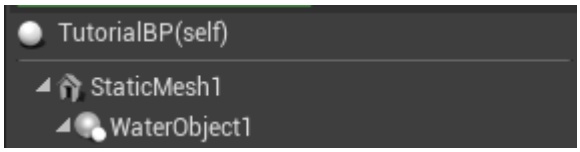
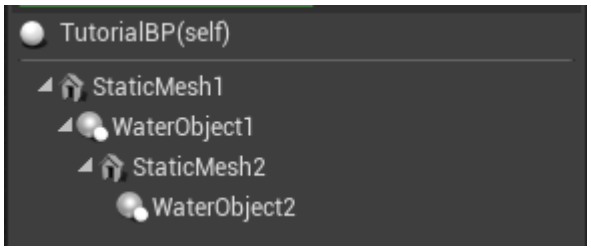
`WaterObject` is the main `SceneComponent` of the Dynamic Water Physics 2 for Unreal Engine. It handles all the aspects of simulating the interaction of the object with water.

Hierarchy

`WaterObject` needs to be attached as a child of `UStaticMeshComponent`. This is because the mesh data is used for simulation. Below are a few examples of blueprint hierarchies that can be used:

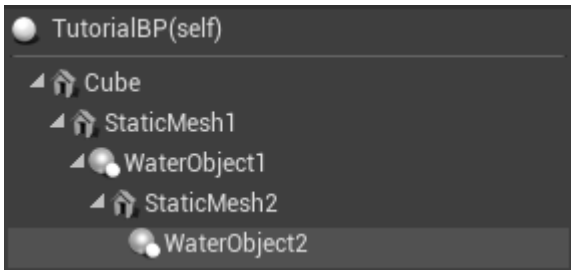


Simplest possible setup. *WaterObject1* is using *StaticMesh1* to retrieve mesh data and is also applying forces to *StaticMesh1*.



Nested setup. *WaterObject1* is using *StaticMesh1* to retrieve mesh data and *WaterObject2* is using *StaticMesh2* to retrieve mesh data, while both *WaterObject*s are appying forces to *StaticMesh1*.

`WaterObject` always retrieves mesh data from the first parent `UStaticMeshComponent`. However, the resulting forces are applied to the first `UPrimitiveComponent` in the hierarchy with *Simulate Physics* enabled that the script comes across, iterating from itself towards the scene root. An example of this:



Cube in this image has *Physics Enabled* set to `False` which means that both `WaterObjects` will be applying forces to the first parent `UPrimitiveComponent` which has it enabled - in this case *StaticMesh1*.

Mesh Data

`WaterObject` uses mesh data (vertices and triangles) to calculate the correct physics forces. This means that the performance of the `WaterObject` is directly proportional, O(n), to the number of triangles present on the mesh. Most LOD0 meshes have an unnecessarily high number of triangles for this use so using LODs is recommended.
There are two settings:

- `Mesh LOD` - defaults to -1 which tells the script to use the highest available LOD (lowest detail).
- `Mesh Section` - defaults to 0 and tells the script which mesh section to use.

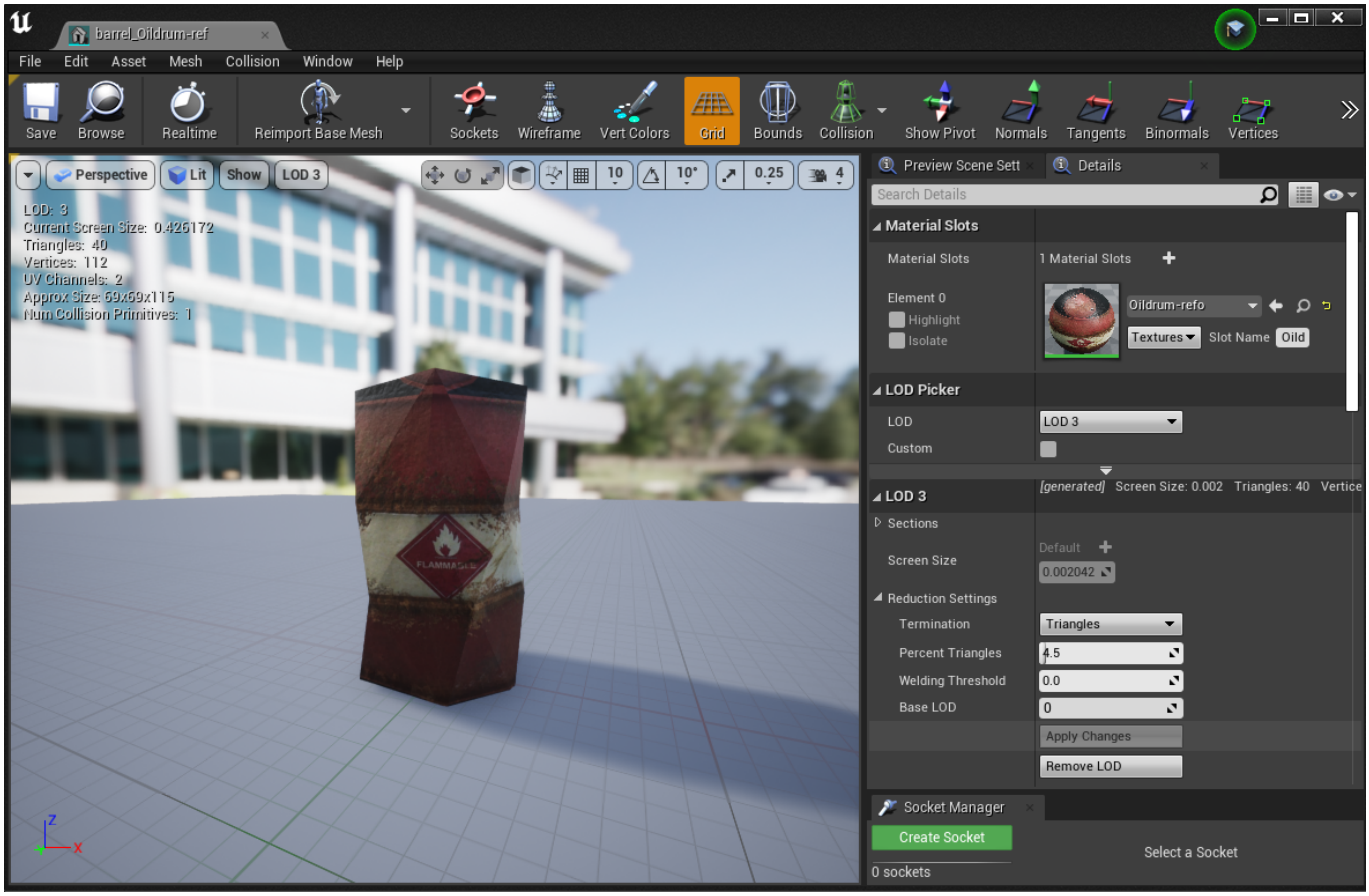
Generally adequate triangle count for different shapes:

- **Cube** - 12 triangles.
- **Sphere** - 12-24 triangles
- **Concave Shapes** - ~32 triangles.
- **Ship Hull** - ~64 triangles but can range from 32 to 128 depending on size and required detail.

For most shapes around 16-32 triangles is adequate and as long as the mesh roughly represents the object shape increasing the number of triangles will not improve the quality of the simulation.

Setting up LODs

LODs in Unreal can be edited by double-clicking the mesh in the *Content Browser* and selecting the LOD through the *LOD Picker* (*Details* sidebar):



Mesh editor with the preview for LOD 3 enabled for the *Barrel* prop mesh from the demo scene.

To adjust the number of triangles on the LOD adjust the *Percent Triangles* slider until the wanted triangle count is achieved. By default with the `Mesh LOD` of `WaterObject` set to -1 the highest LOD will be used, which in this case is LOD 3.

Water Data

By default `WaterObject` uses `Default Water Height`, `Default Water Normal` and `Default Water Flow`. These three settings can be adequate if the water is flat and uniform across the scene. However, if using a non-flat water `WaterObject` needs to *know* where the water is. This is done

through `WaterData` components. The base class is `UWaterDataBase` which can then be overridden to implement support for different water systems, such as the included `UWaterDataUnrealWater`.

- **UWaterDataBase** - supports single flat water surface with an option to assign a *Water Height Reference Actor* which will then be used as the water height reference.
  - Excellent performance since the water level is the same across the world.
- **UWaterDataUnrealWater** - adds support Unreal Water plugin (Unreal 4.26+).
  - Water height, normals and flow querying is supported.
  - Higher CPU overhead from using the flat water.
  - On small props and other non-essential items `WaterObject` ⇒ `Query Single Point` can be used to maximize performance.

Step-by-step Setup Guide

A quick step-by-step guide for setting up the barrel from the demo:

Basic Setup

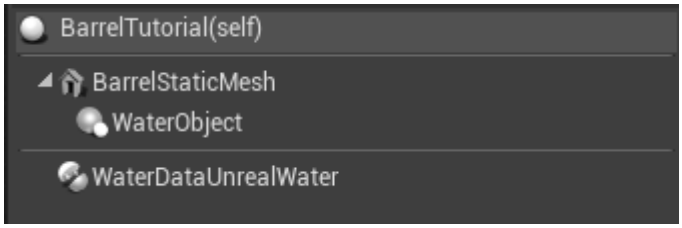
1. Right click in the *Content Browser* ⇒ *Blueprint Class* to create a new empty blueprint.
2. *Add Component* ⇒ *Static Mesh*.
3. Drag the newly created *StaticMesh* over the current scene root to make it a new root and rename it to *BarrelStaticMesh*.
4. Select the *BarrelStaticMesh* and asign the `Static Mesh` under the *Details* panel to `barrel_Oildrum-ref`.
5. Tick *Simulate Physics* field under the same *Details* panel.
6. *Add Component* ⇒ *WaterObject* and rename it to *BarrelWaterObject*.
7. Place the blueprint into the scene and press *Play*. The barrel will now float at world position of Z = 0.

Adjusting LODs

1. Double click on the `Static Mesh` to open the mesh editor.
2. Under *Details* ⇒ *LOD Picker* select lowest lod. By default this is LOD 3.
3. Adjust the *Percent Triangles* until the mesh has lowest number of triangles while still keeping its general shape.

Adding WaterData

1. Click on `Add Component` and then on `Water Data Base` or `Water Data Unreal Water`, depending on the water used.
2. **If using Unreal Water there is a known issue as of Unreal 4.27 where the BuoyancyManager will not register the object as in water if it starts partially or fully submerged, which means that the object needs to be above the water at the start.**



End result of the setup guide.