# Dynamically Lit Objects

Checked with version: 2017.3 - Difficulty: Intermediate

Dealing with dynamically lit objects, especially large objects require more tricks than their static counterparts. Objects that are non statically lit in many cases are expected to change position, hence the need for dynamic lighting information. Dynamic objects have to work with these limitations in mind when predetermined lighting calculations aren't an option. Here are some things to consider to improve the quality of dynamic object lighting:

- **Light Probe Proxy Volume (LPPV).** Surfaces of dynamic objects that aren't lit by dynamic lighting typically use Light Probe data to fill in their lighting information (In a Scene where probe is not present Environment Lighting is used). Depending on lighting strategy used in the setup of the Scene, this can range from indirect lighting information down to shadowing and baked diffused probe lighting information. This Light Probe strategy usually works fine for small dynamic objects, however larger objects require a finer granularity of Light Probe lighting. This is where Light Probe Proxy Volumes comes in. Check Unity manual for LPPV guide. Using Light Probe Proxy Volumes allow a large dynamically lit object to use more than a single Light Probe resulting in higher lighting accuracy.


The example above showcases how the capsule with LPPV demonstrate higher accuracy of Light Probe sampling despite only using 2x2x2 Volume grid.

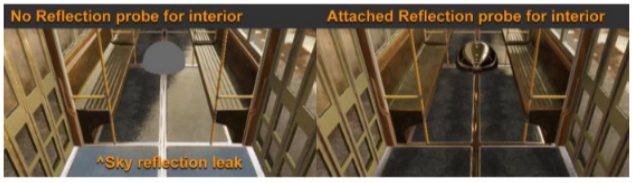
- **Per object baked Ambient Occlusion Map (AO)** Dynamic objects only receive lighting from Light probes or ambient lights. There's a need to precalculate an occlusion for the object, especially if the object involves a concave interior such as the tram in the example.


On the example above the tram on the left without AO applied Light Probe lighting data without knowing how to differentiate the interior and the exterior surfaces. With the prebaked AO, this map serves as a guide to reduce the intensity of light and reflection from the exterior, giving a much more grounded look.

Per object Ambient Occlusion offline baking can even give further detailed occlusion by baking from higher detailed mesh to lower detailed mesh similar to how Normal map baking works.

NOTE: Per object AO doesn't interact with other Dynamic object, for example if a dynamic object such as character entering the tram, it will be receiving Light Probe data from the scene and doesn't necessarily match the occlusion of the tram interior.

- **Local Reflection.** Most dynamic objects don't warrant their own reflection, however for objects that involve concave interiors, attaching a reflection probe to the object and allowing it to run in realtime can help reduce false reflection hits coming from the environment reflection probe.




Exaggerated material to showcase reflection issues.

- **Fake Shadows or occlusion based on assumptions.** If certain assumptions can be made for an object, there are tricks that can be used to improve visual quality. In this sample shown below, the tram is expected to be always on rail and in order to help its ground light occlusion in shaded area, a simple multiply transparent material plane is placed.


Similar tricks usually used in other games where under a character there's a blob shadow projector instead of the character casting real shadows. In real time rendering, if you can find a tricks that works and are cheap in performance usually it can be used as a viable solution.

There are certainly more tips and tricks that can be done for improving visual rendering. The above list should give content creators confidence in thinking of solutions for different kinds of visual target requirements.