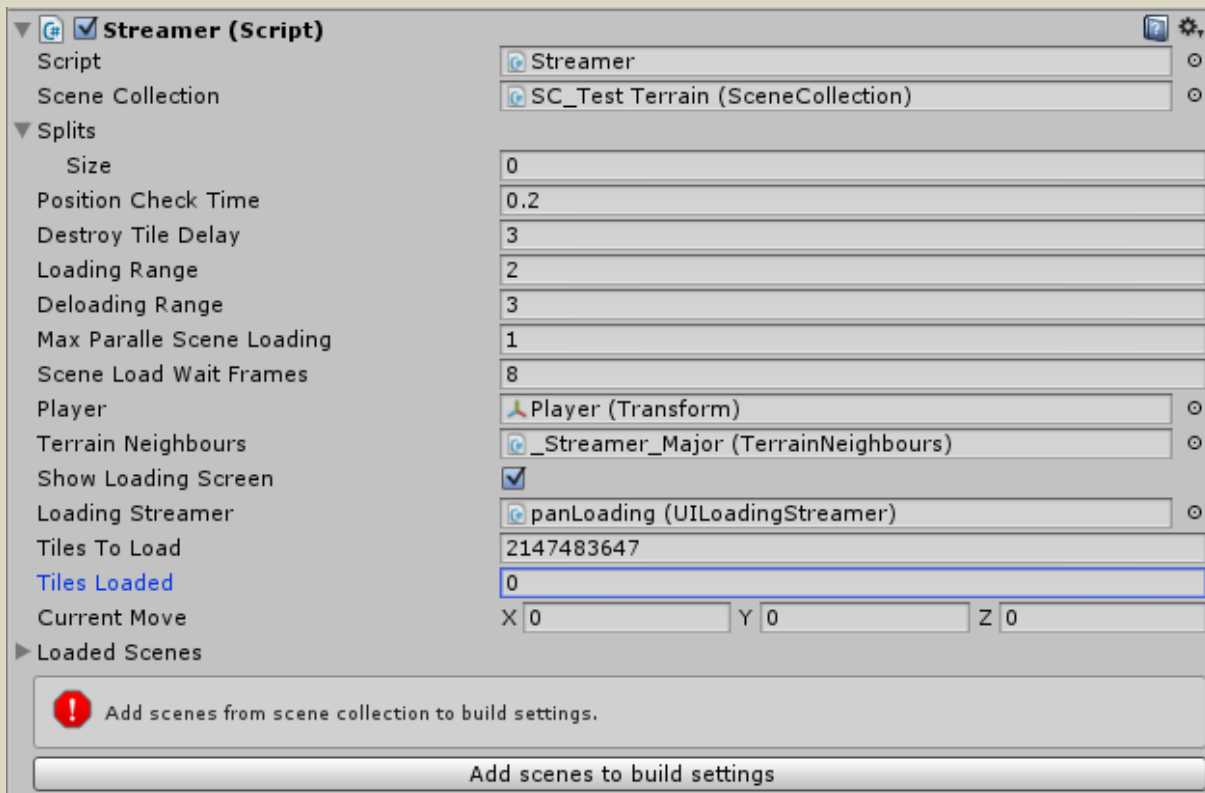


WORLD STREAMER MANUAL

1. Fast test - 2 streamers at one scene

- You must have **SceneStreamer tag** in your project.
- Open scene "Tutorial World Streamer - Game" or "Tutorial World Streamer - Game Float Fix or World Streamer - Game Float Fix Looped "
- Scene objects named: `_Streamer_Major` and `_Streamer_Minor` must have SceneStreamer tag.
- Click on Streamer Major in hierarchy and click Add Scenes to build settings (if you don't have them). You have to do the same with streamer Minor.



- Click play and it works.

2.Idea and project structure.

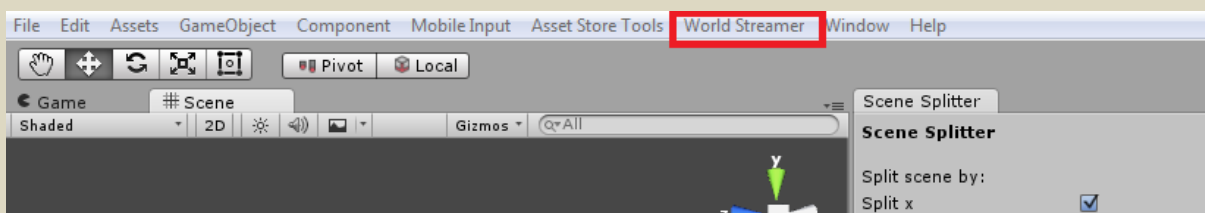
- You must have **SceneStreamer tag** in your project.
- "Work" scenes where you hold all models that will be streamed from disc. If you have unity 5.3, this scene will be used only one time because whole work could be continued on split scenes. Of course you could recreate it again from split scenes by Local Scene Updater Tool.
- **Empty saved scene** to work on Local Scene Updater Tool. If you don't have unity 5.3, you don't need it.
- "Game" scenes where you hold player, cameras and light, streamers objects
- World is streamed in sectors which are represented by `SCENE_XYZ` objects. Each object type could have its own size and range of loaded sectors. An example - terrain is streamed in 2000x2000 sectors with range 1, models in

200x200 with range 9 . This will give you opportunity to load small packages without performance drop. Sectors/Layers which contain terrains should have the same XZ size in unity units as the terrain parts.

- "Game" scene after launch will stream world asynchronously in accordance with chosen division of space : 1d,2d,3d , vertically, horizontally.
- In our scripts we attached functions useful to activate teleport and loading screen.

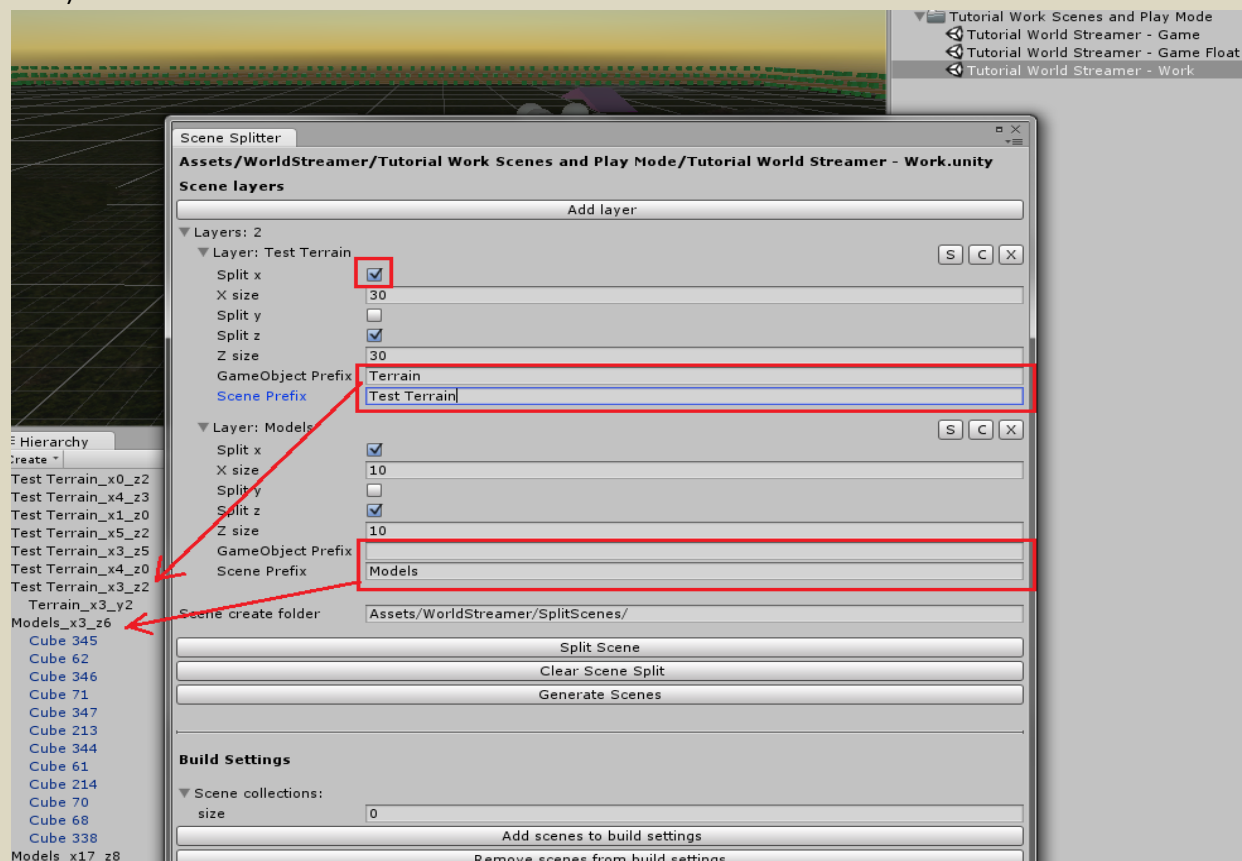
3.Stream your world step by step.

- Create "Work" scene where you will put your models and terrains which you want to stream.
- Copy your models and terrains to this scene.
- Open window "Scene Splitter" at World Streamer =>Scene Splitter



-Add streaming layer by using button "Add layer" Layers give you ability to separate terrain and models with one click. It's recommended to stream terrain and models separately. You could also separate stream process for far and close details. For example 1st layer for far view, 2nd for close details, 3rd for terrain. You could load far view objects in far distance and small details in close distance if they are necessary. In that way of thinking you will reduce cpu, gpu, number of objects and memory usage at your app.

- Check boxes with axes that represent space in which you want to stream world. Set X,Y,Z sector size (in unity units).

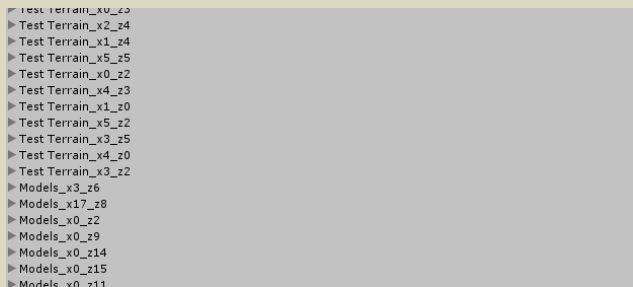


- Find your objects: Fill your "Game Object Prefix" which will allow you to segregate objects into sectors. If you don't use any, script will segregate all objects in the scene. This is some kind of filter for system to find objects that will be streamed. If object is disabled it will not attach it to any sector - useful to hide for example "work player/light/camera" in sorting process. **If you want to use multiple layers and non-prefix option** - layer without prefix must be the bottom one in your layer list, like in tutorial screen.

- Segregate your objects into catalogues: Fill your "Scene Prefix" which will allow you to search from hierarchy objects that will become streamed scenes. Splitter will sort objects by XYZ position (**object or parent pivot if it have parent!**) into new objects that contain "Scene Prefix" and sector names - "XYZ matrix"

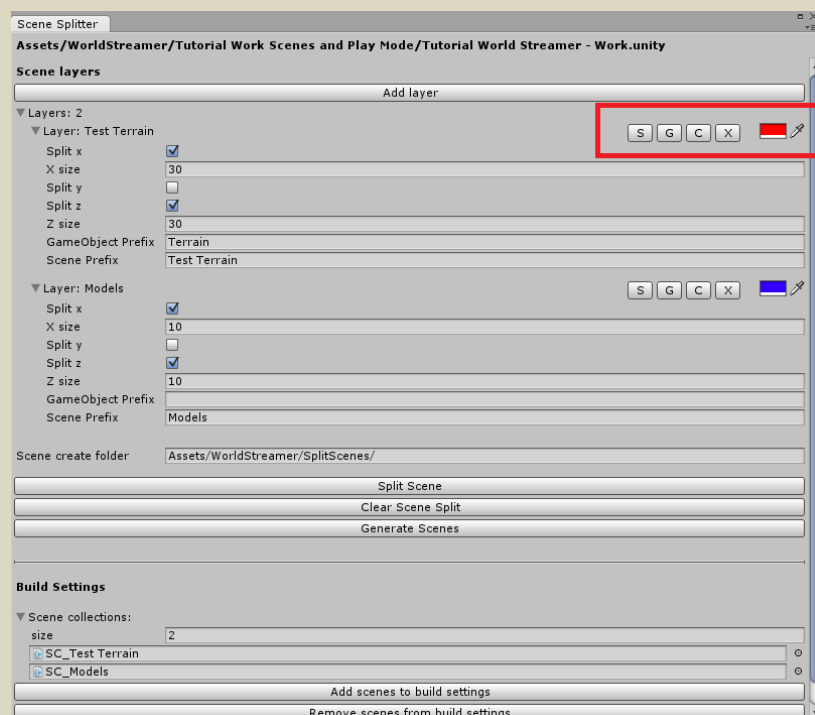
- Disc directory for streamed scenes: Fill your "Scene Create Folder" to set path for new scene objects at your project.

- Press Split Scene button to sort prefabs and terrains in chosen interval. In this structure your world is ordered and ready for stream! After click scene split, system will save your sector options at the scene in "_SceneSplitterSettings", object in your scene hierarchy. Streamer will create scenes only from objects in hierarchy that contain exactly this prefix that you type in scene splitter window. You will get this situation:

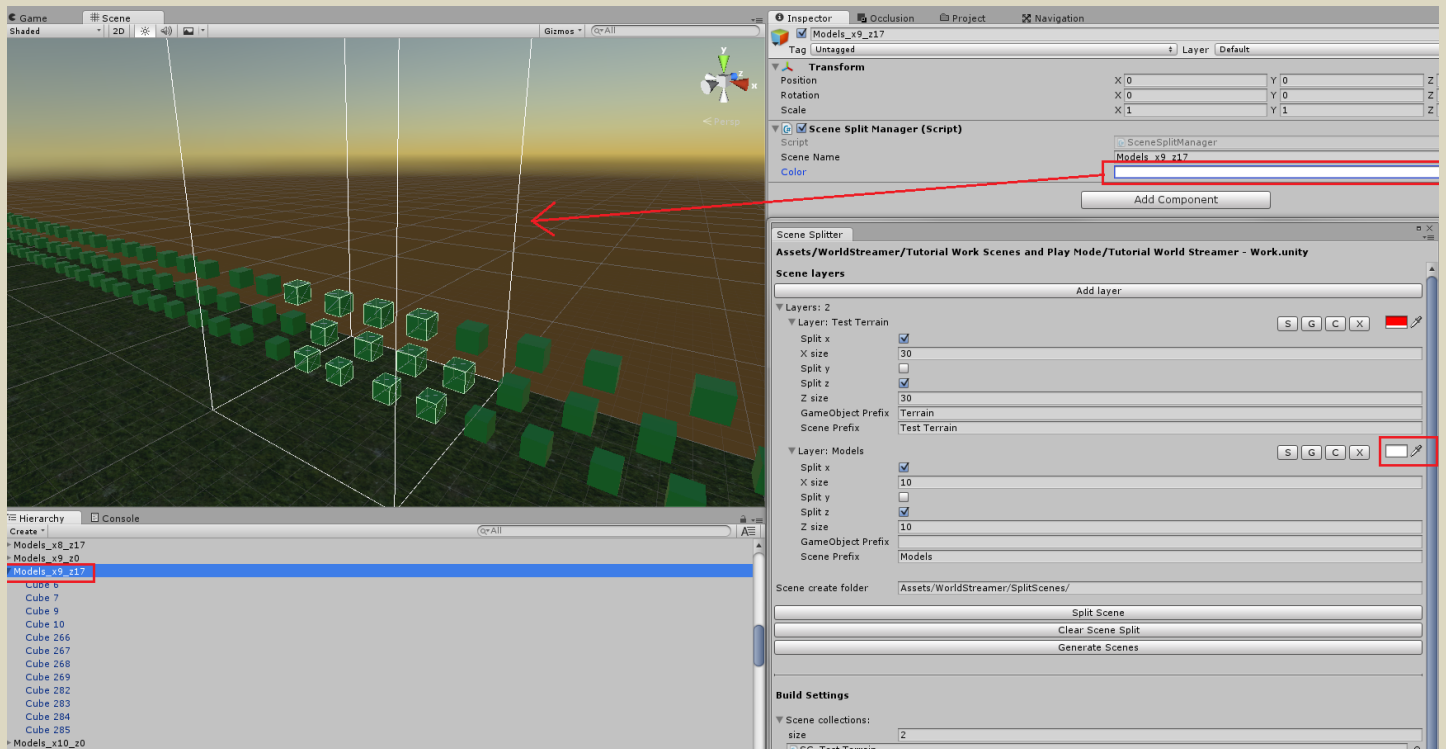


- When you push "Generate Scenes" button, system will create scenes that will be streamed during your game process. All scenes will be saved in scenes folder. It will be named: Sc_"Scene Prefix". If you have multiple streamers/layers system will build scenes for each "Scene Prefix".

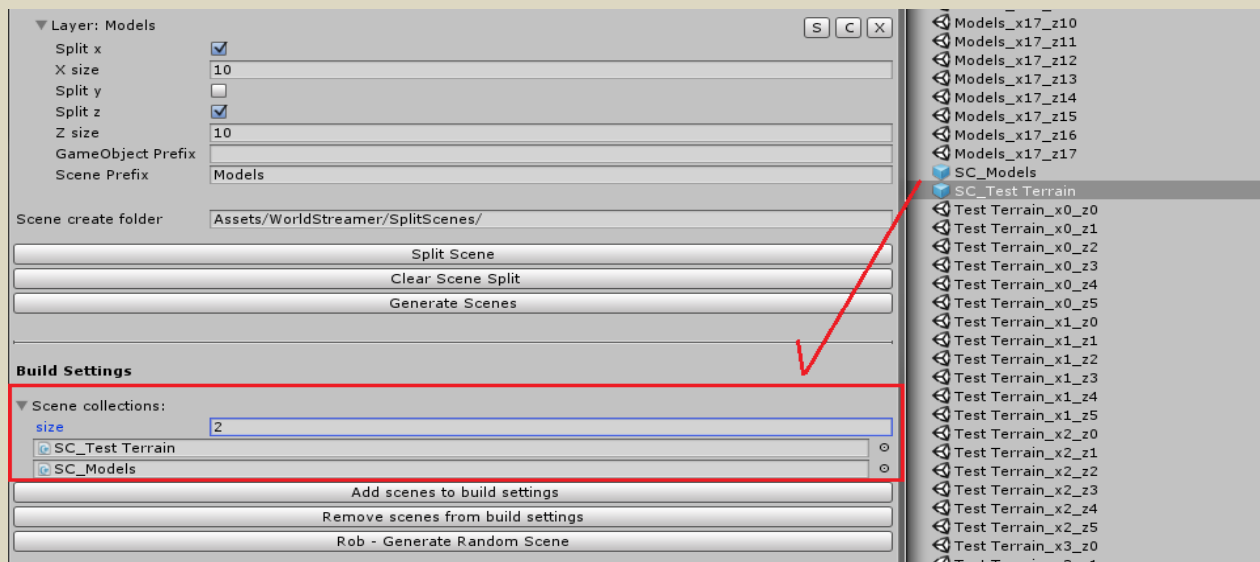
- You could also split (S), undo splitting (C), generate scenes (G), or remove layer (X) separately for each layer by using this buttons:



- Colour box is a colour of gizmo. That will help you to see, size of sector are after split. You simply need to split scene and click on sector at hierarchy.



- In Scene Splitter you have to drag and drop your "prefab Scene Collection" to Scene Collection window. This will allow you to fill build settings with your scenes. **It must be done before streaming.** You could also add these scenes in streamer script - later. If you have more than one streamer at scene you have to drag and drop both of them.

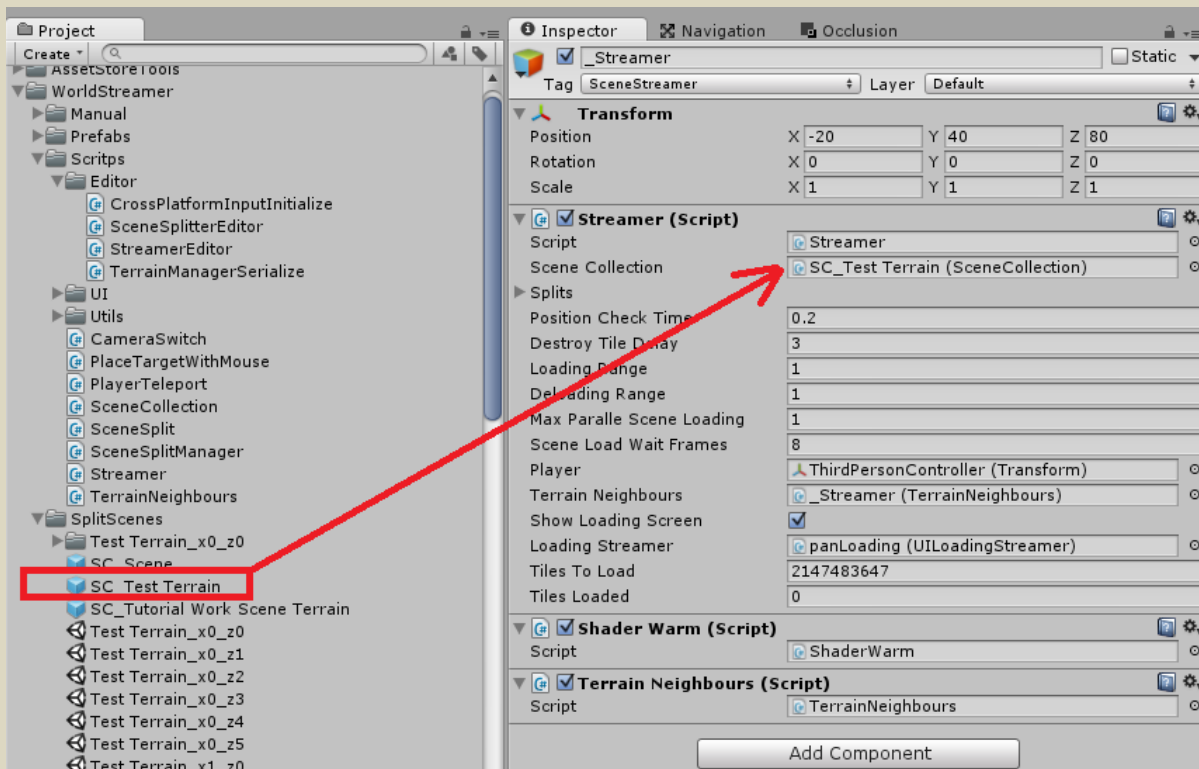


- Click "Add scenes to build settings" button to automatically add your scenes to build settings - They must be checked in build settings if you want to stream them during game otherwise unity will not be able to load them.

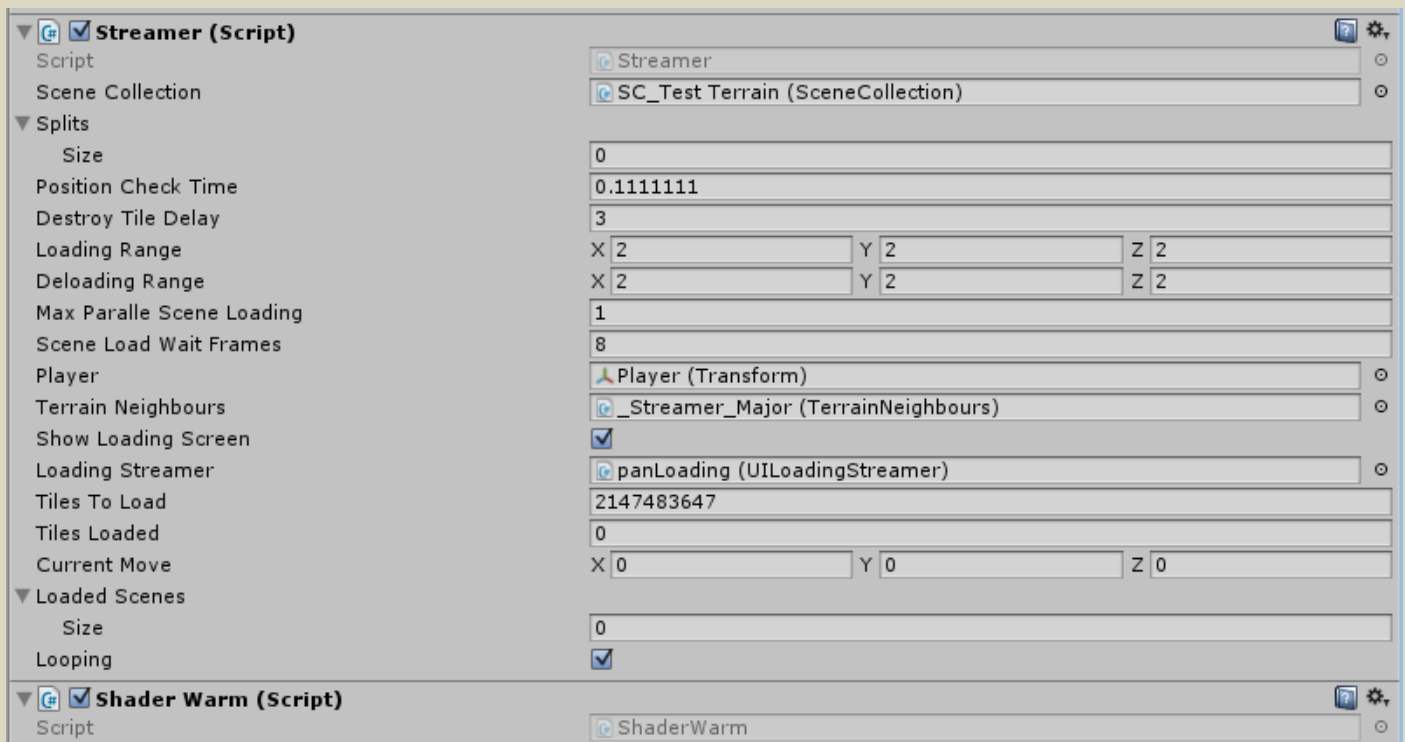
- Create scene with your player, camera and controller.

- Add "streamer" script to any object that is not destroyable during game. Set tag SceneStreamer on it. If you want multiple streamers create 2 or more and call them "_Streamer_Major" and "_Streamer_Minors_n" where "n" is number of minors. For example: _Streamer_Major, _Streamer_Minor_1, _Streamer_Minor_2 etc. We advise you to use Major streamer for terrains and Minors for models.

- Add scene collection object SC_"Scene Prefix" to your all world streamers scripts and fill in options.



4. Streamer options.

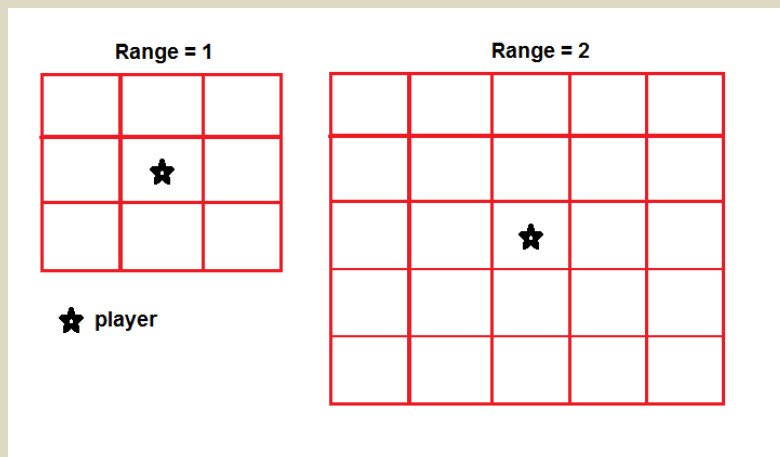


- "Position check" value, in seconds, is useful to change position refreshing time. Streamer is loading/unloading your assets/world depending on your position in XYZ world.

- "Destroy tile delay" value, in seconds, is useful to precise time, after which your sector will be unloaded from RAM memory, when sector will leave "Loading range". This value is useful when player is moving along the border

of sectors or the player often moves between sectors. This will help you to avoid numerous load/unload actions in short time.

- "Loading range" is an integer value that precise sector radius that you want hold at RAM memory at once. "1" - 9 sectors, "2" - 25 sectors, "3" - 49 sectors etc. Loading range could be different for every axis in your world. **If world is looped deloading range must be shorter than half your world in sectors - 1 sector.**



- "Deloading range" is an integer value that precise sector radius outside which function will unload sector/scene. Remember ! Sector will be unloaded after time that you set in "destroy tile delay". Loading range could be different for every axis in your world. **If world is looped deloading range must be shorter than half your world in sectors - 1 sector.**

- "Max Parallel Scene Loading" is an integer value that give you opportunity to decide how many sectors you want to stream at once. This option is useful to optimize streaming. Low value will cause longer loading but you won't get any performance drop. As starting value you should use 1 sector.

- "Scene Load Wait Frames" is value in frames useful to set delay value in loading sector after sector. It's highly recommended to set some empty frames during streaming process, this will save the pipeline.

- "Player" is place where you put object that represent player position for stream system.

- "Terrain Neighbours" is place where you put object which contains "Terrain Neighbours" script. This will allow you to synchronize LOD between Neighbour terrains.

- "Show Loading screens" is useful to show loading screen when you start game or teleport your player

- "Loading streamer" -> Here you put your canvas with loading screen. (GUI). Teleport and loading screen GUI structure is available at "StreamTest" scene. If you have multiple streamers and you want to wait until all sectors are loaded you have to put both streamers in "UI Loading Streamer Script" in "panLoading" object. Also both of them should have checked boxed "Show Loading Screen" in streamer scripts.

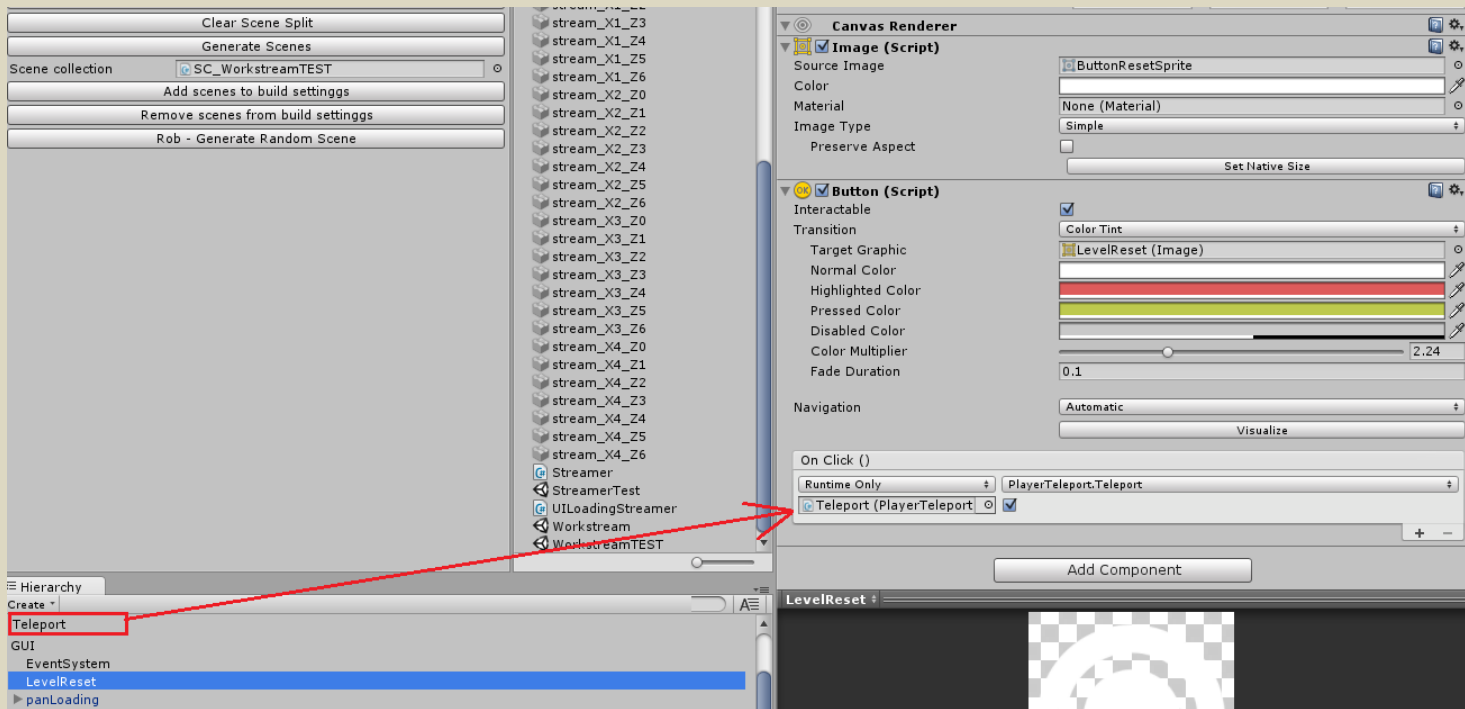
- "Current Move" is value in unity units that are used for float point fix system. It holds your real position without resetting to 0. If you add your player position and current move position in efect you will get your real position without position resetting system. **It's usefull for multiplayer games** to correct client server position messages (RPC).

- "Looping" is an bool value that will make your world looped. You only could use it, when you use float point fix system. Looping it's automatic, it loops your world after last (the highest or lowest) x,y or z sector in streamer. It could be also used for repetitive objects like asteroids in the space games. Main streamer could be not looped but you could use minor streamer to loop some models.

- Teleport is an optional option which is described further in this tutorial.

5.BRAVO Simply click play and stream your world!

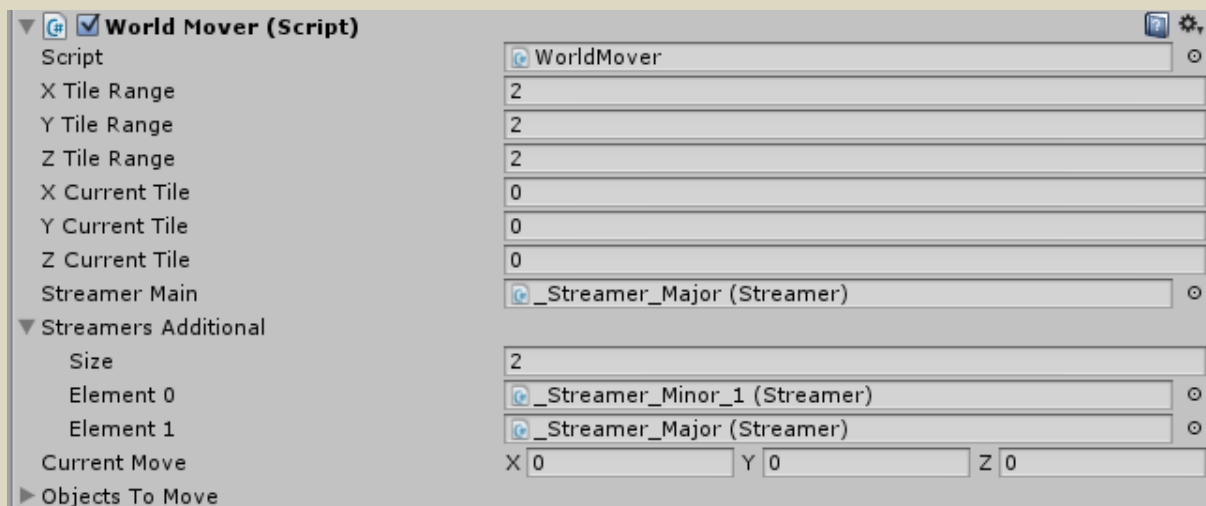
6.Teleport.



- Add "Player teleport" script to object which represents target position and rotation after teleport.
- Fill in "player teleport script" --> "Streamers" window with objects that contains "streamer " script at scene. If you have more than one you have to put there all of them.
- Fill in "player teleport script" -->" Player" window with object that contains player position
- Add "button" script to your canvas
- In button script chose option "Runtime Only", and fill it with teleport object. Set: PlayerTeleport ->Teleport (bool) function. Remember to check the box!

7.Float fix option.

- Create _World_Mover empty object. Add World mover script.

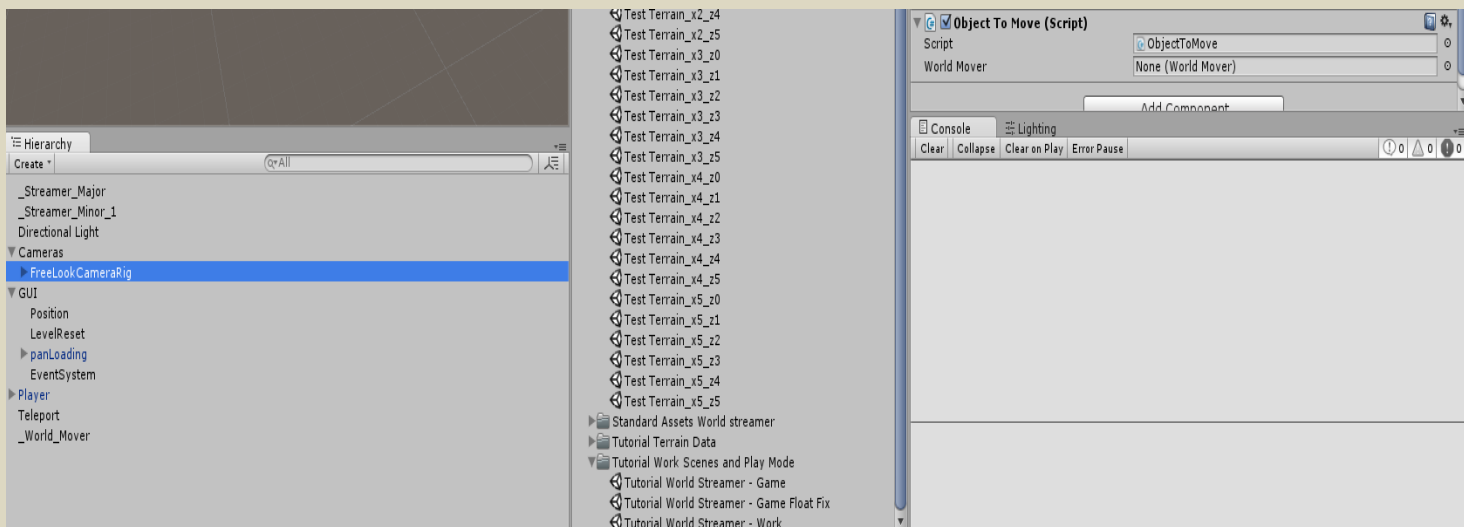


-Drag and drop Major world streamer object or simply world streamer if you have only one

- Fill Streamers Additional if you have any minors

- "XYZ Tile Range" Set amount of sectors after which system will reset your coordinates. For example if tile range is "2" and major streamer has got sector size 200x200 units, streamer will set 0,0,0 position to your object/player after 2 sectors - which will be 400 units.

- Add "Object to move" script to each object that is not connected with player and you want to use float fix for it. This objects will get the same position in reference to player after coordinates reset. Fill "Object to Move" with "World_Mover" object. For example If your camera is not connected with player, put this script there. If you forget about this, player will jump in position and camera will stay or it will get strange behavior. Make the same operation to object that you want to move with player.



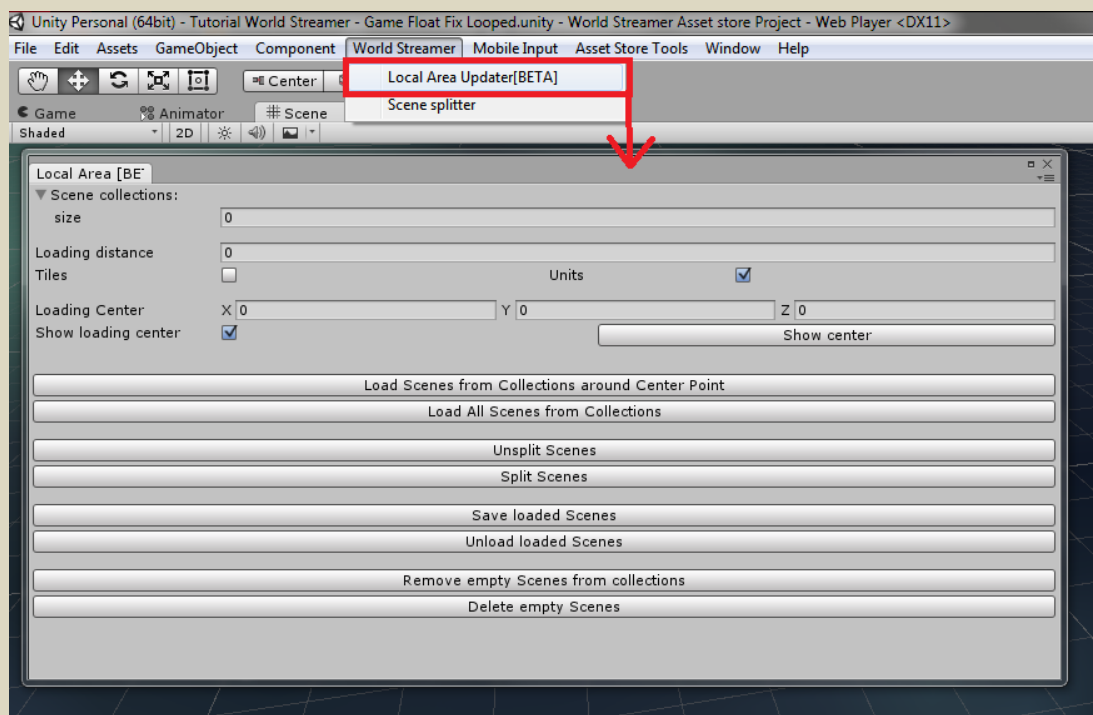
- Fill Teleport object that contains "Player Teleport script" with _World_Mover object.

- REMEMBER while you using floating point fix system you could not use unity static batching in your models (but you could use it on terrains), because system will not be able to move them. Anyway you could batch models your own, by custom tool from asset store. You will reduce draw calls even more!

8. Local area updater tool [requires unity 5.3]

If you have split world on older world streamer version you have to resplit it and regenerate scenes before use that tool. This will very fast now

Using that tool you are able to work on split scenes, actualize them, adding new without opening "big world" scene. Local area updater tool, will load your split scenes from one or multiple scene collections. You can change them, add new models, move them. After "split" and "save loaded scenes" Local Area updater tool will refresh all modified scenes in your project, or add new if that is necessary. At scene with your streamer, you simply need to add new scenes to build settings, by clicking add to build settings message/button at your streamer scripts and it's done. This is big step for huge worlds, or huge teams. Devs could work on different part of world or his layers at the same time, also you don't have to load whole world in editor to work on it!



Local Area Updater tool options:

- **Please use it on empty saved scene if you don't want to add unnecessary objects to the scenes.**
- Scene collections is a place where you can add your multiple or one scene collection. From this "scene collections", system will load split scenes for you.
- Loading distance is a range of loaded world. It could be in sectors or unity units (checkbox below). When unity units option is checked, units will be recalculated into sectors. Unity units are useful when sectors in many layers have different size for example terrains and models.
- "Loading center" is the XYZ position in around which models will be loaded in range that you specified above. Soon we will add editor camera following streaming.
- "Load scenes from collections around Center point" will load your scenes, from chosen collections. **Remember about their correct order in multiple layers, because if you use empty prefix, it will resplit your models to wrong scenes!** Empty prefix should be last on the list.
- "Load all scenes from collections" will load all scenes that are connected to this scene collections.
- "Unsplit scenes" it's useful when you want to create your big scene from splitted scenes. You simply need to load all scenes from collections than click "unsplit" them and you have your big scene with all models in one place again.
- "Split scenes" it will put new added or moved models to correct scenes.
- "Save loaded scenes" will create new or actualize old scenes with changes that you made at this area. It will **show you bugged unity window, simply click ok or enter**. This window contain list of scenes that you updated. If list is to big unity window is bugged, we have no access to it, to fix that.
- "Unload loaded scenes" will remove your local area and you will back to clean scene.
- "Remove empty scenes from collections" by this button you could remove empty scenes from scene collections. This will avoid empty scene loading during gameplay.
- "Delete empty scenes" will delete empty scenes from your project, sometimes it's useful to hold them, for example if you will put new models in the area, system will not have to create new scene for this again.

- So normal workflow is:

- * load models in specific area by "Load scenes from collections around Center point"
- * put your models , move them, change etc
- * split scenes
- * save loaded scenes
- * That is all what you have to do to actualize your world now :)

9. TIPS and additional info about unity.

- Option "Rob - Generate Random Scene" at Scene Splitter is useful to test and see how it really works. It generates random scene, that you can split and stream before you will start with scenes at your project.
- You can check performance only in development build with auto-connect profiler option. **Access to memory in unity editor is very slow** and generates many CPU spikes that will not show up at game build.
- Terrain LOD is automatically synchronized if there is a terrain neighbour script at your not destroyable object in scene. If you use floating point system connect it with world mover.
- If you want to remove whole memory from textures at your games, use amplify or other texture streaming system. This will allow you to use unlimited resolution of textures without memory grow. Streamer will work extremely faster because it will load only colliders and meshes and terrains. Textures will be streamed from block by other system.
- REMEMBER to check your static objects as static ! It will reduce cpu use during scene streaming process. If you use floating point system fix you have to batch/bake them using custom tool.
- REMEMBER to check "Prebake Collision Meshes" box at player settings, to stream colliders much faster! This option will make your game build time much longer! Best option is to use it at final builds.
- We advise you to check "optimize mesh data" box in player settings, this will reduce game build size and stream time but it will extremely lengthen the build time! So check it only on final build or when you have too much time.
- Shader.set.Parser spike during your streaming : If you don't have speedtree objects at game starting location you have to put empty boxes with empty speedtree shaders: bark, leaves, billboard. Normally unity should initialize these shaders if they are added to "GraphicsSettings" in "Always Included Shaders" but this is a temporary unity bug. There also could be problems with other specific shaders at unity!
- Culling per patch spike on CPU while terrain loading. You probably have too much trees and grass at your loaded scene. You could fix that if you change detail resolution per patch to lower. When unity load terrain it refresh all trees and grass objects at existing loaded scenes too. It's stupid but haven't been fixed yet by unity. You could also reduce it, by hiding terrains that are not in your view. Simply turn them off or disable draw on terrain details and trees.
- Every error or warning at your scenes will slow down stream system. Remember to clean your scenes from bugs and mistakes

- Use as simple colliders for your objects as possible! If colliders are baked (player settings) they are loading much much faster.

- **If your scene is too heavy** cut it into smaller parts and load bigger range. You will load many small parts and this way guarantee better performance. Good way is also to load terrain separately by second world streamer script. Terrain will be loaded in different frames than rest of the models. **The clue is do not load everything at once!**

- We advise you to use <https://www.assetstore.unity3d.com/en/#!/content/14656> to control memory usage. It's cool asset.

10. World Streamer change set

version 1.1 changes:

- When you rebuild scenes, world streamer don't miss Scene collection prefab anymore
- When you type wrong GameObject Prefix in Scene Splitter you will get info: No object to split.
- When you made mistake with "Scene create folder" you will get info, about that the folder don't exist, crash problem have been removed.
- Scene collection object now have name from scene objects "Scene Prefix".
- During scenes generating, when scene prefix typed wrong you will get an info - No objects to build scenes.

version 1.2 changes:

- Float point fix
- Multiple streamers support
- Reduced memory usage during scenes creating process
- Improve scenes creating speed

version 1.3 changes:

- Improve scenes creating speed
- Multiple sorting process for few layers at once
- Multiple steamers - automatic scene creating for multiple layers and streamers
- Cancel creating scene process
- Warning if you forgot about: streamer tag or deloading range is shorter than loading, thx for feedback!
- Save options for sorting process
- Streaming layers manager in scene splitter
- Documentation update
- Index out of range fix, it could show in very specific situations
- Manual update with more tips and details, thx for feedback!

version 1.4 changes:

- Automatic resizing looped world system,
- Different stream range in selected axis
- Gizmos with information about future sectors
- Scrollbar in scene splitter window
- Webplayer support
- Generate scenes for separated layer - "G" button
- Compatibility with terrain stitcher and multiple terrain brush

version 1.5 changes:

- Scene creating is 20 times faster it requires unity 5.3
- Added new loading/deloading it requires unity 5.3
- Local area updater tool [beta] it requires unity 5.3

- Additional support for huge teams that work on one world
- Additional support for huge world

Big thanks for feedback! We are always open, we would love to help you to make cool games!