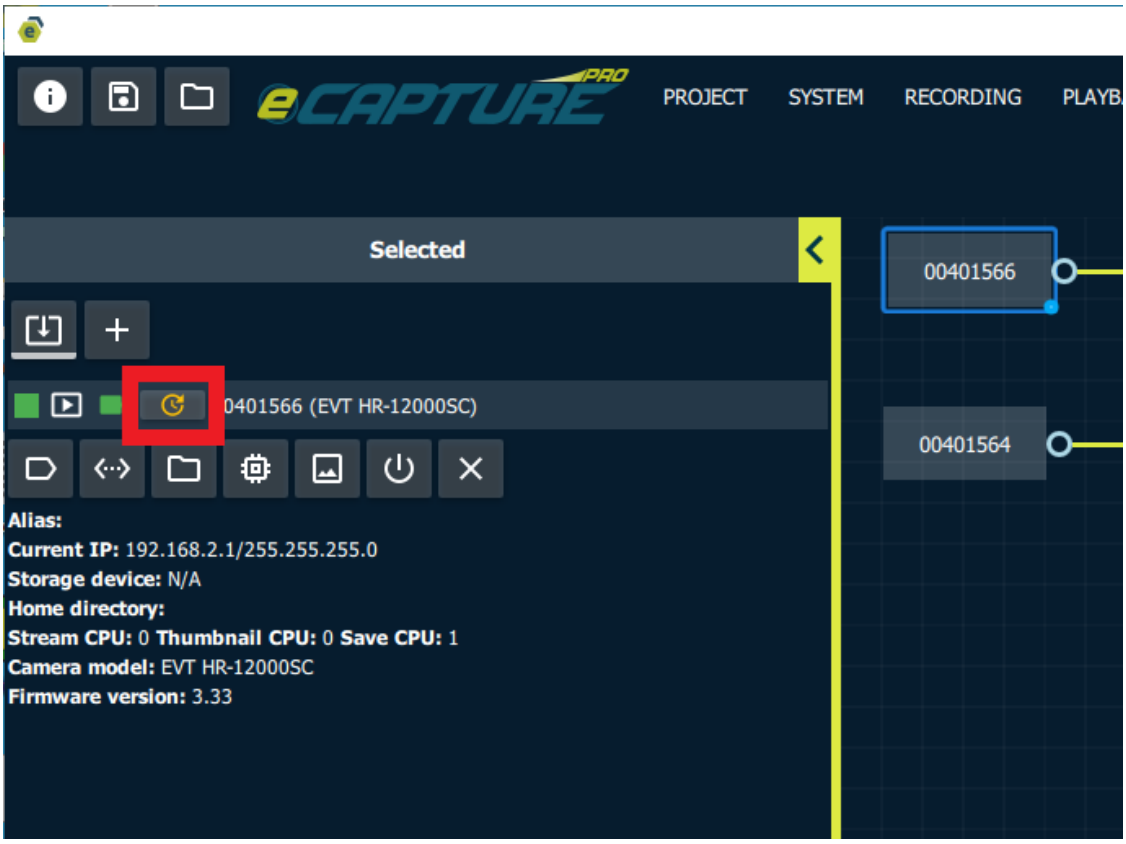




Now Change the settings to the desired value.



The CPU affinity settings are applied when the camera is opened so in order for the change to take effect the camera must be restarted. You will know if the camera needs to be restarted if a button appears on the camera status line.

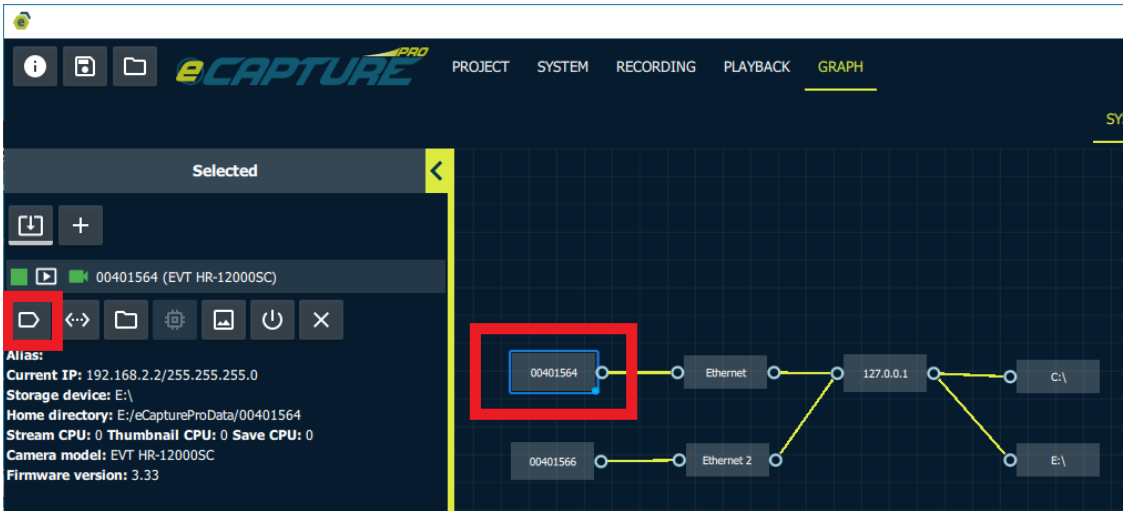


Go ahead and click this button to restart the camera with the new CPU affinity setting.

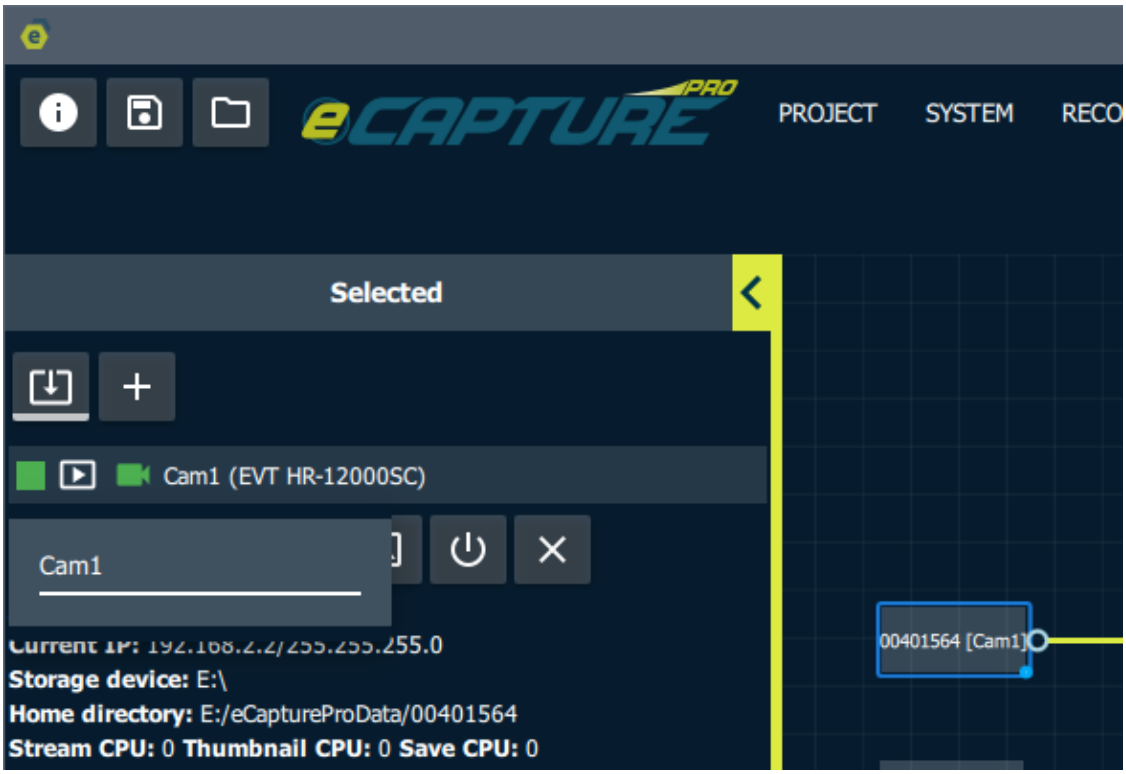
Camera Naming

It may be useful to give each camera a more meaning full name than just it's serial number. To do so add an Alias.

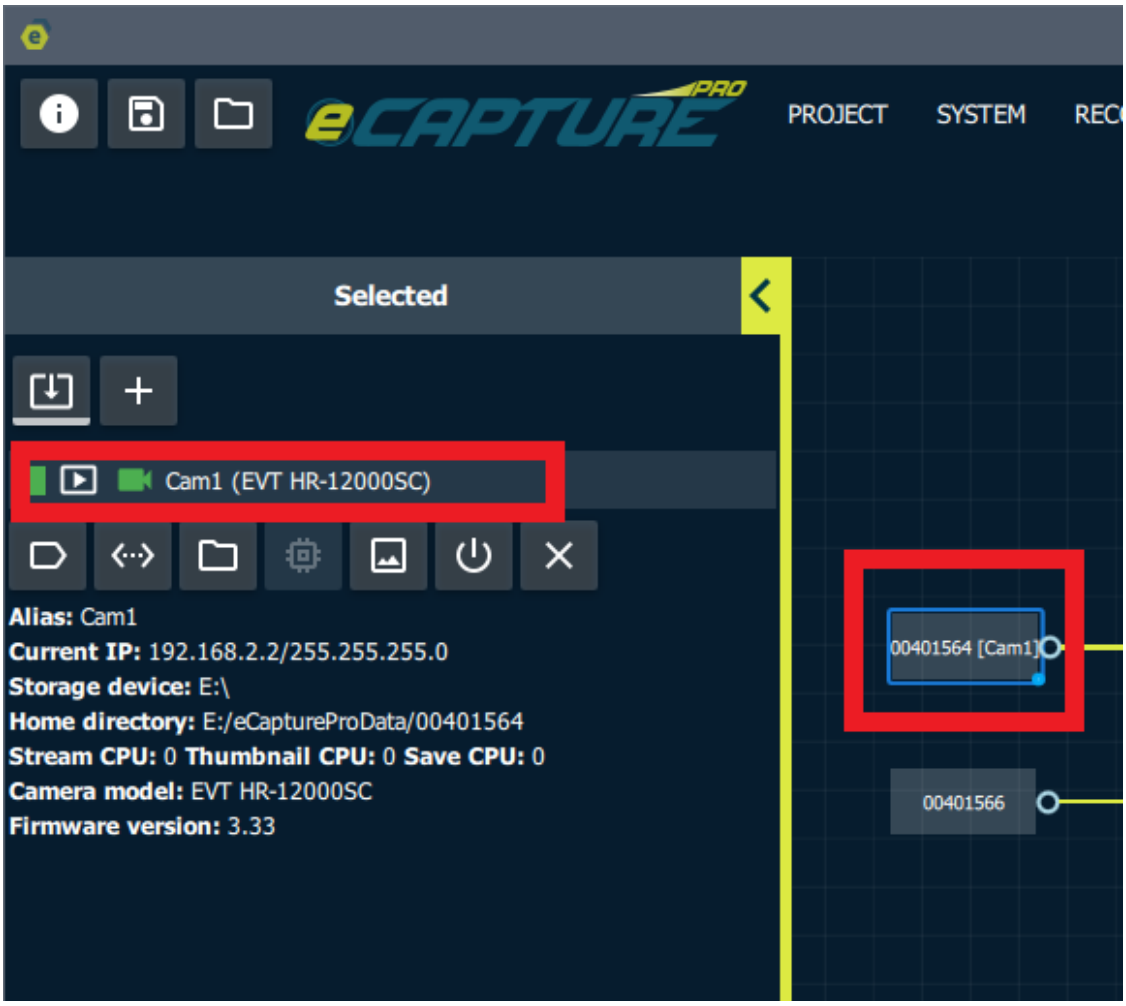
Select the camera in the System Graph.

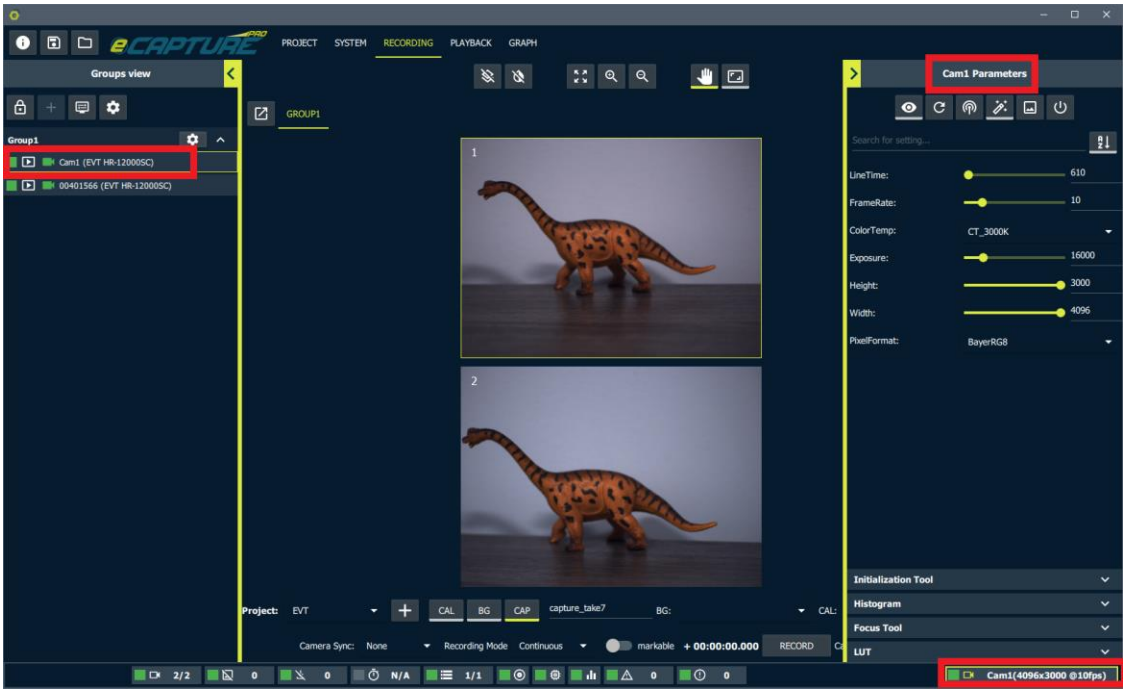


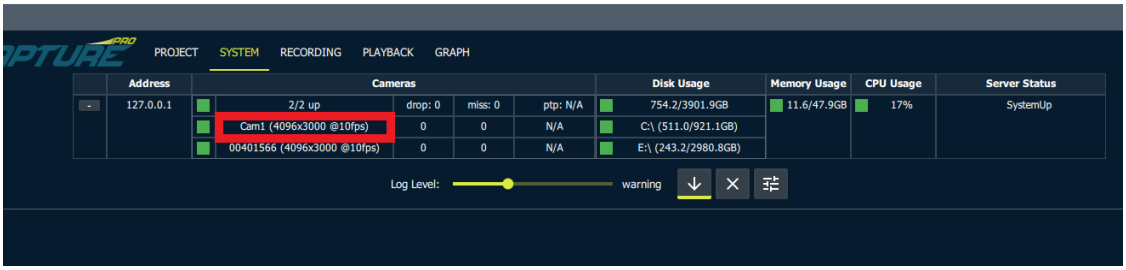
Give the camera a **unique** name.



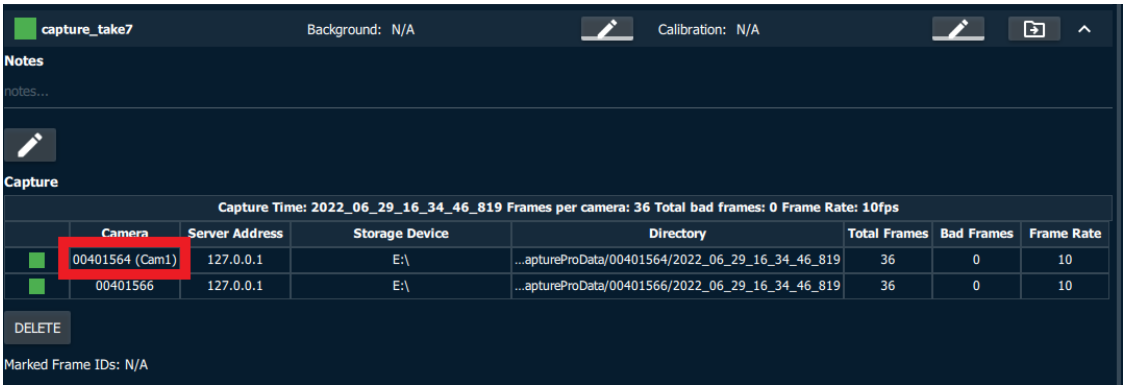
Now the camera will be displayed by it's alias instead of serial number in various places throughout the application.


PROJECT
SYSTEM
Selected
Cam1 (EVT HR-12000SC)
Alias: Cam1
Current IP: 192.168.2.2/255.255.255.0
Storage device: E:\
Home directory: E:/eCaptureProData/00401564
Stream CPU: 0 Thumbnail CPU: 0 Save CPU: 0
Camera model: EVT HR-12000SC
Firmware version: 3.33
00401564 [Cam1]
00401566


PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Groups view
Group1
Cam1 (EVT HR-12000SC)
00401566 (EVT HR-12000SC)
GROUP1
Cam1 Parameters
LineTime: 610
FrameRate: 10
ColorTemp: CT_3000K
Exposure: 16000
Height: 3000
Width: 4096
PixelFormat: BayerRG8
Initialization Tool
Histogram
Focus Tool
LUT
Project: EVT
CAL
BG
CAP
capture_take7
Camera Sync: None
Recording Mode Continuous
markable
+ 00:00:00.000
RECORD
Cam1(4096x3000 @10fps)



It will also be displayed by the alias in the recording take table.



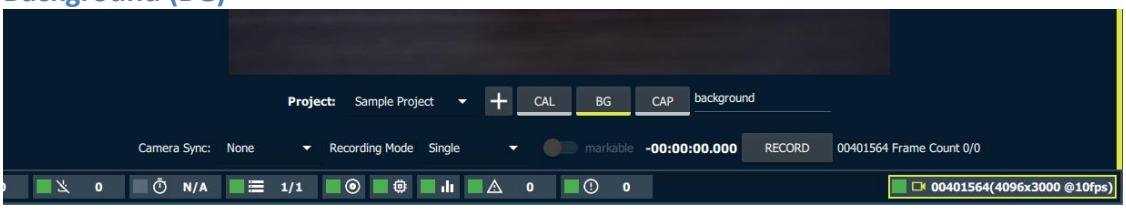
Note that when a capture is exported the Alias will now appear in the export folder hierarchy instead of the serial number.

Project Structure

A project consists of a grouping of takes. There are three different categories of takes:

- Background
- Calibration
- Capture

Background (BG)

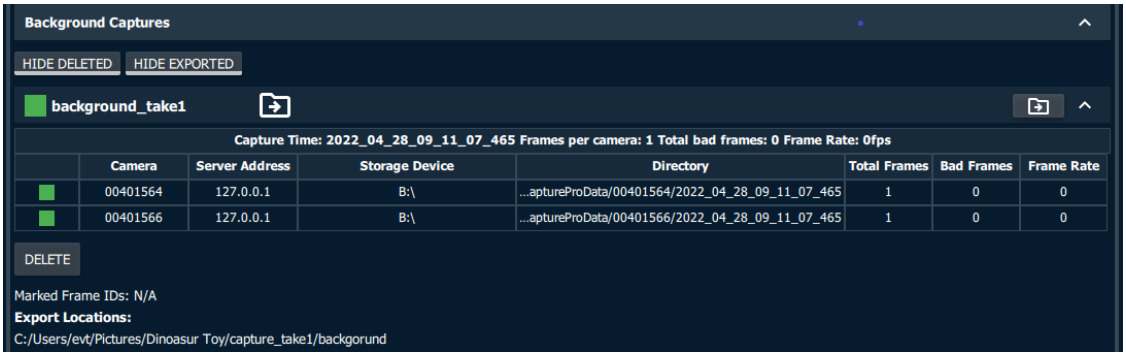


When BG is selected the recommended recording controls are:

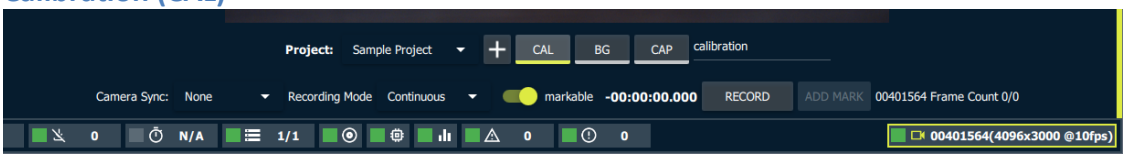
- Recording Mode: Single
- Markable: False

A background take typically consists of a single image from each camera capturing the background of the scene.

Status table for a background take:



Calibration (CAL)



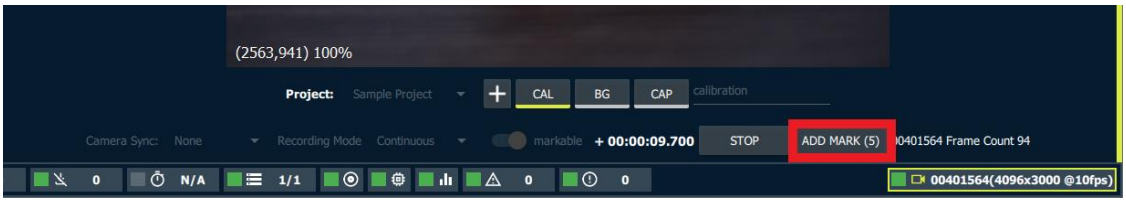
When CAL is selected the recommended recording controls are:

- Recording Mode: Continuous
- Markable: True

A calibration take is meant to capture a series of images from each camera for use in calibrating the system. This series of images are typically “marked”.

Marking

Marking is done by clicking the “Add Mark” button during a continuous recording.

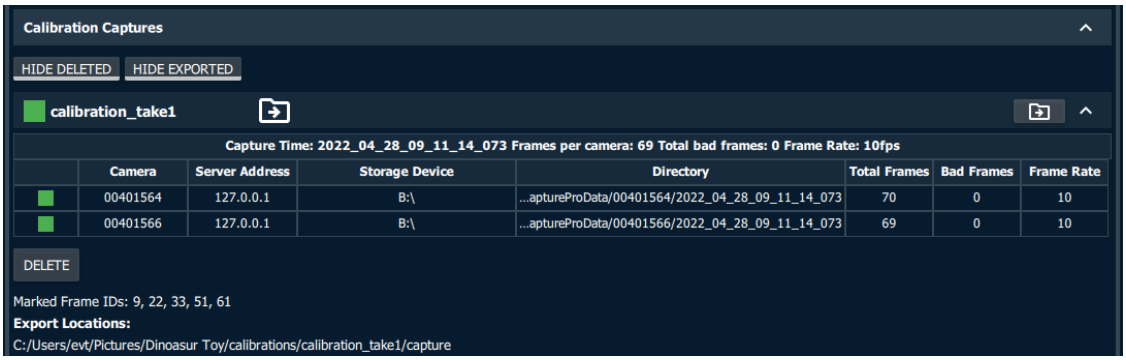


When the “Add Mark” button is clicked the current frame will be noted by eCapturePro. Only marked frames will be exported when the take is exported.

For example lets say we ran a continuous recording for 500 frames and marked the frames: 55, 123, 244, 312, 478. When this take is exported then only these 5 marked frames from each camera will be exported.

Calibration takes are automatically exported. This means that when the continuous recording is completed the marked frames will automatically be exported.

Status table for a calibration take:



Calibration take export structure

```
/<ExportPath>/<Project Name>
├ calibrations
│ └ <Calibration Take Name>
│ │ └ capture
│ │ │ ├ <Camera 1 Display Name>
│ │ │ │ ├ frame0000000000.ext
│ │ │ │ ├ frame0000000001.ext
│ │ │ │ ⋮
│ │ │ │ └ frameXXXXXXXXXX.ext
│ │ │ ⋮
│ │ │ └ <Camera N Display Name>
│ │ │ │ ├ frame0000000000.ext
```

```
│ │ │ │ ├ frame0000000001.ext
│ │ │ │ ⋮
│ │ │ │ └ frameXXXXXXXXXX.ext
```

So in this example this will be:

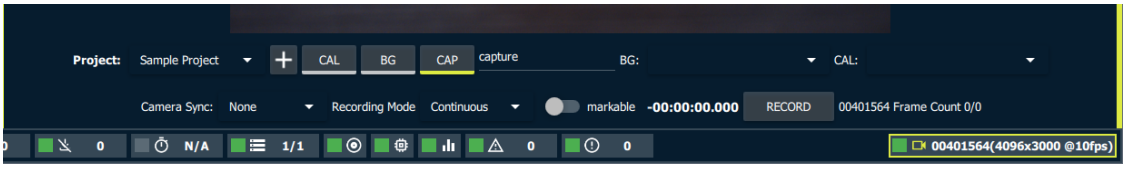
```
C:\Users\evt\Pictures\Dinosaur Toy
 ├ calibrations
 │ └ calibration_take1
 │ │ └ capture
 │ │ │ ├ 00401564
 │ │ │ │ ├ frame0000000000.tiff
 │ │ │ │ ├ frame0000000001.tiff
 │ │ │ │ ├ frame0000000002.tiff
 │ │ │ │ ├ frame0000000003.tiff
 │ │ │ │ └ frame0000000004.tiff
 │ │ │ └ 00401566
 │ │ │ │ ├ frame0000000000.tiff
 │ │ │ │ ├ frame0000000001.tiff
 │ │ │ │ ├ frame0000000002.tiff
 │ │ │ │ ├ frame0000000003.tiff
 │ │ │ │ └ frame0000000004.tiff
```

The user will then compute a calibration.xml file and place it in the following location:

```
<Project Name>
 ├ calibrations
 │ └ <Calibration Take Name>
 │ │ └ capture
 │ │ │ └ calibration
 │ │ │ │ └ calibration.xml
```

If a post export script is registered with the application it will be invoked after the calibration is automatically exported. This script can then call a program to compute the calibration.xml and place it in the directory structure indicated above. More info on the registration of post export scripts will follow bellow.

Capture (CAP)

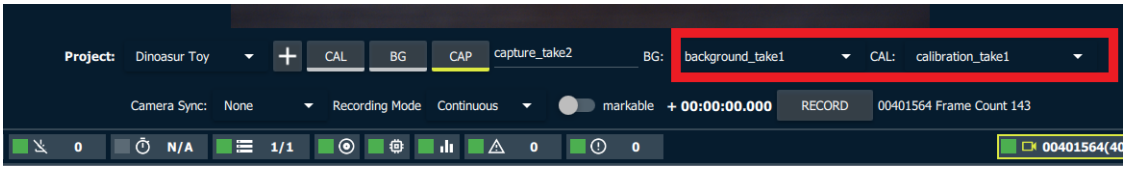


When CAP is selected the recommended recording controls are:

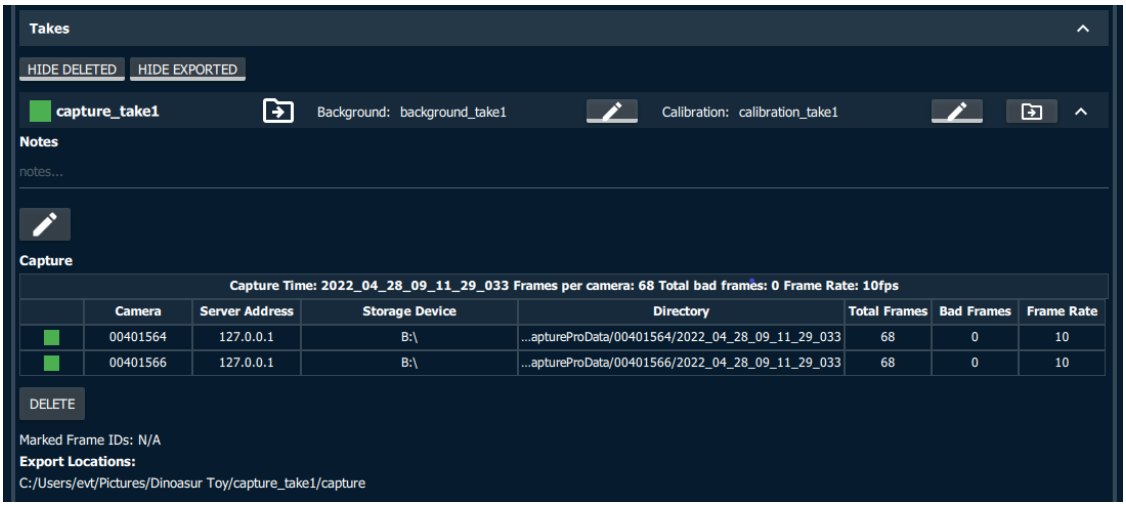
- Recording Mode: Continuous

- Markable: False

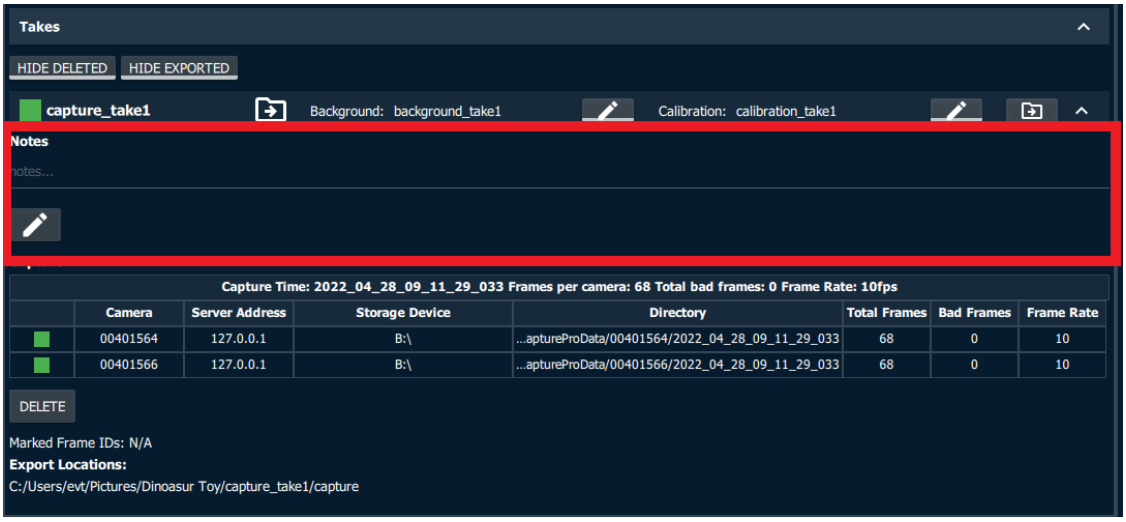
Capture takes can be associated with previously completed Background and Capture takes. This can either be done at the time of recording or after recording and before exporting.



Status table for a capture take:



If a user has notes they would like to be associated with this take they can enter them in the notes section of the take panel.



Capture Take Export Structure

When a capture take is exported the following will happen:

- The associated background take frames will be exported to the target location.
- The user computed calibration.xml file for the associated calibration take will be exported to the target location
- The capture take frames will be exported to the target location

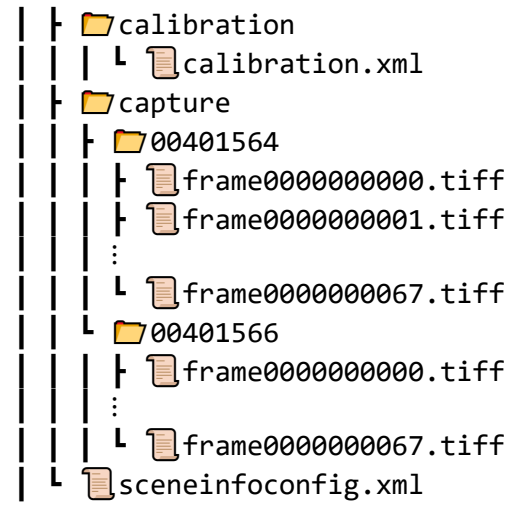
```
<Project Name>
 └ <Take Name>
 │ ├ background
 │ │ ├ <Camera 1 Display Name>
 │ │ │ └ frame0000000000.ext
 │ │ ⋮
 │ │ └ <Camera N Display Name>
 │ │ │ └ frame0000000000.ext
 │ ├ calibration
 │ │ │ └ calibration.xml
 │ ├ capture
 │ │ ├ <Camera 1 Display Name>
 │ │ │ ├ frame0000000000.ext
 │ │ │ ├ frame0000000001.ext
 │ │ │ ⋮
 │ │ │ └ frameXXXXXXXXXX.ext
 │ │ ⋮
 │ │ └ <Camera N Display Name>
 │ │ │ ├ frame0000000000.ext
 │ │ │ ├ frame0000000001.ext
 │ │ │ ⋮
 │ │ │ └ frameXXXXXXXXXX.ext
 │ └ sceneinfoconfig.xml
```

The format of the sceneinfoconfig.xml is as follows

```
<?xml version="1.0" encoding="UTF-8"?>
<SceneInfoConfig StartFrame="0" EndFrame="<End Frame ID>">
    <FPS Numerator="<FPS Numerator>" Denominator="<FPS Denominator>"/>
</SceneInfoConfig>
```

In this example the export file structure will look like:

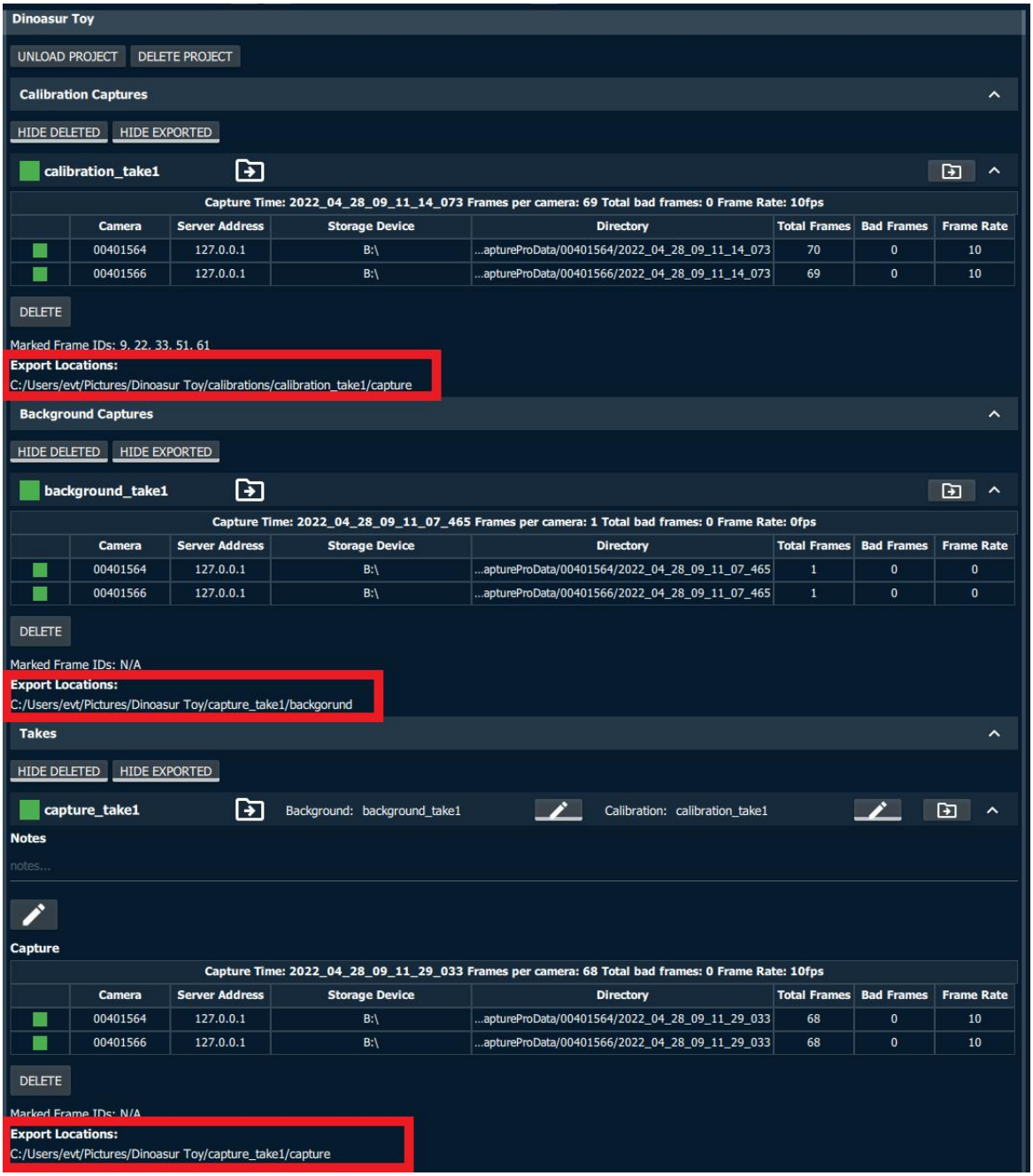
```
C:\Users\evt\Pictures\Dinosaur Toy
 └ capture_take1
 │ ├ background
 │ │ ├ 00401564
 │ │ │ └ frame0000000000.tiff
 │ │ └ 00401566
 │ │ │ └ frame0000000000.tiff
```



Where the sceneinfoconfig.xml file looks like:

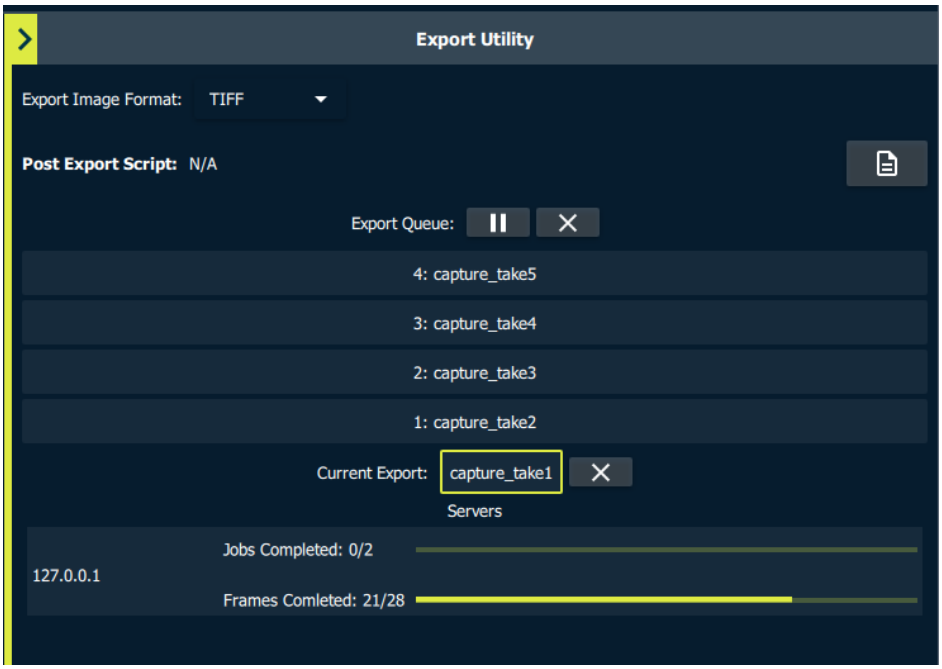
```
<?xml version="1.0" encoding="UTF-8"?>
<SceneInfoConfig StartFrame="0" EndFrame="67">
    <FPS Numerator="10" Denominator="1"/>
</SceneInfoConfig>
```

After export completion the location of the exported takes will be indicated in the project view.

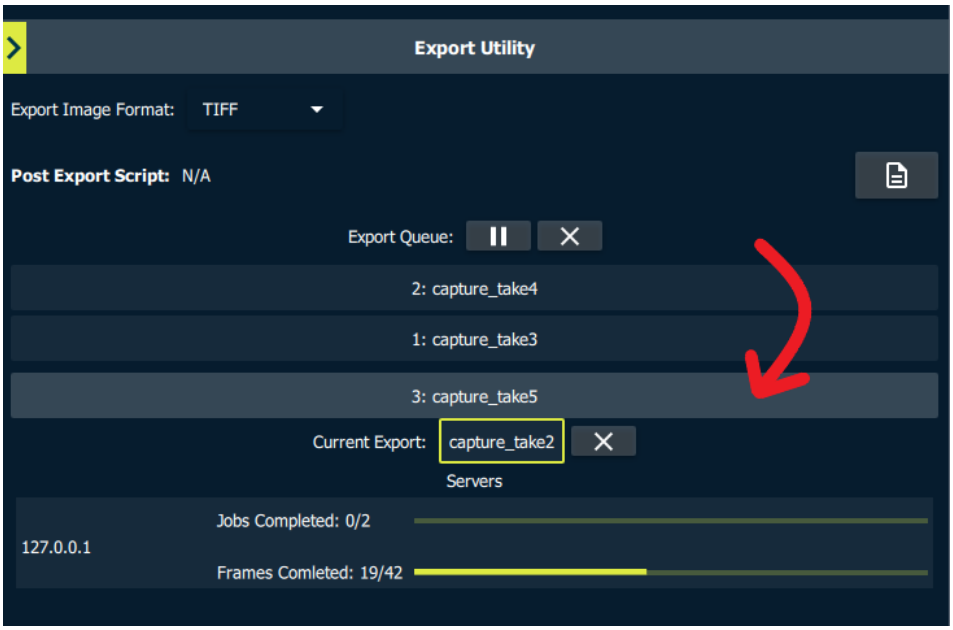

Dinoasur Toy
UNLOAD PROJECT
DELETE PROJECT
Calibration Captures
HIDE DELETED
HIDE EXPORTED
calibration_take1
Capture Time: 2022_04_28_09_11_14_073 Frames per camera: 69 Total bad frames: 0 Frame Rate: 10fps
Camera | Server Address | Storage Device | Directory | Total Frames | Bad Frames | Frame Rate
00401564 | 127.0.0.1 | B:\ | ...apturePro Data/00401564/2022_04_28_09_11_14_073 | 70 | 0 | 10
00401566 | 127.0.0.1 | B:\ | ...apturePro Data/00401566/2022_04_28_09_11_14_073 | 69 | 0 | 10
DELETE
Marked Frame IDs: 9, 22, 33, 51, 61
Export Locations:
C:/Users/evt/Pictures/Dinoasur Toy/calibrations/calibration_take1/capture
Background Captures
HIDE DELETED
HIDE EXPORTED
background_take1
Capture Time: 2022_04_28_09_11_07_465 Frames per camera: 1 Total bad frames: 0 Frame Rate: 0fps
Camera | Server Address | Storage Device | Directory | Total Frames | Bad Frames | Frame Rate
00401564 | 127.0.0.1 | B:\ | ...apturePro Data/00401564/2022_04_28_09_11_07_465 | 1 | 0 | 0
00401566 | 127.0.0.1 | B:\ | ...apturePro Data/00401566/2022_04_28_09_11_07_465 | 1 | 0 | 0
DELETE
Marked Frame IDs: N/A
Export Locations:
C:/Users/evt/Pictures/Dinoasur Toy/capture_take1/backgorund
Takes
HIDE DELETED
HIDE EXPORTED
capture_take1
Background: background_take1
Calibration: calibration_take1
Notes
notes...
Capture
Capture Time: 2022_04_28_09_11_29_033 Frames per camera: 68 Total bad frames: 0 Frame Rate: 10fps
Camera | Server Address | Storage Device | Directory | Total Frames | Bad Frames | Frame Rate
00401564 | 127.0.0.1 | B:\ | ...apturePro Data/00401564/2022_04_28_09_11_29_033 | 68 | 0 | 10
00401566 | 127.0.0.1 | B:\ | ...apturePro Data/00401566/2022_04_28_09_11_29_033 | 68 | 0 | 10
DELETE
Marked Frame IDs: N/A
Export Locations:
C:/Users/evt/Pictures/Dinoasur Toy/capture_take1/capture

Export Queue

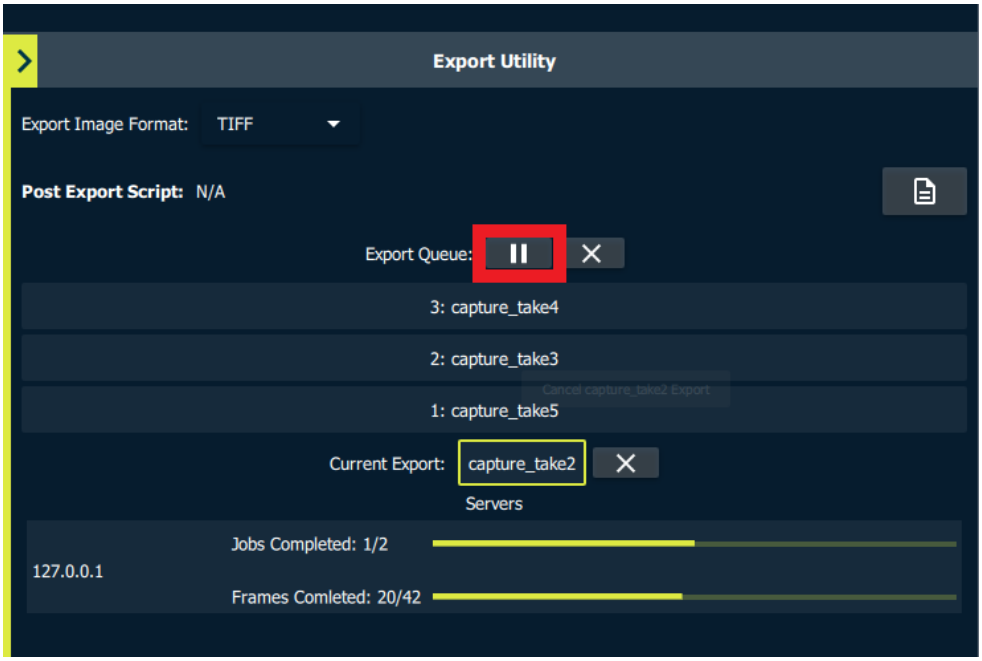
When the user clicks the export button takes are added to the export queue.



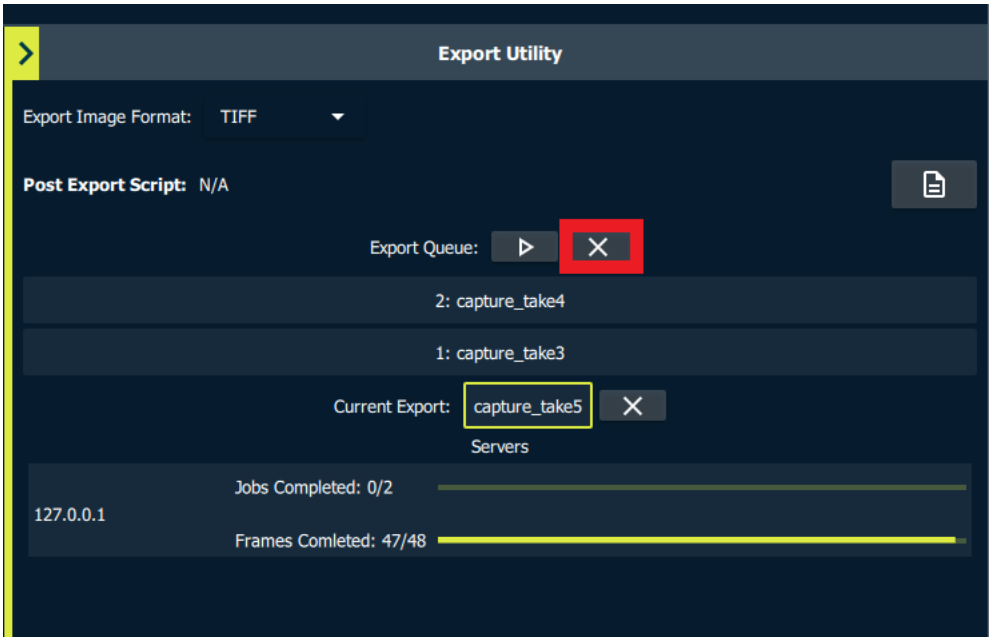
Once takes are enqueued they can be re-arranged by clicking, holding and dragging.



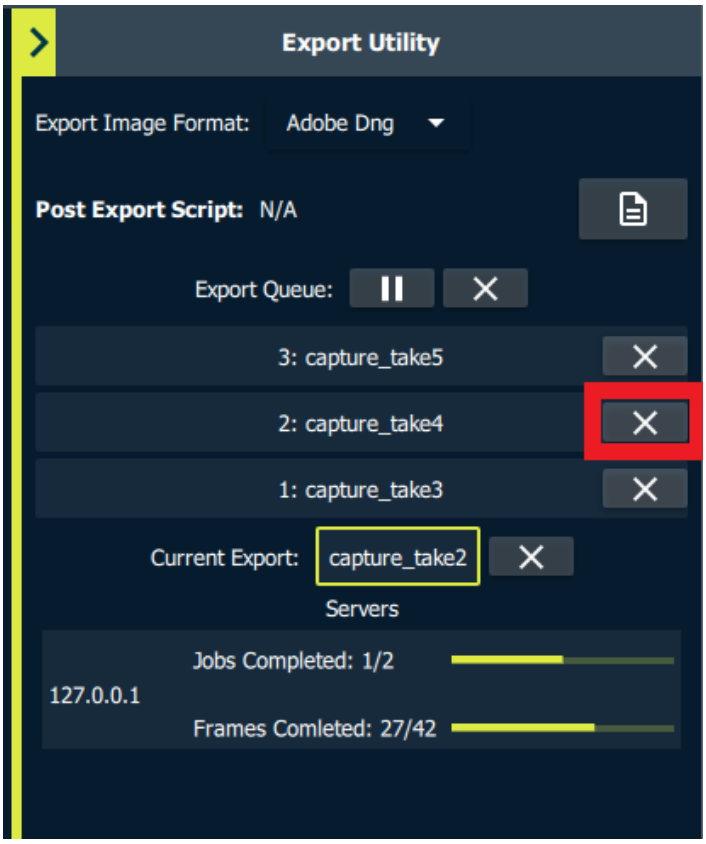
The export queue can be paused and resumed. Pausing does not pause the current export but once it finishes no other takes will be exported until the queue is resumed.



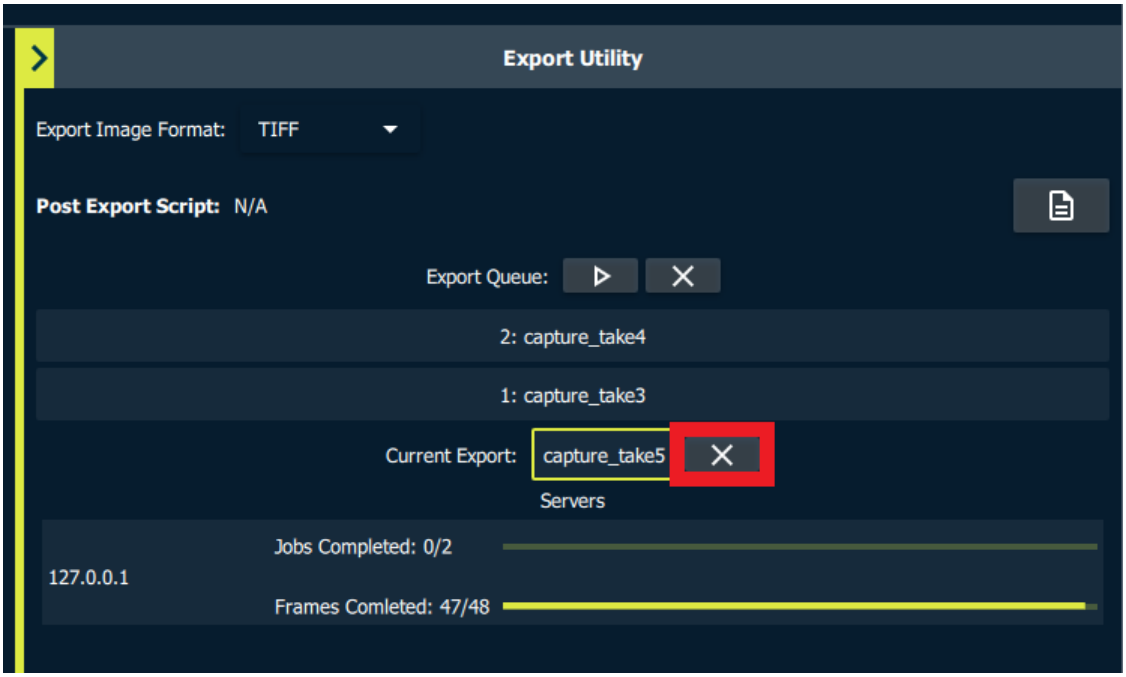
All takes currently waiting in the export queue can be cleared.



Takes in the queue can be cleared individually cleared too.

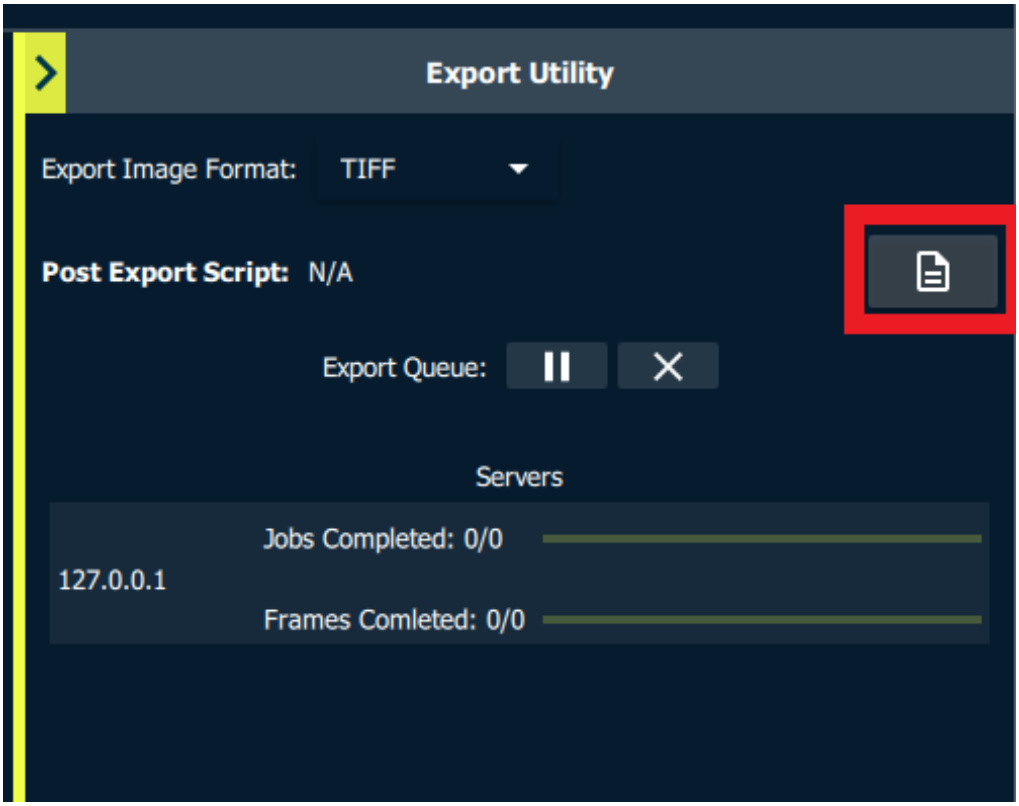


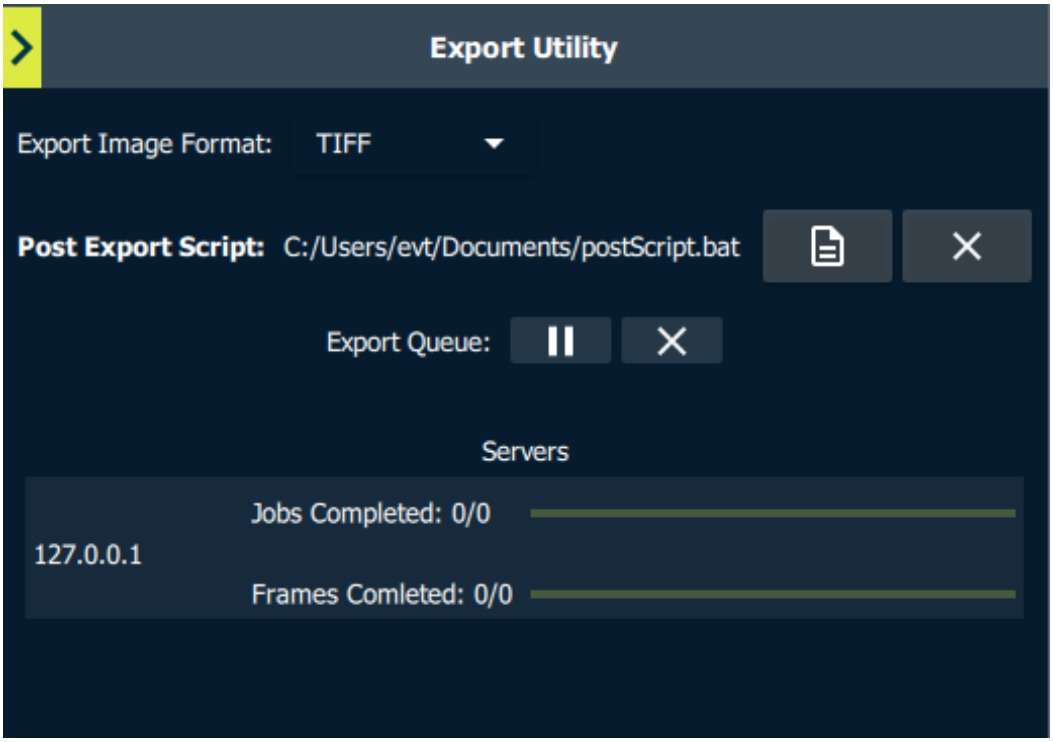
The current export can also be cancelled.



Post export script

The user can supply the path to a post export script.





This is a script that will be invoked on the completion of an export. The script will be called as follows:

```
<Script filepath> <Export Location> <Take Type>
```

Where <TakeType> will be:

- ‘C’ for Calibration Takes
- ‘P’ for Capture Takes

Calibration Take:

```
"<Script filepath>" "<Export Path>/<Project Name>/calibrations/<Take Name>" C
```

Capture Take:

```
"<Script filepath>" "<Export Path>/<Project Name>/<Take Name>" P
```

So for example if we supplied a script at the location C:/Users/evt/Documents/postScript.bat then it will be called as follows for the previous example Calibration Take:

```
"C:/Users/evt/Documents/postScript.bat" "C:/Users/evt/Pictures/Dinosaur Toy/calibrations/calibration_take1" C
```

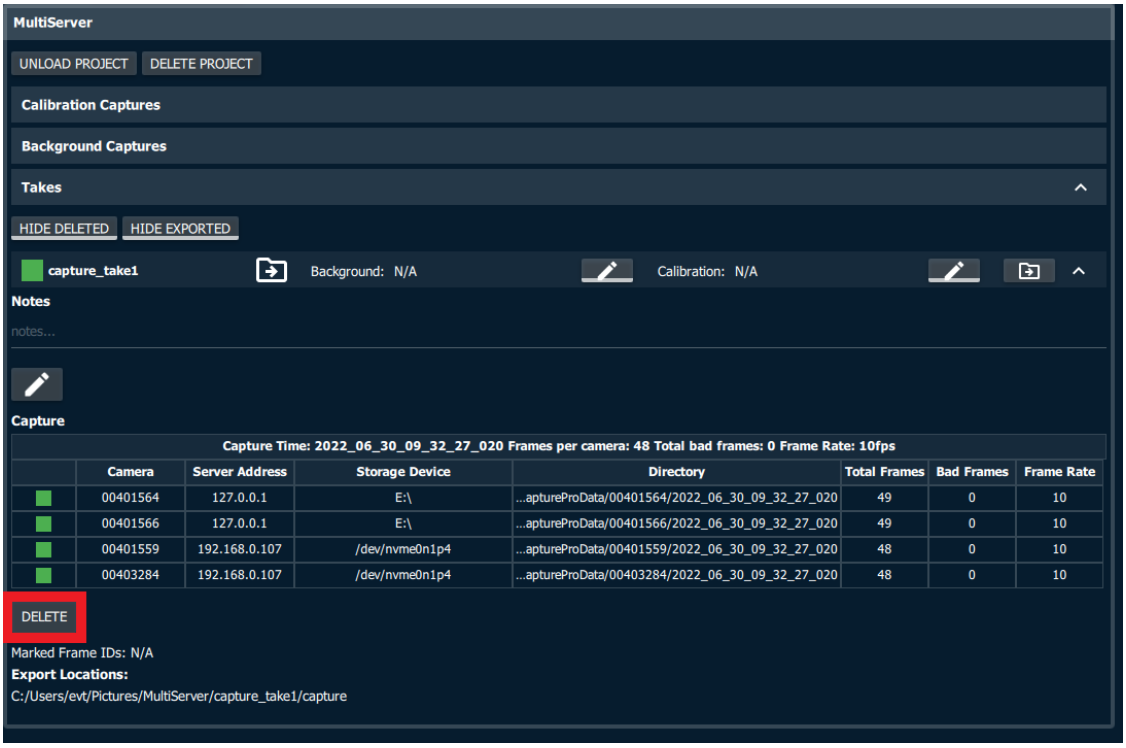
Capture Take:

```
"C:/Users/evt/Documents/postScript.bat" "C:/Users/evt/Pictures/Dinosaur Toy/capture_take1" P
```

Deleting Captures and Clearing Drives

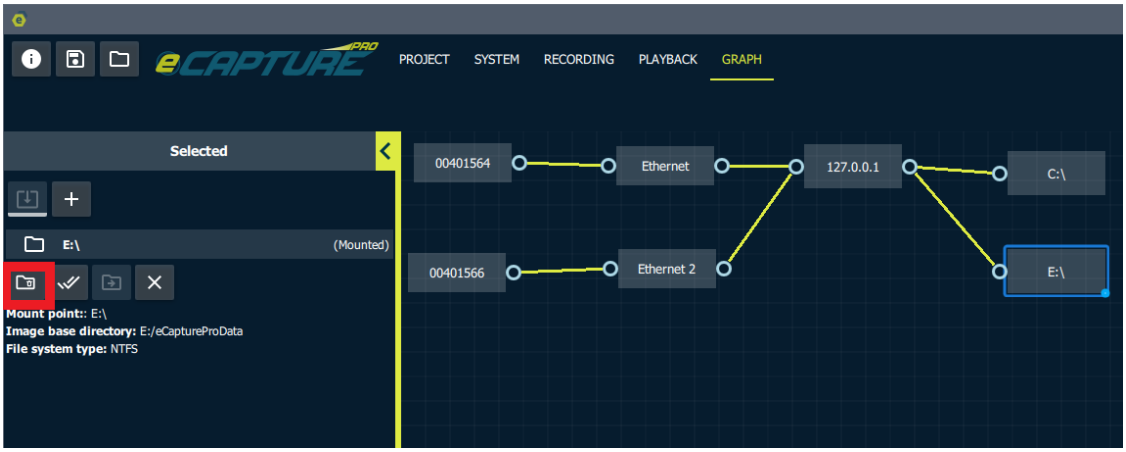
After takes are exported you can delete them to free up space on the storage devices.

Takes can be deleted individually.

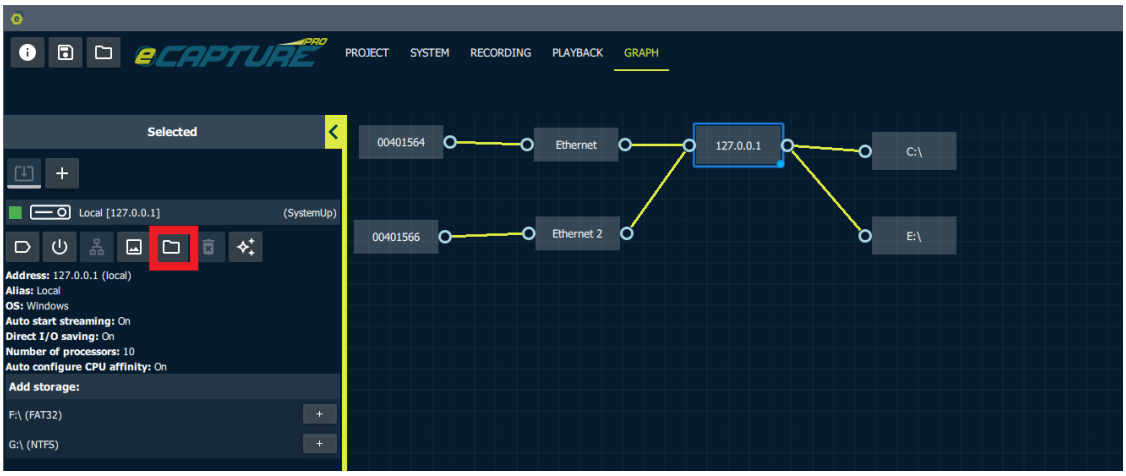


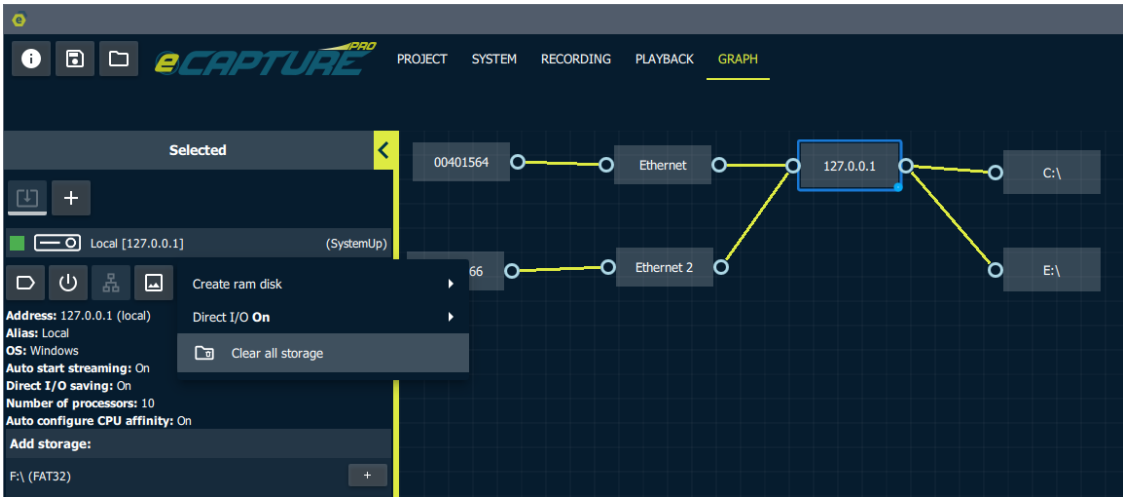
Storage can either be cleared individually or all of a server's storage devices can be cleared at once. This will only clear eCapturePro data from the drives. If **any** storage device is cleared then **all** previous recordings will be marked as deleted.

Clear an individual storage device.



Clear all storage devices on a server.


eCAPTURE PRO
PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Selected
Local [127.0.0.1]
(SystemUp)
Address: 127.0.0.1 (local)
Alias: Local
OS: Windows
Auto start streaming: On
Direct I/O saving: On
Number of processors: 10
Auto configure CPU affinity: On
Add storage:
F:\ (FAT32)
G:\ (NTFS)
00401564
Ethernet
127.0.0.1
C:\
00401566
Ethernet 2
E:\


eCAPTURE PRO
PROJECT
SYSTEM
RECORDING
PLAYBACK
GRAPH
Selected
Local [127.0.0.1]
(SystemUp)
Create ram disk
Direct I/O On
Clear all storage
Address: 127.0.0.1 (local)
Alias: Local
OS: Windows
Auto start streaming: On
Direct I/O saving: On
Number of processors: 10
Auto configure CPU affinity: On
Add storage:
F:\ (FAT32)
00401564
Ethernet
127.0.0.1
C:\
66
Ethernet 2
E:\

Troubleshooting Suggestions

For many cameras on the same system the ring buffer per camera may be too large. If they system is running out of memory then try decreasing ring buffer size through the environment variable MELLANOX_RINGBUFF_FACTOR. Try reducing it from 18 to 16.

Reduce the live stream thumbnail resolution to 1/256 for systems with many cameras.

Increase the “LineTime” parameter to the maximum value (will vary with frame rate).

Try different manual CPU affinity settings.

Disable power saving mode in the system BIOs. Set the power usage mode to Performance mode if that option is available.

Disable Hyperthreading in the system BIOs.

Ensure that PCIe lanes are not shared between the Mellanox cards and other PCIe devices. Ie if the card is PCIe Gen 4 then it should enumerate on the system as PCIe Gen 4 not PCIe Gen 3.

Ensure that the GPU driver is from the GPU manufacturer not the default Microsoft provided driver.

Errata

For windows if there is a mounted network drive (given a drive letter) and the network drive is disconnected then the capture server application may have lots of lag.

On linux the first time you install eCapturePro you will have to log out after the install then log back in to refresh the environment before eCapturePro will work.

Using the “Auto re-configure interface + camera IPs” when NICs and cameras are added to the system may result in failed requests to force camera IPs for a period right after the nic has been configured.

Uninstalling eSDK on linux removes the entire directory /opt/EVT This is where eCapturePro is installed so un-installing eSDK will remove eCapturePro

The linux installer lets you choose the install location of eCapturePro but only the default location should be chosen. The application may not work if a different location is chosen.

If the current IP for a NIC does not match the saved IP then you must resolve this in the system graph NIC context menu before cameras will be opened on the NIC.

The feature to load a LUT from CSV does not provide feedback if it fails. You will know if it succeeded if the LUT graph updates to display the data input via CSV.

May get warnings regarding couldn’t start/stop thumbnail. These can be ignored.

The live stream thumbnail right click menu > “Select and Full Screen” option changes the thumbnail resolution to Full. This can lead to increase CPU usage and maybe dropped frames. When the display is returned to group mode via the right click menu > “Show Group” the thumbnail resolution is returned to the group’s thumbnail resolution setting.

False color is applied to 8 bit de-bayered thumbnail image. So the results may not be useful if the user plans on saving bayer images.

Broadcasting auto algorithm region settings between cameras may not work.

If the windows environment variable editor is opened while eCapturePro is installing then eCapturePro’s environment variables may fail to be set.

There may be grey frame that appear in playback. This does not mean those frames were dropped, they just could not be obtained from the capture server for playback. The grey frames are a debug feature that should be removed.

If the playback display resolution or frame rate is changed by the user then the current playback recording is de-selected and the playback controls are greyed out. The current playback recording must be re-selected from the list of recordings.

When any disk is cleared all previous recording will be marked as deleted.

For recordings with a frame rate less then 10fps, buffered images from previous streaming sessions may not be cleared correctly so the first image in the recording may have been from before recording started.

The alias given to a camera may not fit in a camera graph node.

There is no check for multiple cameras having the same alias. This can be an issue since when the take is exported if a camera has an alias the camera's images will be placed in a folder with the alias as the name. So if two cameras have the same alias then one camera's exported frames will be overwritten by the cameras.

Deleting a take and clearing a drive does not have adequate user feed back. However deleting a directory and clearing a drive is a blocking operation for the capture server. So the capture server will be un-responsive until the delete operation completes. This can be a problem because if the directory to delete contains lots of data it can take a long time to delete.

If cameras are streaming and another one is plugged in then the one that was plugged in will fail to start streaming until the cameras that were previously streaming are restarted.

Frame count for recordings may not match between cameras in continuous recording mode since some cameras may be stopped recording before others.

If you have the playback frame slider selected and you use your keyboard arrow keys to move the slider many times in a row then playback can freeze.

Revision History

Revised on	Version	Description
08-05-2022	0_1_7	Initial document creation