

UDK Intermediate – Particle effects

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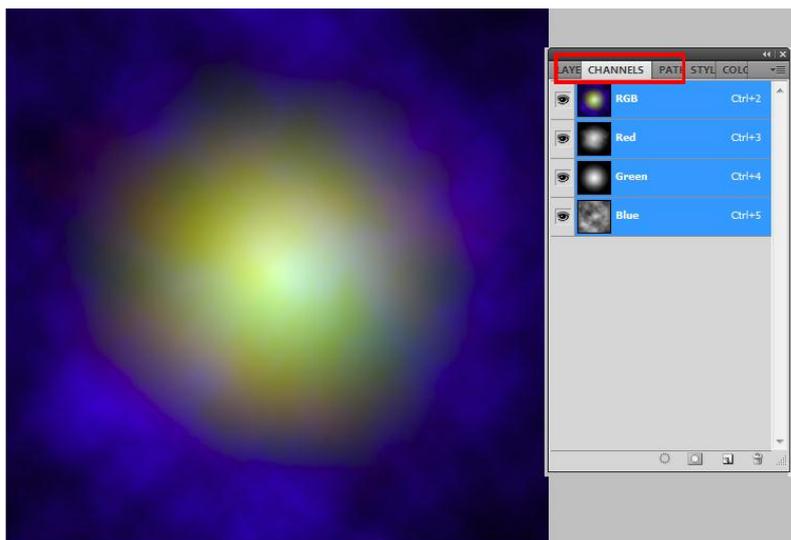
In this tutorial I will explain the process of creating a particle effect like smoke for UDK. This requires an intermediate understanding of Photoshop and the UDK material editor.

I would like to note that the majority of my knowledge for this tutorial has come from the wonderful free tutorial on Eat3d - http://eat3d.com/free/udk_esmoke. I will go into slightly more detail as to why we do certain things and what certain options do and why we use them as some of these things were not explained in the Eat3d tutorial. There were also some parts that confused me or took me a while to understand when watching it, I feel it is worthwhile to go over in detail each step and explain some things that were not completely covered.

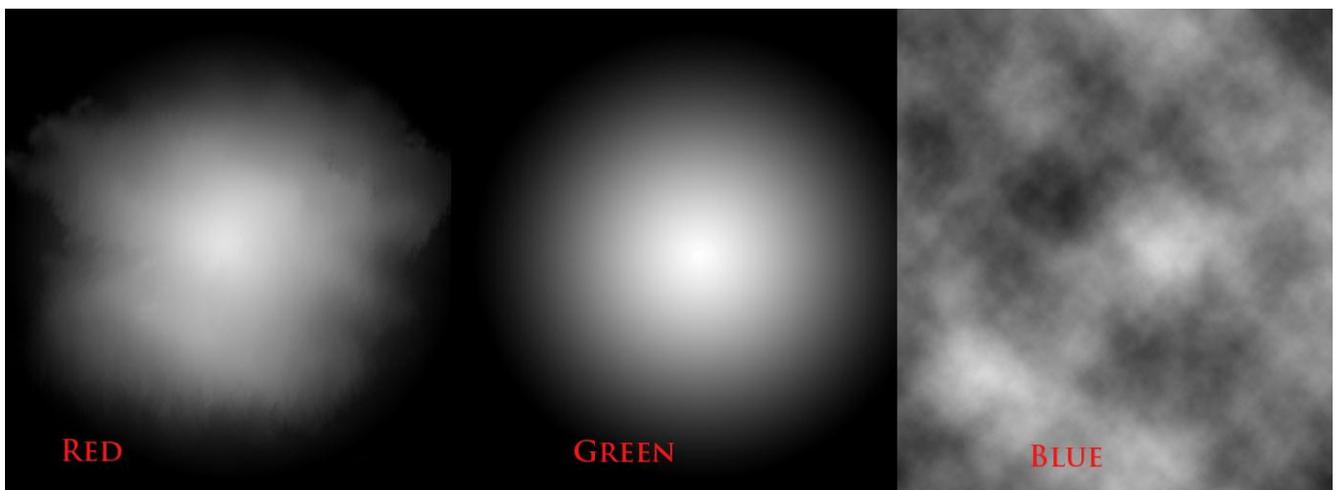
I have also added a section on how to change the colour of your particles as it is a useful thing to know and was not included in the eat3d tutorial

Creating your texture in Photoshop

The Eat3d tutorial provides you with a premade material. I would like to quickly go over creating your own material as this was something that was not covered.

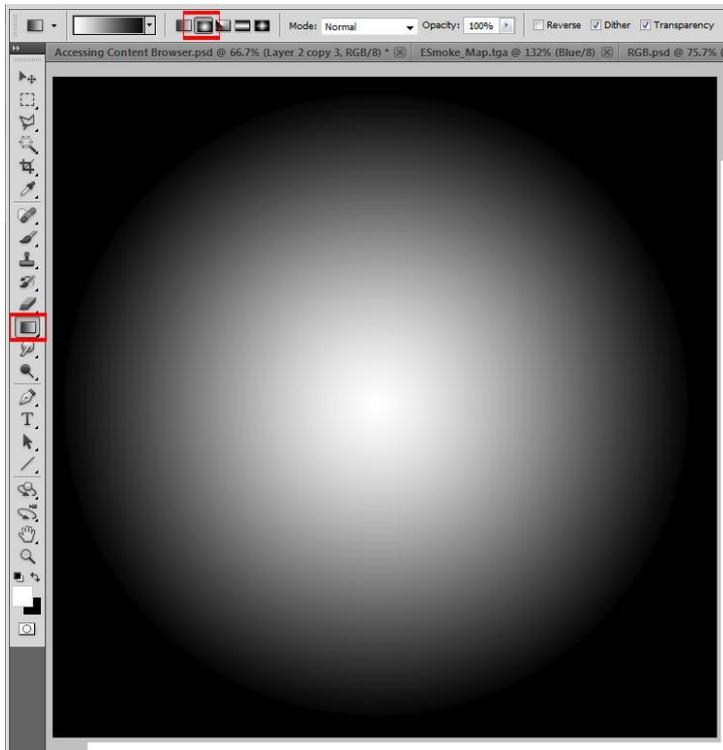


As you can see, the above image has been created by putting different values into the R G and B channels in Photoshop. This is the breakdown of those images



To create these you need to create a new document and fill it with white. Make sure your two colours selected are white and black, then go to channels, select the blue channel and go to Filter>Render>Clouds.

For the green channel, click on it and then select your gradient tool and change its gradient type to radial gradient instead of linear gradient. Have white selected as your main colour and black as your background then drag in the canvas to create the circle. After a couple tries you should get the right size.



For the red channel create another radial effect like above but smaller and use the smudge tool to give it the desired effect. You can change the look of the smudge by changing the brush. Alternatively, you can use a blocky brush and change the opacity to draw in the effect. Opacity and opacity jitter are in the brush options under the transfer tab.

The Material

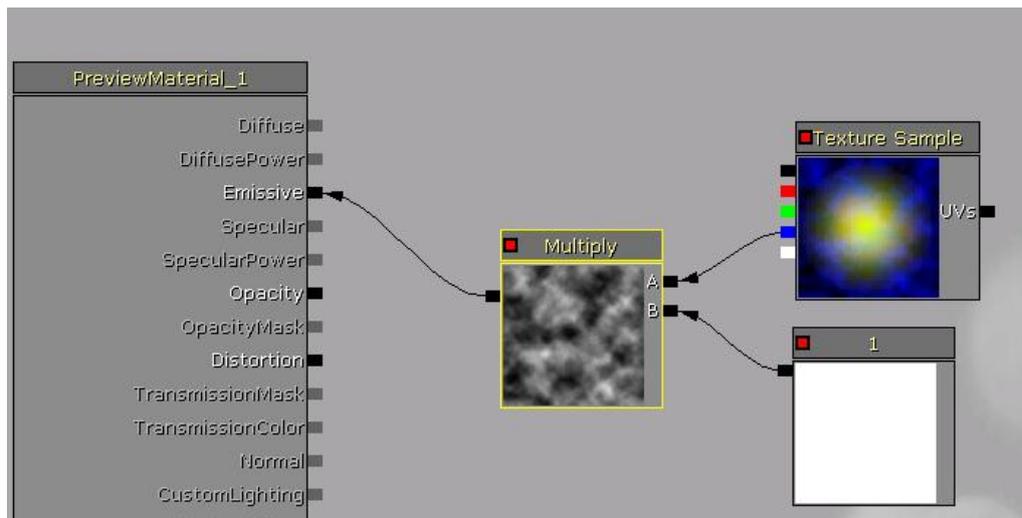
After importing the texture, create a new material and bring the texture in. We need to change the material so that the blending we will be using works properly. In the material options change the blending mode to Additive and the Lighting Model to Unlit.

We use the additive blending because this mode has a base opacity that is driven by the intensity of its diffuse and emissive inputs. Basically this means the weaker the diffuse colour input, the more transparent it will be, the stronger the diffuse the more opaque it will be. This will allow for the misty transparent feel that you get in many particles like smoke or fire.

We use the Unit lighting model because we don't want light to affect this material. Unlike metal where we want light to hit and reflect on the object its applied to (specular) we don't want light hitting and bouncing off something like smoke.



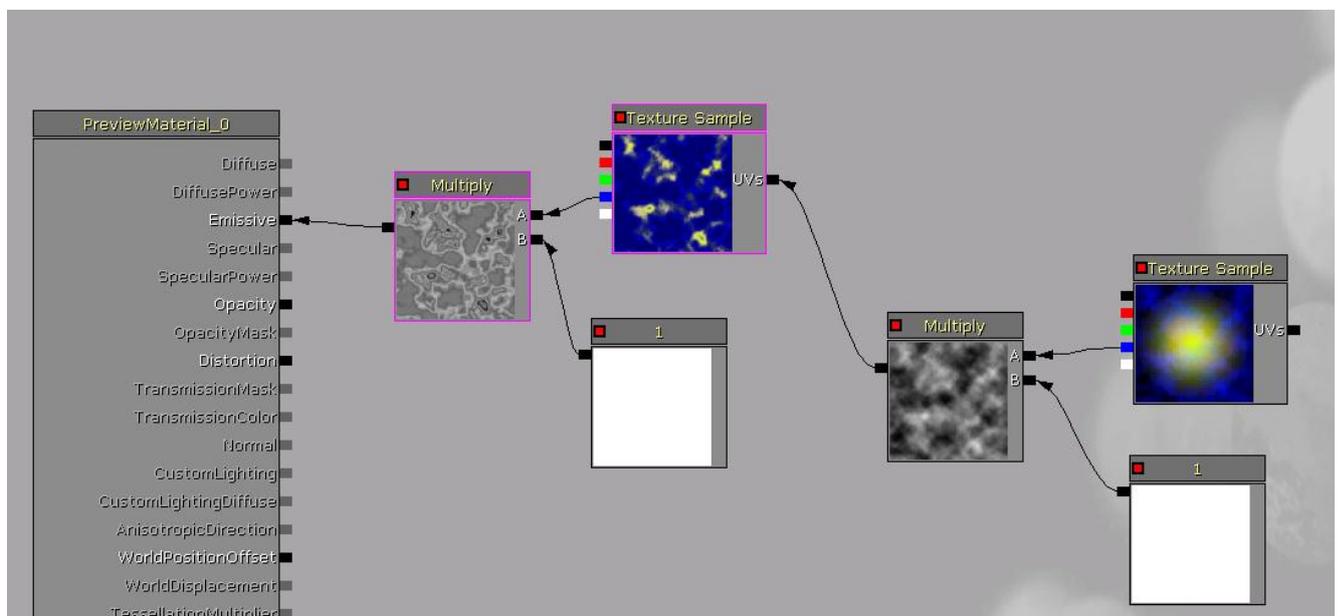
The next thing we want to do is add a multiply (Click+M) and a constant node (Click+1). Now we want to add the BLUE channel of our texture into A and the constant into B. Put the multiply into the Emissive Slot.



Now we want to give the material some movement and a more wavy feel. Create two add nodes and a texture coordinate node. We also need to create a two pannar nodes, a multiply, a constant node and we need to create another sample of our texture. You can right click on any node to duplicate.

You can find the texture coordinate and pannar nodes if you right click and go to the coordinate menu. Pannar nodes allow for the movement of the texture in both U and V. You can change the amounts on the node itself. Texture coordinate nodes can be used to change the tiling on the texture it is attached to.

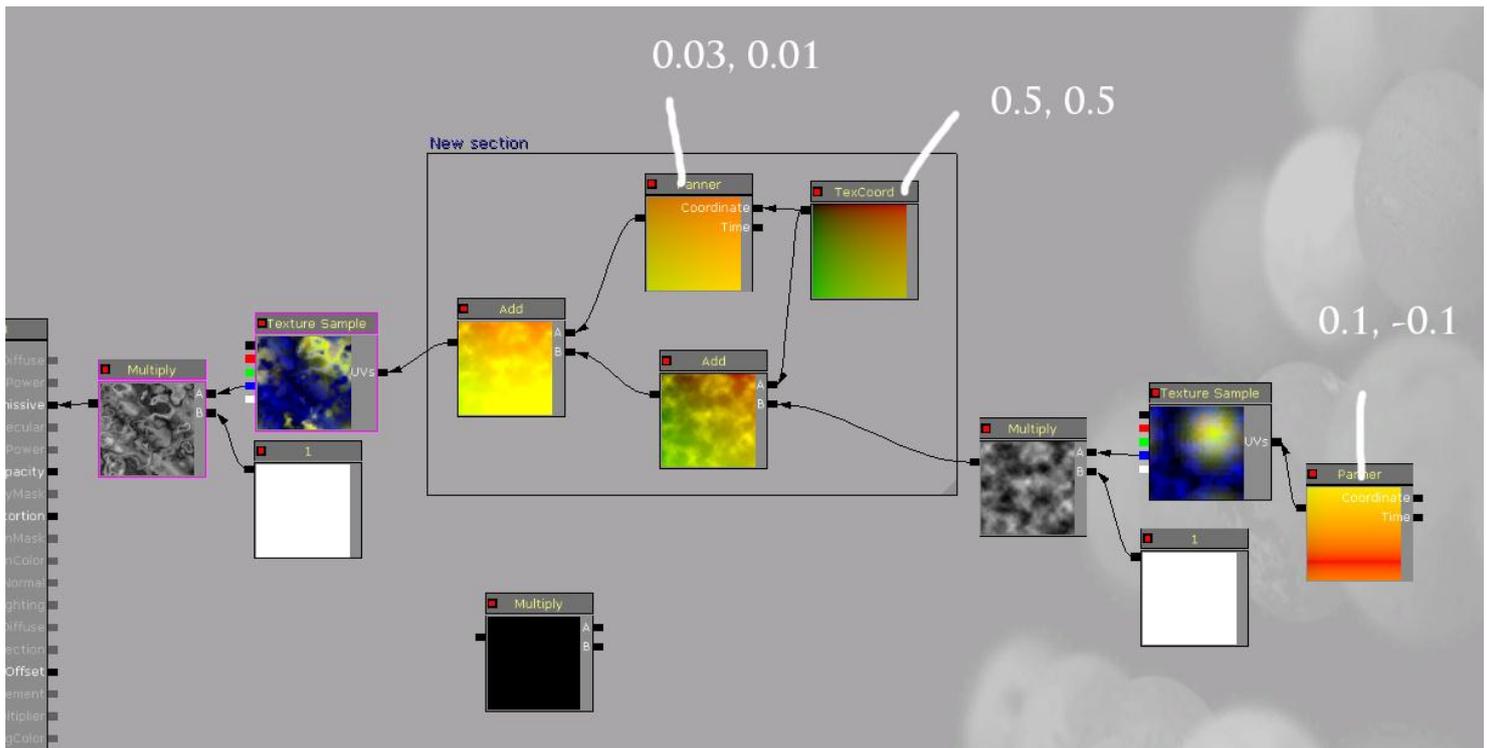
We are going to use these nodes to create distortion on our material. Firstly we are going to plug our newly duplicated texture sample into the A slot of the multiply node using its BLUE channel and plug the constant into the B slot. Bump the value on the constant up to 1 and then plug the multiply into the Uvs of your original texture node. This will warp the texture.



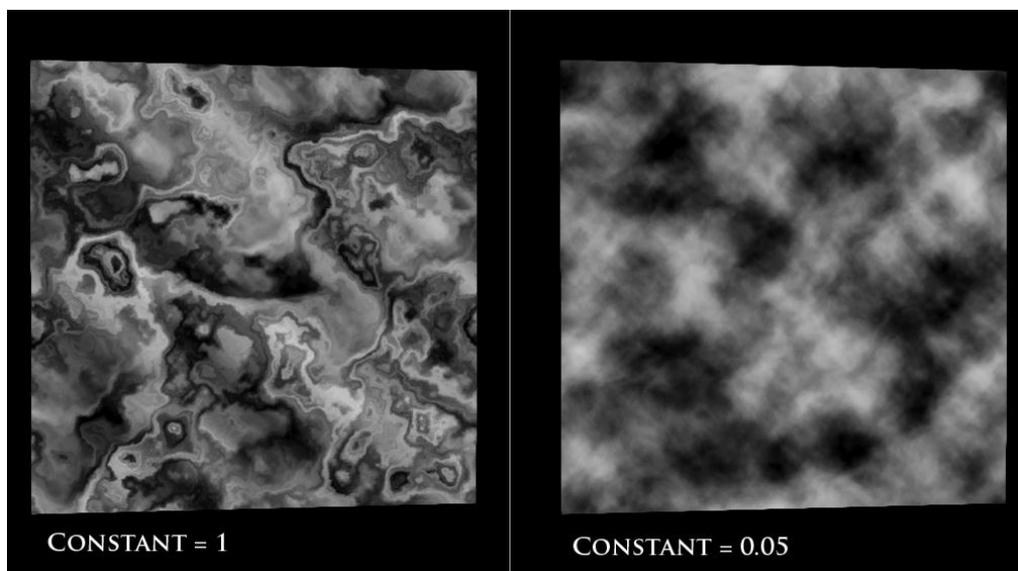
Now we need to make the warped texture move. We do this by applying the pannar node to our duplicated texture sample in the UV input and changing the settings to X speed = 0.1 and Y Speed = -0.1. This will cause the material to move.

Now we need to layer the effect and change the tiling to get some more interesting movements going on. Using your other pannar node, change the X speed = 0.03 and Y Speed = -0.01. Plug your texture coordinate node into the coordinate input of the pannar node and plug the pannar node into one of the A slots of the Add node. Plug your other add into the B slot of the first Add node. Plug your texture coordinate into the second

Add nodes A slot and the multiply node into the B slot. Confusing? I know! Here is a picture to help. I have created a comment around the new section to show you what's new and written their settings on there as well. Remember to save every so often.

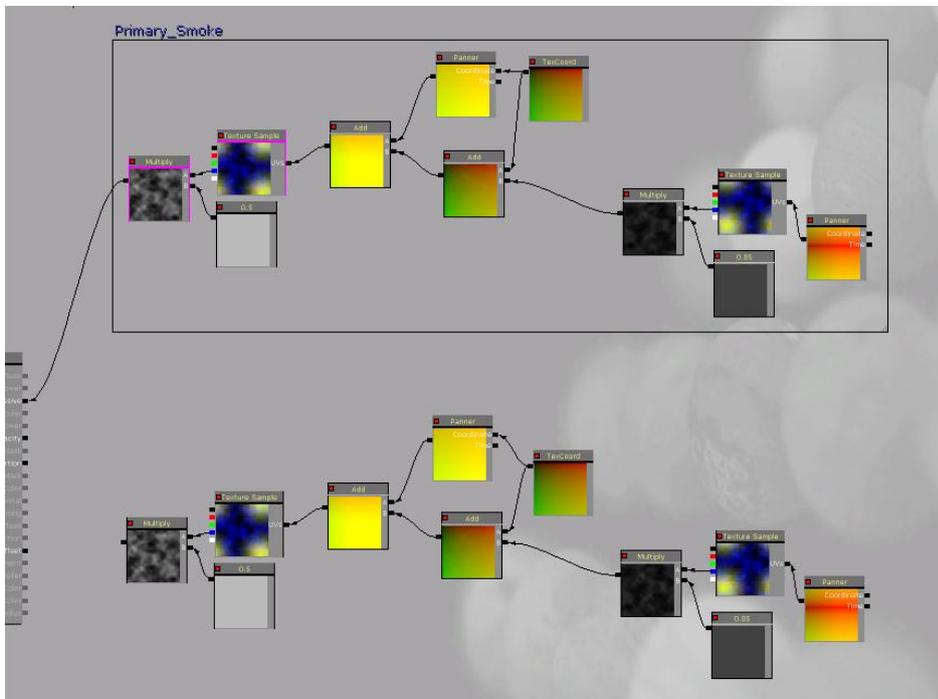


Now you should see the warping on the material. It's a bit crazy so we're going to tone it down by dropping the value on the far right constant at the end of the chain from 1 to between 0.5 and 0.05 depending on what you like best and what works for your texture. You can also change the first constant to control the amount of transparency.

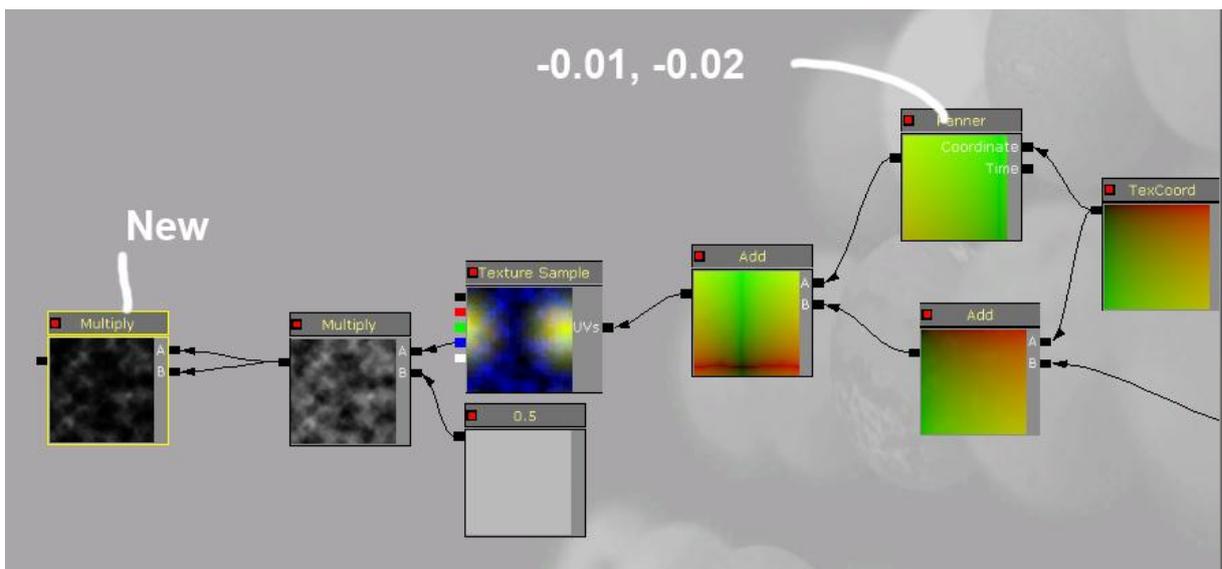


This section is finished now but we are going to use a duplicate of it for the next section. To create a duplicate of the entire section alt+click+drag around all the current nodes to select them all and then right click on one of the nodes selected. Choose duplicate and then move the newly duplicated section down. Now we are going to create a comment box for our first section by again selecting all the nodes (alt+click+drag) and the right clicking in the grey area and selecting new comment at the bottom. Call this 'Primary_Smoke'. You can now select the comment title box and move all these nodes together as you would normally.

Note: The comment box will move all nodes inside it regardless of if you created the comment box with a node selected or not. If you move the comment box over another group then moving it again will move those nodes. Try to be careful and give the boxes enough space.



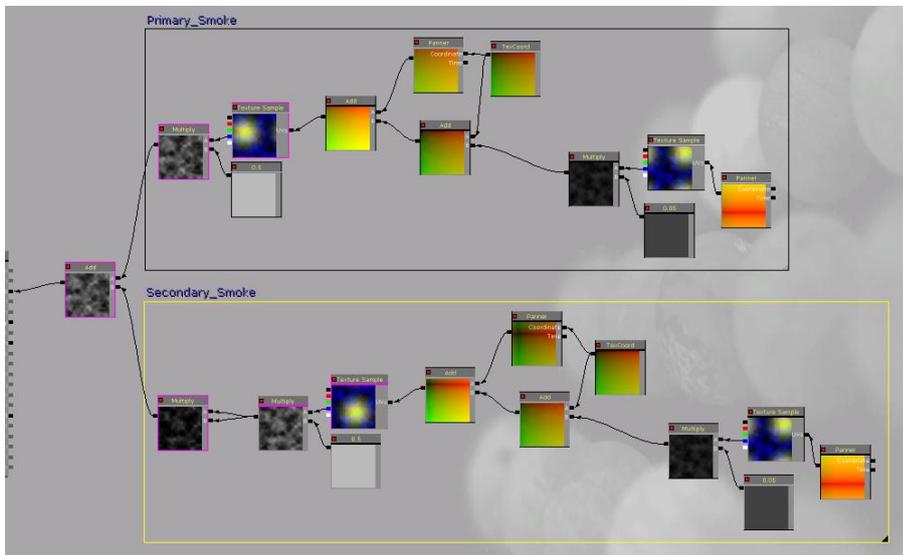
Now we are going to focus on our section set of nodes. Firstly we are going to change the top panner node to X = -0.01 and y = -0.02. Then we will multiply our front multiply node by itself (the front is the left side) by creating a new multiply node in front of it and plugging it into both connections. I also changed the front constant node to 0.5.



Create a new comment for this section and call it Secondary_Smoke. Then create an add node and add the Primary and secondary smoke together and plug that add node back into emissive.

What we've done is give more variation to the smoke material by changing the panning on the second set. You should now see that it pans in two directions. To check the effect, simply look at the difference between having just the primary chain plugged into the Emissive and then with them added together. You will notice the difference. We have also darkened the output of the secondary set by multiplying it by itself. Because the material blend mode is set to additive (black is transparent) that means that by darkening the second set it is not as strong as the first sets effect.

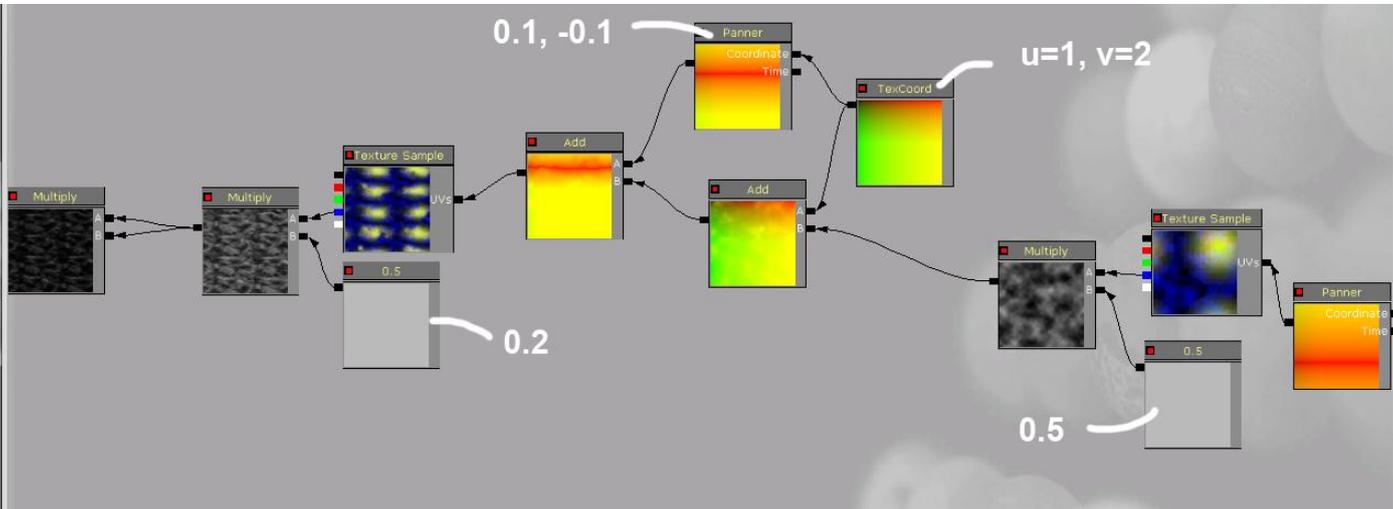
You can delete the add node at the end, it was just for demonstration purposes



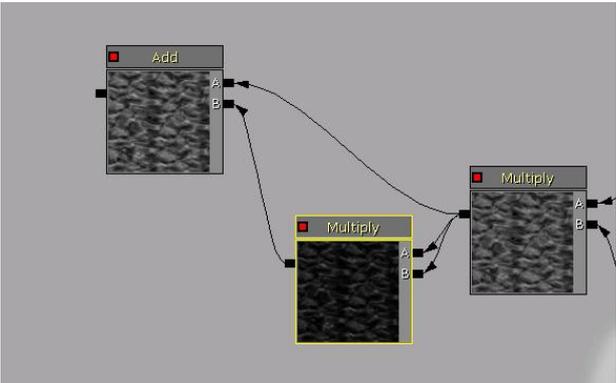
Now we need to make another copy. You can copy the secondary smoke nodes by selecting all the nodes within the box (but not the box itself) pressing Ctrl+C and then right clicking and saying 'paste here'. Remember to paste away from the other boxes because your nodes will get caught in them. This is also the reason I do not just click Ctrl+C and then Ctrl+V because it will paste the nodes on top of the others and it's a pain to move them.

Now we are going to change the values of some of the 3rd set of nodes. Change the top panner node to 0.1 and -0.1, then the texture coordinate to u=1 and v=2. Now change the root constant (far right) to 0.5 and the other constant (left) to 0.2.

Note: The far right constant controls the distortion intensity and the far left constant controls the power of the texture sample (how opaque it is). This is the same for all three sets of nodes to give you complete control.



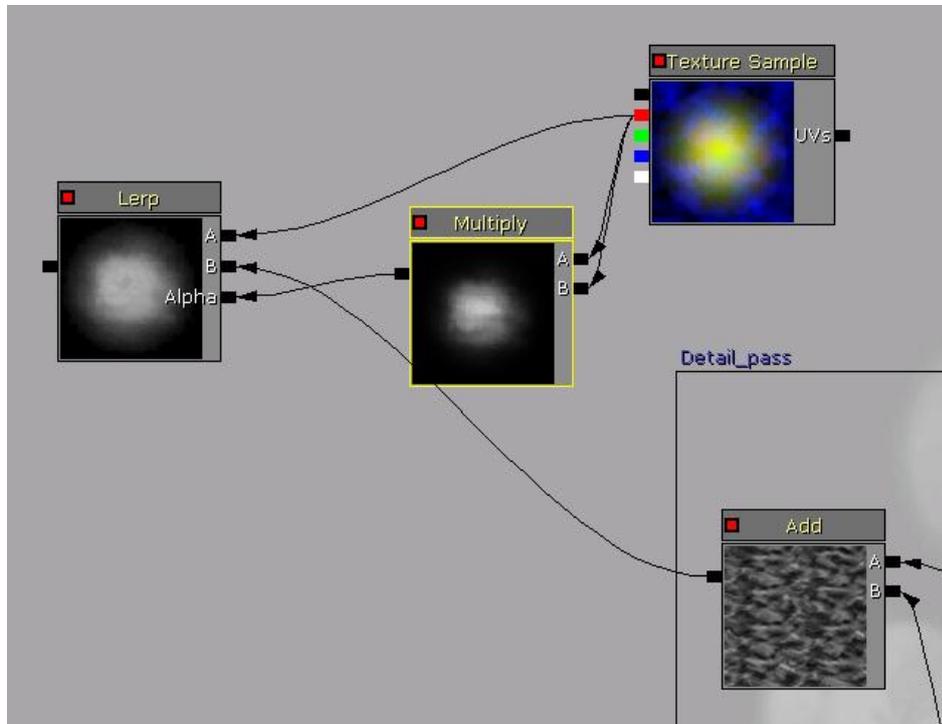
As you can see in the picture we have increased the tiling amount. Now we just have to add an 'Add' node to the front of the chain, and add the two front multiply nodes to A and B.



Finally we create a comment for this group as well called 'Detail_Pass'.

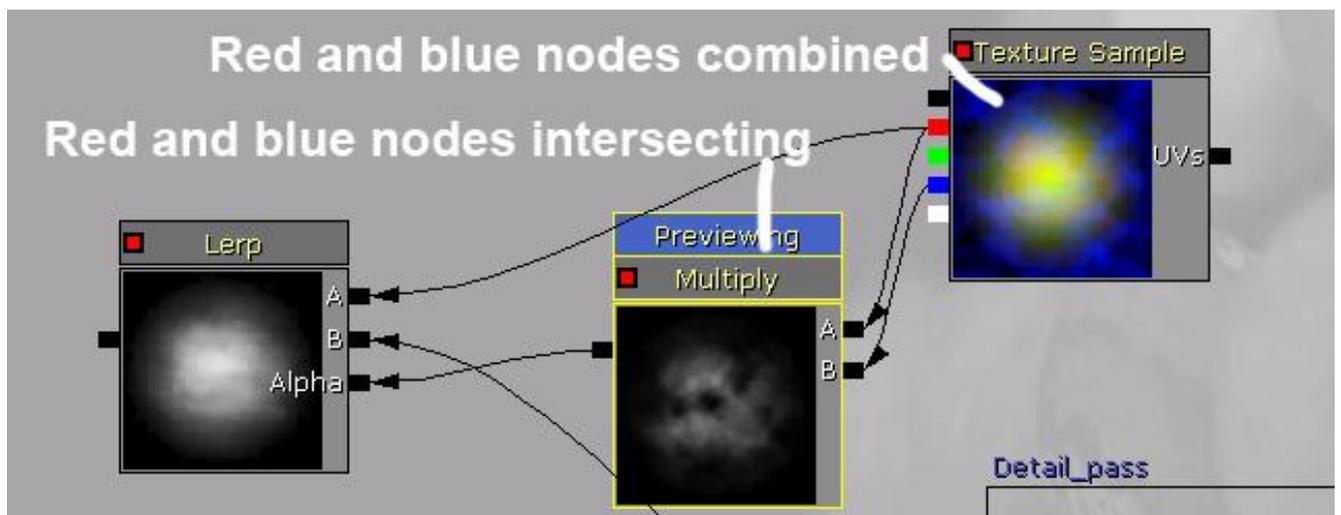
Now we are going to merge all these together to finish the material.

Create another copy of your texture sample, a multiply node and a Lerp (Linear interpolation node – Click+L). A Lerp allows for the combining of 3 nodes, one of which includes an alpha. Plug your RED channel of your texture sample into the A slot of the LERP and also into the A and B slots of the multiply node. Then plug the multiply into the Alpha of the Lerp. For the B slot on the Lerp we are going to plug in the detail pass.

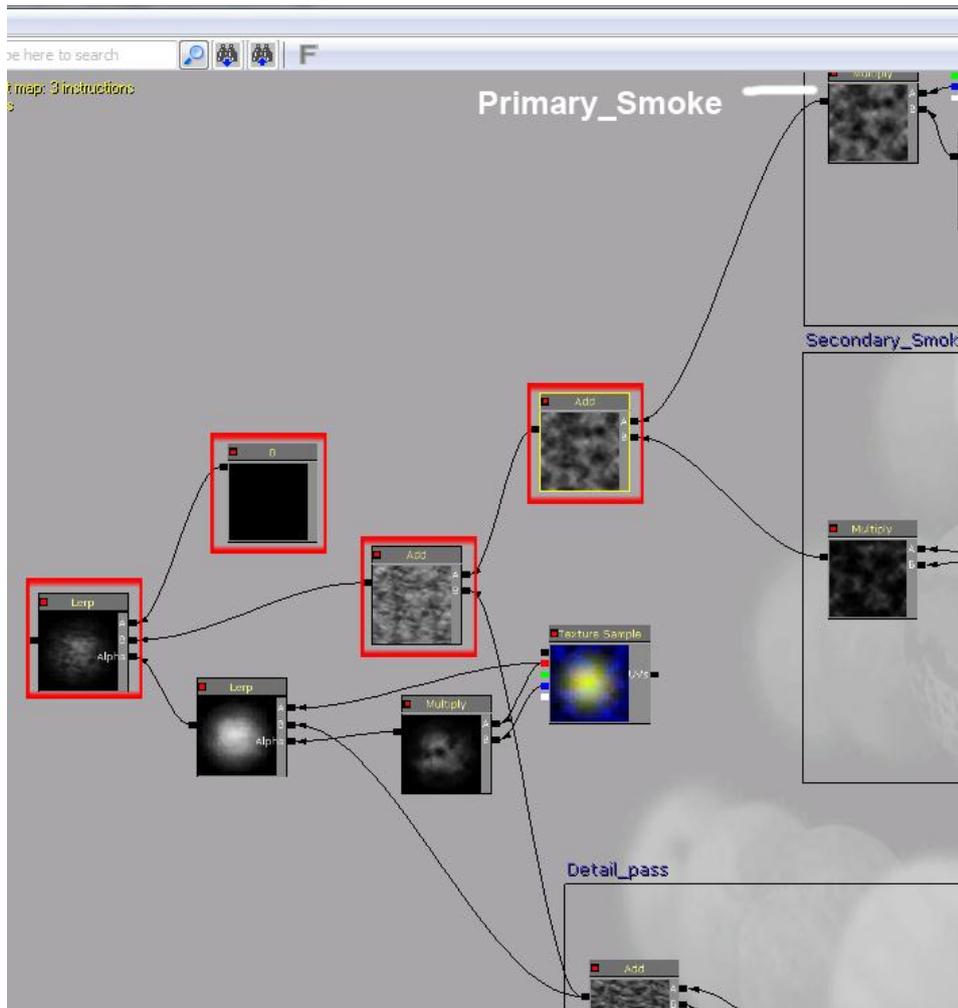


What we have done here is tell UDK that the detail pass is only going to affect the area defined by the red channel on our texture sample. As you can see on the Lerp the detail from our detail pass is being masked around the edges because of the black in additive blending mode. We use the multiply mode to make the white areas more opaque and define where the detail pass will show through.

As an example (you can try this if you want to) Grab the blue node from the texture sample and plug that into the B slot of the multiply node with the A slot being occupied with the red channel of the texture sample. You can see that where those two colours intersect is what is white and that is the area that defines where the detail pass is allowed to show up. You can also click on the multiply node and the Lerp node and select 'Preview node on mesh'. This will show you that node in the preview screen so you can see the effect without having it connected to a main material input. You can right click and chose 'Stop previewing' to stop it.



Now we need to create another Lerp, two add nodes and a constant node. Plug the constant into the new Lerp's A node and plug the old Lerp into the alpha. Now we need to plug the Primary and secondary smoke boxes into one of the add nodes and plug that add node into the A input of the second add node. For the B input on the second add node, plug in the detail pass. I have put red boxes around these new nodes in the picture to make it easier to understand.



You can now plug the chain into the emissive channel and create a group for the new section called 'Merge'

Now I'm going to recap how you can modify your smoke effect. We have 3 separate node chains that give slightly different smokey effects using distortion, opacity, tiling and panning (movement).

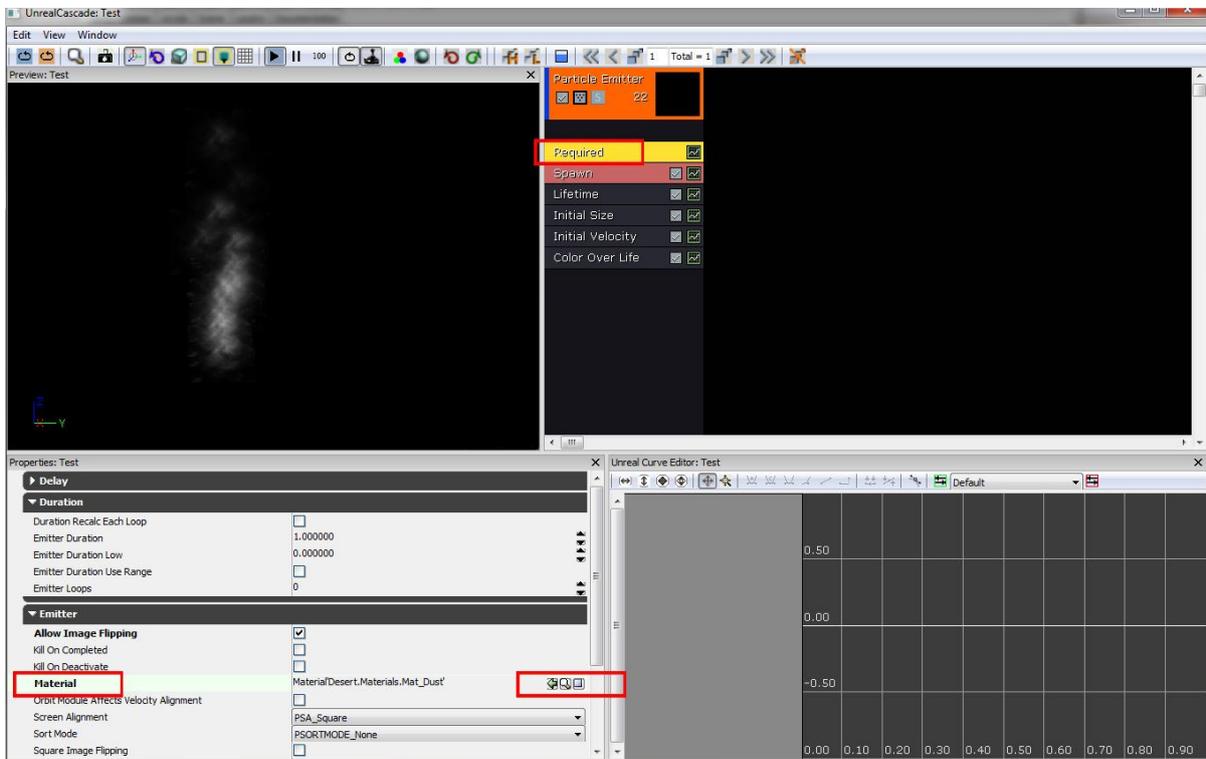
The Red boxes indicate the panning nodes controlling the movement speed and direction of the effect. If you want the smoke to appear to be moving slower or faster, change these.

The yellow boxes indicate the constant nodes that control the amount of distortion for each effect. Higher values increase the distortion.

The light blue boxes indicate the constant nodes that control the strength of the effect (how transparent or opaque it is). Higher values = more opaque and lower values = more transparent.

Try changing these values for each of your effects until you get something you like.

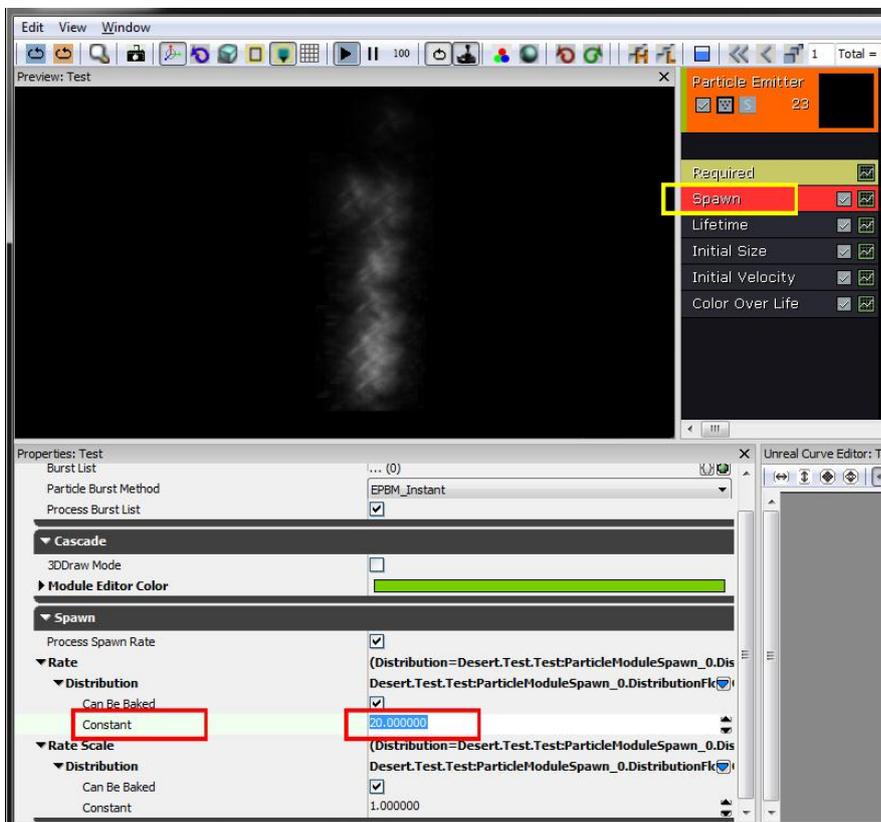
For my final smoke I have made sure that the primary smoke effect is more opaque and has a slightly stronger distortion and speed then the detail and secondary. I highly suggest playing with the values of all 3 to get comfortable with how they work.



Now we need to customize the effect.

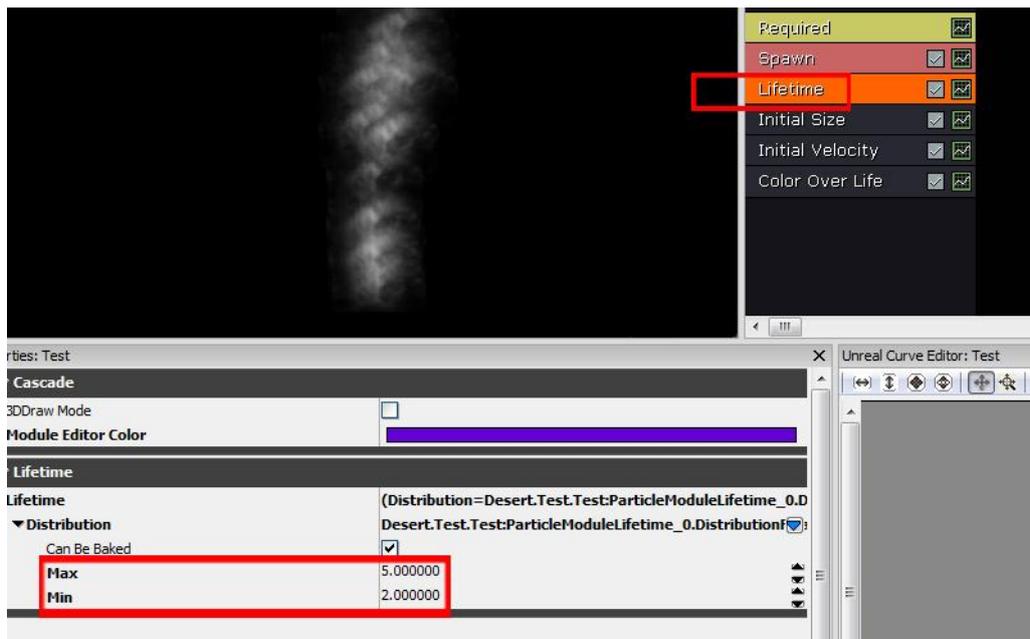
The 'Particle Emitter' has many options that we can use to change the look and feel of our particle.

The first option after the 'Required' properties is the 'Spawn' options. Under the Spawn tab in the properties, option the 'rate' and then 'Distribution'. Here you should see the Constant value. Changing this number will change the rate that the particles spawn at. Higher values will make the particle spawn rate faster, so there will be more particles active at once.

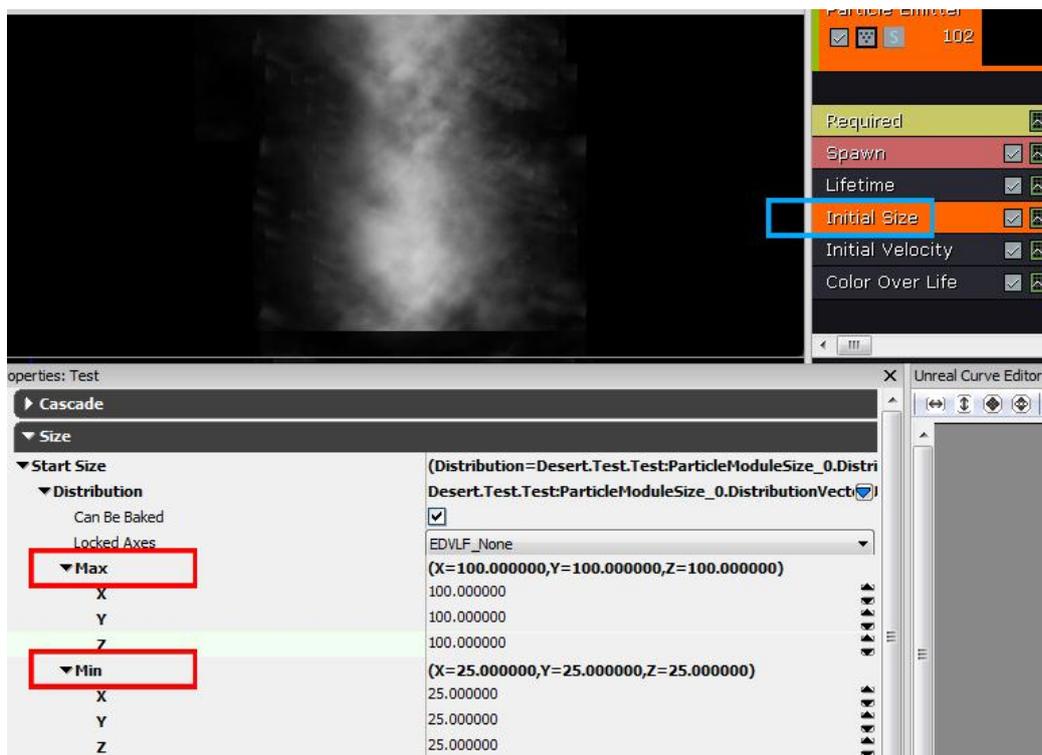


Next click on 'Lifetime' and under the Lifetime tab in the properties set the min and max duration of each particle being emitted. Having a min and max of 1 will cause every particle to have fixed duration before fading out. Changing the min to 2 and the max to 5 will cause each particle to have a lifespan between those numbers, meaning it will look more random as the particles will fade out at different times. Increasing the

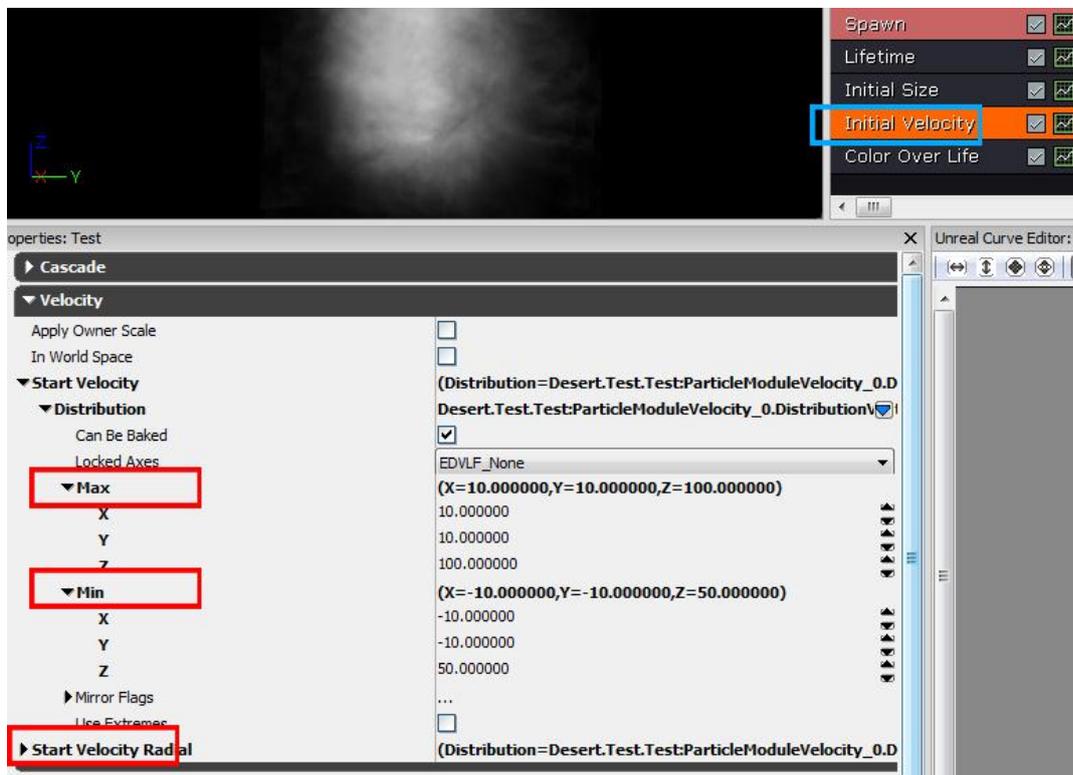
lifetime will also increase the length of the particle (how high up it goes). Make sure to zoom out to observe these changes.



The next group of settings is in the 'Initial size' section. Click on this and expand the 'Size' tab in properties. Open the distribution arrow and then the min and max arrows to customize this. You can set the minimum and maximum start size of your particles in the X, Y and Z axis. The greater the difference in min and max values, the more your particles will spawn in different sizes at random.

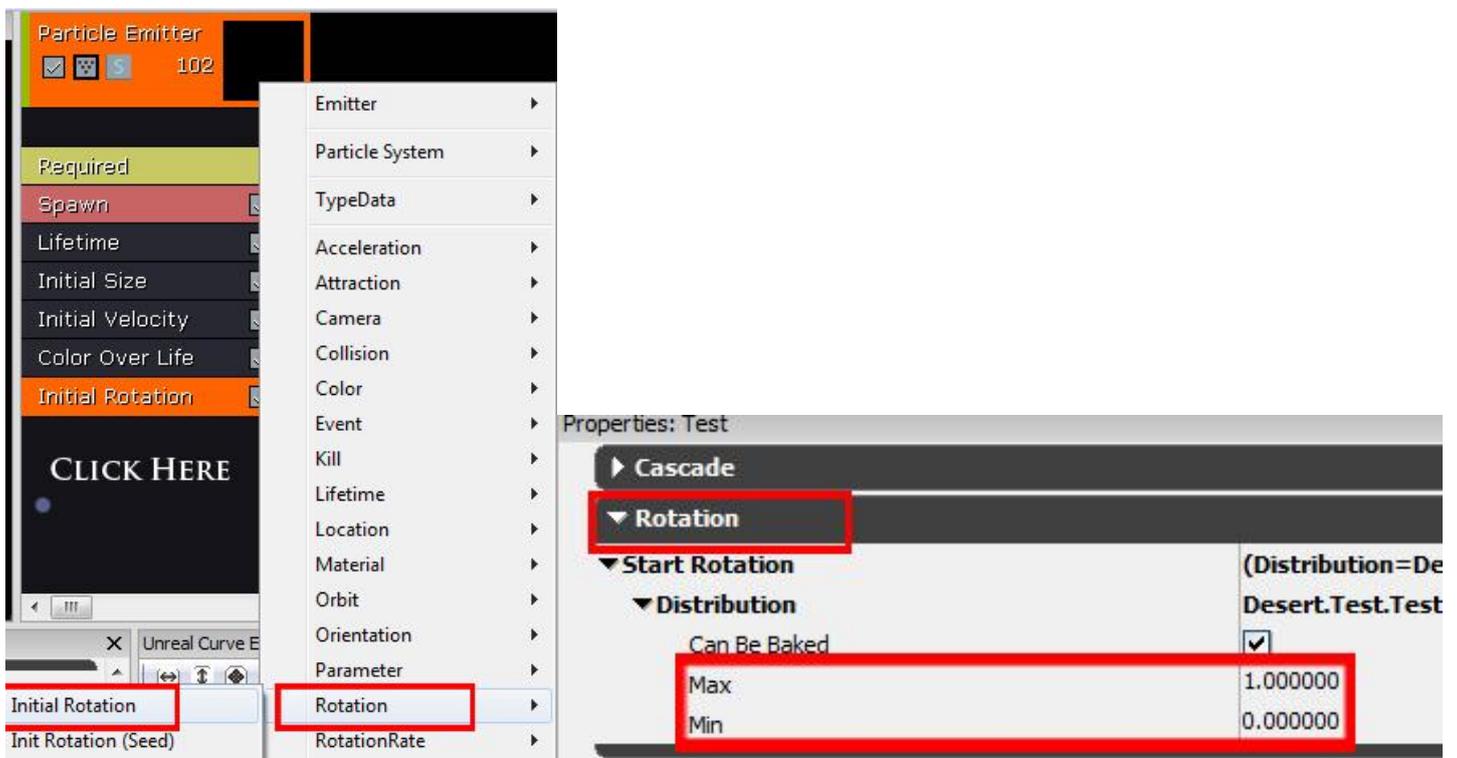


Next we have the 'Initial velocity' section. These values can be changed in the same way, by changing the min and max velocity a particle spawns at. You can also change the radial velocity.

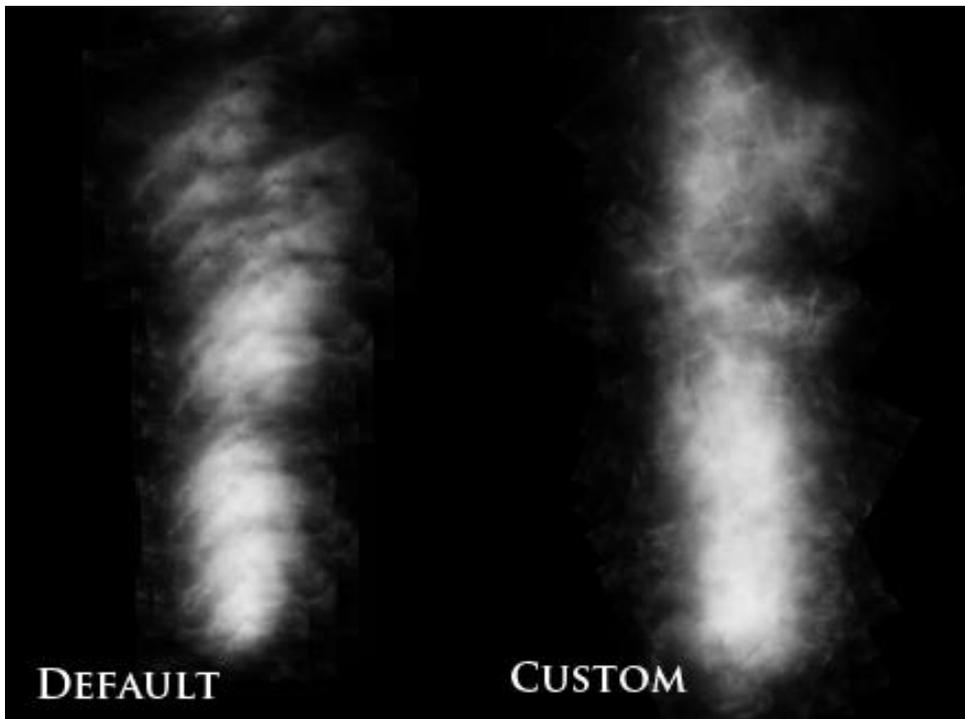


Now at this point we have customized quite a few things, but our particle still looks very repetitive. To fix this we are going to add a 'Initial Rotation' value which will change the rotation of each particle randomly between the min and max values.

To do this we right click under the particle emitter and go to **Rotation>Initial Rotation**. This will add that tab to the particle so we can modify it.

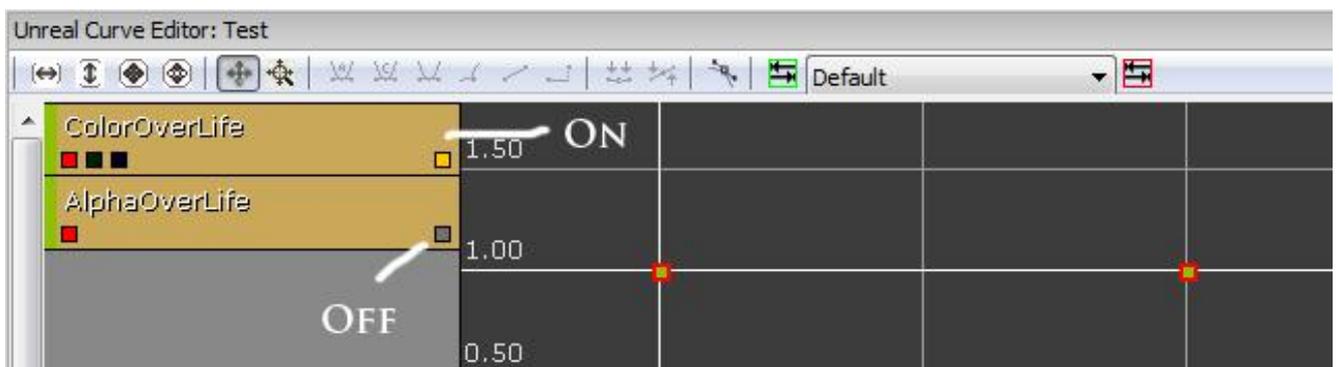
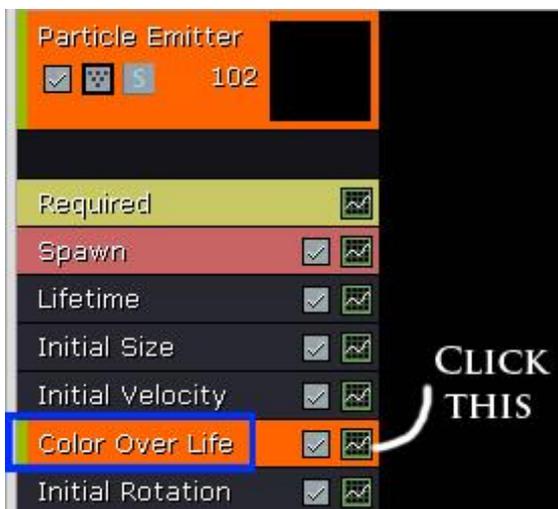


You can now change the values (above picture). Here are my settings with the default rotation of max=1 min=0 and my custom one of max=50 Min=1



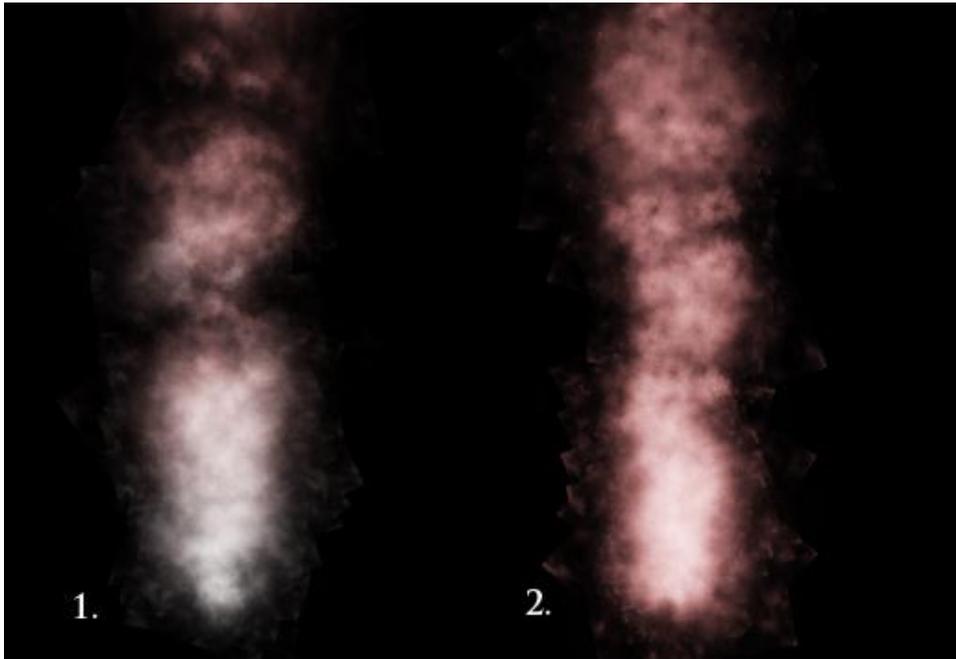
You can see how much better the custom one looks.

Finally we can change the colour of our particle by using the 'Colour over life' tab. Firstly click the little green graph next to its name. The graph will then appear beneath. On the graph you will have the name of the thing you are editing, in this case the ColouoverLife and the Alpha. I have turned the alpha off (clicked the little yellow square at the end of its name, once off it turns grey as you can see. The three boxes for the Colouoverlife stand for R G and B, I currently only have R selected while the other two are turned off (grey boxes)



You can see two dots with red squares on the graph above. The left one represents the start colour and the right one represents the end colour. Here I have changed the end one by holding alt and dragging the right

red dot upwards. Then I have changed the starting dot by moving it up. Note that I'm only changing the Red value.



You can use the R, G and B values to change the colour of your particle and also change the colour over the life of the particle. This is useful for things like Fire, where you have the flame at the beginning and smoke at the end.