



# NEXT-GEN SOFT-SHADOWS

For Unity built-in lights.

**NGSS** features a ground-breaking combination of kernel filters mainly based on Monte Carlo. The result is a high quality smothered dynamic penumbra shadows with superior banding and aliasing removal, making extremely tiny shadowmaps look outstanding. NGSS also uses least amount of sampling to filter out shadows while skipping fully lit or fully shadowed areas making it the fastest solution on the market for realistic penumbra shadows.

**Key features:** A PCSS filter (Area-like soft-shadows) and a PCF filter (uniform soft-shadows). A powerful denoiser that skyrockets the base filters, acting as a separable filter and features screen space infinite Frustum Shadows with bilateral filtering and edge tolerance. And finally an optional Normal Inset Bias library that improves shadow bias values by extruding mesh along normals. NGSS works on any platform where Unity support real-time shadows with at least SM3.0 for PCF and SM3.5 or better for PCSS. **Does not work well with DX9/GLES 2.**

## **Automatic setup of NGSS shadows libraries:**

**Note:** If you are running cloud builds jump directly to section **Cloud Builds Library Integration**

**1** - Open the NGSS install wizard at the top menu "**Tools - Psychose Interactive - NGSS Libraries Setup (Built-in Renderer)**".

This tool will install all required internal libraries for all lights types and backups Unity original files in case you want to revert to original files using the same tool.

**2** - For spot or point shadows click on "**Install NGSS Spot/Point Libraries**". For directional shadows click on "**Install NGSS Directional Libraries**". Optionally you can install the **Shadows Bias Library** which help fight shadows artifacts such as acne and panning. The tool also logs confirmation messages in the text box area such as warnings and errors.

**3** - Add one instance of **NGSS\_Directional** component to your directional light and one of **NGSS\_Local** to any of your Local lights. You can now restart the Editor.

**4** - To uninstall **NGSS** libraries, repeat steps **1 - 2** and click on "**Uninstall**" buttons. This is the same step you must follow when you update new versions of NGSS (Uninstall and Install).

**Note:** If automatic setup fails for some reason, then follow the Manual steps below.

## **Manual setup of NGSS shadows libraries:**

**1** – Open Unity and add NGSS components to your scene lights. Local lights only one instance of **NGSS\_Local** component in the scene and directional light requires one instance of **NGSS\_Directional** component. Both are located in "**Assets/Psychose Interactive/NGSS/Scripts**".

**2** - Go to the directory where you Installed Unity and open the **Data\CGIncludes** folder. On Windows can found at "**C:\Program Files\Unity\Editor\Data\CGIncludes**". On Mac: "**/Applications/Unity/Unity.app/Contents/CGIncludes**".

**3** - Rename the files **AutoLight.cginc**, **UnityDeferredLibrary.cginc** and **UnityShadowLibrary.cginc** (add them a ".bak" extension). It will allow you to revert to default Unity shadows in the future.

**4** – Copy **AutoLight.cginc**, **UnityDeferredLibrary.cginc** and **UnityShadowLibrary.cginc** from your project "**Assets/Psychose Interactive/NGSS/Libraries**" folder into the **Data\CGIncludes** folder. Optionally you can also copy the **UnityStandardShadow.cginc** too. This library helps fights shadows artifacts by extruding meshes along normals.

**5** - Close the Editor and delete the **ShaderCache** folder (located in your project **Library** folder). This forces Unity to re-compile internal shaders/libraries. You can open Unity now.

**Note:** To uninstall **NGSS Shadows libraries**, revert to the original Unity libraries you backed up in step 3 and delete your project **ShaderCache** before restarting the editor. This is the same step you must follow in order to update to future 2.x versions.

## Cloud Builds Library Integration:

If you are running cloud builds and you don't have access to the **Unity Editor/Data/GCIncludes** folder, you can always include the library directly on your shaders.

**#include "AutoLight.cginc"** should become:

**#include "Assets/Psychose Interactive/NGSS/Libraries/AutoLight.cginc"**

**#include "UnityDeferredLibrary.cginc"** should become:

**#include "Assets/Psychose Interactive/NGSS/Libraries/UnityDeferredLibrary.cginc"**

**#include "UnityShadowLibrary.cginc"** should become:

**#include "Assets/Psychose Interactive/NGSS/Libraries/UnityShadowLibrary.cginc"**

**#include "UnityStandardShadow.cginc"** should become:

**#include "Assets/Psychose Interactive/NGSS/Libraries/UnityStandardShadow.cginc"**

Once you've added these lines to your shaders, right click and re-import your shader.

## Shadows components:

**Directional Shadows:** Directional shadows properties are tweaked within **NGSS\_Directional** component. They are self documented (hover your mouse over any property to display popups info). You should not have more than one instance of this class.

**Local Shadows:** Spot and Point shadows properties are tweaked within **NGSS\_Local** component. They are self documented (hover your mouse over any property to display popups info). You should not have more than one instance of this class. Only your main local light should contain an instance of **NGSS\_Local** component. To tweak shadows type and shadows softness of any additional local light you can do it by tweaking the Shadows Strength and Shadows Type directly in the Light component.

**Frustum Shadows:** Add **NGSS\_FrustumShadows.cs** to your **Main Camera** to enable infinite screen space shadows. Frustum Shadows properties are tweaked within that component. You should not have more than one instance of this class.

**Shadows Bias library:** To tweak the new bias value, use the public property **NGSS\_NORMAL\_BIAS** value on **NGSS\_Local** component. For directional light, is the normal bias property on the Light component. This bias works in tandem with the base constant bias. Normally you want to reduce constant bias as much as possible and tweak normal bias to your needs.

## **Custom frameworks integration (Built-in Renderer):**

If you are using a special shader effect or rendering framework (such as Lux, HxVolumetric, Aura, pre-integrated skin shader, uber, etc) that relies on shadows opacity (internally mapped to the first component of **\_LightShadowData**), you need to add one NGSS shader compile define. Otherwise your effect opacity might behave wrongly when you tweak shadows opacity. Search anywhere for **\_LightShadowData** and add this before accessing to the first component of **LightShadowData**:

```
#if defined(NGSS_GLOBAL_OPACITY_DEFINED)

    _LightShadowData.r = NGSS_GLOBAL_OPACITY;
#endif
```

Notice that we are only looking to change the first component of **\_LightShadowData** (.r or .x).

The **NGSS\_GLOBAL\_OPACITY\_DEFINED** will ensure that nothing in your shaders will break if you delete NGSS shadow libraries or if you update/install Unity.

## **Custom Framework modded libraries :**

We provide various library mods that works out of the box with NGSS. Grab them inside **"Psychose Interactive/NGSS/Libraries"**

For Uber replace the two provided files (**UBER\_AutoLightMOD.cginc** and

**UBER\_UnityDeferredLibrary.cginc**) in your **Assets/UBER/Shaders/Include/** folder.

Before replacing the files make a backup, add BAK or something on both original UBER files, just in case we never know.

Once you replace the files you have to right click the entire UBER folder and select re-import, so the new changes are re-compiled.

If you already installed NGSS libraries then you are good to go, if you didn't, do the NGSS install procedure and you will be ready to go.

Repeat the same procedure for any other library framework if you use them.

## **Useful Tips and Tweaks:**

If your target platform is Desktop or high-end Consoles, try to enable 32 bit depth buffer in Graphics Menu, this provide better shadows precision. Available only in Unity 2017 and up.

If you are targeting Mobile or low end devices, don't go crazy with the maximum quality. Start at the lowest quality possible the maximum recommended is ~8-16 samplers.

Always test your shadows in your in-game, not on empty scenes. NGSS shadows looks spectacular on high frequency details of your scene. You would be surprised how little amount of samplers NGSS need!

Try enabling shadows dithering and see how it looks. Dithering is highly recommended when doing less than 32 samplers.

Disabling Cascaded Shadows (through project Graphics Menu) will give you around 30-40% speed on low-end devices in Forward rendering as the shadows are sampled directly into the shader (Requires NGSS Directional libraries to be installed). This action will also disable the Denoiser automatically which is only recommended on Desktop with modern GPUs.

We always recommend **StableFit** projection over **CloseFit** as the later has projection problems and produces large shadows artifacts due to the shadows pancake algorithms.

You don't need to install all shadows libraries, install only what you need (either Local or Directional libraries) but if quality is what you are looking for, it's recommended to install them all.

All local lights (Spot & Point) don't need the NGSS\_Local component, only the main one which acts as the Manager requires it. You can still switch between PCF/PCSS filter and shadows softness using the Unity Light properties "Shadows Strength and Shadows Type".

**OpenGLCore** 4.1 (or older) the support is limited to PCF for Local Lights and you can't install both Local and Directional libraries, only one should be installed or Local Shadows won't show.

## **Support and contact:**

For any question, issue, bug, custom inquiry, custom framework or renderer integration please contact us with your invoice number (if first time reaching support):

**Email support:** [support@psychozinteractive.com](mailto:support@psychozinteractive.com)

**Discord live support:** <https://discord.gg/AXJGzsm>

**Unity Forum support:** <https://forum.unity.com/threads/next-gen-soft-shadows-2-sophisticated-dynamic-penumbra-shadows-for-unity.440088/>