Breakable Objects System
User Manual

WSM GAME STUDIO

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2018

SUMMARY

Intro

Thank you for purchasing “Breakable Objects System”!

Breakable Objects System consist in generic C# scripts that allows you to easily create any breakable object, provided you have the unbroken and broken pieces models of the object.

The package includes a ready to use breakable crate prefab sample

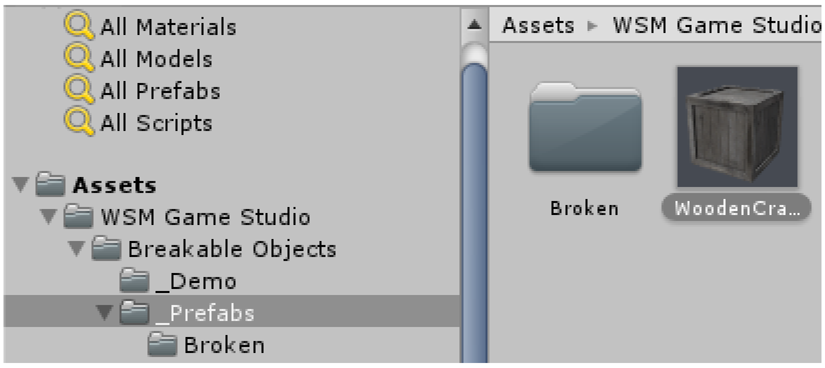
It’s really simple to use and customize the breaking process.

Follow this tutorial or watch it on youtube if you like:

Youtube Tutorial

How to Use This Asset

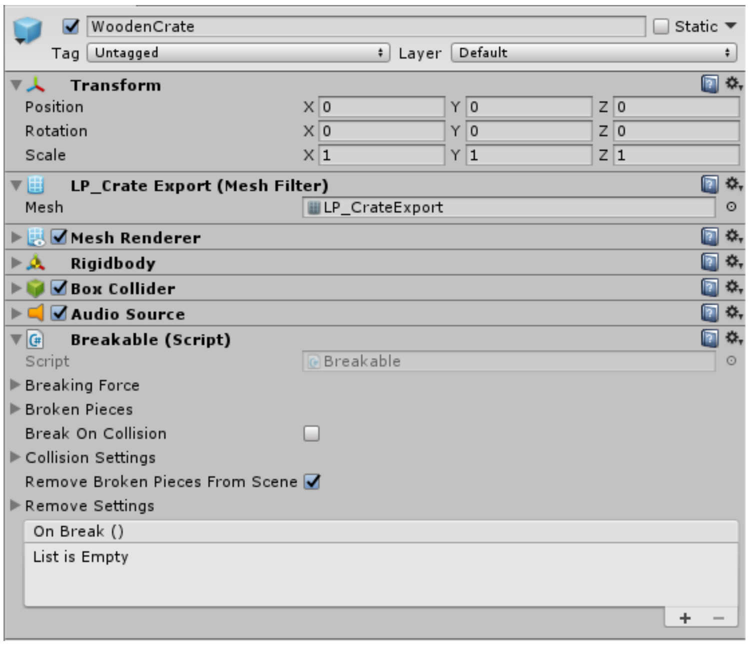
In this section you will learn how to handle the breakable object prefab. All the samples are based on the breakable crate prefab included in the package (WoodenCrate).



Breakable Object Prefab

A breakable object is composed by four basic components

- Rigidbody (Unity Physics)
- Collider (You can use any type of 3D collider)
- Audio Source (For optional breaking SFX)
- Breakable Script



```
WoodenCrate                                   Static
Tag  Untagged                     Layer  Default
Transform
  Position    X 0    Y 0    Z 0
  Rotation    X 0    Y 0    Z 0
  Scale       X 1    Y 1    Z 1
LP_Crate Export (Mesh Filter)
  Mesh        LP_CrateExport
Mesh Renderer
Rigidbody
Box Collider
Audio Source
Breakable (Script)
  Script      Breakable
  Breaking Force
  Broken Pieces
  Break On Collision                 ☐
  Collision Settings
  Remove Broken Pieces From Scene    ✓
  Remove Settings
  On Break ()
  List is Empty
```

The Breakable script allows you to:

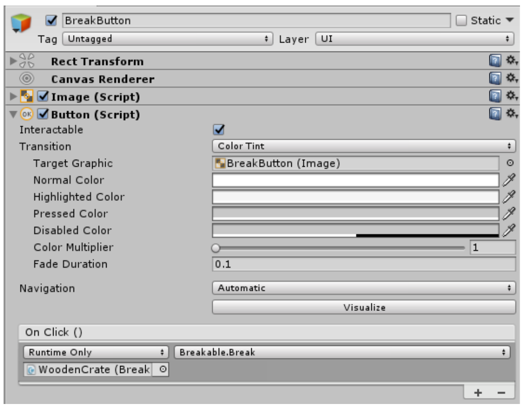
- Select the Breaking method (Method Call or Collision)
- Customize the Breaking Process
- Handle the Broken Pieces Behaviour
- Invoke Custom Events

Selecting the Breaking Method

There are two different breaking methods

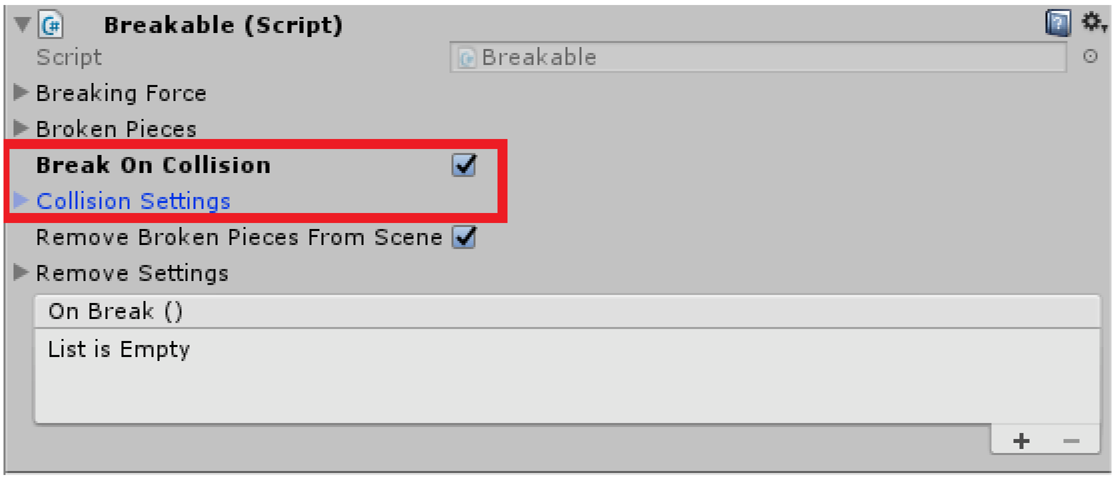
- Break by Method Call
- Break by Collision

By default, the object can be broken by calling the Breakable Script "Break()" method.
For example, check the "BreakButton" on the "BreakMethodCall" demo scene. As can be seen in the image below, the "Break()" event is called on the "BreakButton" OnClick event.



```
BreakButton                                   Static
Tag  Untagged                     Layer  UI
Rect Transform
Canvas Renderer
Image (Script)
Button (Script)
  Interactable        ✓
  Transition          Color Tint
    Target Graphic    BreakButton (Image)
    Normal Color
    Highlighted Color
    Pressed Color
    Disabled Color
    Color Multiplier  1
    Fade Duration     0.1
  Navigation          Automatic
                      Visualize
  On Click ()
  Runtime Only        Breakable.Break
  WoodenCrate (Break
```

To enable collision break, simple check the “Break On Collision” option on the Breakable script and expand the “Collision Settings” for configuration.

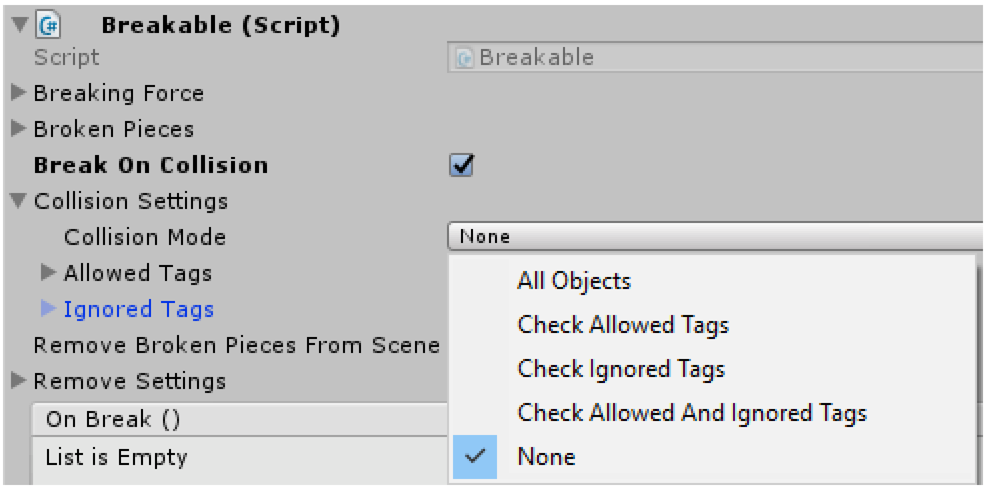

Breakable (Script)
Script: Breakable
Breaking Force
Broken Pieces
Break On Collision ✓
Collision Settings
Remove Broken Pieces From Scene ✓
Remove Settings
On Break ()
List is Empty

Setting up Collision Break

The collision settings uses the unity Tag system to define what objects can trigger the breaking effect on collision.

First, select the Collision Mode that suits better your needs:

- All Objects
- Check Allowed Tags
- Check Ignored Tags
- Check Allowed And Ignored Tags


Breakable (Script)
Script: Breakable
Breaking Force
Broken Pieces
Break On Collision ✓
Collision Settings
Collision Mode: None
- All Objects
- Check Allowed Tags
- Check Ignored Tags
- Check Allowed And Ignored Tags
- ✓ None

Allowed Tags
Ignored Tags
Remove Broken Pieces From Scene
Remove Settings
On Break ()
List is Empty

After selecting the collision mode, fill the “Allowed Tags” and/or “Ignored Tags” lists. This step is NOT required for the “All Objects” Collision Mode.

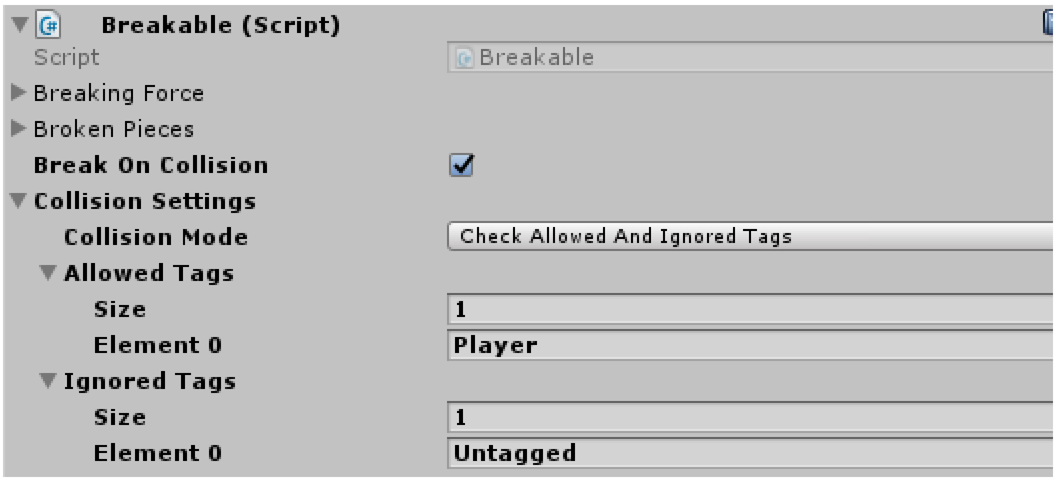
By selecting the “All Objects” Collision Mode, any colliding Game Object will trigger the object breaking process.

By selecting the “Check Allowed Tags” Collision Mode, only Game Objects with tags listed on “Allowed Tags” list will trigger the object breaking process. This mode can be used when only few objects are allowed to break the object.

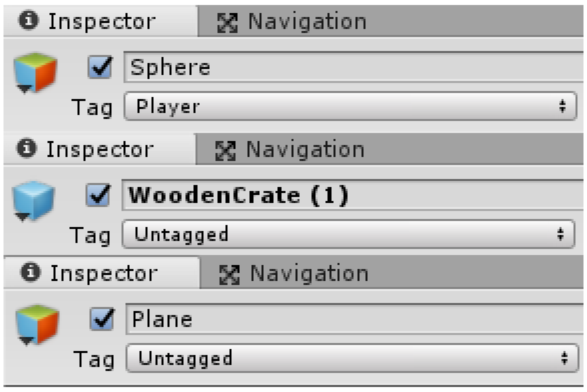
By selecting the “Check Ignored Tags” Collision Mode, ALL Game Objects with tags NOT listed on “Ignored Tags” list will trigger the object breaking process. This mode can be used when only few objects are NOT allowed to break the object.

The “Check Allowed And Ignored Tags” Collision Mode, it’s a combination of the two previous configurations.

For example, check the “BreakByCollision” demo scene. As can be seen in the image below, the crates in this scene are setup to break when colliding with a Game Object tagged as “Player” and ignored all untagged objects (which includes the ground plane and the other crates).


Breakable (Script)
Script: Breakable
Breaking Force
Broken Pieces
Break On Collision: ✓
Collision Settings
Collision Mode: Check Allowed And Ignored Tags
Allowed Tags
Size: 1
Element 0: Player
Ignored Tags
Size: 1
Element 0: Untagged

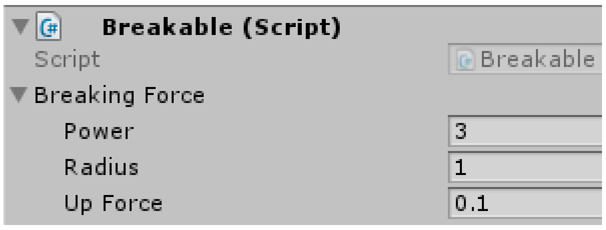
This way, only the Sphere tagged as player can break the crates. Note that, the same effect can be achieved by selecting the “Check Allowed Tags” Collision Mode.


Inspector | Navigation
✓ Sphere
Tag: Player
Inspector | Navigation
✓ WoodenCrate (1)
Tag: Untagged
Inspector | Navigation
✓ Plane
Tag: Untagged

Customizing the Breaking Process

The breaking process is based on the Unity physics engine. The unbroken object prefab is replaced by the broken pieces, then a breaking force is applied to the pieces to add more realism to the breaking effect.

By adjusting the breaking force settings, you can customize the breaking process to suit your needs.



Breakable (Script)

Script	Breakable
Breaking Force	
Power	3
Radius	1
Up Force	0.1

The breaking force is composed by three parameters:

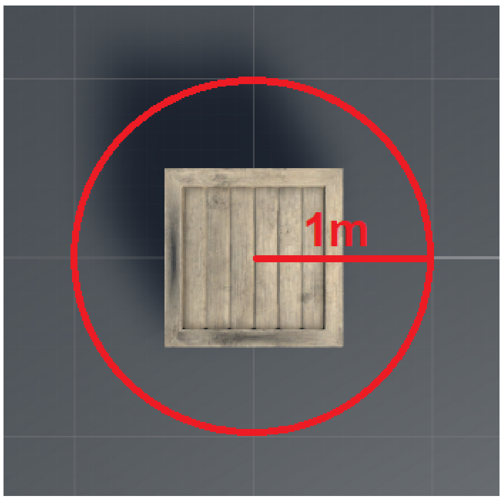
- Power
- Radius
- Up Force

The "Power" parameter defines how strong will be the force applied to the broken pieces. The higher the value, the further the pieces will fly away from the original position.

The "Radius" parameter defines how far from the original position the pieces will still be affected by the breaking force.

The optimum Radius value depends on the size and shape of the original object. For example, the "WoodenBox" prefab it's 1x1 meters. As can be seen in the image below, a Radius of value 1 creates a sphere around the entire crate.

Always adjust the radius to a value that will involve the entire object.



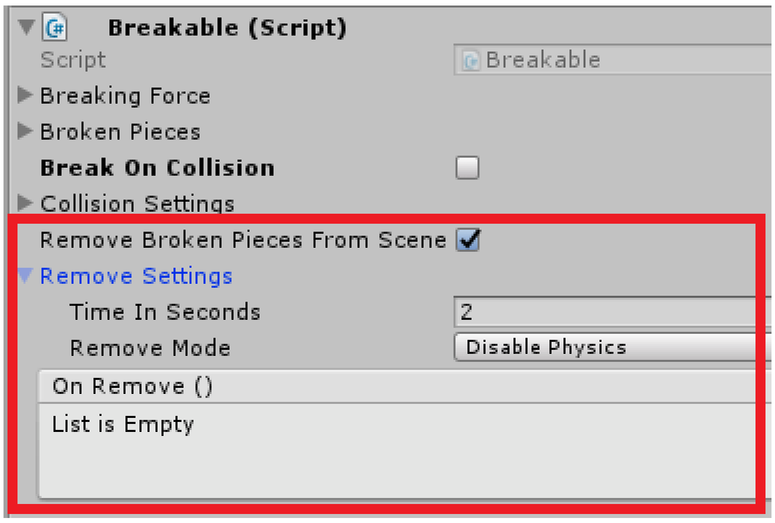
The “Up Force” parameter, defines how high the pieces will fly away. At lower values, this parameter can be used to create a more realistic breaking effect. At higher values it can simulate a breaking reaction caused from an uppercut attack or explosion force upwards.

Feel free to experiment new values and customize your breaking effect. There are several samples scenes in the “_Demo” folder to help you, like the “Crack” and “Explode” scenes for example.

Remove Broken Pieces From Scene

Spawning several broken pieces and keep then on your scene forever can be costly for Unity physics engine over time. To reduce the performance impact on your scene lifetime, you can define how the broken pieces will behave after the explosion effect.

This behaviour is defined by the “Remove Broken Pieces From Scene” option. It’s already enabled by default. But you can disable this option, if you want the player or the environment to keep physically interaction with the broken pieces after the break effect.



Breakable (Script)

Script: Breakable
Breaking Force
Broken Pieces
Break On Collision ☐
Collision Settings
Remove Broken Pieces From Scene ✓
Remove Settings
Time In Seconds: 2
Remove Mode: Disable Physics
On Remove ()
List is Empty

When enabled, this option gives you four different options to deal with the spawned broken pieces.

- Destroy
- Disable
- Disable Physics
- Execute On Remove Event Stack

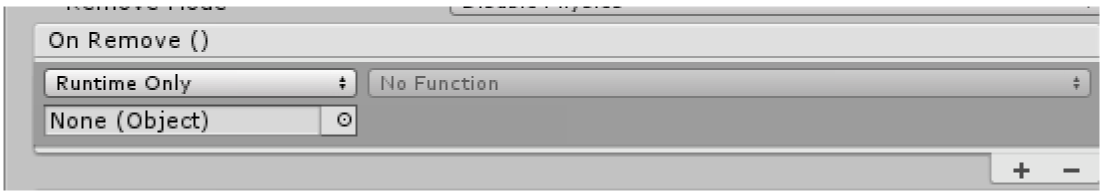
Note that the selected remove action will be executed after the time interval defined in the "Time in Seconds" parameter has elapsed.

The “Destroy” option it’s recommended if you don’t use any type of object pooling system, otherwise, it’s recommended to use the “Disable” option instead.

The “Disable Physics” option reduce the load on the physics engine but keeps the mesh renderer for scene aesthetics purposes.

If none of the above options suits your needs, you can use the “Execute On Remove Event Stack” and execute one or more custom events.

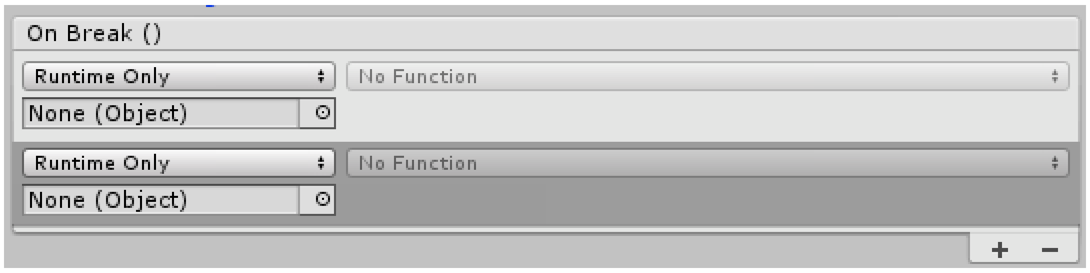
To add a custom event, simple click on the plus icon, then select the Game Object that has your custom script attached and then select your custom method. Note, that only public methods will appear in the drop down.



Custom Break Events

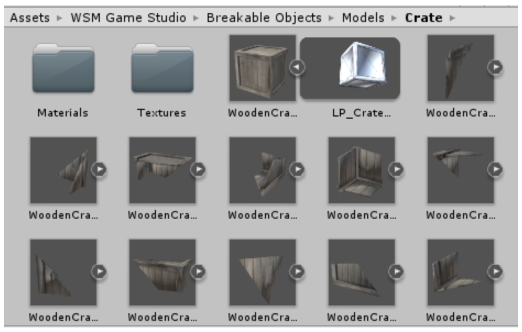
Let’s suppose you want to execute a custom action after the object breaks, like spawning some loot, warning nearby enemies about the player presence or even starting a raging reaction from the shopkeeper that owns the product you just broke. Well, you can!

Just click the plus icon on the “On Break” event list and add how many custom events you need.



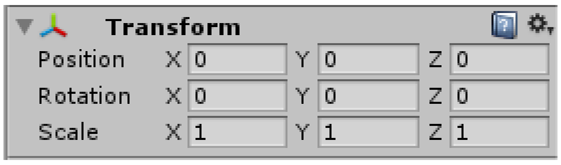
Creating a new Breakable Object

You can also create your own breakable objects, provided you have the unbroken and broken pieces models of the object, like the wooden crate models sample below.


Assets ▸ WSM Game Studio ▸ Breakable Objects ▸ Models ▸ Crate ▸
Materials
Textures
WoodenCra...
LP_Crate...
WoodenCra...

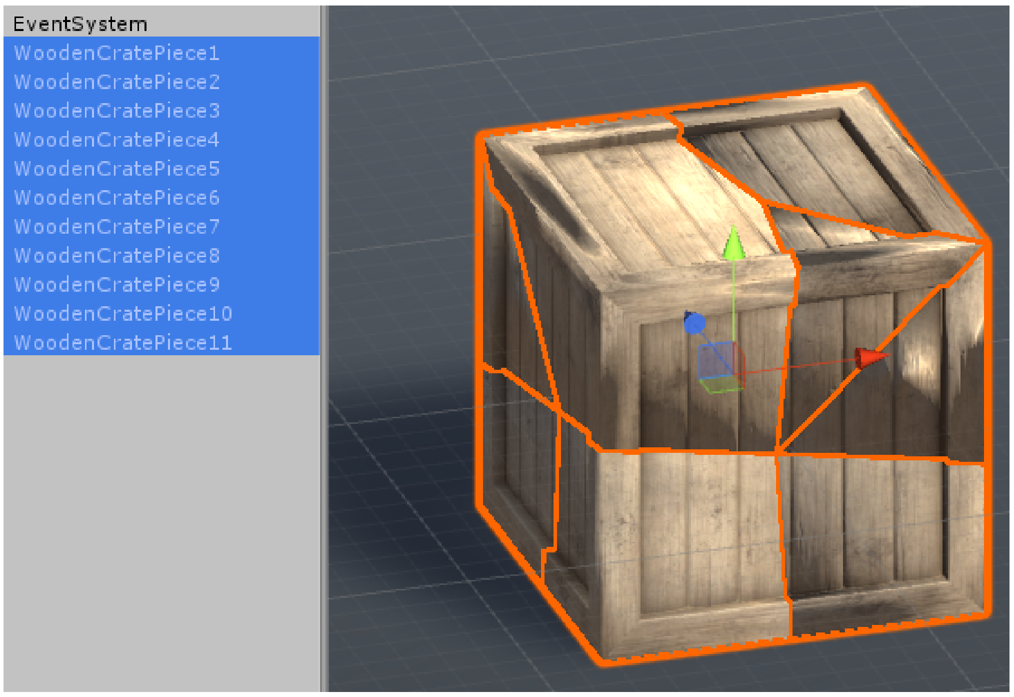
Creating the Broken Pieces Prefabs

First, add all your broken pieces models at your scene, select all of them and reset the transforms to default.



Transform			
Position	X 0	Y 0	Z 0
Rotation	X 0	Y 0	Z 0
Scale	X 1	Y 1	Z 1

Ideally, after resetting all the pieces transforms, they should look like a cracked version of the unbroken model. This is optional, but adds more realism to your breaking effect.



```
EventSystem
WoodenCratePiece1
WoodenCratePiece2
WoodenCratePiece3
WoodenCratePiece4
WoodenCratePiece5
WoodenCratePiece6
WoodenCratePiece7
WoodenCratePiece8
WoodenCratePiece9
WoodenCratePiece10
WoodenCratePiece11
```

Now, add the following components to all the pieces:

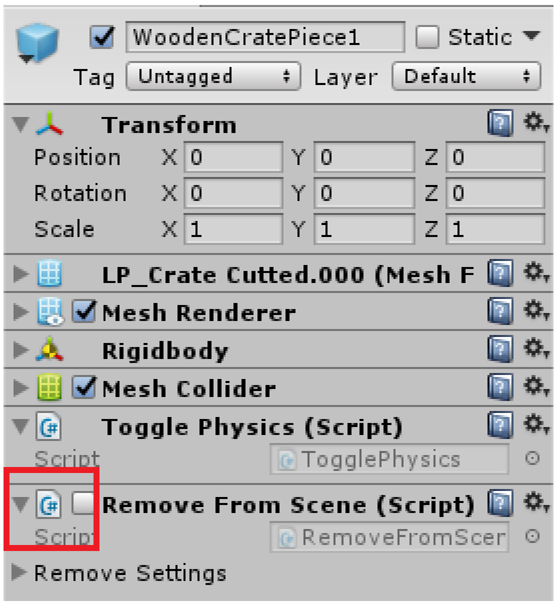
- Rigidbody
- Collider
- Remove From Scene Script (Disabled)

Keep the default rigidbody configuration or adjust the mass if you like (Warning changing the mass can require some tweaks in the breaking force later, see “Customizing the Breaking Process” section for more details).

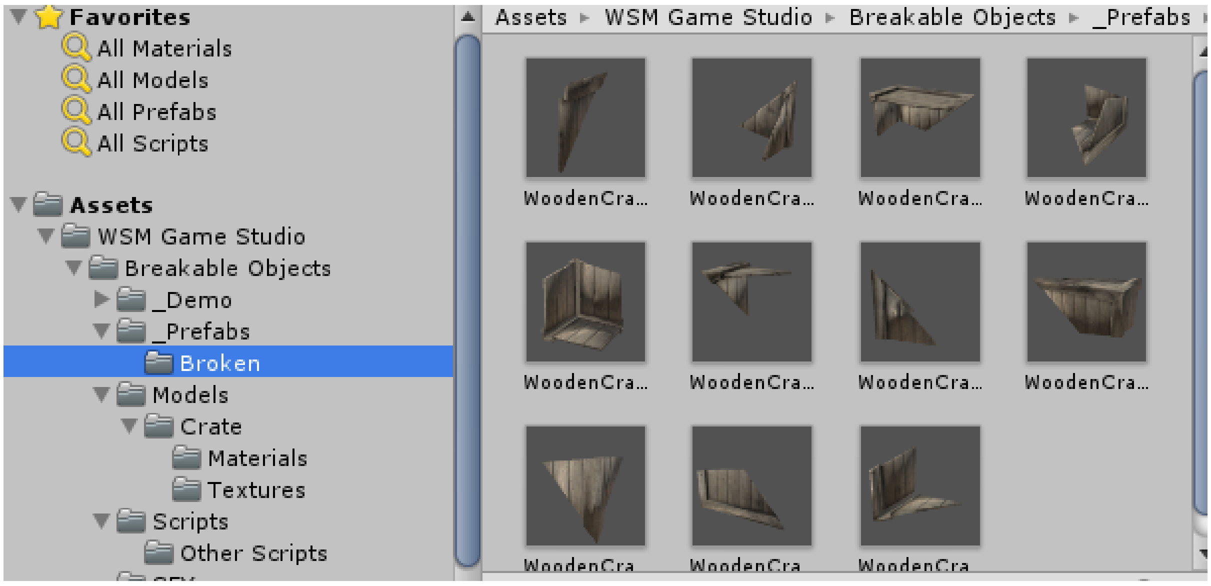
You can use any type of collider for the pieces, although it’s recommended to use a mesh collider for best fitting purposes.

Note that the “Toggle Physics” script will be added automatically after adding the “Remove From Scene” script. There’s no need to adjust the remove settings, since they will be overwritten later during the breaking process.

But, you need to UNCHECK the Remove From Scene Script component as can be seen in the image below.


WoodenCratePiece1 Static
Tag Untagged Layer Default
Transform
Position X 0 Y 0 Z 0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
LP_Crate Cutted.000 (Mesh F
Mesh Renderer
Rigidbody
Mesh Collider
Toggle Physics (Script)
Script TogglePhysics
Remove From Scene (Script)
Script RemoveFromScer
Remove Settings

Drag and drop your first broken piece to the “_Prefabs/Broken” folder to save it as a prefab and repeat the process for all the broken pieces at your scene.

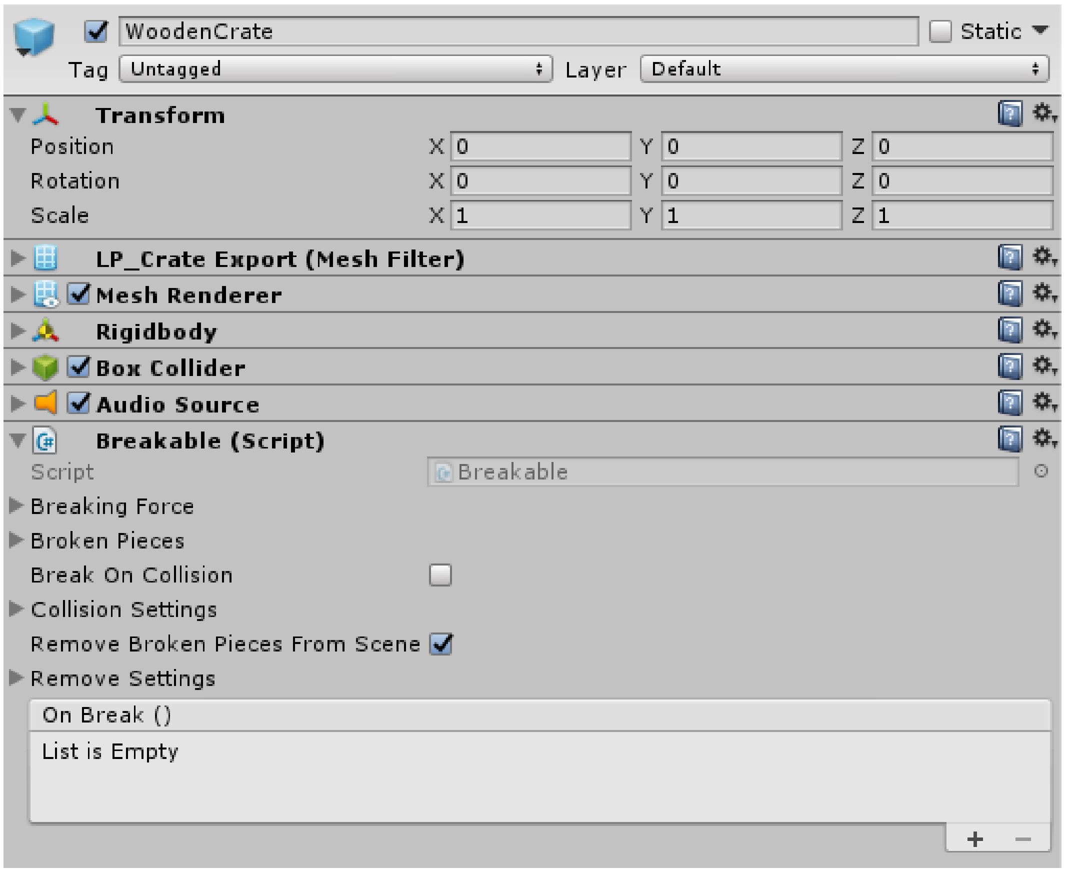


Now that the broken pieces prefabs are done, we can create the main breakable object prefab.

Creating the Breakable Object Prefab

First, add the unbroken model to your scene, then add the following components to it:

- Rigidbody
- Collider
- Audio Source (optional)
- Breakable Script



WoodenCrate ✓ · Static ☐
Tag: Untagged · Layer: Default

Transform

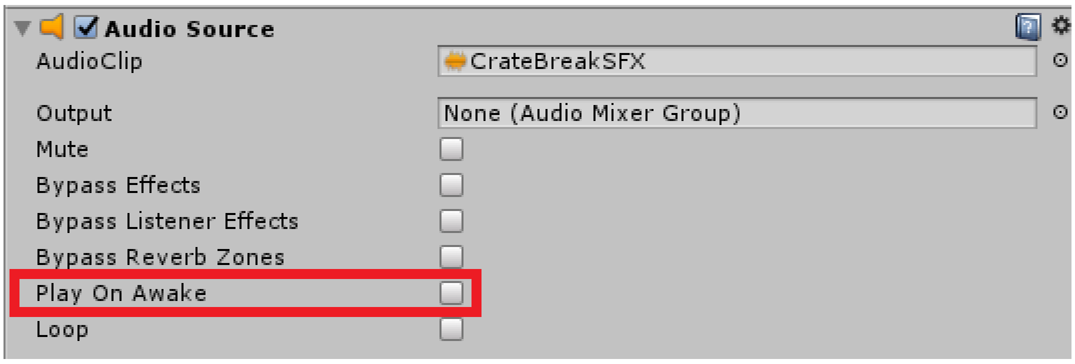
Position	X 0	Y 0	Z 0
Rotation	X 0	Y 0	Z 0
Scale	X 1	Y 1	Z 1

LP_Crate Export (Mesh Filter)
✓ **Mesh Renderer**
Rigidbody
✓ **Box Collider**
✓ **Audio Source**
Breakable (Script)

Script	Breakable
Breaking Force	
Broken Pieces	
Break On Collision	☐
Collision Settings	
Remove Broken Pieces From Scene	✓
Remove Settings	

On Break ()
List is Empty

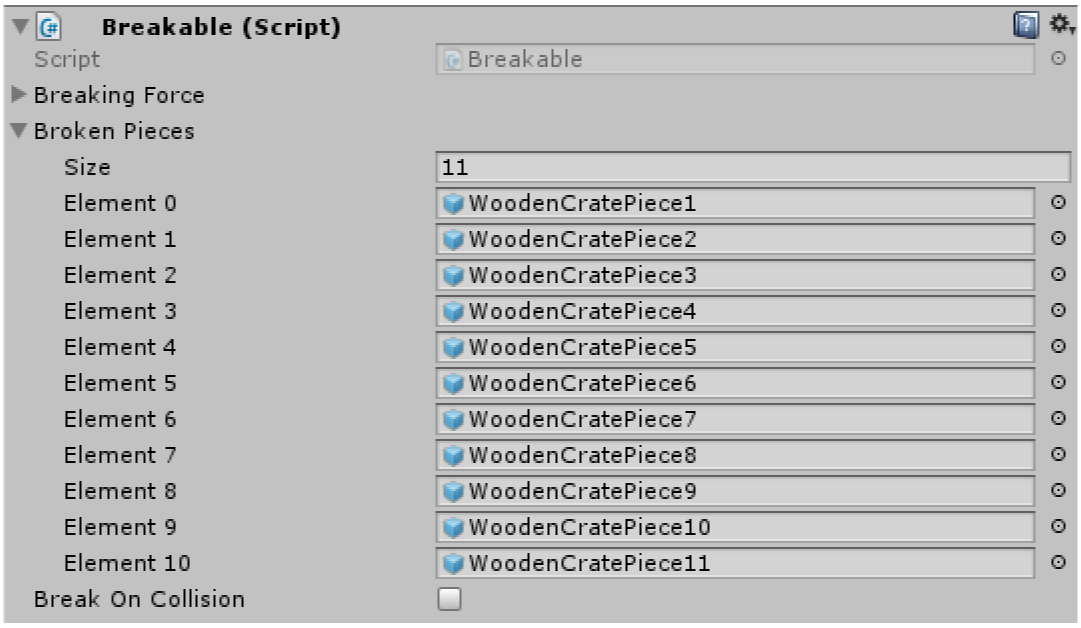
Drag and drop your breaking SFX on the audio source component and UNCHECK the "Play On Awake" option.



✓ **Audio Source**

AudioClip	CrateBreakSFX
Output	None (Audio Mixer Group)
Mute	☐
Bypass Effects	☐
Bypass Listener Effects	☐
Bypass Reverb Zones	☐
Play On Awake	☐
Loop	☐

Now, expand the “Broken Pieces” list on the Breakable script and Drag and Drop your pieces prefabs to fill the list.



Breakable (Script)

Script	Breakable
Breaking Force	
Broken Pieces	
Size	11
Element 0	WoodenCratePiece1
Element 1	WoodenCratePiece2
Element 2	WoodenCratePiece3
Element 3	WoodenCratePiece4
Element 4	WoodenCratePiece5
Element 5	WoodenCratePiece6
Element 6	WoodenCratePiece7
Element 7	WoodenCratePiece8
Element 8	WoodenCratePiece9
Element 9	WoodenCratePiece10
Element 10	WoodenCratePiece11
Break On Collision	☐

Finally, set up the Breakable script parameters to customize your breaking process. For more information, check the “How to Use This Asset” section.

Drag and drop your unbroken game object to the “_Prefabs” folder to save it as a prefab.

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