

Soft Mask

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Documentation for version 1.7.0

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What is Soft Mask?

Soft Mask is a component for smooth masking of UI elements in Unity.

Being added to a Game Object, Soft Mask “masks” its child elements. Soft Mask gives a quite similar effect as standard Mask and Mask Rect 2D but has some advantages over them.

- Unlike [Rect Mask 2D](#), Soft Mask does not need to be axis-aligned and may be rotated freely.
- Unlike [Mask](#), Soft Mask may be semi-transparent, which allows you to create smooth transitions from visible to invisible parts of an image, and also use inclined or rounded edges of UI elements.



Soft Mask



*Unity's Standard Mask
(notice visual artifacts on the rounded
corners caused by cutoff)*

Features

- *Ease of use*: just place it on a parent element in the same way as standard Mask. There's no need to assign special materials or modify the masked elements in any other way.
- *Support for Image, Raw Image, Sprite, and Texture*: use standard Image or Raw Image components as a mask. Or set a Sprite, Texture or even Render Texture explicitly.
- *Support for TextMesh Pro*: mask your high-quality SDF texts along with other UI elements.
- *Custom shader support*: make your UI shaders compatible with Soft Mask by adding just a few lines to the shader code.
- *Mask Inversion*: invert the inner and outer areas of the mask separately.
- *Real-time updates*: change the configuration at runtime — create, destroy, enable, disable, move, rotate and reorder a mask or masked elements.
- *Raycast filtering*: restrict input processing to only visible parts of the masked UI.
- *Flexible adjustment of mask's color channels*: use black and white images, images with transparency or set a custom weight for each color channel.

Getting Started

To start using Soft Mask you need to import the package into your project. It could be done via the [Package Manager window](#). After importing the package, the Soft Mask component becomes available for use on your Game Objects. For more information about applying masks, see guides in [The Use of Soft Mask](#) section.

If you're using TextMesh Pro, check [Using Soft Mask with TextMesh Pro](#).

The package includes example scenes so that you can see Soft Mask in action right away. Those examples may be imported into your project via the [Package Manager window](#). The imported samples don't affect the work of Soft Mask so you can freely remove or re-import them at any time.

The Use of Soft Mask

Applying a Soft Mask

To apply a Soft Mask, follow the steps below.

1. Add a UI/Soft Mask component to a Game Object in the same way as you add a standard Mask.
2. Set up a Soft Mask:
 - If you want the mask image to be visible (as with the *Show Mask Graphic* option of the standard Mask), ensure that the Game Object has an Image or Raw Image component. The Soft Mask will use the same image that is rendered by this component.
 - If you do not want the mask image to be visible and only want to use it as a mask, you have two ways to do this:
 - Select *Sprite* or *Texture* in the *Source* drop-down list and set a sprite or texture for the mask. In this case, the Game Object doesn't have to have a Graphic component at all.
 - Alternatively, if you already have an Image or Raw Image on the Game Object, you can just disable it. Soft Mask will continue masking. Note that this option has some limitations, for details see [Interaction with the Graphic component](#).

Replacing a standard mask by a Soft Mask

You can easily replace a standard Mask that uses an Image or Raw Image component by a Soft Mask. To do so, follow the steps below.

1. Select one or more Game Objects with Mask that you want to convert.
2. Execute *Tools / Soft Mask / Convert Mask* to Soft Mask menu.

This menu is available only when all the selected objects have a standard Mask component as well as either Image or Raw Image component. There are also several cases when the menu is available but

conversion is still not possible. In these cases a message box with a detailed explanation is shown up on a conversion attempt.

All the changes made by this menu are recorded to the Undo history, so if you are not satisfied with the result, you may easily roll back the changes by the standard *Undo* command.

Disabling a Soft Mask

If you want to turn off masking, disable the Soft Mask component on the Game Object. Unlike the standard Mask, when the Graphic component of a Game Object is disabled, Soft Mask still keeps masking.

Using Soft Mask with TextMesh Pro

To enable Soft Mask to mask [TextMesh Pro](#) texts in your project, follow the steps below.

1. Import TextMesh Pro resources by executing the *Window / TextMeshPro / Import TMP Essential Resources* menu.
2. Click the menu *Tools / Soft Mask / Update TextMesh Pro Integration*. This will generate versions of TextMesh Pro shaders with Soft Mask support which will be used automatically on TextMesh Pro UGUI objects inside a Soft Mask.

For more information on using SoftMask with TextMesh Pro, see [Integration with TextMesh Pro](#).

Adding support of Soft Mask to custom shaders

Soft Mask is able to mask all Graphic components which use the standard Unity UI shader. If you want to use a custom shader for rendering masked UI elements (your own ones or from another package from Asset Store), you can adapt them to work with Soft Mask.

To add the support of Soft Mask to a shader, you have to insert some declarations and instructions into the shader code. As an example of what exactly should be done, see the shader `SoftMask/Samples/Materials/WaveWithSoftMask.shader`. This shader is used by the *04-CustomShaders* example. All the instructions required for Soft Mask support have the comment `// Soft Mask Support`

For a more detailed step-by-step guide, see [Custom Shader Tutorial](#).

Using Soft Mask in code

Everything related to Soft Mask is contained in the `SoftMasking` namespace. All the properties described in the [Properties](#) section are also available from the code. The public interface of `SoftMask` is documented via XML comments.

If you are interested in how Soft Mask is implemented, you can find an overall description at the beginning of the `SoftMask` class.

Reference

Interaction with the Graphic component

Unlike Unity's standard Mask, Soft Mask doesn't rely on the rendering of the Graphic component. When you set *Source* to *Graphic*, Soft Mask just picks up some properties (texture and border mode or UV rectangle) from the Graphic component but doesn't really use it in itself.

This approach has some limitations compared to a standard Mask:

- You can use only Image or Raw Image of all Graphic components as a mask source. Text and any other Graphics will not work as a mask.
- Soft Mask doesn't support the Filled type and Fill Center option of Image.
- The color set in the properties of Image or Raw Image isn't taken into account by Soft Mask. Only the texture is used.

When the Graphic component is disabled, Soft Mask continues to work, but it isn't updated accordingly when properties of the Graphic change. Despite the limitation, this operating mode may be useful when you migrate from a standard Mask with the *Show Mask Graphic* option enabled to Soft Mask.

Integration with TextMesh Pro

[TextMesh Pro](#) is a package that implements high-quality text rendering.

Soft Mask can be used to mask TextMesh Pro texts. To make it possible, Soft Mask includes a script that generates specializations of TMP's shaders with special Soft Mask instructions. These shaders then replace the originals for masked text objects on the fly.

The shader generation should be invoked manually. It is available via the *Tools / Soft Mask / Update TextMesh Pro* menu. The generated shaders are stored in the project: it's a good idea to put them under version control and share across the team. For more about generated shaders see [Shader Generation](#) section.

Samples

There are two example scenes included in Soft Mask which demonstrate usage of Soft Mask with TextMesh Pro. You can find these scenes in the `Samples/Scenes/TextMeshPro` folder.

Shader Generation

To activate integration the menu *Tools / Soft Mask / Update TextMesh Pro Integration* should be executed. It runs a script that generates specializations of TextMesh Pro shaders with Soft Mask support. The script does this by copying original TextMesh Pro shaders and patching them accordingly.

Generated shaders are stored in the `SoftMask/Shaders/Generated/Resources` folder. Soft Mask automatically picks up these shaders and uses them as replacements of standard TextMesh Pro shaders in the case when a TextMesh Pro object is nested into a Soft Mask. If you want to know more

about these mechanics or want to implement something like this for your own shaders, see the `SoftMask/Scripts/MaterialReplacements.cs` file.

Shader generation can be executed at any moment. If generated shaders already exist, they will be overwritten. The generated shaders are referenced by name, not by GUIDs, so it's completely safe to remove the generated shaders folder and re-run the *Update TextMesh Pro Integration* menu.

Generated shaders contain absolute paths to TextMesh Pro and Soft Mask shader include files. If you have moved any of these packages, you need to regenerate shaders by executing *Tools / Soft Mask / Update TextMesh Pro Integration*.

Known Issue The current version of the TextMesh Pro integration couldn't detect which shader variants are used in your scenes. This may lead to Unity removing necessary shaders from the build. If your texts look simpler in the build than they should, you probably faced this issue. To bypass it, you can add the patched shaders to the *Always Included Shaders* list on the *Graphics Settings* window. For more information, see [this post](#).

Updating the Packages

Any update of TextMesh Pro could potentially break Soft Mask integration. Please follow the guidelines below to be sure that your project will not be broken during an update of these packages.

- Whenever a new version of TextMesh Pro is available, it's recommended to test the integration on an empty project first. To do so:
 - a. Create a new project.
 - b. Import the updated TextMesh Pro and Soft Mask.
 - c. Import TextMesh Pro essential resources.
 - d. Execute the *Tools / Soft Mask / Update TextMesh Pro Integration* menu.
 - e. Open an example scene from the `SoftMask/Samples/TextMeshPro` folder. Ensure that it works as expected and the *Console* window contains no errors.
- If the integration isn't working in an empty project, please [contact](#) the developer and wait for a Soft Mask update before updating TextMesh Pro.

After updating either TextMesh Pro or Soft Mask, the *Tools / Soft Mask / Update TextMesh Pro Integration* menu should be executed again.

Limitations

The integration with TextMesh Pro has some limitations. Most of them are caused by the fact that the Soft Mask is a UI-only solution while TextMesh Pro also can display texts in 3D scenes.

- Only *TextMeshProUGUI* component can be masked.
- Surface and Overlay versions of shaders aren't supported by Soft Mask.
- Like standard Text, TextMeshProUGUI can't be used as a mask.

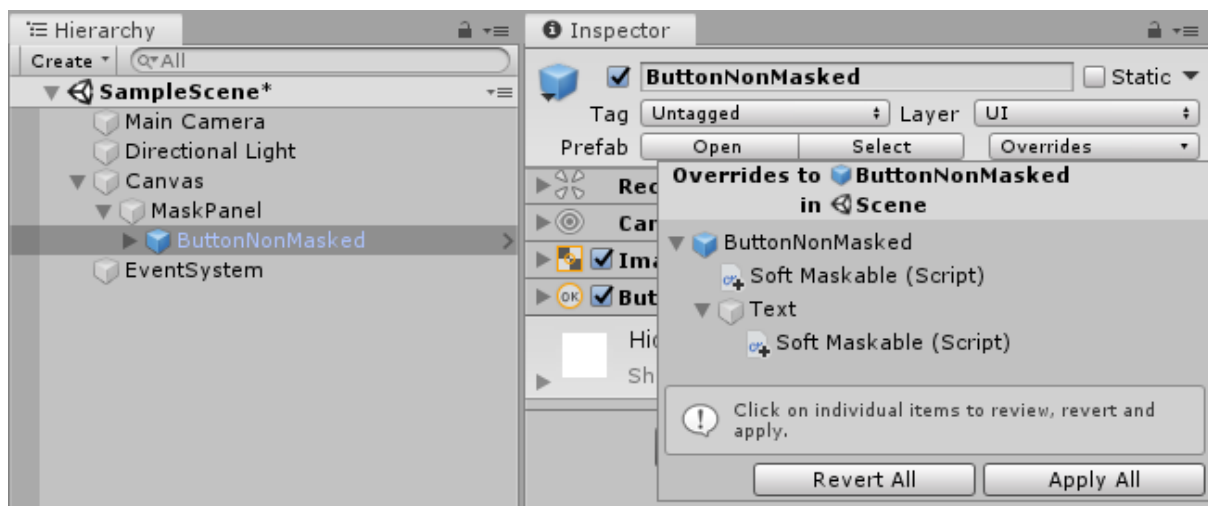
Prefabs

Prefabs may be used freely with Soft Mask. But due to some internals of Soft Mask the use experience with prefabs may be less convenient than expected. This section explains these inconveniences in detail.

Soft Mask creates an invisible script named *Soft Maskable* on each of its children. This script dynamically replaces the actual material that will be used for rendering. During usual work with a Scene, these scripts are completely unnoticeable. They are created and destroyed automatically as objects get under a Soft Mask and back.

But if you create a prefab from an object that is masked by a Soft Mask, that invisible script is saved into a prefab. If you later place an instance of this prefab not inside a Soft Mask, the attached *Soft Maskable* will be destroyed. Unity will treat this situation as a modification of a prefab instance and show it on the UI. If you revert properties back to the prefab defaults, the invisible script will be re-instantiated again and then immediately destroyed.

So, instances of prefabs that have been created from a masked object will behave a bit strangely when they're not masked by a Soft Mask. The opposite is true as well: an instance of a non-masked prefab that's put inside a Soft Mask will display the addition of a new component.



The ButtonNonMasked is an instance of a non-masked prefab that is placed into a mask. As you can see, Unity Inspector shows the addition of the new components.

This may make your workflow a bit inconvenient but it doesn't incur any errors.

A general recommendation on whether to create a prefab from a masked or a non-masked object is as follows: if you use this prefab mostly inside masks, create it from a masked object (with a *Soft Maskable* script). If you use it mostly without masks, create it from a non-masked object (without a *Soft Maskable* script). This will minimize the number of runtime operations.

Nested Masks

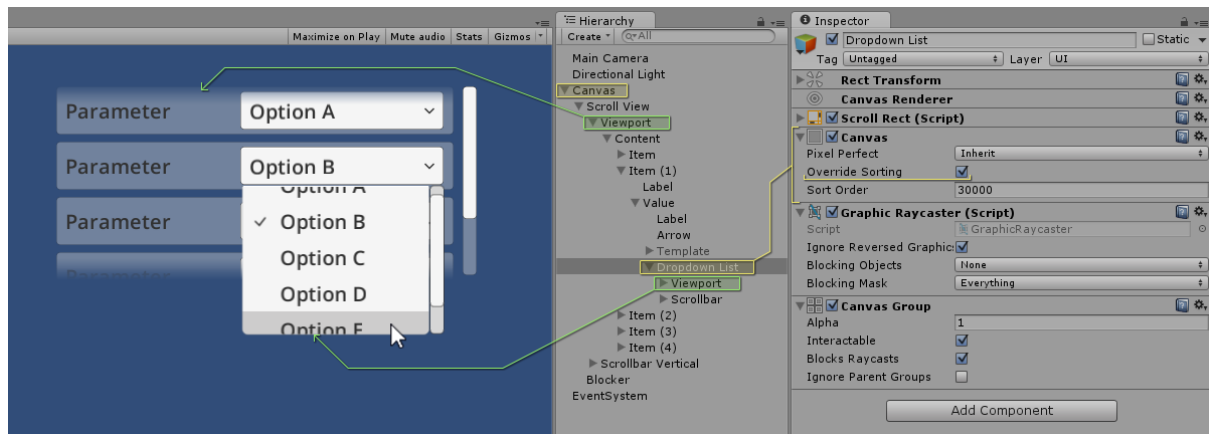
Soft Mask doesn't support nesting of masks. That is, you can't create a soft masked area inside another soft masked area. This is contrary to Unity's standard masking components—*Mask* and *Rect Mask 2D*, which can be nested freely.

If you need nested masked areas, consider using a standard Unity's Mask instead of either a parent or child Soft Mask.

Each UI element below Soft Mask is masked by the closest parent Soft Mask. If you place a Soft Mask inside another Soft Mask, each of them will mask only its own children, and the Inspector window will display a warning message for both masks. Note that if a nested mask has a Graphic component, it will be masked by the parent mask, which may not be what you expect.

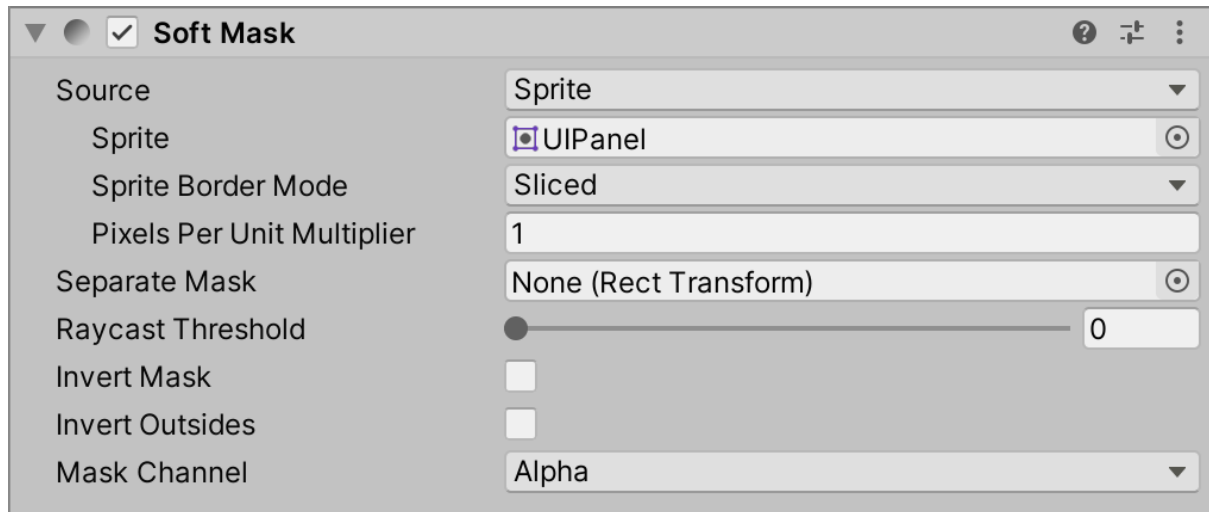
Known Issue Due to specifics of how standard Mask works with other components on the same Game Object, a standard Mask nested into a Soft Mask may work incorrectly in case if it was added after Soft Mask had been activated. For more information, see [this post](#).

The exception from this limitation is nested canvases with *Override Sorting* enabled. The effect of standard Unity masking components doesn't cross the borders between nested canvases with *Override Sorting* set. It is used by, for example, the standard *Dropdown* component: it spawns its drop-down list in a separate canvas. If you place a Dropdown inside a masked area, the drop-down list will not be clipped, as expected. Soft Mask works in the same way:



An example scene with nested canvases (yellow) and Soft Masks (green). Note that the nested canvas has *Override Sorting* enabled.

Properties



Soft Mask Inspector

Property	Description
Source	<p>Defines the way to configure a mask image. Possible values:</p> <p>Graphic The mask image is taken from the Graphic component of the Game Object. Soft Mask supports Image and Raw Image components only. If there is no appropriate Graphic on the Game Object, a solid rectangle of the RectTransform dimensions will be used.</p> <p>Sprite Mask image is taken from an explicitly specified Sprite. When this mode is used, <i>Sprite Border Mode</i> can be also set to determine how to process Sprite's borders. If the sprite isn't set, a solid rectangle of the Rect Transform dimensions will be used. This mode is similar to using an Image with an according <i>Sprite</i> and <i>Type</i> set.</p> <p>Texture The mask image is taken from the explicitly specified Texture 2D or Render Texture. When this mode is used, <i>Texture UV Rect</i> can be also set to determine what part of the texture should be used. If the texture isn't set, a solid rectangle of the Rect Transform dimensions will be used. This mode is similar to using a Raw Image with an according <i>Texture</i> and <i>UV Rect</i> set.</p>


Separate Mask	<p>Allows to specify a separate Rect Transform that should be used as a mask. If you set this property, the Soft Mask will still mask only its own children but the masking window will match the specified Rect Transform. If <i>Source</i> mode is set to <i>Graphic</i>, the Graphic component of the specified object will be used.</p> <p>This property simplifies the way to make masks that are moving relative to the masked content. An example of this you may see in the sample <i>04-CustomShaders</i>.</p> <p>When the value is set to None, the Rect Transform of the Soft Mask will be used (this is the way standard Unity's Mask works).</p> <p>The default value is None.</p>
Raycast Threshold	<p>Specifies the minimum mask value that the point should have for an input event to pass. Accepts values in range [0..1].</p> <p>If the value sampled from the mask is greater or equal to this value, the input event is considered to be 'hit'. The default value is 0, which means that any input event inside the RectTransform is passed further. If you specify the value greater than 0, the mask's texture should be readable.</p> <p>An example usage of this property you can find in the sample <i>02-Minimap</i>.</p>
Invert Mask	<p>If checked, the mask inside the masking rect is inverted. That is, the points where the mask is transparent become opaque and vice versa. The masking rect is the Rect Transform of the Game Object that Soft Mask is attached to or the transform specified by the <i>Separate Mask</i> property if it's set.</p> <p>Mask inversion is applied after <i>Mask Channels</i>.</p>
Invert Outsides	<p>If checked, the mask outside the masking rect is inverted. By default, the outsides of a mask are fully transparent. When this option is enabled, the outsides of a mask will be fully opaque. The masking rect is the Rect Transform of the Game Object that Soft Mask is attached to or the transform specified by <i>Separate Mask</i> if it's set.</p> <p>Combining this option with <i>Invert Mask</i> you may achieve the effect of cutting a hole in the underlying objects.</p> <p>Unlike <i>Invert Mask</i>, this option isn't affected by <i>Mask Channels</i> because the texture isn't used at all for the outside area of a mask.</p>
Mask Channel	<p>Defines what color channels of the image are used as a mask. Possible values:</p>

	<p>Alpha (default) The alpha channel (transparency). Coincides with <i>Channel Weights</i> = (0, 0, 0, 1).</p> <p>Red The red channel. Coincides with <i>Channel Weights</i> = (1, 0, 0, 0).</p> <p>Green The green channel. Coincides with <i>Channel Weights</i> = (0, 1, 0, 0).</p> <p>Blue The blue channel. Coincides with <i>Channel Weights</i> = (0, 0, 1, 0).</p> <p>Gray The average value of the red, green and blue channels. Coincides with <i>Channel Weights</i> = (0.33, 0.33, 0.33, 0).</p> <p>Custom Allows to set a specific weight for each color channel of the image.</p>
Channel Weights	<p>Displayed if <i>Mask Channel</i> is Custom.</p> <p>You can set the weight from 0 to 1 for each color channel. Given the value sampled from the mask texture is <i>mask</i> and the specified property value is <i>weights</i>, the resulted mask value is calculated as:</p> $\sum_{i \in \{r,g,b,a\}} mask_i \cdot weights_i$

Additional properties for Texture-based masks:

Texture	Defines a texture to use as a mask.
Texture UV Rect	Defines coordinates and size of the texture fragment to display the image, given in normalized coordinates (range 0.0 to 1.0). This property works in the same way as UV Rect property of <i>Raw Image</i> .

Additional properties for Sprite-based masks:

Sprite	Defines a sprite to use as a mask.
Sprite Border Mode	<p>Specifies how to render the sprite borders. Possible values: Simple, Sliced, Tiled. They all work in the same way as corresponding values of Type property of <i>Image</i>.</p> <div> <p>If you notice visual artifacts in <i>Sliced</i> or <i>Tiled</i> mode when the central part of a</p>  </div>

	<p>mask is too shrunk, you may try to reduce the anisotropy level of the mask texture or even disable it at all. Disabling mipmapping may also help. The cause of these artifacts is that when a child element is rendered there are no separate vertices between different parts of a sliced sprite and all the mapping is performed in a shader. In the case when the central part is collapsed, the texture coordinate change is too steep which causes the hardware to perform texture filtering in a way that produces artifacts. In most cases, both anisotropy and mipmaps aren't needed for UI textures.</p>
Pixels Per Unit Multiplier	<p>A multiplier that's applied to the Pixels Per Unit parameter of the selected sprite. Default value is 1 which means that sprite's original Pixels Per Unit is used without modifications. This parameter behaves the same way as the corresponding property of the standard Unity Image which lets you achieve the same look as when a standard Image component is used a mask Source.</p>

Limitations

- Only textures and sprites can be used as a mask. Currently, Soft Mask doesn't support masking by Text or any other Graphic components except Image and Raw Image.
- Soft Mask doesn't support nested masks. To work around this limitation, use a standard Mask or Rect Mask 2D in combination with a Soft Mask. See [Nested Masks](#) section for more information.
- Sprites that are packed in *Tight Packing Mode* aren't supported as a mask. Disable packing for the mask sprite or use *Rectangle Packing Mode*.
- Sprites with an alpha split texture aren't supported as a mask. Disable compression for the mask texture or use another compression type.
- Soft Mask is intended to work with Unity UI and doesn't support any other 2D or 3D graphics "out of the box".

Performance

- Soft Mask uses 3 global shader keywords, while Unity 2018 provides 256. Before using Soft Mask, make sure that you have enough free slots in the project. For details about Shader Keywords, see [Multiple Program Variants](#) section in the Unity Documentation.
- Support of Soft Mask adds to a shader from 7 to 10 constants and 1 sampler, depending on Soft Mask settings.
- All child elements of a Soft Mask are rendered using the special shader. This shader is more complex and a bit slower than the standard shader. Execution speed of the shader depends mostly on the *Border Mode* value. The fastest mode is Simple. It's recommended to use Soft Mask only when the capabilities of standard Mask are insufficient for your task.

Compatibility

Soft Mask 1.7.0 is compatible with Unity versions 2020.1 – 2022.2.

Soft Mask doesn't contain any platform-specific code and should work on all the platforms supported by Unity.

Support and feedback

If you need support for this product or wish to provide feedback or suggestions, feel free to email me at knvazev751@gmail.com or post on [the forum thread](#).