Nuke 11 Rotoscoping

Introduction

Rotoscoping is a fancy term for creating masks on image sequences, such that you can apply some set of operations on that mask only. For example, color correct only a certain object in the image sequence or copy a certain object from the image sequence into another image sequence.

The term rotoscoping seems to be an esoteric VFX-specific term. It has some historical context in that it was originally a technique used in the early 1900s to do similar work (tracing/masking). From Wikipedia…

> Rotoscoping is an animation technique used by animators to trace over motion picture footage, frame by frame, when realistic action is required. Originally, photographed live-action movie images were projected onto a glass panel and re-drawn by an animator. This projection equipment is referred to as a rotoscope, developed by Polish-American animator Max Fleischer. Although this device was eventually replaced by computers, the process is still referred to as rotoscoping.

Other terms closely related to rotoscoping include…

- matte (photography) - combine 2 or more image elements, usually a foreground and background, into a single image. For example, a picture of an actor and a image of a

landscape. The term matte is often used to refer just to the background that will end up in the final image.

- composite (vfx?) -- compositing is the combining of several image elements into a single image / sequence of images, often with the goal of making the final output look as if its a single cohesive scene.
- chroma key (vfx?)
- green screen (vfx?)

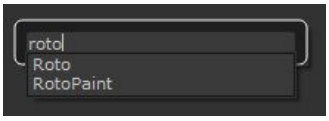
Roto Node

In Nuke, rotoscoping is done using the Roto node. Image data is fed into the Roto node and the artist defines the masks/traces by manually drawing it out in the Viewer. These masks/traces are then output from the node as a channel (e.g. alpha channel, red channel, etc…) and can be used further down the node graph or dumped out for some other tool to use.

Adding Node

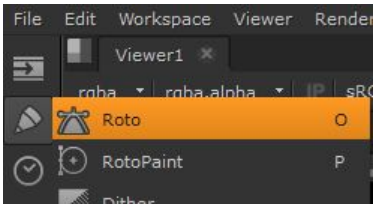
To add a Roto node, you can use any of 3 basic methods described in the main Nuke document…

- Tab menu → hit tab in the graph and type in Roto…



- Context menu → right-click in the graph and goto Draw → Roto…

- Toolbar → click the pencil and select Roto…

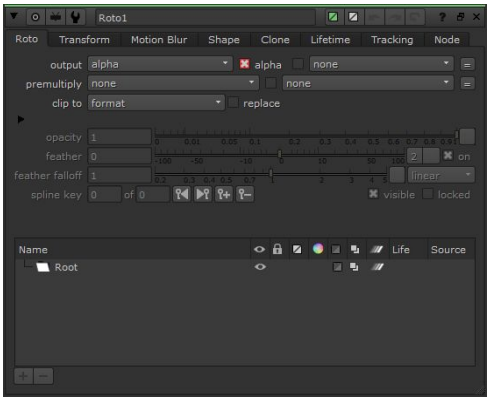


If you already have a node selected when you add the Roto node, it'll get added to the output of the selected node. If the selected node already has an output, it'll get added between the nodes.

Tracing Shapes

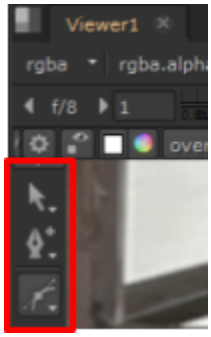
You can trace/draw the shapes for a Roto node directly in the viewer, but you need to make sure that you first have that Roto node's properties open.

> **NOTE**: To open up the properties for a node, double-click on the node.



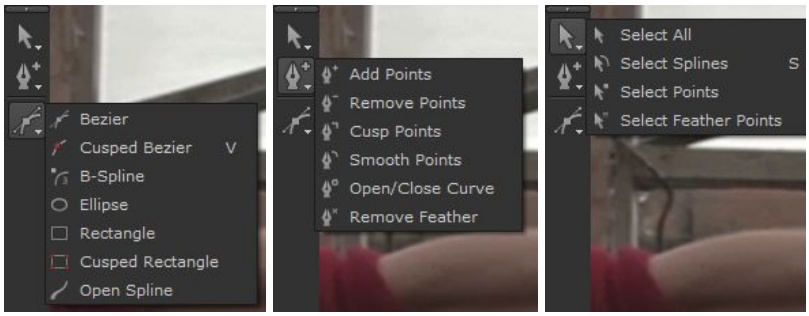
> **NOTE**: Remember that you can have the properties for multiple nodes open at once. If you have the properties for 2+ Roto nodes open at once, the one that's currently selected will be the one you're drawing on.

Once open, you'll see 3 buttons in a vertical toolbar hugging the left of the viewer you have open…



NOTE: Remember that the Viewer doesn't have to be the Viewer that the Roto connects to. So long as the properties of the Roto node are open, you can draw in any open Viewer.

The top button is for selecting parts of an existing shapes, the middle button is for manipulating points on existing shapes, the third button is for drawing new shapes…



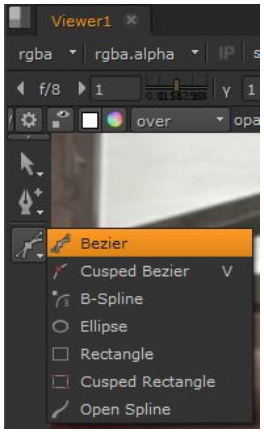
NOTE: Be careful when clicking the 3 main buttons. If a button is already selected but you click it anyways, it'll switch to the next item in it's list. For example, if I have the first button already selected and I click on it again, it'll cycle to the next item in it's list…

If you want the dropdowns to show up, you need to click-and-hold until it pops up.

Creating Shapes

To draw/trace shapes on a Roto node, you need to have the node's properties open and the node selected.

In the Viewer, make sure you have the Bezier tool selected...



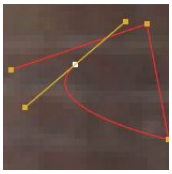
NOTE: You can play around with other tools in this list as well. They all draw stuff but Bezier is the easiest to work with. Cusped Bezier is like Bezier except that it won't give you bezier handles as you draw (discussed further below).

You can then start clicking in the viewer to start drawing the shape. If you…

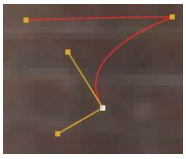
- LMB click → it'll drop a point without bezier handles

Don't worry if you forget to add in bezier handles. You can always add handles for a point after you're done tracing (discussed further on in this doc).

- LMB click+drag → it'll drop a point where you clicked and the drag defines the length of the bezier handles.



The bezier handles here are symmetric. Once you've dropped the point, you can do Ctrl+LMB on a handle to change it without changing the other handle. You can also do this after the fact once you're done tracing (discussed further on in this doc).

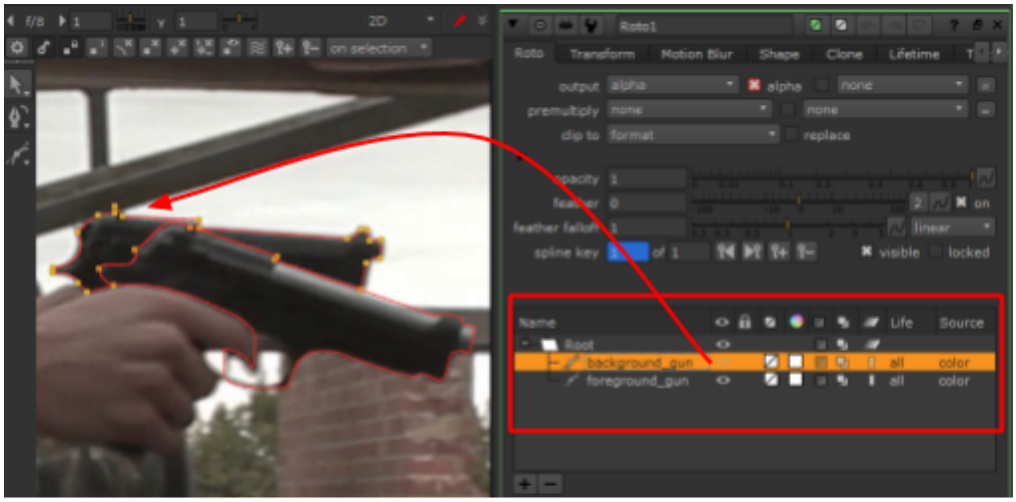


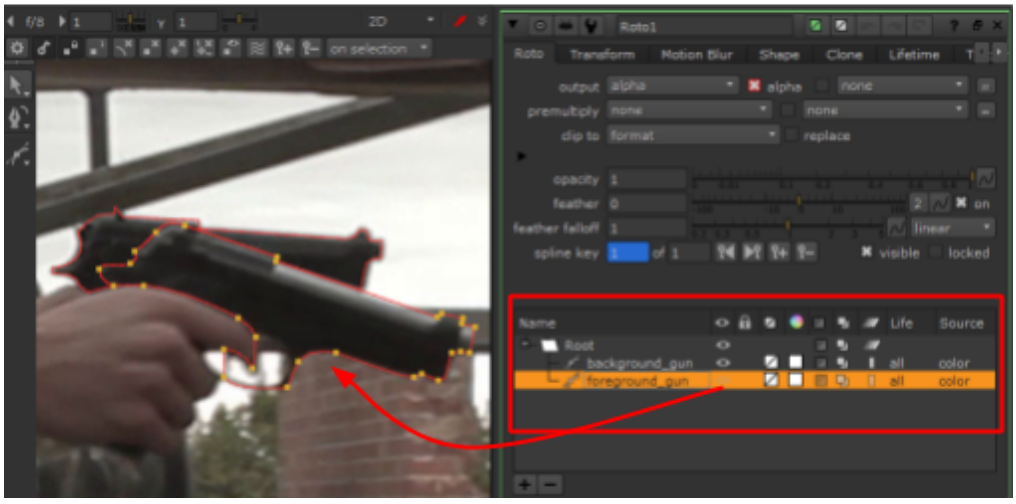
NOTE: If you aren't in drawing mode and you accidentally hit Ctrl+LMB, it'll lock the color picker onto a particular pixel. That pixel will get highlighted in red. If this happens by accident, Ctrl+RMB will remove it.

NOTE: The shape you draw must be a closed -- it can't have any gaps/openings. If you don't close it yourself, Nuke will close it for you as soon as you switch to another tool.

Once your shape is completed, you'll see it in the list of shapes in that Roto node's properties. A Roto node can hold on to multiple shapes. The final output of the Roto node will combine all these shapes together (so don't worry if there's overlapping happening between your shapes).

The Node properties like you do things such as hide shapes, lock shapes, etc...



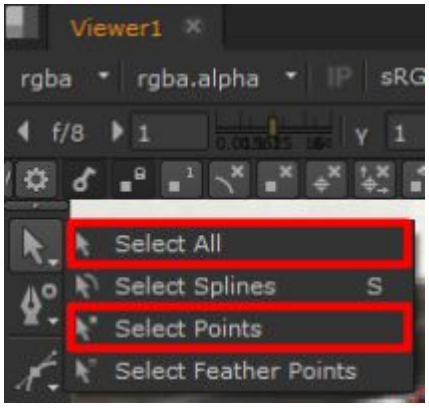


NOTE: To rename a shape, double-click on the name in the properties panel.

Modifying Points

> **NOTE**: Make sure you have the Roto node's properties open and the shape you want to edit selected. You'll know the shape is selected when you see the points highlights in the viewer / when the shape is selected in the Roto node's properties.

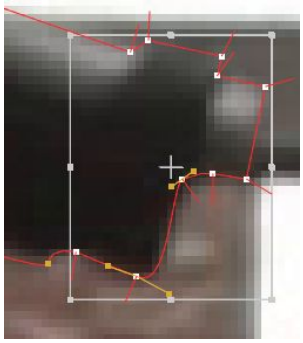
You can move points via the 1st toolbar button in the Viewer.



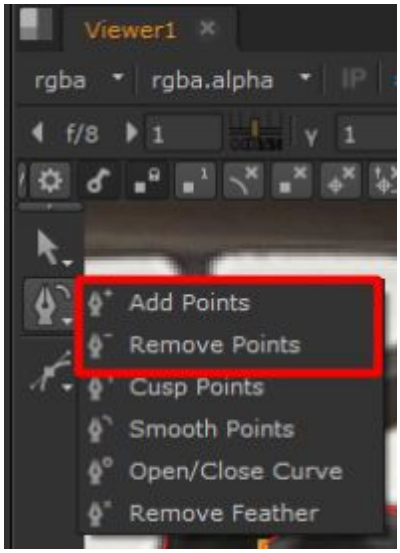
- Select All → select everything, including points
- Select Points → select just points

> **NOTE**: Typical people use Select All for everything. Rarely ever will you be tweaking points only -- what's more likely to happen is that you'll tweak a point, then maybe tweak its feathers or it's bezier handles, and then go back and tweak that point again, etc.. etc.. It's a mixed workflow.
>
> The problem with Select All is that Nuke uses proximity-based selection. So, if 2 selectable things are very close to each other, when you click it'll always select one over the other (even if you're very careful with your clicks). The work around to this (aside from not using Select All) is to zoom in until the 2 selectable things are separated enough to make distinctly selectable.

You can manipulate many points at once by first selecting the shape and then either marquee selecting over points or Shift+LMB clicking points...



You can add and remove points from a shape points via the 2nd toolbar button in the Viewer.



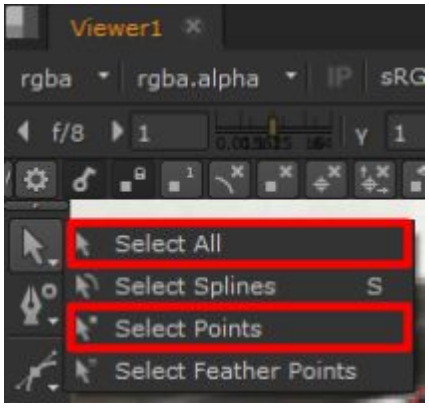
The items listed here are self-explanatory...

- Add Points → adds points to where you click
- Remove Points → removes points you click

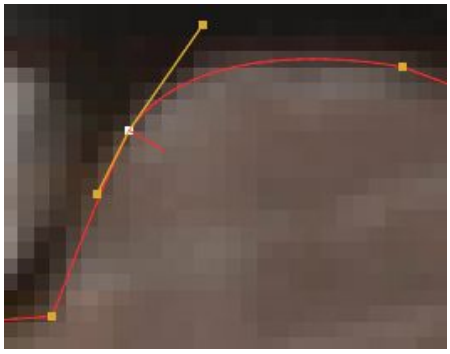
Modifying Bezier Handles

> **NOTE**: Make sure you have the Roto node's properties open and the shape you want to edit selected. You'll know the shape is selected when you see the points highlights in the viewer / when the shape is selected in the Roto node's properties.

You can change around the bezier handles for a point by selecting it via the 1st toolbar button in the Viewer.



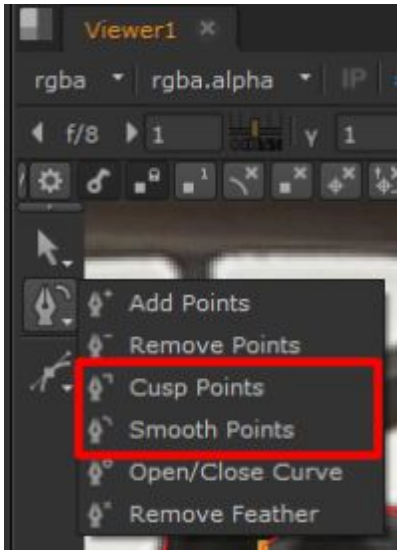
Once selected, if the point actually has has bezier handles, you'll see 2 other lines+points protruding from that point…



If you…

- LMB click-and-drag a handle → it'll symmetrically move around the handles, meaning that a change in one handle will make a proportionally opposite change in the other handle.
- CTRL + LMB click-and-drag a handle → it'll asymmetrically move around the handle, meaning that the change to the handle won't affect the other handle.

You can add and remove bezier handles from a point via the 2nd toolbar button in the Viewer.



The items listed here are self-explanatory...

- Cusp Points → removes the bezier handles on points you click
- Smooth Points → add bezier handles on points you click (or smooth if handles already exist)

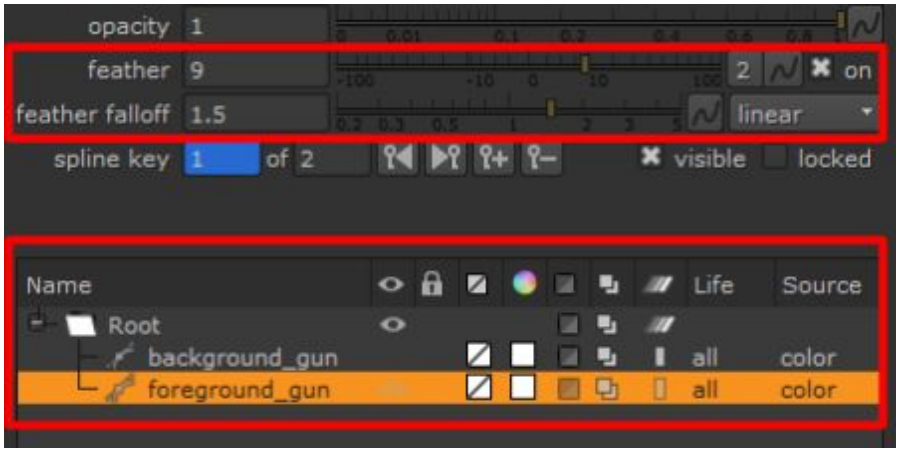
Feathering Shapes

Feathering is used when what you're tracing has a blur (e.g. motion blur). You trace over the object as normal and provide a feather for the region where the blur is occuring. The feathered region will less intensely apply whatever operation the output of the Roto feeds into.

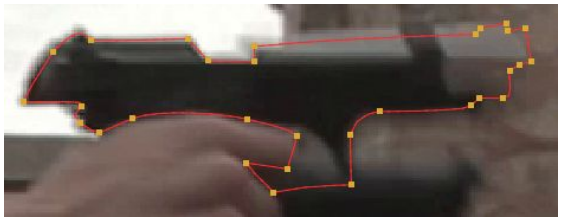
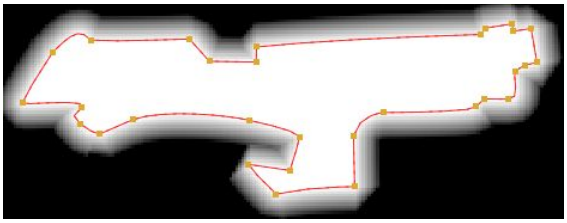
There are 2 ways to apply feathering. The first is to use the global feathering option found in the Roto node's properties.

Shape Feathering

Select the curve you're operating on and then change feathering sliders…

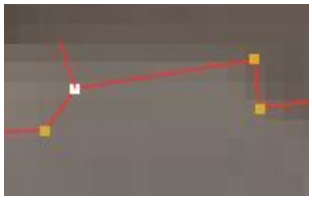
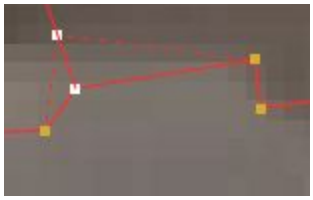


The output won't be immediately visible on the trace, but you can see it if you view the alpha channel…

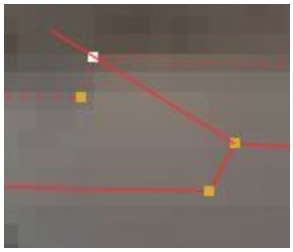
Point Feathering

The second way to feather shapes is to apply the feather directly on the points. When you select a point, you should see a little red line protruding from that point. If you click-and-drag that line, it'll create a feathered region. That region will be denoted by a dotted line...

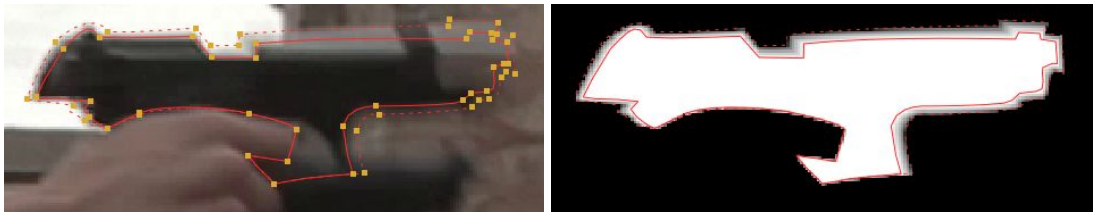



> **NOTE**: If you can't see the protruding line, it may be that the line is parallel to the lines connecting neighbouring points. Either way, you can Ctrl+LMB drag to create the feathered region -- it does exactly the same thing as pulling out the line.

The points on this new dotted line will be a copy of the original points. If the original point had bezier handles, so will the point on the dotted line (and the handles will be pointing in the same direction and have the same length). You can manipulate the points independently from the original, but they'll always be tied to the original. You'll see a line going through the dotted line point and the original point when you select either…



The output won't be immediately visible on the trace, but you can see it if you view the alpha channel…



Animating Shapes

If you're tracing over an image sequence, you can animate the points on your shapes using normal keyframe animation.

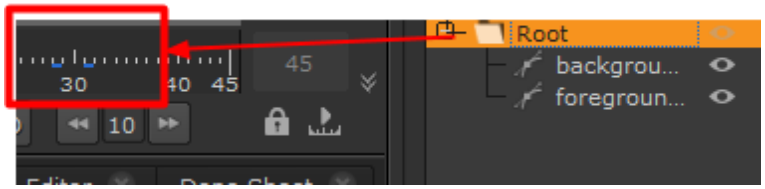
To keyframe a shape…

1. select the shape to keyframe
2. move the frame where the keyframe should be set
3. manipulate the points on that frame

As soon as you change something on a shape, a keyframe automatically gets set. You can then change stuff however you see fit using the dope sheet or curve editor.

> **NOTE**: I haven't tested this but I don't think you can add/remove points on a keyframe (outside of feathering points).

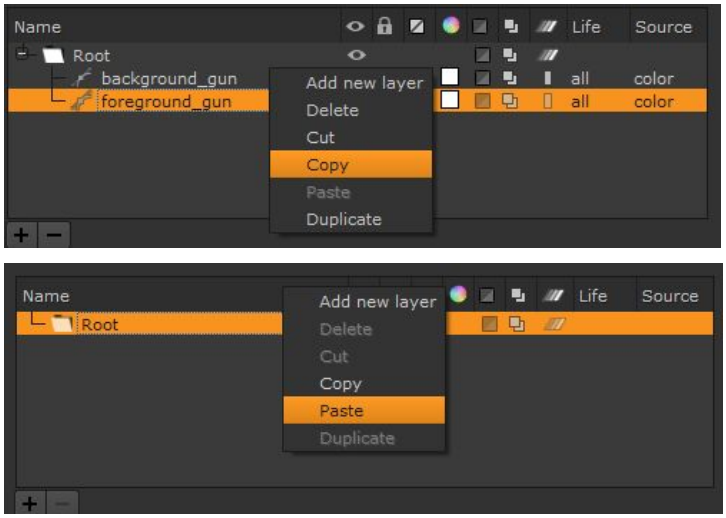
Values are keyed only on the selected shape. If your Roto node has multiple shapes, the scrubber will only show keyframes for the currently selected curve. If Root is selected, it'll show the keyframes for all shapes.



Note the number of blue ticks in the above examples. They're the keyframes. The background_gun shape only has 1 keyframe, while the foreground_gun shape has 2 keyframes. Depending on what curve is selected, the keyframes shown in the scrubber/dope sheet/curve editor will be different.

Copy/Paste Shapes

You can copy/move shapes to other Roto nodes by RMB-clicking the shape in the properties panel and selecting Copy/Cut, then going to another Roto node and pasting it.



You can also drag-and-drop shapes between the properties panel of different Roto nodes.

Best Practices

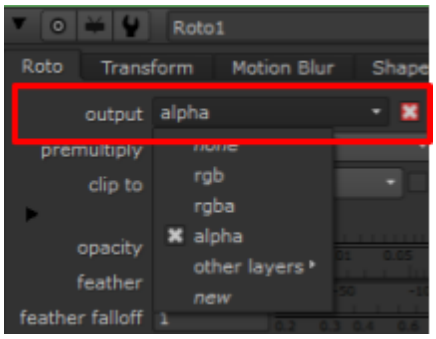
Some important points to be aware of when making your shapes…

1. start from frame where object being traced is most stable -- the most stable/easiest to trace still of the object is the one you should start with.
2. add points around joints -- if the object bends in a certain spot, that spot should probably have a point.
3. keep the number of points to a minimum -- this helps maintain "point consistency".
4. make points symmetrical -- if there's a point, there should probably be another point across from it.

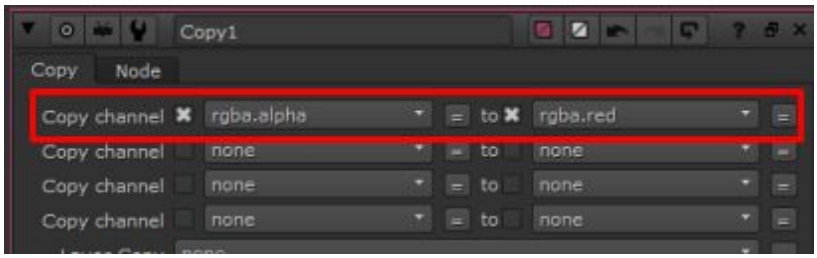
   NOTE: The lessons didn't really explain why these are important. These seems to apply only to image sequences -- individual images probably don't matter as much?

Channel Output

By default, the shapes you traced/drew will show up in the alpha channel (combined with the original input), so it won't be visible. You can control which channel the Roto node dumps its output to via the properties…



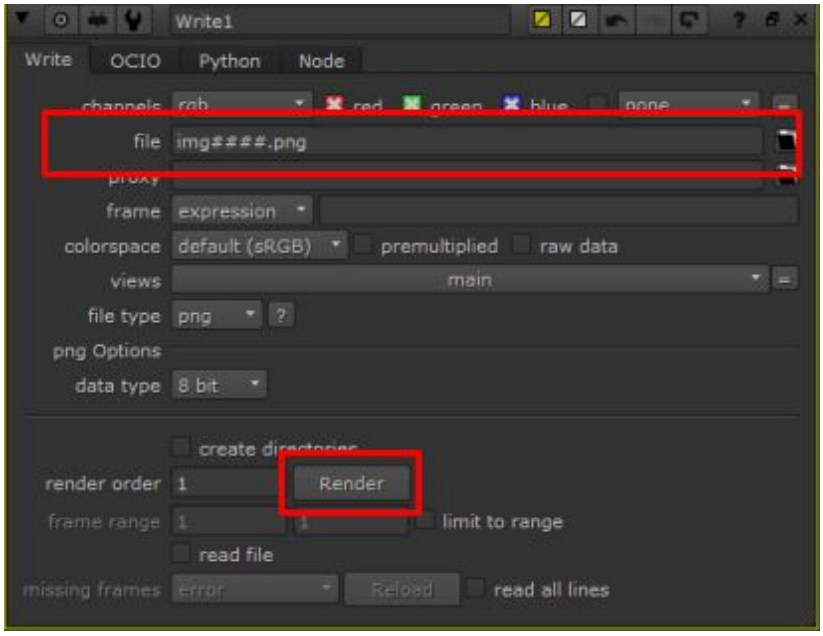
The output is typically left as alpha. If you want to have the output go to another channel, you can use a Copy node to change it…



> **NOTE**: This is super useful if you want to see the mask you're creating as well as the original image -- just each the output of the copy node go to another Viewer node.

Cache Output

In many cases, the user wants to cache the traces/drawings out to disk to an image sequence (maybe they want to feed the masks downstream to some other application). This is done by feeding the Roto node's output to a Write node....



NOTE: Have an image sequence? Make sure your Write node is outputting as an image sequence by using # signs in the filename… e.g. img####.png.