URP+ 2022 Documentation

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Introduction

URP+ is an innovative Unity asset designed to significantly enhance the visual quality of graphics within the Unity engine, particularly for projects utilizing the Universal Render Pipeline (URP). This asset narrows the visual fidelity gap between URP and the more demanding High Definition Render Pipeline (HDRP), offering a suite of advanced graphical features and shaders. With URP+, users can achieve more realistic and visually striking graphics, traditionally associated with HDRP, while benefiting from the efficiency and simplicity of URP. Designed primarily for PC and console platforms, URP+ is the perfect tool for developers and creators aiming to elevate the graphical fidelity of their games and applications on these platforms.

Prerequisites

To ensure optimal performance and compatibility, URP+ has specific requirements:

- **Unity Version:** URP+ is compatible with Unity 2022.3. It's essential to use a supported version of Unity to leverage all the features effectively.
- **Render Pipeline:** This asset is specifically tailored for projects using the Universal Render Pipeline. Ensure your project is set up with URP prior to integrating URP+.
- **Target Platforms:** While URP+ is predominantly focused on enhancing graphics for PC and console markets, it's optimized for these platforms' unique capabilities and performance characteristics. You should consider the specific hardware and performance requirements of your target platform when using URP+.

Getting Started

To begin using the URP+ asset in your Unity project, you'll need to configure your scene's Global Volume object with the URP+ components. Here's a step-by-step guide to get you started:

Locate or Create a Global Volume

In your scene hierarchy, find an existing Global Volume object or create one by navigating to *GameObject > Volume > Global Volume* in the Unity editor menu.

Add URPPlus Settings Component

With the Global Volume object selected, go to the Inspector window. **>** Click the Add Component button at the bottom of the Inspector. **>** Search for URPPlus Settings and click to add it to the Global Volume.

Configure URPPlus Settings

Iridescence Model: Choose between PhysicalBased or Approximation.

Sheen Model: Choose between PhysicalBased or Approximation.

Coat Geometric Specular AA: Check this box to enable anti-aliasing for a smoother appearance on shiny surfaces that use ClearCoat.

Screen Fade Distance: Adjust this parameter to set the fade distance for screen space refraction.

MicroShadows: Micro shadows are shadows that the URP+ simulates for small details embedded in the Material of a GameObject, but not in its Mesh geometry.

High Quality DepthNormals: This option includes calculations of normal maps (including DetailMap) and PerPixel Displacement for DepthNormals (affects SSAO and other effects that use them)

Add URPPlus Weather Controller Component

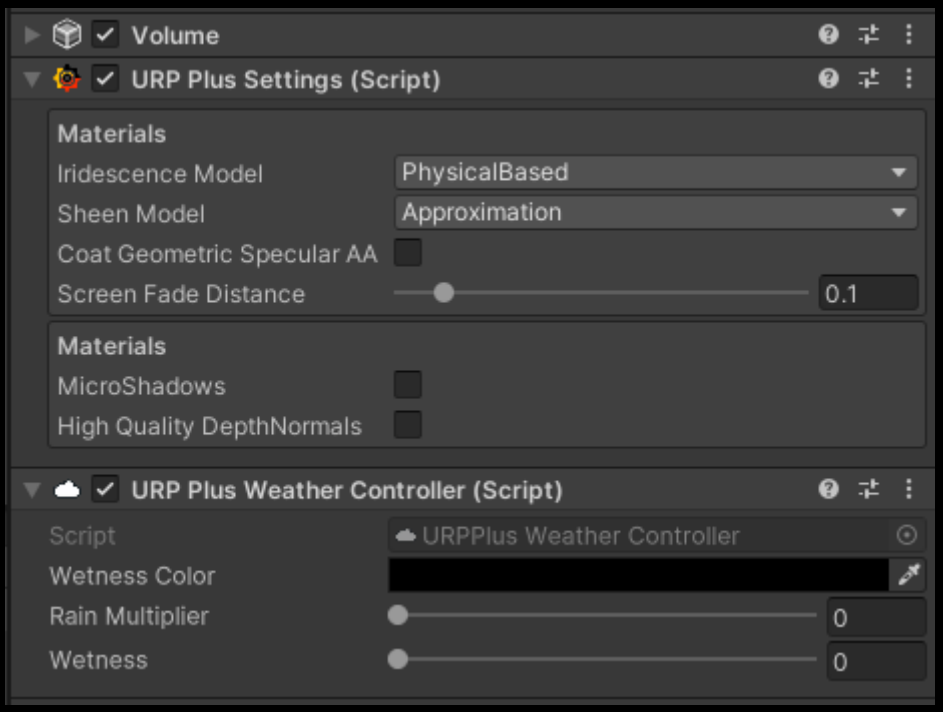
Still within the Inspector for the Global Volume object, click Add Component again.
Search for **URPPlus Weather Controller** and select it to add to the Global Volume object.

Configure URPPlus Weather Controller

Wetness Color: Control the color of surfaces when they are wet.
Rain Multiplier: Adjust this value to increase or decrease the intensity of rain effects.
Wetness: Control the level of wetness effect on materials during rain, giving a realistic damp look.

Save the Configuration

After you have configured the settings to your liking, ensure you save the scene to retain these settings.



Detailed Features

Surface Options

Workflow Mode

This dropdown allows you to choose the shading model that fits your texturing workflow.

Surface Type

You can set the material to either **Opaque or Transparent**. Transparent surfaces will render with transparency, using the alpha channel of the albedo texture.

Blending Mode

Alpha: Uses the Material's alpha value to change how transparent an object is. 0 is fully transparent. 1 appears fully opaque, but the Material is still rendered during the Transparent render pass.

Additive: Adds the Material's RGB values to the background color. The alpha channel of the Material modulates the intensity. A value of 0 adds nothing and a value of 1 adds 100% of the Material color to the background color.

Multiply: Multiplies the color of the Material with the color behind the surface. This creates a darker effect, like when you look through colored glass.

Premultiply: Assumes that you have already multiplied the RGB values of the Material by the alpha channel. This gives better results than Alpha blending when filtering images or composing different layers.

Preserve Specular Lighting

When enabled, specular reflections are maintained even on transparent surfaces, which can be useful for materials like glass, where you want to keep the reflective properties alongside transparency.

Depth Write

This checkbox controls whether the material writes to the depth buffer. If enabled, the material will contribute to depth-based effects like shadows and depth of field.

Depth Test

This dropdown lets you select the depth comparison function used when rendering. "LessEqual" is a common setting that renders the material if it's closer to the camera than what is already in the depth buffer.

Render Face

You can choose to render **Front, Back, or Both** sides of the polygons. **Front** is the default and typically what you want for most materials.

Alpha Clipping

The Alpha Clipping option controls whether your Material acts as a Cutout Shader or not.
Threshold: Set the alpha value limit that URP+ uses to determine whether it should render each pixel. If the alpha value of the pixel is equal to or higher than the limit then URP+ renders the pixel. If the value is lower than the limit then URP+ does not render the pixel. The default value is 0.5.

Shadow Threshold

Enable the checkbox to set another threshold value for alpha clipping shadows.
Shadow Threshold: Set the alpha value limit that URP+ uses to determine whether it should render shadows for a pixel.

AlphaToMask

When enabled and using MSAA, URP+ enables alpha to coverage during the depth prepass.

Material Type

This setting allows you to choose the overall behavior of the material, with options like **Standard, SubSurface Scattering, Anisotropic, Iridescence, Translucency**.

EnableTransmission

When enabled URP+ processes the transmission effect for subsurface scattering. Simulates the translucency of the object. This property only appears when you select **SubSurface Scattering** from the **MaterialType** drop-down.

Geometric Specular AA

This checkbox enables geometric anti-aliasing on specular highlights, which can reduce the aliasing effect seen on high-gloss surfaces.

Displacement Mode

This dropdown gives options for displacement mapping, which can alter the actual geometry of the surface at render time for added realism. Options include **None, Vertex, Pixel, or Tessellation.**

Lock with object scale

Enable the checkbox to alter the height of the displacement using the Scale of the Transform. This allows you to preserve the ratio between the amplitude of the displacement and the Scale of the Transform.

Lock with height map tiling rate

Enable the checkbox to alter the amplitude of the displacement using the tiling of the Height Map. This allows you to preserve the ratio between the amplitude of the displacement and the scale of the HeightMap Texture.

Minimum steps
Use the slider to set the minimum number of Texture samples which URP+ performs to process pixel displacement.

Maximum steps
Use the slider to set the maximum number of Texture samples which URP+ performs to process pixel displacement.

Fading mip level start steps
Use the slider to set the mip level at which the pixel displacement effect begins to fade out.

Primitive length
The length of the Mesh (in meters) on which URP+ applies the displacement mapping.

Primitive width
The width of the Mesh (in meters) on which URP+ applies the displacement mapping.

Depth Offset
Enable the checkbox to modify the depth buffer according to the displacement. This allows effects that use the depth buffer to capture pixel displacement details.

Tessellation Options

Tessellation Mode

This dropdown allows you to select the method by which tessellation is applied. The "Distance" option, for example, varies tessellation based on the distance of the object from the camera, reducing detail when further away to optimize performance. The "EdgeLength" option controls tessellation based on the length of the edges of the tessellated triangles. It aims to maintain a consistent edge length across the surface, regardless of distance from the camera, which can be critical for ensuring uniform detail in certain types of environments or objects.

Phong Tessellation

URP+ applies Phong tessellation to the mesh. Phong tessellation applies vertex interpolation to make geometry smoother. If you assign a displacement map for this Material and select this option, URP+ applies smoothing to the displacement map.

Tessellation Factor

The number of subdivisions that a triangle can have. If you want more subdivisions, set this to a higher value. More subdivisions increase the strength of the tessellation effect and further smooths the geometry. Note that higher values also increase the resource intensity of the tessellation effect. To maintain good performance on the Xbox One or PlayStation 4, do not use values greater than 15. This is because these platforms cannot consistently handle these many subdivisions.

Start Fade Distance

This setting determines the distance from the camera at which tessellation begins to fade out. In this example, tessellation will start to reduce at 20 units away from the camera.

End Fade Distance

This value sets the distance from the camera at which tessellation will be fully faded out, meaning no additional detail from tessellation is applied. Here it's set to 50 units, so beyond this distance, the mesh will display without additional tessellation detail.

Triangle Size

The screen space size (in pixels) at which URP+ should subdivide a triangle. For example, if you set this value to 100, URP+ subdivides triangles that take up 100 pixels. If you want URP+ to tessellate smaller triangles, and thus produce smoother geometry, set this to a lower value.

Triangle Culling Epsilon

This parameter helps in optimizing the tessellation process by culling small triangles that contribute little to the surface detail. The negative value of -0.25 indicates that small triangles are being aggressively culled to improve performance.

Surface Inputs

Base Map

The Base Map slot is for the primary texture that defines the color and pattern of the material. This map influences the overall appearance and is the starting point for the material's look.

Alpha Remapping

Use this min-max slider to remap the alpha values from the Base Map to the range you specify. Rather than clamping values to the new range, URP+ condenses the original range down to the new range uniformly. This property only appears when you assign a Base Map.

Metallic

This slider adjusts the metallic property of the material. A higher value will make the material behave more like metal, with increased reflectivity and specific color highlights.

Smoothness

The smoothness slider controls the material's surface glossiness or shine. A higher value results in a smoother, more reflective surface, while a lower value creates a rougher, more diffuse appearance.

Metallic Remapping

Use this min-max slider to remap the metallic values from the Mask Map to the range you specify. Rather than clamping values to the new range, URP+ condenses the original range down to the new range uniformly. This property only appears when you assign a Mask Map.

Smoothness Remapping

Use this min-max slider to remap the smoothness values from the Mask Map to the range you specify. Rather than clamping values to the new range, URP+ condenses the original range down to the new range uniformly. This property only appears when you assign a Mask Map.

Specular Color

Allows you to manually define the specular color. You can assign a Texture to define the specular color on a pixel level and use the color picker to select a global specular color for the Material. If you do both, HDRP multiplies each pixel of the Texture by the color you specify in the color picker.

Mask Map

An optional slot for a texture that contains a mask for the metallic, smoothness, detail mask and ambient occlusion values, allowing for more complex and varied surface properties across the material.

Normal Map

Here, you can apply a normal map to simulate fine surface details and texture without increasing the polygon count.

Bent Normal Map
Assign a Texture that defines the bent normal map for this Material in tangent space. URP+ uses bent normal maps to simulate more accurate ambient occlusion. Note: Bent normal maps only work with diffuse lighting.

Tangent Map
This is similar to a normal map but is specifically used to adjust the tangents of the surface normals, which can affect the anisotropic reflections and how light interacts with the microsurface details.

Anisotropy
This slider controls the level of anisotropy, which affects the highlight shape on the material, simulating how light reflects on surfaces like brushed metal or hair, where the reflection is stretched along a particular direction.

Anisotropy Map
An optional texture slot to define the anisotropic intensity across the material.

Coat Mask
The feature adds an extra Material layer which simulates a transparent and thin coating on top of the base Material. The feature affects the color and the Smoothness values of the underlying base material slightly. The index of refraction (IOR) of the Clear Coat is 1.5.
Performance impact: Rendering Clear Coat has roughly twice the cost of rendering a base material, because the lighting is evaluated once per layer.
This property defines the intensity of the effect: 0 - no effect, 1 - maximum effect. Setting the Mask value to 0 does not disable the feature.
There is the Clear Coat map property to the left of the Mask property. The channels have the following mapping:
Red – the Mask property.
Green – the Smoothness property.
If a Clear Coat map is present, URP+ multiplies the map's pixel values by value of the Mask property.

ClearCoat Smoothness
This property defines the spread of highlights on the surface. 0 gives wide, rough highlights. 1 gives sharp, glasslike highlights.

Height Map
Assign a Texture that defines the heightmap for this Material. URP+ uses this map to apply pixel or vertex displacement to this Material's Mesh.

Parameterization

Use the drop-down to select the parametrization method for the to use for the Height Map.
Min/Max: HDRP compares the Min and Max value to calculate the peak, trough, and base position of the heightmap. If the Min is -1 and the Max is 3, then the base is at the Texture value 0.25. This uses the full range of the heightmap.
Amplitude: Allows you to manually set the amplitude and base position of the heightmap. This uses the full range of the heightmap.

Diffusion Profile

The URP+ stores most Weather settings in a **Diffusion Profile** Asset. You can assign a **Diffusion Profile** Asset directly to Materials that use WeatherInputs.
To create a **Diffusion Profile**, navigate to *Assets > Create > Rendering > URP+ > Diffusion Profile*.

Thickness & Curvature

These sliders control the perceived depth and curvature of the surface, which can affect how light penetrates and exits a translucent material.

Tiling & Offset

These settings control the repetition (Tiling) and placement (Offset) of the texture maps on the material, allowing you to scale and move the textures to fit the material properly.

LayeredLit Surface Inputs

Layer Count

This slider determines the number of texture layers that will be blended together.

Layer Mask

An optional texture slot that, if provided, uses a mask to define how the layers are blended together.

Tiling & Offset

These settings control the repetition (Tiling) and placement (Offset) of the *Layer map* on the material, allowing you to scale and move the layer texture to fit the material properly.

Vertex Color Mode

This dropdown lets you select how vertex colors influence the layered materials. Options like **Multiply** or **Add** can be used to blend layers based on the mesh's vertex color data.

Main Layer Influence

When enabled, this checkbox gives the main (first) layer predominant influence over the other layers, which can be useful when you have a base texture that should remain the most visible.

Use Height Based Blend

This feature, when checked, allows the layers to blend based on a height map. This creates a more natural transition between textures, emulating how different terrains intersect in nature.

Fabric Surface Inputs

Thread Map

A dedicated map that defines the intricate patterns of threads in the fabric, offering additional texture and depth to the material.

Fuzz Map

Controls the appearance of fine, fuzzy fibers on the surface of the fabric, which can give it a more realistic and tactile feel.

Fuzz Scale and Intensity

These parameters adjust the scale and the prominence of the fuzz effect, allowing for subtle adjustments to how "fluffy" or "fuzzy" the fabric appears.

Hair Surface Inputs

AO Map

The Ambient Occlusion Map can be used to add depth and definition to the hair, emphasizing the shadows and occlusion naturally occurring between strands.

Ambient Occlusion Remapping

Tiling and Offset settings for the AO map allow for adjustment of the map's scale and position, optimizing the shadowing effects for the most natural appearance. This property only appears when you assign a *AO Map*.

Smoothness Mask

A texture map that controls the smoothness variations across the hair, giving you the ability to create areas that reflect light differently, such as shinier roots or tips.

Smoothness

This slider adjusts the overall glossiness or shine of the hair material, affecting how light reflects off the hair.

Smoothness Remapping

Use this min-max slider to remap the smoothness values from the *Smoothness Mask* to the range you specify. Rather than clamping values to the new range, URP+ condenses the original range down to the new range uniformly. This property only appears when you assign a *Smoothness Mask*.

Specular Color

Defines the color of the specular highlights on the hair, which can be adjusted to simulate different types of hair and conditions.

Specular Multiplier

This setting amplifies the intensity of the specular reflection, giving you control over how shiny the hair appears.

Specular Shift

Alters the position of the specular highlight, which can change the appearance of how light interacts with the curvature of the hair.

Secondary Specular Multiplier & Shift

These controls allow for an additional layer of specular highlights, offering complexity to the hair's reflective properties.

Transmission Color

This color picker influences the hue of light passing through the hair, giving a tinted backlight effect that can simulate realistic lighting scenarios.

Transmission Rim
Controls the intensity of the rim lighting effect, enhancing the hair's edges when backlit.

Static Specular Highlight
Adjusts the static or non-dynamic highlight strength, providing a consistent sheen that does not change with the lighting environment.

Static Light Color & Vector
These settings allow for the definition of a static light source, affecting the color and directionality of the light affecting the hair, independent of the scene's lighting.

Eye Surface Inputs

Sclera Map

This texture defines the appearance of the sclera, the white part of the eye, giving it color and texture variations.

Sclera Smoothness

Controls the reflectivity of the sclera, affecting how shiny or matte it appears, which can influence the eye's wet look.

Sclera Normal Map

Adds detailed surface texture to the sclera, giving it a more realistic appearance by simulating the subtle irregularities of an eye's surface.

Iris Map

The primary texture for the colored part of the eye, it defines the iris's unique patterns and colors.

Iris Clamp Color

Sets the color that will be used if the refraction ray reaches the inside of the Cornea.

Iris Normal Map

Similar to the sclera, this adds depth and texture to the iris, enhancing the realism of the eye's intricate patterns.

Position Offset

Sets the offset of the Iris placement, useful since real world eyes are never symmetrical and centered.

Cornea Smoothness

Affects the clear outer layer of the eye, adjusting its glossiness to simulate the wet, reflective surface of the cornea.

Pupil Radius

Sets the radius of the Pupil in the Iris Map as a percentage.

Pupil Aperture

Sets the state of the pupil’s aperture, 0 being the smallest aperture (Min Pupil Aperture) and 1 the widest aperture (Max Pupil Aperture).

Minimal and Maximal Pupil Aperture

Sets the range of the pupil's size, from fully dilated to fully constricted, providing dynamic responsiveness to in-game lighting conditions.

Limbal Ring Size Iris/Sclera

Adjusts the size of the limbal ring, the dark ring around the iris where it meets the sclera, which can enhance the eye's depth and expressiveness.

Limbal Ring Fade

Controls the gradient or softness of the limbal ring's edge, blending it naturally into the iris and sclera.

Limbal Ring Intensity

Adjusts the darkness or visibility of the limbal ring, adding to the overall realism of the eye.

Mesh Scale and Position Offset

Controls scaling of the eye mesh.

Detail Inputs

Detail Map

This slot is where you can assign a detail texture that adds fine details to the surface of the material. It typically contains a grayscale image that can affect the albedo, normal, and smoothness properties.

Detail Albedo Scale

This slider adjusts the intensity of the detail map's influence on the material's albedo, or color. Scaling this up can increase the visibility of small details, while scaling down can make them more subtle.

Detail Normal Scale

Similar to the Detail Albedo Scale, this controls the impact of the detail map on the material's normal map. It enhances the perceived depth and texture of the surface details.

Detail Smoothness Scale

This adjusts the influence of the detail map on the material's smoothness. Higher values will make the fine details appear smoother, while lower values will retain more of the base material's texture.

Tiling & Offset

These settings control the repetition (Tiling) and placement (Offset) of the *Detail Map* on the material, allowing you to scale and move the detail texture to fit the material properly.

Weather Inputs

Weather Enable

When checked, this feature enables weather.

Rain Mode

This dropdown allows you to select the rain mode: Planar and Triplanar. Planar includes only puddles, while Triplanar includes a full rain projection.

Weather Profile

The URP+ stores most Weather settings in a **Weather Profile** Asset. You can assign a **Weather Profile** Asset directly to Materials that use WeatherInputs.
To create a **Weather Profile**, navigate to *Assets > Create > Rendering > URP+ > Weather Profile.*

Puddles Normal Intensity

This slider controls the intensity of the puddle normal map.

Rain Normal Intensity

This slider controls the intensity of the rain normal map.

Rain Distortion

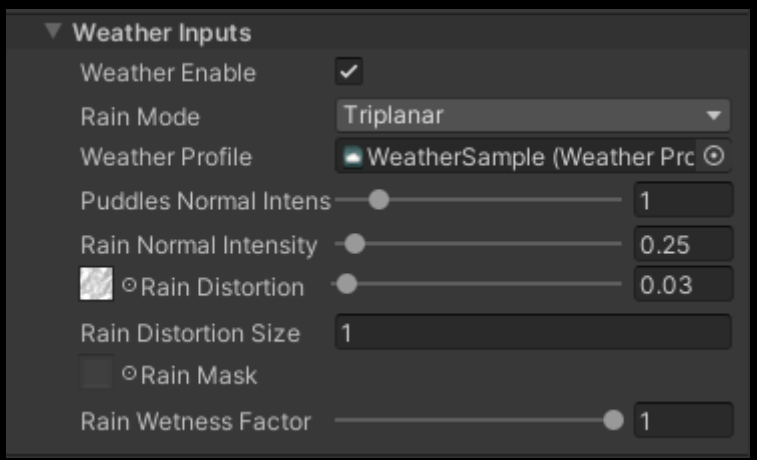
This slider controls the visual distortion for rain normal map.

Rain Mask

An optional texture slot to define the rain intensity across the material.

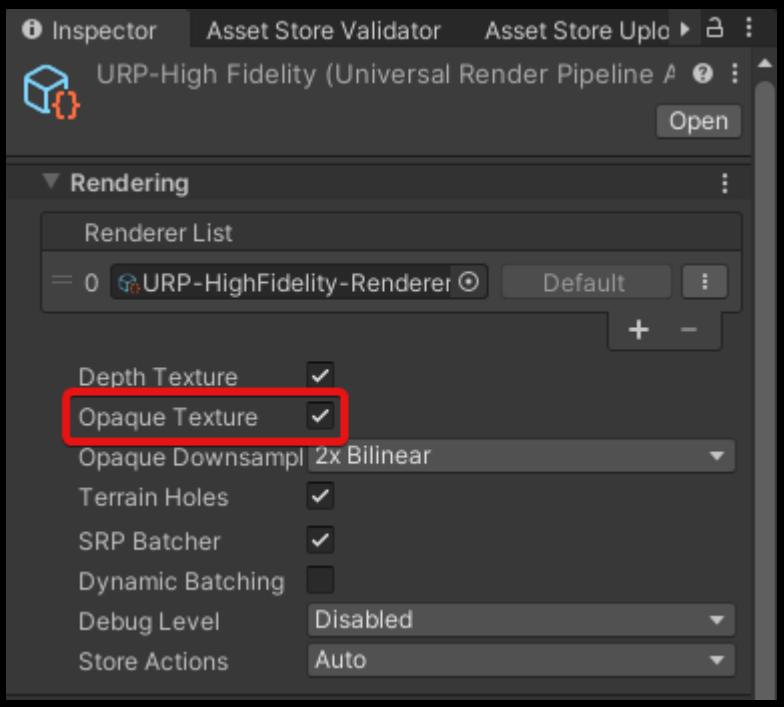
Rain Wetness Factor

This slider controls how wet surfaces appear during/after rainfall



Transparency Inputs

To work with refraction - turn on this option, nothing will work without it!



Refraction

The dropdown menu for Refraction can typically be toggled 'On' or 'Off'. When set to 'On', it activates the refraction effect, which simulates the bending of light as it passes through transparent materials. This effect is vital for creating realistic glass or liquid materials.

Index Of Refraction (IOR)

This slider adjusts the degree to which light bends when entering the material. The Index of Refraction is a measure of how much light is bent, or refracted, when entering a material. Adjusting this value would control the strength of the refraction effect.

Transmittance Color

The color picker allows you to choose the Transmittance Color, which determines the color light will be as it passes through the material. This can be used to simulate colored glass or other tinted transparent materials.

Enable Chromatic Aberration

When checked, this feature enables chromatic aberration, a visual effect that simulates how different wavelengths of light separate when refracted, resulting in a subtle color fringing at the edges of transparent objects. This can add a layer of realism to high-quality renders.

Chromatic Aberration

Accompanying the toggle, this slider lets you adjust the intensity of the chromatic aberration effect. In the example, it is set to 0.1, indicating a slight dispersion of light that can enhance the believability of the material.

Shadow Attenuation

This parameter regulates the impact of shadows on the refraction effect applied to the material. As light passes through transparent or refractive surfaces, shadows cast by the material may be attenuated or modified to enhance realism in the rendered scene.

Emission Inputs

Emissive Map

This is the texture slot where you can assign an emissive texture map. This map determines which parts of the material will emit light, as well as the color of the light emitted. HDR textures are supported, allowing you to create high-intensity effects.

Emission Intensity

This setting adjusts the overall brightness of the emitting areas. Intensity 1 corresponds to standard emission, but you can increase this value to make the material glow brighter or decrease it for a more subtle effect.

Emission Multiply with Base

When this checkbox is selected, the emission effect is blended with the primary color of the material. This can create a more cohesive and natural glow that takes into account the color of the material.

Emission Fresnel

When this option is checked, the Fresnel effect is applied to the emission. The Fresnel effect makes the emission more intense at angles of incidence, mimicking the behavior of light on curved or tilted surfaces in the real world.

Emission Fresnel Power

This slider, along with Fresnel Emission, controls the strength of the Fresnel effect. A higher value concentrates the radiation at the extreme corners, while a lower value distributes it more evenly over the surface.

Global Illumination

This dropdown menu allows you to select how the emissive material interacts with the scene's global illumination. Options include **None (no contribution to global illumination), Realtime (dynamic GI contribution), Baked (static GI contribution).** This setting determines whether or not the light emitted by the material will affect surrounding objects.

Advanced Options

Cast Shadows

This checkbox determines whether the material will cast shadows when illuminated by a light source. When unchecked, the material will not cast shadows, which can be useful for performance optimization. This property only appears when you select **Transparent** from the **SurfaceType** drop-down.

Receive Shadows

When checked, this option allows the material to receive shadows from other objects, adding realism to the scene. Disabling this option can be useful for materials where shadow casting is not required, such as glowing objects.

Specular Highlights

This feature enables the rendering of specular highlights on a material, which are bright spots that reflect a light source. This gives the material a realistic appearance, especially on glossy surfaces.

Environment Reflections

When this option is enabled, the material reflects its surroundings, which can greatly improve the integration of the material with the scene by adding realistic reflective properties.

Sorting Priority

The slider sets the priority for rendering the material in relation to other transparent materials. A higher value will render the material on top of others with lower values, which is particularly useful for correctly displaying layers of transparent materials.

Enable GPU Instancing

This option allows the material to take advantage of GPU instances, which can reduce the number of draw calls and improve performance when rendering multiple instances of the same material.

ClearCoat Second Normal

When enabled, it allows materials with a transparent layer to use a second normal map, providing additional detail and depth, especially on complex surfaces such as automotive paints or coated materials.

Horizon Occlusion

This setting is used to improve the appearance of lighting on materials by considering the occlusion of light as it hits surfaces at shallow angles, similar to the concept of ambient occlusion but focused on the edges where the surface geometry meets the sky or distant horizons. When enabled, Horizon Occlusion will darken the areas where the object's surface geometry is close to parallel with the viewing angle, simulating the natural occlusion effect that occurs in real life when objects block or partially block light as it skims across a surface.

Specular Occlusion Mode

This drop-down list lets you choose the method by which the specular occlusion is calculated. The following options are available: **Disabled, From AO (Ambient Occlusion)AO+Bent Normals, From GI (Global Illumination).** Each of which determines how close the specular reflection should be based on environmental factors.

Support and Contact Information

For support and inquiries regarding URP+, please feel free to reach out through the following channels:

Discord

Join me on Discord for community support, where you can ask questions, share your experiences, and offer suggestions. The invite to the Discord server can be found on the asset store page or within the asset's documentation - Discord.

Email

For direct support, you can email me at **urpplus@gmail.com**. I aim to respond as quickly as possible to provide personalized assistance.

As the sole developer of URP+, your feedback and success are very important to me. Whether you have technical questions, need help with troubleshooting, or want to share your project, I'm here to help.