

# TerrainSlicer

Version 1.3

2021-12-13

## Introduction

Standard Unity terrain system does not provide any functions to split and optimize terrain created once with multiple layers in order to achieve a realistic view.

**Note:** slicing functionality is *independent of the rendering pipeline* (HDRP, URP or Standard/BuiltIn). Default demo scene is implemented for Standard Renderer.

There is a demo scene for Universal Render Pipeline located in

`DemoSceneURP.unitypackage`. In order to use it for an URP project, it must be imported to the project.

All of the slicing/optimization functions are available via the "Window/Terrain Slicer" menu.

## Main goal

Add ability to slice terrains and reduce layers by percent of their usage.

## Motivation

Why do I need this tool?

- increase performance on some "hard-to-render" scene places
- extract part(s) of terrain to another scene(s)
- allow for level designer to free painting with all possible layers but provide ability to cut-off mostly unused layers finally to match Unity 4/8 layers recommendations
- setup terrain params separately w/o need to re-create whole terrain again by connected parts
- allow to copy terrains with complete separations of layers, trees, details etc

- allow to copy set of trees/details from one terrain to another
- leave only painted trees and details in final revision of terrain, reducing original, probably large tree/details palette

Example: you have large terrain with some bumpy areas and others are flat. In such case you can split terrain and use different Pixel Error value (put it to maximum value for flat areas and some small value for detailed terrain). From the other side, you can decrease Base Map distance param for higher height varied areas (because of lower visible distance).

## Package contents

Package contains mainly the following scripts: `TerrainSlicerController`, `TerrainLayerUsageOperations`, `TreeDetailsCopyComponent`. Other scripts are utility code to work with terrain.

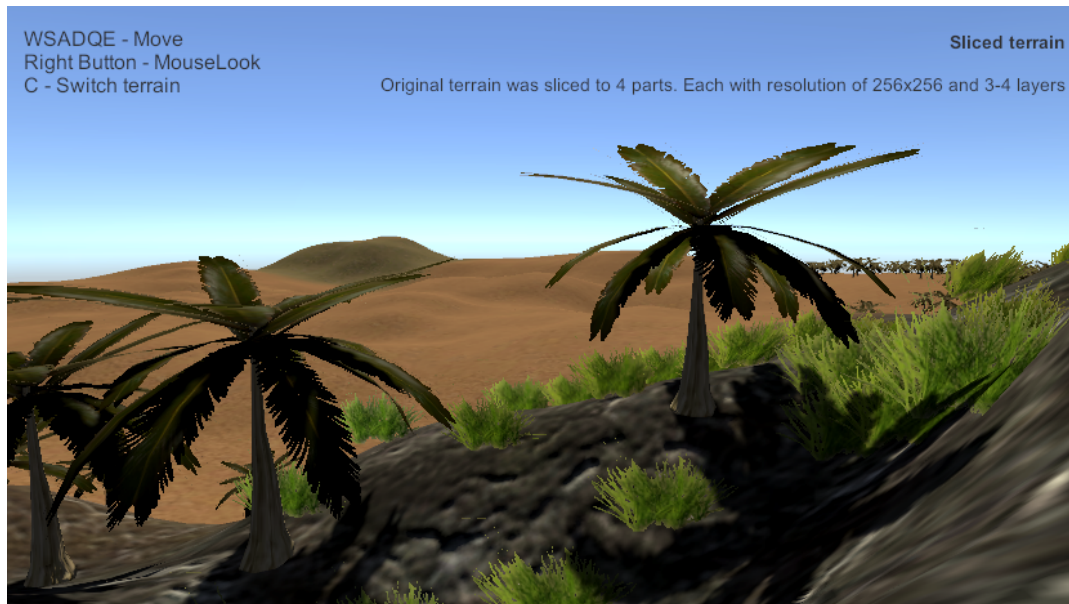
There is a demo scene located in

`TerrainSlicer/Scenes/DemoScene/DemoScene.unity`.

It contains source terrain and several updated variants: with manually optimized layers, auto optimized and both splitted and optimized variants.

Scene is playable, in play mode keys WSADQE are for move, Right Mouse button is for mouse look and C is to switch between terrain variants.

**Note:** Default demo scene is for Standard Renderer. URP adoption is located in separated `DemoSceneURP.unitypackage`.



And as a bonus :)

- small pack of non-standard terrain layers
- palm tree
- several grass billboards

Scripts are decorating existing selected terrain and provide extra editors in Inspector. They can be attached to terrain via the menu "Window / Terrain Slicer".

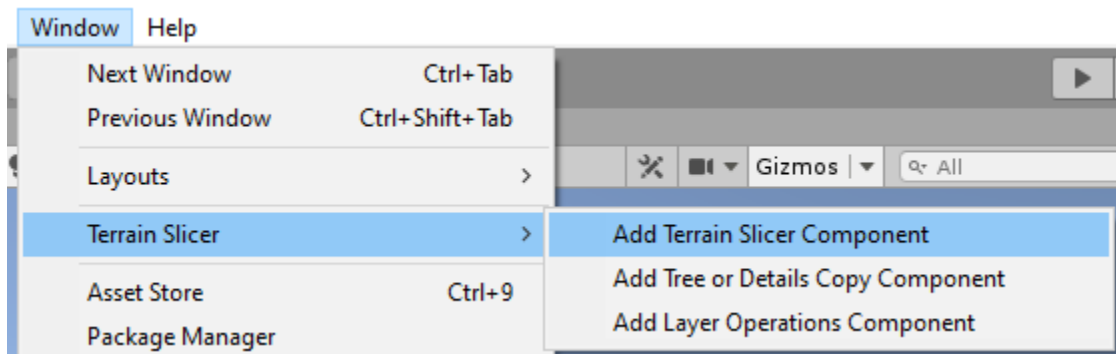
`TerrainSlicerController` - script to slice existing terrain by pointed target resolution. I.e. if the original terrain has heightmap resolution of 512x512 elements, slicing with target resolution 256x256 will produce four connected terrains. Bonuses are options to skip trees/details and reduce layers by percent of their usage or by maximum available layers (i.e. 4 or 8).

`TreeDetailsCopyComponent` - script to copy trees and/or details palette from any other terrain. Can be useful for scenes with multiple terrains to use single set of trees and details on all of the terrains.

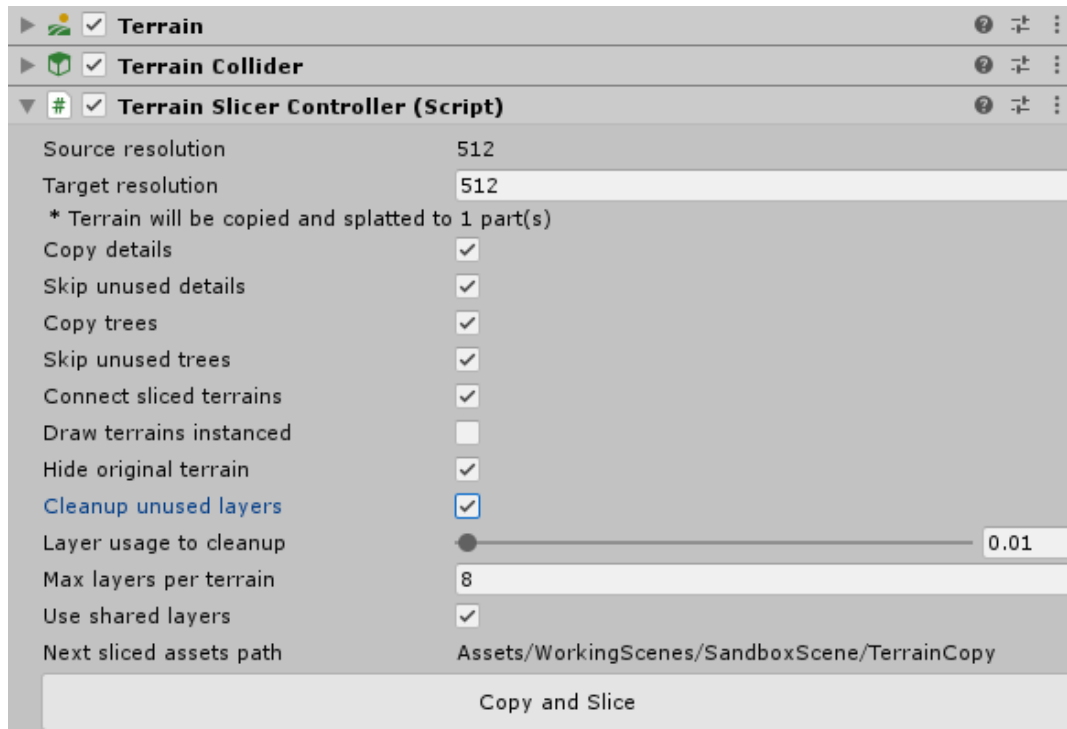
`TerrainLayerUsageOperations` - script which shows all terrain layers and their usage (in percent) on terrain. The script provide the following functions:

- Completely delete any layer, other layers will be “pulled” to cover whole terrain by the proportional percent level.
- Replace any layer with another one - in this case the original layer will be deleted and all of it's occupation will be covered by the target layer (with the same alpha in splatmap).
- Swap layers - just swap layer with another chosen layer.
- Provide ability to copy source terrain prior to any operations.

Any of the scripts can be attached to Terrain object from “Window” menu



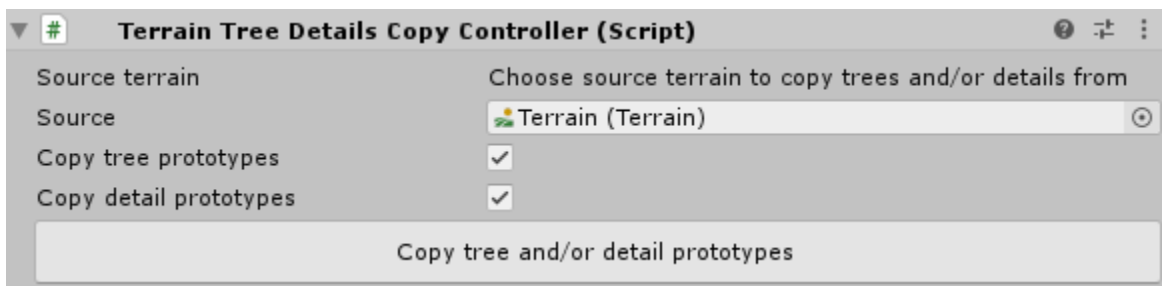
TerrainSlicerController params can be as following



- Copy details - whether or not copy terrain details (grass or mesh details)
- Skip unused details - skip not painted details
- Copy trees - to copy trees
- Skip unused trees - skip not painted trees
- Connect sliced terrains - mark all generated terrains as "Connected". Must be checked to avoid glitches on terrains edges because of different LODs
- Draw terrains instanced - set for all generated terrain, not so useful if all of generated terrains will contain different layers set
- Hide original terrain - disable source terrain, leave only copy(-ies)
- Cleanup unused layers - to remove layers which usage is less than given percent or which are exceeded layers limit. Both fields (percentage and layer limit) appeared below right after enabling this option
  - Layer usage to cleanup - threshold to remove layers which have usage (summary alpha in splatmap) lower than pointed value
  - Max layers per terrain - maximum allowed layers for each produced terrain. Layers are sorted by their usage and all above the limit are removed

- Use shared layers - whether or not all sliced parts will contain separate layers or only their instances will be used for repeated usage on different parts. Shared layers are useful for performance and to control them through every generated terrain (i.e. change of tiling on one terrain will change it on all). Separate layers can be useful to bring more different details to different terrain parts
- Next sliced assets path - path where new terrain data (splatmap and layers) will be saved. Current terrain will always be left unchanged in order you need to restore it
- Copy and Slice - performs slicing or optimization operation

TerrainTreeDetailsCopyController params can be as following



- Source - source terrain to copy trees and details prototypes
- Copy tree prototypes - whether or not to copy tree prototypes
- Copy detail prototypes - whether or not to copy detail prototypes

*Note: prototypes are copied, not referenced (or not instanced). It means You can change trees or grass params on current terrain w/o affecting original terrain.*

TerrainLayerUsageOperations params can be as following






Terrain Layer Usage Operations (Script)

Please Copy terrain prior to any modification! Scene will contain old one disabled and new one active and ready for modifications.

Copy terrain (Resources and GameObject)

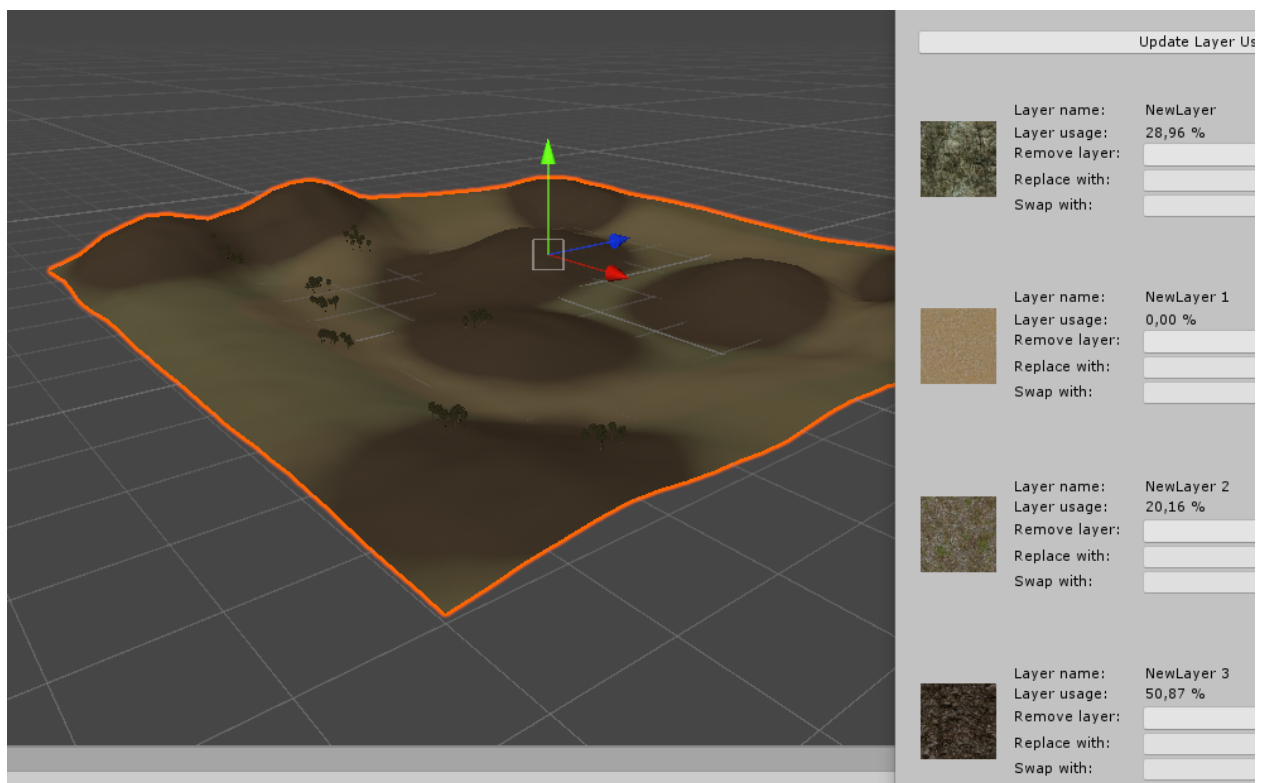
Layer usage can be non actual after any painting operations

Update Layer Usage Info

	Layer name: DirtLayer Layer usage: 34,43 % Remove layer: <div>Remove</div> Replace with: <div></div> Swap with: <div></div>
	Layer name: GrassLayer1 Layer usage: 0,00 % Remove layer: <div>Remove</div> Replace with: <div></div> Swap with: <div></div>
	Layer name: GrassLayer2 Layer usage: 6,74 % Remove layer: <div>Remove</div> Replace with: <div></div> Swap with: <div></div>
	Layer name: GrassLayer3 Layer usage: 0,00 % Remove layer: <div>Remove</div> Replace with: <div></div> Swap with: <div></div>
	Layer name: RockLayer4 Layer usage: 6,26 %

- Copy terrain - will copy terrain to new game object. All copied assets will be stored to path, calculated by the same way as for `TerrainSlicerController` "Next sliced assets path"
- Update layer usage info - will recalculate all layer usages. Must be clicked initially after add the script and after any terrain repaint
- Each cell contains: layer diffuse texture, layer name, usage (*calculated as sum of all alpha values of this layer in splatmap divided by overall sum of all layers*), controls to remove, replace and swap the layer. Operations were described above.

## Demo screenshots

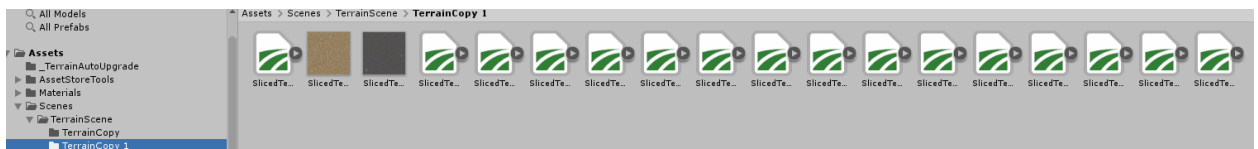


*Unused layers detection*





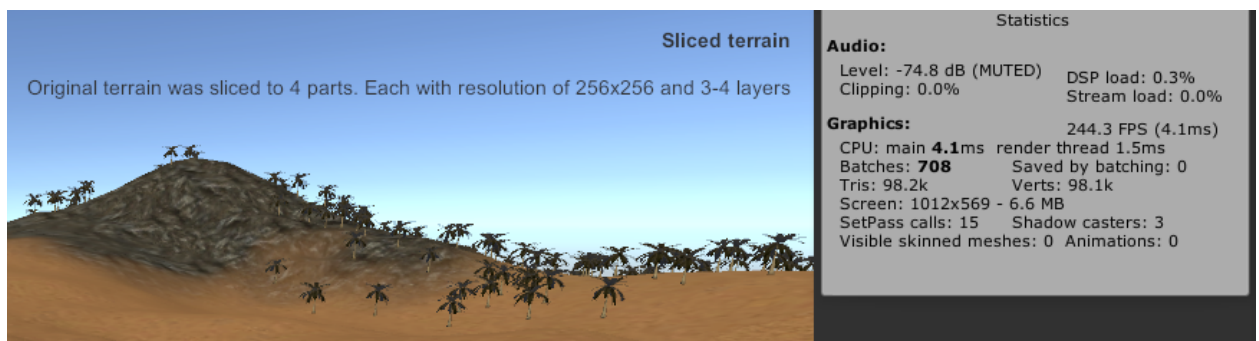
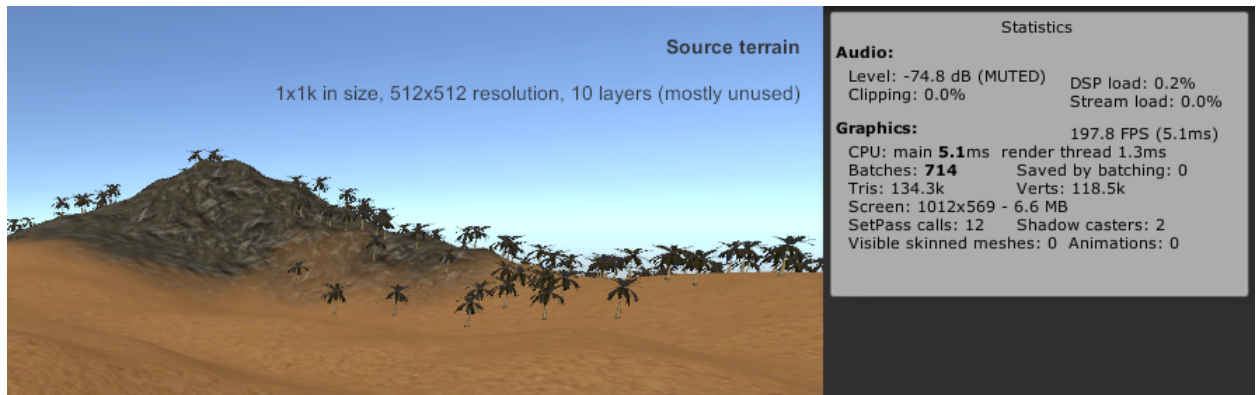
*Update tiling for layer for copied terrain*



*Assets generated by slicer*



*Sliced terrain with optimized layers*



*Compare performance between source terrain and sliced terrain with increased pixel error only for one sliced part*

## Version history

### 2021-12-13 version 1.3

Added default demo scene for Standard renderer

Added DemoSceneURP.unitypackage with scene adopted for URP

### 2020-11-29 version 1.2

Added skip unused trees and details during copy

Added TerrainTreeDetailsCopyController to copy tree/detail prototypes between terrains

### 2020-10-14 version 1.1

Original version with Slicer and LayerOptimization components

