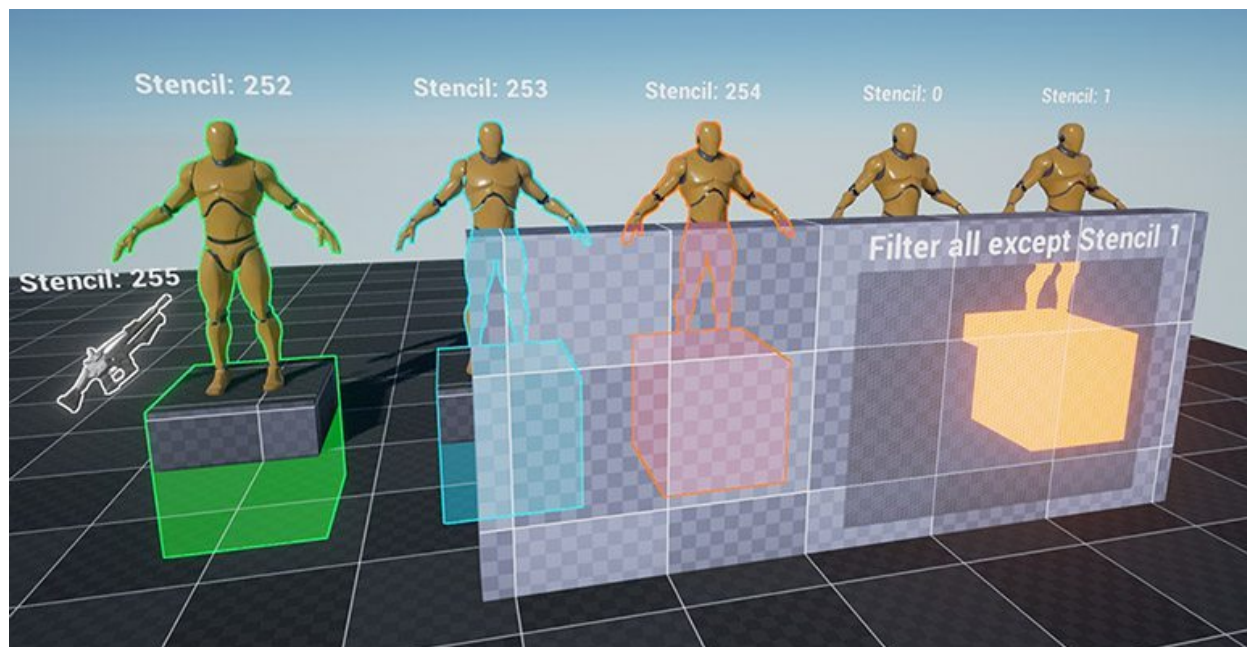


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Multi-color Outline Post Process in Unreal Engine 4

🕒 OCTOBER 21, 2015 🔄 MAY 6, 2019 💬 [COMMENTS: 203](#)

With some of the recent changes to Unreal Engine 4, rendering multi-color outlines is now possible! This is done through the use of Custom Stencil, a new buffer similar to Custom Depth – but allowing meshes to render as integer values. This provides us with a 1-255 range of indices that can be used to apply different outline colors to meshes and even combine multiple features such as the decal x-ray shown below by using a different stencil index.

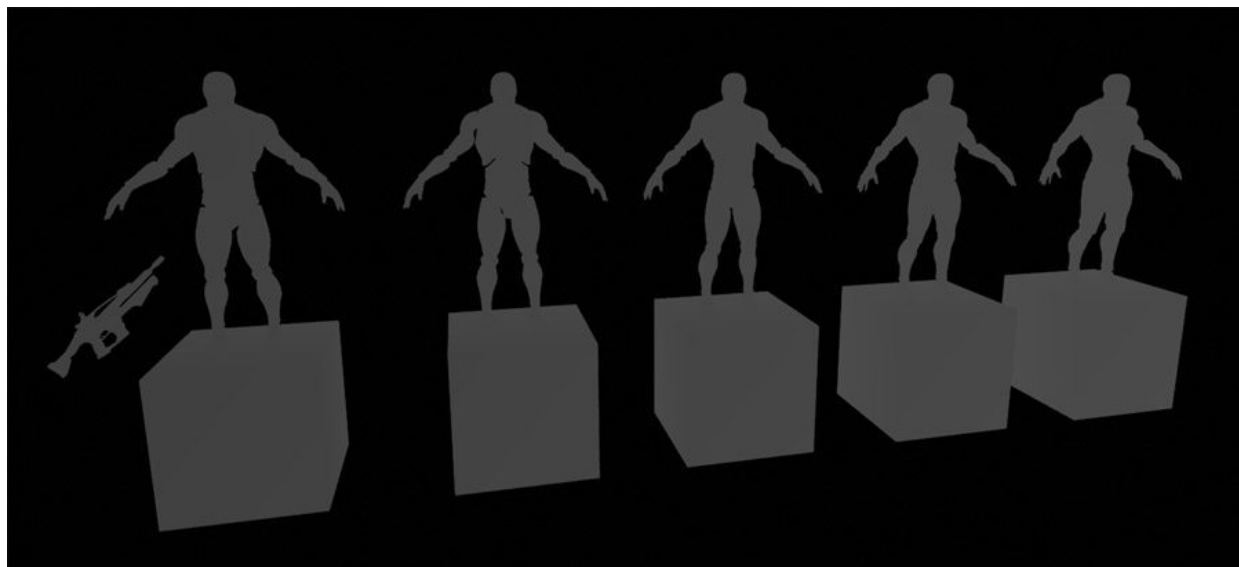


The Original Custom Depth

The original outline material I made last year was based on Custom Depth, before Custom Stencil was available. This meant there was no way to determine the mesh type after it was

drawn into the buffer as single channel depth value. More info on the effect and other uses for Custom Depth are available in my of [my earlier posts](#). The original effect uses fewer instructions (97 vs. 144 of the new material) so if you don't require multiple colors in your game you can consider sticking to the old effect.

The new effect is still using Custom Depth to determine the (optional) occlusion which adds the faint overlaid color adjusted by tweaking the *FillAlpha* parameter in the post process. This occlusion can be turned off in the material by unchecking *FillOcclusion* in the material instance.



Above: the Custom Depth visualizer.

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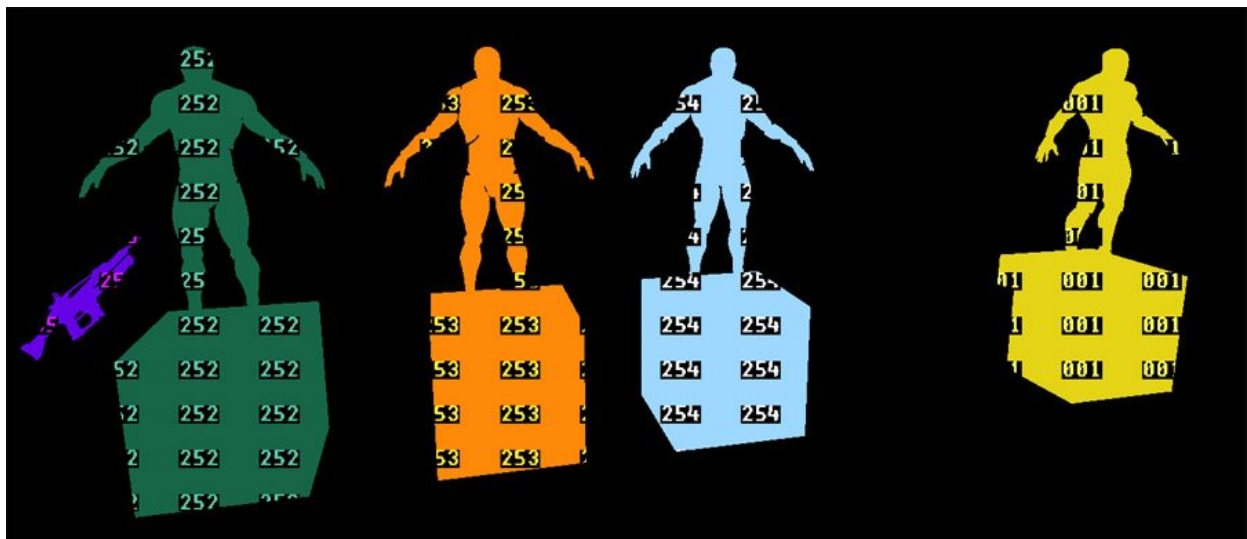
Setup Instructions

To enable the outline you need to place a **Post Process Volume**. Make sure you **set it to Unbound** so it's available regardless whether camera is inside the volume or not. With the post process volume selected, go to **Settings > Blendables** and add the PPI_OutlineColored as the first entry.

Enabling Custom Stencil

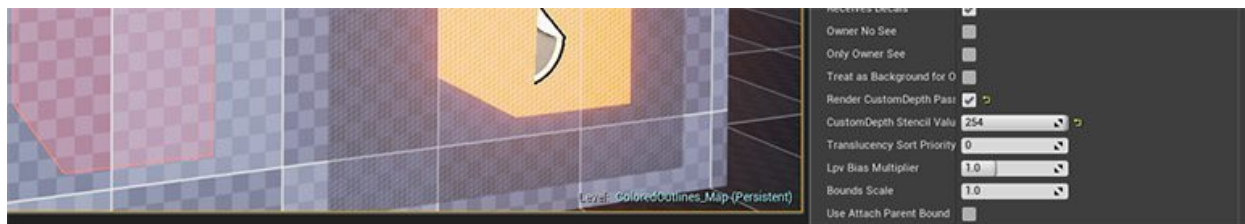
Custom Stencil is disabled by default, to enable go to *Window > Project Settings > Rendering > Post Process > Custom Depth-stencil Pass* and set it to **Enabled with Stencil**.

Some of the meshes are not visible in the Custom Stencil visualizer in this example, their Stencil value is set to 0 (default), excluding them from this buffer.



To enable this visualizer go to your viewport, look for *Lit > Buffer Visualizer > Custom Stencil*.

You can enable Custom Depth and change the Stencil index through the editor menu of a mesh under the Rendering category.



If you're using C++ you can define the stencil indices in your game header (ex. SurvivalGame.h) for your convenience and bookkeeping.

```
/* Stencil index mapping to PP_OutlineColored */  
#define STENCIL_FRIENDLY_OUTLINE 252;  
#define STENCIL_NEUTRAL_OUTLINE 253;  
#define STENCIL_ENEMY_OUTLINE 254;  
#define STENCIL_ITEMHIGHLIGHT 255;
```

Enabling custom depth and setting the index in C++ is pretty straightforward.

```
GetMesh()->SetRenderCustomDepth(true);  
GetMesh()->SetCustomDepthStencilValue(255); // assign an int32 within 1-255 range.
```

Previous posts on subject

- [The many uses of Custom Depth](#)
- [Recreating Evolve's outline post effect](#)
- [Outline Post Process](#)
- [Hologram Material](#)

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Tom Looman [Twitter](#) [LinkedIn](#) [YouTube](#) [GitHub](#) [Patreon](#)

Hi, my name is Tom. I'm a game developer & programmer who has worked with Unreal Engine 4 since day 1, both as an indie developer and as an engineer at Epic Games. Over the years I created 70+ tutorials and samples for the Unreal Engine community, I hope you'll find my content useful!

Share



203 Responses

 **Comments** 203 **Pingbacks** 0**Garrett Hogan**

June 11, 2019 at 5:24 AM

Hey Tom, this doesn't seem to work at all in UE4.22. Not sure what I could possibly be doing wrong unless I am missing some step in the instructions. I have:

- Added the PP volume to my level
- Set it to boundless
- Added the outline effect to the PP materials array
- Enabled custom depth on my characters mesh
- Set the stencil value to 1.0 to match the index in the materials array

And all of the necessary project settings for custom depth and stencil are already enabled by default. I would really like to use this effect and I'm super bummed that I can't seem to get it to work. Any ideas?

Reply

**[Tom Looman](#)** 

June 11, 2019 at 1:01 PM

By default the stencil indices in my material start at 255 instead of 1. This so that other FX can still use the lower range easily. From your list of steps that seems to be the one thing that comes to mind why it isn't working.

Reply

**Garrett Hogan**

June 11, 2019 at 4:58 PM

Ok, so I should set the stencil index in my mesh to be 255 or 254?

Reply

**Garrett Hogan**

June 12, 2019 at 3:03 AM

I was able to get the outline working but I guess it doesn't work in VR? It seems to get displaced. I have instanced stereo turned on btw

Reply

**Tom Looman** 

June 12, 2019 at 1:30 PM

I haven't tried it in VR myself actually but I can imagine it may give some slightly odd effects due to how processing may be slightly different in each eye.

Reply

**Curs0**

June 12, 2019 at 1:44 PM

I can confirm it's working for VR (4.21)

Reply

**Garrett Hogan**

June 12, 2019 at 4:44 PM

I'm on 4.22 and the outlines are displaced from the mesh

Reply

**Tony**

June 4, 2019 at 12:26 PM

Hi Tom,

How would you go about making the outlines no coalescent?

Thanks for the help!

Reply

**Tom Looman**

June 5, 2019 at 2:02 PM

Not sure what you're after Tony, so you want to get disconnected outlines per object?

Reply

**Anonymous**

June 10, 2019 at 1:09 PM

yeah,

I'd like to highlight multiple objects next to each other. currently the highlights merge into one but i'd like each object to be fully outlined separately.

Thanks for the help

Reply

**Tom Looman**

June 10, 2019 at 3:43 PM

That only reliably works if they use unique stencil indices, other methods are more by approximation – eg. you check how big the difference is in Custom Depth between pixels and if it's large enough you assume it's a new object (aka an edge) but this really is just an approximation.

Reply



Jonathan A Seaver

June 16, 2019 at 5:05 PM

Hi Tom, can you elaborate on this a touch? I've setup a CustomDepth node into a Divide into Power and then Masked and Clamped the result, so I now have different values (0-1) for actors that are (significantly enough) at different depths. But I'm confused how to use that information with the texel math you've done to ensure that each object has its own outline.

Reply



Jonathan A Seaver

June 19, 2019 at 2:33 PM

I'm going to answer my own question here, because I found a solution. On the Marketplace is a product called OutlineMaker which is extremely similar to what Tom has done here. However, as long as meshes have different stencil values, they will retain their own outlines and not be coalesced into one shape. So, the trick is just to use assign random stencils in specific ranges for each color you want to have. I only have two colors, so I assign random values b/w 0-124 and 125-255, respectively and the odds of two meshes ending up with the same random stencil value is actually extremely low. Cheers!

Reply



Damon

May 17, 2019 at 9:54 PM

Hi Tom, I was wondering how you achieved the effect where "Stencil 0" has no outline at all? I'm sure it's something very basic but I can't seem to figure out how you did it...

Reply

**Dan**

May 18, 2019 at 12:15 AM

I too am not being able to achieve this – turning on/off the boolean as such – overriding the events in BP. It should still theoretically work?

PrintStringing the bool for sanctity and its coming through fine... but i see 0 outline with the blendable at default values – even changing “Outline Thickness” or the 3 Color values – 0 output to the mesh. Yes – PPVolume is set to Unbound & the PPI is input into the Blendables material field.

<https://puu.sh/DtHeM/c0bec9c3e2.png>

Reply

**Tom Looman** 

May 19, 2019 at 1:41 PM

This outline specifically depends on stencil values so it won't work with stencil of 0 (you can see that result in the images) You'll need a high stencil value for this particular setup (I count down from 255 for the stencils so you can still use the lower indices for other stuff in your render pipeline) So anything between 252-255 I believe are the colors, you can see the first valid index as a material parameter too.

Reply

**ekdikeo**

May 3, 2019 at 3:34 AM

Hi Tom!

Looks like you need to call SetCustomDepthStencilValue() in the desired component rather than simply setting the value directly (and it looks like Epic should probably make that value protected, to ensure that people use the setter..)

Reply

**Tom Looman**

May 6, 2019 at 10:42 PM

I've updated the post, thanks for mentioning it! I agree that they shouldn't leave it open if it can't be set directly w/o breaking.

Reply

**Brian Cross**

May 7, 2019 at 6:15 PM

Hi Tom, for those that have purchased the files, how can we get this fix? Or maybe I'm confused and we don't need an update? Thanks!

Reply

**Tom Looman**

May 7, 2019 at 9:21 PM

No fix needed, the code is just the C++ sample I added to this blog and is not part of the Material itself.

Reply

**Sinisa**

April 29, 2019 at 4:44 PM

Thanks for the material!
But I noticed, it doesn't work anymore in 4.22 and VR.
Did anything change? It used to work before.

Reply

**Daniel**

April 15, 2019 at 6:22 PM

Hi Tom. Thank you for making this.

It seems like the UE 4.22 update broke your shader – or maybe it’s an issue on my end?
Would you mind checking?

Reply



Tom Looman 

April 17, 2019 at 1:43 PM

Hi Daniel, What’s the error or effect that’s no longer working on your end?

Reply



kevin

April 23, 2019 at 1:22 PM

I have also a problem since 4.22 in VR, but it’s fine in desktop.

Reply



davinci

April 7, 2019 at 5:52 AM

Oh Sorry. It was my fault. don’t mind that. i was trying to combine multiple color outline and soft outline (your tutorial)

Reply



Avaku

May 11, 2019 at 5:35 PM

what is the tutorial called? Please send link.

Reply

davinici



April 7, 2019 at 5:37 AM

Hi, Tom, I have a question.

To make the outline shine, I multiplied the result value of the last lerpnode by the color, and I kept seeing the first color. I want to get rid of the first color. What should I do?

Reply



davinci

April 7, 2019 at 5:35 AM

Hi, Tom, I have a question.

To make the outline shine, I multiplied the result value of the last lerpnode by the color, and I kept seeing the first color. I want to get rid of the first color. What should I do?

Reply



Brian Cross

March 28, 2019 at 7:50 PM

Hi Tom, great work. I have a couple of questions I did not see answered in any comments yet.

1. Is it possible to access the Color1 – Color4 values of PPI_OutlineColored from a Blueprint?
2. Is it possible to modify any of the values of PPI_OutlineColored from a Blueprint at run time? I would like to change the OutlineThickness when a weapon is in focus.

Thanks in advance for the answers!

Reply



Tom Looman 

April 17, 2019 at 1:45 PM

Hi Brian, Since they are all parameters you can change them like any other material at runtime. Getting to the post process can be a little trickier then regular materials.

You might want to add the PP material to the Camera of your pawn instead of a volume in the level (also so you dont need to re-do this step for every new level) From there you should get able to access your Camera and 'blend material' in your Blueprint and alter the properties (it's been a while since I did so myself, but its a good place to start)

Reply



Brian Cross

April 20, 2019 at 9:16 PM

Thanks for the reply Tom. If anyone else has this question, I think this is how you do it: <https://forums.unrealengine.com/development-discussion/blueprint-visual-scripting/26062-how-to-edit-post-process-material-parameter>

But I was trying to change the outline thickness on an individual object in the world, which I don't think you can do using this method.

Reply



Tom Looman 

April 20, 2019 at 10:34 PM

That's correct, I do have a solution for this, using non post processing outlines. I'm not sure when I'll get to post about it, but the gist of it is that using translucent cube around the mesh to instead handle outlines PER OBJECT. This is hugely powerful as you can use unique materials per mesh in this way. You even have more information on objects like its location and world position of the pixel which again...is pretty powerful.

The biggest reason is performance though as this way you don't spend time sampling every screen pixel but instead only the coverage area of your outlined mesh which is a huge gain in terms of saved fill-rate.

Reply



Brian Cross

April 22, 2019 at 3:58 PM

That is very interesting. I would love to read a post (and buy a blueprint) on this method of outlines. Please put it on your to do list 😊 Thanks!

Reply



Anonymous

February 22, 2019 at 5:56 AM

nothing appears, i have everything enabled and everything the way it should but nothing appears. My normal outline works fine though. 4.20
that sucks =/

Reply



Tom Looman 

February 23, 2019 at 8:48 PM

I don't recall anything being different in 4.21 that affects this. The project needs to have Custom Depth + Stencils enabled, and the meshes must set the matching Stencil index in their properties so they use the correct colors. Where in the "normal" outlines you only need custom depth, here it's important to properly set up the Stencil Indices.

Reply



Carlo

February 10, 2019 at 1:56 AM

Hey Tom,

Thanks a lot for this material!

I just got it, but I couldn't make it work. Nothing appears.

Tweaking with FillAlpha and FillOcclusion or with the CustomDepth stencil value didn't change anything. I have other outline materials working fine except this one. Please, do you have an idea of what could go wrong?

Currently using: Mac, UE 4.21.2

Reply



Carlo

February 10, 2019 at 12:55 PM

After restarting the project everything works fine now. Not sure what happened.

Reply



Rasmus

January 29, 2019 at 5:21 PM

Hi Tom! Great stuff! I want to show a silhouette when my player is covered by particular objects. I use the different bits to write different values. That way the index adds up where they overlap, and I use this to render a silhouette.

The problem is that this also generates a silhouette when the player is in front of the occluding objects. I seem to have no way of telling whether an object is in front of or behind an occluder if both of them are writing to the stencil buffer.

Is there any way around that?

Thanks!

Reply



Tom Looman 

February 10, 2019 at 4:27 PM

That's a limit indeed. When both are writing to the CustomDepth buffer then you can't compare your SceneDepth reliably against the CustomDepth as only the front is picked.

I do have a more advanced trick that I worked on, but it's not quite ready for release – it avoids post processing and so have more information about the object, which in theory could allow you to check again whether we are in front or behind another object in CustomDepth.

The idea is based on this tweet:

<https://twitter.com/TheRealSpoonDog/status/951223934480871424>

Reply



Michael Herrmann

January 11, 2019 at 5:26 PM

Hi, i also have a multiplayer question. For example: I have Actor A and B, both are outlined. Now take players 1 and 2. Player 1 should see the outlines only on Actor A and Player 2 only on Actor B. Is that possible?

Reply



Tom Looman 

January 16, 2019 at 1:21 PM

Sure, on a client you can disable CustomDepth on the Pawn that is not in your Team for example. When each client runs the code individually (eg. on spawn of that pawn, the client in his BeginPlay checks which Team the pawn belongs to) and enables/disabled custom depth and or the stencil based on it being an enemy or friendly.

Reply



Kevin

January 8, 2019 at 9:53 PM

Hey Tom,

I noticed that this effect doesn't work properly anymore with the newer Engine Versions.

Do you have a workaround for that?

Reply



Olly

January 14, 2019 at 2:40 PM

I have it working fine in 4.21. Can you provide any more details on your scene/steps you took to implement it? Anything to provide clues as to why it isn't working.

One thing i did have to do was make sure that the material instance was pointing to the correct material.

Reply



Anonymous

January 30, 2019 at 7:19 PM

I have reparented the material but I have no colour on the material and thus it does nothing.

Reply



Moai27

January 8, 2019 at 7:48 AM

it works very well. this tutorial awesome! thank you . And i have one question. In the multiplayerGames, i want to only our team is visible (hide in wall), if you advise to me , i'll be really happy ...

Reply

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