VOLUMETRIC FOG & MIST

Reference Guide

Kronnect

Contents

Introduction

Thanks for purchasing!

Volumetric Fog & Mist is an advanced full-screen post-image effect for Unity that adds realistic fog, mist, dust and clouds effects to your scenes.

This asset is highly optimized but due to the nature of its algorithm it's not suitable for mobile devices. For mobile devices, use Dynamic Fog & Mist, also included in the package. You can add both assets to your project and enable the most appropriate for the running platform (see Dynamic Fog & Mist section at the end of this document).

Demo Scenes

Just load any demo scene included and click "Play". You will be able to move around using WASD or cursor keys. Press spacebar to jump, F to change fog style and T to toggle on/off the fog.

The Fog Of War demo scene allows you to "Cut" the fog as you pass through it (press "C" to enable fog cutting mode).

You can delete the Demo folder entirely or ignore it when importing the asset into your project.

Quick Start

1. Add the VolumetricFog script to your main camera in your scene.

2. Choose one of the preset and that's all!

You can of course customize any of its parameters to match your game mood and requirements.

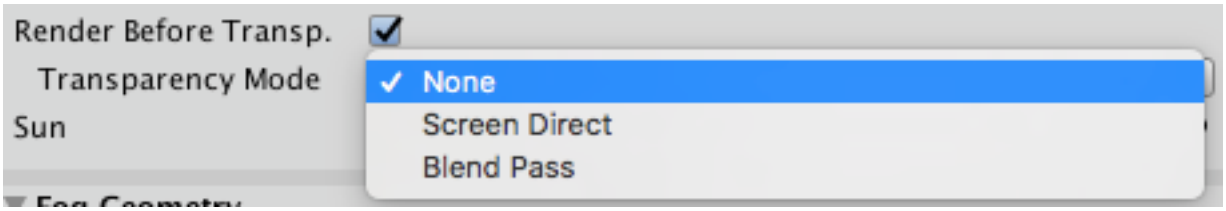
Please read this document to learn more about all supported features.

Special Features

Transparency Support

By default, Volumetric Fog & Mist renders before transparent objects. That means that any particle, grass, tree or object that uses transparent queue will be visible. You can toggle this option so the fog renders on top of everything.

Sometimes this behaviour is not desired and you may want that fog blends nicely on top of particles. For that matter, Volumetric Fog & Mist provides 3 transparency modes:



None: this is the default behaviour, since it's the fastest mode. Fog will be rendered before transparent objects and all transparent objects will appear on top of fog.

Screen Direct: in this mode, the fog will still be rendered behind transparent objects BUT an additional fog pass is executed JUST over the transparent objects. This is the preferred option if you need to blend fog over particles.

Blend Pass: this mode is similar to Screen Direct, but the second pass is rendered on the active destination render texture, not directly to the screen. It's slower but may work in some setups where Screen Direct is not compatible, like in VR.

Fog Volumes

You can define special zones (fog volumes) where fog alpha will automatically change. Create a fog volume from the menu GameObject / Create Other / Fog Volume. Position the fog volume over the desired area, edit the collider bounds and set the desired fog alpha and transition duration in the inspector.

By default, Fog Volumes will react to any collider that contains the camera to which the fog image effect is attached (for first person controllers this is the default behaviour). But you can also assign a different collider so they will also work with third person controllers.

Check out Demo Scene #7 "MountainClimb" for an example of Fog Volumes.

Elevated Fog & Clouds

You can make the fog start above Camera position to simulate floating smoke or even clouds! Try it assigning a value above the Camera Y position to Base Height property in the inspector.

Check out Demo Scene #7 “MountainClimb” for an example of how to enable a dynamic cloud layer that reacts when player climbs a mountain.

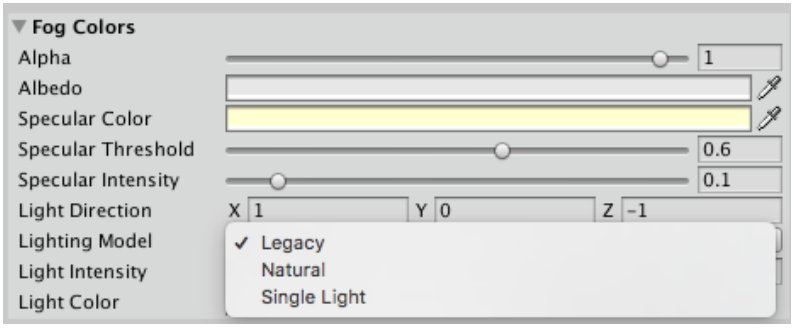
Automatic fog light alignment with Sun

A light game object existing in the scene can act as the Sun and be assigned to Volumetric. You’ll find a property in the inspector, called Sun, where you can drag and drop the desired light in your scene.

After assigning a light as the Sun, the fog will react to the sun light direction, intensity and color automatically. Click “Unassign” to break the link and allow to freely customize light direction, intensity and color.

Fog Colors and Lighting Model

To provide more artistic choices, Volumetric Fog provides different “colorization formulae”. This option is located under Fog Colors section:



Legacy: this is the traditional technique used in Volumetric Fog & Mist. It lerps between the ambient light and the sun or light color to provide the final fog color.

Natural: in this mode, the color lerps between the ambient and ambient + light color and the result is multiplied by the light intensity.

Single Light: in this mode, the ambient color is not used. Just the light color multiplied by the light intensity.

Note that if a Sun object is assigned, the Sun’s light intensity is added to the Light intensity parameter.

Void Areas

Another great feature included in the asset is the **void area**. This option is useful if you want a clear area around a world space position. For example, in 3rd Person View games, you may want a clear area around the character.

This option is similar to the Distance Fog feature (using Distance > 0) but Distance Fog Works having into account the distance from the Camera. So Distance parameter is useful for 1st Person View and Void Areas for 3rd Person View.

Void areas can be **spherical or boxed**. To make a spherical void area just move the radius slider to the left. To make it boxed, set the width and depth sliders.

Also, you can assign your character game object to the property field in this section, so the center of the void will follow it automatically.

Fog Area

Void Areas can be inverted, so fog will only appear inside the bounding sphere defined by the fog area. The demo scene #6 “HighClouds” shows an example. Also, the demo scene #10 shows how to use the fog area API to create custom fog areas during runtime.

To enable a fog area:

- Set the position of the fog area in Void Area position property.
- Check “inverted” toggle in the inspector.
- Choose a radius and a falloff (in void area section) for spherical fog area or radius/depth/height for a box-type fog area.

You can also create any number of fog areas during runtime calling **fog.CreateFogArea API**. Please check demo scene 10 source code for quick examples.

Fog of War

You can also set any number of void areas just calling **SetFogOfWarAlpha** method of the Volumetric script. Just pass the world space position, the radius and the desired new alpha for the fog. Just make sure the center and size of the fog of war (configured in the inspector) are properly set (by default the fog of war is centered on 0,0,0 with a size of 1024x1024). Optionally pass a duration to produce a smoother effect.

Call **ResetFogOfWar** to reset the cleared areas back to normal.

Point Light support

Up to 6 point lights can be selected to illuminate the fog with different colors, ranges and intensities.

This feature can be used to achieve many visual effects, from fog gradients, glow or bloom, definitely enhancing the ambiance of your scenes.

At night, if you have the fog synced with a Sun game object, the fog will be dark. You can use this feature to illuminate the surrounding area of the characters.

Note that point light are simulated in the shader, so it's not necessary to have real point lights in the scene. But if you have them, you can simply assign them to the slots in the Point Light section or make the asset choose them for you automatically using the slider and checking "Track Point Lights".

Sun Shafts

Light scattering is the physical phenomena that makes the light reflect/refract when it crosses different densities, adding shafts of light across the scene from the light source. Volumetric Fog & Mist includes a light scattering option, which approximates that effect in screen space (that means that it only works when the light source is in front of you).

To enable this option, you need to assign a light source to the Sun property and check the Enable toggle in the inspector. Then customize the effect with the different parameters in that section.

Please note that light scattering will increase the workload on the GPU, so you may have a configuration parameter in your game to enable it in addition to the fog. Also note that Sun Shafts are designed so they work better when they cross the fog.

Depth Blur

This option blurs the color buffer before overlaying the fog to simulate additional light scattering. Try it and experiment with different depths.

Sun Shadows

Enable this feature to cast Sun shadows over the fog.

The “Force Update Interval” parameter can be set to a value greater than 0 to specify the interval in seconds between shadow casting shoots. If set to zero (default value) it will shoot shadows only if the Sun changes rotation (this is usually the most efficient setting). You can set this value to 0.016 to shoot every frame (if you target 60 frames/s or set even a lower value) have the shadows always updated but this will take extra ms from your framerate. It just depends if you have moving objects on the scene that clearly cast shadows over the fog and you want to ensure that shadows are always in sync with those objects.

The “Max Distance” will determine the maximum distance from the camera for the shadows. It does not affect performance but shadow quality. The greater the value the poor quality and vice versa. The Resolution parameter also affects shadow quality in a more direct way as this value determines the size of the shadow texture that’s produced in each shadow shoot. The default value of 3 uses a 4096x4096 texture, you can increase this value to 4 and it will use a 8192x8192 texture which is currently the maximum texture size allowed by Unity 5. You may experiment with lower resolutions as well and see if they work for you – it will improve performance and reduce VRAM memory usage.

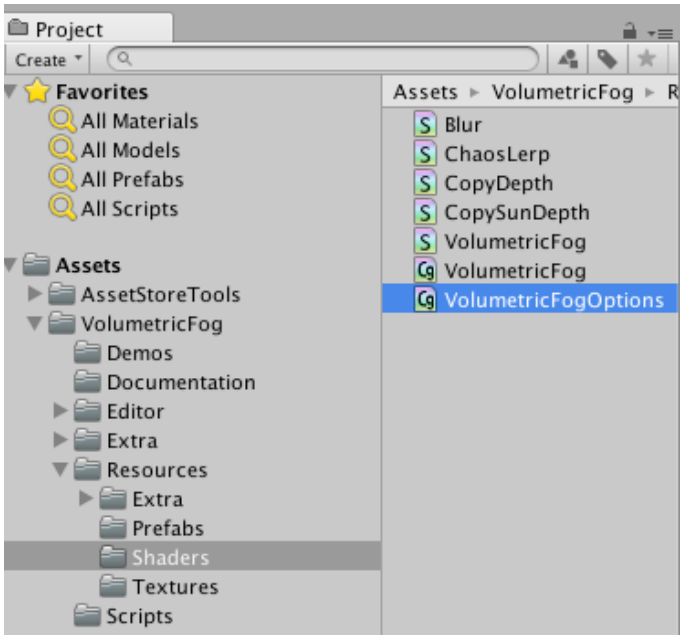
The “Bias” parameter option will offset the shadow start from the object itself to prevent self-shadowing. By default, a value of 0.1 ensures this can’t happen so this value should be left as it’s, unless you need to change it to create special effects.

The “Shadow Cancellation” slider allows you to control the alpha transparency of the fog under shadows. If you set this value to 1, only lit fog by the assigned Sun light will be visible producing a Volumetric Light effect.

Use the “Jitter” parameter to reduce banding effects when using Sun Shadows feature.

Orthographic Camera support

To enable orthographic camera support, you need to edit VolumetricFogOptions.cginc file located in VolumetricFog/Resources/Shaders folder:



This file contains a global macro called “FOG_ORTHO”. To enable orthographic camera support, just change the 0 to 1 so it reads:

```
#define FOG_ORTHO 1
```

VR and Single Pass Stereo Rendering

Volumetric Fog & Mist is fully compatible with VR in both “Multi” and “Single”-Pass Stereo Rendering. It has been tested with Oculus DK2 with both Oculus and OpenVR SDKs.

Important: if you enable Single Pass Stereo Rendering in Player Settings, make sure you verify that it’s reflected in Volumetric Fog & Mist inspector on your camera. Check this new option which is automatically set based on the Player Settings when the inspector is shown.

Enhanced compatibility

Enhanced Sprite Compatibility

Standard Unity sprite shaders are not compatible with Image Effects as they are not rendered as 3D objects and don't write to ZBuffer on real world positions. That forces Image Effects to be rendered before the transparent queue so at least sprites (as particles) are not covered by the Image Effect. This cause that sprites look floating over the scene as the fog makes them clearly separated from rest of the scene.

To avoid the problem described above, Volumetric Fog & Mist includes two custom sprite shaders found in Resources/Extras folder. You will find two materials with names SpriteFogDiffuse and SpriteFogUnlit, which you may just assign to your Sprite Renderers to make Sprite fully compatible with the Image Effects.

Compatibility with Time of Day

If you use Time of Day asset, you may assign the Sun game object found under Sky Dome to the Sun field in the Volumetric Fog & Mist inspector. That will sync the direction and color of the Sun light with the fog.

Compatibility with other Sky Managers

The compatibility with Sky managers in Volumetric Fog & Mist affects two parameters:

- Depth of skybox: many sky managers use a "Sky Dome" to render the sky. This sky dome is a big sphere that surrounds the scene. To allow sky haze work with sky domes, reduce the sky depth parameters under the sky haze section.
- Sun orientation: fog lighting will adapt automatically to the Sun orientation. Just drag and drop any gameobject that reflects current Sun direction onto the Sun property in the inspector.

Compatibility with Gaia

Volumetric Fog & Mist is also available from Gaia's Extension Manager. You will find a list of convenient buttons that configures and select the different presets of Volumetric Fog & Mist in just one click.

Compatibility with Horizon(ON)

Volumetric Fog & Mist has been tested with recent versions of Horizon(ON). It will only work with the real terrain though, so you will probably need to reduce the max distance factor and combine Volumetric Fog & MIst with the fog effect provided by Horizon(ON) for the long distance.

Performance Tips

Volumetric Fog uses an extremely optimized ray-marching algorithm to provide "volumetric sense" fog in front of your player. This great effect comes at a performance price that makes Volumetric Fog & Mist not suitable for mobile devices (at least mobile devices to date).

However, we have added a few optimization parameters to provide you with more control regarding the performance vs quality:

- **Max Distance**: reduce the max distance property to a value that matches your scene/requirements so no extra fog is calculated unnecessarily.

- **Transparency Mode** (see page 4 for more information): set to None to avoid extra overhead, or ScreenDirect on any platform if you absolutely need support for transparent objects. Only use BlendPass in VR.

- **Downsampling**: increase this value to improve performance. A high value will produce visible artifacts around objects. A x2 value usually works well. A x4 or higher value works better with elevated/cloud fog. You can enable the "Edge improvement" option to reduce fog bleeding/pixelization around geometry borders.

- **Stepping**: controls the step of the ray-marching algorithm. Reduce this value to improve performance.

- **Stepping near**: additional factor for the ray-marching step applied only to close distances. Increase to improve the fog effect when stepping is reduced.

- **Sky Haze**: reduce to 0 to improve performance.

- **Distance** (starting Distance in Fog Geometry group): reduce to 0 to improve performance.

- **Height:** try to set the minimum height for the look you need.

Optional features that you may check they're either on (because you want them) or off (because you don't want them and want to make sure they are really disabled):

- **Point Lights**: reduce the number of point lights that can illuminate the fog (Point Light section). Make sure the range for non-used slots is zero.

- **Light Scattering**: uncheck the Enable toggle to disable the effect and increase performance. Make sure that if you enable it, the effect is visible when facing towards Sun, otherwise you will be wasting lot GPU cycles!

- **Fog Void / Fog of War**: disable (either setting the fog void radius to zero) or disabling fog of war feature (toggle in its section) if you're not using them to reduce GPU work.

Common Issues (FAQ)

When I import Volumetric Fog & Mist I see some errors in the console related to Standard Assets.

Depending on your Unity version if it's older than 5.5, Volumetric Fog & Mist includes a copy of the Standard Assets inside the Demo folder. They were used only in the demo scenes so you can remove them along the demo folder if you don't need them anymore. In Unity 5.5, the Standard Assets are no longer included to avoid issues with your own usage of Standard Assets (instructions to import the demo scenes are easy to follow and included in a readme file inside the demo folder).

So depending on your Unity version if it's older than 5.5, this copy of Standard Assets corresponds to 5.1.1, 5.3.1 or 5.4 Unity versions. If you already have the Standard Assets imported in your project you may receive errors due to duplication of files. The errors will go away when you delete the duplicated files. You may delete the Standard Assets folder inside Volumetric Fog & Mist Demos folder.

I have exceeded the maximum number of allowed shader keywords. What can I do?

Volumetric Fog & Mist shader uses the following keywords, defined in VolumetricFog.shader file. Since V6.4, a new option in the inspector allows you to remove some of these keywords. This option is accessible pressing a button with the text "Build Options" located on top of the Volumetric Fog & Mist inspector.

If you want to further optimize the shader, you can edit it and modify it depending if you want the feature or not:

A) I don't need that feature: just remove the corresponding keyword or the entire #pragma line.
B) I need that feature: you may remove the #pragma line AND remove all #if related statements in the shader so that code will always execute.

#pragma multi_compile __ FOG_DISTANCE_ON
Used when you set Starting Distance > 0.

#pragma multi_compile __ FOG_VOID_SPHERE FOG_VOID_BOX
Used when you enable fog void option.

#pragma multi_compile __ FOG_AREA_SPHERE FOG_AREA_BOX
Used when you enable fog area option..

#pragma multi_compile __ FOG_HAZE_ON
Used when you Sky Haze setting is > 0.

#pragma multi_compile __ FOG_OF_WAR_ON
Used when you enable Fog of War feature.

#pragma multi_compile __ FOG_POINT_LIGHT0 …
Used when the range setting of the optional point light setting is > 0.

#pragma multi_compile __ FOG_SCATTERING_ON
Used for light scattering (god rays, sun shafts).

If you want to further optimize shader keywords at project level, consider using Shader Control asset (check it on the Asset Store).

When I generate a build, it stucks or takes lot of time!

This is a known issue with Unity when compiling shaders with many keywords. You may want to reduce the shader complexity removing some keywords that you don't use – check the previous question to learn about the different keywords used by the shader.

I see banding artifacts, how can I remove them?

To reduce banding artifacts (ie. circles on the sky), make sure your camera has HDR enabled and use the Dithering and Jittering options found in the Optimization & Quality settings section. You can customize the dither/jitter effects using the sliders next to the toggles. For low density fog, you may need to increase the dithering intensity and / or jittering.

Can I extend the maximum distance far beyond the 2000 limit?

You can edit the custom inspector to increase that cap. However increasing that value will impact performance. If you need to cover vast or far areas with fog, consider adding Dynamic Fog & Mist in addition to Volumetric Fog & Mist. Use Volumetric Fog & Mist for short distance effects and Dynamic Fog & Mist for the background.

When I enable transparency pass (ScreenDirect or BlendPass) I see dots around transparent objects. What is it?

Those dots are artefacts due to MSAA (antialias). MSAA smoothens sharp edges adding average pixels (the dots) which does not render to depth buffer causing some artefacts when the transparency pass is enabled. To remove those dots, disable MSAA or use a post-processing antialias effect instead.

Additional Support

Please visit kronnect.com for questions, support and more info.

Dynamic Fog & Mist

You will find a copy of Dynamic Fog & Mist included in this package located in the Extras folder.

Dynamic Fog & Mist is somewhat less impressive visually than Volumetric Fog but it will provide better performance.

If you're not interested in using Dynamic Fog & MIst, remember to remove the Extra folder completely.