UltEvents

v1.1 Created by Kybernetik

Contents

1. Quick Start

```
public UltEvents.UltEvent myEvent;
```

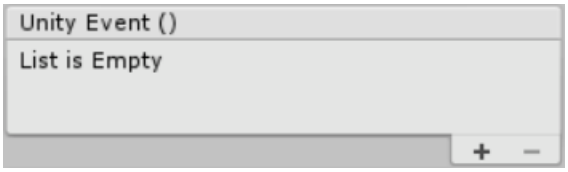
```
[SerializeField] private UltEvents.UltEvent myEvent;
```

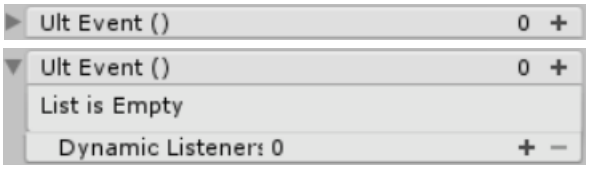
- To create an UltEvent: declare a serializable field in your script as shown above.
- Once you have declared your event it will show up in the inspector for your script like a regular field so you can configure it to run code.
- To trigger the execution of the event, simply call `myEvent.Invoke()`.
- There are also various Premade Event Scripts which expose `MonoBehaviour` events like Awake, Update, etc.
- A scene with some example events can be found in *Assets/Plugins/Ult Events/Example*.

2. UnityEvents vs. UltEvents

UnityEvents allow users to easily setup and configure persistent event callbacks via the Inspector. UltEvents serve the same purpose, but with more features and less restrictions.

Serializable Event System Feature Comparison	UnityEvent	UltEvent
Persistent listeners (serialized)	✔	✔
Dynamic listeners (non-serialized)	✔	✔
Reorderable function list		✔
Parameter types: bool, int, float, string, UnityEngine.Object	✔	✔
Parameter types: Enum (regular and flags), Vector (2, 3, 4), Quaternion, Rect, Color, Color32		✔
Maximum parameter count	1	Unlimited
Method parameters	Strict	Flexible
Allows methods with non-void return types		✔
Use values returned from earlier calls as parameters		✔
Public methods	✔	✔
Non-public methods		✔
Static methods		✔
Compact and collapsible GUI		✔
Displays dynamic (non-serialized) listeners in the GUI		✔
Context menu commands (Invoke, Clear, Copy, Paste)		✔
Select a specific component when there are multiple of the same type		✔





3. Creating and Triggering an Event

You can either declare and invoke an UltEvent in your own script or use a Premade Event Script.

3.1. Declaring an Event in a Script

You can declare an UltEvent like any other serialized field you want to show in the inspector:

```
public UltEvents.UltEvent myEvent;
```

```
[SerializeField] private UltEvents.UltEvent myEvent;
```

You will also need to call `myEvent.Invoke()` to trigger the event when you want it to execute.

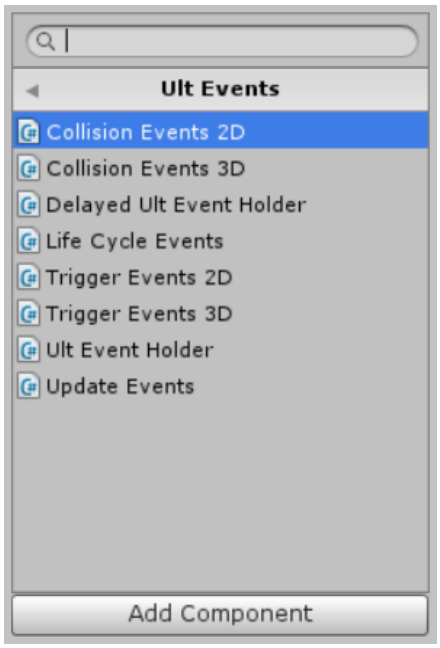
3.2. Invocation Exceptions

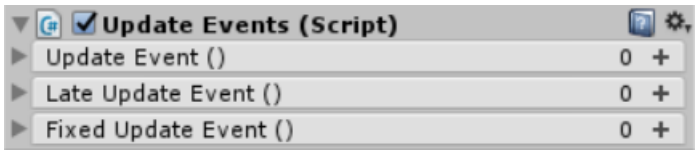
- The regular `Invoke` method contains no exception handling. Any exceptions will be passed out to the caller like normal.
- The `InvokeSafe` method will automatically catch and log any exceptions.
- If you have `using UltEvents;` declared at the top of your script, you can make use of the `UltEventUtils.InvokeX` extension method which does nothing if the event is null to avoid throwing a `NullReferenceException`. This is useful in case you call `AddComponent` at runtime since your event field will be null unlike when you add a component using the Unity Editor which will automatically create a new event object.

3.3. Premade Event Scripts

This plugin includes several scripts which have UltEvents triggered by various `MonoBehaviour` events:

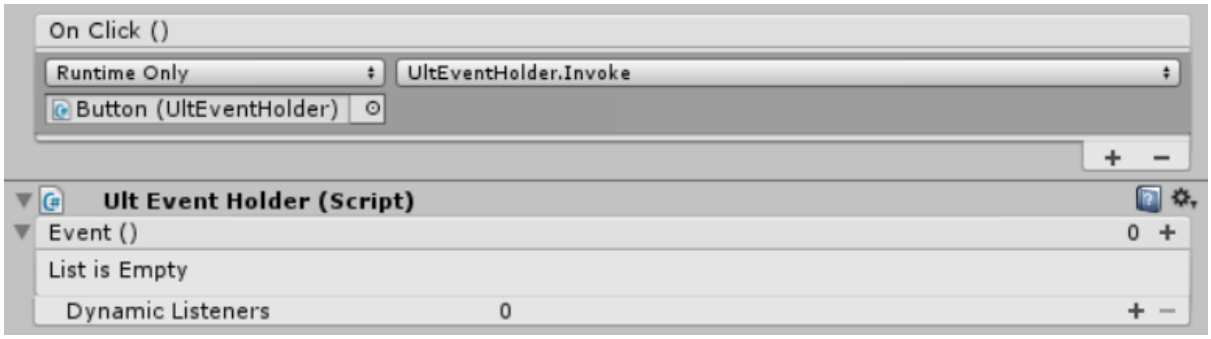
Script	Events
CollisionEvents2D	OnCollisionEnter2D, OnCollisionStay2D, OnCollisionExit2D
CollisionEvents3D	OnCollisionEnter, OnCollisionStay, OnCollisionExit
LifeCycleEvents	Awake, Start, OnEnable, OnDisable, OnDestroy
TriggerEvents2D	OnTriggerEnter2D, OnTriggerStay2D, OnTriggerExit2D
TriggerEvents3D	OnTriggerEnter, OnTriggerStay, OnTriggerExit
UpdateEvents	Update, LateUpdate, FixedUpdate





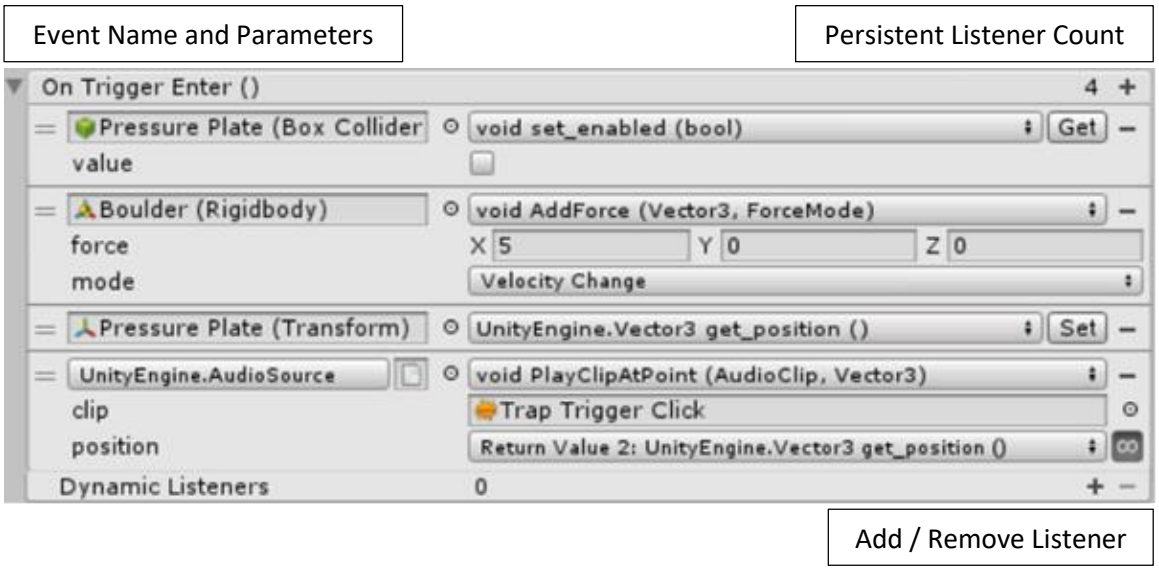
3.4. UltEventHolder

The `UltEventHolder` script is similar to the Premade Event Scripts, except that it only has a single event which isn't triggered by anything. One use for this script is to receive a redirected `UnityEvent` from a UI element so that you can make use of the improved features of the `UltEvent`.



The `DelayedUltEventHolder` script can be used similarly to impose a delay before the event is actually executed.

4. Configuring an Event

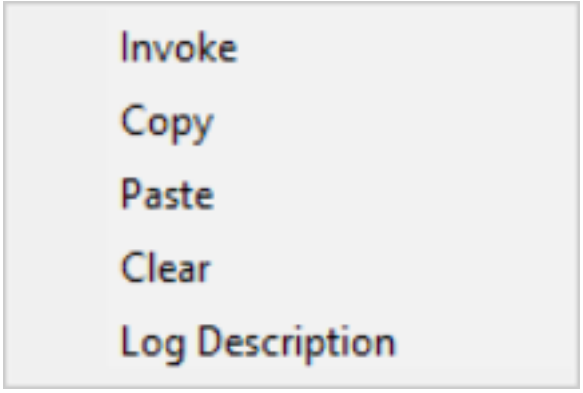


An `UltEvent` has two sets of listeners; persistent (configured in the Unity Editor using the Inspector) and dynamic (added using code at runtime).

You can add a persistent listener using the [+] button or by dragging and dropping an object from the Hierarchy Window or Project Window onto the event.

If you have multiple calls, you can drag them around to change their execution order. Execution starts at the top and travels down the list.

You can Right Click on an event header to open a context menu with functions to Invoke, Copy, Paste, Clear, or Log a description of its contents.



4.1. Configuring a Function Call

The left field determines the target; either a `UnityEngine.Object` (such as a `GameObject` or `Component`) on which an instance method will be called, or a `System.Type` in which a static method will be called.

The right button opens the method selection menu.

When a new call is added, it will be given the component containing the event as its default target.

To set a static method, you can either click on the target field and press the Delete key, or open the method selection menu and select "*Static Method*". Then the target field will show a type picker which allows you to specify the type where the method you want to call is declared. Once you have selected a type, the method selection menu will show all of the supported methods in that type.

The sub-menus near the top of the method selection menu allow you to select methods from any other components on the same `GameObject`. Doing so will automatically change the target object accordingly.

If a method name you selected previously no longer exists (such as if you select a method then rename or remove it from your code), it will be highlighted in red. It will also show a [**?**] button which will assign another existing method with the most similar name according to a metric known as Levenshtein Distance.

The method selection menu also allows you to select properties. Doing so will default to the property's Setter if it has one and is a supported argument type. It will also show a [**Get**] button which can be used to toggle to the Getter so you can use its return value as a parameter in subsequent methods (see Linked Return Values for more details).

5. Advanced

5.1. Event Parameters

The standard `UltEvent` class allows you to register methods with predefined values, but doesn't let you pass in custom parameters when the event is invoked. For example, you could have an event that instantiates a prefab at a specific location you set in the event's inspector, but you couldn't use the information from an `OnCollisionEnter` message to have your event instantiate the prefab at the point where the collision occurs. To do this, you need to use the generic versions of `UltEvent` instead.

To use a generic event type you must first create a serializable class that inherits from the desired event type. For example, if you want an event that takes a `Vector3` parameter, you would write the following:

```
[Serializable] public sealed class Vector3Event : UltEvents.UltEvent<Vector3> { }
```

Then you can use that event type instead of the regular `UltEvent` when declaring your event field:

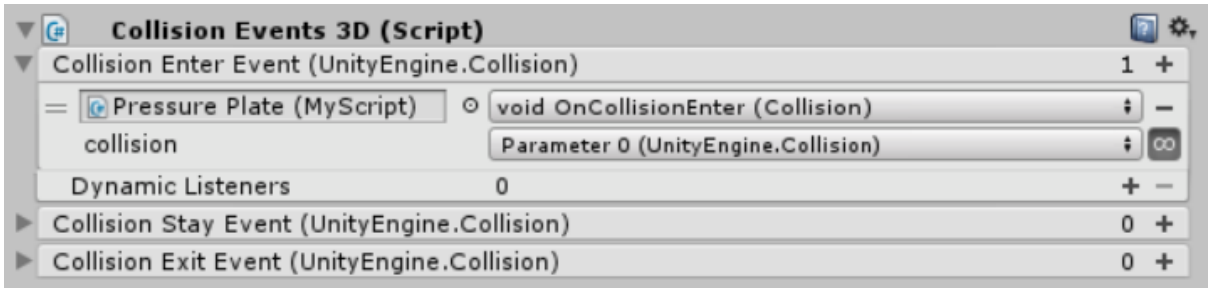
```
public Vector3Event myEvent;
```

And when you want to invoke the event you will need to pass in the required parameters:

```
myEvent.Invoke(transform.position);
```

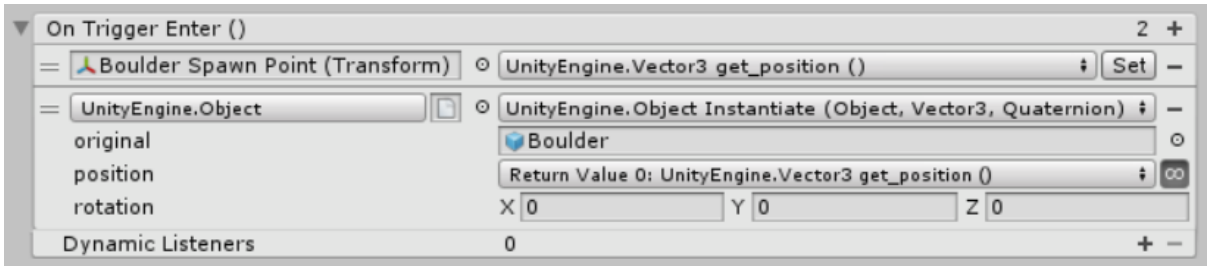
When using the inspector to configure an event with parameters, any method parameters with the appropriate type will show a [∞] button which toggles that parameter between linked (so it receives the value you pass into the Invoke call) and unlinked (so you can use the inspector to specify its value normally).

If you specify a parameter type that isn't normally supported by UltEvents such as `UltEvent<Collision>` or `UltEvent<SomeCustomClass>`, you will be able to select methods with that parameter type which would not normally appear in the list. Such parameters are automatically linked and can't be unlinked.



5.2. Linked Return Values

If you register a method with a non-void return type, you can use the value it returns as a parameter in later methods. Any parameter that matches the return type of a previous method will show the same [∞] button used to link Event Parameters.



The “Parameter Constructors ->” sub-menu contains various methods for constructing simple values to use as parameters in subsequent functions. For example, `ReturnVector3` takes its X/Y/Z values as separate float parameters so you can link them individually.

5.3. Configuring Events Using Code

You can easily register delegates to an event using the `+=` operator like a standard C# delegate:

```
myEvent += SomeMethod;// Existing Method.
```

```
myEvent += () => ...;// Lambda Expression.
```

Normally this will register the delegate as a dynamic listener (non-serialized), however if you are currently in Edit Mode (in the Unity Editor but not in Play Mode) it will register as a persistent listener instead.

To specifically add a dynamic listener, you can either access the `dynamicCalls` field directly or use the static `AddDynamicCall` method which will automatically null-check the event:

```
myEvent.dynamicCalls += SomeMethod;
```

```
UltEvent.AddDynamicCall(ref myEvent, SomeMethod);
```

5.4. Configuring Persistent Listeners Using Code

To specifically add a persistent listener, you can either create a `new PersistentCall` and add it to the `PersistentCalls` list or you can call `AddPersistentCall` which returns a `PersistentCall`.

```
var call = new PersistentCall((Action<float>)SomeMethod);
myEvent.PersistentCalls.Add(call);
```

```
var call = myEvent.AddPersistentCall((Action<float>)SomeMethod);
```

You can then configure the call using `SetArguments` or by accessing the `PersistentArguments` array directly.

```
call.SetArguments(2);
```

```
call.PersistentArguments[0].Float = 2;
```

All of these `+` operators and `Add` methods have corresponding `-` operators and `Remove` methods.

Questions, feedback, feature requests, etc: kybernetikgames@gmail.com.