

# Introduction

Welcome to the uScript User Guide! This is the official manual for the uScript Visual Scripting Tool for Unity.

This section of the user guide covers material on how to install uScript, familiarize yourself with general visual scripting concepts, and provide some general advice you should be aware of before using uScript for the first time.

**Mobile Users** - [you can view a mobile formatted version of this documentation here.](#)

*Documentation version: 0.9.0*

# Welcome To uScript

Thank you for your interest in the uScript Visual Scripting Tool for Unity 3! uScript allows you to visually create program logic that allows you to bring your ideas to life.

Created by Detox Studios, a company founded by veteran video game developers, uScript was created based on many years of development experience of previous game engines and visual scripting systems used on award-winning video games. It was designed to empower non-technical developers such as game designers, artists, architects and others to directly create runtime programming code visually and to iterate on ideas directly. It is our belief that to be competitive and innovative, it is vital to put the power of creation and iteration directly into the hands of the creative.

## How Does It Work?

uScript allows you to listen for events happening in your game and to visually create logic to run when those events happen. The conditions which trigger those events and the complexity of the logic that is run depends purely on what you wish to do. Examples of this might include turning off a light when the player enters a trigger, creating a weapons and ammunition mechanic, moving the player, setting up a working door prefab, or even creating and managing an entire custom inventory system.

## Goals

uScript was developed to be production-ready with four major goals in mind:

- **Usability** – It was our number one goal to take something as complex as programming game logic, and visualize it as best as possible in order for non-technical people to be able to do what they want without having to worry about technical aspects getting in their way. This is a very challenging problem as the more technical aspects you hide the more flexibility is lost. We spent a massive amount of time making uScript the easiest to use solution available while keeping the flexibility to do what you want as you become more advanced with the tool. We continue to put a lot of our development efforts into constantly improving this aspect of the product, including product features, documentation, and video tutorials.
- **Iteration** – Any developer worth their salt knows that the best ideas (and products) are ones that can be quickly iterated on in development. The flexibility to quickly try new ideas without fear is critical to inspiring innovation and being competitive. uScript allows you to visualize your ideas quickly and try different things in a very rapid, non-destructive development environment. Also, because uScript allows gameplay logic to be created by other team members besides programmers, it

greatly increases productivity through parallel iteration and experimentation. This frees up a team's engineers to focus on technical innovation and competitive advantages instead of implementing (and re-implementing) product design concepts.

- **Expandability** – Because every product has unique needs and development pipelines, it would be impossible for a visual scripting system to handle 100% of all needs "out of the box". Because of this, uScript was designed to be extremely customizable and extensible for projects big and small. This extensibility is accomplished through several key features including the ability to create custom visual nodes (logic blocks) using C# code or even through visual scripting with uScript itself (via nested uScripts/recipes), customizable editor UI and full ".Net Reflection" of Unity's objects, components, properties, and variables.
- **Community** – Because of uScript's ability to be customized and expanded in many ways, it was important to us that its users had a place to go to share their nodes, creations, knowledge, and ideas. We also wanted to have a way to share uScript news and updates, and have open two-way dialog with our users regarding uScript. In support of that goal, we have created a community portal ( <http://uscript.net> ) for uScript users and future users.

We hope you enjoy uScript as much as we do!

# Setting Expectations

A powerful visual scripting system consists of nodes (the building blocks of making a visual script) that do something very small and specific such as add numbers together, move the location of an object, or play a sound. You then use these simple nodes in combination in creative ways to create very complex and powerful logic specific to your project's needs. Your creativity and knowledge are the only limiting factors.

Some users may expect a single logic node that encapsulates a bunch of functionality into it to make their game for them (like a “Make FPS” or “Make Monster Wander” node). The problem with this approach is that it is not feasible to create such “high level” nodes as every game is unique- sometimes in big ways and sometimes in subtle ways. Whatever the case, if we made complex logic nodes, it would greatly limit the flexibility of uScript to allow users to experiment and be creative in their game development as they would be stuck with the functionality built into these “mega-nodes”. The purpose of uScript is not to make your game for you-- it is to empower you to make the game you wish to make!

We have put a massive effort into designing uScript to be as easy as possible for non-technical users, but using any visual scripting tool still requires some basic understanding and knowledge by the user of software/game development, math & physics, and game design sensibilities in order to create some of the more advanced visual scripts. If you are not familiar with game development and the Unity technology, you will still have a more difficult time creating your product than those with a greater set of experience and knowledge in these matters. The key is to be sure you take the time to fully understand the tools you are using in order to make them work well for you.

## Prerequisites

To use uScript and get the most out of this powerful tool, there are both required and recommended prerequisites:

### Required

- **Unity** – uScript works with both the free and pro versions of Unity 3 (and soon to be Unity 4). You need to have the latest version of Unity installed in order to install and use uScript.
- **uScript** – you of course need to install uScript in order to use the tool. The uScript editor is accessed from within Unity.

## Recommended

- **Unity Basics** – You should be familiar with the basic use of Unity. If you have not used Unity before, we recommend you read their documentation and become familiar with the Unity pipeline, development philosophy, and terminology. Specifically, understanding what the following things at the very least will greatly help you in using uScript:
  - **GameObject** - the foundation object in which most things in Unity derive from.
  - **Component** - this is how you turn simple, empty GameObjects into amazing objects that can do specific things in your game.
  - **Prefab** - a great way to manage and modify complex GameObjects in your game.
  - **Scene** - this is how you break your game apart into pieces that can be loaded into memory when you need them..
  - **Resource Folder** - this is how Unity streams assets at runtime.
- **Scripting Basics** – While uScript allows you to visually create scripts for your product without needing to know the syntax of a programming language, it is recommended that you have a basic understanding of how programming works. We have created the Scripting Basics section to give you a primer in some of the basic concepts of scripting.
- **Math & Physics** – Many of the things you may want to do will involve various math and physics to accomplish. While uScript contains the low level nodes needed to perform these complex math operations, an understanding of how to utilize these nodes to get the results you are looking for will be helpful.

# Installing & Updating

The following section explains how to install or update uScript into a Unity project.

**IMPORTANT!** - Currently, uScript is officially supported on Unity 3.5 and Unity 4.0

**Note!** - *If installing or updating uScript into an existing Unity project, we always strongly recommend that you backup your project files first using your preferred backup method!*

## Installation

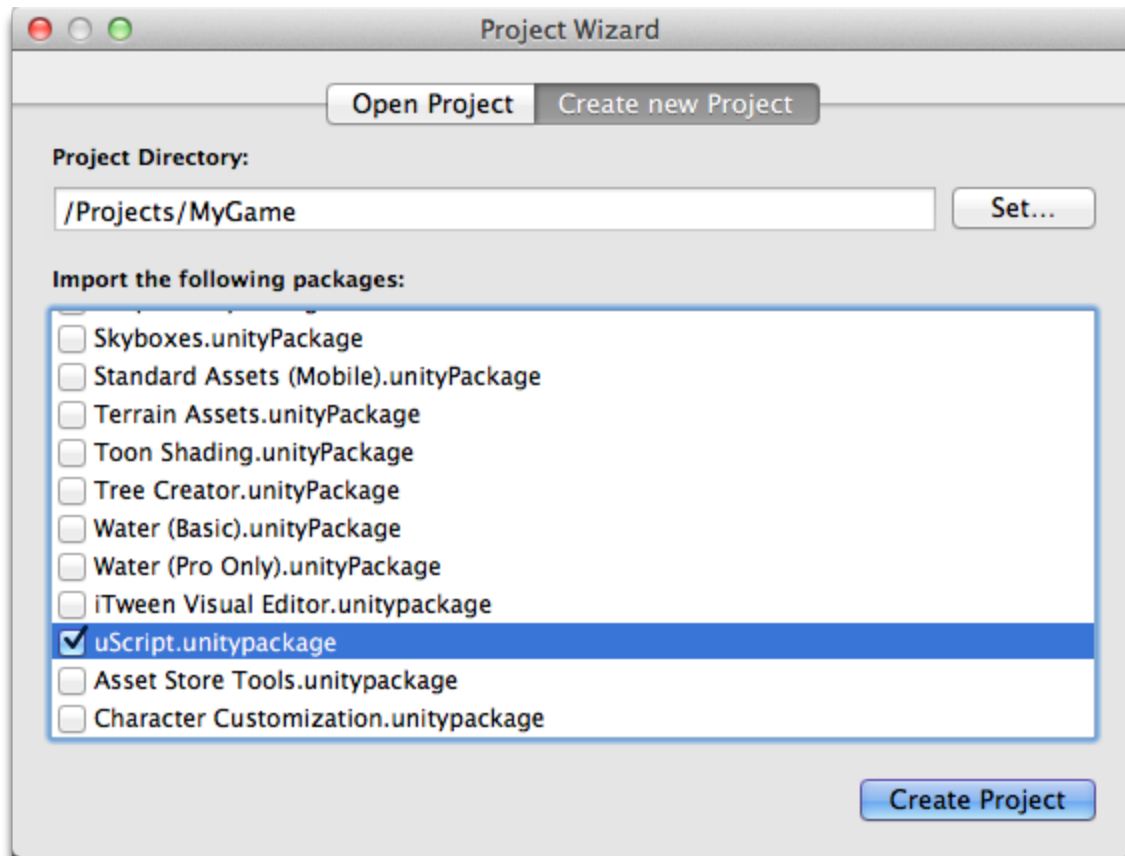
Like other Unity editor tools, uScript needs to be installed in each Unity project you wish to use it in. There are two common ways to install uScript depending on how you purchased it. Both ways are described below.

### **Unity Asset Store**

If you have purchased uScript from the Unity Asset Store, you can install uScript into any new project in one of two ways:

#### **Method 1 - Import the uScript package on project creation**

If you have already purchased uScript through the Unity Asset Store, you can choose to have uScript installed when creating a new Unity project. Just select it from the list in the project creation wizard:



**Note!** - If using this method to install uScript into a new project, you should still check to see if you have the latest version of uScript installed. The package that is installed using this method will have been the last version you got from the Asset Store, and may not be the latest version available.

## Method 2 - Import through the Unity Asset Store

You can install uScript at any time into a new or existing Unity project by using the Unity Asset Store window in the Unity editor. You can bring up the Asset Store window from inside the Unity editor. It is located under the Window menu in Unity (**CTRL+9** or **CMD+9** on Mac).

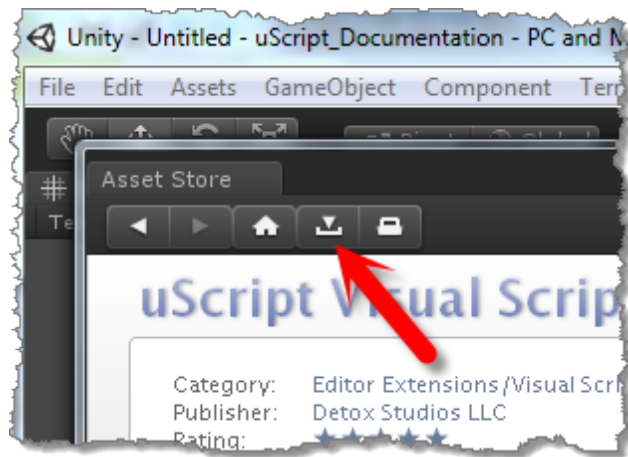
**Note!** - Either of the methods shown below can also be used to update an existing install of uScript for a project. If you are able to update an existing uScript install, the "Import" buttons in the

*examples below will instead show as "Update" when a new version of uScript is available for updating.*

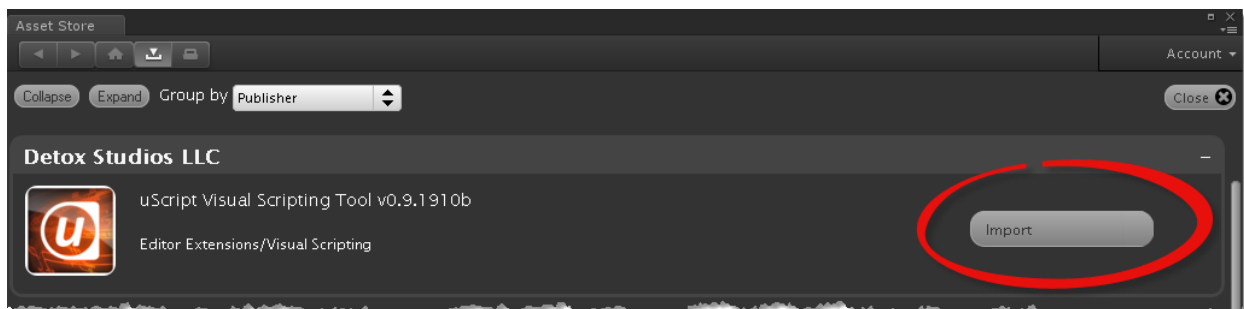
There are two methods to install uScript through the asset store:

### **Method 1 - Download Manager**

Once the Asset Store window appears, you can bring up the Download Manager by selecting this button:



Then, once in the Download Manager, select the "Import" button for uScript:



### **Method 2 - Asset Store uScript Page**

Optionally you can just browse to the uScript store page and select the "Import" button there as well:






### ***uScript Package Installation***

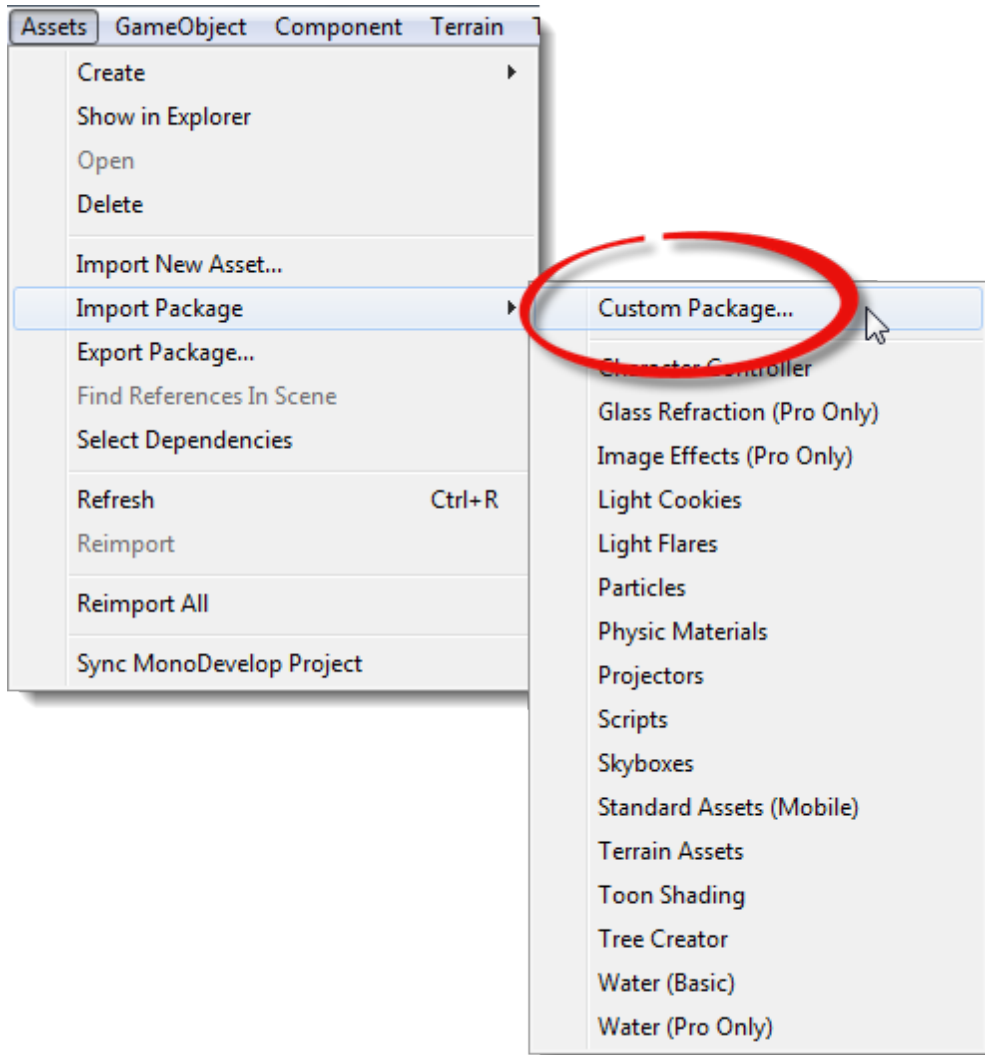
If you have purchased (or downloaded the PLE version) directly from Detox Studios, you will be provided with a Unity installation file for installing uScript.

uScript uses the standard Unity package format (.uscriptpackage) and can be installed like any other Unity package file. Please follow these instructions to install uScript directly from the package file (*uScript.unpackage* or *uScript\_PLE.unpackage*):

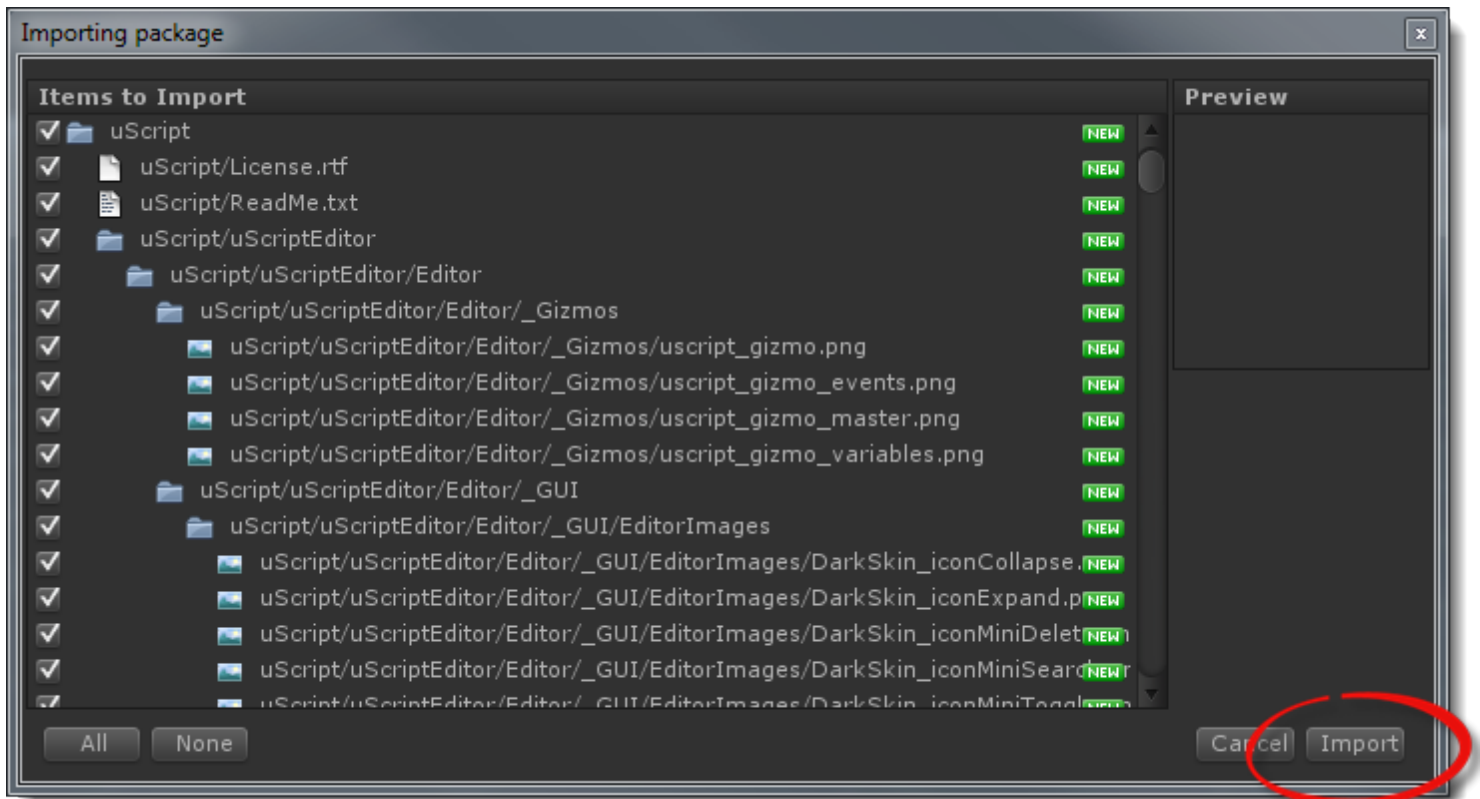
- Make sure you have downloaded and unzip the latest version of uScript from ***<http://www.detoxstudios.com/products/uscript/download>***:

 uScript.unpackage

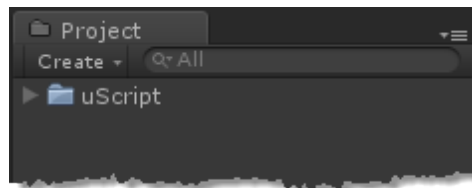
- Run Unity and select *Import Package/Custom Package...* from the “Assets” menu and browse to the uScript.unpackage file to install uScript:



- When the Importing package window appears in Unity, make sure everything is selected and click the "Import" button:



- Once uScript has installed, you should now have "uScript" folder in the root of your Unity project's "Assets" folder:



## Updating uScript

If you are updating or re-installing uScript into a Unity project where uScript was already being used, it is recommended that you perform a clean re-install of uScript as detailed below. Unity's package file system does not currently support the ability to remove obsolete files from a previous install-- it can only update or add files. This means if you do not remove the old version of uScript before installing the new version, you may be left with legacy files that could potentially cause issues in using the new version of uScript.

**Note!** - Please be sure you have fully backed up your Unity project before attempting any updates.!

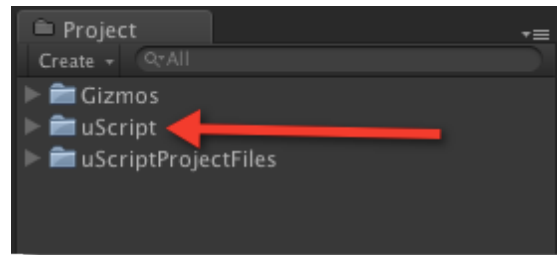
## Performing a Clean Re-Install of uScript

A clean re-install is when you delete the root uScript folder before importing the latest *uScript.unitypackage* file into your Unity project.

This is the recommended way to update uScript because we may have changed or deleted old files and Unity's package system will not remove files when installing a new package over an old one. This can lead to old or conflicting files that can cause issues.

Please follow these steps to do a clean re-install:

- Load your Unity project(s) using uScript and delete the root "uScript" folder in your "Project" tab by right-clicking it and selecting "Delete" from the context pop-up menu. This is best done with a blank/new Unity scene open instead of an existing scene you may have uScript graphs in. Just select "New Scene" from the Unity's "File" menu-- there is no need to save this blank scene after you re-install uScript:



**IMPORTANT!** - Do not delete your **uScriptsProjectFiles** folder!  
This is where your project's uScript graphs and any custom nodes are located. They will be lost if you delete this folder.

- You can now re-install uScript. See "Installing & Updating" above for details.

## Fixing Compile Errors After Updating

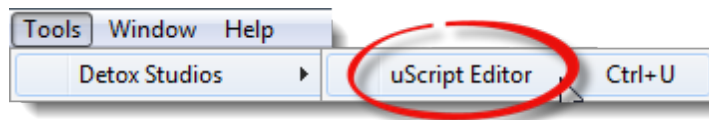
If you get compile errors from Unity after upgrading uScript, you most likely need to delete your generated uScript code files and re-generate them. This can happen when uScript's nodes have been updated to fix bugs or support new features. for more information.

Assets/uScriptProjectFiles/uScripts/\_GeneratedCode/scrap.cs(134,48): error CS1501: No overload for method `In' takes `4' arguments

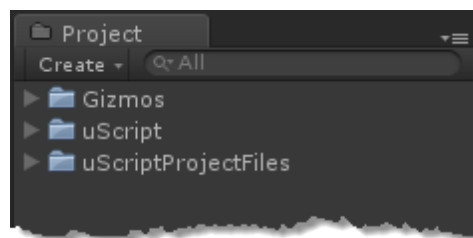
# Running uScript For The First Time

Intro Text Here

- You can run the uScript Editor by going up to the “Tools/Detox Studios” menu in Unity and selecting “uScript Editor” or by pressing *CTRL+U* (or *CMD+U* on Mac):



- After running the uScript editor for the first time, uScript will add the following items to your project:
  - some uScript gizmos to your projects *Gizmos* folder. If the Gizmos folder does not exist, uScript will create it.
  - a *uScriptProjectFiles* folder in the root of your project's *Asset* folder. This folder is where your uScript project-specific files will go such as; your uScript graphs, generated script files and any custom nodes you wish to add to uScript for this specific Unity project.
  - a GameObject to your open Unity scene called *\_uScript*. This is also referred to throughout the User Guide as the uScript Master GameObject.

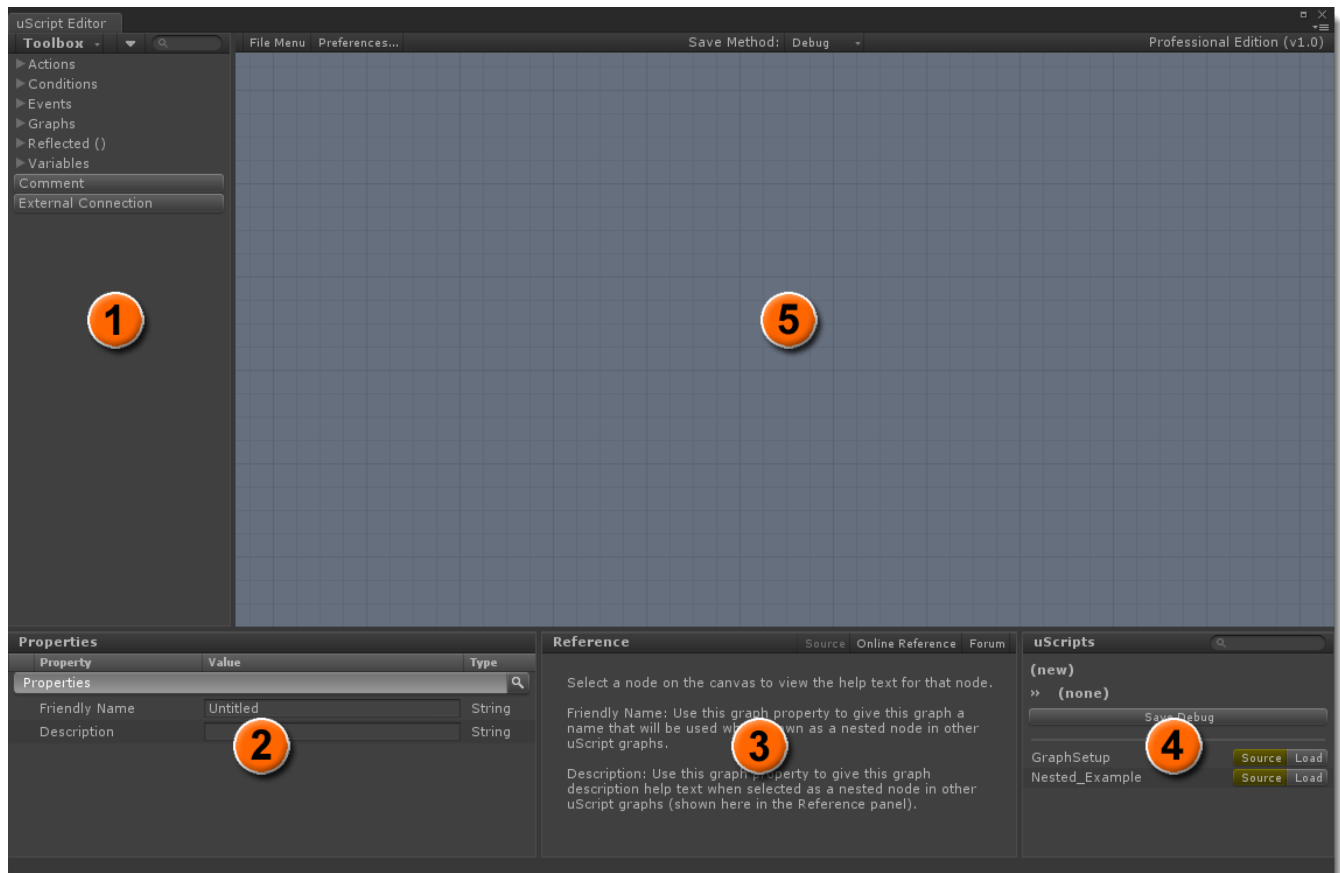


# Discovering uScript

This section covers the uScript Editor interface and basic functionality.

# Editor Interface

The uScript Editor contains five major sections.



## Editor Sections

### Action Panel

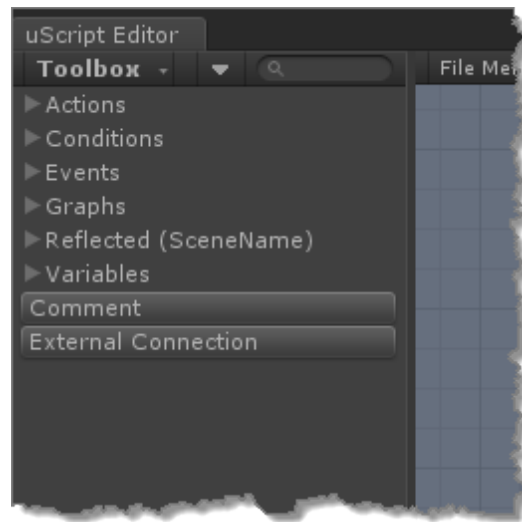
*See 1 in the above image for this panel's location.*

This panel has more than one view. The default view is the *Toolbox*, which contains a list of all the nodes you can place on the Canvas. The other panel is the *Contents* panel, which shows all the nodes you currently have placed on your graph. Both panels are described in detail below.



## Toolbox

The Toolbox panel contains all the possible nodes that can be placed in your graph. To place a node from the Toolbox, just click the node button and a new instance of that node will appear in the center of the Canvas. If you wish to know what the node does before placing it, just hold the mouse cursor over the node button and its help text will appear in the *Reference Panel*.



By default, the Toolbox contains the following node categories:

**Actions** - This section contains all the basic action nodes. Action nodes are the basic building block for creating all complex logic in uScript. For more information on Action nodes, see "Node Types" in the *Working With uScript* section.

**Conditions** - This section contains most of the Action nodes related to comparing variables and other key environment data. While they work the same as other Action nodes, they were broken out into their own section for ease in finding them since they play a key role in building complex logic.

**Events** - This section contains all the Event nodes. All logic in uScript must initially be triggered by an event, making these nodes a critical part of any uScript graph you create. For more information on Event nodes, see "Node Types" in the *Working With uScript* section.

**Graphs** - Optional. This section is only displayed if your Unity project contains special uScript graphs called Nested Graphs. Nested Graphs will create nodes you can place in other graphs. They are very powerful because they let you visually create new nodes for uScript. For more information on Nested Graphs and Nested Nodes, please see the "Graph Types" topic in *Working With uScript*.

**Reflected ( )** - This section contains all the nodes (including Actions, Properties, and Variables) that have been reflected by uScript from your Unity project. This section will contain the name of your currently loaded scene if you have one loaded such as "Reflected (*YourSceneName*)". The idea is that uScript can only reflect things that are available in your currently loaded Unity scene. For more information on Reflection, see the "Reflected Nodes" topic in the Working With uScript section.

**Variables** - This section contains all the basic variable nodes that are more commonly used by uScript when creating graphs. If you can't find a variable type you are looking for here, try looking in the Reflected ( ) section for a complete list of all variables. For more information on variables, see the "Variables" topic in the Working With uScript section.

The following nodes are also shown in the root of the Toolbox:

**Comment** - This node button allows you to place a special node on your graph that you can use to write comment text in.

**External Connection** - This node button allows you to place an External Connection in your graph. External Connections are used when making Nested Nodes. To learn more about Nested Nodes, see the Nested Graphs section of the "Graph Types" topic found in the *Working With uScript* section of this guide.

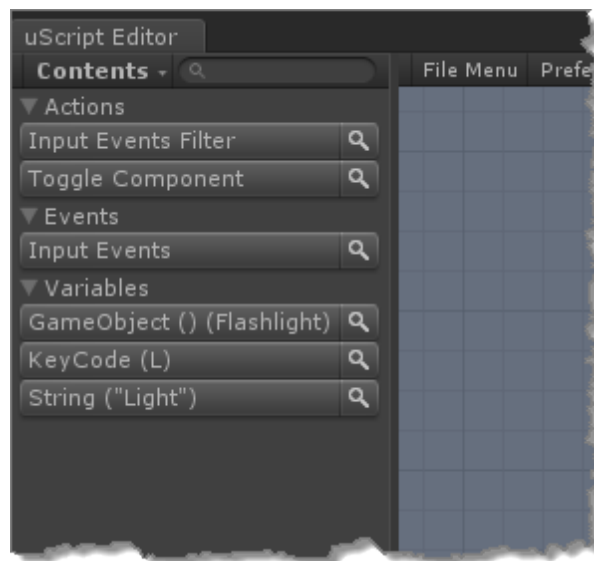
**Tip** - use the small arrow button at the top of the panel next to the search filter field to expand or collapse the entire node tree.

**Tip** - use the filter field at the top of the panel to help you quickly find what nodes you are looking for. Simply start typing key words

*for the Toolbox to filter the nodes it will show. Be mindful though to make sure you clear the selection later to show all the nodes again.*

## Contents

The Contents panel allows you to see a list of all the nodes you currently have on your graph. Pressing the node button will select the node in the graph, updating the Properties panel, and clicking on the little magnifying glass icon on the right of each button will focus the canvas on that node.



This panel can be very useful for helping you navigate around a large graph. For more information on using this panel, See "Canvas Navigation".

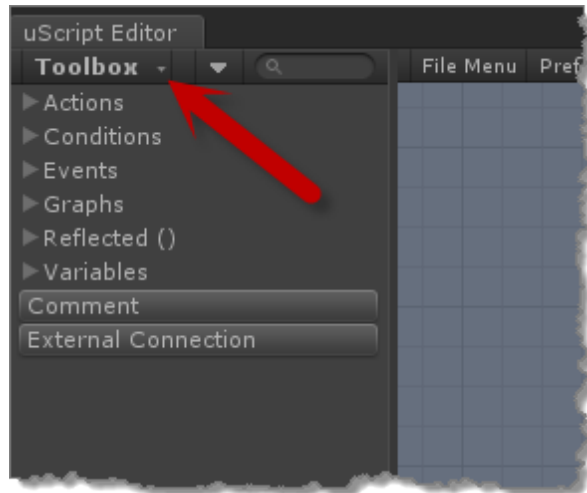
**Tip** - the nodes in your Contents list for nodes that have been deprecated will turn a pink/purple color, allowing you to quickly find them.

**Tip** - use the filter field at the top of the panel to help you find what you are looking for on graphs with many nodes. Be mindful though to make sure you clear the selection later to show all the nodes again.

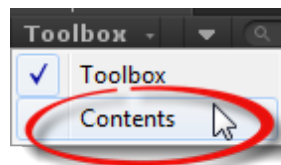
## Changing The Displayed Panel

The panel displayed can be changed by clicking on the panel title pulldown (which is set to *Toolbox* by default). The following example shows you how to change the panel from showing the *Toolbox* to showing the *Contents* panel.

To begin, click here:



And select *Contents* from the pulldown:



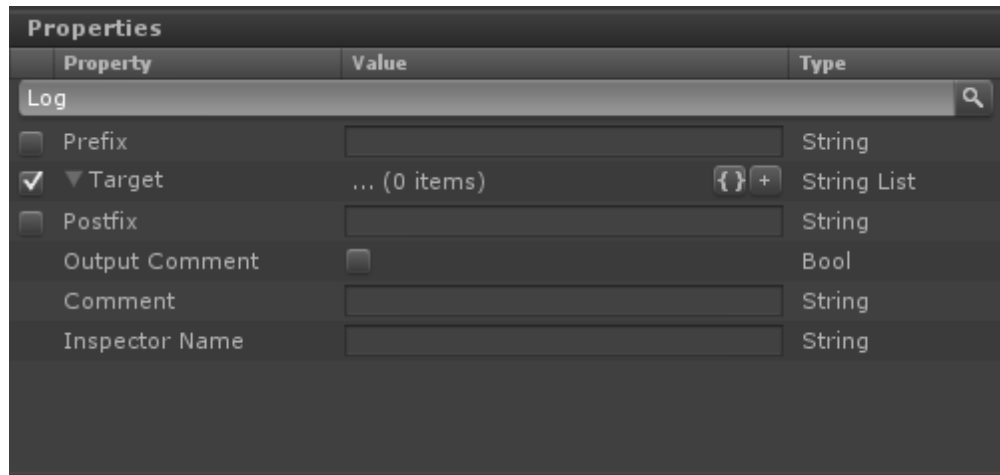
The Contents panel should now be displayed instead of the Toolbox.

## Properties Panel

See **2** in the above image for this panel's location.

This panel displays all the properties for the selected node(s). Here you can set important values and hide or show sockets on the node. By default only one node's properties at a time can be displayed in this panel. If you wish to increase this number, you can do so in uScript's *Preferences Window*. See the "Editor Preferences" topic in the *Discovering uScript* section of the User Guide.

Each node will have a unique set of properties that can be set. Each node also has a default value for its various properties that will be used if not specified. Here is the properties for a Log node:



The Properties Panel is made up of for key columns:

**Socket Shown Checkbox** - the checkboxes in the far left column specify if a given socket should be displayed on the node in the canvas. If it is checked, it will have a corresponding visible socket on that node. If a checkbox is not displayed next to a property, that most likely means that it is either a core property common to most nodes or an optional special property and is used by uScript for informational or debugging purposes only.

**Property** - this shows the name for the property. To learn more about what that specific property does, you can refer to the *Reference Panel* and read the help text for that property.

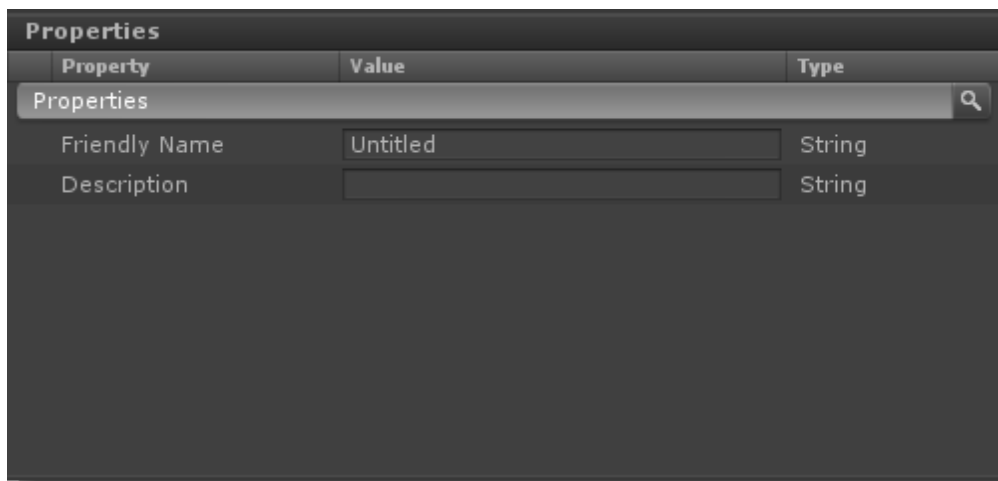
**Value** - this is where you can define the data for each property directly on the node. Optionally, you can hook up Variable Nodes to the node's exposed property sockets to define the node's property data. When a variable node is hooked up to a socket, the value field will become disabled. This is because uScript will always use a variable node's value over what might be defined in the *Property Panel*.

**Value Buttons** - Some properties may have common Unity buttons depending on their type-- such as the asset browser button or the array buttons used to add elements to an array, as shown here:



**Type** - the type column tells you what kind of data or variable is required for each property. See the "Variables" topic in the *Working With uScript* section for more information on variable types.

When no nodes are selected, the properties panel will display the properties for the currently loaded graph:

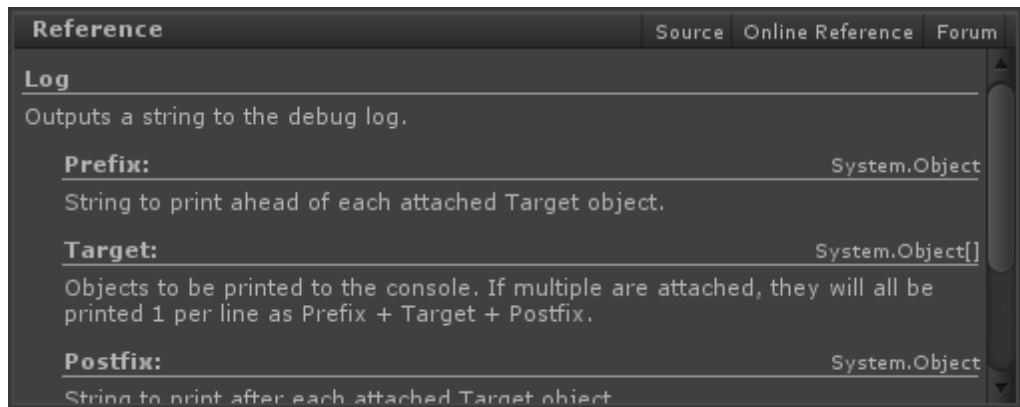


See the *Graph Properties* section of the "Creating Graphs" topic for more information on graph properties.

## Reference Panel

See **3** in the above image for this panel's location.

This panel displays help text of a selected node, or the help text for a node that has focus from the mouse cursor in the Toolbox. The help text for each node is actually generated from the node itself. Also, when making Nested Nodes, you can specify help text in the graph's and External Connection node's properties that will be displayed here (see the *Nested Graph* section of the "Creating Graphs" topic for more details).



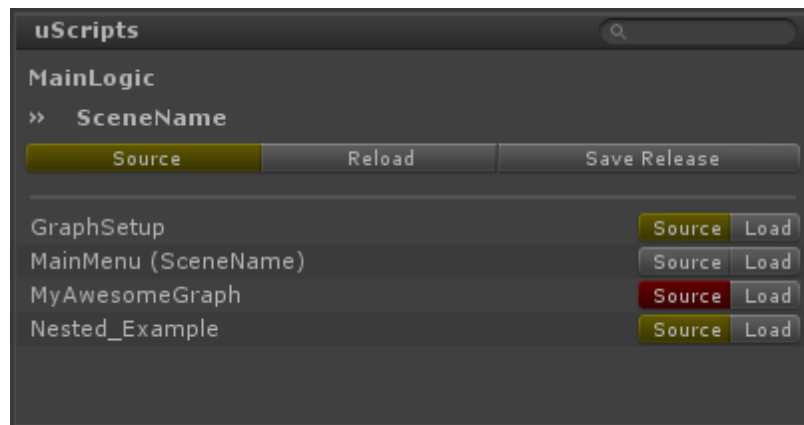
This panel has three buttons in its title bar area:

- **Source** - the source button will use Unity's "ping" feature and show you the source file of that node in Unity's project tab. This button will become disabled if the selected item on the Canvas does not have a corresponding source code file.
- **Online Reference** - this button will launch your default web browser and load the latest online version of the uScript documentation.
- **Forum** - this button will launch your default web browser and load the [uScript Community's forum](#). Our forum is a great place to search for past questions that have been answered, hang out with other uScript users, or ask new questions that may not be answered in the documentation.

## uScripts Panel

See 4 in the above image for this panel's location.

This panel shows you all the graphs you have created in your Unity project. It also gives you some information about your graphs.



This panel has one field in its title bar area. This is a *filter field* and allows you to enter text that can be used to filter the graph files displayed in it's list within the panel's lower section.

The top part of this panel shows you your currently loaded uScript graph (*MainLogic* in this case). If the graph belongs to a specific Unity scene, the scene name will be shown below it (the *MainLogic* graph belongs to the *SceneName* Unity scene in this case). Lastly, there are buttons showing you the current actions that can be done to this graph:

**Source** - this button will use Unity's "ping" feature to show you the source code files that were generated by uScript for this graph. This button is also color coded to help show you the current state of the generated source code files:

**Gray** - the source code files exist and are up to date with the graph.

**Yellow** - the source code files exist, but are not up to date with the graph.

**Red** - the source code files are missing and need to be regenerated (by saving the graph in either *Debug* or *Release* mode).

**Reload** - this button will reload the graph from the latest version that was saved to disk.

**Save Debug/Release/Quick** - this button will save any changes to the graph. It will also regenerate the source code files associated with this graph (unless quick save was chosen).

The bottom part of this panel shows you a full list of all the uScript graphs within the Unity project (unless there is active filter text, in which case only a sub-set of the full graph list might be displayed).

Each graph file shown in the list has two buttons to the right of the file name:

**Source** - this button will use Unity's "ping" feature to show you the source code files that were generated by uScript for this graph. This button is also color coded to help show you the current state of the generated source code files:



**Gray** - the source code files exist and are up to date with the graph.

**Yellow** - the source code files exist, but are not up to date with the graph.

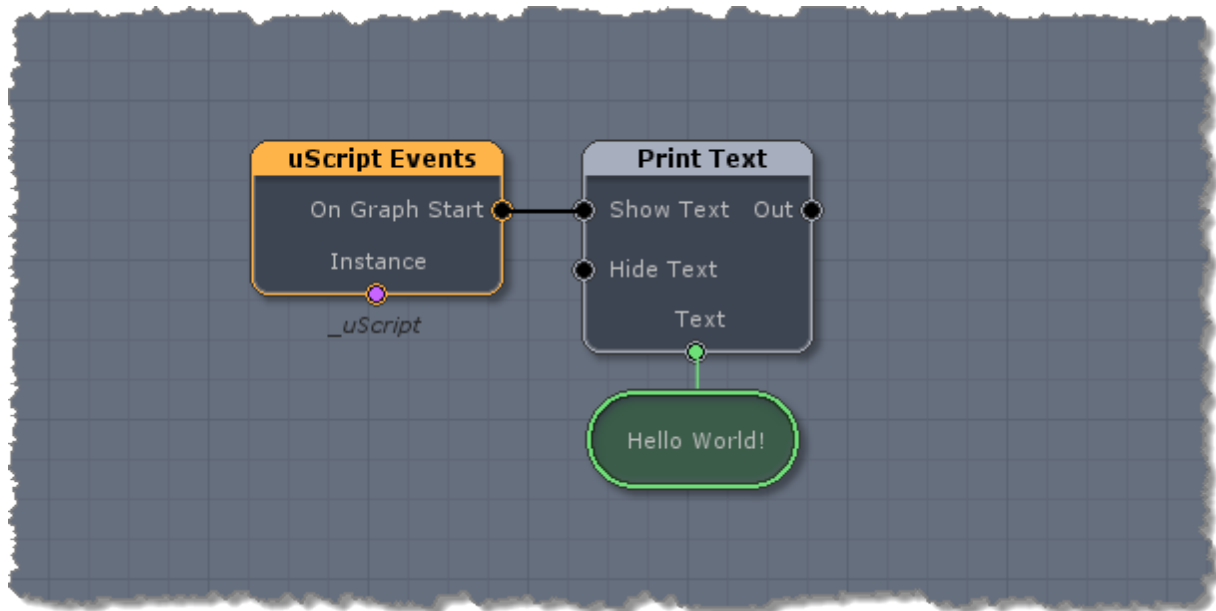
**Red** - the source code files are missing and need to be regenerated (by saving the graph in either *Debug* or *Release* mode).

**Load** - This button will load the selected graph into the uScript Editor. You can also double-click on a file in the list with the left mouse button to load it into uScript.

## Canvas

See **5** in the above image for this panel's location.

The Canvas is where you create your logic graphs by placing and connecting various nodes. At the top of the Canvas is the Menu Bar which is used for file management and editor preferences. See the Canvas Navigation section below for information on making the most out of the Canvas area.



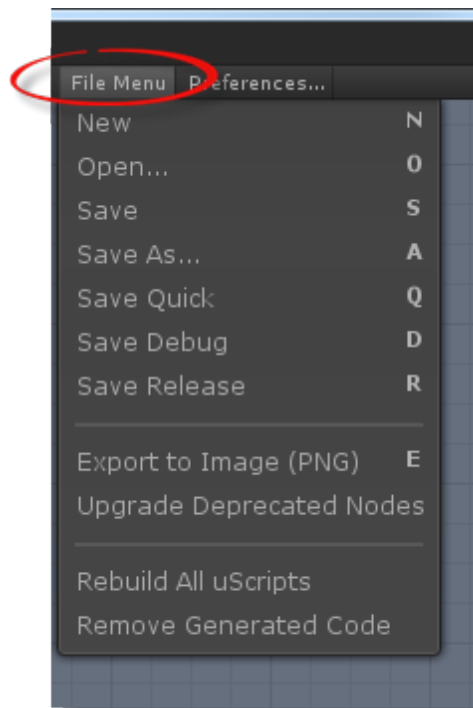
# Menu Bar

Across the top of the Canvas is uScript's menu bar. There are four key items found here that are explained below.



## File Menu

The file menu is where you can perform file-based operations such as saving and loading uScript graphs or deleting and regenerating uScript graph code files. Click the *File Menu* button to expand it:



## Menu Items

The following items can be found in the File Menu:

**New** - use this to create a blank/new uScript graph for your project.

**Open...** - open an existing uScript graph in your project.

**Save** - save the currently open graph using the current set save mode (*Debug*, *Release*, or *Quick*). To set the save mode, use the *Save Method*

*pull*down also found on the Canvas Menu Bar. If you have not already saved the open graph, this will function the same as the "Save As..." option below.

**Save As...** - saves the currently open graph as a new graph file. You will be asked to specify a name for the graph when using this option.

**Save Quick** - save the currently open graph using the Quick save method. This save method is useful when you wish to save some changes to your graph without having to wait for Unity to recompile the generated script files. It will **NOT** generate the code files like using the other "Save" menu items. If you use this quick save option, make sure you perform a full Save (release or debug) before running the game (*pressing Play in Unity*).

**Save Debug** - save the currently open graph using the Debug save method. Saving graphs as debug will allow you to step debug your graphs by using breakpoints by generating script files with extra debug information used by uScript. See the Visual Debugging section of the "Debugging Your Graphs" section for more information on debugging.

**Save Release** - save the currently open graph using the Release save method. This is the method that should be used when saving out your graphs for releasing your game. Saving graphs this way creates smaller, more optimized generated script files. You will not be able to use visual step debugging when saving your graphs this way.

**Export to Image (PNG)** - this will allow you to export your graph as a .png image file. This can be a great way to print out your graphs on a plotter or to post an image of your graph in a forum or as part of a tutorial.

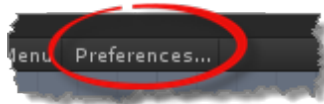
**Upgrade Deprecated Nodes** - useful for auto-updating all deprecated nodes on your graph at once. You should only use this option if you are sure you wish to have all your nodes updated automatically. You may wish to review each node that needs updating to see if any data might be potentially lost that you care about. See "Pink Nodes" in the *Working With uScript* section for more information on deprecated nodes.

**Rebuild All uScripts** - this will tell uScript to regenerate the script code for all of the uScript graphs in your Unity project. This can be useful if you have updated custom nodes and they cause Unity to generate compile errors on your existing graphs generated script code. This action is best done with a blank Unity scene loaded to help prevent data loss.

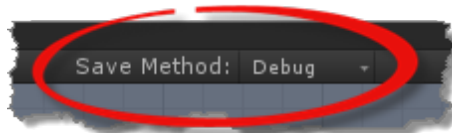
**Remove Generated Code** - uScript relies on Unity to be able to fully compile it to function properly. If for some reason Unity is having trouble compiling the generated script files, you can quickly delete all of your generated script files with this option. Don't worry though- no work would be lost. As long as your *.uscript* files remain in the project, uScript can always rebuild the generated script code. Note however that you should **NOT** save any Unity scenes while these files are missing as it could cause your scene's connection to the uScript graphs to be lost (and will require manual hookup). This action is best done with a blank Unity scene loaded to help prevent data loss.

## Preferences Button

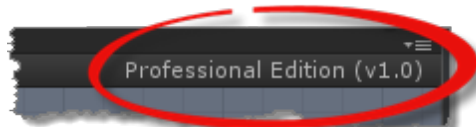
Use the Preferences button to bring up uScript's Preferences Window. This window allows you to customize some aspects of uScript. See "Editor Preferences" for more information.



**3. Save Method Pulldown** - this pulldown allows you quick access to uScript's preference setting of how uScript should save scripts when saving. See the "Save Method" section in the "Editor Preferences" topic for more information.



**4. uScript Version Information** - the right-most section of the menu bar shows you what version, and version number, of uScript you are currently running.



# Canvas Navigation

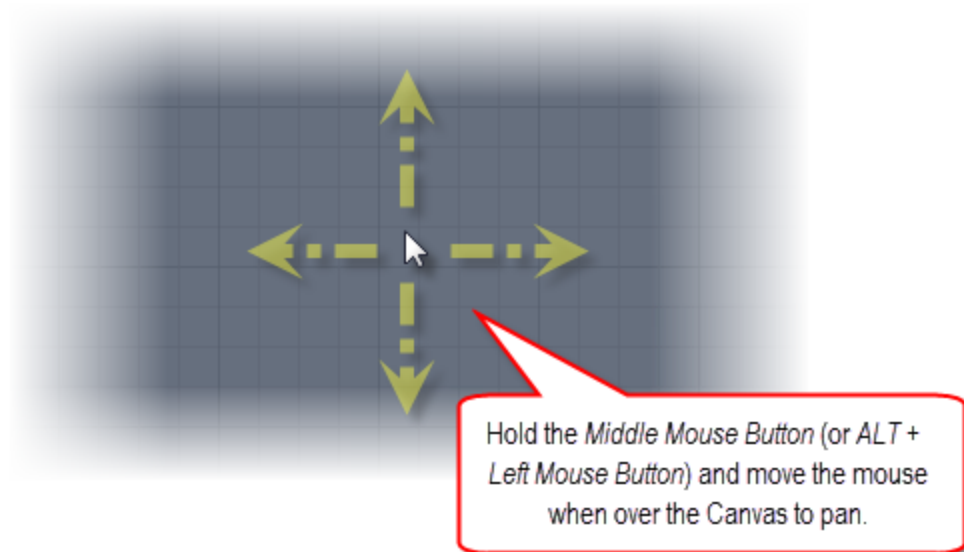
The Canvas is the section of uScript where you create and edit your visual graphs. The uScript Canvas is infinitely large, allowing you to move out in any direction from the initial "home" position in order to create as much visual logic as you like. This of course though leads to the problem of making sure you can still find everything you have created and to quickly be able to move to where you wish to be on the Canvas.

**Note!** - learn the hot-keys you can use with the Canvas to really become a power user! See "Hot-Keys"

## Moving Around The Canvas

### Panning

One of the first thing you will want to do is to pan the Canvas around. This is easily accomplished by holding down the *Middle Mouse Button* while over the Canvas and moving the mouse. If you don't have access to a mouse with a middle mouse button, you can optionally use *ALT + Left Mouse Button* instead.



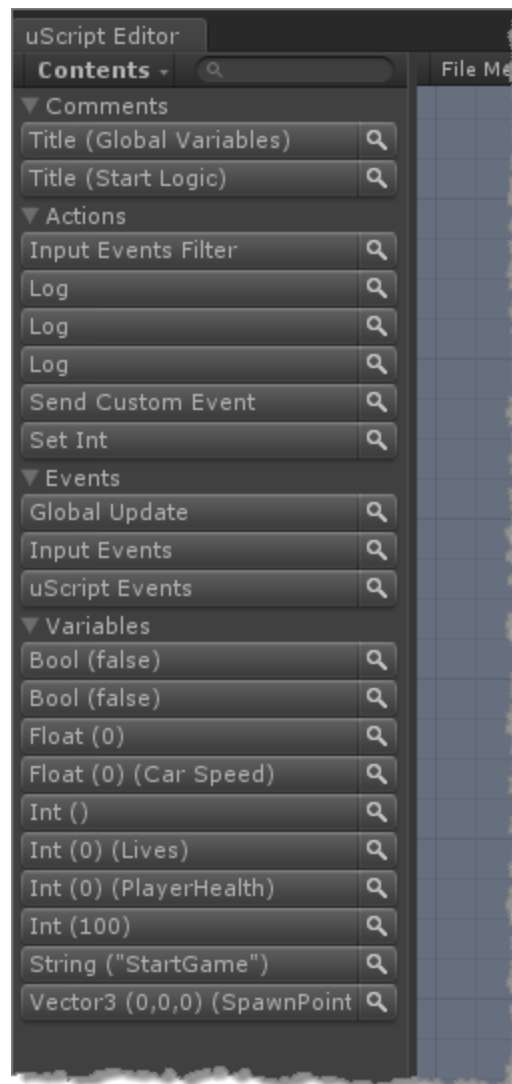
## Other Ways To Get Around

uScript also offers several other useful ways to get around the Canvas and find what you are looking for.

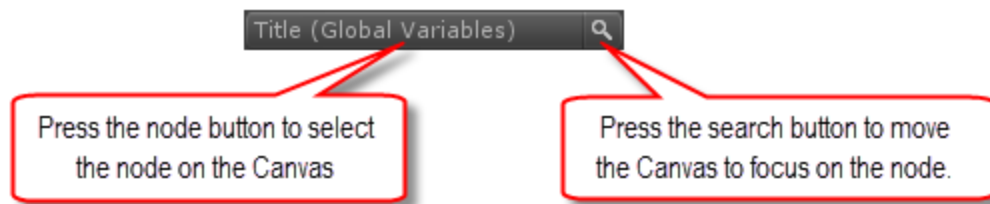
### Contents Panel

The Contents Panel can be a great way to see all the nodes currently on the Canvas. It also allows you to quickly select the nodes or jump the Canvas focus to a node. For information on accessing the Contents Panel, see "Editor Interface".

Here is an example of the contents Panel for a graph with several nodes on it:



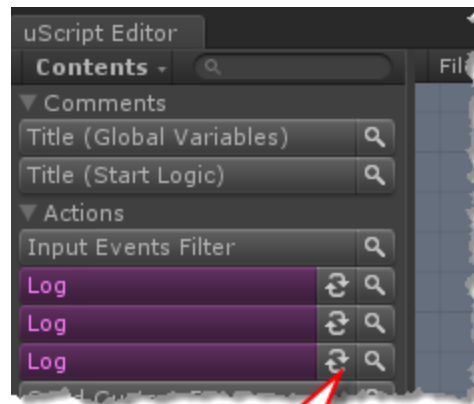
Each "node button" in the list allows you to either select the node (by clicking on the node button itself) or move the Canvas view to center over the selected node (by pressing the search button on the right side of each node button):



Nodes can also be multi-selected by holding down the SHIFT key while clicking on the node buttons:

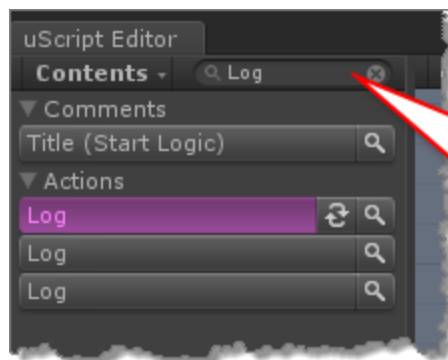


When nodes on the Canvas are out of date, either because they have been updated in a way that might cause data changes or loss or because the Deprecated attribute was added to a node, the node button for that node will show up as a purple/pink color and add a new button option for the node, allowing you to update the node:



Pres the Update button on a node button to update it to the latest version.

You can also use the Search Filter Field to help you narrow down the nodes visible in the list to help you find things quickly:



Use the search filter field to find specific nodes when you have a large number of nodes on the Canvas.

## Home Key

You can use the HOME key to quickly reset the Canvas position to it's center.

## Event Node Focusing

Since all graph logic starts with an Event Node, it can be very helpful to quickly jump Canvas focus between the events nodes to find the logic you are looking for. In uScript you can do this by pressing the bracket keys on the keyboard ( "[" and "]" ). These two hot-keys will move the canvas focus to the next/previous Event Node.



## Canvas Zooming

To zoom the Canvas in and out, you can use the *Scroll Wheel* on your mouse. If you do not have access to a *Scroll Wheel* on your mouse (or equivalent on laptop touchpads), we also have some hot-keys to allow for zooming.

### Fixed Zooming

You can also perform fixed zooming using keyboard hot-keys. Fixed zooming means that uScript will auto zoom to specific percentages when the key is pressed. This allows for much faster zooming with hot-keys.

The hot-keys to zoom are the:

- **MINUS** key (-) - zooms out at 10% increments
- **EQUALS** key (=) - zooms in at 10% increments
- **ZERO** key (0) - resets the zoom level to 100%

**Note!** - *these hot-keys are on the main keyboard. The same keys on the numeric pad of keyboards that have them will **not** work (as they are different keys).*

## Node Manipulation

Once you know how to move around the Canvas, the next most important step is to be able to manipulate the nodes on the Canvas.

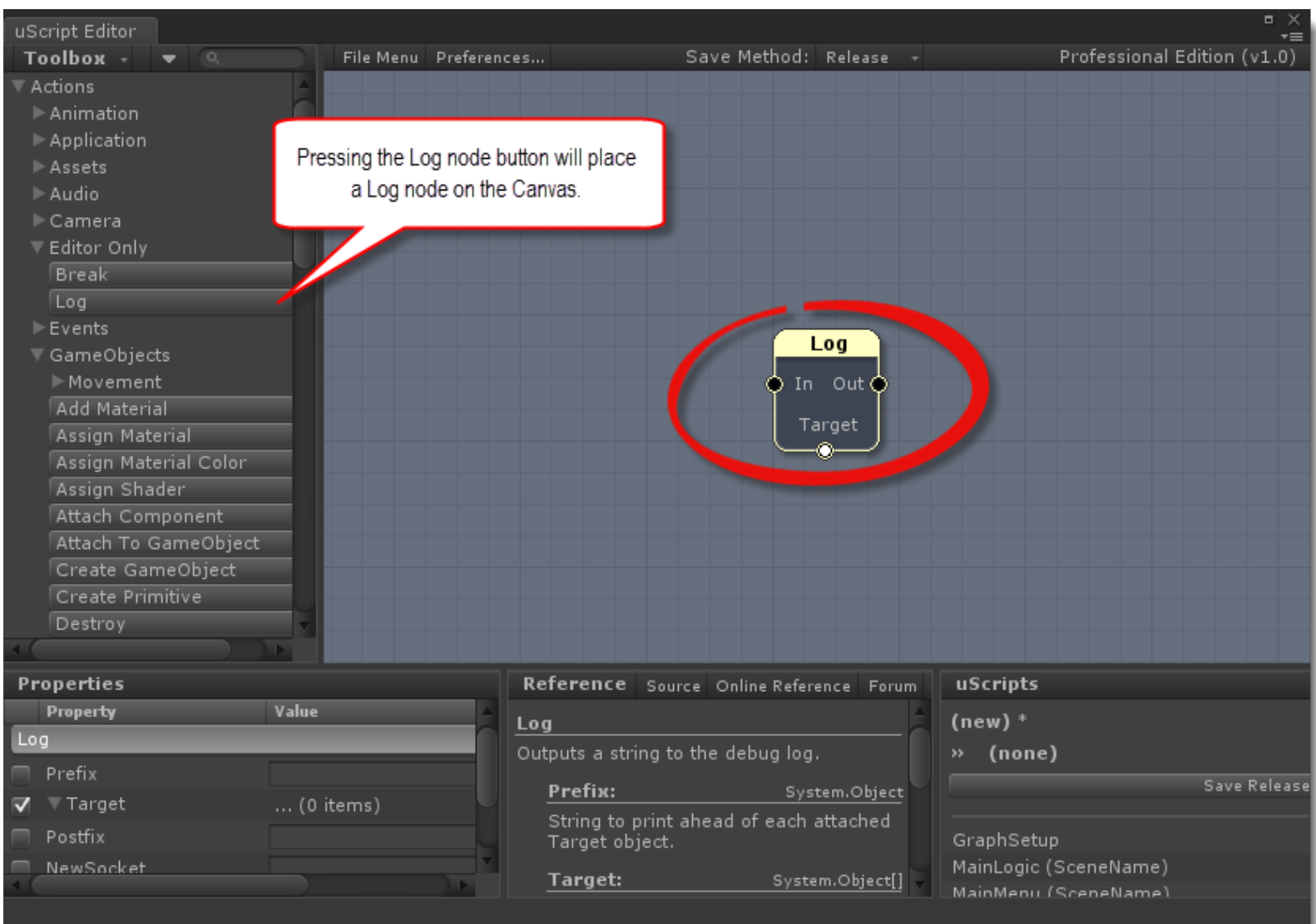
**Note!** - *all node manipulation can be undone using the Undo/Redo system in Unity. Simply use the standard Undo/Redo hot-keys; CONTROL+Z for Undo and CONTROL+Y for Redo (Use COMMAND instead of CONTROL on the Mac)*

### Placing Nodes

There are three main ways to place a new node on the Canvas.

## Using The Toolbox

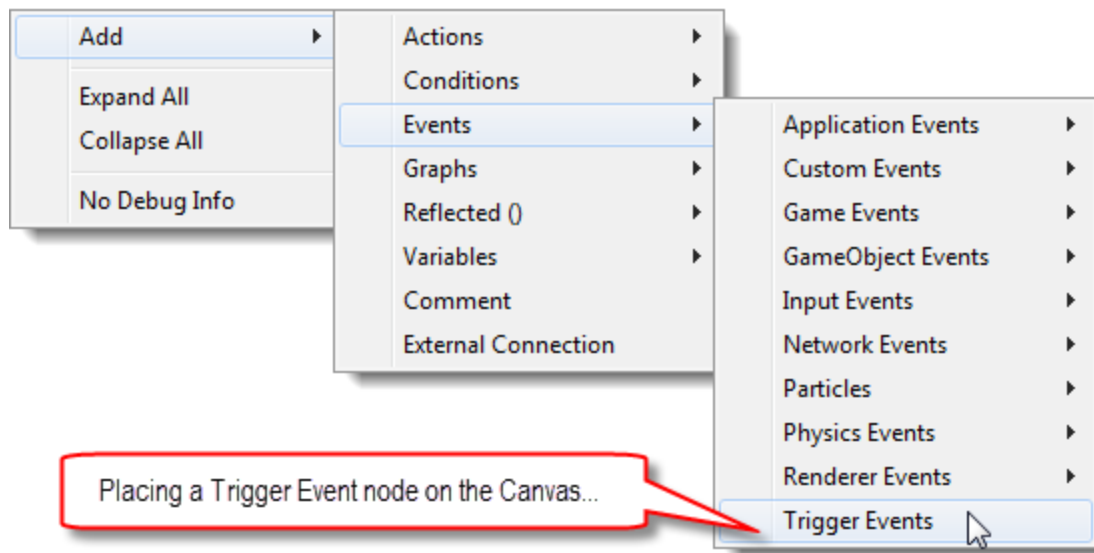
The first is to select the node's node button on the Toolbox. Clicking on the node button will place an instance of that node in the center of the visible Canvas and automatically selects the new node:



## Canvas Context Menu

Another way to place new nodes is to Right-Click on the Canvas and use the Canvas Context Menu. Once the Context Menu appears, go to the "Add" section and navigate to

the node you wish to place. Once you have selected the node you want, it will be placed at the position on the Canvas where you right-clicked:



## Copy Paste An Existing Node

Lastly, you can simply copy an existing node on the Canvas and paste it as a new node. When you do this, the new node will have all the same settings as the old node you copied it from. However, no connection hooked into the original node will be made, allowing you to quickly setup a new node based on an existing one.

## Selecting Nodes

To select nodes on the Canvas just Left-Click on the node you wish to select. It will highlight with a yellow border. To deselect a node (or multiple nodes), just Left-Click on a blank area of the Canvas grid.

If you wish to select more than a single node at a time, you can also use the following hot-keys:

- **CTRL+A** - this will select all nodes on the Canvas.
- **SHIFT+Left-Click** - allows you to multi-select node and toggle their selection state on or off.

## Selection Box

Lastly, you can draw a selection box. This will select all nodes that it touches. To create a selection box, just Left-Click on the Canvas and drag the mouse cursor. The selection box will be drawn out as you move the mouse cursor away from its starting location.

You can also use the following hot-keys with box selection:

- **SHIFT** - holding the SHIFT key while doing a box selection will add new nodes to the current selection.
- **CONTROL** - holding the CONTROL (CMD on Mac) key, will remove nodes from the current selection.

## Contents Panel

You can also select nodes by using the Contents Panel. Information on using the Contents Panel to select nodes can be found above in this section.

## Moving Nodes

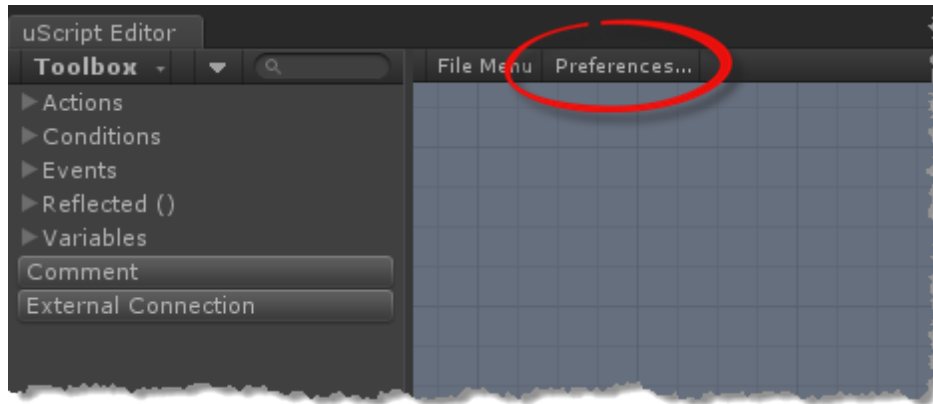
Moving nodes is as simple as Left-Clicking on a node and dragging it with the mouse. If more than one node is currently selected, just Left-Click on any one of them to drag them all together.

## Deleting Nodes

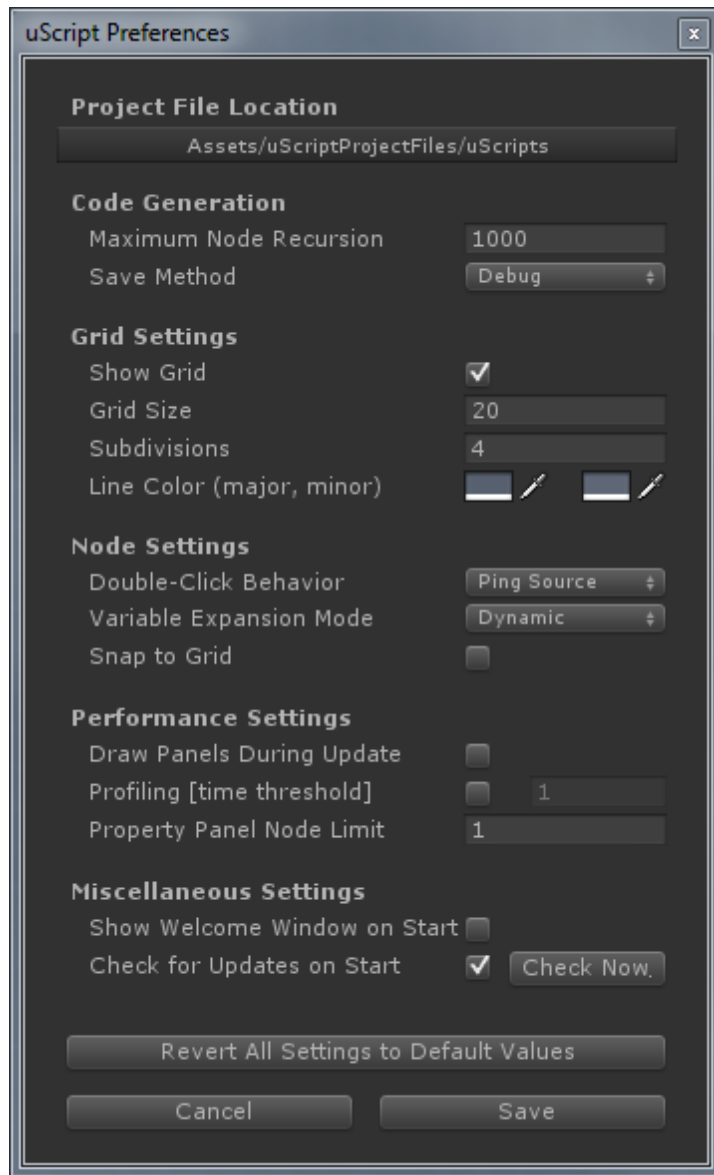
To delete nodes, first you must select them. Press the DELETE or BACKSPACE key to delete selected nodes on the Canvas.

# Editor Preferences

The uScript Editor has a few preferences that you can set to your liking. uScript's preferences can be accessed by pressing the Preferences button above the Canvas in the top left of the uScript Editor.



Pressing the button will cause the uScript Preferences window to appear:



## Preference Settings

The following describes what each setting does. Press the "*Revert All Settings to Default Values*" button to reset uScript settings to their default values.

**Note!** - The settings file used by uScript is created when uScript first runs and can be located at *../Assets-/uScriptProjectFiles/uScriptSettings.settings* by default.

## Project File Location

### Path Button

**Default Value:** *Assets/uScriptProjectFiles/uScripts*

**Legal Values:** *Any legal path within your project's Assets folder.*

This button allows you to modify where uScript will save its graph and generated code files in your project.

## Code Generation

### Maximum Node Recursion

**Default Value:** *1000*

**Legal Values:** *100 - 1000*

Defines a maximum number of times that code generate by uScript will be allowed to call itself (loop/recurs) when generating scripts in debug mode. If you exceed this number, uScript will warn you. This helps to prevent creating infinite loop cases that would cause Unity to become unresponsive.

### Save Method

**Default Value:** *Debug*

**Legal Values:** *Quick, Debug, Release*

Lets you specify the default save type for uScript.

- **Quick** - uScript will only save the .uscript graph file and will not try to generate a C# script from the graph. This is useful when you want to save quick changes without having to wait for Unity to compile the generated script code. Please note, that if you run your project after saving this way, you will not see any of your changes in the running game because no new code was generated by uScript.
- **Debug** - uScript will generate scripts for your graphs on save. These graphs will contain extra debug information used by uScript allowing you to perform step debugging of your graphs.
- **Release** - uScript will generate scripts for your graphs on save. The generated graphs will be stripped of any debug information that uScript uses. You cannot perform step debugging of your graph if saved this way.

## Grid Settings

### Show Grid

**Default Value:** *Checked*

**Legal Values:** *Checked, Unchecked*

Determines if the Canvas background grid will be shown.

### Grid Size

**Default Value:** *20*

**Legal Values:** *8 - 100*

Specifies the space, in pixels, between the grid lines of the Canvas background graph.

### Grid Major Line Spacing

**Default Value:** *4*

**Legal Values:** *1 - 10*

Specifies the spacing of the major grid lines of the Canvas background graph.

### Grid Color Major

**Default Value:** *R:87 B:96 G:110 A:255*

**Legal Values:** *R:0-25 B:0-25 G:0-255 A:0-255*

Specifies the color of the major grid lines of the Canvas background graph.

### Grid Color Minor

**Default Value:** *R:95 B:103 G:118 A:255*

**Legal Values:** *R:0-25 B:0-25 G:0-255 A:0-255*

Specifies the color of the minor grid lines of the Canvas background graph.

## Node Settings

### Double-Click Behavior

**Default Value:** *Ping Source*

**Legal Values:** *Ping Source, Open Source, Load Graph Ping Source, Load Graph Open Source*



Defines how uScript should handle double-clicking on nodes with the left mouse button.

- **Ping Source** - uScript will use Unity's "ping" feature to highlight the node's source file in the Unity project tab. Nested graph nodes will focus on their generated .cs script file.
- **Open Source** - uScript will tell Unity to open the node's source file in the source code editor defined in Unity's settings. Nested graph nodes will open their generated .cs script file.
- **Load Graph Ping Source** - Performs the same as *Ping Source* with the exception that if you double-clicked on a nested graph node, it will load that nested graph into the editor instead of pinging it.
- **Load Graph Open Source** - Performs the same as *Open Source* with the exception that if you double-clicked on a nested graph node, it will load that nested graph into the editor instead of opening its source .cs script in the default source code editor.

## Variable Expansion Mode

**Default Value:** *Dynamic*

**Legal Values:** *Always Expanded, Always Collapsed, Dynamic*

Defines how uScript should handle displaying variable nodes when they are selected.

- **Always Expanded** - uScript will always show variables nodes fully expanded to fit the value it contains.
- **Always Collapsed** - uScript will truncate variable node values and display the node as a circle regardless if it is selected or not.
- **Dynamic** - uScript will truncate variable node values and display the node as a circle when not selected and expand them to show the full value when selected.

## Snap to Grid

**Default Value:** *Unchecked*

**Legal Values:** *Checked, Unchecked*

Specifies if uScript should snap node to the grid. uScript supports simple snapping that will snap the top left corner of nodes to the grid.

## Performance Settings

### Draw Panels During Update

**Default Value:** *Unchecked*

**Legal Values:** *Checked, Unchecked*

Specifies if uScript should draw the contents of its various UI panels when panning in the Canvas. Because of the massive amount of UI elements that need to be drawn in the uScript Editor you can dedicate all of your CPU's power to more smoothly render the Canvas while it is moving if uScript does not need to redraw the UI elements of the panels at the same time.

### Profiling [time threshold]

**Default Value:** *Unchecked (time threshold: 1)*

**Legal Values:** *Checked, Unchecked (time threshold: 0.01 - 10)*

This setting is used for uScript debugging purposes only. It allows uScript to print out useful information to Unity's console window related to the time being spent in various parts of uScript's code. The time threshold determines what minimum time needs to elapse in a section of code before printing to the Unity console. This setting should remain off unless you are specifically working with Detox Studios LLC to help debug a performance issue.

### Property Panel Node Limit

**Default Value:** *1*

**Legal Values:** *1 - 20*

Defines how many selected nodes can display their properties in uScript's Properties Panel at the same time. Setting this to greater than 1 can be helpful if you wish to compare the properties of multiple nodes at once. Setting this number too high may cause performance slowdowns of the uScript editor when multiple nodes are selected at the same time on slower computers.

## Miscellaneous Settings

### Show Welcome Window On Start

**Default Value:** *Specified by the user when first running uScript.*

**Legal Values:** *Checked, Unchecked*

Determines if uScript shows its Welcome Window containing helpful links when the uScript Editor is run.

## **Check For Updates On Start**

**Default Value:** *Specified by the user when first running uScript.*

**Legal Values:** *Checked, Unchecked*

Determines if uScript checks to see if an updated version of uScript is available for download when the uScript Editor is run.

# Working With uScript

This section of the user guide provides information on working with uScript to create your own visual logic. We do this by describing the various features of uScript as well as providing simple examples of using the various nodes in combination.

# Key Concepts

Before you start working with uScript, and to get the most out of it, it is important that you have a good understanding of key concepts for both Unity and uScript.

While uScript's purpose is to unleash the power of programming to those without programming experience, you still need to have an understanding of Unity terminology and its various systems and features.

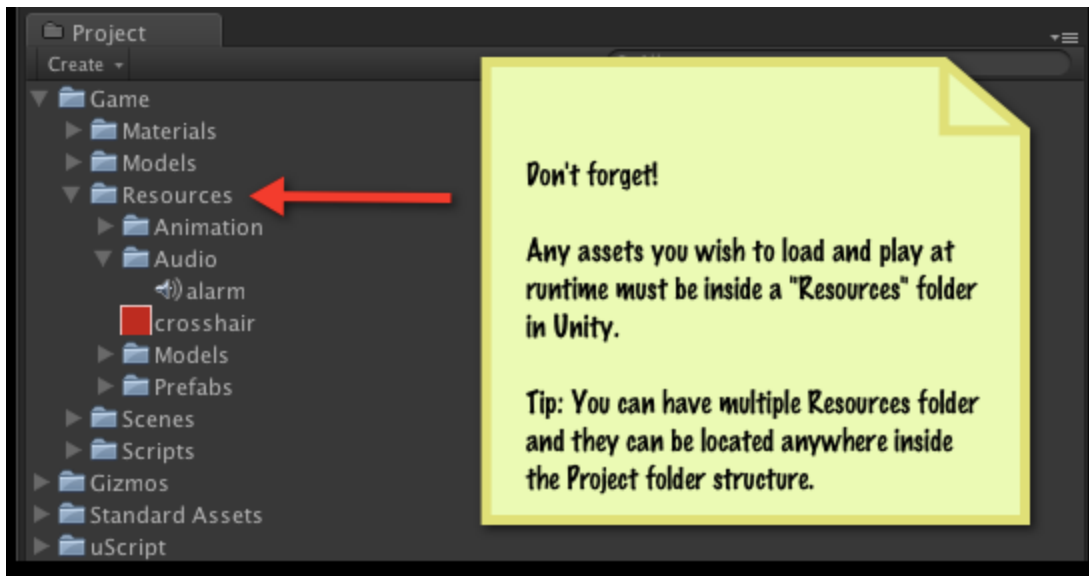
Also, please see the Unity prerequisites area of the "Setting Expectations" topic in the Introduction section for a list of specific Unity concepts we highly recommend you know how to use.

## *Playing Assets At Runtime*

One of the first things many people usually wish to try with uScript is to do something with an existing asset in their game such as spawn a prefab, play a sound or animation, or use some other kind of asset such as a Texture2D, GUISkin, Font, etc. It is important to remember that uScript must follow Unity's rules when it comes to doing this!

## **Using a Resources Folder**

Putting all your assets into a Resources folder is the first/easiest way to access assets to stream in at runtime when you build the game. Unity requires that any asset that is not present in the game/scene in the editor, must be put into a "Resources" folder in order to be loaded while the game is running:

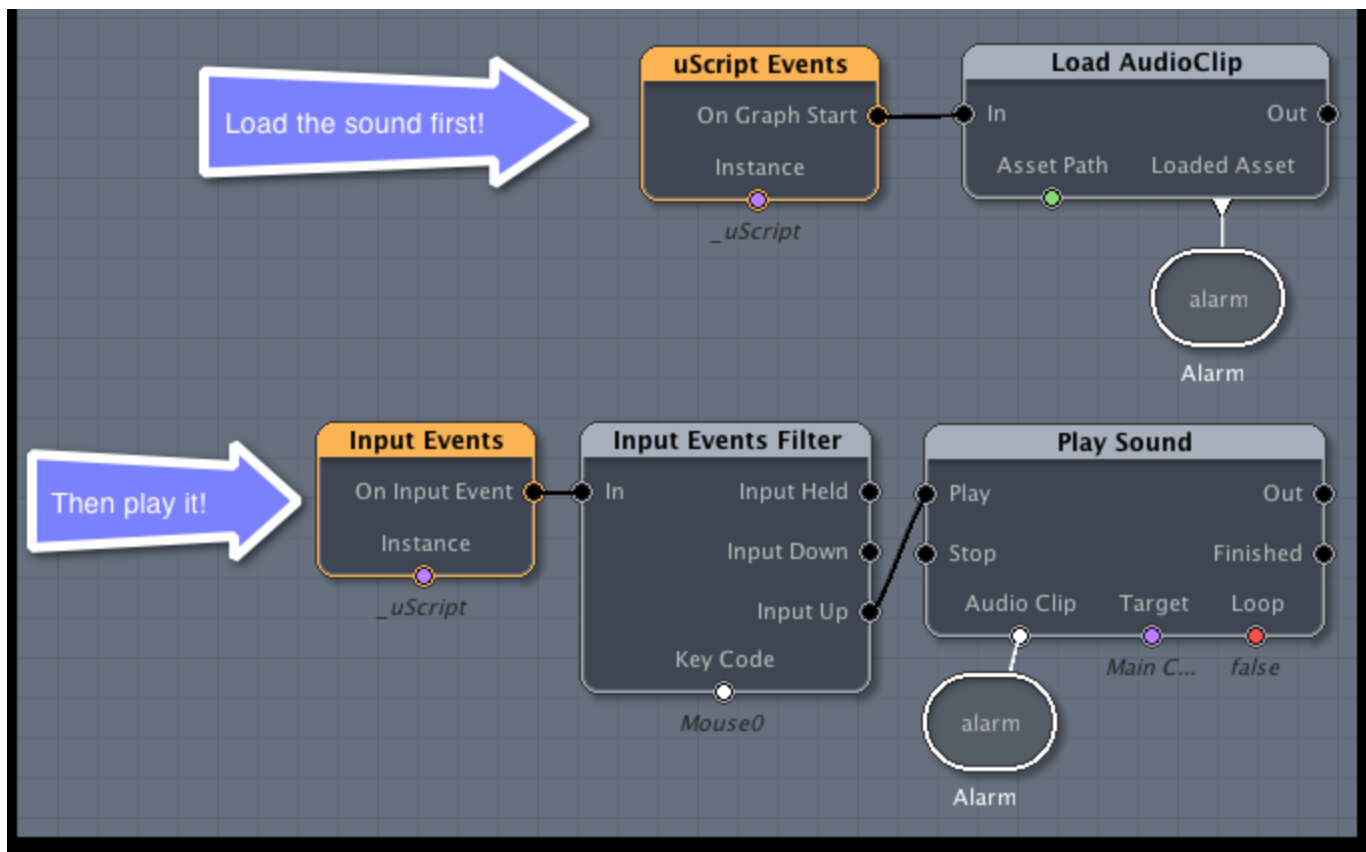


We recommend you familiarize yourself with this aspect of Unity so you understand how it works and what the tradeoffs are. You can read more about the Resources folder here in Unity's documentation:

**Unity Documentation:** [Loading Resources At Runtime](http://unity3d.com/support/documentation/Manual/Loading%20Resources%20at%20Runtime.html) -  
<http://unity3d.com/support/documentation/Manual/Loading%20Resources%20at%20Runtime.html>

If using the Resources folder to stream your assets into the game at runtime, the most important thing to remember is that you will need to load the asset in uScript by using a Load <Asset Type> node before you can use access that asset with other nodes that wish to use it.

Here is an example of a sound loaded into uScript when the scene first runs and then other logic that plays the sound whenever the left mouse button is pressed:



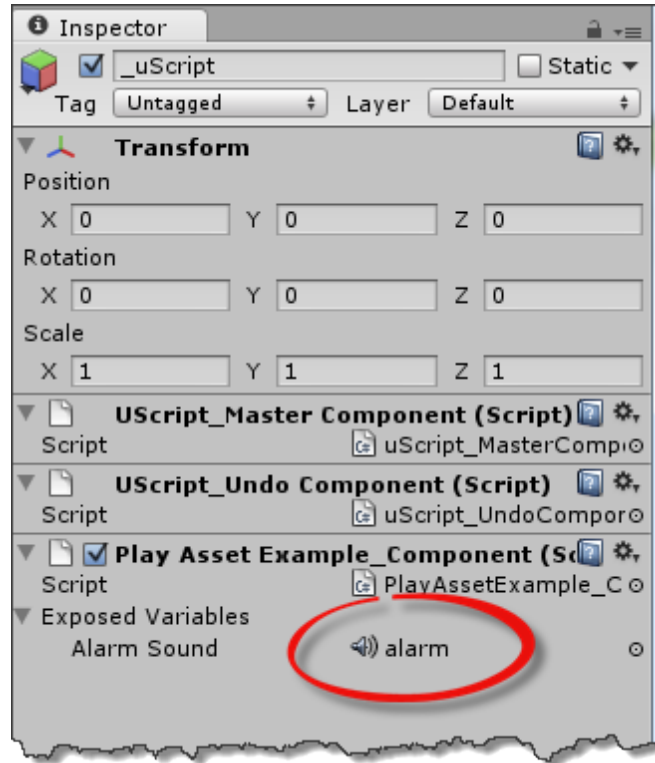
**Note!** - You do **NOT** need to load animations or prefabs through a Load <Asset Type> node like other assets. This is because all animations need to be assigned to GameObjects in the editor so it is assumed if the GameObject or prefab is in the Unity scene, the animations have been loaded by Unity as well.

### Using Exposed Named Variables

Another way you can access assets at runtime is to assign the asset to a named variable you have exposed in uScript (see Named Variables section within the "Variables" topic in the Working With uScript section of this guide for details regarding exposing Named Variables).

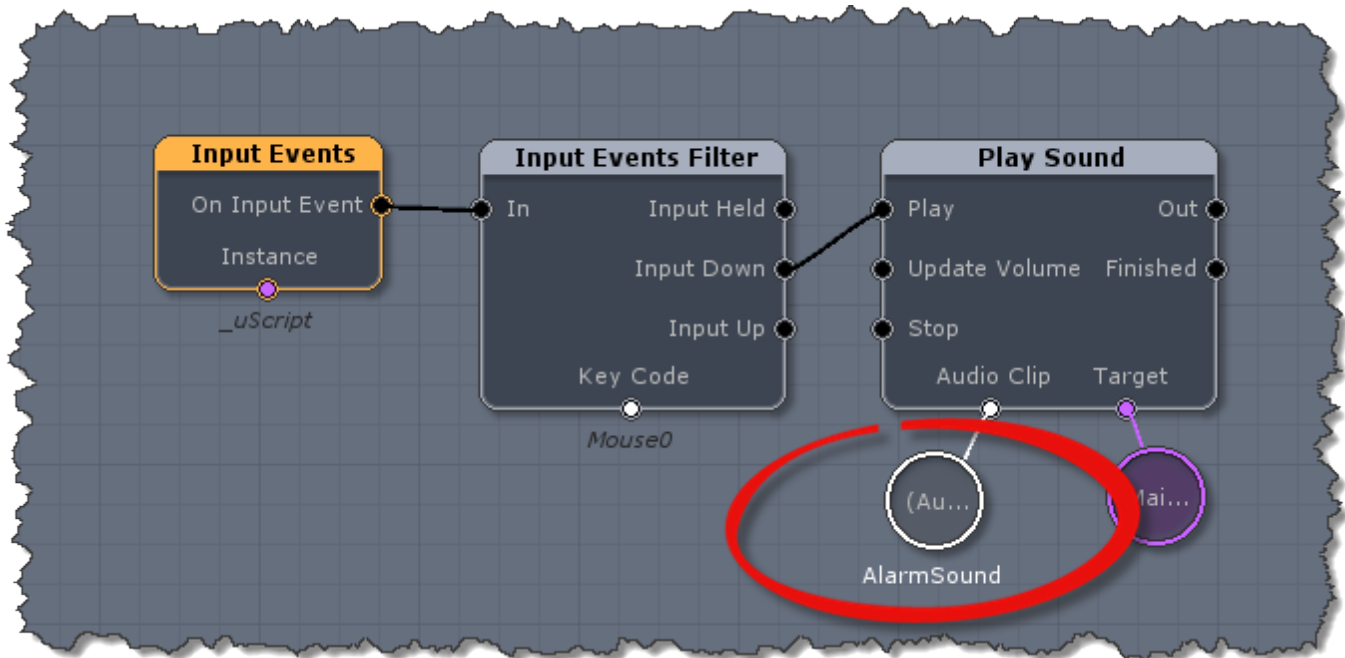
When an asset has been assigned to an exposed variable, Unity knows that it should package up that asset when building the game, so there is no need to manually load that asset from a Resources folder beforehand. This also means that you do not need to have your asset in a Resources folder at all when using this method.

Here is an example of assigning an Audio asset to an exposed Named Variable on a graph called *PlayAssetExample* that is assigned to the *\_uScript* GameObject (an AudioClip variable called *AlarmSound*):



Now that the AudioClip is assigned, we can just tell Unity to play it whenever we like without the need of having to load the asset beforehand:

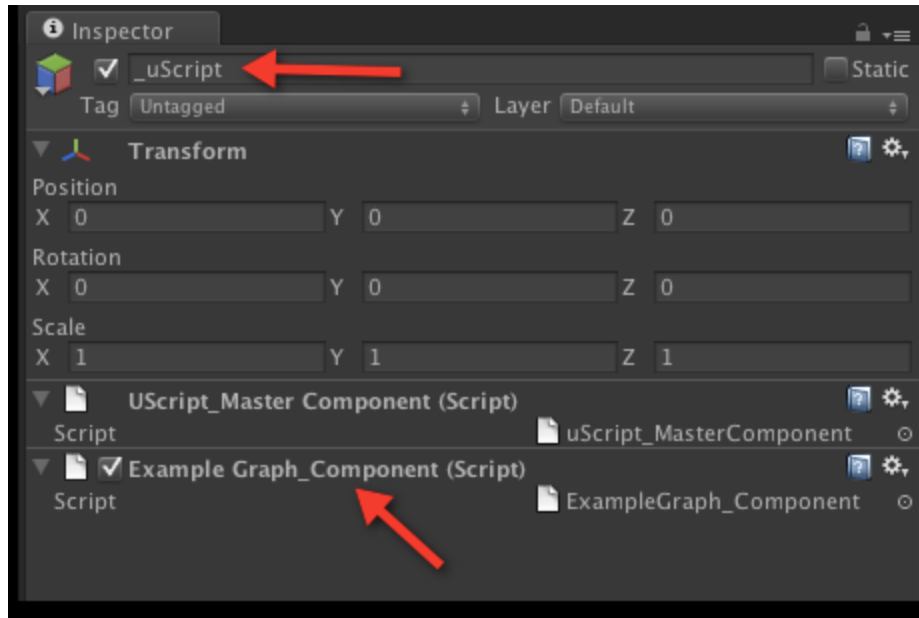




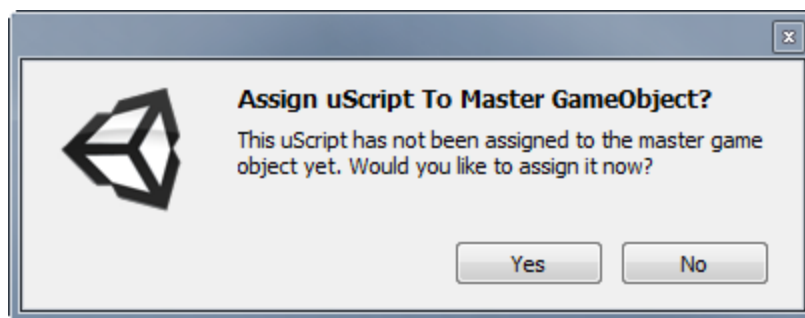
### **\_uScript Master GameObject**

uScript needs to make a GameObject for itself that contains key uScript components. The default name for this GameObject is "\_uScript". For your graphs to work in your scene, they must be assigned to a GameObject. In most cases they can just be assigned to the master uScript GameObject unless you are doing something specific like Nested or Prefab uScript graphs (see the "Graph Types" topic in the Working With uScript section for more information about graph types).

In this case the graph we saved was called "*ExampleGraph*". uScript will generate a component script file and append "\_Component" to the end of the name. This graph component is what is assigned to the GameObject for the uScript graph to be active in the Unity scene:



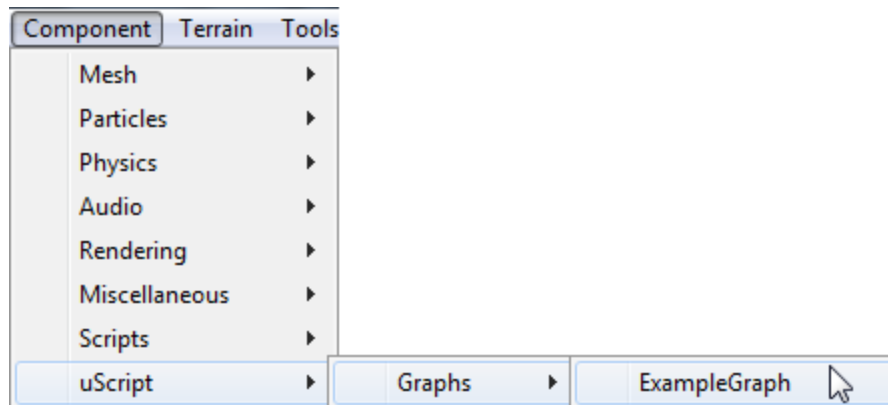
When you first save a new graph, uScript will ask if you would like to attach it to the master GameObject. Just press Yes to have the graph's generated code component to be assigned automatically. If you choose No, then uScript will not assign your graph to any GameObject and you will need to manually assign it to your GameObject of choice.



**Note!** - *Selecting No is useful for graphs that you wish to assign to Prefabs or not have assigned in the scene at all (like for Nested Graphs).*

If for some reason you wish to manually assign your graphs to the `_uScript` master GameObject (or any other GameObject in your Unity scene), just locate the generated code component file (it will be called `YourGraphName_Component.cs`) and drag it onto the GameObject's inspector panel. You can

also assign the graph component from Unity's Component menu. Just go to the uScript/Graphs section and choose the graph component you want to assign.



### ***uScript Files***

uScript currently generates three files for each uScript graph you create. These files will be located in your project's root assets folder in *uScript-ProjectFiles/uScripts/* by default. Let's assume you create a new uScript graph called "MyGreatGame"—these are the files uScript would generate:

- **MyGreatGame.uscript** – This is the “master” binary file that uScript uses to save your uScript graph. You don't want to delete this file (unless you want to actually delete the uScript permanently). This file can generate/re-generate the other two code files below at any time. Sometimes you will need to regenerate the code files from this file when uScript has been updated and you receive compile warnings or errors from Unity.

uScript uses the above master graph file to automatically generate the following code files whenever the graph is saved (with the exception of Quick Save) or "Rebuild All Scripts" is used from the file menu in uScript. These files are what Unity actually uses when your game is run:

- **MyGreatGame\_Component.cs** – This is a “wrapper” output C# script file. This is the component code that would be assigned to a GameObject in your Unity scene, such as the uScript master GameObject (see above), in order to have your uScript graph active in the scene. This file is automatically built/rebuilt by uScript from the .uscript binary file above.

- **MyGreatGame.cs** – This file is where all the “magic” is. This is the file that contains your entire uScript graph as pure C# code. This file is automatically built/rebuilt by uScript from the .uscript binary file above.

**Note!** - *you may notice a slight pause after saving a uScript graph because, when the C# script files are generated, Unity will recompile the script files to update them with your changes. This is why "Quick Save" in uScript can be handy-- it allows you to save changes you have made to the master .uscript file without causing uScript to regenerate the C# script files. Just make sure you do a full save before trying to run your game so that the latest code files are generated!*

### **Uniquely Named GameObjects**

Currently uScript needs to be able to tell which specific GameObject you want it to use by its name. This means that you should have a unique name for any GameObject you wish to use or reference in uScript, as that is the only way uScript can identify a specific GameObject between Unity sessions (a session means quitting and then running Unity again). While Unity does support unique IDs internally for all GameObjects in your scenes, unfortunately these unique IDs are not persistent. This means that we cannot rely on the GameObjects to have the same ID numbers in between closing and reopening Unity, leaving the only choice for the user to make sure they uniquely name their GameObjects they wish to use in uScript.

As an example, if you place three point lights in your scene, Unity will name them all "Point light" by default. If you wish to reference one of those lights in uScript, you should give it a unique name so that uScript can find the correct light you wish to use.

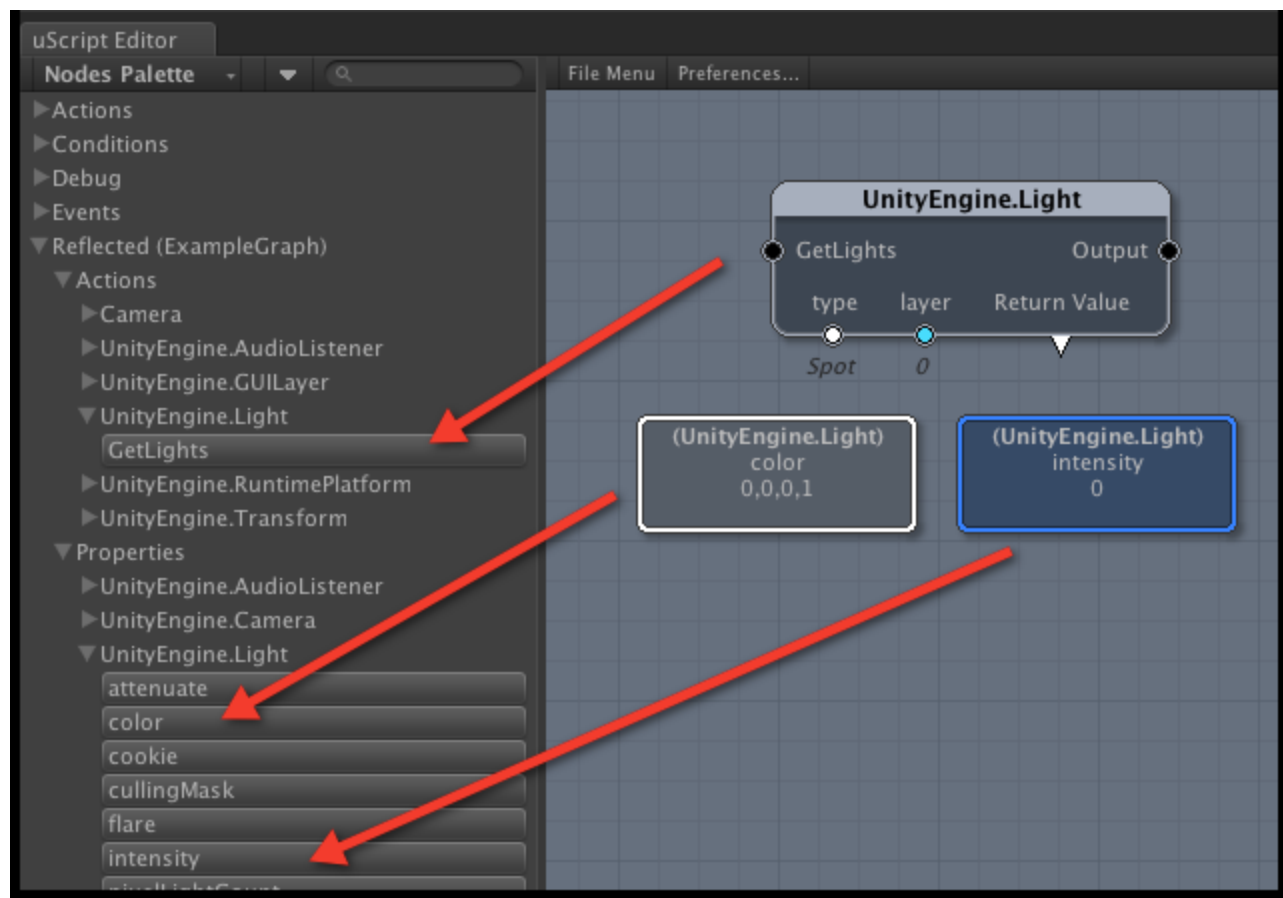
### **Reflection**

uScript will use .Net Reflection in order to visualize many aspects of your existing GameObjects, Components and Scripts (C#, javascript, and Boo) in Unity. In the case of scripts created in either javascript or Boo, you may need to place the scripts inside a "Standard Assets" folder in your Unity project because of the order in which Unity compiles scripts. C# scripts do not have this restriction.

It is important to note that uScript can only reflect things that are part of active GameObjects in your Unity scene. uScript will reflect any public Actions (methods/functions), Properties (Properties/Public Variables exposed to the Unity inspector – both Get and Set), and Variables (all variable types). You must assign an instance GameObject (see above) to them so uScript knows what specific GameObject you want to use.

All reflected nodes can be found in the Nodes Palette under the "Reflected()" section. If you have a Unity scene with a name, the scene name will be shown between the parentheses - Reflected(*YourSceneName*).

This image shows an example of auto-created nodes made through reflection for some aspects of a light GameObject in the scene. To reiterate-- if you do not have a light in your Unity scene, these light nodes generated through reflection would not show up for you. You must have a light in your scene for them to appear:



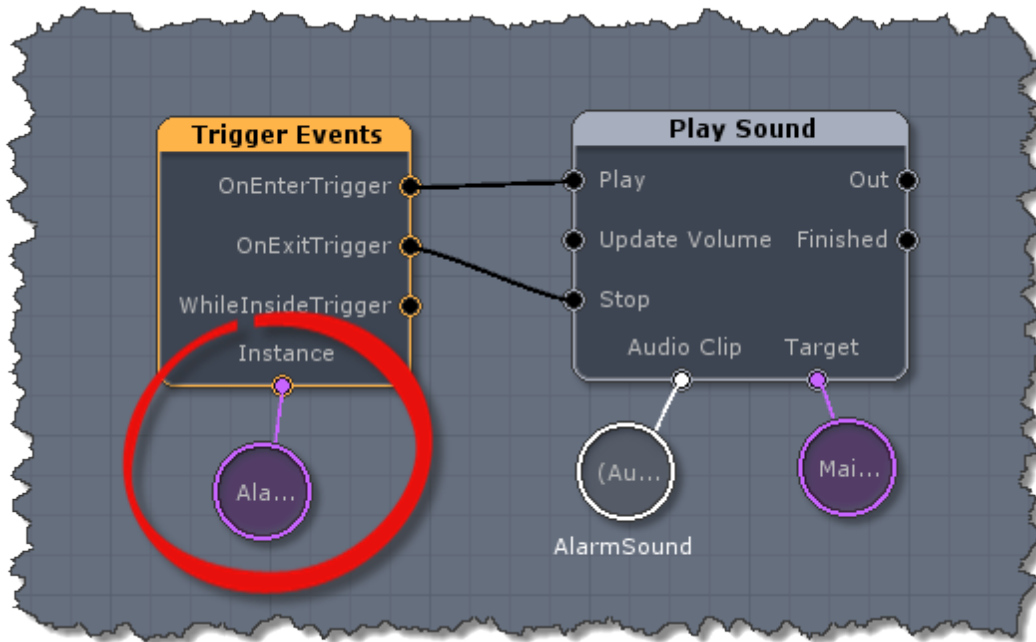
**Note!** - the bottom two "square shaped" colored nodes are properties of the GameObject and can be used just like variables. These two would let you change the light's intensity and color. Again, you need to assign the Instance of the light GameObject you wish to effect in the node's properties or uScript won't know which light in your scene you wish to affect!

### **Instances**

uScript's Event Nodes and many Reflected Nodes require you to assign a specific GameObject to it so that uScript knows what object you want to fire that event or read/write a reflected property. In many cases, for the more global event nodes, using the master `_uScript` GameObject is fine (and uScript will auto-assign the -uScript master GameObject by default when placing many Event Nodes). For other nodes however, you want to tell uScript exactly what GameObject is firing an event.

It is also important to note that for many event types, Unity requires that you have a certain component on your GameObject to work correctly. As an example, if you want to have a trigger, you need to make sure that a Collider component assigned to that GameObject in Unity and that it has the "Is Trigger" checkbox checked.

Using the Trigger Events node as an example, you need to tell uScript what trigger GameObject in your scene you want to make fire that event (you could have hundreds in your scene!). This is done by assigning an instance (a specific GameObject) to the property of the event. In the below image, we are assigning a GameObject trigger called "AlarmTrigger" to the Trigger Events node. This means that when the player enters the specified trigger (AlarmTrigger), the event will fire and cause text to print to Unity's console. No other trigger you may have in your the game will cause this event to fire.



**Note!** - in many cases, uScript will not allow you to assign a *GameObject* as an instance for an event node if it does not have the correct component assigned to it. Keep an eye on the Unity console output for uScript warnings if you try to assign the wrong thing.

# Graph Types

A graph is the term used to describe visual logic in uScript. A single graph can have many separate sections of visual logic used to do various things while your game is running. A uScript graph is all the logic that is contained within a single uScript file (\*.uscript) you have created with the uScript Editor. Another words, each uScript file you make is considered a uScript graph.

While there are no hard rules in how you use uScript, there are three ways that uScript is primarily used to create logic-- *Scene Graphs*, *Prefab Graphs*, and *Nested Graphs*.

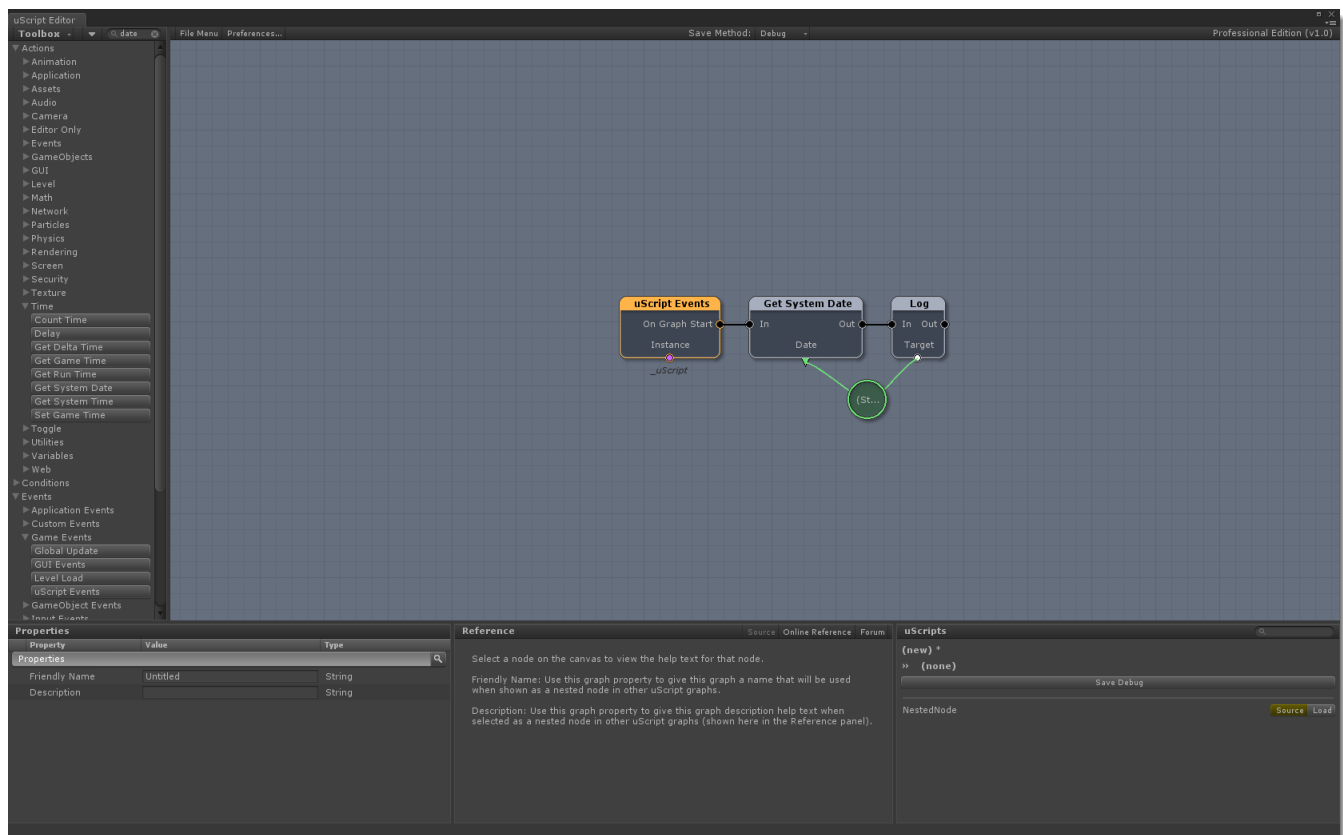
## **Scene Graphs**

Creating a single uScript graph for your scene to perform gameplay logic is the basic way in which you use uScript. In many cases, it is fine to just have one uScript graph for each of your Unity scenes (levels) as you can manage most of your gameplay logic in this way.

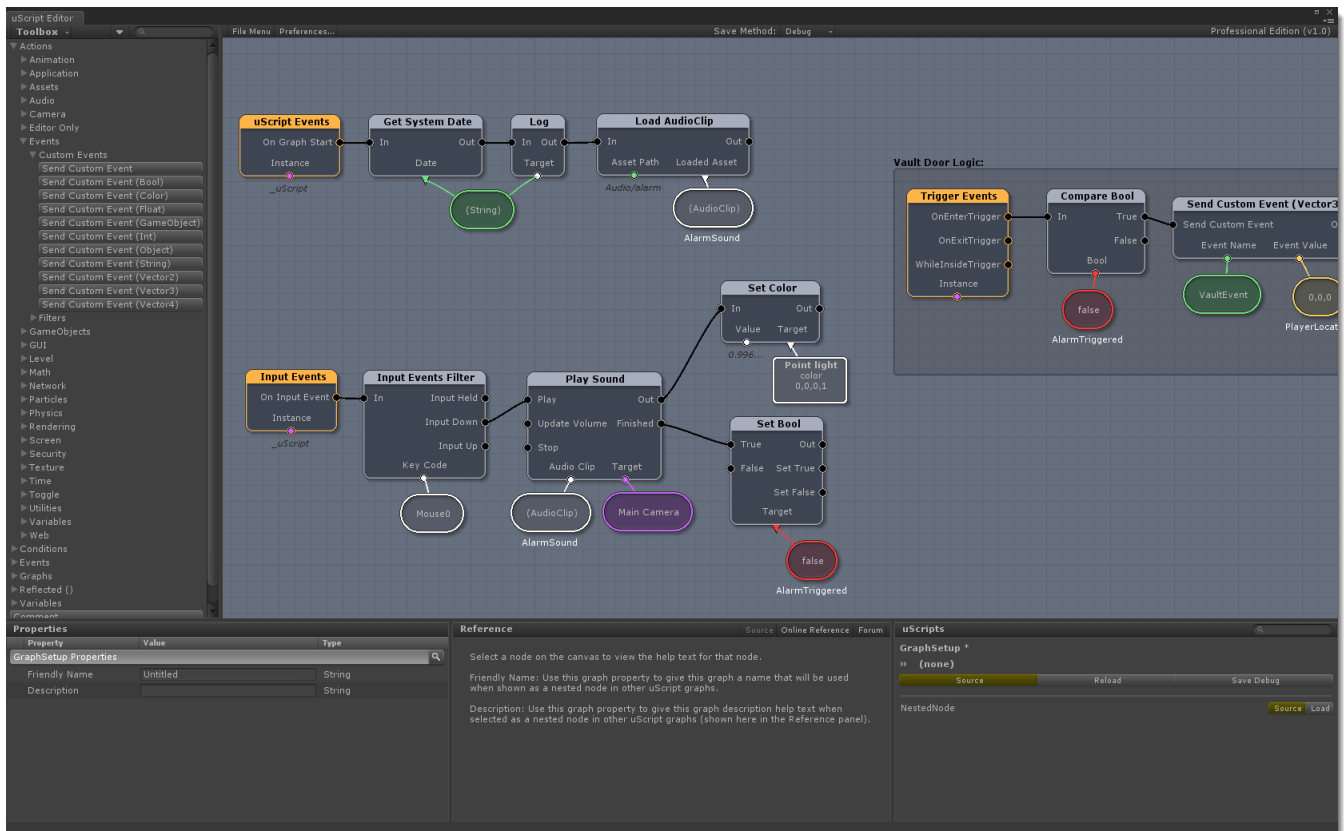
That graph is usually assigned to the uScript master GameObject that it creates for your scene. Because uScript handles things within its graph, you don't end up with a lot of components and scripts cluttering up your scene's GameObjects.

Here is an example of a very simple standard logic graph:





Here is the same uScript graph with more complex logic added to it:



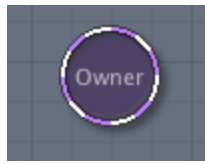
## Prefab Graphs

Just like the name implies, these are uScript graphs that you can place on a prefab GameObject which will be spawned into your game at runtime. These graphs are very powerful and allow you to handle GameObject-specific logic on the prefab itself. An example of this could be shooting a missile into the world.

Your main gameplay uScript graph would be responsible for spawning the missile when the player hits the fire button for example, but once it is spawned you may have missile-specific logic you want to have on the missile itself so that when it collides with something it will play particle effects, sounds, add explosion forces all by itself-- and then have it destroy itself from the scene when it is done.

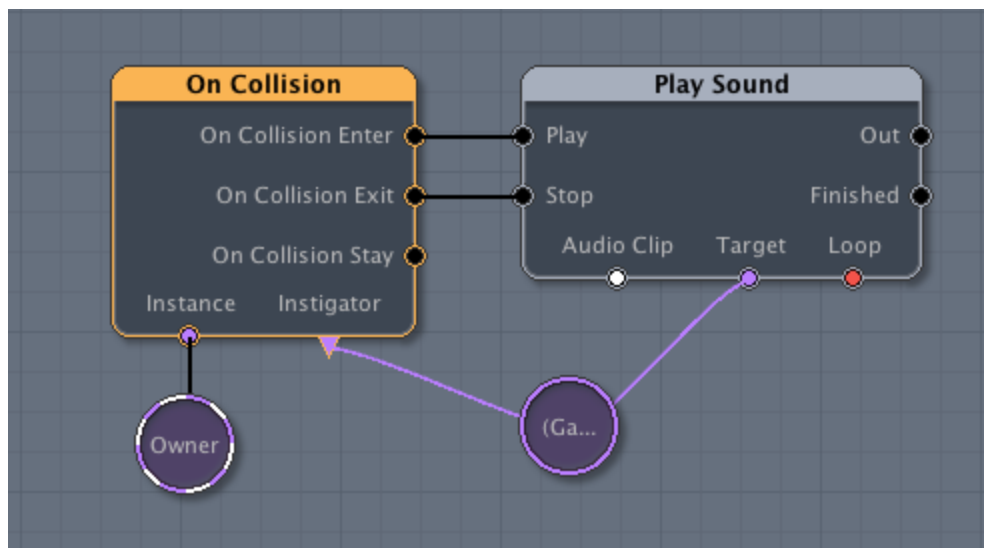
This means each instance of the prefab you spawn in the world will automatically run its own uScript graph logic and you don't have to worry about keeping track of them in the main uScript gameplay graph.

In order to create uScript graphs for prefabs, you will want to use the special "Owner GameObject" variable whenever you need to assign a node's Instance property to the prefab. This special variable tells uScript to use whatever GameObject the uScript graph is assigned to.



**Note!** - for those of you more familiar with scripting, the Owner GameObject variable is the equivalent of "**this**" in many programming languages. It simply tells uScript "Use whatever GameObject this graph is assigned to."

Here is an example Prefab Graph using the Owner variable:



### Nested Graphs

uScript can also be used in another way to help organize and extend the functionality of uScript itself. Special uScripts can be created that will allow non-technical users to take complex visual logic and create their own custom action node from it. We call these Nested uScripts.

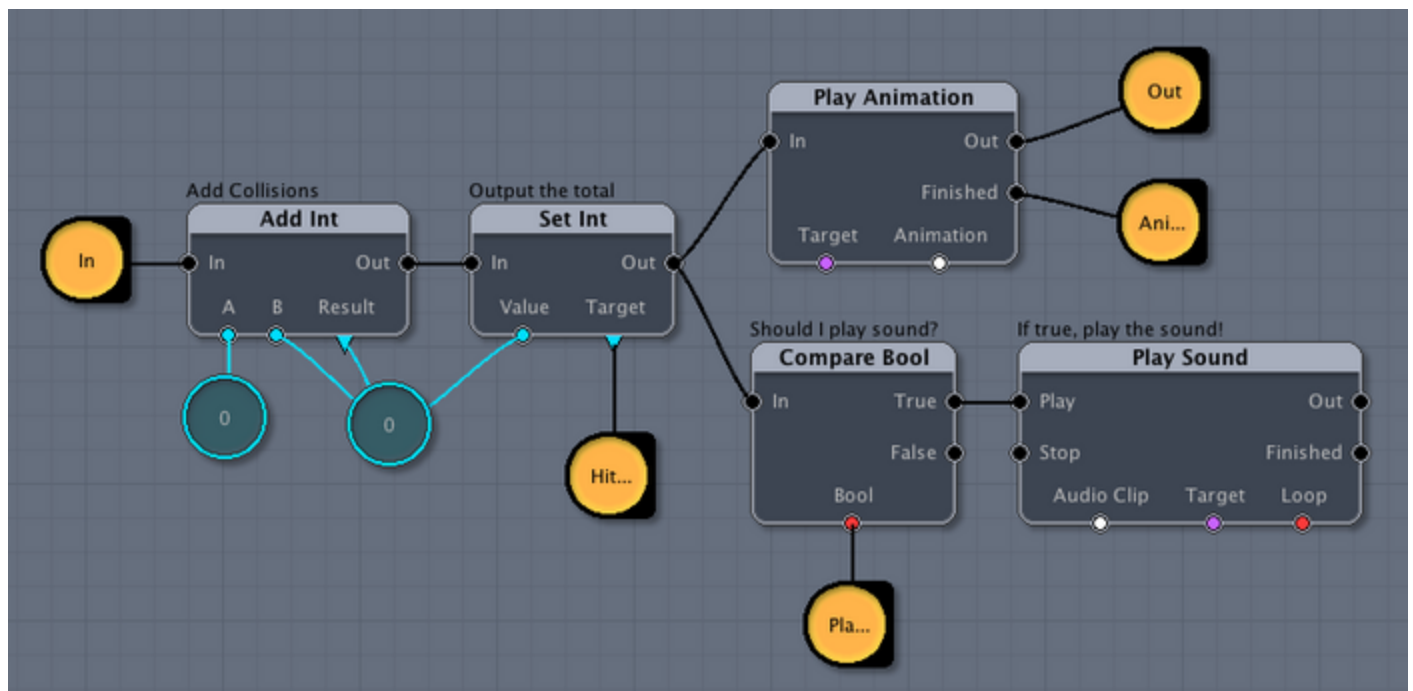
Another way to think of them are recipes that perform a task you may want to reuse in different parts of your project or even in completely different projects. You can very easily build up a library of these recipes for yourself and to share with other team members or on the uScript community website.

In order to make input/output/variable sockets appear on the nested uScript node on your graph, you need to use External Variables within the nested uScript hooked up to

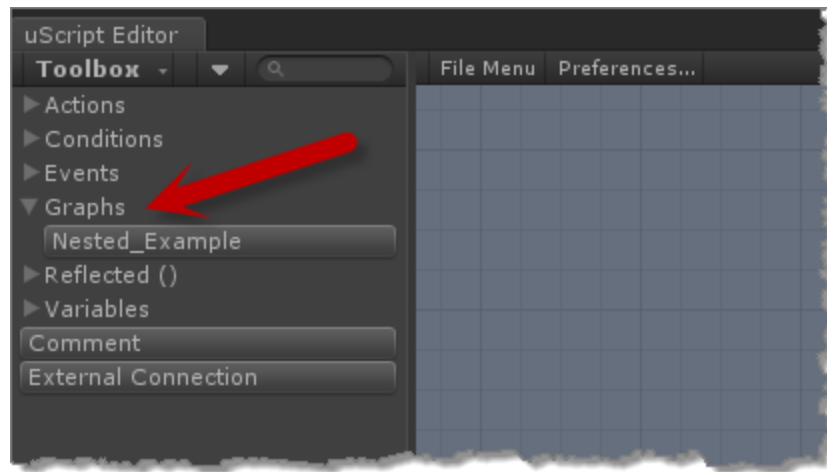
the sockets you wish exposed. By using these and naming them, they will create sockets on the nested uScript node.



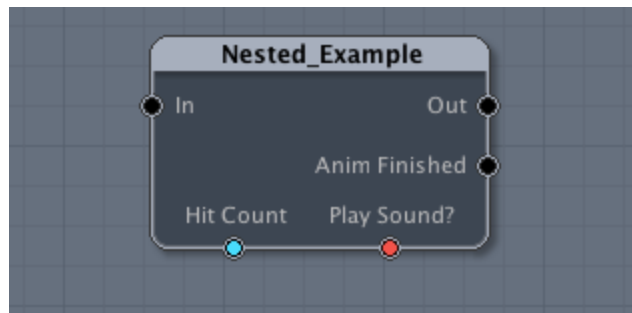
Here is an example of creating a Nested uScript saved as "Nested\_Example.uscript":



Graphs that contain External Connection nodes will appear in the "Graphs" section of the Nodes Palette and can be placed as nodes in other graphs. The "Graphs" section will not appear if no uScript graphs in your project contain an External Connection:



And here is what it looks like when placing it inside another uScript graph:



# Node Types

Section coming soon...

# Variables

Variable nodes, also just called variables most of the time, are a key part of uScript graphs. One way to think of variables are as containers that you can use to store a piece of information. You can either get a piece of information out from one of these containers, or put a piece of information into one of these containers. However, with the exception of List Variables (which we will discuss a bit later in this topic), you can only ever store a single piece of information at a time inside a variable.

All programming languages use variables in some way to store and retrieve data. Because uScript is a visual scripting system, it must also use variables to store the information you wish to use in your uScript graphs. uScript follows some key rules regarding variables, shown here:

## Key Rules

- uScript has three types of variables:
  - **Type Variables** - a simple variable that can hold a single piece of information of a certain type (texture, sound, text, color, etc.)
  - **List Variables** - a list variable is a collection of type variables of the same type. Think of them as a group of containers-- each of which can hold a piece of data (but always of the same type).
  - **Properties** - properties are variables that are exposed to uScript through reflection. Though they can be used in the same ways other variables can, they require that you also specify the "owner" of the information by assigning an Instance to the Property's node properties.
- Variables are of a specific "type". The type determines what kind of information can be read or written to it.
- Variables can be assigned a Name, making them a clone of any other variables in a specific uScript graph that share it's name.
  - Named variables can be exposed to Unity's Inspector panel for external access to the variable's information.
- Most uScript nodes have variable sockets along the bottom of them, allowing you to hook up variables as required by the node.
  - You can also directly assign data to the node's variable sockets through the node's properties panel.

## Color Codes

uScript uses color coding on the border of it's variable nodes for the most commonly used variable types in uScript. Any variable type not currently assigned a specific color

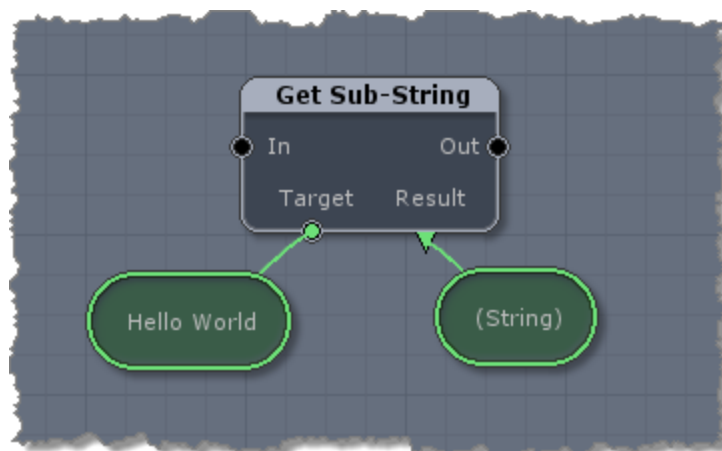
will have a white border.

Standard variable types that currently support color coding are:



- **Float** - Blue
- **Int** - Cyan (light blue/green)
- **String** - Green
- **Boolean** - Red
- **Vector3** - Gold
- **GameObject** - Magenta (purple)

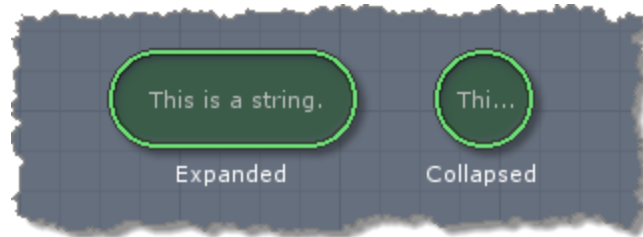
uScript's Event and Action nodes also use this same color coding for it's bottom variable sockets. Here is an example of a couple of nodes using a String variable. You can see how the green color for the String variable is also matched on the a node's socket that require a String variable for both input and output. Even the connection lines between the variable and the node's socket is the same color (green in this case):



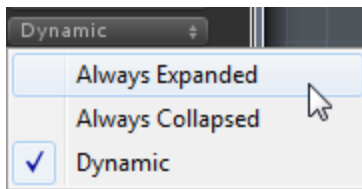


## Variable Node Display Options

Variables in uScript are by default displayed as circles that on selection may be expanded to fit the full value of the variable if it does not fit in it's default, collapsed state.



In the uScript Editor's Preferences window you can choose how you wish to have uScript display variable nodes (see "Editor Preferences" for details).



## Variable Node Types

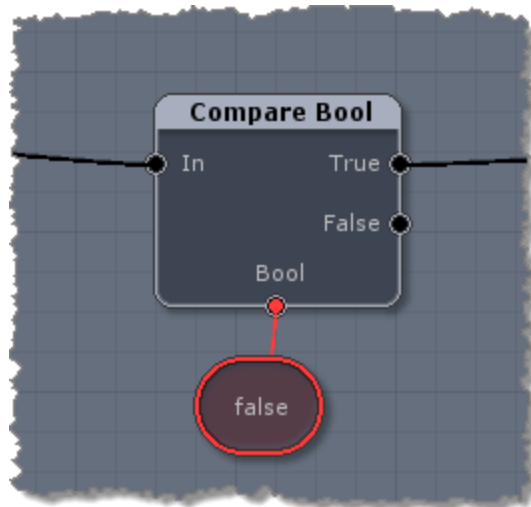
### Common Variables

While uScript can use any type of variable that Unity uses through reflection, there is a common set of variable types you will find yourself using repeatedly in uScript. Those variables are described here.

#### Bool

Bool stands for boolean and it can either store the value **true** or **false**. They work great as a way to decide if you wish to do something or not and many other comparison type situations.

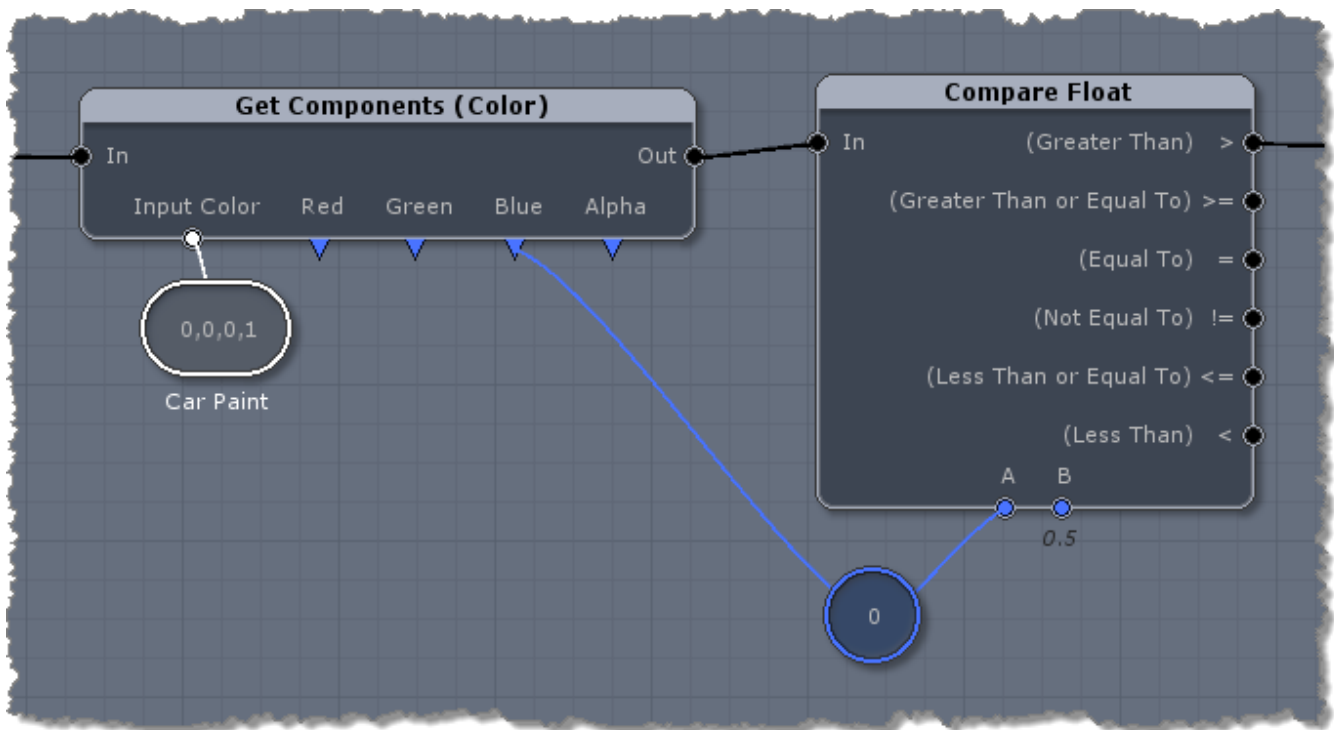
*Example* - here we check to see if a Bool variable is set to true or false. If it is true, the logic carries on to do something else:



## Color

The Color variable stores a color as Red, Green, Blue, and Alpha float components. Legal ranges for the color components are between 0.0 and 1.0.

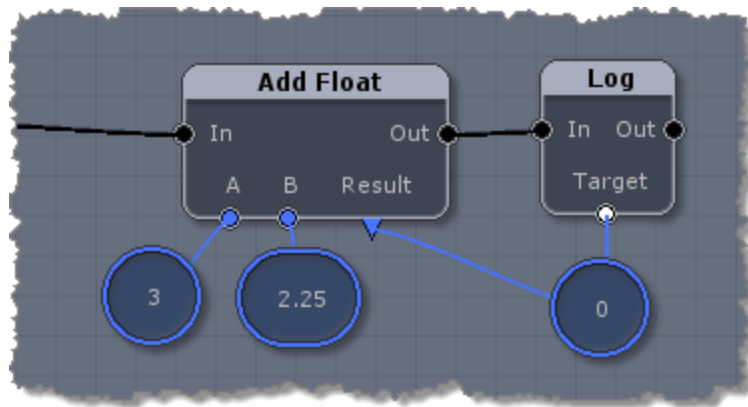
*Example* - this logic get's the Blue float value from the named "Car Paint" Color variable and then checks to see if it is greater than "0.5":



## Float

A float is a number that contains decimal places. Even a "whole" number such as 4 would be considered as 4.0 when it is a float. Most times Unity will want a number as a float as the need of decimal places is very important in math. Unity will also commonly use the range of 0.0 - 1.0 to represent percentages and other ranges internally. For example, if you wished to set the Intensity (brightness) on a light to 42%, you would represent that the float value 0.42.

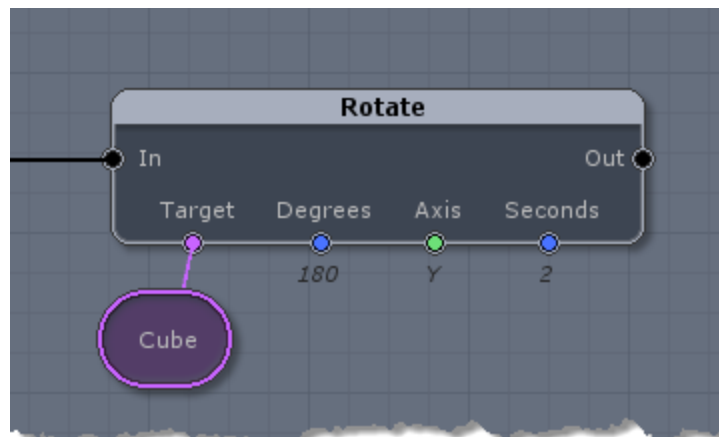
*Example* - this logic will add two floats together and then print the result to Unity's console window. You might notice that the Float variable hooked up to the "result" socket shows "0". This is because 0 is the default value for a float variable. Once this logic is run in the game, the real value will be inserted into it (5.25 in this case) before the Log node prints out to the console window.



## GameObject

Everything you place in your scene in Unity is a GameObject. This variable type allows you to store a specific object from your Unity scene so you can access it inside uScript in order to work with it.

*Example* - in this example we are rotating a GameObject from the Unity scene called "Cube".

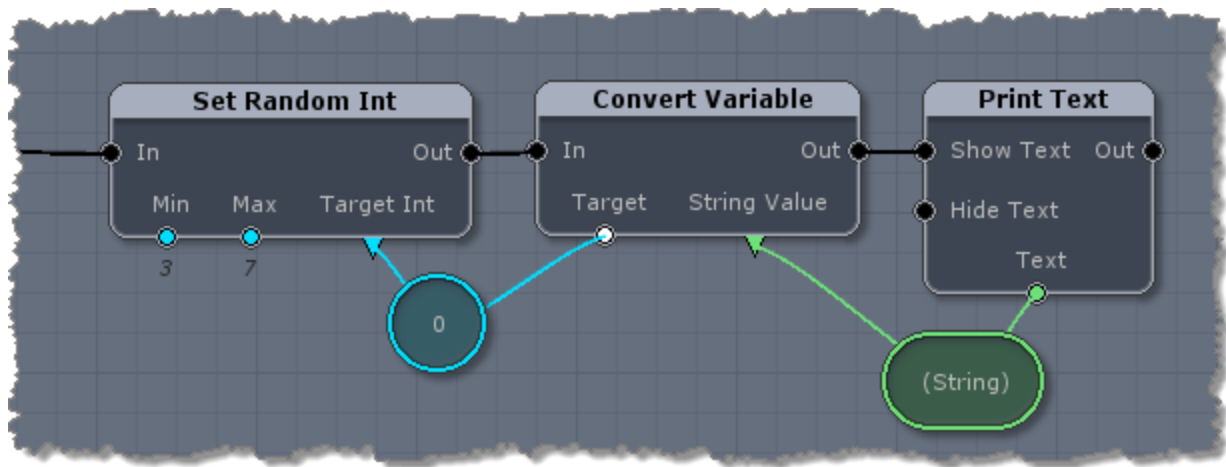


**Note!** - uScript relies on Unity to provide the correct GameObject by its name. It is important that you uniquely name any GameObjects in your Unity scene that you wish to directly use with uScript by name. If you do not wish to uniquely name your GameObject (or can't such as with prefabs spawning at runtime), please see the **Owner GameObject** variable type instead.

## Int

An Int is a whole number and can **not** contain any decimal places. Ints are not used as frequently in game logic as float variables, but are very handy for things such as counting totals or other times where you only need to use whole numbers.

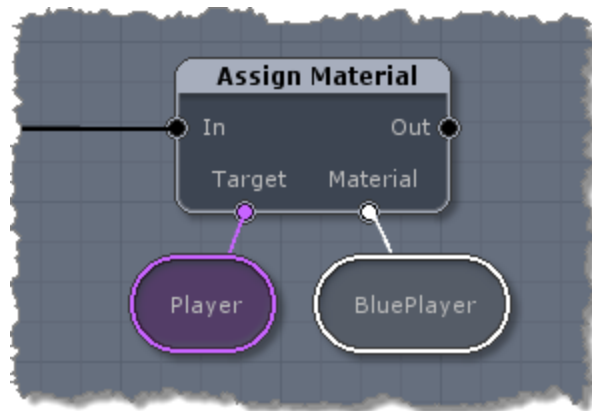
*Example* - this example sets an Int variable to a random number between 3 and 7, then converts the Int variable value into a string variable (see String below) before finally printing the resulting number to the screen.



## Material

The Material variable type holds a Unity material which is made up of texture, color and other information to describe how a GameObject should "look" in the game.

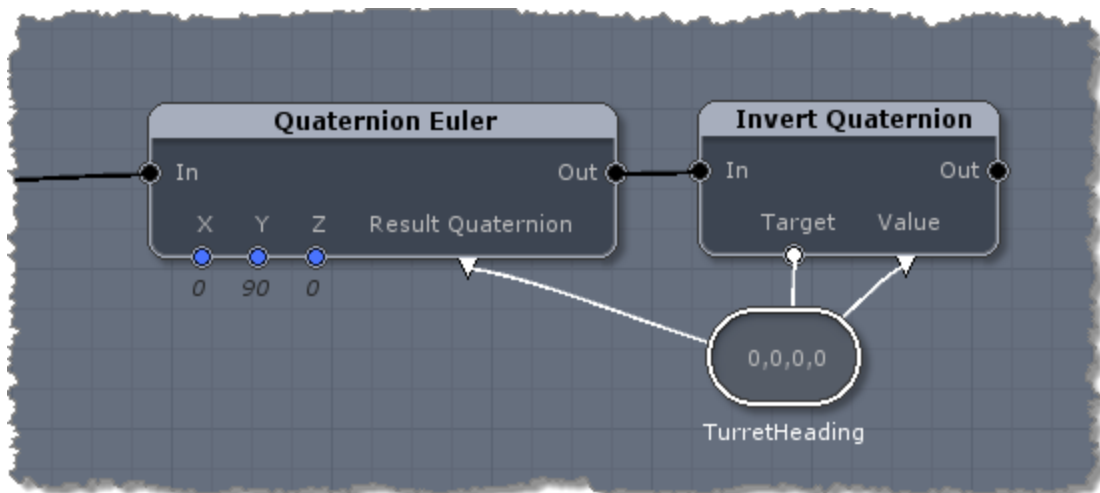
*Example* - this example assigns a material called "BluePlayer" to a GameObject called "Player".



## Quaternion

A Quaternion variable is made up of four float components and describes the rotation of a GameObject in mathematical terms. It is very rare that you would want to actual modify the components of this variable type directly and will instead mostly use by just passing on a Quaternion value you got from Unity into another uScript node or GameObject.

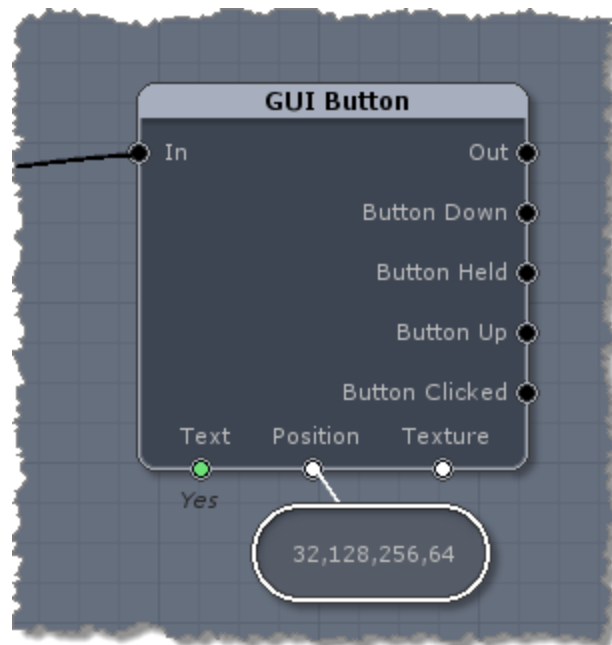
*Example* - this logic creates a Quaternion value from Euler degree input (90 degrees on the Y axis in this case) and passes that value to a named Quaternion variable called "TurretHeading". It then Inverts the Quaternion variable's value by updating itself in the "Invert Quaternion" uScript node.



## Rect

The Rect variable type is used by Unity for things such as the GUI system. It contains four float components (X Position, Y Position, Width, and Height) that define the size and position of a rectangle.

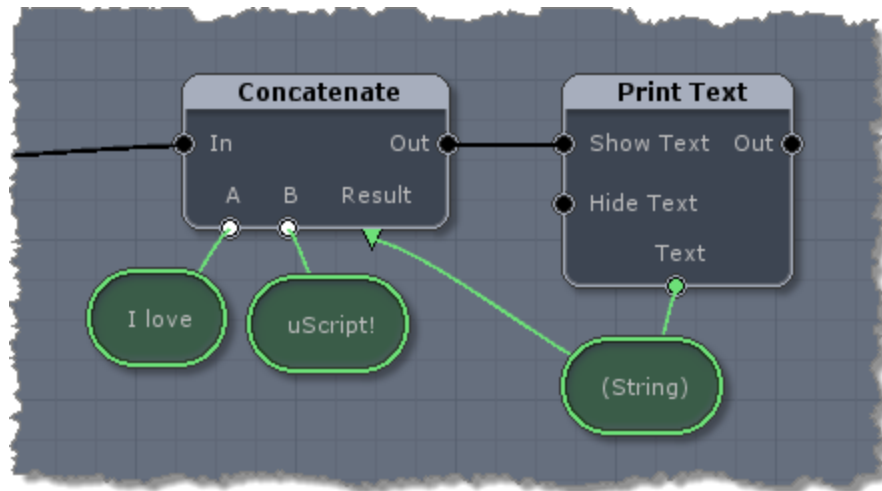
*Example* - this logic uses a Rect variable to define the position and height of a Unity GUI Button in the scene (with a label of "Yes"). Note that it is telling Unity to draw the top left of the button at 32 on X and 128 on Y for the screen position, and of a size of 256 wide by 64 high.



## String

The String variable type is used to hold text. Even if you assign it a number, Unity will just treat it as text and not a number.

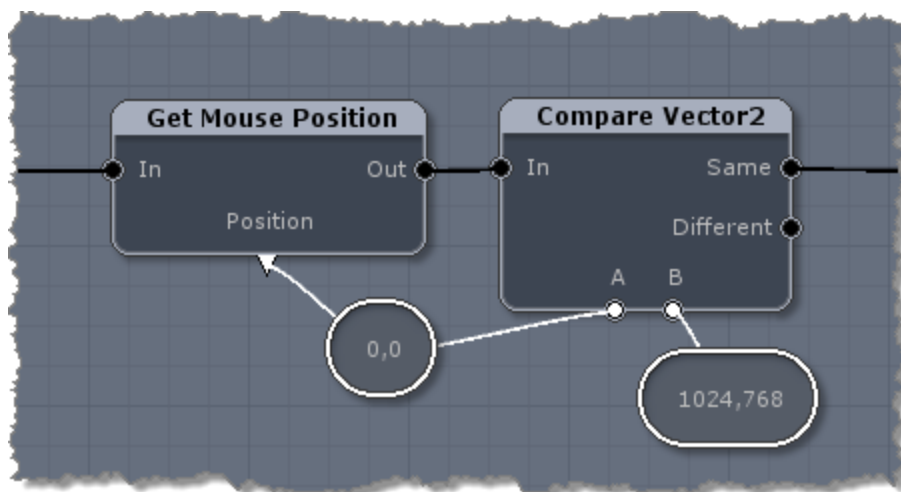
*Example* - in this logic, we combine (concatenate) the text in two different String variables into one new String variable. The results are printed on the screen ("I love uScript!").



## Vector2

The Vector2 variable type holds two float components (X and Y). It is a useful variable type to store a pair of floats that you would normal want to have together, such as a screen resolution or other X and Y location.

*Example* - this logic gets the current X and Y position of the mouse cursor on the screen as a Vector2 and then compares it to see if it is at 1024 on X and 768 on Y as specified from the second Vector2 variable. If so, the logic will continue to other nodes.

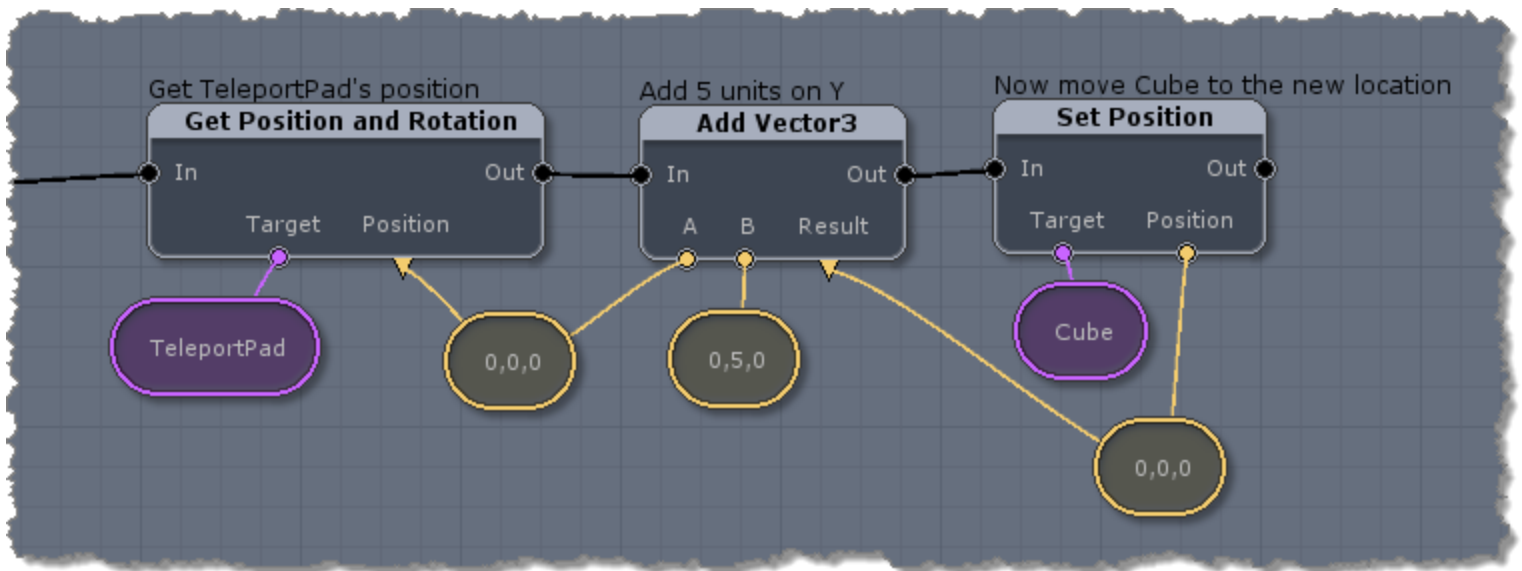




### Vector3

The Vector3 variable type is a very common type to use in Unity. It contains three float components (X, Y, and Z) and is usually used to store a position in 3D space. They are also used to store the force/magnitude of motion in a 3D direction for physics.

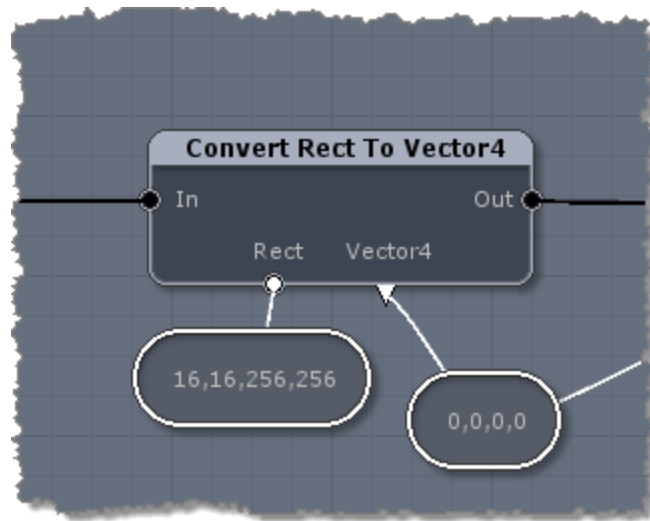
*Example* - this logic tells the GameObject called "Cube" to teleport 5 units above the position of another GameObject called "TeleportPad" by first getting TeleportPad's 3D position in the game as a Vector3 variable.



### Vector4

The Vector4 variable type is basically the same as the Rect variable type mentioned above as it contains four float variable components (X, Y, Z, W). However, this variable type is usually used in physics calculations and other general cases where four float values are useful in defining something.

*Example* - this logic simply allows you to convert a Rect value into a Vector4 value.



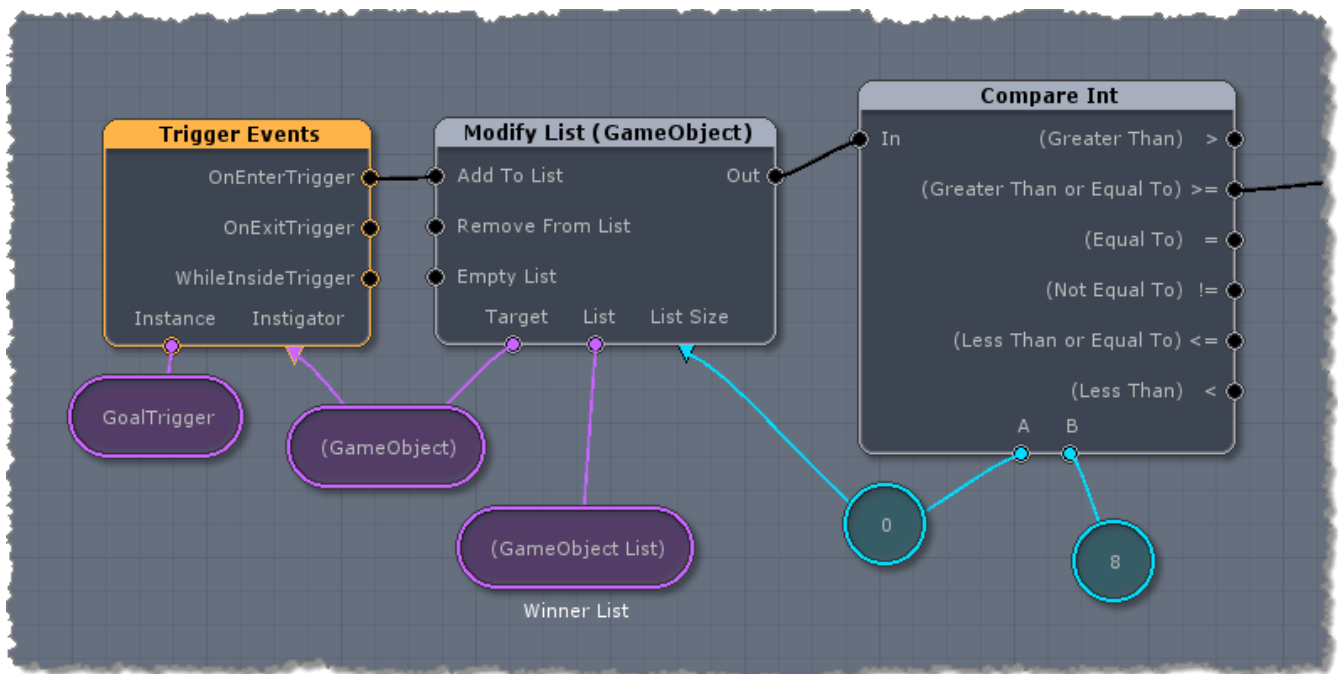
## Other Variable Types

These and other more common variables are found in the Variables section of the Toolbox. Also, if you are using the Professional or Personal Learning Edition (*PLE*) of uScript, you can also access every variable type available in your Unity scene through reflection under *Reflection()/Variables*.

## List Variables

Sometimes you will want to store a bunch of the same variable type together. uScript does this through List Variables. List Variables are just that-- they store a bunch of variables of the same type together. This allows you to use special List nodes we have written to quickly read/write/iterate through the list for various purposes. For those with a programming or scripting background, you can think of a List as a variable array.

A simple example of using a List variable might be if you wanted to end your game once a specific number of GameObjects have touched a trigger (let's say 8 GameObjects and the trigger GameObject is called "GoalTrigger" for example). To do this, you could add each GameObject that touches the trigger to a GameObject List variable and then check the size of the list to see if you have reached 8 GameObjects:



## Properties

uScript can reflect public variables being used by other things in Unity ("public", or exposed, means that the developer who created the variable set it to be accessible by other things outside of itself).

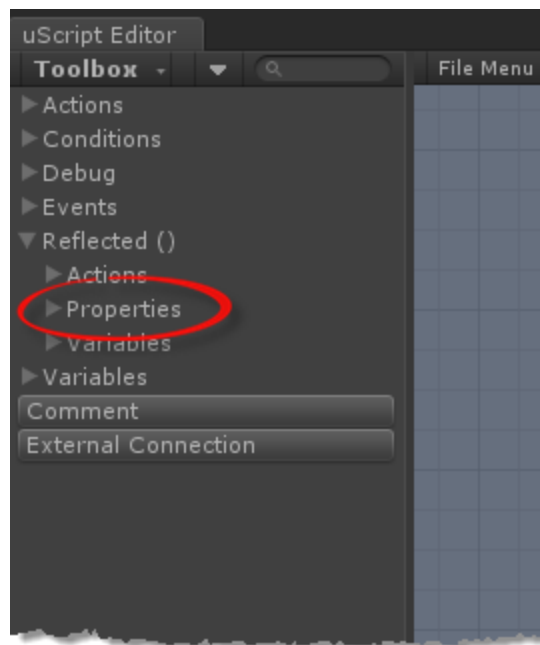
All reflected variables from other objects in Unity are called "Properties" and can be found under the Reflected()/Properties section of uScript. Reflected properties can be a very powerful thing and is also a great way to allow you to pass, or assign, your own uScript graph values outside of your graph to either other uScript graphs or even other Unity scripts or the Unity Inspector panel (see *Named Variables* below).

Please also see "Reflected Nodes" and "Advanced Reflection" for more information about uScript's reflection feature.

**Note!** - because properties are part of reflection, this feature is only available using the Professional or Personal Learning Edition (PLE) of uScript.

## Using Properties

To see what properties are available to use, go to the **Reflected ()** section of the Toolbox and open the Properties section:



Once expanded, you can access any properties that are available in the currently loaded Unity scene. For example, here are the default properties available for all GameObjects:

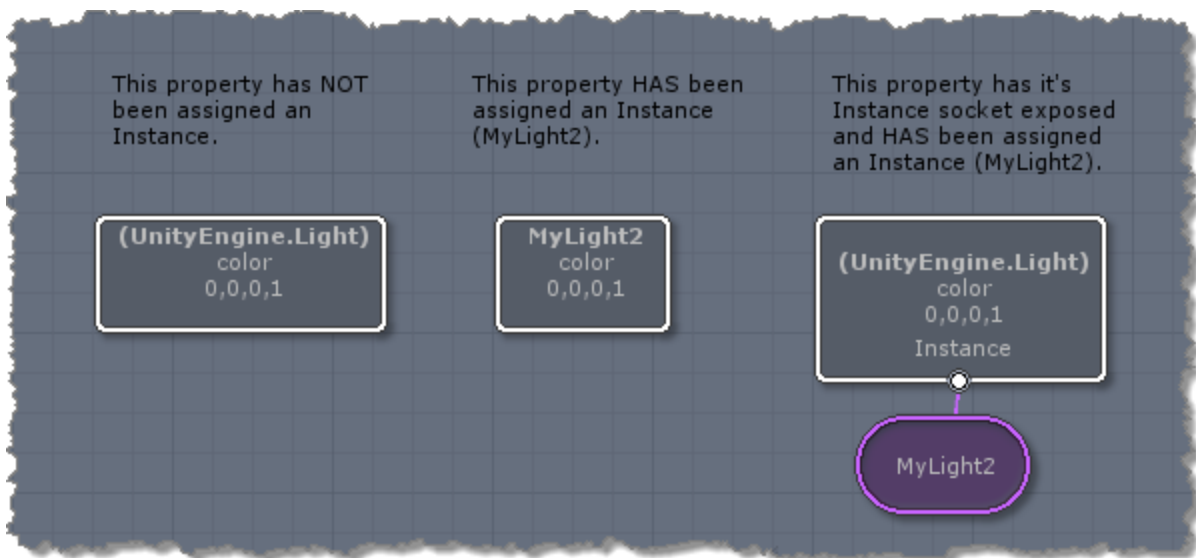


### Setting the Property's Instance

Once a property has been placed on the uScript Canvas, it is important that you specify exactly what GameObject you wish to read or write the property to. This is important because you may have many GameObjects in your Unity scene that all have the same

stuff on them-- like a light component. uScript needs to be able to tell Unity which specific **instance** of a GameObject with the light component you wish to effect. To do this you just need to assign the property's Instance property with the proper GameObject.

Here are three Light component color properties. The first is how it would look when first placed on the graph before an Instance was assigned to it. The second shows the Instance property set (to a GameObject called MyLight2), and the third is also set, but through a GameObject variable hooked up to the Instance socket- which was set to visible from the property node's Properties Panel setting:



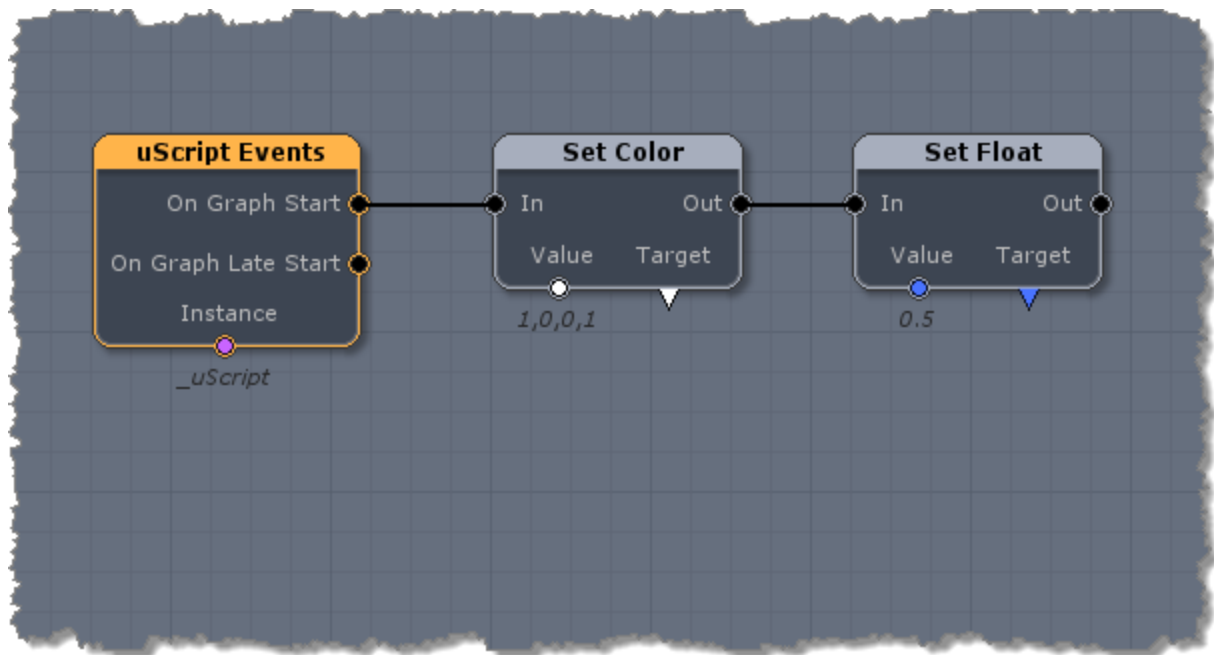
**Tip** - exposing the Instance socket can be very useful when you want to set the instance GameObject at runtime or use the Owner GameObject variable as the Instance.

### **Example - Change Light Color and Intensity**

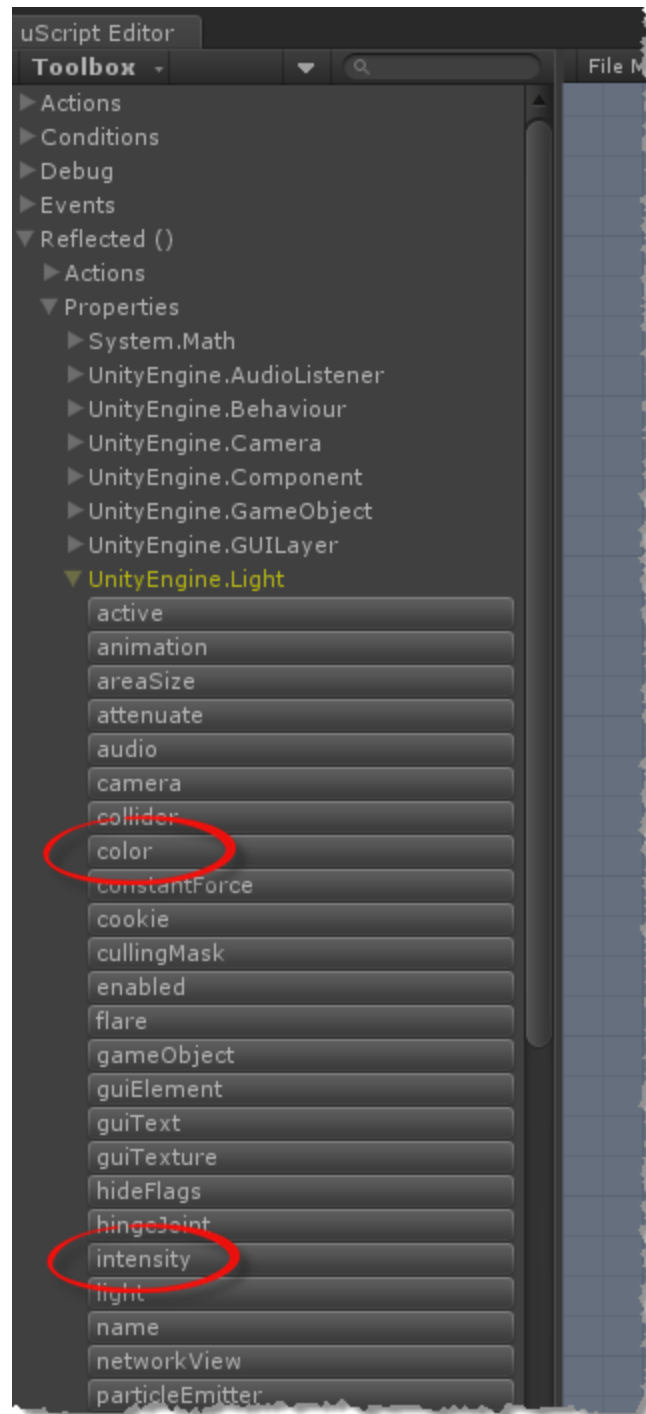
As mentioned above, properties are really just variables. In this example we will set the color and intensity of a specific light in a Unity scene by modifying two of its properties.

Let's say we had three point light GameObjects in the scene called MyLight1, MyLight2, MyLight3 and we wanted to modify the MyLight2 light properties to change the light's color to red and the intensity to 50% (0.5) when the game starts:

**Step 1** - Set up the graph logic:

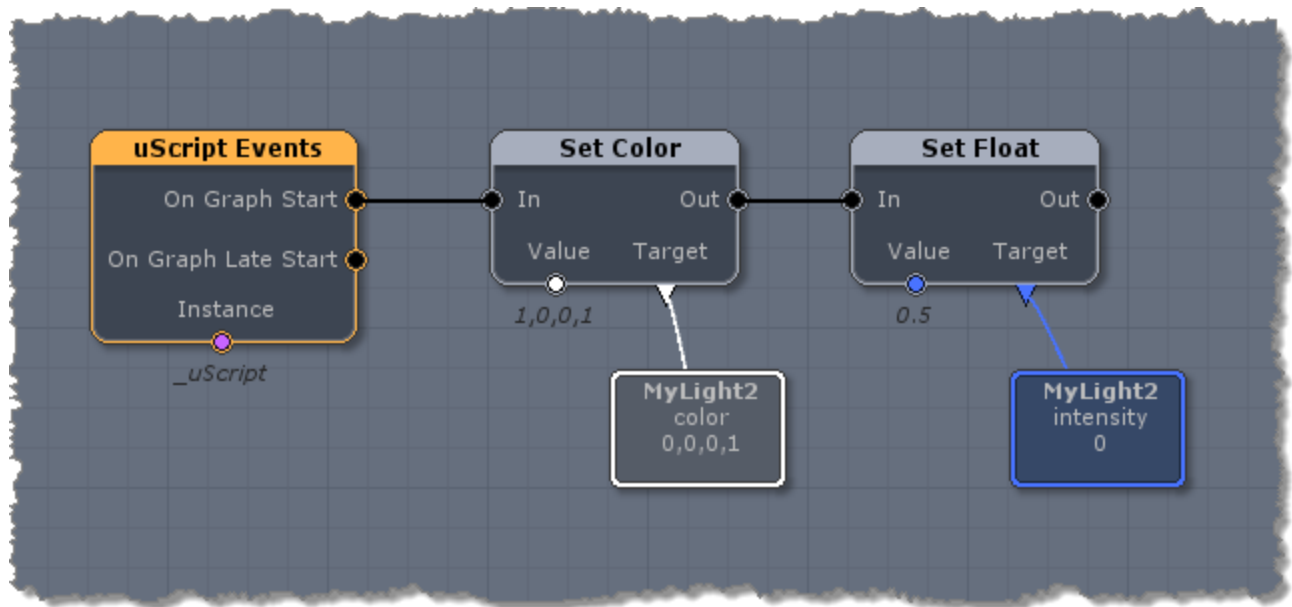


**Step 2** - Find and place the needed property nodes for a light component:



**Step 3** - Hook up the placed property nodes and make sure the set their *Instance* property to the specific light we wish to effect (*MyLight2*):





## Advanced Variable Use

### Special Variable Nodes

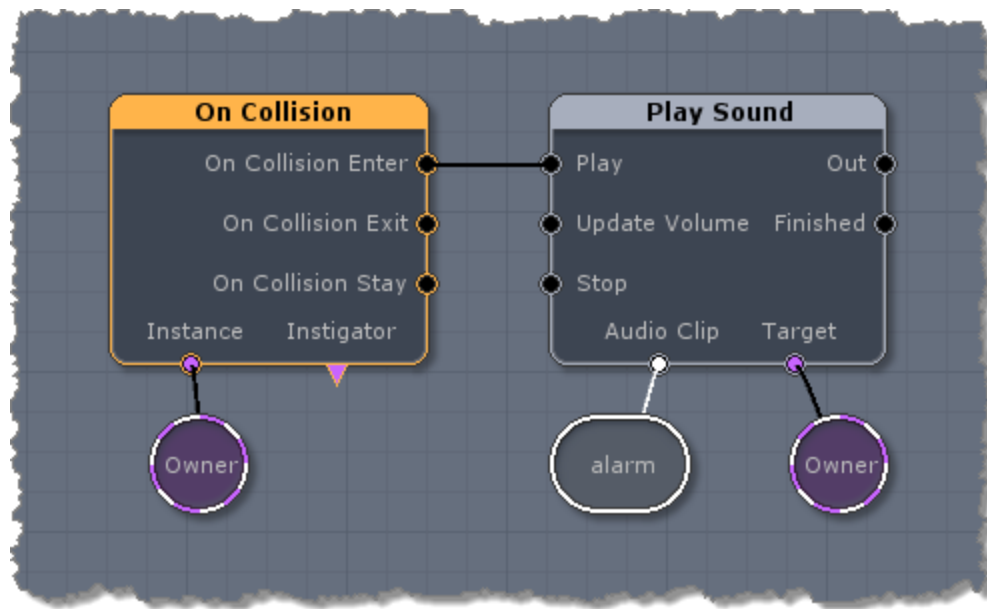
uScript has a few "Special" variables that are designed to perform specific tasks.

#### Owner GameObject

The Owner GameObject is a special variable that tells uScript to "use whatever GameObject this uScript graph is assigned to". This allows you to build reusable graph logic for Unity Prefabs or other such uses. For those familiar with programming, the Owner GameObject variable is the equivalent of *"this"* in code.



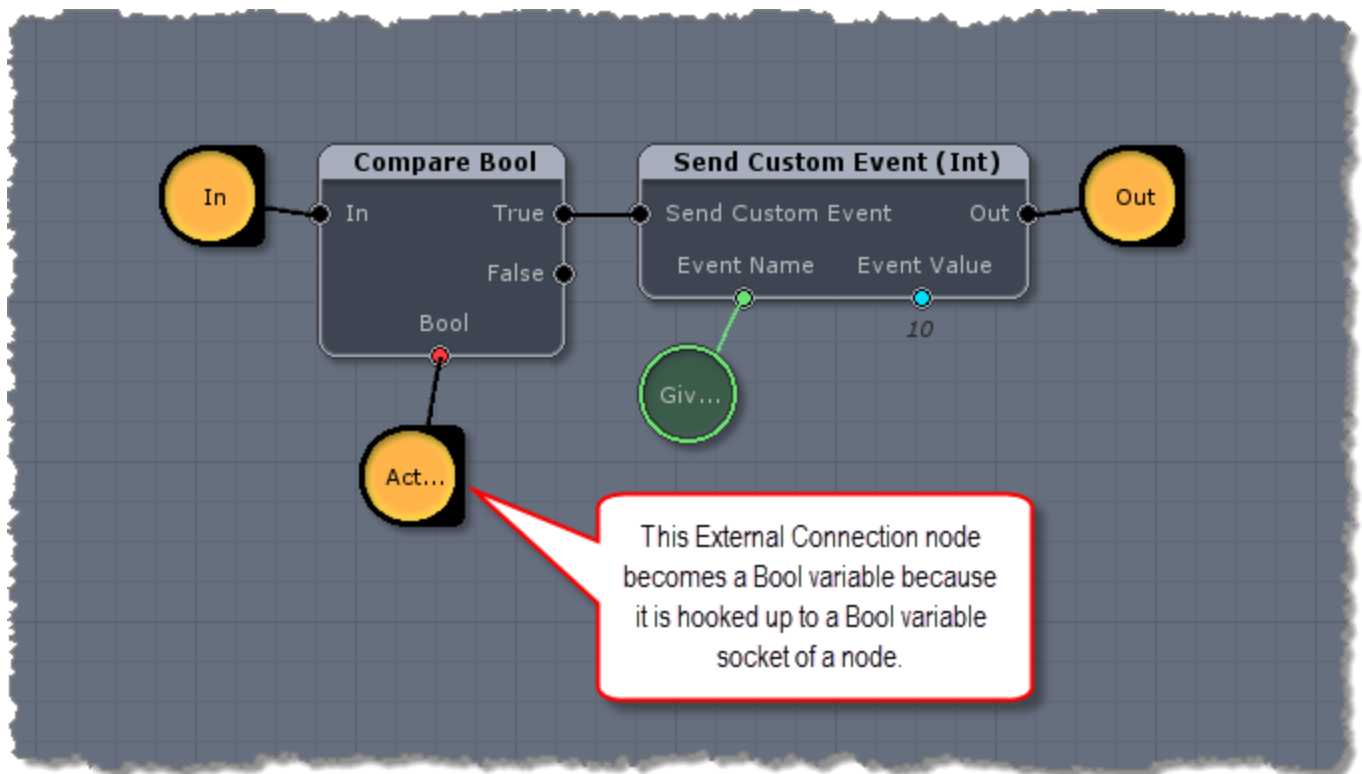
Here is example logic that will play a sound when something collides with a GameObject. Because it uses the Owner GameObject for the Collision Event's instance socket as well as the Play Sound node's target, this graph can be assigned to any GameObject and it will automatically play the sound for that GameObject collision only (and the sound will come from that same GameObject):



## External Connection Node Variables

The External Connection is used when creating nested graph node's in uScript. They can be hooked up to any node socket-- including variable sockets. When an External Connection node is hooked up to a variable socket, it will take on the variable type of the socket it was hooked up to.

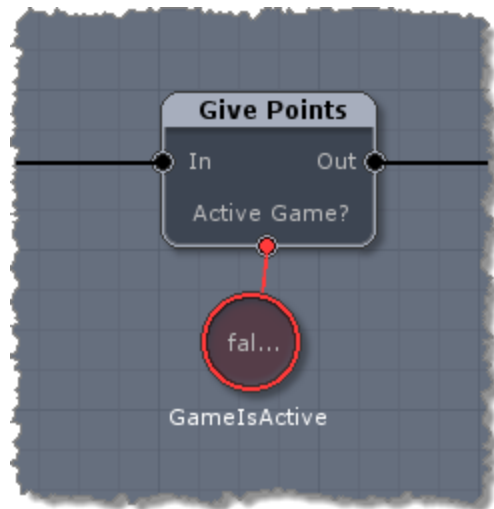
Here is an example of External Connection nodes hooked up to various sockets to create a Nested Graph called "Give Points". Notice that there is one hooked up to a Bool socket of a node:



It is important to setup the External Connection's properties-- especially a friendly name:

Properties		
Property	Value	Type
Name	Active Game?	String
Order	1	Int
Description	Is there an active game going on?	String
Output Comment	<input type="checkbox"/>	Bool
Comment		String

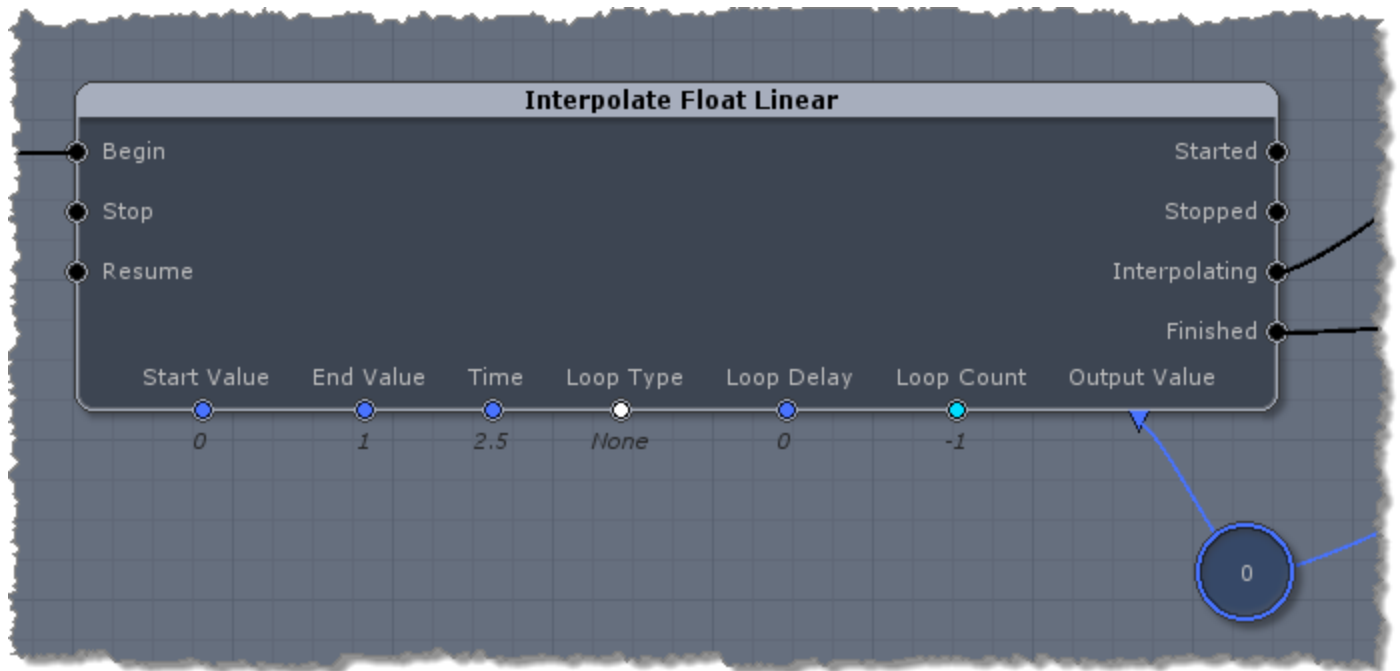
Here is what the nested node looks like (called "Give Points") when used in another uScript graph and hooked up to a Bool variable:



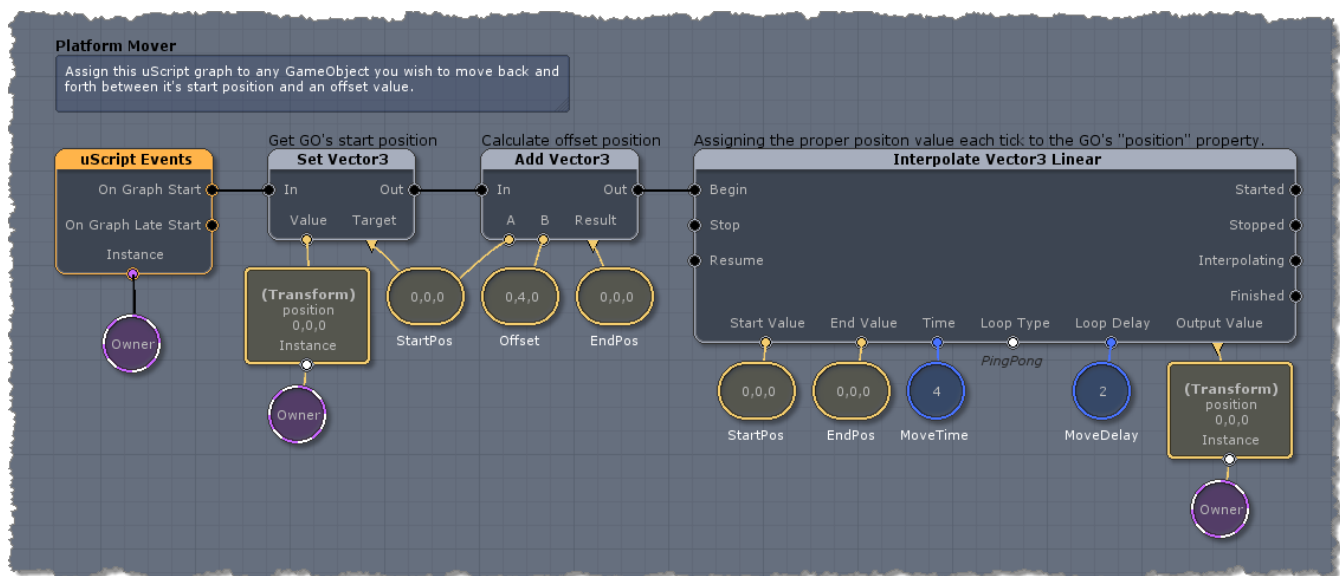
**Note!** - please see the *Nested Graph* section of the topic for more information on creating *Nested Graphs* and using *External Connection nodes*.

## Changing Values Over Time

There are many times when you might wish to change the value of a Variable or Property Node over a set time. This can be accomplished using our Linear Interpolation Nodes. These nodes allow you to define a start and end value that will change between the two over a specified time.



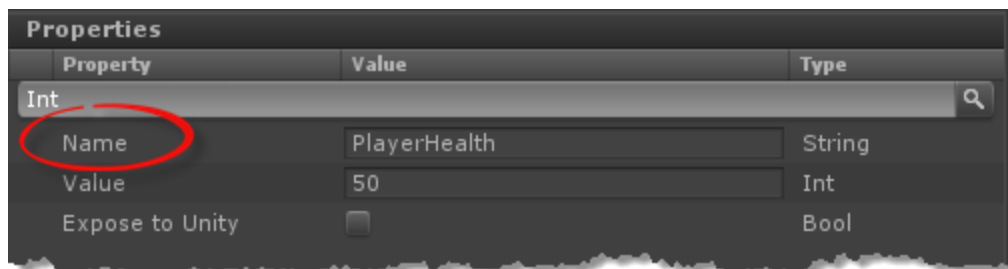
Here is an example where we use an Interpolate node (a Vector3 one in this case) to change the value of a Vector3 over time and feed that value directly into a GameObject's "position" Property Node each tick of the game to move it. Also note we are using the Owner GameObject variable so that this graph can be assigned to any GameObject to move it-- making it very reusable.



## Named Variables

Named variables allow you to "share" a variable throughout a uScript graph without needing to draw many lines to the same variable node to access it. uScript will treat any variable of the same type with the same name as the same variable-- no matter how many instances you might have of that named variable on your graph. If you change the value of one of the named variables, all other instances of that named variable will have it's value automatically updated throughout the entire graph.

Naming a variable is as simple as setting it's Name property in the Properties Panel:



Once you have named a variable, it's name will show up below the variable node on the graph:

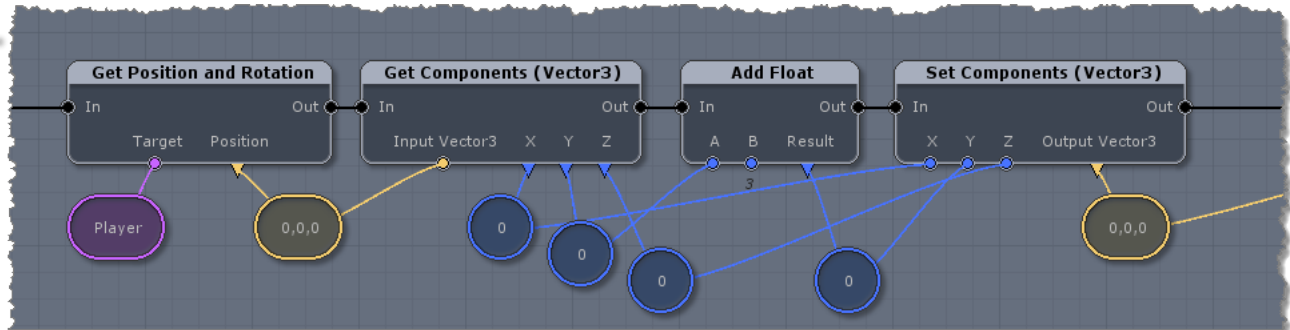


### Named Variable Rules:

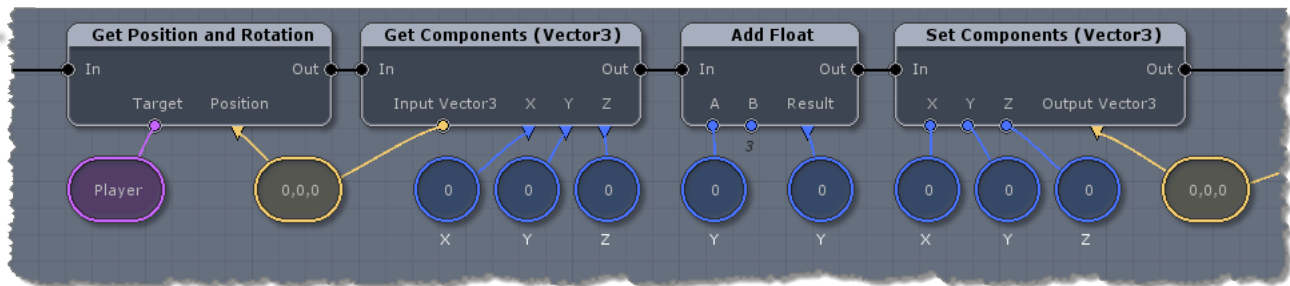
- Named Variables are just regular variables that have been assigned a "friendly name" through the variable node's Properties Panel..
- All instances of a Named Variable must be of the same variable type (string, int, float, vector3, etc.)
- All instances of a Named Variable will always contain the same value, so if you change the value in one instance, all the others will automatically be updated as well.
- Named Variables are unique to each uScript graphs-- they are not shared between graphs in any way. To share values between graphs, please see the Exposed Variables section.
- You can have spaces in your names.

Here is an example of the same logic shown twice. In the first example (1), we are linking the variables directly to all the sockets that need those values. In the second setup (2), we are using named variables to pass along the values to the sockets that need them. These two graphs are functionally the same:

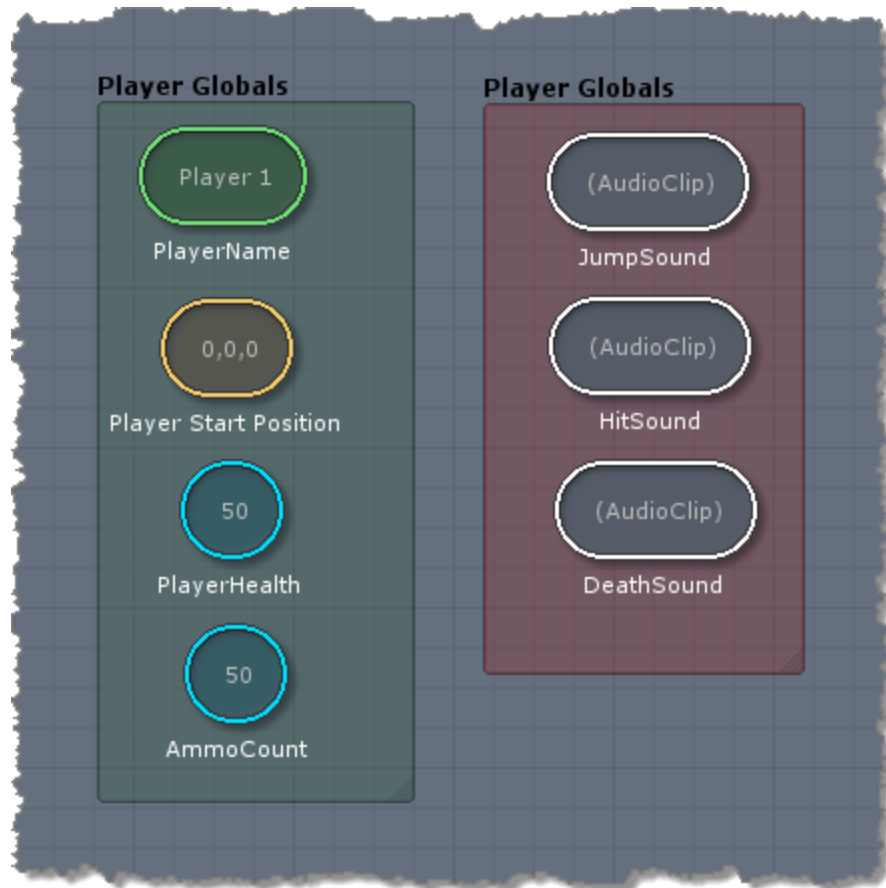
1.



2.

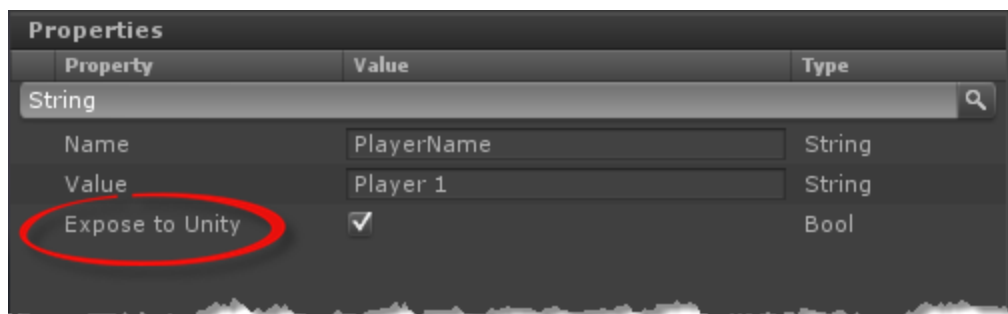


**Tip** - It can be very useful to create a section of a large graphs that contain an instance of all Named Variable in the graph. This can make editing and iterating on the graph faster. Here is an example:



## Exposed Variables

Exposed Variables are simply standard variables that have been named (see *Named Variables*) that have also been set to be exposed to Unity's inspector panel. This is done by checking the "Expose to Unity" option in the Variable Node's Properties Panel. Please note however that this option will only be available for Named Variables as Unity needs a name for the variable in order to expose it.





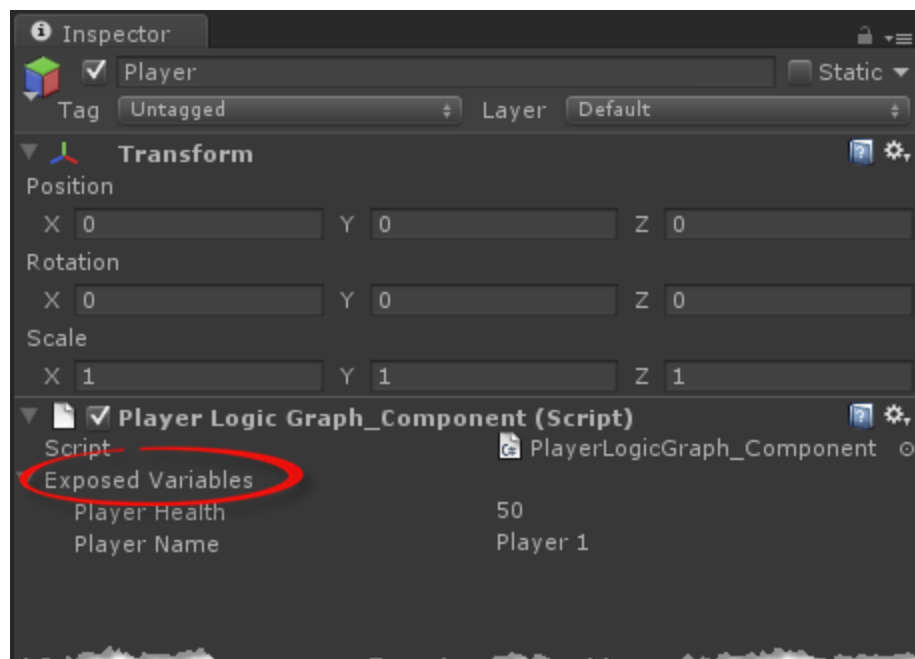
**Note!** - for you programmers/scripters out there, exposing a variable is equivalent to making a variable public in a Unity script.

Exposing variables to Unity has two major benefits:

### Inspector Editing

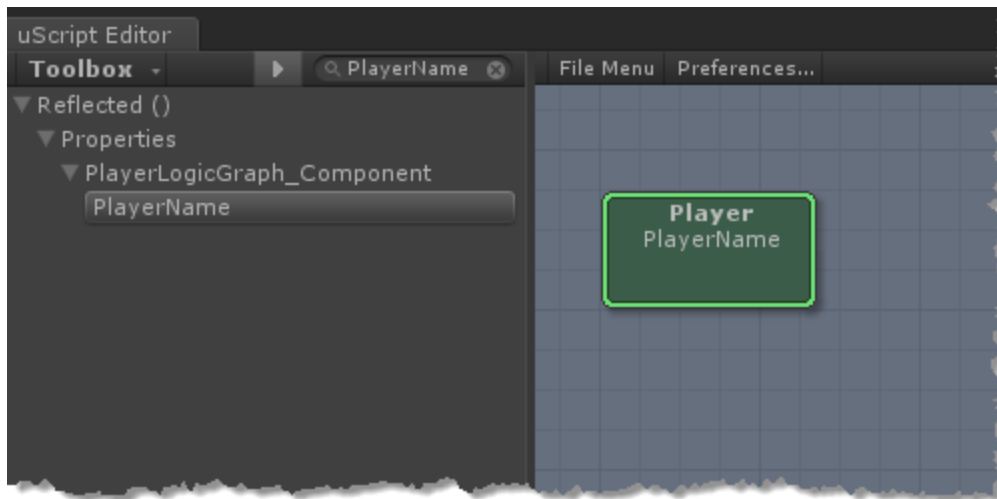
Once you have exposed a variable to the Unity Inspector Panel, you will be able to edit that value from Unity directly without needing to open the uScript editor to view or change the value. This also means you can take advantage of Unity's ability to view and edit the values of exposed variables while the game is running for quick iteration and debugging.

To access exposed variables, open up the uScript graph component on the object that contains the variables you are looking for and expand the "Exposed Variables" section:



### Sharing Values Across Graphs as a Property

You can access any exposed variable from another uScript graph as a reflected property (see *Properties* in this section for details). This is a great way to pass a value from one uScript graph to another.



**Note!** - Make sure you set the Property Node's Instance to the GameObject that has the graph with the exposed variables assigned to it!

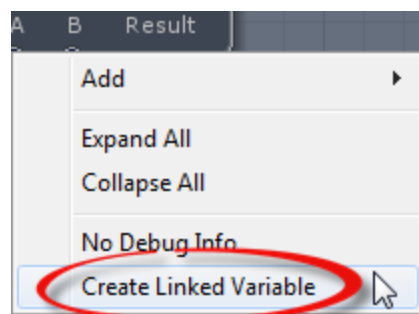
## Variable Tips & Tricks

### Hot-Keys

uScript has several hot-keys that can be used to quickly place nodes on the graph. For example, holding the "S" key while left-clicking on the canvas will place a String Variable, "B" will place a Bool Variable, etc. For a full list of hot-keys, see the Canvas section of the "Hot-Keys" topic in the References section.

### Context Menu

Another way to quickly place a Variable Node and have it automatically hooked up to a socket, is to use the right-click context menu. Simply right-click on a node's variable socket and choose the "Create Linked Variable" option of the menu.





# Reflected Nodes

**IMPORTANT!** - The reflection feature is only available in the *Professional* and *Personal Learning Edition (PLE)* versions of uScript. If you wish to upgrade your license of uScript to the Professional version, please contact Detox Studios.

One of uScript's most powerful features, node reflection, allows uScript to visually represent many parts of your game visually without the need to write custom nodes to access them. More advanced uScript graphs will almost always use at least some reflected nodes.

By default uScript will reflect, as visual nodes, any components or scripts that have been assigned to GameObjects in your Unity scene that contain public methods, properties, or variables.

**Also see** "Advanced Reflection" in the *Advanced uScript Topics* section for more information about reflection.

## Rules of Reflection

It is important to remember the rules uScript uses to determine what it reflects as visual nodes inside the editor:

- uScript will reflect Unity runtime components or scripts (referred to collectively as "items" below). uScript can only reflect scripts that have been compiled before the uScript editor. See Unity's documentation regarding compile order if you have problems accessing Java scripts (you should not see this issue when using C# scripts).
- uScript will only reflect items if they meet one of the following criteria:
  - The item exists on a GameObject in the currently loaded Unity scene.
  - Any items specified by reflection in the uScriptUserTypes.cs file.
- All reflected nodes must have their Instance property specified with a specific GameObject that contains the reflected item.
- Reflected Properties are used like any other variable node in uScript-- even though their node shape is different.

## Locating Reflected Nodes

All nodes that are being reflected by uScript can be found in the *Reflected* ( ) section of the uScript Editor's Toolbox panel.

# Creating Graphs

Delete this text and replace it with your own content.

## Your First Graph

### Graph Properties

## Prefab Graph

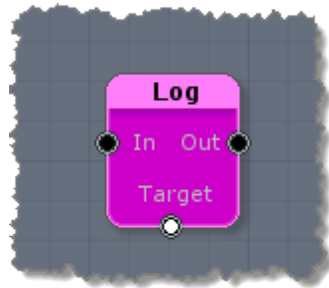
## Nested Graph

## Multiple Graphs



# Pink Nodes

If you have out of date nodes in your graphs that need updating, uScript will turn them a bright pink color.



## Why Nodes Turn Pink

Before getting into how to fix out of date nodes, it is first important to understand **why** nodes might be out of date.

uScript has many nodes and each of these nodes is actually just a C-Sharp script (.cs) that performs a specific function. Other nodes are just part of uScript's reflection system. In both cases uScript just visualizes all this programming script code as visual nodes in the uScript Editor. Because uScript is not in full control of all these visualized scripts, it is important that it has a system in place to handle the case where code it is visualizing as nodes can detect changes that might have been made by someone working on your project.

The primary goal to detect these potential modifications to is to try and handle the changes that were made and preserve as much data in your graphs as possible. This is really important when, for example, you might have a variable in uScript hooked up to a socket on a node and; that node no longer has that socket, the socket has been named differently in the programming code, the socket now takes a different type of variable than before, etc. By not just auto-updating existing nodes on your graph (which could wipe out data you had set on the in the node's Properties Panel) we are able to preserve important node data and settings you might want to have access to before performing the node upgrade.

However, before uScript can rebuild your graphs generated source code and to take advantage of the changes made to either a node or some other reflected code, you must perform the upgrade on the node(s) and make sure everything is set up properly to handle the new code and properties that might have been introduced.



**Note!** - Some simple changes to a node's source code will not cause the node to turn pink because uScript will be smart enough to know how to handle the updated source code and automatically fix everything for you.

Nodes may need to be upgraded for several reasons:

### **Unity Compile Errors**

Because of how Unity's editor tools architecture works, if Unity can not fully compile all the source code of the project due to any compile error, it will not be able to fully compile the uScript Editor itself. When this happens, there is a chance that all nodes on your canvas will show up as pink because uScript is not able to fully function and validate all the projects code to ensure it was the same as before (because Unity couldn't compile it all).

When this happens it is important to discover what is causing the error and fix it before using the uScript Editor. If the cause is uScript generated code (which can easily happen if a node you are using in existing graphs has been modified in major ways), you can safely delete that generated code, then run uScript, upgrade the pink node(s) in the offending graph(s) and then regenerate the code.

### **Updated Node Source Code**

As mentioned above, if a node has been modified in such a way as to change the sockets, or properties required by the node, uScript will need to mark it for updating in an effort to preserve your old data so you can access it before updating the node on existing graphs. This also goes for any node created by uScript of existing project code or other middleware through reflection.

### **Node Marked Deprecated**

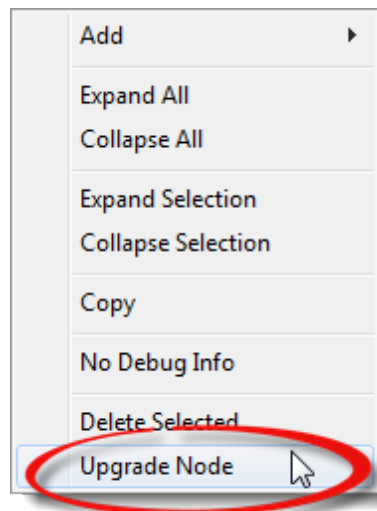
If a node is deprecated through the Deprecate attribute in a node's source code it will be marked pink and in need of replacement or updating (see the *uScript Development Guide's* section on Attributes for more information).

When a node is marked for deprecation without specifying a new node to replace it with, the nodes will need to be removed from existing graphs and

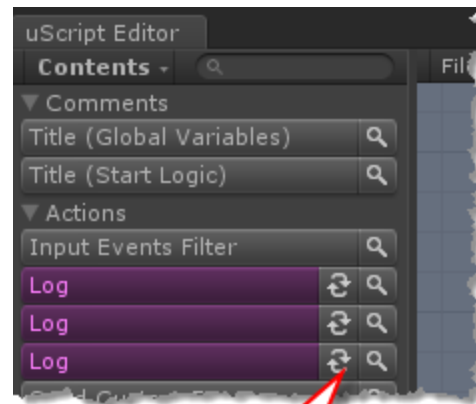
no new instances of that node may be placed. If a new node was specified in the Deprecate attribute, the node must be upgraded to the new node.

## Upgrading Nodes

There are three ways to upgrade pink nodes in your graph. The first is to Right-Click them and select "Upgrade Node" option.

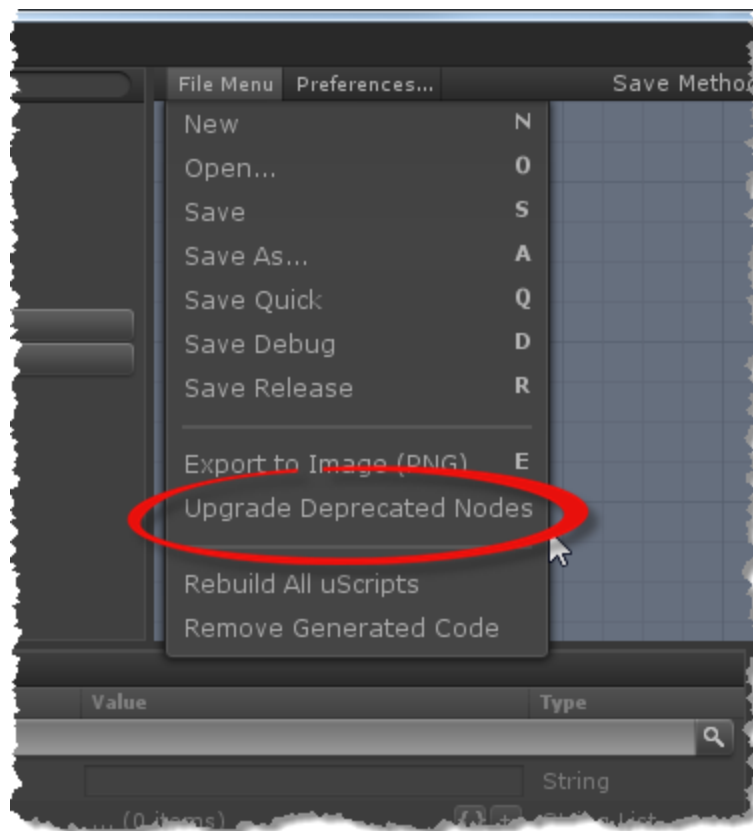


You can also use the Upgrade button on pink nodes in the Contents Panel (See "Canvas Navigation" for more information about the Contents Panel):



Pres the Update button on a node button to update it to the latest version.

Lastly, you can have uScript auto-upgrade all pink nodes on your graph by using the "Upgrade Deprecated Nodes" item in uScript's File Menu:





# Debugging Your Graphs

Sometimes the graphs you make will not work as expected and it will be necessary to track down the problem to fix it. There are several tools at your disposal when needing to debug your uScript graphs.

## Preparing to Debug with uScript

Before you start debugging, there are a couple things you should know beforehand.

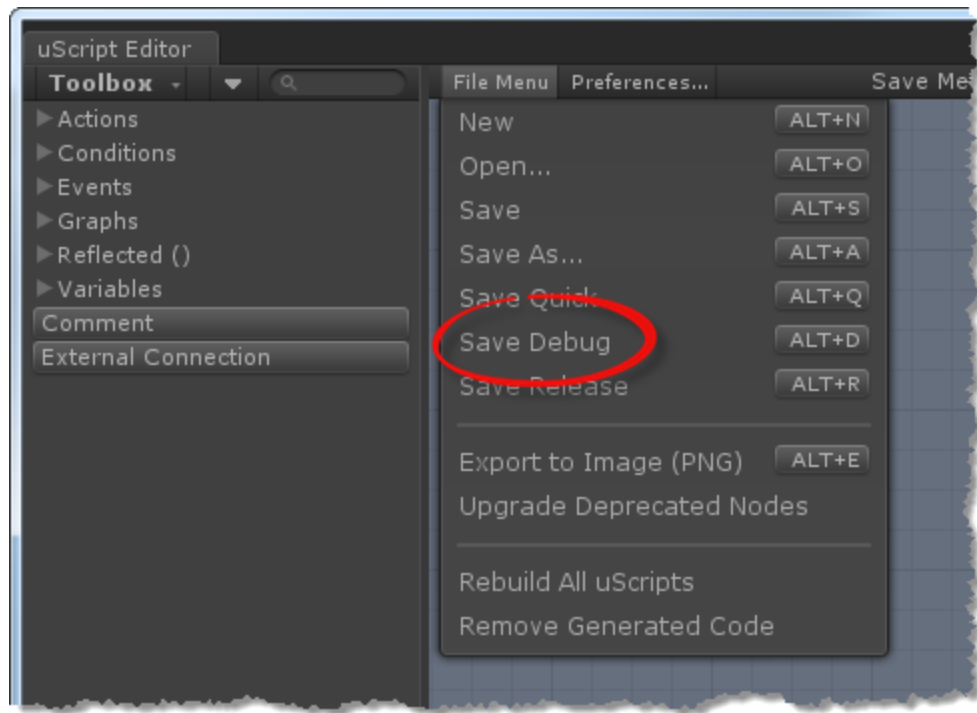
### Debug Save Method

uScript allows you to save your graphs a few different ways. It is important that you use the "Save Debug" method to save graphs you wish to also debug. This is because some of the debug methods mentioned below will only work with the graph has been saved in this way.

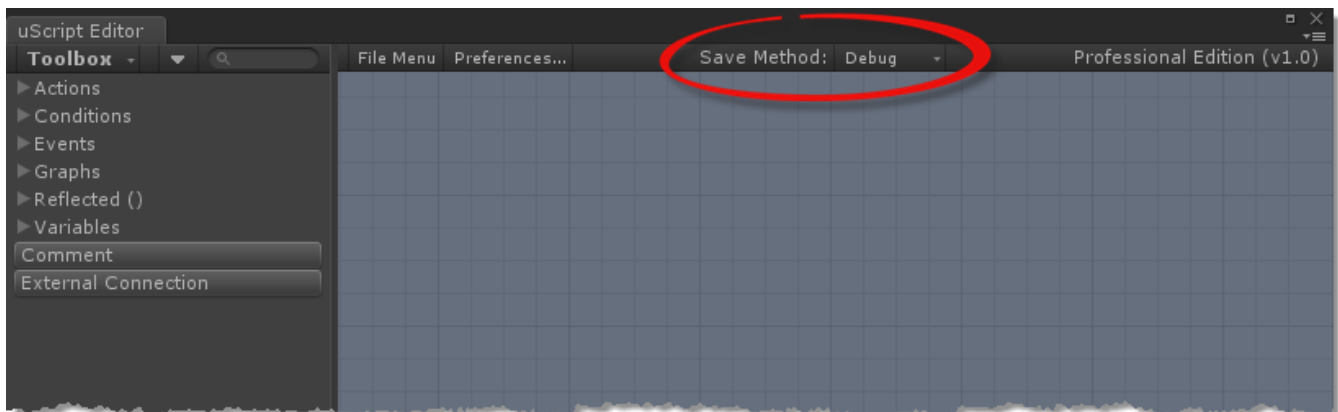
uScript will add in some extra logic to the exported C# script files it makes to support some debugging features. These debugging features are stripped out for optimization when saved as "Release".

To save a graph with debugging enabled, you can:

1. Select the Save Debug option from uScript's File menu (hot-key *Alt+D*):



2. Set the default *Save Method* in the Canvas menu to "Debug". This will ensure that whenever you just use "Save" through the File menu, or pressing the save button in the uScripts Panel, it will use the Debug option:

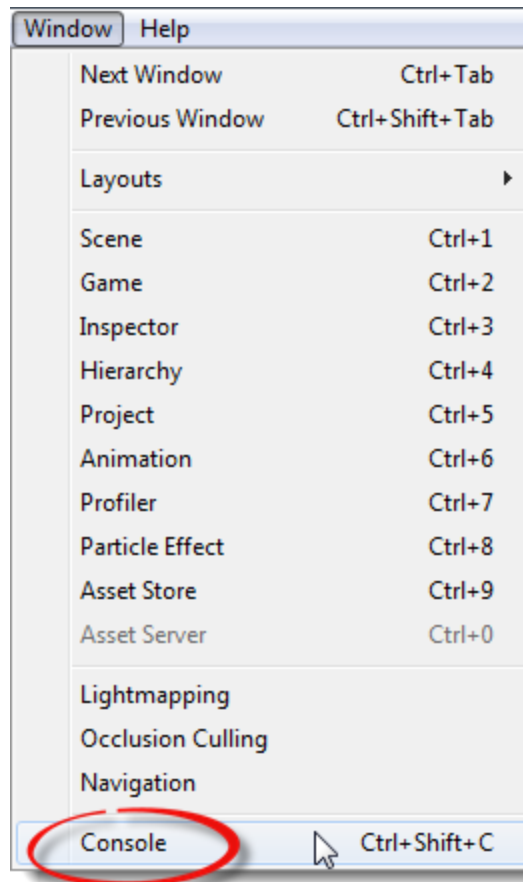


## Using Unity's Console Window

Some of uScript's debug methods mentioned here (as well as other important information uScript may be telling you) use Unity's console window for text output. You

should be familiar with its use and how to access it in order to take full advantage of the debug methods found below.

Unity's debug console can be opened by either left-clicking on bottom status bar of Unity's editor window, by using the *Ctrl+Shift+C* hot-key combo (use *Cmd+Shift+C* on Mac), or by choosing "Console" from Unity's Window menu.



## Using Nodes To Debug

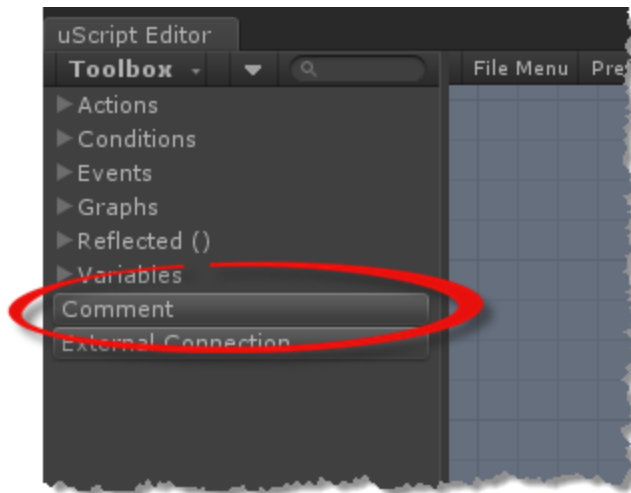
There are a few different ways to comment things in uScript. The function of these methods are to provide information to uScript users about important information regarding the graph logic and how it is used either for design time or runtime.

### Comment Node

Clearly understanding how a graph has been setup and works is a great first line of defense from needing to debug a graph in the first place. One of the best ways to do this is by using Comment Nodes on your graphs. This is a special node that allows you to provide text information right on the uScript Canvas for your graphs. You can place as many of these as you wish and also customize its background and text colors. These nodes

also are positioned "behind" all other nodes so you can also use them to "box in" nodes to help provide more visual context and sectioning of you graphs. This can help greatly for graph organization and readability-- especially on larger graphs.

To place a Comment Node on a graph, you can select it from the top level of the Tool-box, or use the hot-key combo *C+LeftMouseButton* to place one at a specific location on the Canvas.

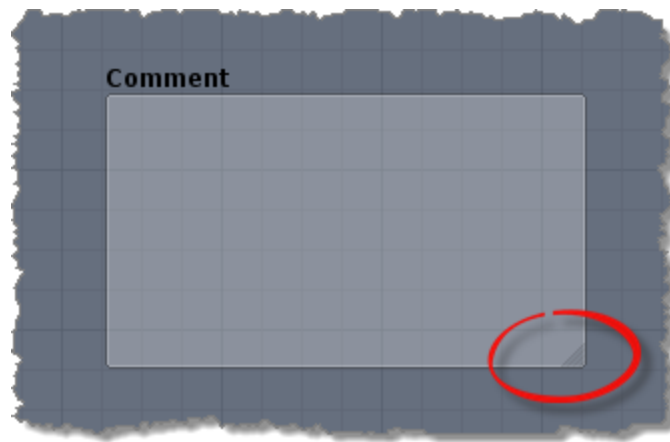


Once placed, you will see a default Comment Node appear on the canvas:

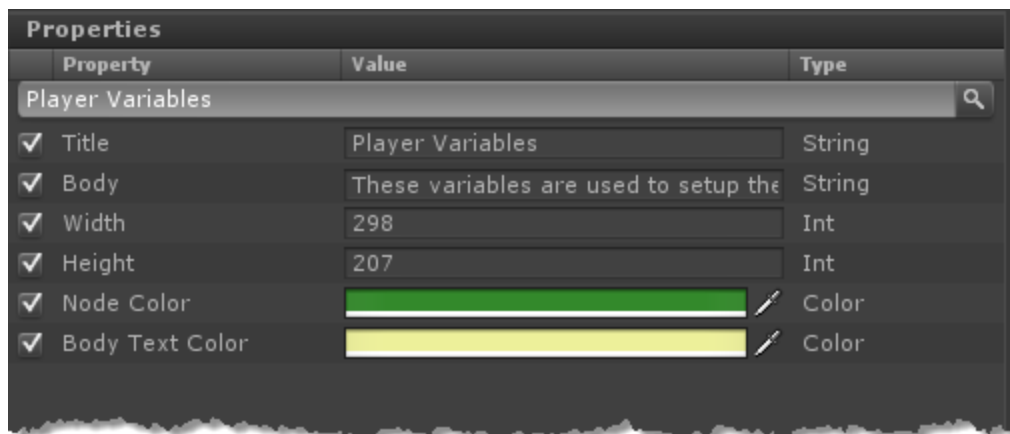


You can move it around like any other node by selecting it. The comment Node can also be resized. To do this, left-click on the resize handle at the lower right of the Comment Node and drag it out to the desired size:

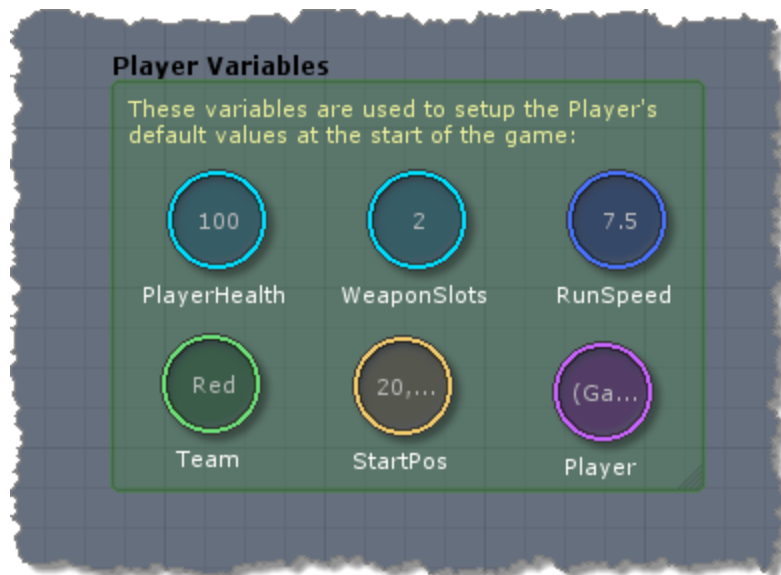




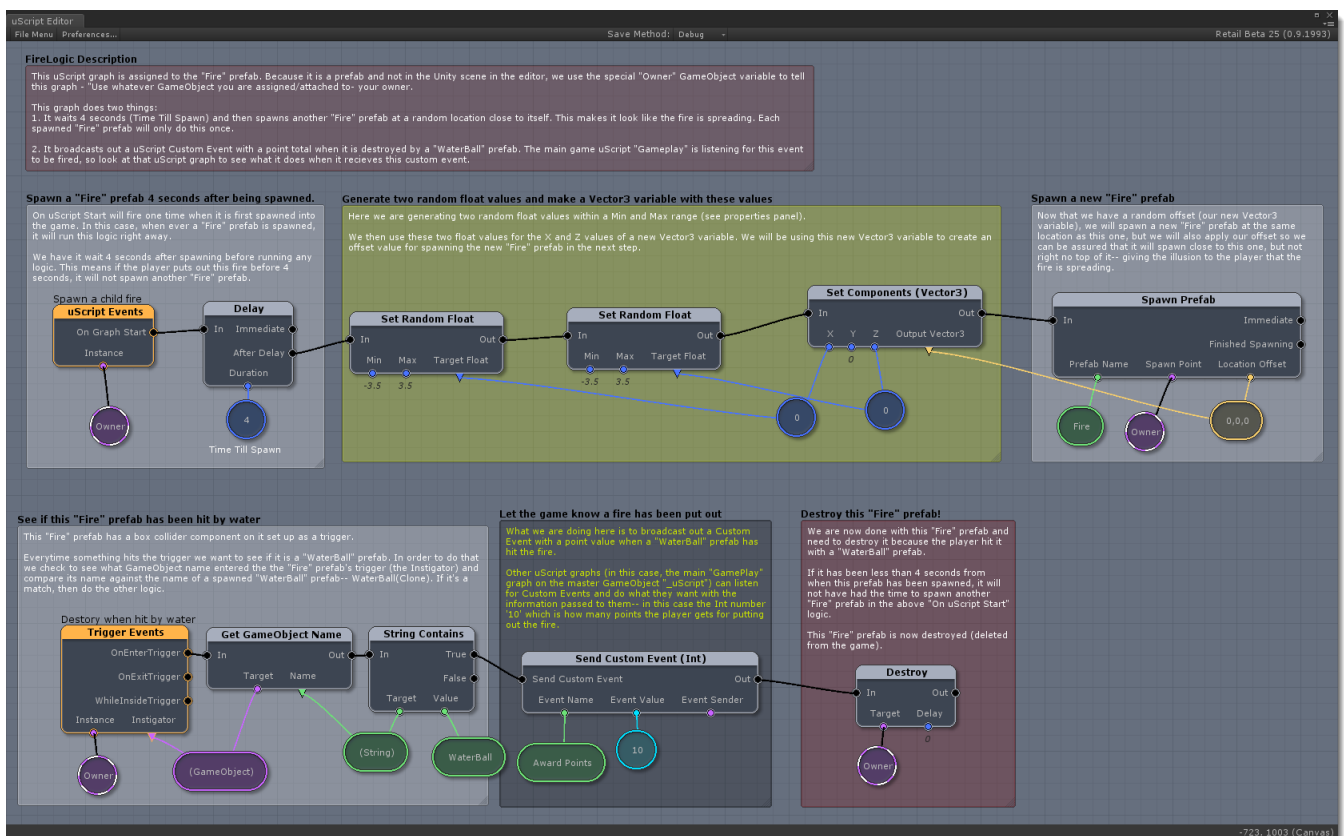
You can edit the properties of the Comment Node by selecting it and editing the settings in uScript's Properties Panel:



Here is an example of a Comment Node setup to hold a bunch of global variables for the player. Notice that "normal" nodes such as these variable nodes can be placed in front of the comment node:



Here is a more complex example of a graph using several Comment Nodes to help explain the details of how the graph works:

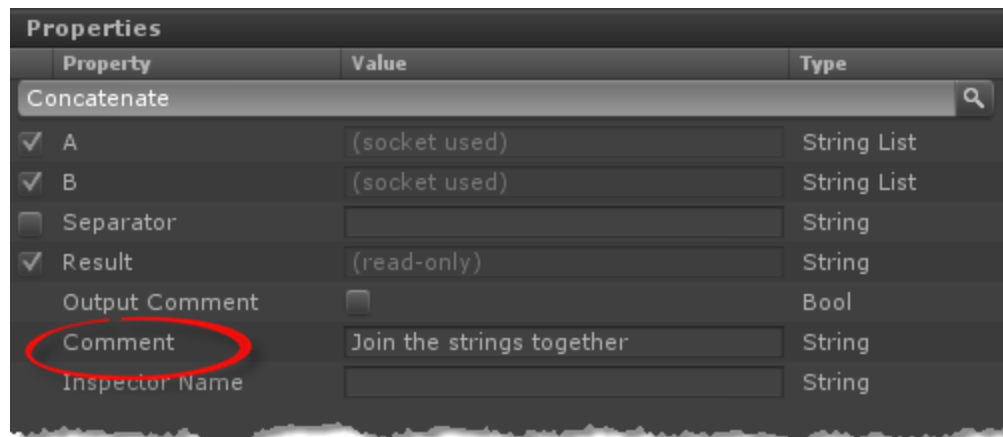


## Information Output

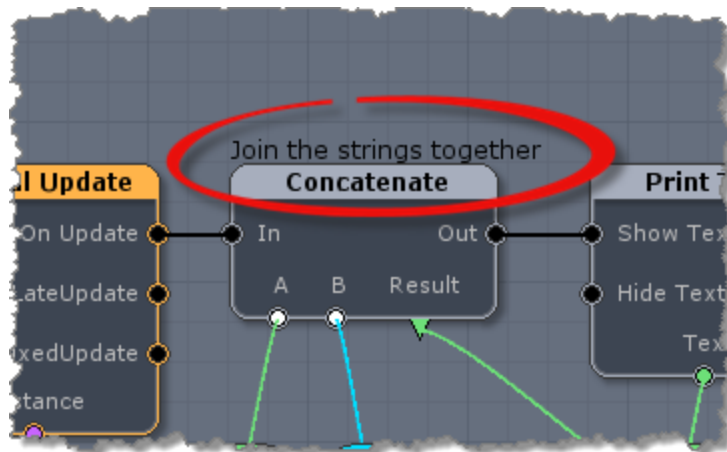
There are three fairly simple ways to output text that will allow you to see the values of variables or if specific logic is even executing at all.

### Comment Property On Nodes

The comment property found on most nodes allows you to place a line of text directly above a node on the uScript Canvas. To enable this, you just need to provide text in the node's Comment property field in the Properties Panel:

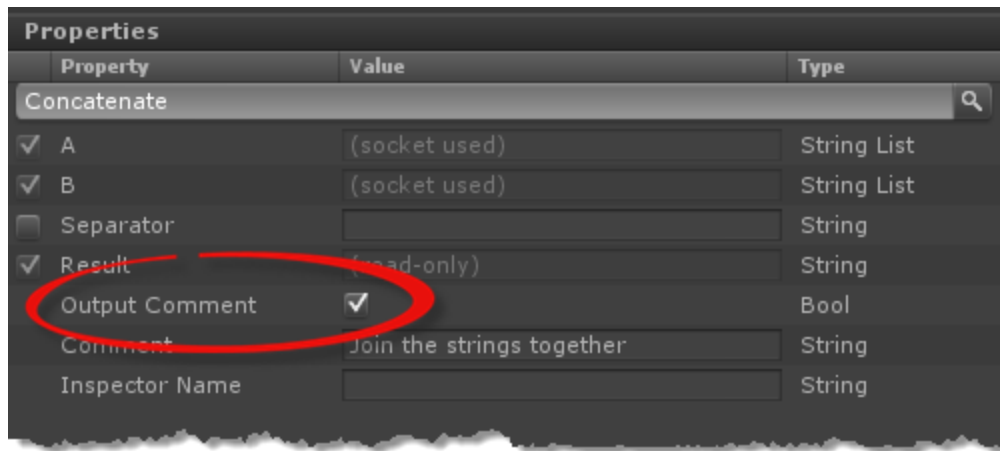


Once this is done, the comment text will appear above the node on the graph:

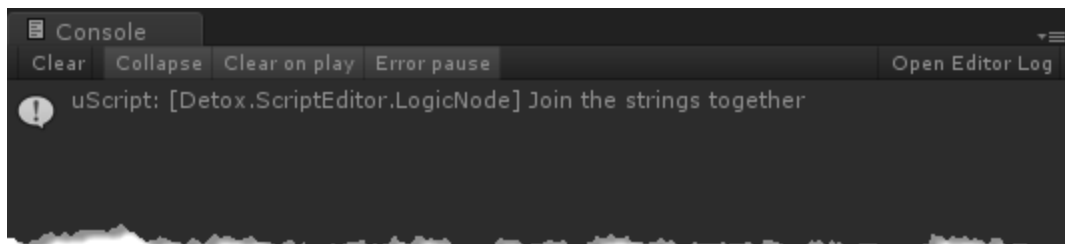


You can also have this comment print out to Unity's console window each time the node executes (receives a signal). To do this, simply check the

node's "Output Comment" property in the Properties Panel and then make sure you are saving the graph using the "Save Debug" option (graphs saved as "Release" will not output debug comments to the console):



Once this is done, the comment will appear in the console window, also pricing information as to what graph and node type the comment came from:

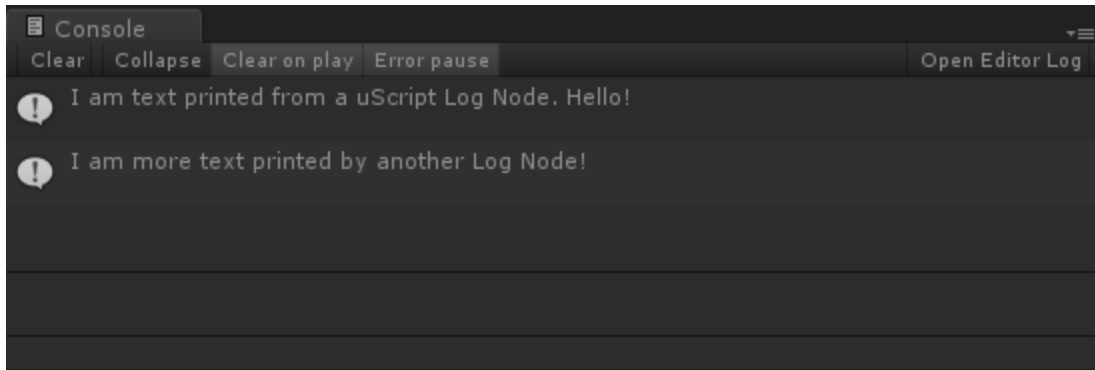


## Log Node

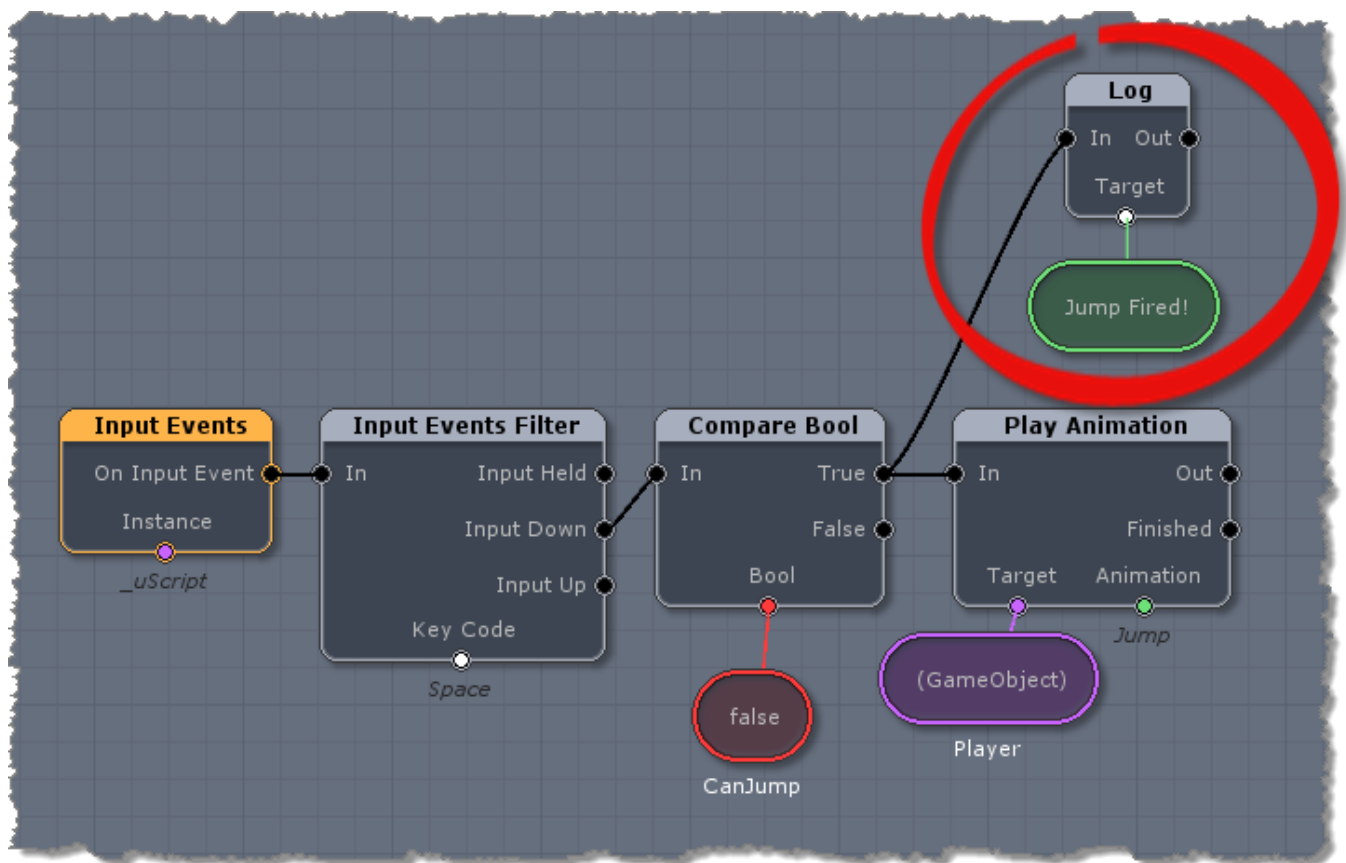
The first is to use the Log Node. This node allows you to output values to the console and uses Unity's `Debug.Log()` script command.



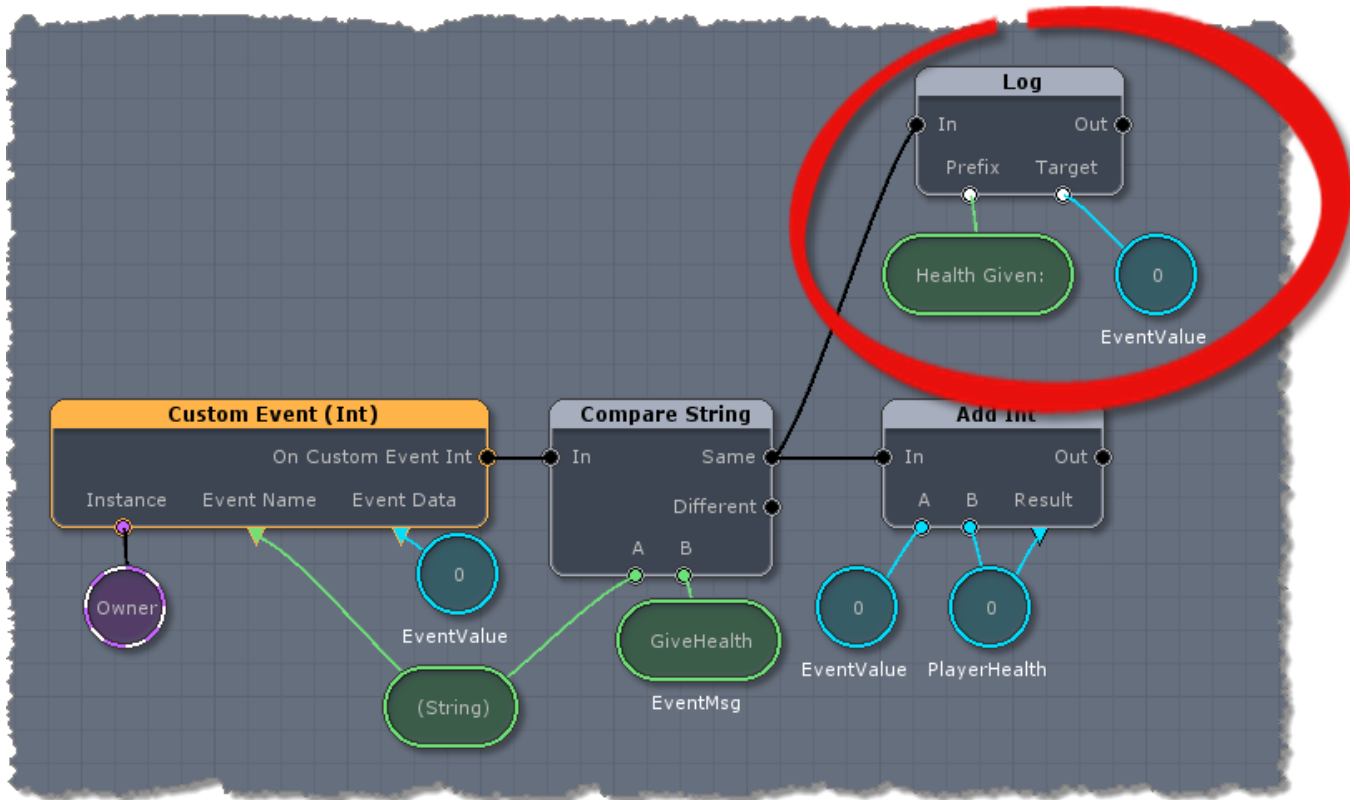
This node allows you to easily print out any variable type value and also to optionally include text before and after that value to Unity's console window.



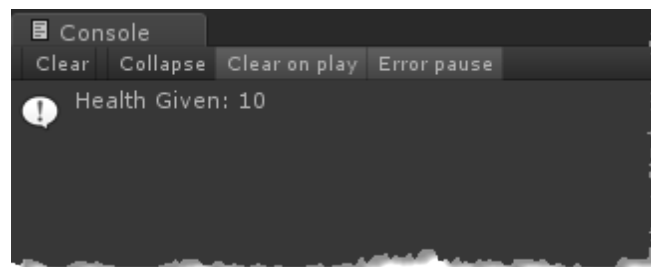
Here is a simple example of using a Log Node to print to the console whenever the player jumps. Notice how the debug logic is not inline with the other logic. This makes it easy to disconnect or remove once no longer needed.



You can also use the Prefix or Postfix sockets to have text or other values appear before or after the Target value. This example shows adding some text before the value to better help the user find the console output text and also know what that value represents.

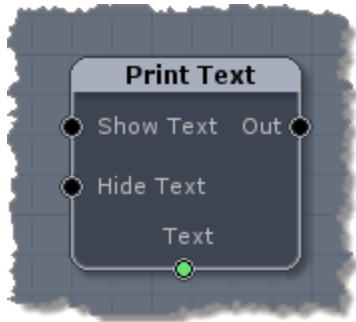


The resulting console output would look like this:

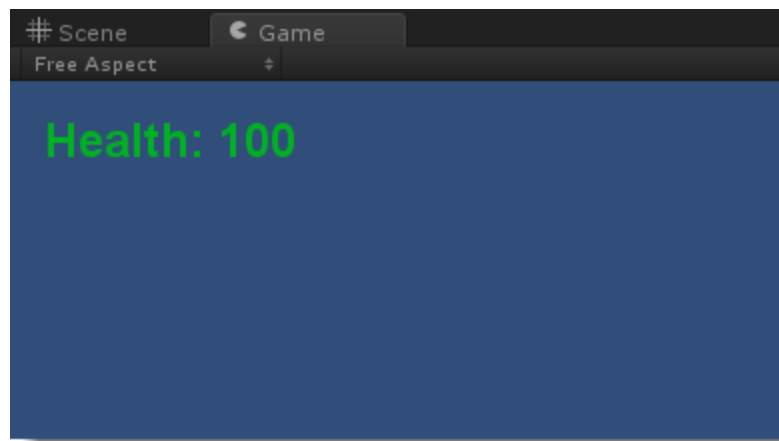


**Print Text Node**

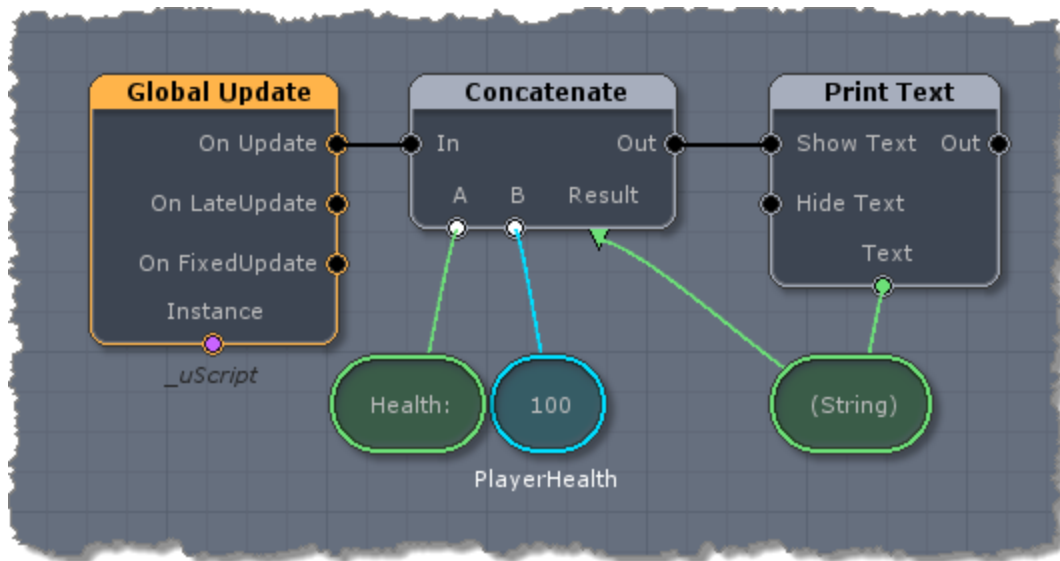
If you would rather print text to the screen instead of Unity's console window, you can use the Print Text Node. This node is very useful when you are running your game on a target device where there is no Unity console to read output text (such as a mobile phone).



Once set up, this node will print text directly onto the game screen:



The above output was generated using the following graph logic. Please note that the Print Text Node's font style or properties will not be applied when running on mobile devices under Unity 3, as Unity 3 does not support that ability:



**Note!** - the *Concatenate* node is very useful to use with the *Print Text* Node because it allows you to input any variable type and to also provide extra text to the debug output (see the above example).

### Other Nodes

There is also nothing stopping you from using other nodes to help with debugging. For example, you could play a certain sound with a *Play Sound* node based on logic you specify. Be creative and I'm sure you will think of others that could help you in special situations!

## Visual Debugging

uScript has the ability to pause graph execution in the editor by setting breakpoints on nodes. When you do this, the game will pause execution when that node is about to fire, allowing you to review the state of variables on your graph and to also step through execution using Unity's pause/play system.

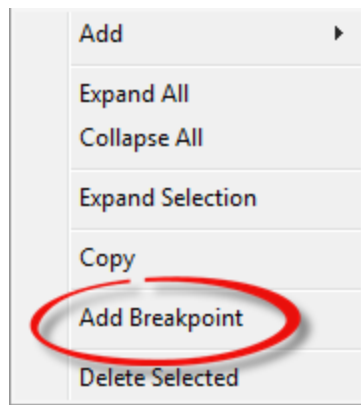
**Note!** - this system requires that you use the *Debug Save* option for the graph you wish to visually step debug.



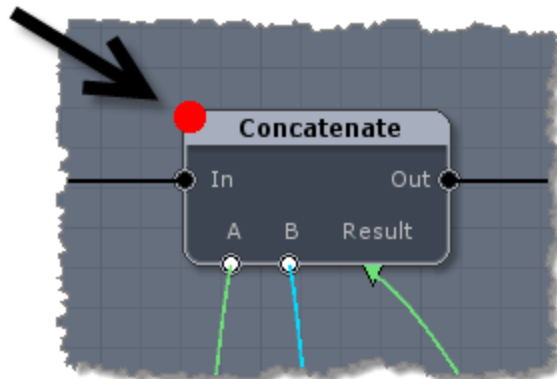
## Using Breakpoints

uScript uses breakpoints that you specify to tell uScript where to pause execution of graph logic while the game is running. You will need to re-save your graph (in Save Debug mode) when setting or removing breakpoints from nodes.

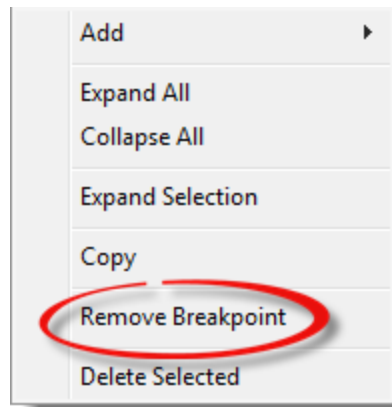
To set up a breakpoint on a node, simply right-click on the node and choose "Add Breakpoint" from the context menu:



Once you do that you will see a red dot at the top left corner of the node. This lets you know there is an active breakpoint set on the node:



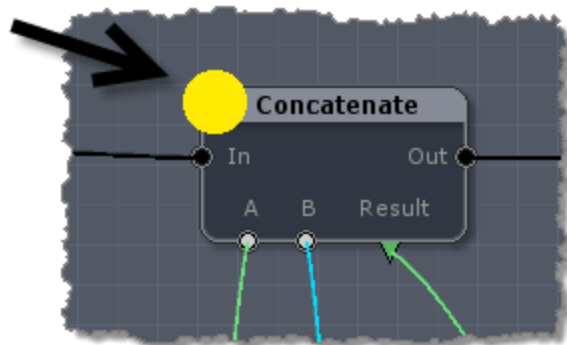
To remove an existing breakpoint from a node, just right-click the node again and choose "Remove Breakpoint" from the context menu:



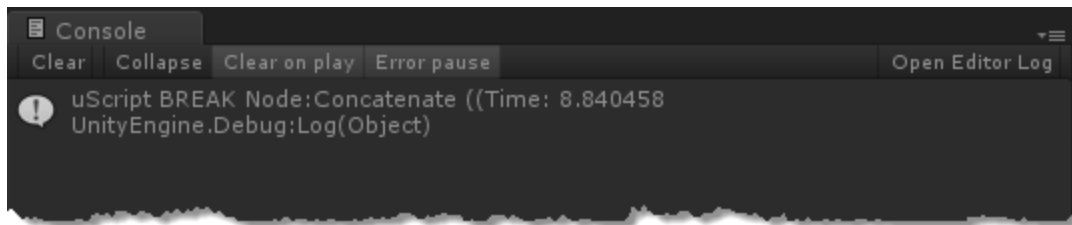
## Hitting A Breakpoint

When the game is running and a node with a breakpoint set on it is about to execute, the following things will happen:

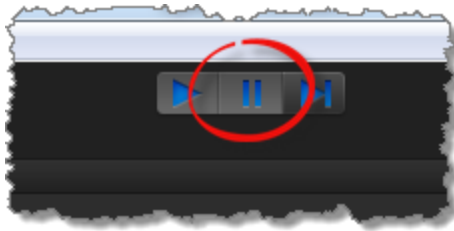
1. uScript will pause the game's execution and change that node's breakpoint from a red dot to a larger yellow dot to show you what node the game is currently executing:



2. uScript will output to Unity's console window with information about which node caused the break:



3. Unity's Pause button in the editor will activate:



Once the game's execution has been paused, you can then either restart execution by pressing the Pause button again, or press the Step button to the right of the Pause button to step through the game manually. If you un-pause game execution, the game will pause again whenever another breakpoint is reached.

For more information on using Unity's Play Mode system, please see the Unity documentation.

## Unity MonoDevelop Debugging

Lastly, because uScript generates C# source code, you could also use Unity's MonoDevelop debugging methods to directly debug the exported script code from uScript. Please see the Unity documentation for information on how to do this. Currently it can be found here: <http://docs.unity3d.com/Documentation/Manual/Debugger.html>

# Script Generation

uScript works by converting your visual graph logic into actual C# programming code that Unity will use for your game.

## Rebuilding Generated Code Files

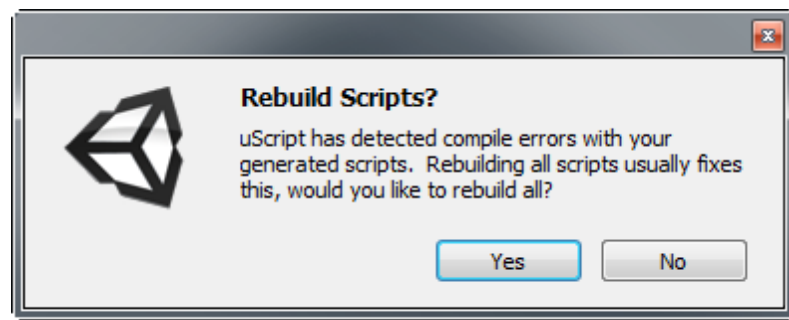
Sometimes this code gets out of sync and will generate compile errors in Unity (usually from a uScript build upgrade that contains new features and improved nodes). When this happens, you need to delete/rebuild your generated scripts so they are in sync with the new uScript build and can take advantage of the new features and enhancements.

## Delete Generated Files

There are two methods to delete your generated uScript code files-- through the uScript editor and manually.

### **Method 1 - Rebuild Scripts Dialog**

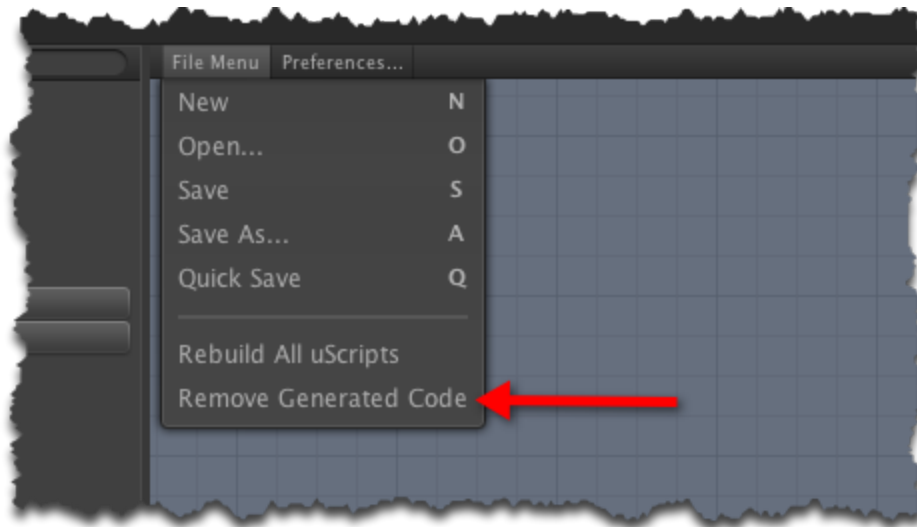
In most cases, uScript itself will detect that it needs to rebuild your uScript's generated code files and ask if you would like to do so in a pop up dialog box. Just press the "Yes" button to have uScript delete and rebuild your generated code files.



**Note!** - *This method will not work if nodes have been modified (updated or deleted)! In that case, please select "No" from the dialog window shown above and use the "Remove Generated Code" button (shown below).*

## Remove Generated Code Button

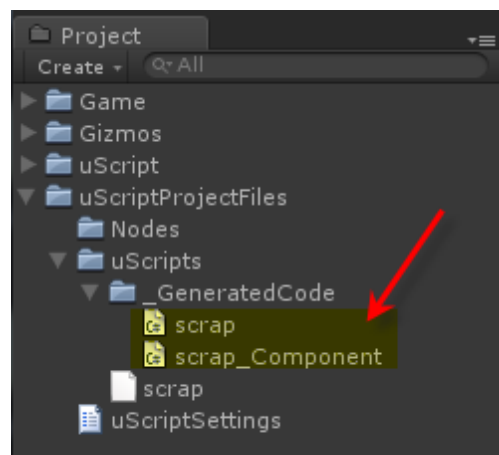
Also, from within the uScript Editor, you can choose to delete your generated code files at any time by pressing the "Remove Generated Code" button in the File Menu above the Canvas.



If the above methods do not work, you can always manually delete your generated code files by following the process below.

### **Method 2 - Rebuilding Scripts Manually**

If all else fails, you can manually delete these files from right within Unity's Project tab. Just open up the "uScriptProjectFiles" folder and then the "uScripts" folder (note, this is different than the root "uScript" folder!). Here you will see a "\_GeneratedCode" folder. Open that folder up and delete the C# files (.cs) inside. See this image for an example of where to go to delete the generated files for a uScript graph called "scrap":



Each uScript graph creates two generated C# files, one is the same name as your graph (scrap.cs in the above example) and the other is a component file (scrap\_Component.cs in the above example).

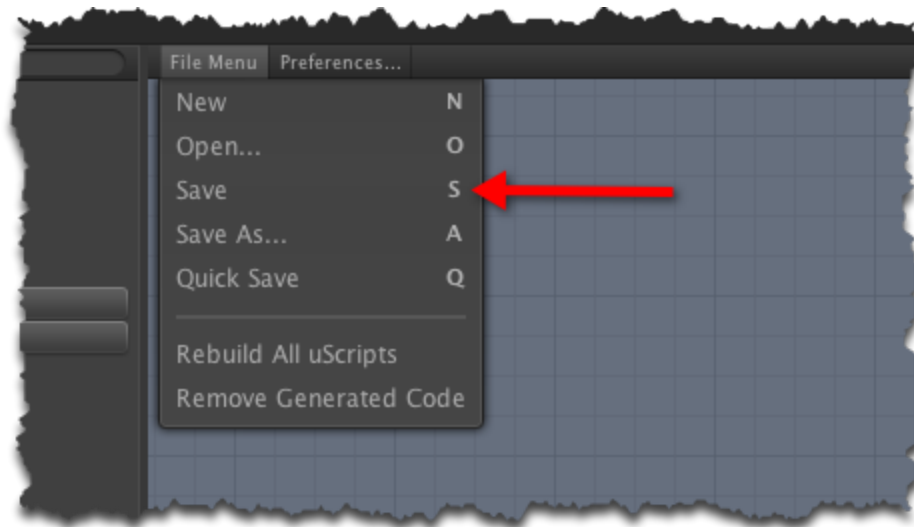
In short, all files inside the "\_GeneratedCode" folder are ok to delete. uScript can rebuild them for you from the .uscript files located in "uScriptProjectFiles/uScript". **Do not delete your .uscript files as those are your actual graph files and you will loose your graphs! Just delete the generated .cs files!**

***Note!** - If you have the Unity console window up, you can usually click on script compile errors there and it will highlight the file is having a problem with. This makes it easy to locate and delete these generated files.*

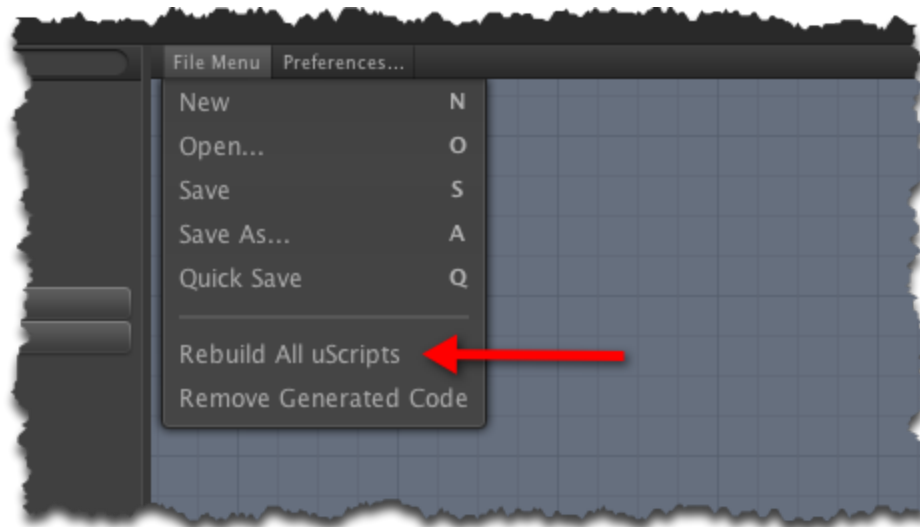
## Rebuilding Generated Files

There are two ways to rebuild the generated code files for your graphs.

**Save the graph.** In the uScript Editor, load the graph you wish to regenerate the code for and hit the "Save" button in the File Menu above the Canvas. uScript will always regenerate your graph's code when you hit the save button.



**Rebuild them all at once.** In the uScript Editor, press the "Rebuild All uScripts" button in the File Menu above the Canvas. This will rebuild all of your graphs code files all at once.



# Advanced uScript Topics

This section covers advanced and specialized topics regarding using and developing with uScript.



# Advanced Reflection

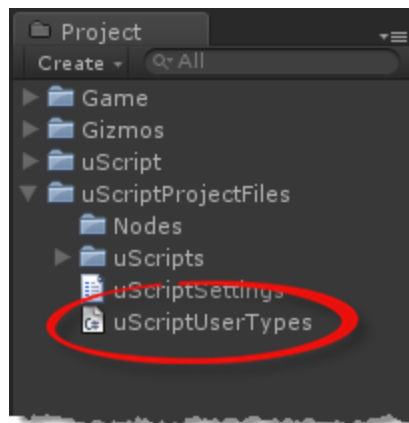
**IMPORTANT!** - The reflection feature is only available in the *Professional* and *Personal Learning Edition (PLE)* versions of uScript. If you wish to upgrade your license of uScript to the Professional version, please contact Detox Studios.

## Reflecting Things That Aren't There

By default uScript will reflect anything that is in the currently loaded scene in the Unity Editor. There are times however that you may want to use reflected nodes and properties for things that are not in the scene at design-time but do appear once the game is running (like maybe assigning a component to a GameObject at run-time). In order to do this in uScript, you can assign the things you wish to force to be reflected by editing the ***uScriptUserTypes.cs*** file found in the root of the *uScriptProjectFiles* folder of your Unity project.

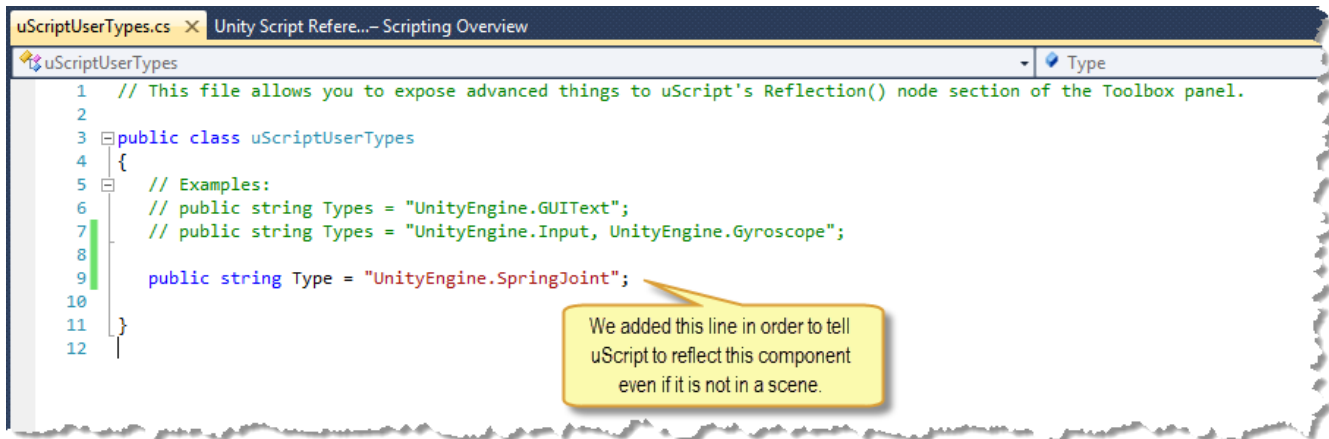
To modify the *uScriptsUserTypes.cs* file, do the following:

1. Open the file in your source code editor of choice (Unity used *MonoDevelop* by default). Just double-click the file in Unity to bring up Unity's default code editor. This file is located in the root of your project's *uScriptProjectFiles* folder:



2. Once open, you can add Unity objects to be reflected. In this example we will be adding the [SpringJoint](#) component, though you can add any valid

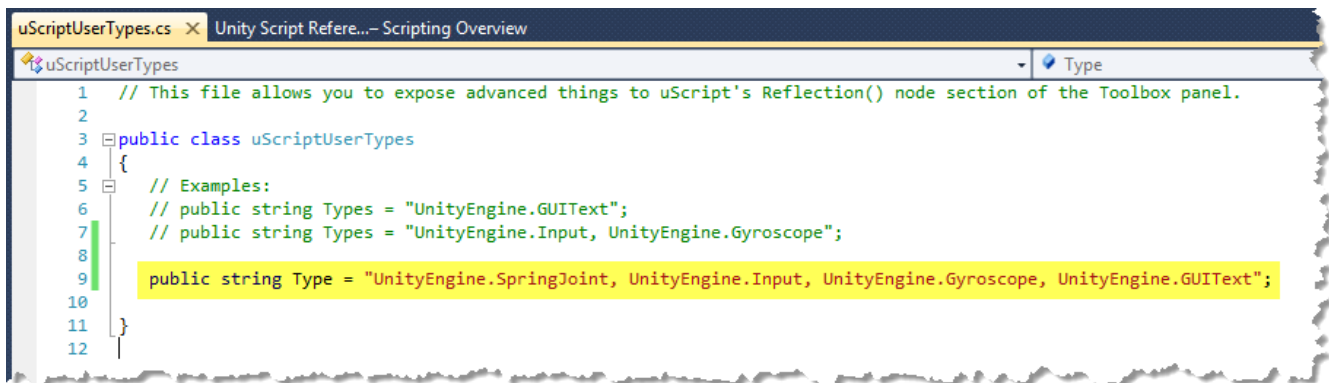
Unity object type:



```
1 // This file allows you to expose advanced things to uScript's Reflection() node section of the Toolbox panel.
2
3 public class uScriptUserTypes
4 {
5     // Examples:
6     // public string Types = "UnityEngine.GUIText";
7     // public string Types = "UnityEngine.Input, UnityEngine.Gyroscope";
8
9     public string Type = "UnityEngine.SpringJoint";
10
11 }
12
```

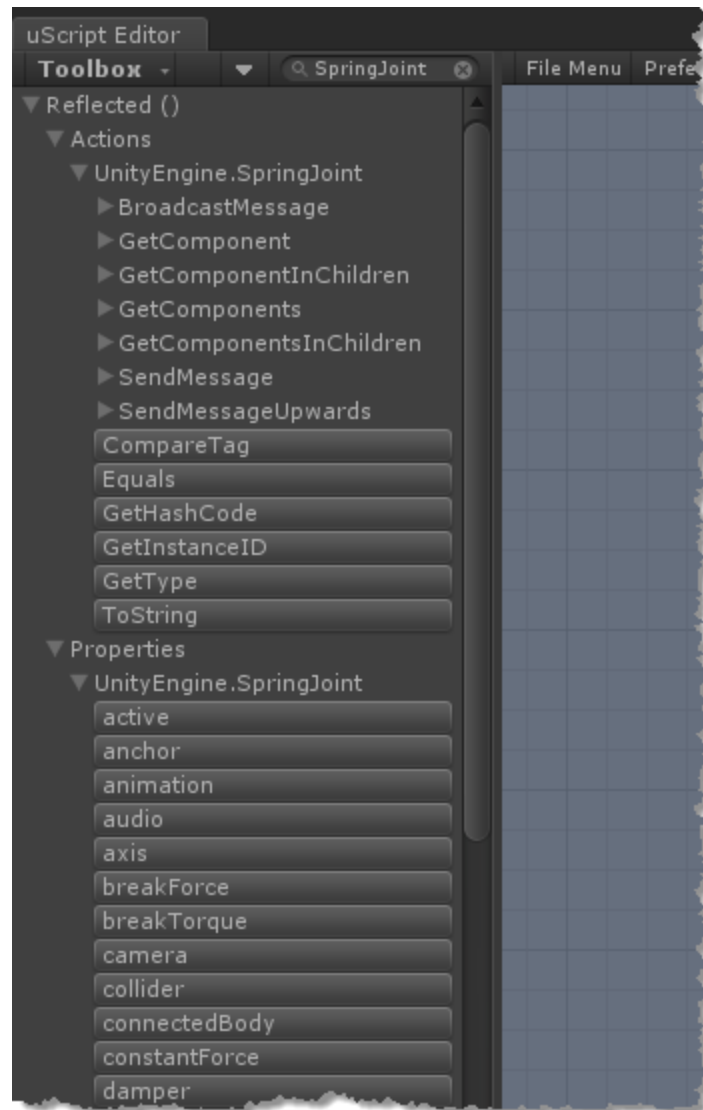
We added this line in order to tell uScript to reflect this component even if it is not in a scene.

**Note!** - if you wish to add more than one Type to be reflected, please assign them to the same Type string variable and use commas to separate them like this:



```
1 // This file allows you to expose advanced things to uScript's Reflection() node section of the Toolbox panel.
2
3 public class uScriptUserTypes
4 {
5     // Examples:
6     // public string Types = "UnityEngine.GUIText";
7     // public string Types = "UnityEngine.Input, UnityEngine.Gyroscope";
8
9     public string Type = "UnityEngine.SpringJoint, UnityEngine.Input, UnityEngine.Gyroscope, UnityEngine.GUIText";
10
11 }
12
```

3. Save the file and return to Unity. If the file was edited properly, Unity will compile it. Once it is compiled close and re-open uScript (*if uScript is already open, you will need to close it first*) to see the additional items you have specified to be reflected. Like all reflected nodes, the new nodes will appear under the *Reflected ( )* section of the Toolbox:



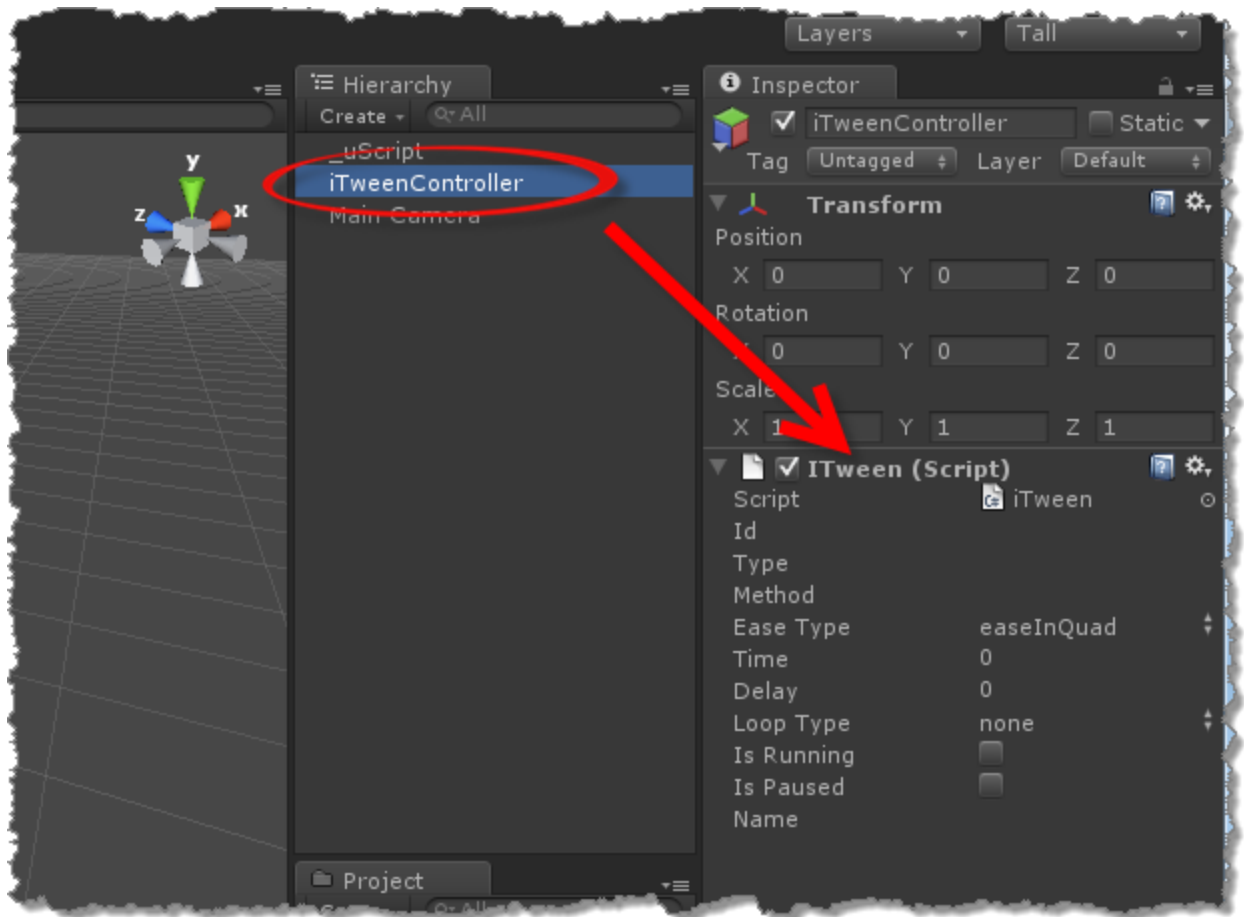
**Note!** - You will only be able to use these newly reflected nodes on Game-Objects you are certain contain the reflected item when you plan to use it at runtime. As always, make sure you have assigned the Instance property for any reflected node to the GameObject you wish to refer to when accessing the specific instance of a reflected item.

## Reflecting Other Middleware

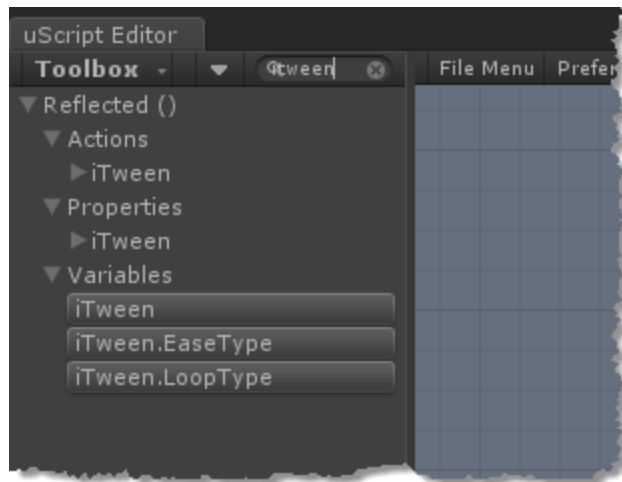
In order to reflect most other Unity middleware in uScript, you will need to either define the item to be reflected (as shown above in "*Reflecting Things That Aren't There*"), or by

assigning the middleware script to a GameObject. In this example we will show you how to reflect iTween as an example.

1. Install the middleware into your Unity project.
2. Create a new, empty GameObject (ours is called *iTweenController* in this example) and assign the middleware's script file to it:



3. Now open the uScript Editor and look for the middleware to be reflected in the *Reflected ( )* section of the Toolbox:



**Note!** - Some middleware may require custom nodes to be created to get the most out of using it in uScript. Some middleware providers (such as NGUI) have created nodes to better integrate their middleware with uScript. We recommend that you contact the middleware author as well as stop by the uScript forum to see if there has been custom nodes created for the specific middleware you are using.

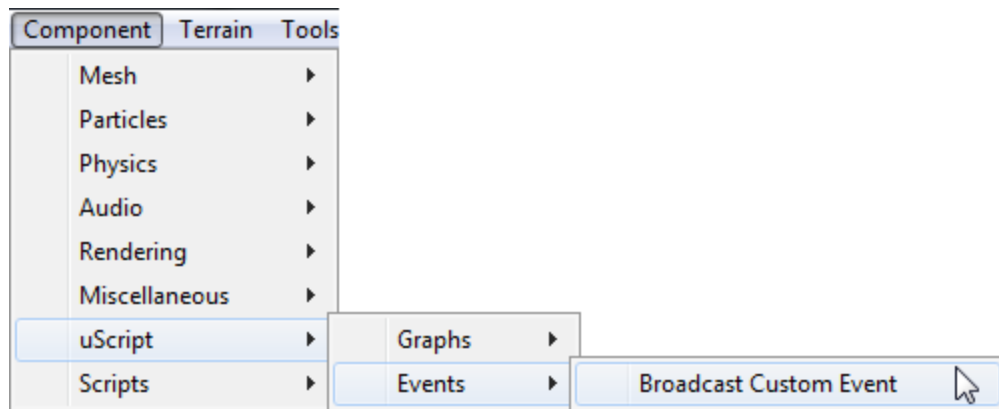
# Animation Event Triggering

uScript ships with a script that you can use to remotely trigger logic in uScript called `BroadcastCustomEvent.cs`. The most popular use for this script is to trigger uScript logic from Unity's [Animation Event system](#).

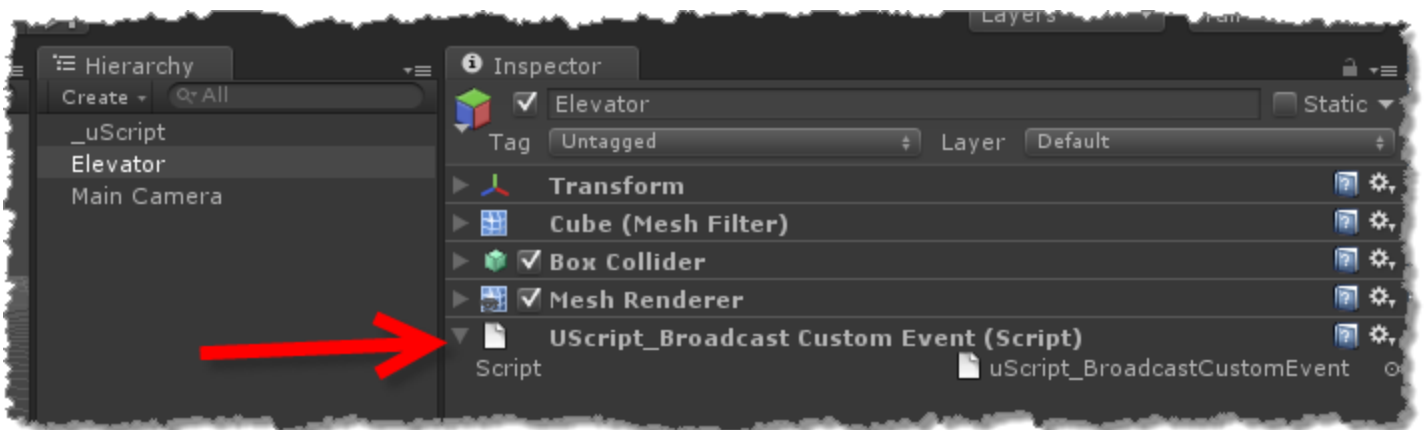
This can be very useful for uScript logic you wish to trigger based on a specific animation (or frame of an animation).

To use this script in your own project, follow these steps:

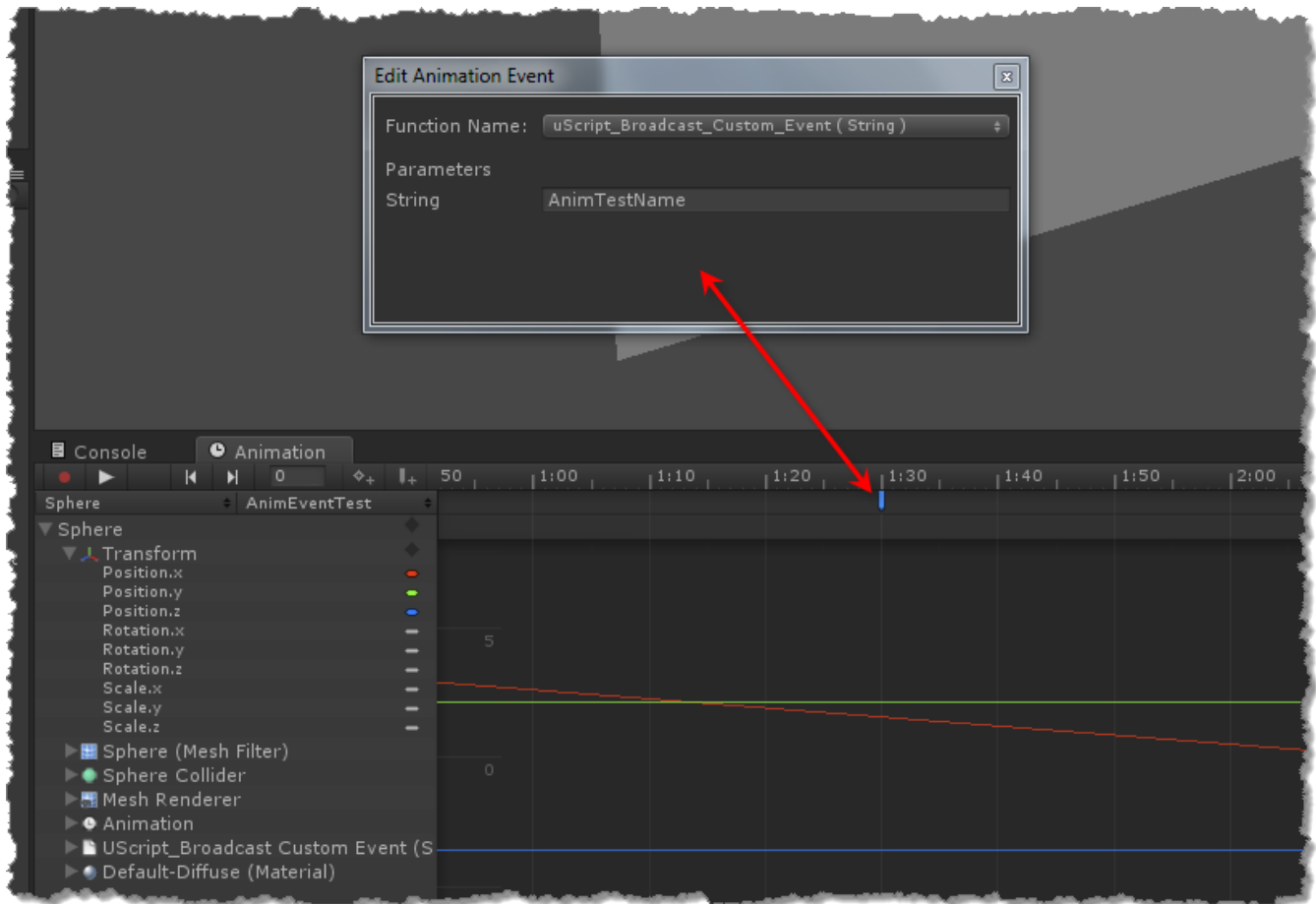
1. Assign the component to the GameObject with the animation you wish to add an Animation Event on:



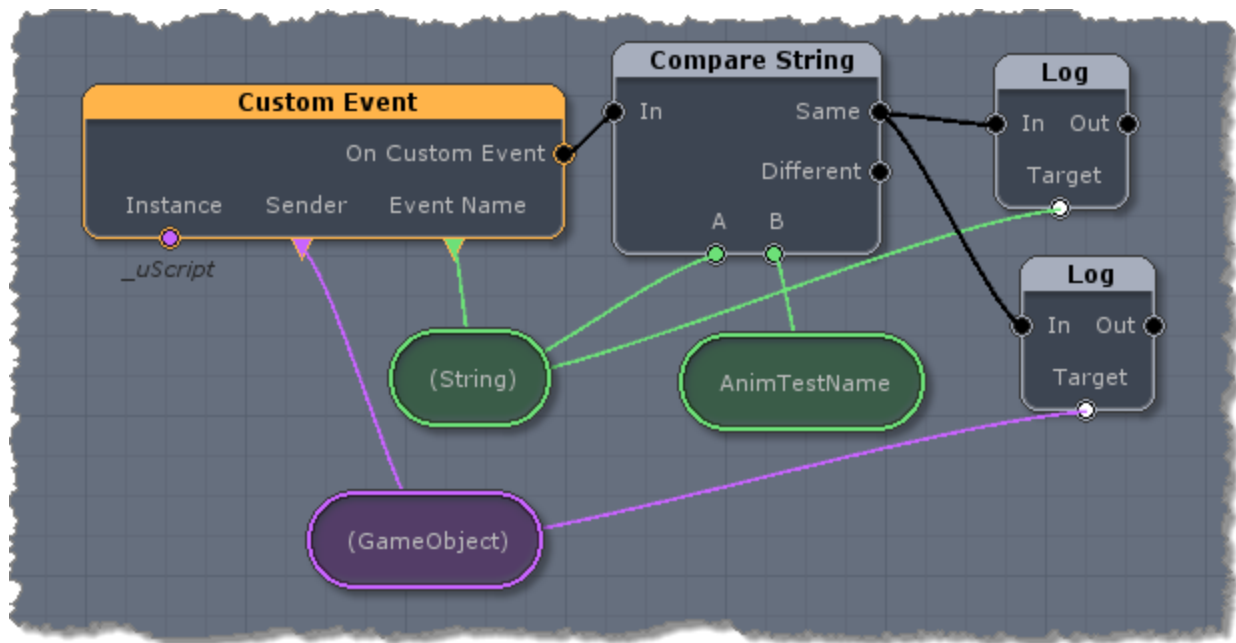
You will now have this script component on the GameObject:



2. Then create a new Animation Event in an existing animation for your GameObject and select the uScript function (*uScript\_Broadcast\_Custom\_Event*), as well as provide the Event Name you wish to broadcast (*AnimTestName* in this case):



3. Now you can go into uScript and create a Custom Event event node and any following logic you wish to run when AnimTestName is broadcast:



**Note!** - those also familiar with scripting can also use this script in other script files to also trigger logic from outside of uScript.



# Distributing Content With uScript Graphs

This section covers ways you can safely (legally) distribute projects and content that use uScript for redistribution through either a Unity package file or to the Unity Asset Store.

If you have used uScript to create scripts and prefabs that you wish to redistribute, you must be careful to not distribute the uScript editor tool itself. This would be a violation of the End User License Agreement (*EULA*) you agreed to when purchasing and using uScript either directly from Detox Studios or through the Unity Asset Store. The PLE version of uScript must also follow these guidelines to ensure uScript itself is not distributed.

**Note!** - *If you wish to redistribute uScript graphs that you want others to be able to view or edit in the uScript editor, they must have their own uScript license. The purpose of this documentation is to show you how to distribute content such as prefabs and Unity packages for direct use by others without uScript installed. One suggestion if you just want them to see how the graphs are made would be to use uScript's screenshot export feature and include the PNG files along with your content.*

## What Should Never Be Redistributed

We have tried to make it as easy as possible to separate the uScript Editor from the support files that may freely be distributed. For clarity, here is a list of files and directories that should never be included in any content you wish to distribute to others:

- The **uScriptEditor** folder - This folder contains the actual uScript Visual Scripting Tool editor files (most importantly the uScript.dll file) and should **never** be redistributed. No files in this folder are needed to run any content and graphs generated by uScript. Their only purpose is to allow you to edit existing graphs and create new ones. If you wish to allow others to view, edit, or create uScript graphs they will need their own license of uScript-- either Retail or PLE depending on how the original content was authored and the usage conditions (free or commercial use).
- The **License.rtf** (or *License\_PLE.rtf*) file - This file can be found in the root *uScript* folder and is for licensed users of uScript who purchased uScript directly through the Detox Studios website (this file does not exist in the Unity Asset Store version as they have their own license agreement). It should not be redistributed with your content.

- The **ReadMe.txt** file - This file can be found in the root uScript folder and is for licensed users of uScript only. It should not be redistributed with your content.

## What You Can (And Should) Redistribute

The following parts of uScript were designed to be allowed to for redistribution as required by your content. As a legally licensed user of uScript, you may freely redistribute these files in whole or in part as you see fit:

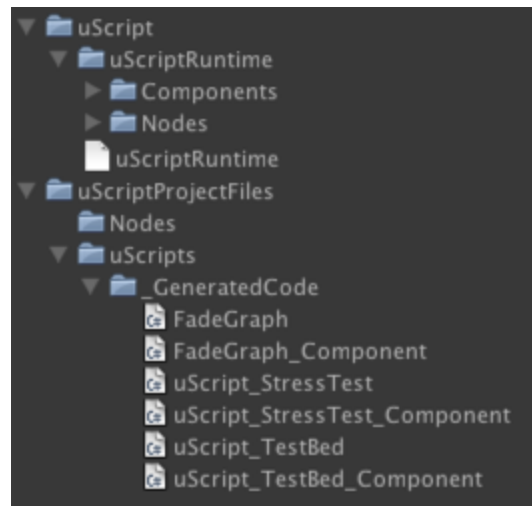
- The **uScriptRuntime** folder (required) - This folder and its contents (including the *uScriptRuntime.dll* and all nodes) should be included. It is fine to distribute the root uScript folder that this folder resides in as long as you do not include the uScript-Editor folder or any of its contents (see above section for details) which also resides inside the root uScript folder.
  - Distributing needed nodes only (optional) - if you know exactly which nodes you used in your uScript graphs you may be able to delete unused nodes files (they are C# .cs files) from inside the Nodes folder in order to reduce your overall file size and clutter to those you are distributing your work to.. You will know if you deleted a node you were using because Unity will generate compile errors. Again, this is optional though and should only be attempted if you feel comfortable doing so.
  - The **uScriptUnityVersion.cs** file (optional) - There is no need to redistribute this file as it is only used by the uScript Visual Scripting Tool editor. It won't hurt anything if it is included however.
- The **uScriptProjectFiles** folder (required) - You may redistribute this folder and any files and sub-directories within it. The only thing you may need to be mindful of is if you have put any third party nodes in the *uScriptProjectFiles/Nodes* folder that you may have licensed from others. In that case you will need to check with the node author(s) to be sure you can redistribute those custom nodes. If you found these nodes on the uScript forum (<http://uscript.net/forum>) you can freely use and distribute the nodes found there as everyone must agree that anything posted there is free to use by anyone for any purpose (please see the forum user agreement for more details).
  - Files you may not wish to include from *uScriptProjectFiles* (but are free to do so if you wish):
    - The **uScriptSettings.settings** file (optional)- there is not much use in redistributing the *uScriptSettings.settings* file as only the uScript editor uses that file.
    - Your **.uscript** graph files (optional) - There is no need to redistribute your *.uscript* graph files as they are only used by the uScript Visual Scripting Tool editor (which should not be redistributed). While redistributing these files should hurt anything you should be aware that they will take up extra space in your package and also give people access

to your graphs if they also have uScript (which you may not want). The only files that are required are the C# script files that uScript generated (that your content actually uses) in the *\_GeneratedCode* sub-folder.

- The **uScript Gizmos** in the root Gizmos folder (optional) - If you wish, you may also redistribute the uScript Gizmos found in your Unity project's root *Assets/Gizmos* folder-- though they are not required for your content to run and should only be considered if you wish to have the uScript Gizmos show up for others on content you have generated with uScript.

## Example

Here is an example of what your uScript files should look like after deleting all the forbidden uScript editor files from a Unity project (see *above*), leaving only the files and directories that should be redistributed with your work:

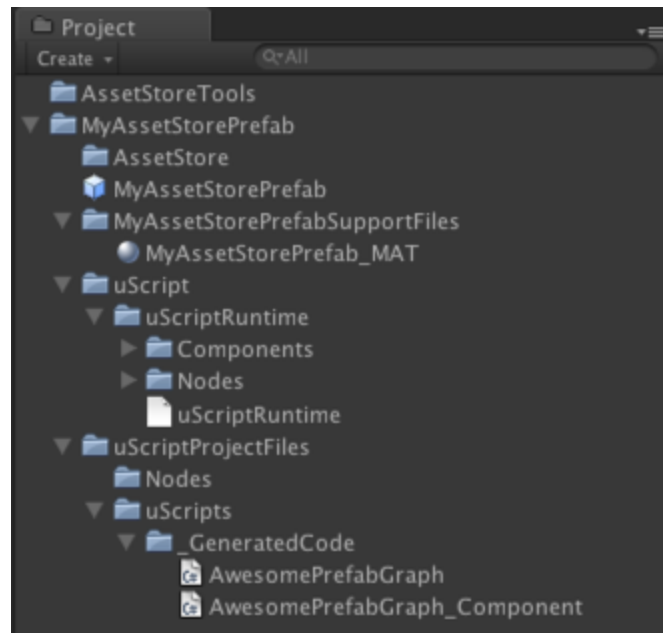


## Moving uScript Files For Redistribution

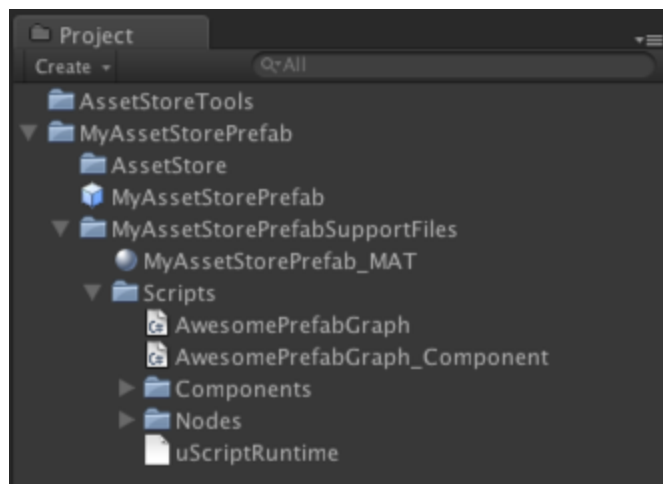
It is recommended that if you will be redistributing something using uScript that you may want to "hide" all the uScript files and folders. This is a fairly straightforward process through the Unity Editor, though there are a few things you will want to keep in mind:

- If you plan to redistribute multiple content that all use uScript, you may not want to move the uScript files from their default locations because they users could end up installing multiple packages that might put the same named script files into multiple locations in their project. This would cause Unity to generate compile errors since the C# (.cs) files would be duplicated in multiple places within their Unity project.
- Moving the uScript files may make it harder for you to update your content later (or at least more time consuming).

That said, here is an example of a prefab ready for submission to the Unity Asset Store using the default uScript folder structure...



... and here is the same example where the uScript files have been moved deeper into the package to hide them away (everything is under a Scripts folder)...



# Using uScript With Large Teams

When using uScript on a large team where not everyone has a uScript license (if all your developers do have a license of uScript, there is nothing to worry about), you will need to be sure that you do not install, or add to source control, the *uScript/uScriptEditor* folder and files. The files contained in this folder are only used for the uScript Editor itself. If you have developers that need to load uScript graphs into the editor for any reason, they will need their own licensed copy of uScript.

For more information on what files should and should not be distributed with your project (including through source control), see the topic "Distributing Content With uScript Graphs" in this section.

# Modifying uScript

uScript has been designed to be expanded and modified in several ways, For more information on ways you can extend uScript for your project's needs, such as creating new nodes, please see the [uScript Development Guide](#).

# References

This section contains useful information regarding resources beyond this user guide that you may find helpful in learning and using uScript.

# Hot-Keys

**Note!** - if you are using O SX (Mac), replace Control (CTRL) with the Command (CMD) key.

## General

Action	Key	Alt-Key	Mouse	Alt-Mouse	GUI
Cut	CTRL + X				
Copy	CTRL + C				
Paste	CTRL + V				
Undo	CTRL + Z				
Redo	CTRL + Y				
Close uScript	CTRL + W				

## Canvas

Action	Key	Alt-Key	Mouse	Alt-Mouse	GUI
Zoom In/Out			Mouse Wheel		
Zoom Out (by 10%)	-				
Zoom In (by 10%)	=				
Zoom to 100%	0 (zero)				
Hide/Show Panels	` (tilde key)				
Delete Selected	DELETE	BACK-SPACE			
Center on next event node	]				
Center on previous event node	[				
Reset Canvas to center	HOME	CTRL + H			
Deselect All	ESC		LMB (over Canvas)		Canvas
Toggle Grid	CTRL + G				
Place String variable where clicked			S + LMB		Canvas
Place Vector3 variable where clicked			V + LMB		Canvas
Place Int variable where clicked			I + LMB		Canvas
Place Float variable where			F + LMB		Canvas



### Canvas (continued)

Action	Key	Alt-Key	Mouse	Alt-Mouse	GUI
clicked					vas
Place Bool variable where clicked			B + LMB		Canvas
Place GameObject variable where clicked			G + LMB		Canvas
Place Object variable where clicked			O + LMB		Canvas
Place Comment node where clicked			C + LMB		Canvas
Place External Connection where clicked			E + LMB		Canvas
Place Log node where clicked			L + LMB		Canvas
New node selection			LMB ( <i>over node</i> )		Canvas
Toggle node selection			SHIFT + LMB		Canvas
Marquee - New box selection			LMB + Drag		Canvas
Marquee - Add to selection			SHIFT + LMB + Drag		Canvas
Marquee - Remove from selection			CTRL + LMB + Drag		Canvas
Move node			LMB + Drag		Canvas
Pan Canvas			ALT + LMB + Drag	MMB + Drag	Canvas / Node
Context Menu			RMB		Canvas / Node

## Unity

Action	Key	Alt-Key	Mouse	Alt-Mouse	G-UI
Launch the uScript Editor	CTRL + U				

# Tutorials

Detox Studios provides many video tutorials. For a list of current video tutorials, please go here: <http://www.uscript.net/docs/index.php?title=Tutorials>

# Example Projects

Detox Studios provides many examples through a Unity project called *ExampleProjects* that contains many scenes showing different ways to use uScript with Unity. You can download this Unity project file here: [http://www.uscript.net/docs/index.php?title=Example\\_Projects](http://www.uscript.net/docs/index.php?title=Example_Projects)

**Note!** - *make sure you download the correct version of this project for the version of Unity you are using and to follow the installation instructions found on the web page.*

# Web Links

**uScript Community Website** - [uscript.net](http://uscript.net)

**uScript Community Forum** - [uscript.net/forum](http://uscript.net/forum)

**uScript Facebook Page** - [www.facebook.com/uScript](http://www.facebook.com/uScript)

**uScript Twitter** - [twitter.com/uScript](http://twitter.com/uScript)

**uScript YouTube** - [www.youtube.com/user/uscripttool](http://www.youtube.com/user/uscripttool)

**uScript Screencast** - [www.screencast.com/users/uScript](http://www.screencast.com/users/uScript)

**Detox Studios Website** - [www.detoxstudios.com](http://www.detoxstudios.com)

**Unity Technologies Website** - [unity3d.com](http://unity3d.com)

**Unity's Online Documentation** - [docs.unity3d.com](http://docs.unity3d.com)