HOUR 15

Level Blueprint: Creating Level Events

INTRODUCTION

In this lecture, you will use the Level Blueprint to learn basic scripting concepts, such as how to assign an Actor to an event. You will also learn how to assign Actors to reference variables and change their properties through Blueprint.

LECTURE GOALS AND OUTCOMES

Goals

The goals of this lecture are to

- Learn to assign Actors to events
- Learn to assign Actors to reference variables
- Learn to change the properties of an Actor through Blueprint

Outcomes

By the end of this lecture you will be able to

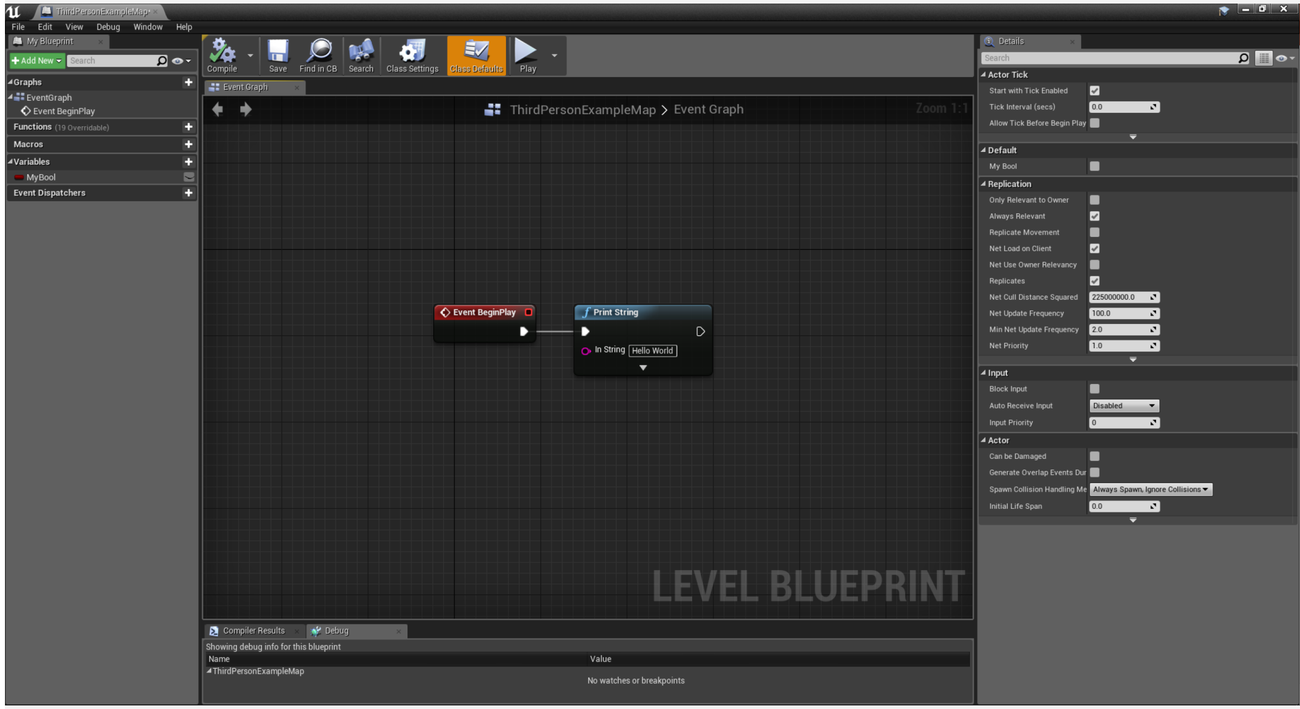
- Assign an Actor to an event
- Assign an Actor to a reference variable
- Change the properties of an Actor based on player actions

LEVEL BLUEPRINTS

Basic Concepts

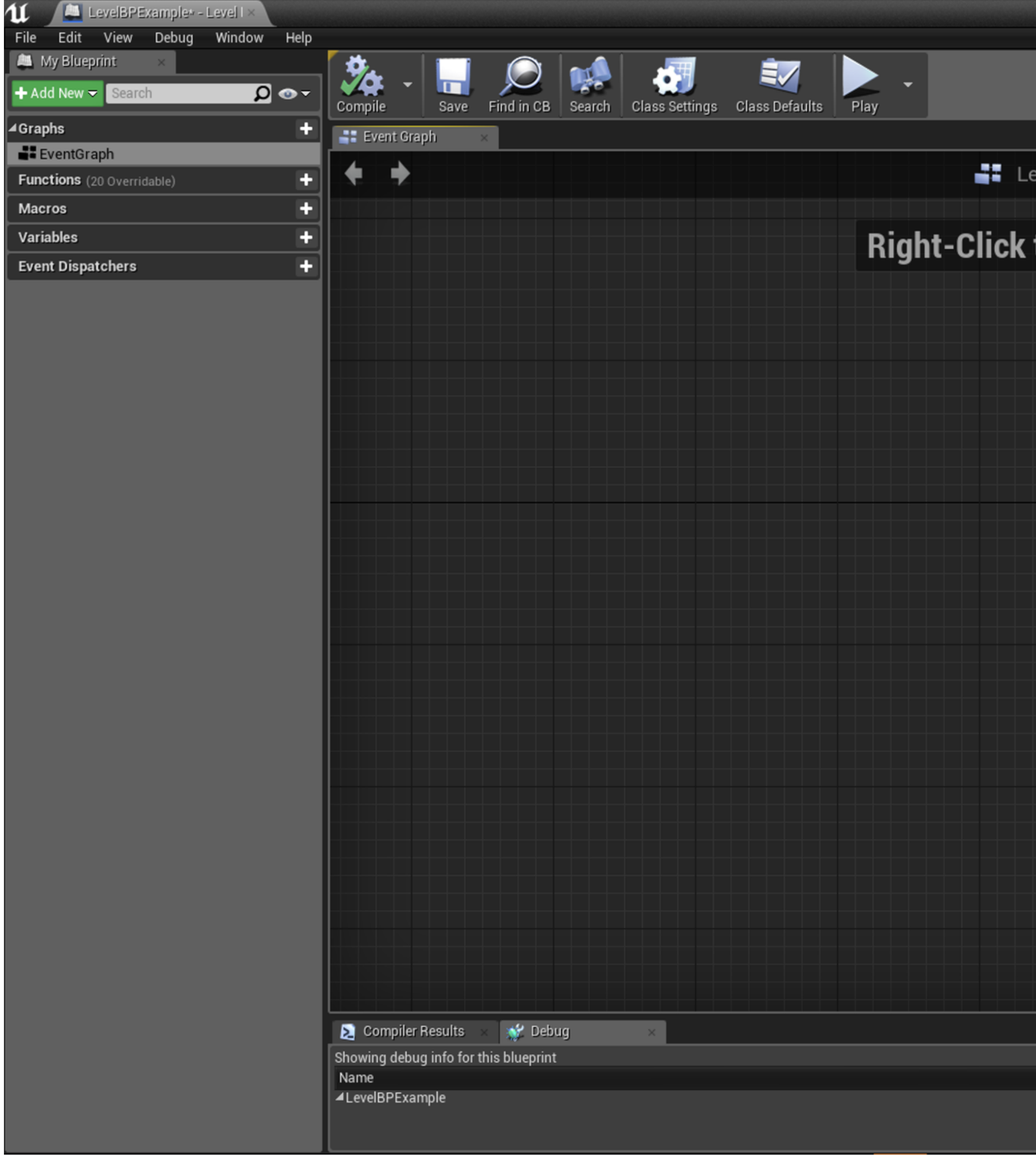
LEVEL BLUEPRINT

A Level Blueprint is a specialized type of Blueprint that acts as a Level-wide global event graph. Each Level in your project has its own Level Blueprint created by default.



LEVEL BLUEPRINT

Level Blueprints are used to drive Level-based events and control internally scripted behaviors for in-game Actors placed in the Level.

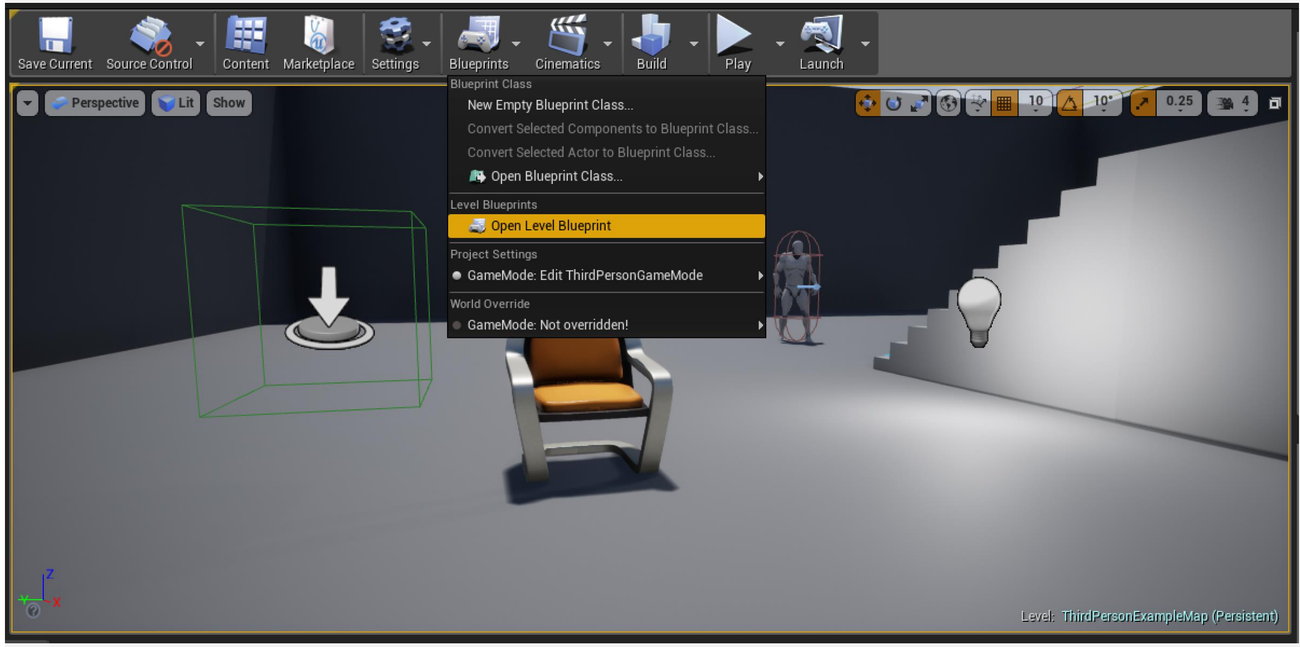


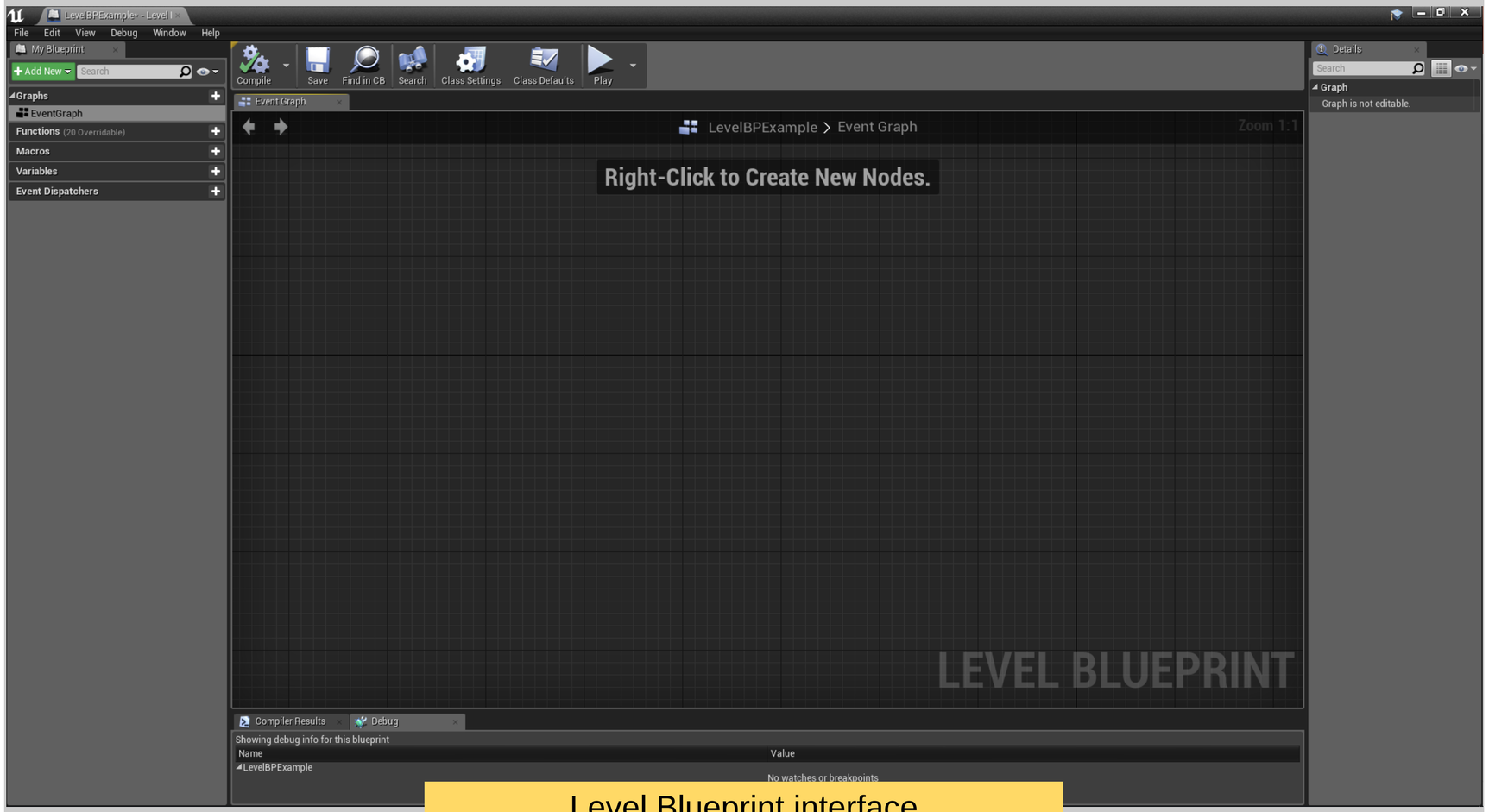
Each Level created has a Level Blueprint associated with it.

Although the Level Blueprint is associated with a Level, it does not know about the Actors in the Level unless you tell it about them. You can do this by assigning an Actor to either an event or an Actor reference variable.

OPENING A LEVEL BLUEPRINT

To open the Level Blueprint for the current Level, click on the Blueprint icon and in the drop-down select Open Level Blueprint.





Level Blueprint interface

LEVEL BLUEPRINT INTERFACE

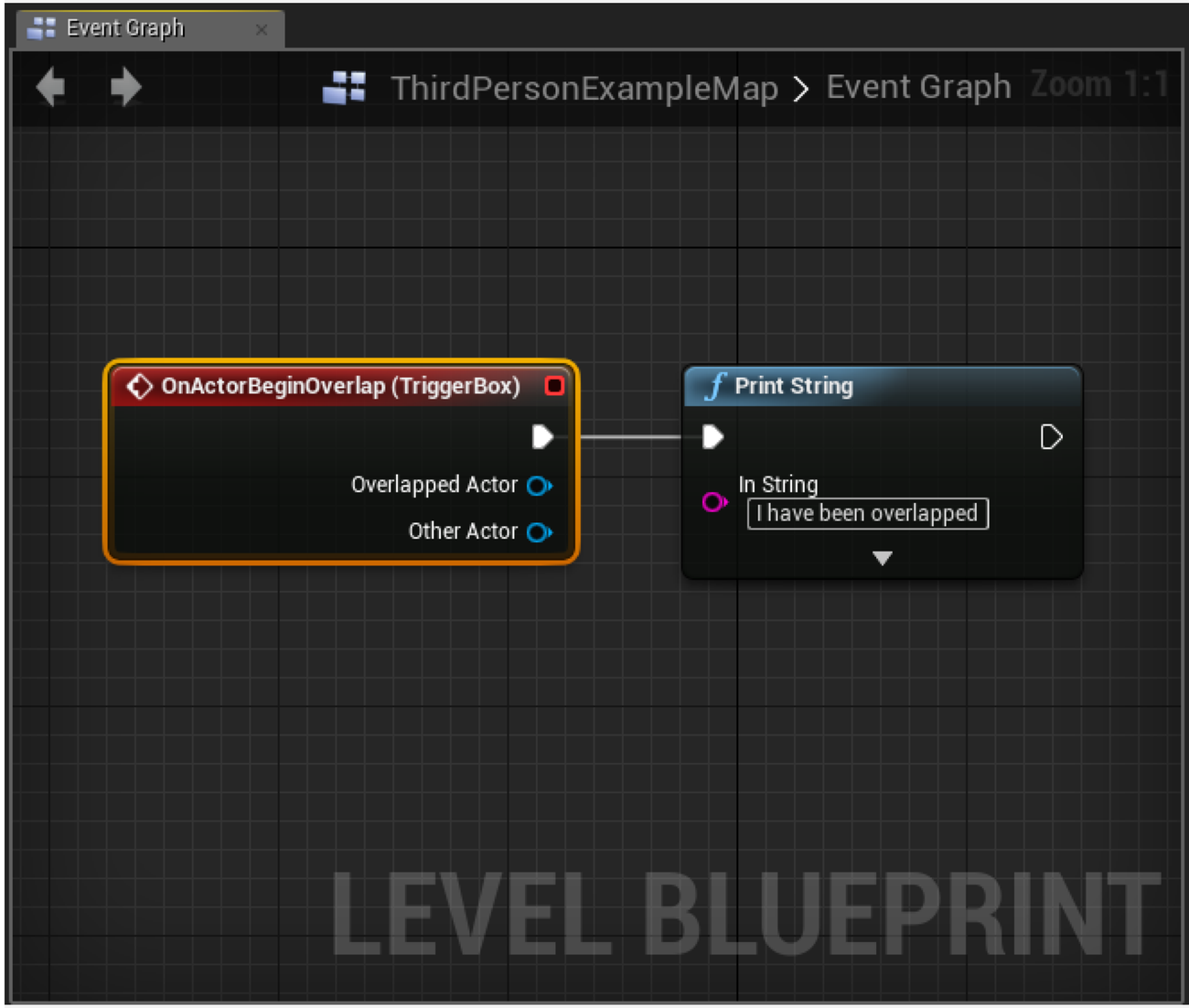
The Level Blueprint Editor is similar to other Blueprint Editors except that it does not have a Components tab, a Viewport tab, or a Construction Script function.

LEVEL BLUEPRINT

Assigning Actors to Events

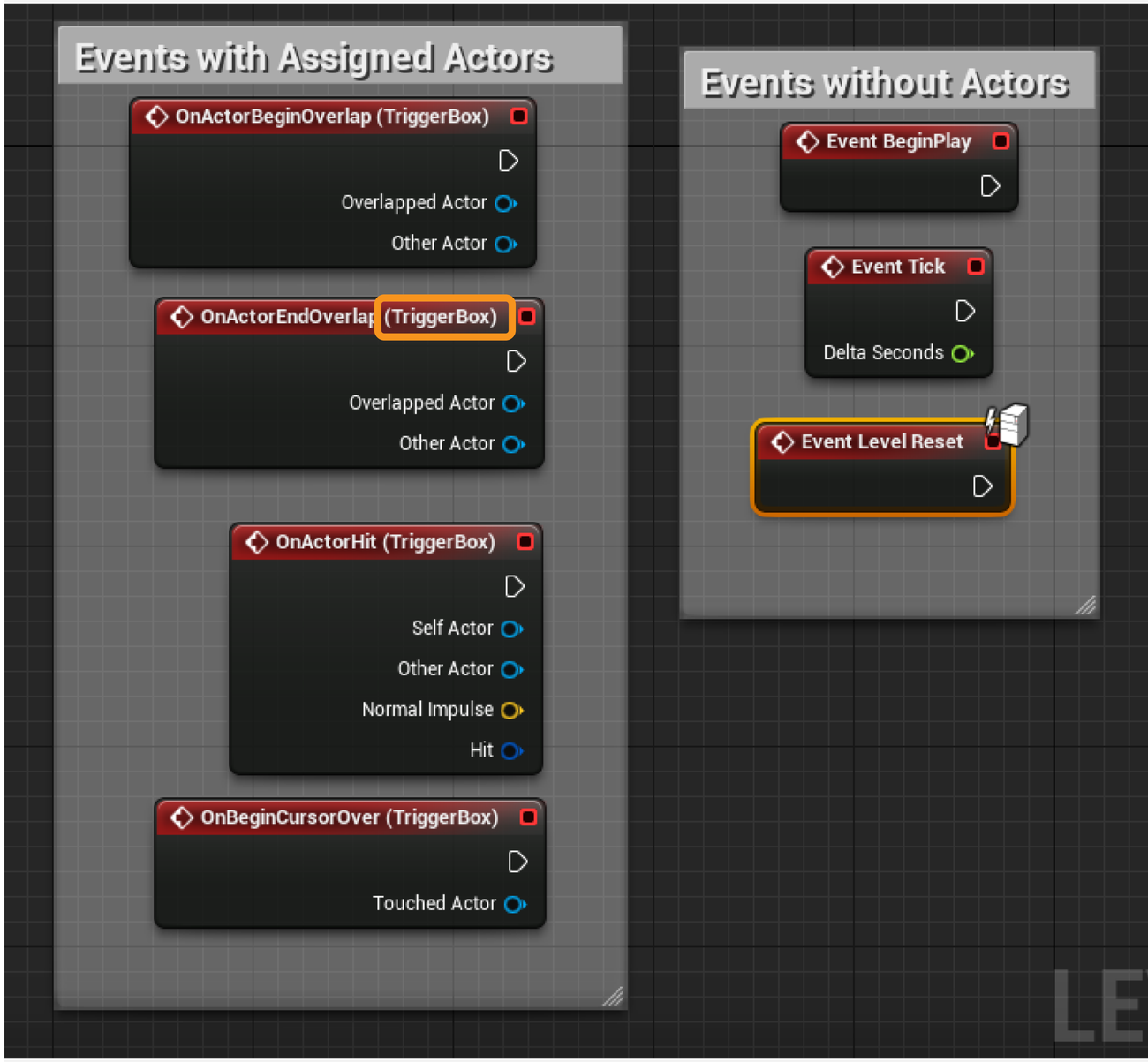
ASSIGNING AN ACTOR TO AN EVENT

Blueprints are event based, meaning that an event needs to happen in order for a Blueprint sequence to be executed. In the Level Blueprint, events typically need an Actor to be assigned to them.



ASSIGNING AN ACTOR TO AN EVENT

On the right are examples of common events. Some events need assigned Actors, and some do not. Events with assigned Actors show the name of the Actor that has been assigned to the event. In this case, the Actor is called TriggerBox.

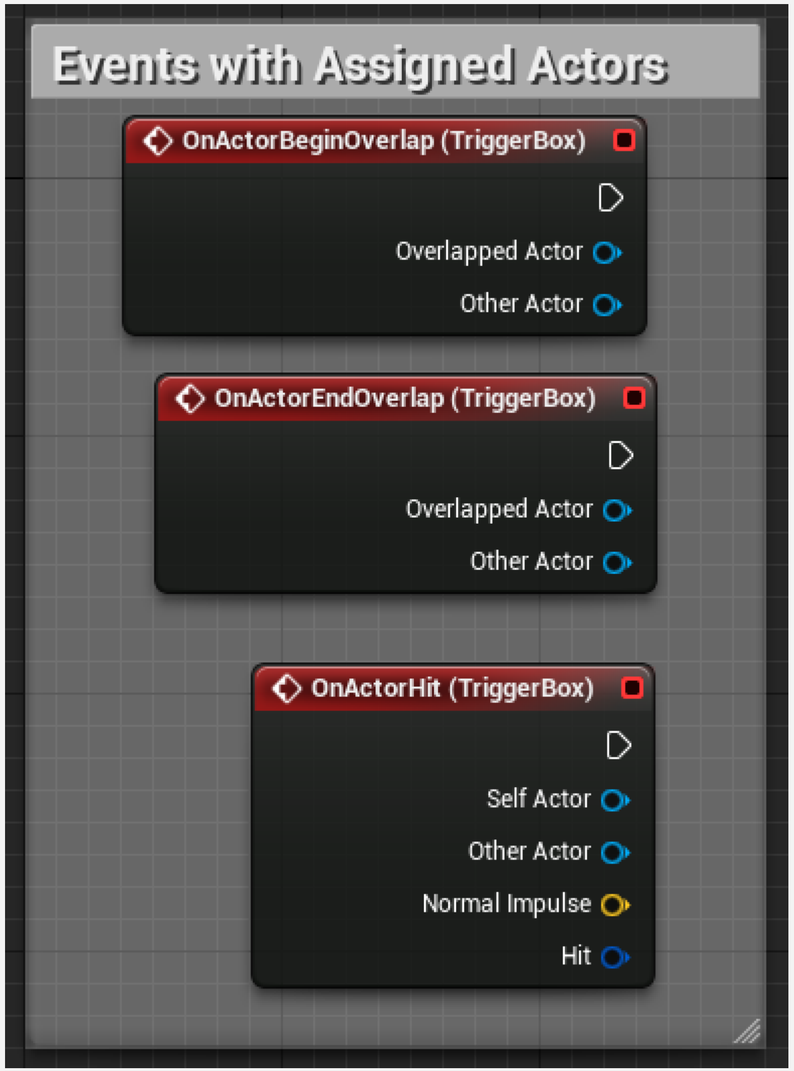


LEVEL BLUEPRINT

Collision Events

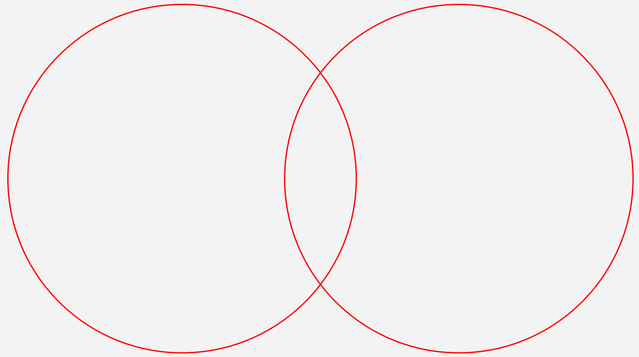
COLLISION EVENTS

Some of the most common types of events are collision events. Collision events require an Actor to be assigned to them, and they fall into two categories: Overlap and Hit events.



OVERLAP EVENTS

Overlap events happen when a collision hull of an Actor or its components intersects with the collision hull of another Actor or its components.

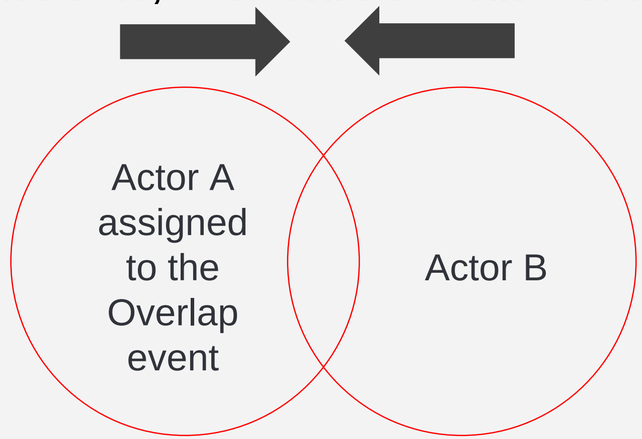


OVERLAP EVENTS

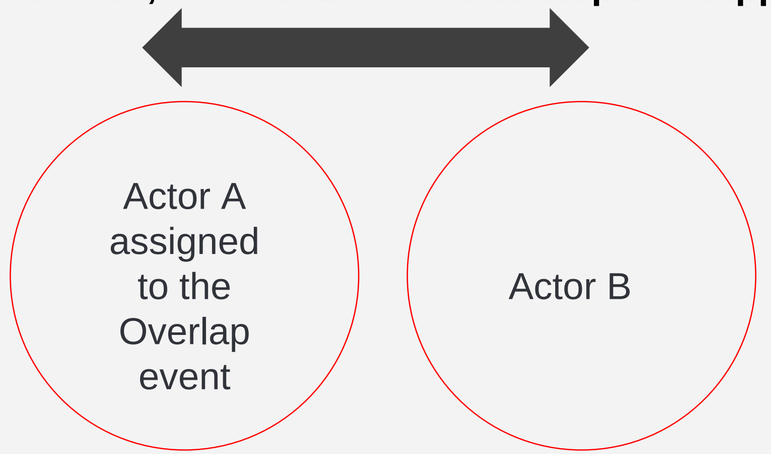
Overlap events are then broken down into two states. When collision hulls first intersect, the event is referred to as a Begin Overlap event; when they stop overlapping, it’s called an End Overlap event.

Both Overlap event types execute once each time the Actor assigned to the event is overlapped.

Begin Overlap:
Executes once, when collision hulls first overlap



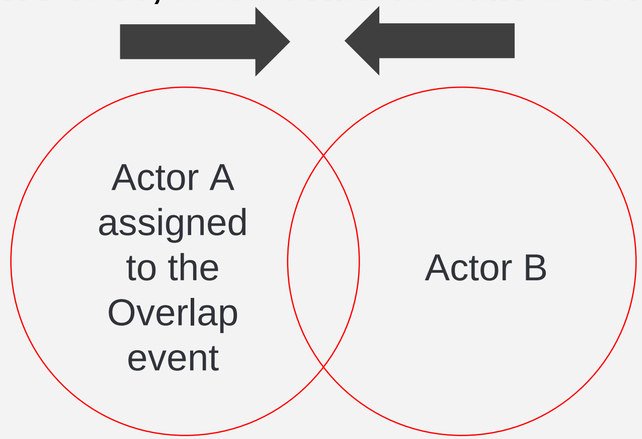
End Overlap:
Executes once, when collision hulls stop overlapping



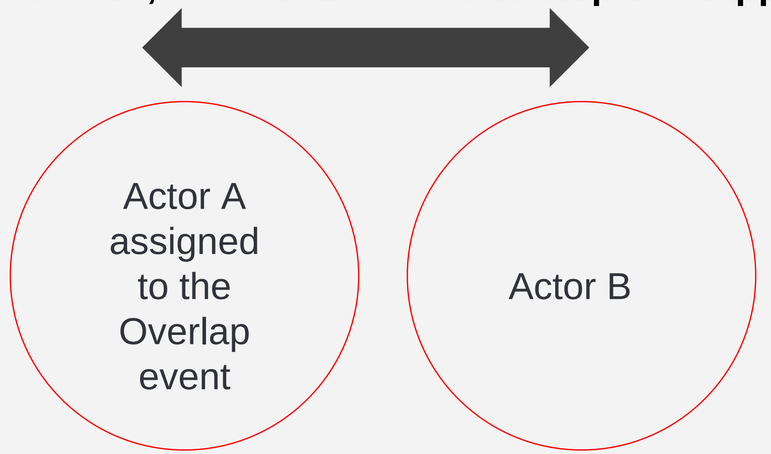
OVERLAP EVENTS

For example, if Actor A (assigned to the event) is overlapped by Actor B, the Begin Overlap event is executed. If another Actor overlaps Actor A, the Begin Overlap event will be executed again.

Begin Overlap:
Executes once, when collision hulls first overlap



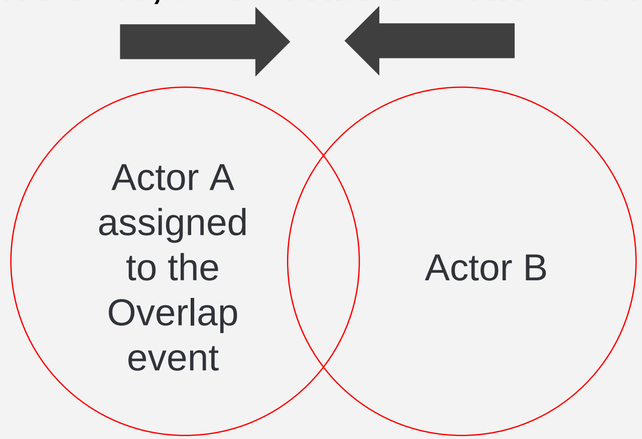
End Overlap:
Executes once, when collision hulls stop overlapping



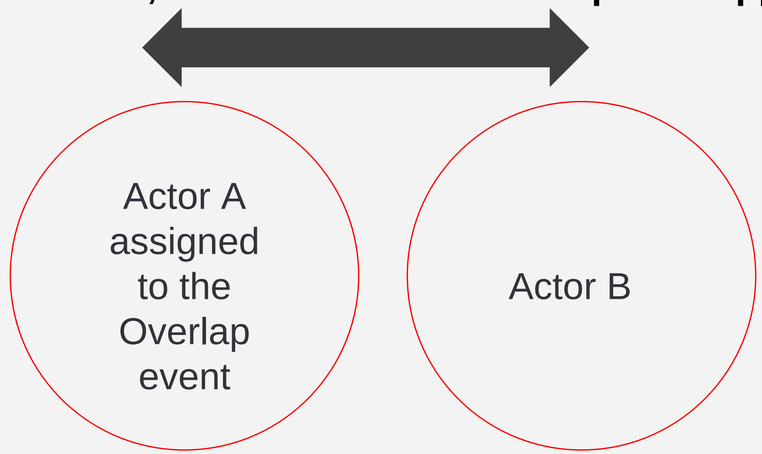
OVERLAP EVENTS

However, in order for Actor B to trigger the Begin Overlap event again, Actor B needs to end the overlap by moving away and then overlap Actor A a second time.

Begin Overlap:
Executes once, when collision hulls first overlap



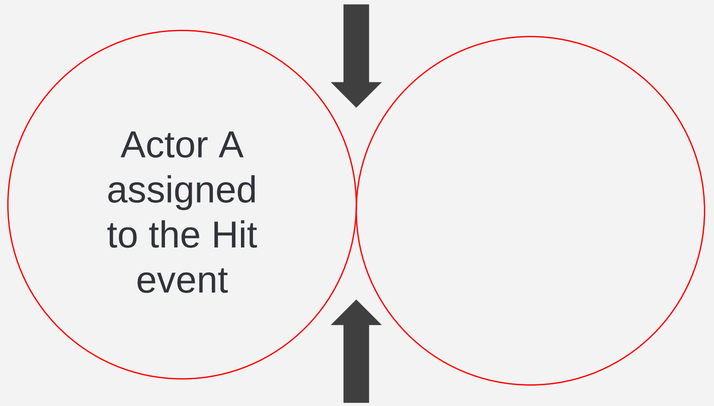
End Overlap:
Executes once, when collision hulls stop overlapping



HIT EVENTS

Hit events happen when a collision hull of an Actor or its components touches the collision hull of another Actor or its components.

Hit event:
Executes when collision hulls touch but do not overlap

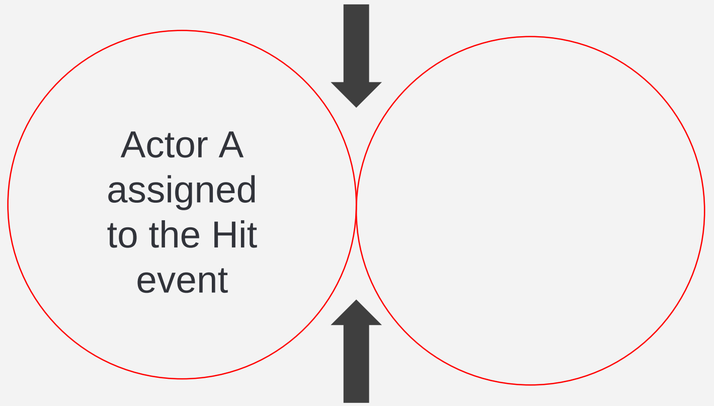


Both Actors' collision hulls
need to be set to Block for the Hit event to execute.

HIT EVENTS

Hit events will execute multiple times as long as the Actor assigned to the event is hit by a new Actor each time or continues to hit a single Actor as it is moving.

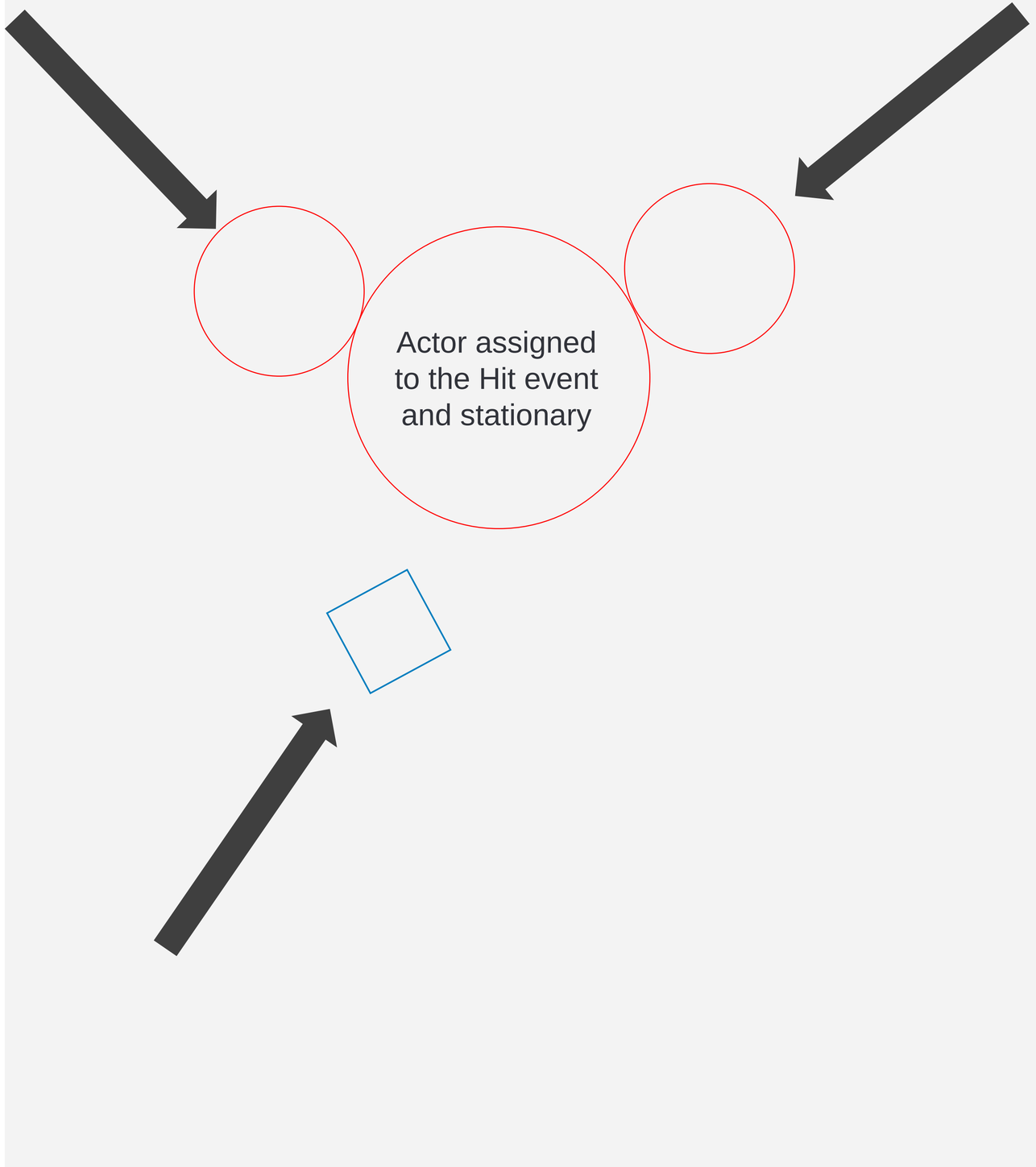
Hit event:
Executes when collision hulls touch but do not overlap



Both Actors' collision hulls
need to be set to Block for the Hit event to execute.

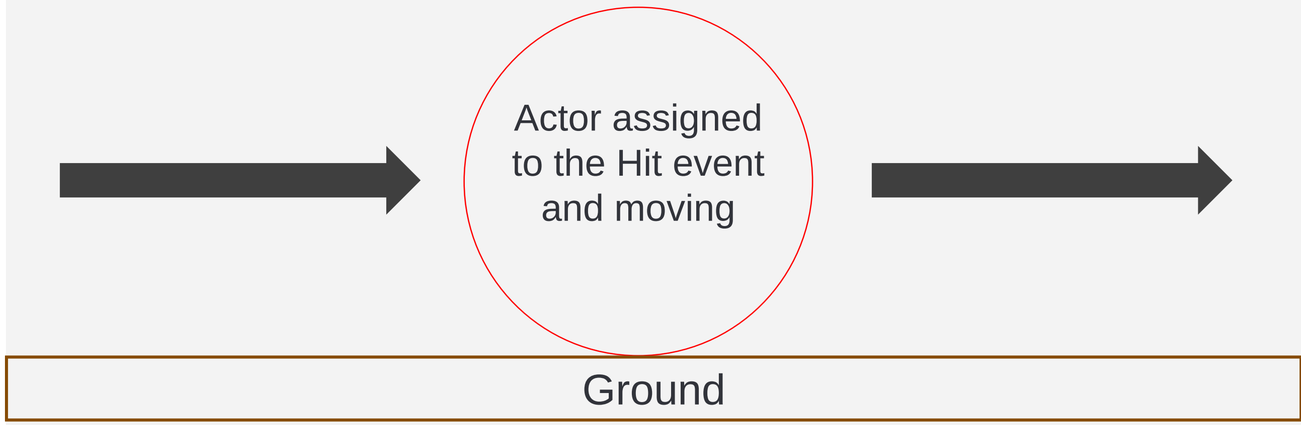
HIT EVENTS

If the Actor assigned to the Hit event is stationary and is hit by multiple other Actors, the Hit event will execute for each hit.



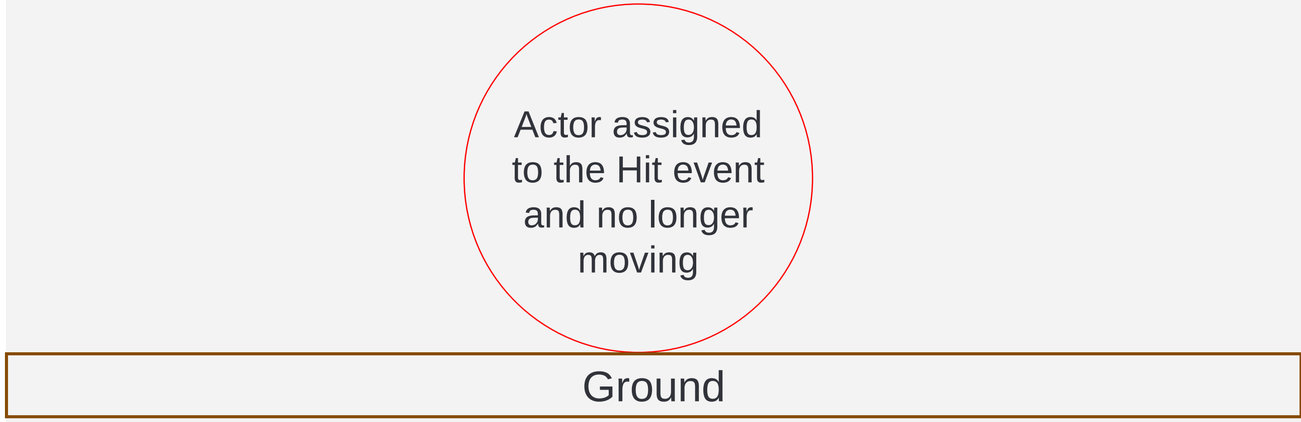
HIT EVENTS

If the Actor assigned to the Hit event is moving and continues to hit the same Actor, the Hit event will also execute multiple times until the Actor comes to a rest.



HIT EVENTS

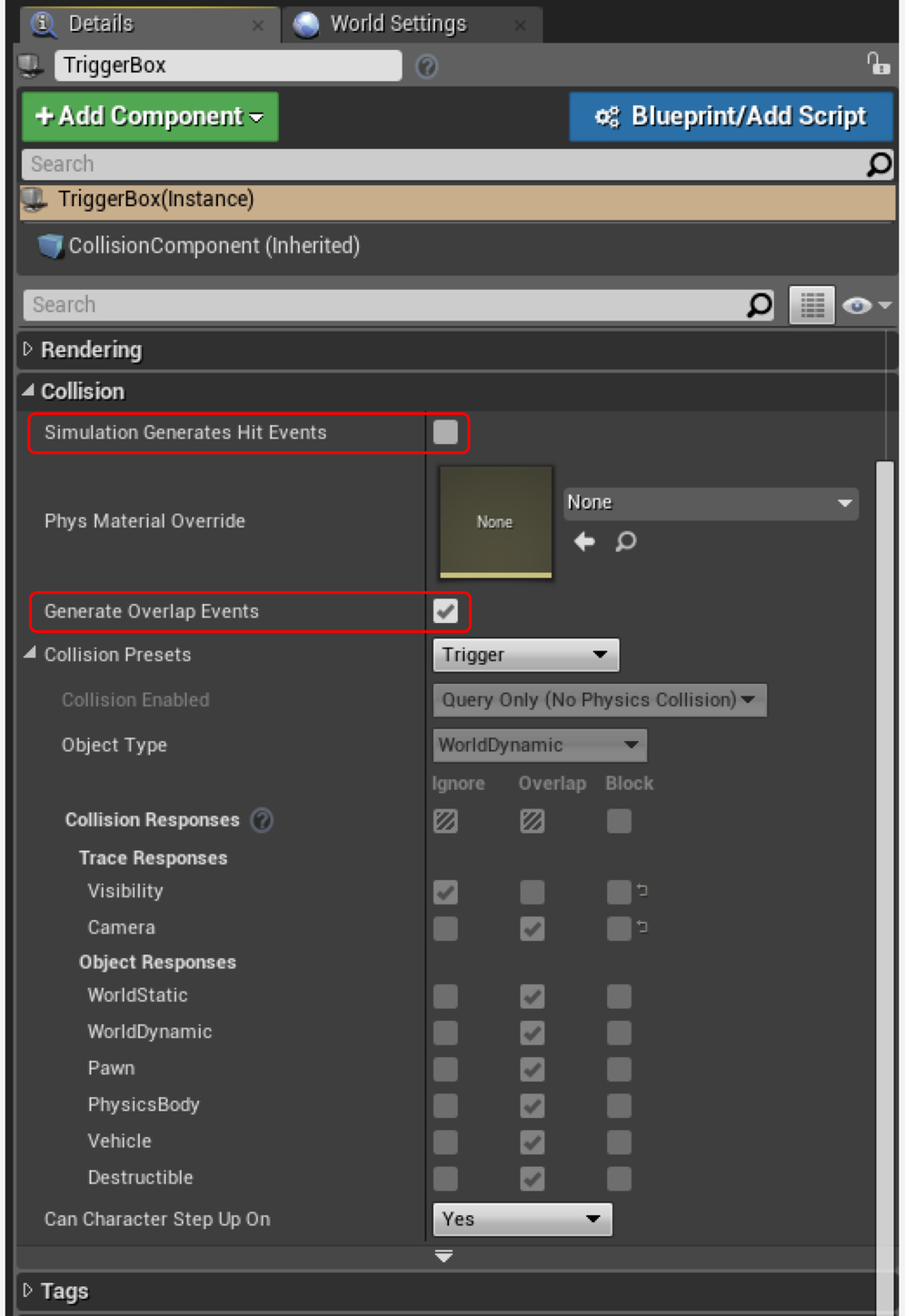
Once the Actor assigned to the Hit event comes to a rest, the Hit event will stop executing unless the Actor is hit again by another Actor.



GENERATE EVENT PROPERTIES

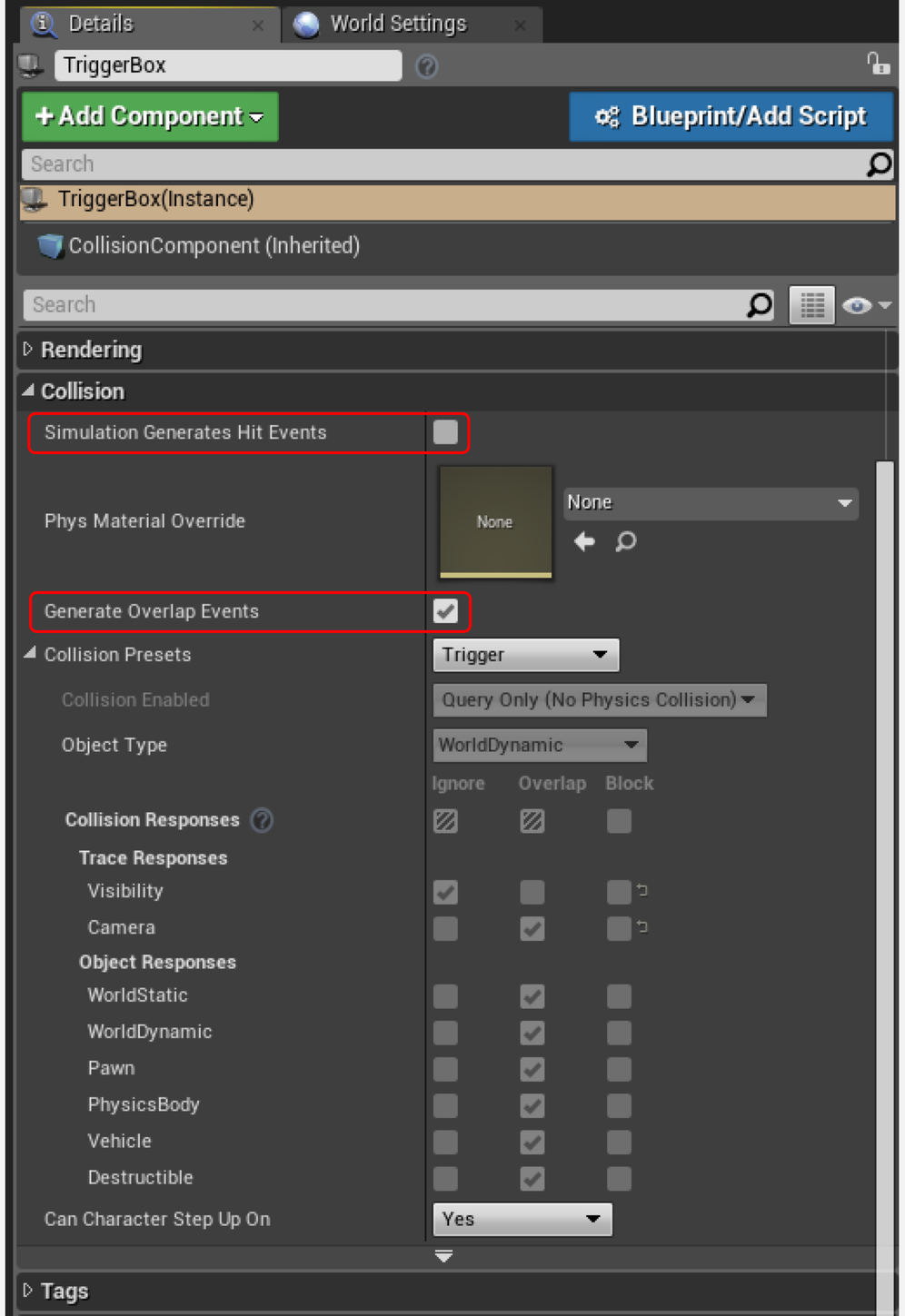
Generate event properties are found under the Collision tab in the Level Details panel for a selected Actor. These properties allow Actors to communicate to Blueprint that a collision has occurred.

- **Generate Overlap Events** is used for Overlap events.
- **Simulation Generates Hit Events** is used for Hit events.



GENERATE EVENT PROPERTIES

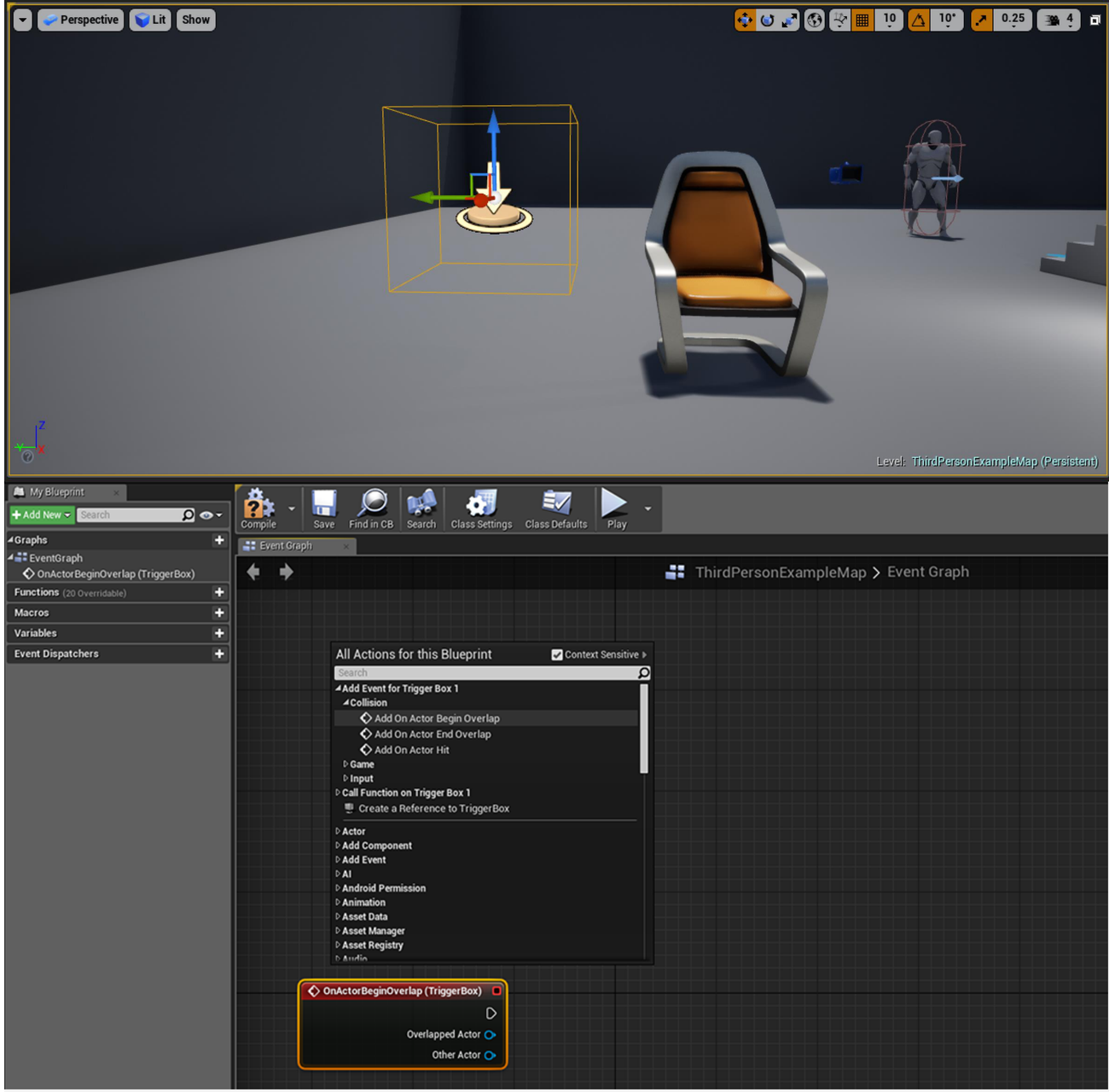
The Generate Overlap Events property is on by default, and Simulation Generates Hit Events is off by default.



ASSIGNING ACTORS TO COLLISION EVENTS

Assigning an Actor to a collision event is a simple process:

- Select the Actor in the Level and open the Level Blueprint Editor.
- Right-click in the Event Graph to bring up the Blueprint Context Menu.
- Select the collision event type you need.

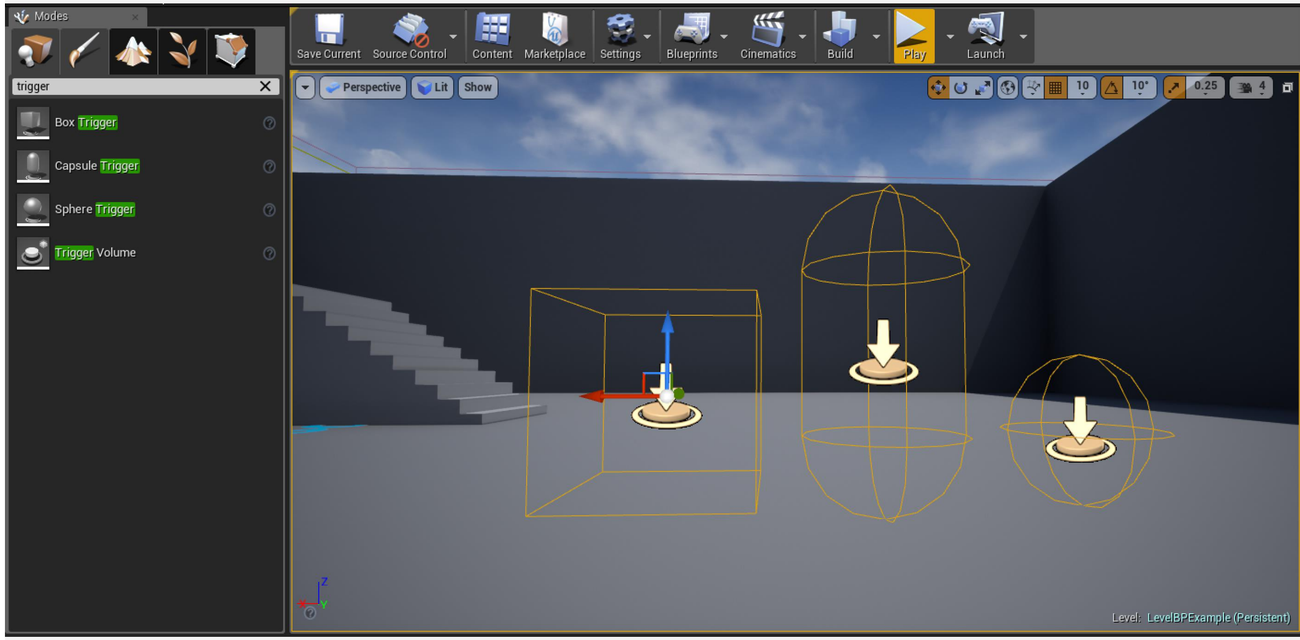


TRIGGER ACTORS

Trigger Actors are a collection of Actors found in the Modes panel. There are three basic types:

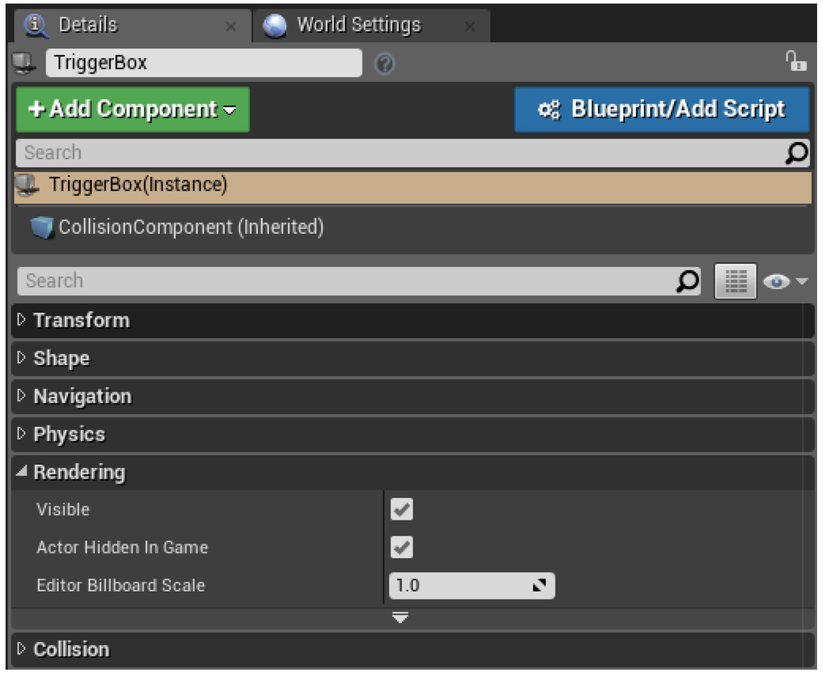
- Box Trigger
- Capsule Trigger
- Sphere Trigger

Each is used to define an area in a Level for an overlap collision event to take place. You can place as many Trigger Actors as needed in your Level and assign each to its own collision events.



Actor Rendering Properties

When working with collision events and Trigger Actors, it helps to be able to see the Trigger Volume when playtesting your Level. By default, Actor Hidden In Game in the Rendering section of the Level Details panel is set to True. Temporarily turning this off will allow you to see the volume while playing your game. Once the collision event is working, remember to turn it back on.

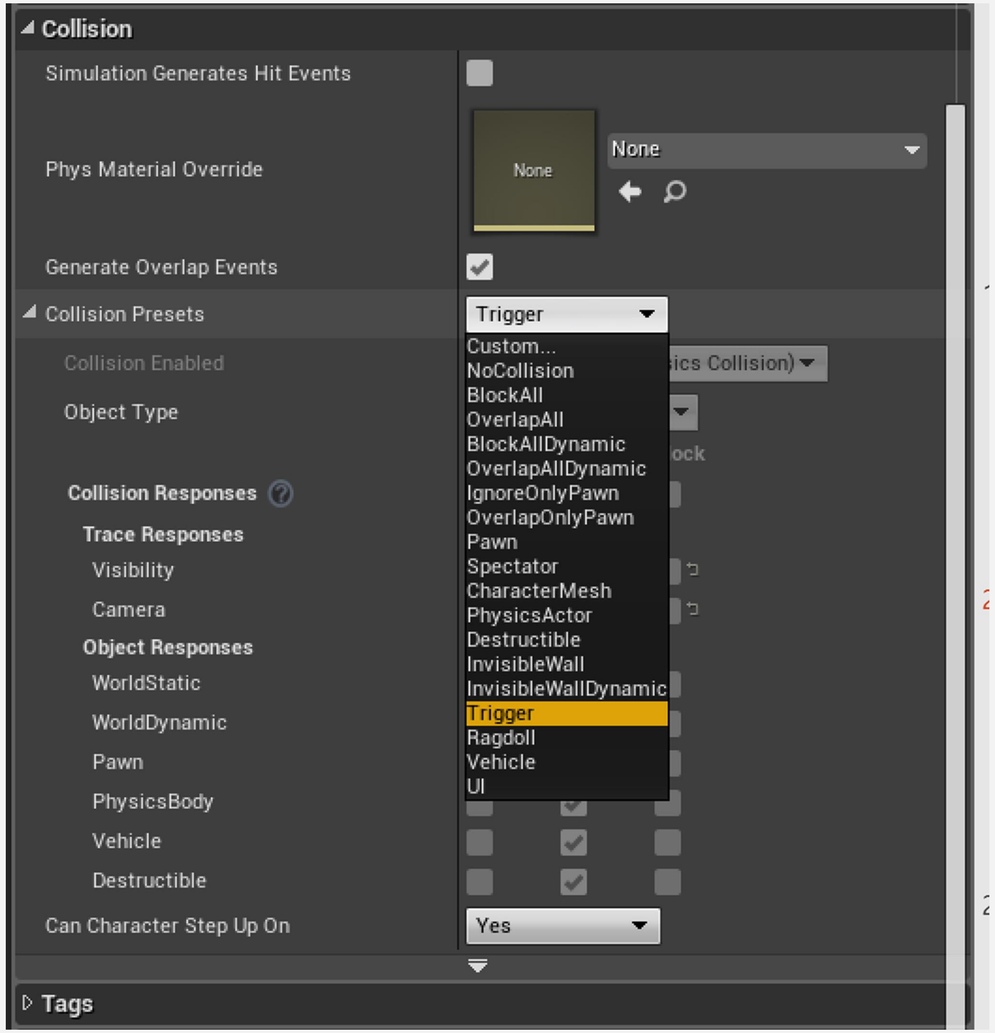


LEVEL BLUEPRINT

Collision Properties

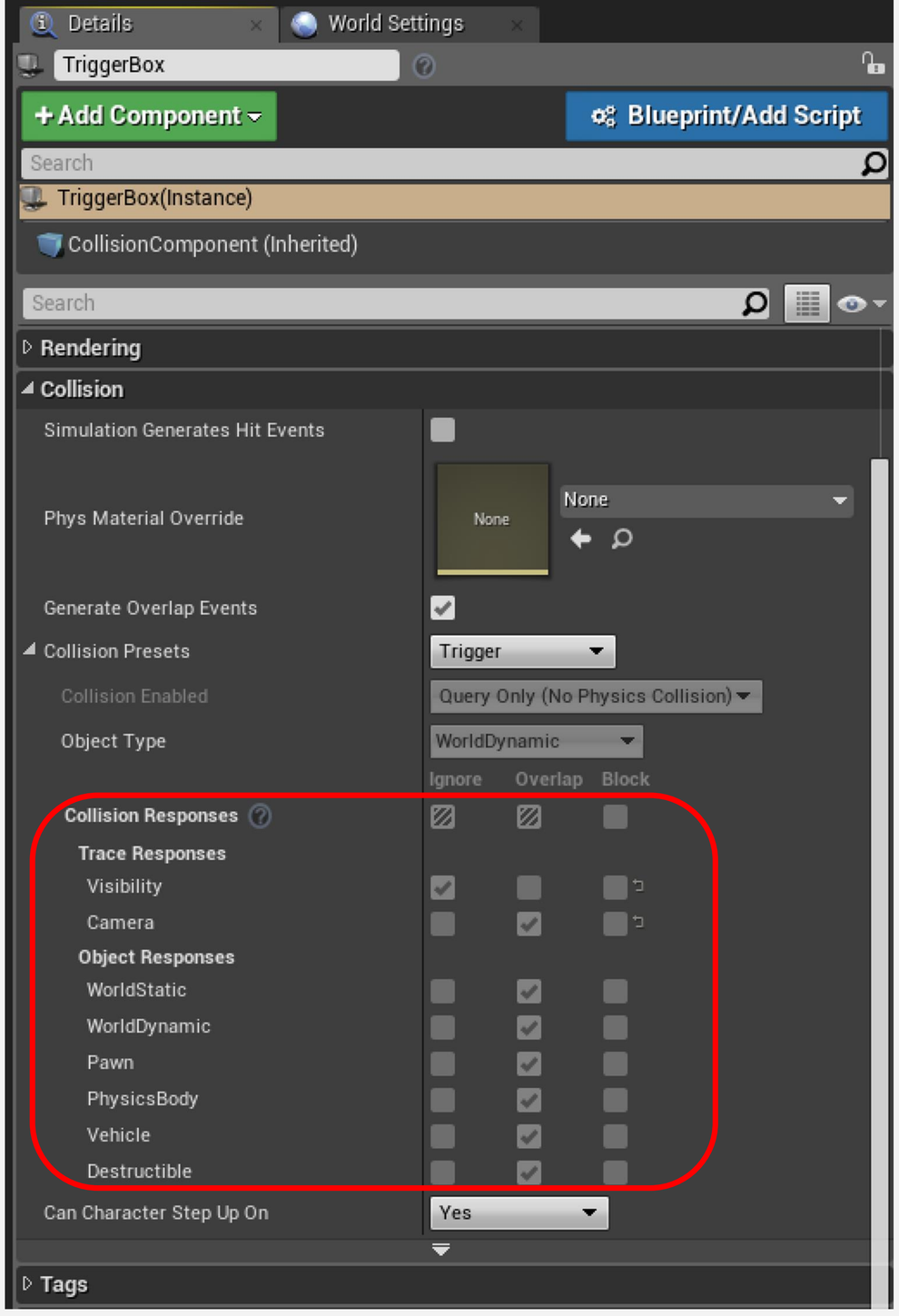
COLLISION PRESETS

Collision presets are a definable collection of properties that store how an individual Actor or a group of Actors should handle collisions with other Actor types in-game.



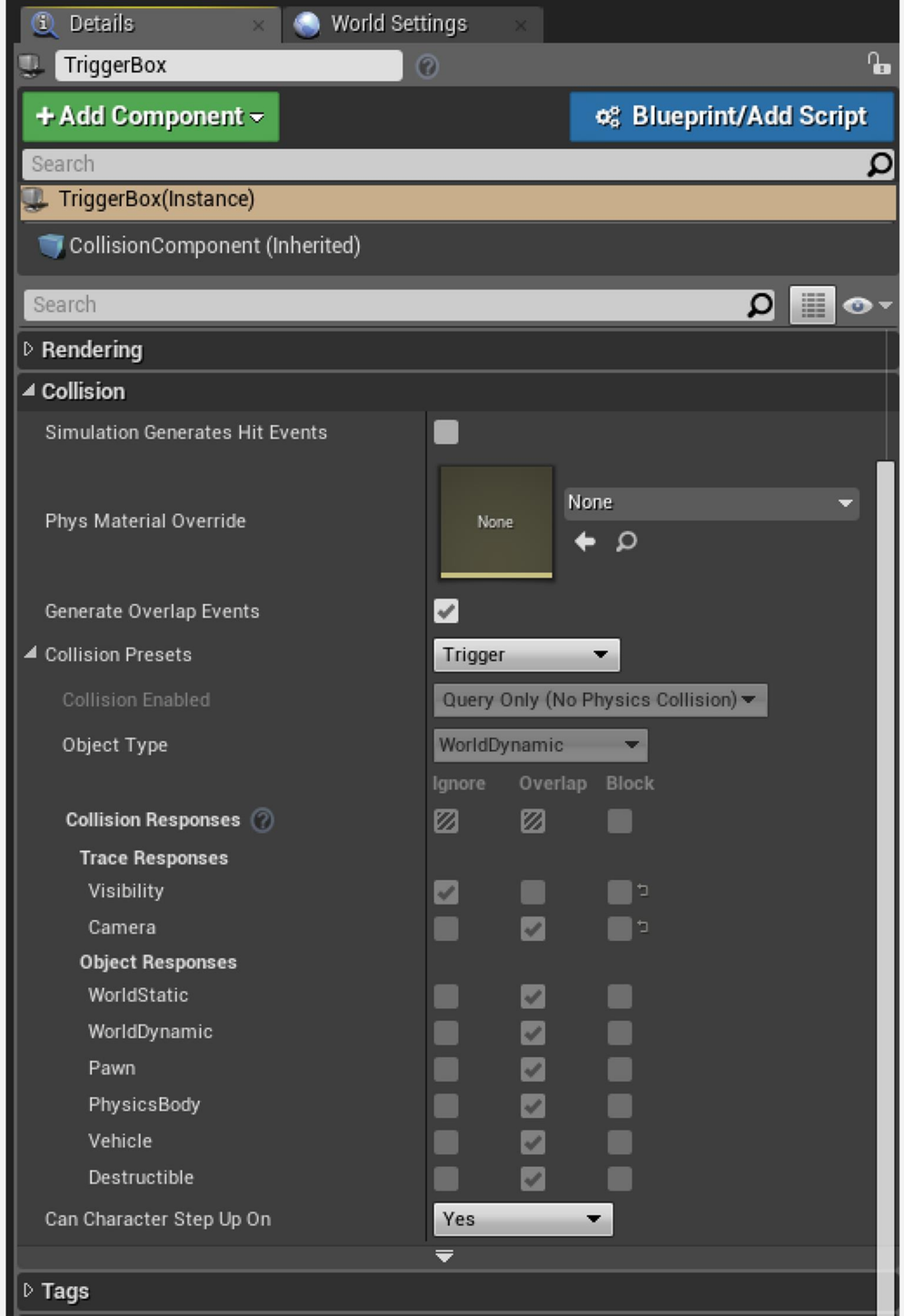
COLLISION RESPONSES

Collision presets are stored in the Collision Presets property and contain common combinations of collision responses for various Actor types, so that an Actor knows how to deal with other Actor types it may collide with. The three response settings are Ignore, Overlap, and Block.



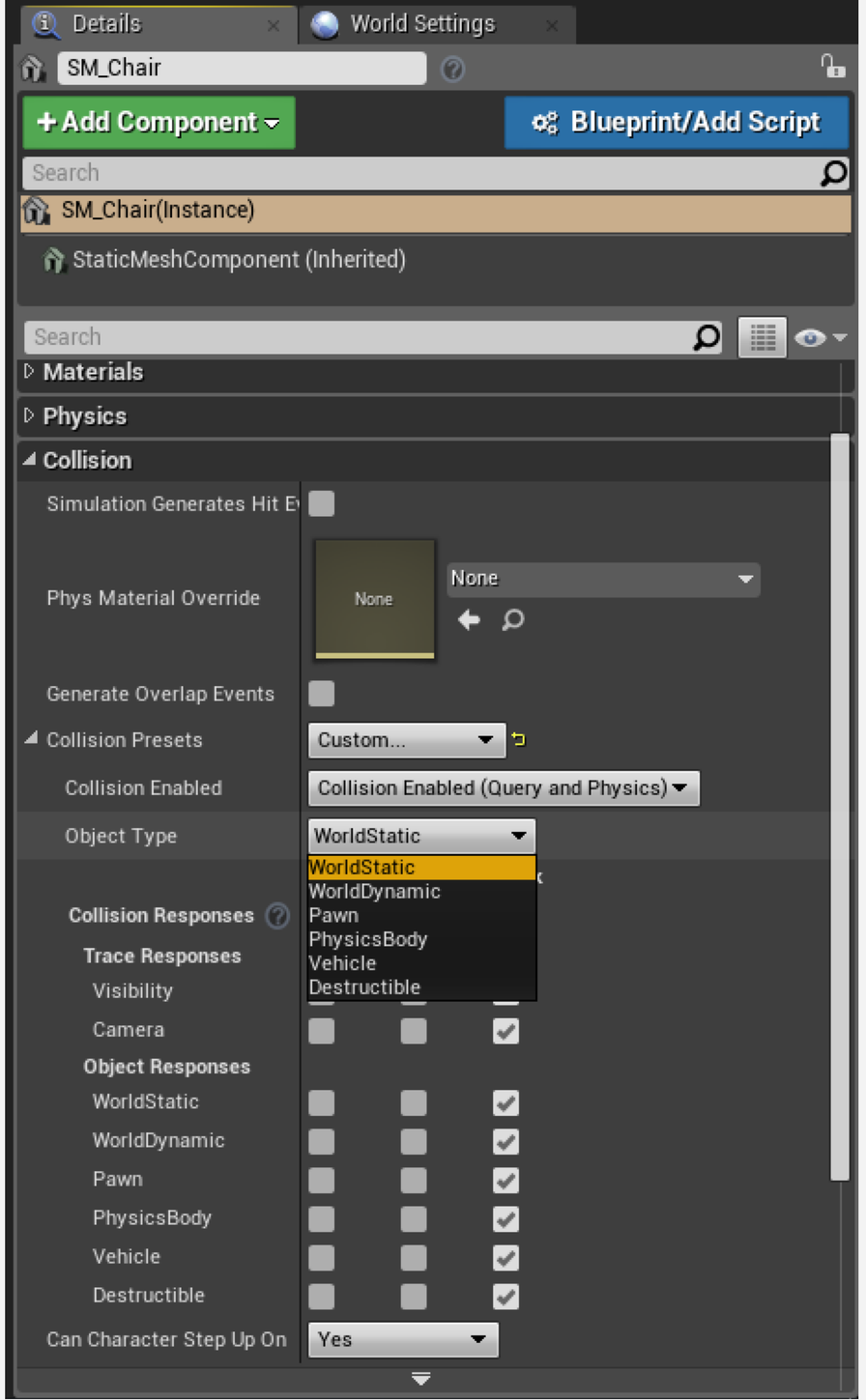
COLLISION RESPONSES

All collision events are tied to the Collision property settings of all the Actors involved. For example, if an Actor is assigned to an Overlap event but its collision response is set to Block and the second Actor also has a collision response set to Block, the two Actors will never overlap, so an Overlap event would never execute, but a Hit event would.



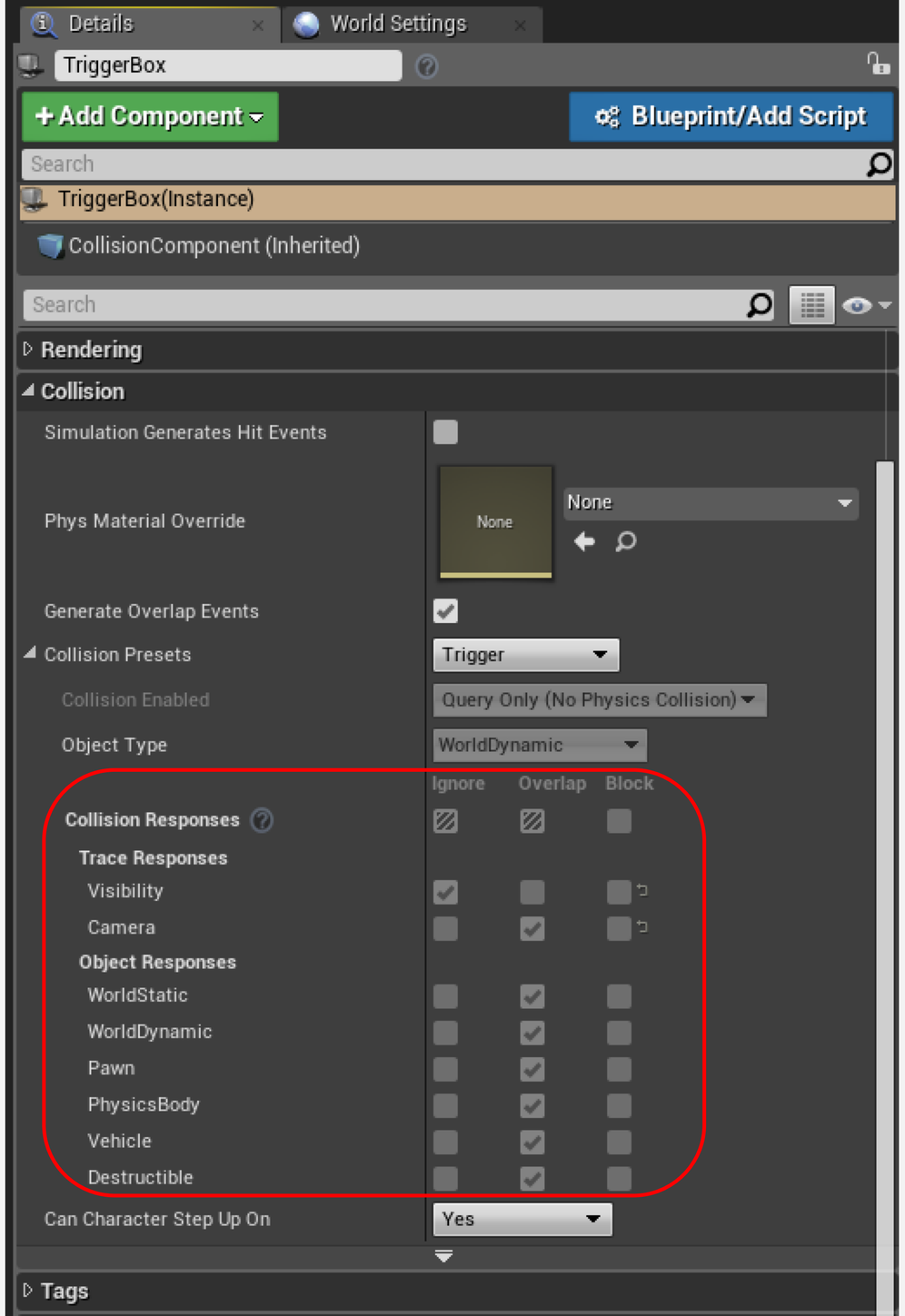
OBJECT TYPE

All Actors placed in a Level fall into one of six default object-type categories.



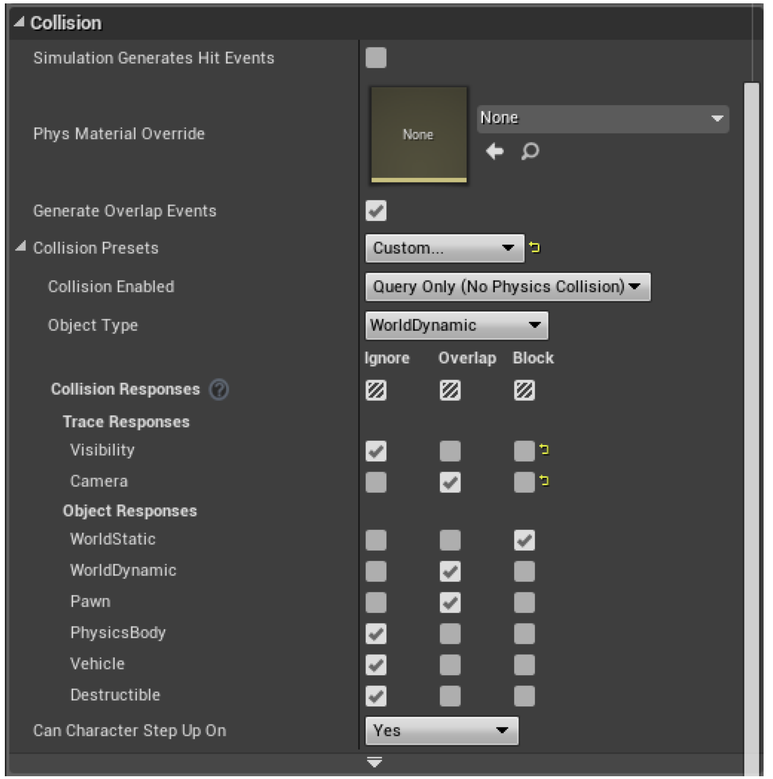
OBJECT TYPE

The Object Type property declares what category an Actor falls into so that when it collides with another Actor, that Actor will know how to respond to it.



Custom Collision Presets for an Individual Actor

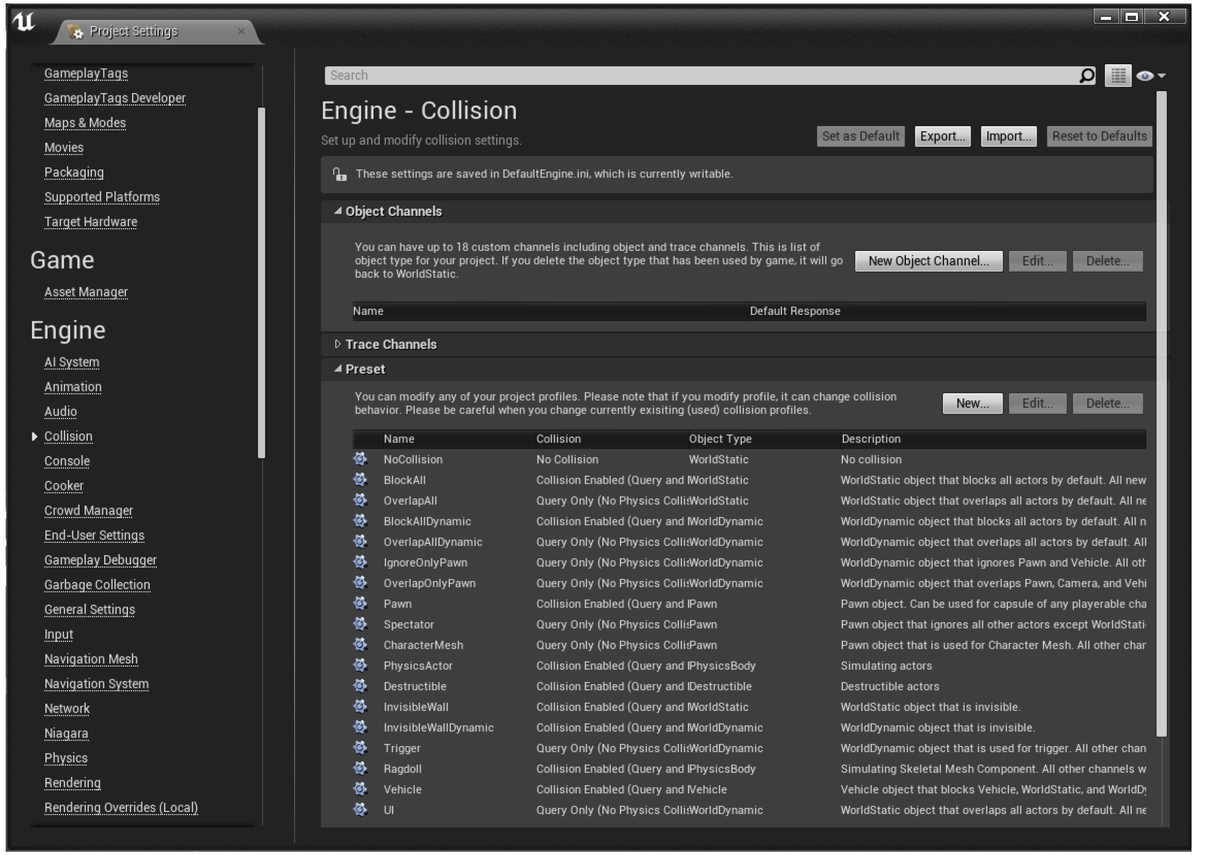
You can customize an individual Actor’s collision responses simply by picking Custom Preset. This will allow you to manually edit how the Actor should respond to other Actor types. It will also allow you to change the Actor’s object type.



Setting Collision Presets for an Entire Project

You can define new object types and collision presets for an entire project. Doing so will speed up production if your project has a lot of specific needs when dealing with collision responses.

On the Level Editor menu bar, choose Edit > Project Settings > Collision.

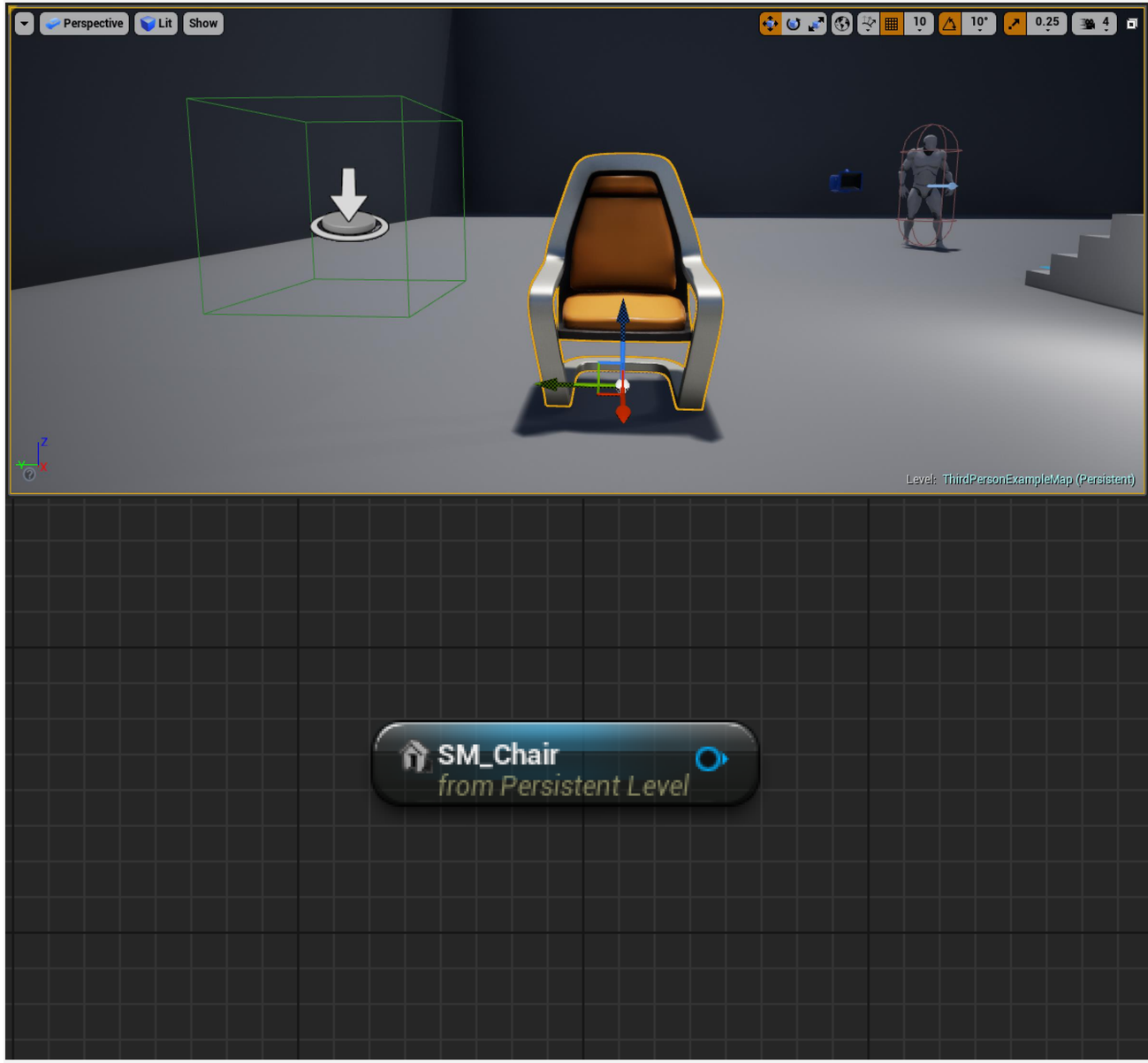


LEVEL BLUEPRINT

Assigning Actors to Reference Variables

ACTOR REFERENCE VARIABLES

An Actor reference variable represents an Actor and all of it properties in Blueprint. It is how you refer to an Actor whose properties you want to modify in Blueprint.

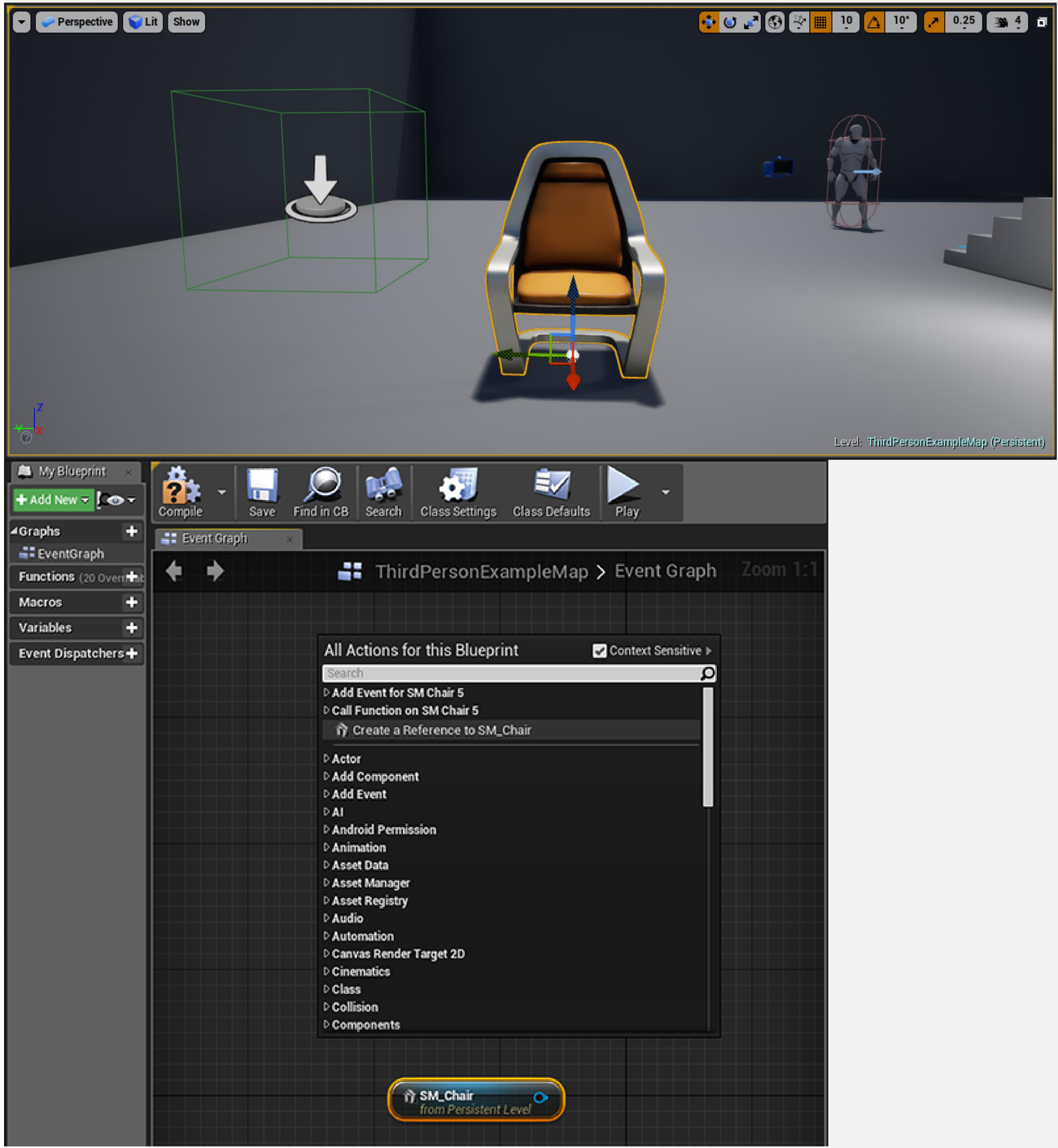


ACTOR REFERENCE VARIABLES

You can only assign Actors already placed in the Level to an Actor reference variable in the Level Blueprint.

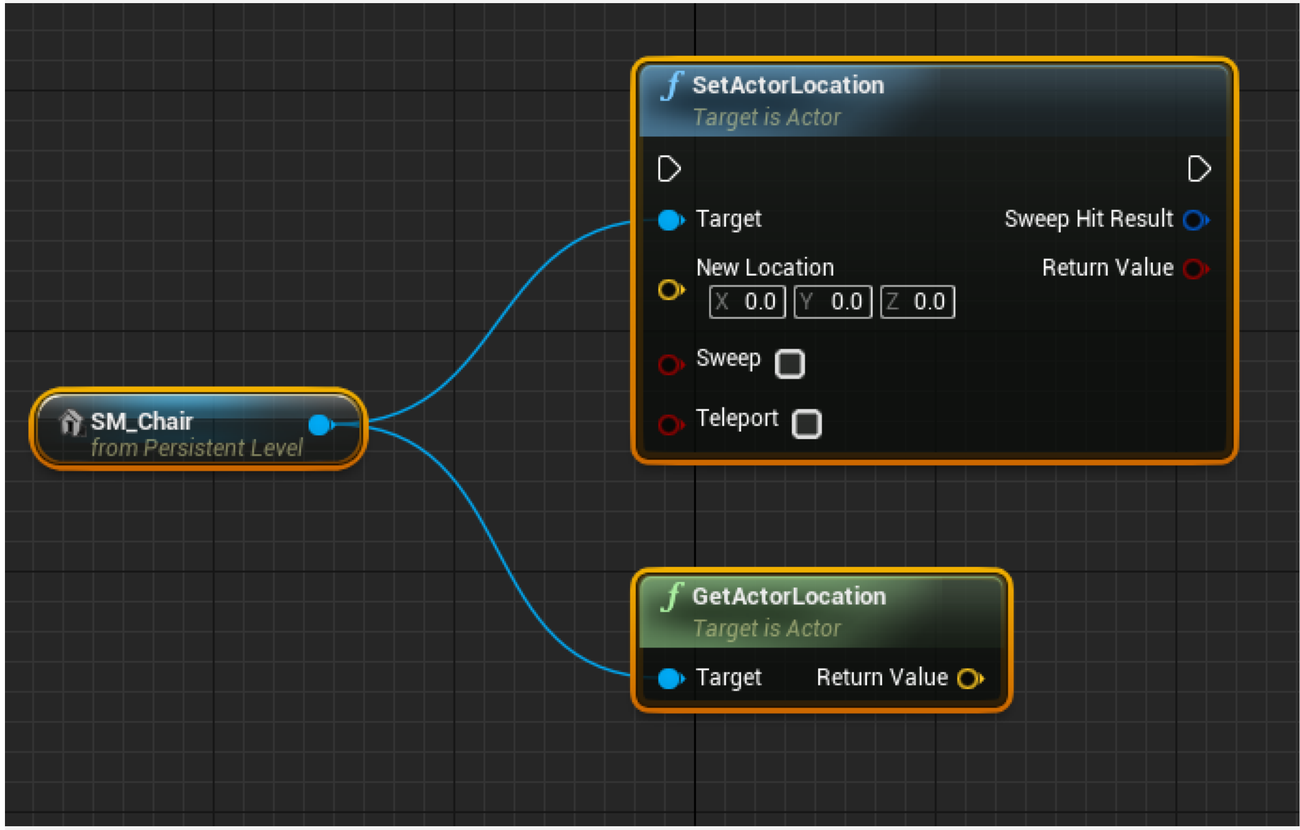
To assign an Actor to an Actor reference variable:

- Select the Actor in the Level and open the Level Blueprint Editor.
- Right-click in the Event Graph to bring up the Blueprint Context Menu.
- Select Create a Reference to [Actor] to add a variable for the selected Actor.



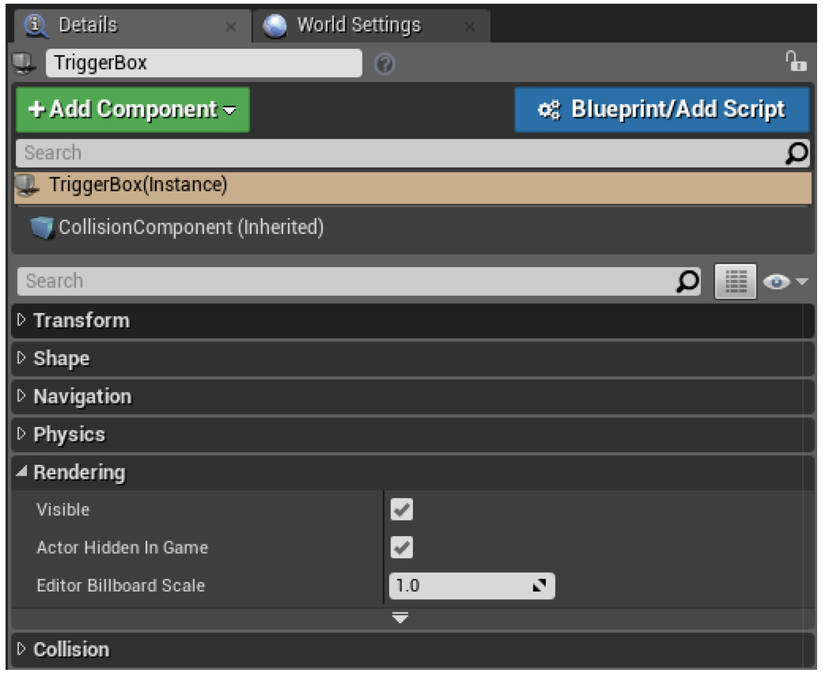
CHANGING AN ACTOR'S PROPERTIES

Once an Actor has been assigned to a reference variable, you can get or set the Actor's properties. For example, you can use a function to change its location in the Level.



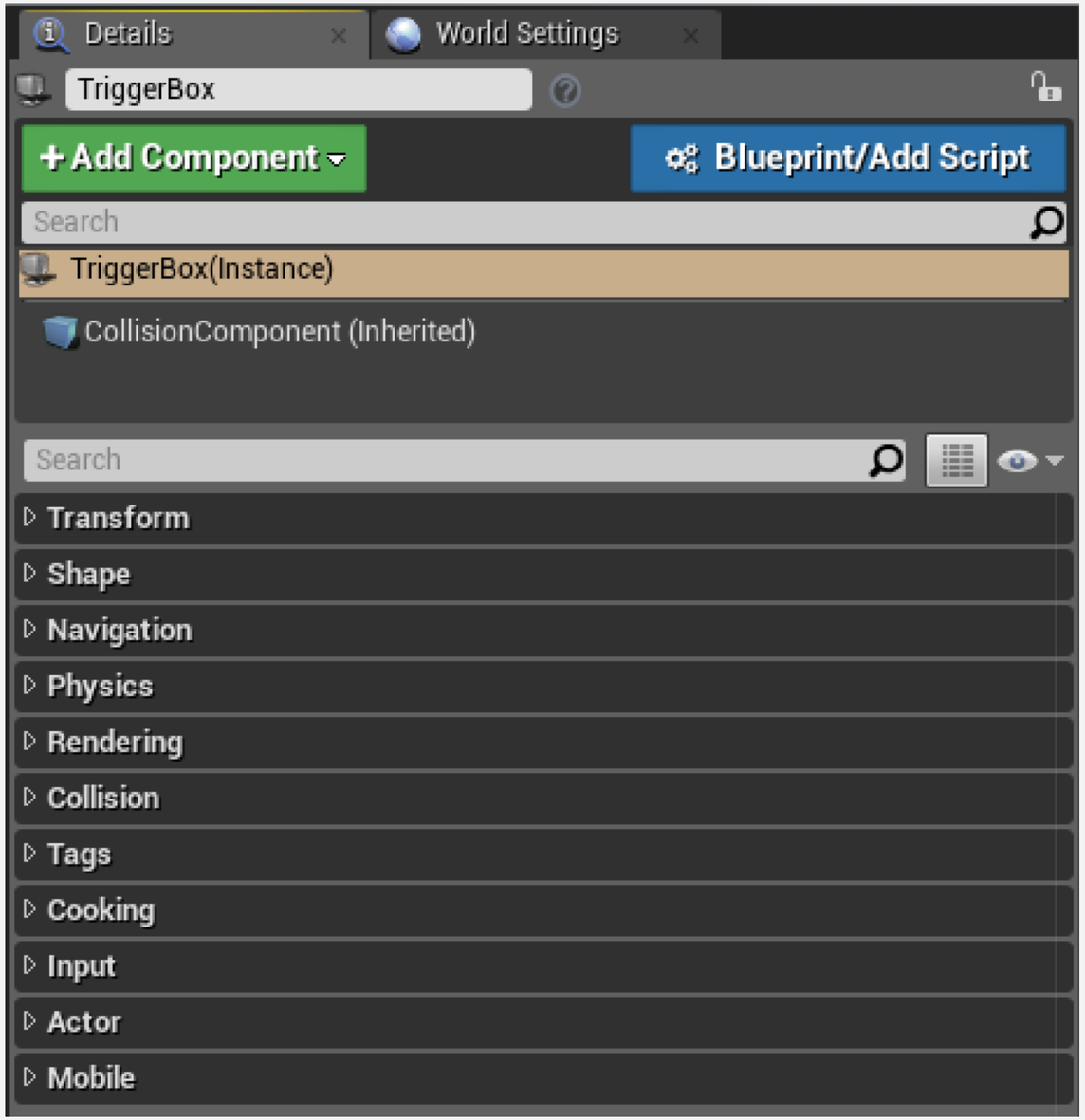
Actor Properties

If you are not sure what kind of properties an Actor has, select the Actor in the Level and look at its properties in the Level Details panel.



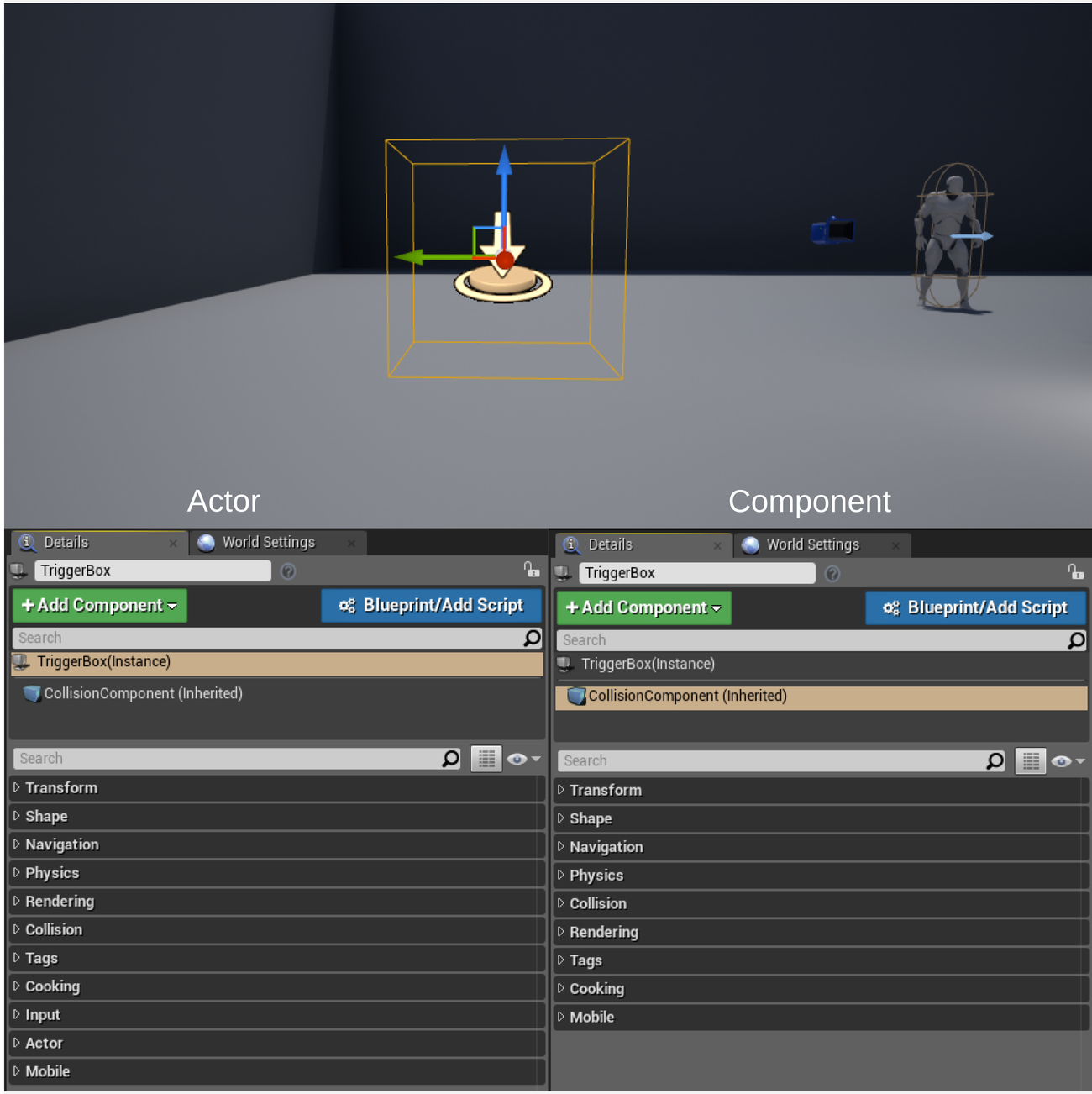
ACTOR COMPONENTS

All Actors placed in a Level have common properties on the Actor level, such as transform and rendering settings.



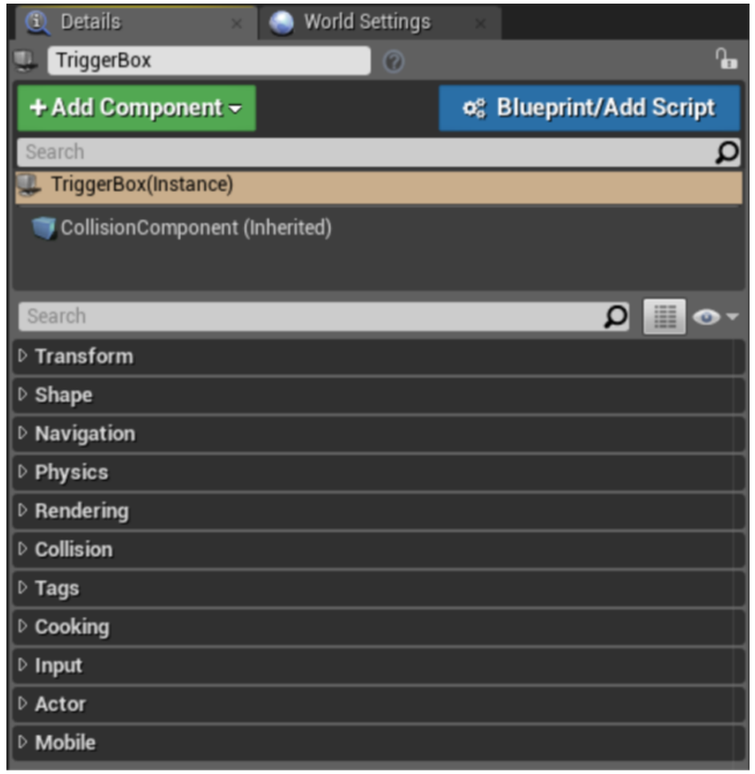
COMPONENT PROPERTIES

Other properties of an Actor are on the component level. A component is a subobject element of an Actor. For example, a Box Trigger Actor has a Collision component.



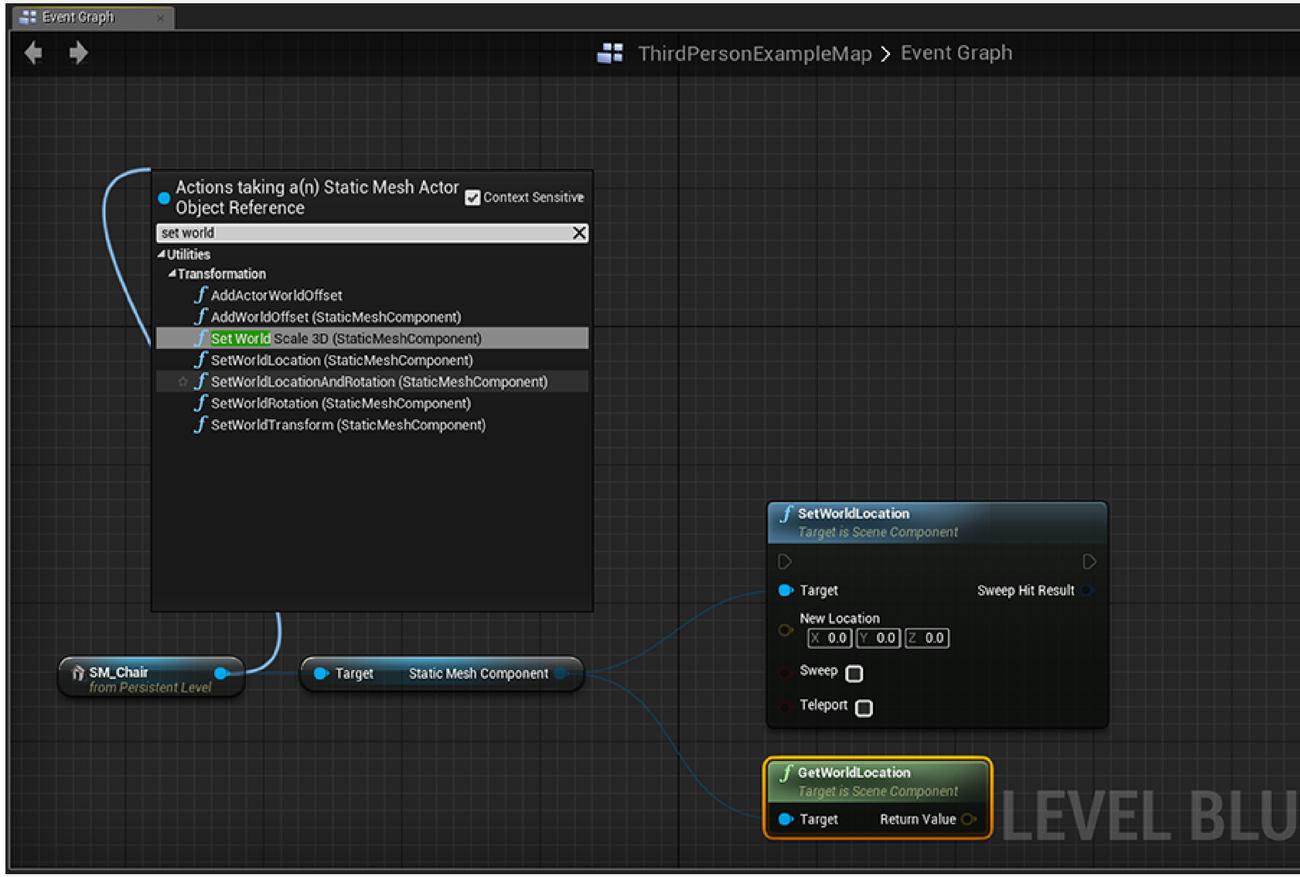
Actors and Components

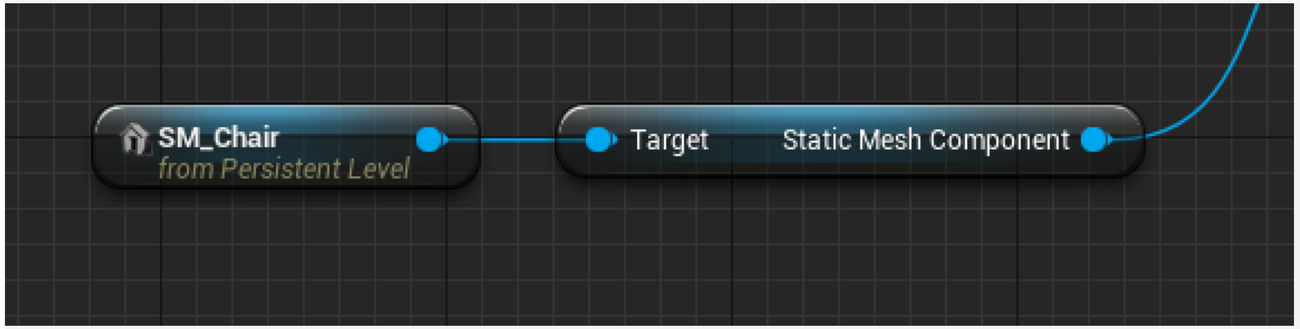
Many of the default classes already provided in the Editor show the component properties on the Actor level. For example, the Actor properties for the Box Trigger shows the Shape property tab on the Actor level, but the shape property is actually a property of the Collision component.



CHANGING AN ACTOR'S PROPERTIES

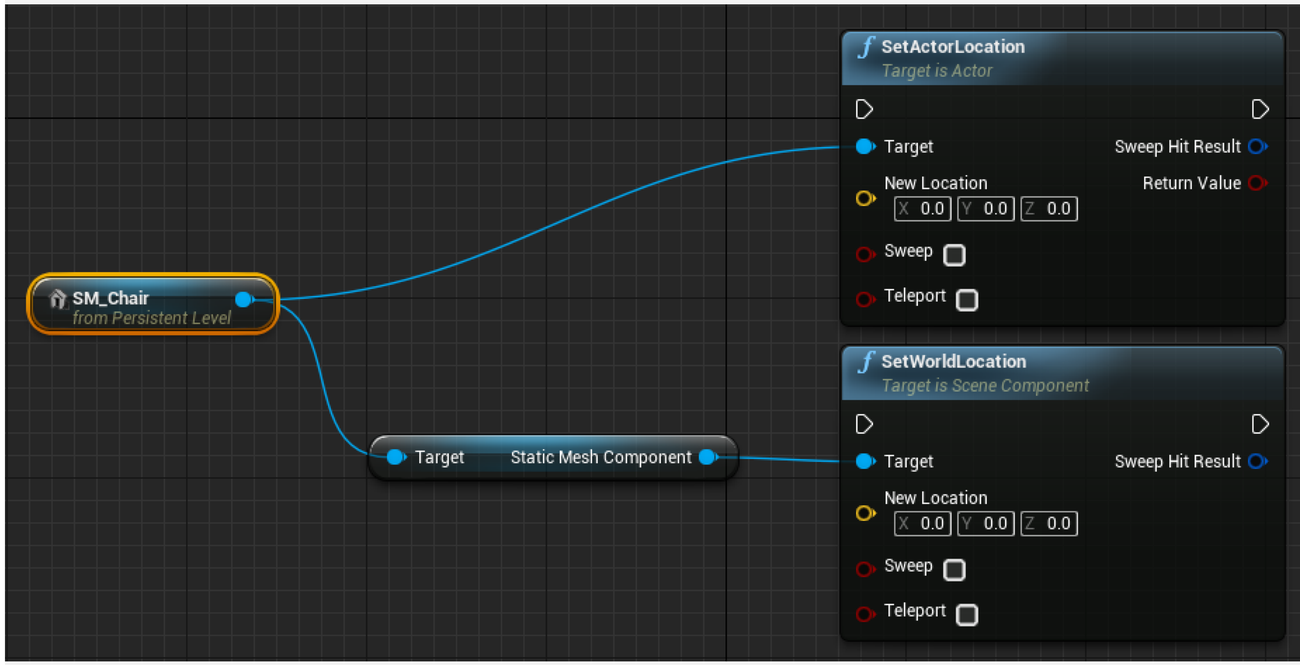
You can use a component reference to get or set a property on a component of an Actor.





CHANGING AN ACTOR'S PROPERTIES

Setting the properties of an Actor or its components requires a function that targets the Actor or the Actor's components. In the example on the right, both functions change the location of their target, but the top function targets the Actor and the bottom one targets a component of the Actor.

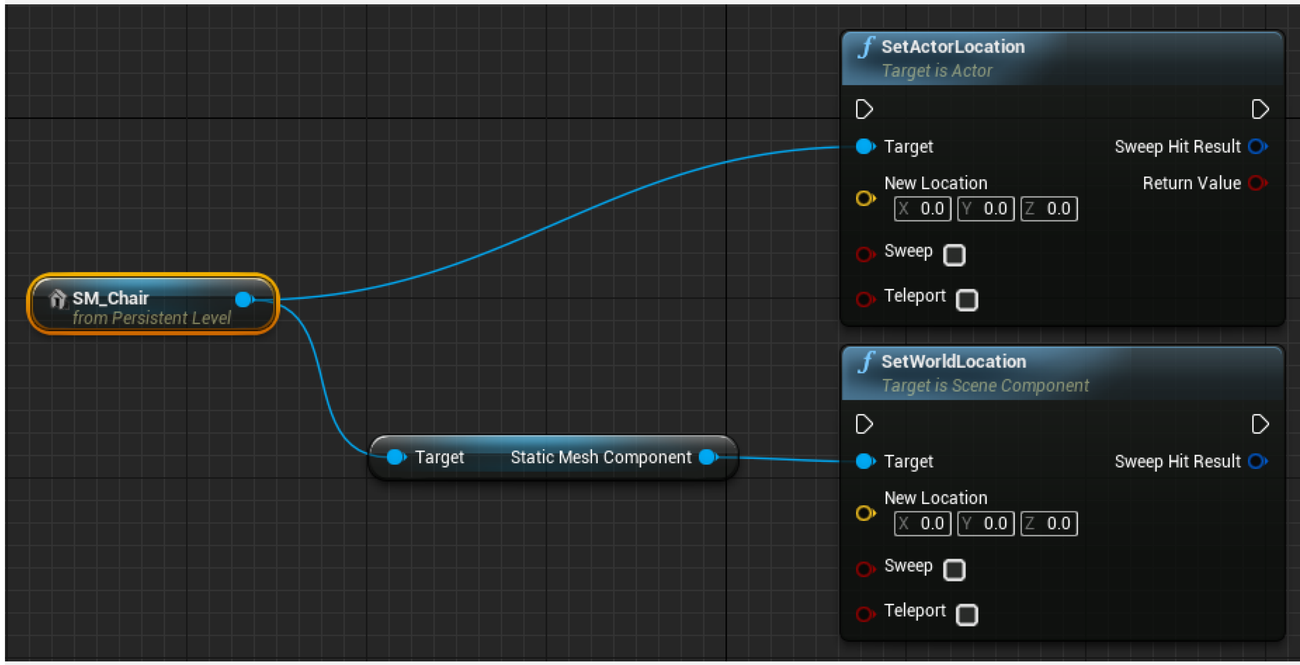


LEVEL BLUEPRINT

Walkthrough

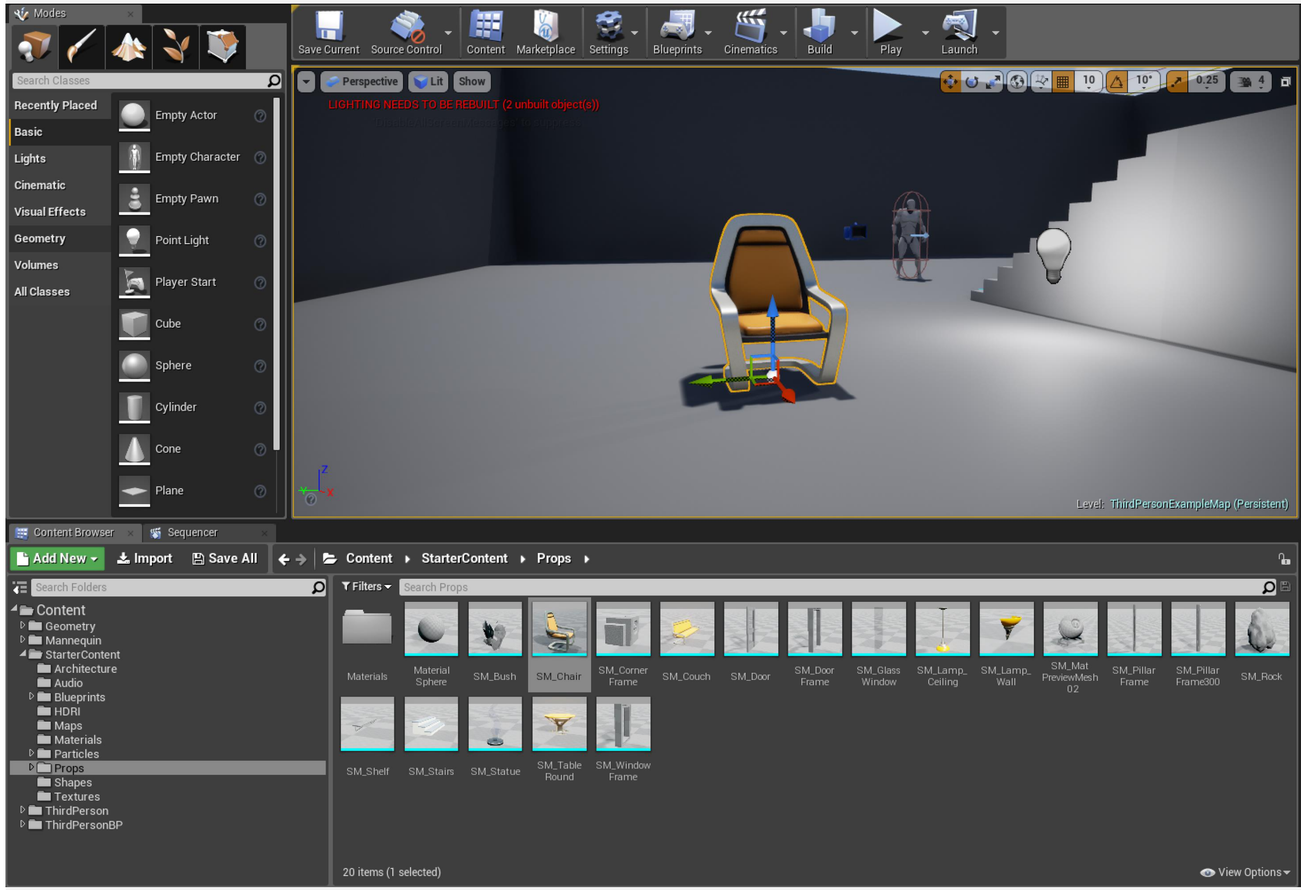
CREATE A NEW PROJECT

Create a new project using the Third Person template with starter content.



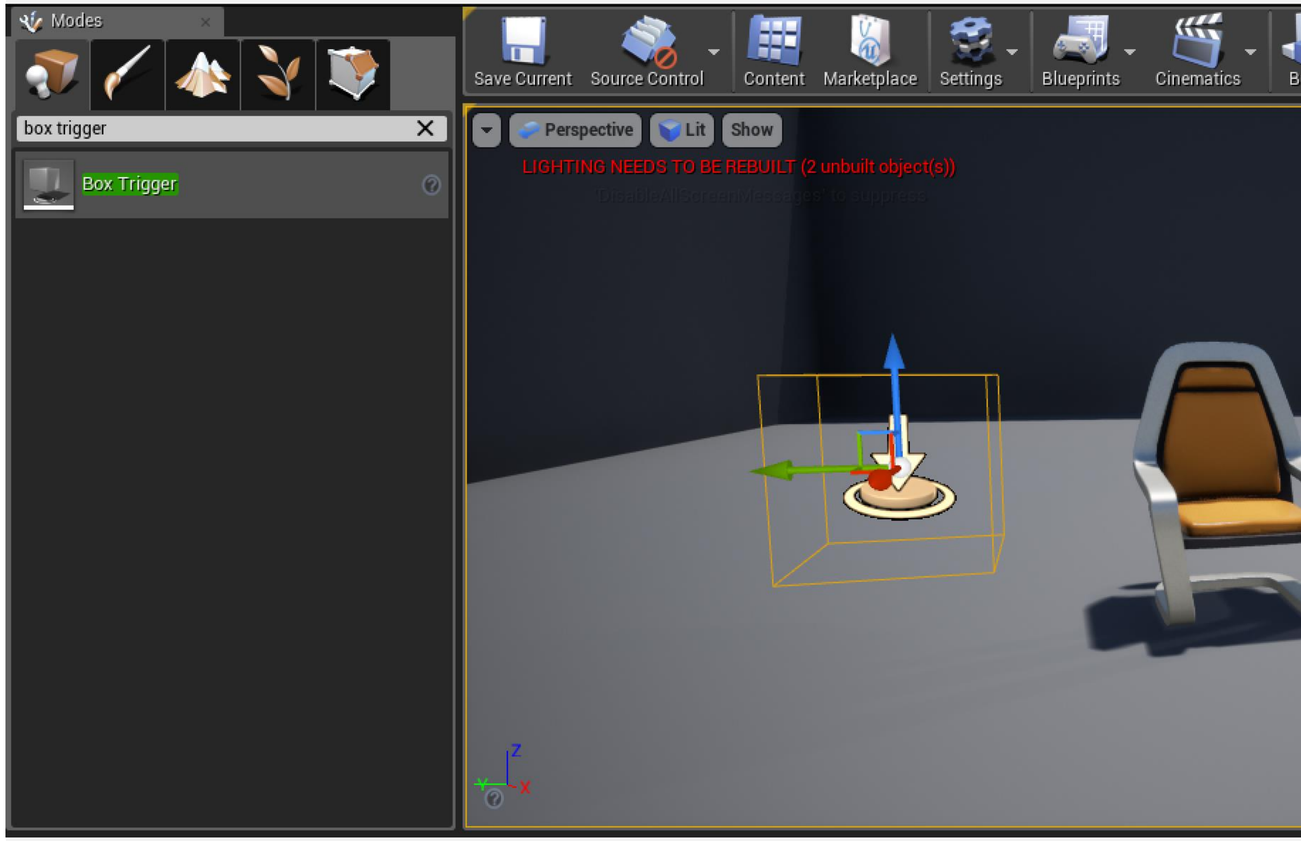
ADD ACTORS TO WORK WITH

Add the SM_Chair Static Mesh asset from the Content Browser to the default Level.



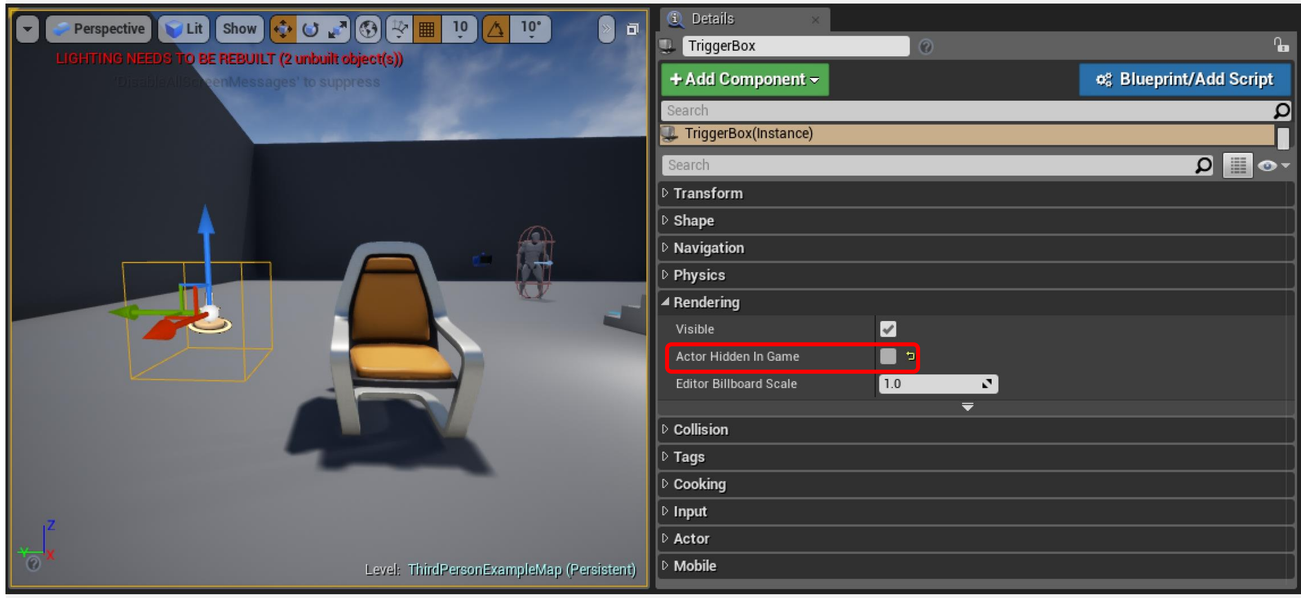
ADD ACTORS TO WORK WITH

Now add a Box Trigger Actor. In the Modes panel search box, type “Box Trigger” to find the Box Trigger and drag it into your Level.



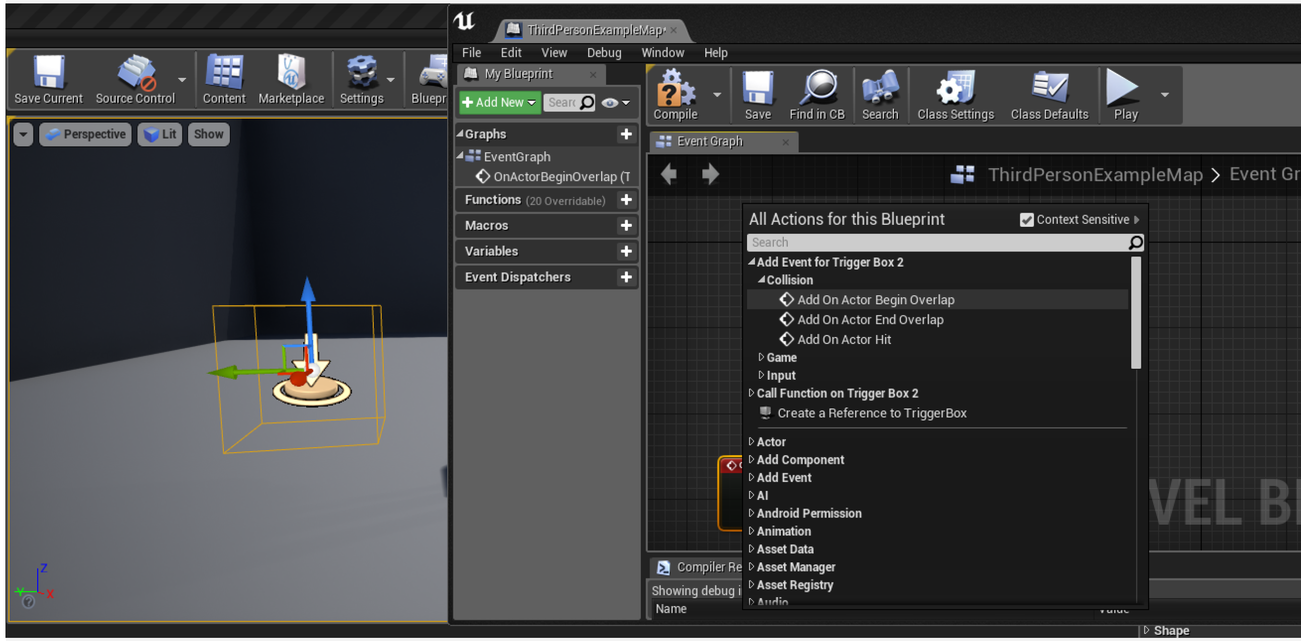
CHANGE THE BOX TRIGGER'S RENDERING SETTING

Temporarily change the Box Trigger Actor's rendering setting so you can see it in-game. Select the Box Trigger, and in the Level Details panel under Rendering, turn off Actor Hidden In Game.



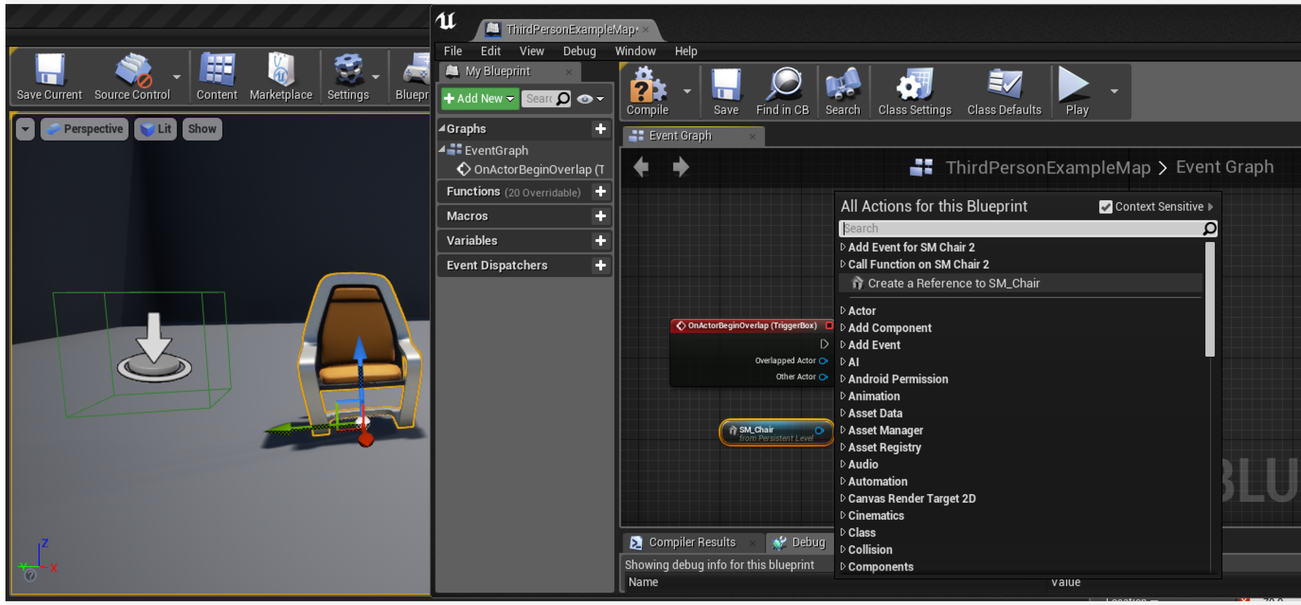
ASSIGN THE BOX TRIGGER TO AN OVERLAP EVENT

Select the Box Trigger Actor in the Level and open up the Level Blueprint Editor. Right-click in the Event Graph to bring up the Blueprint Context Menu and select Add On Actor Begin Overlap to assign the Box Trigger Actor to an overlap collision event.



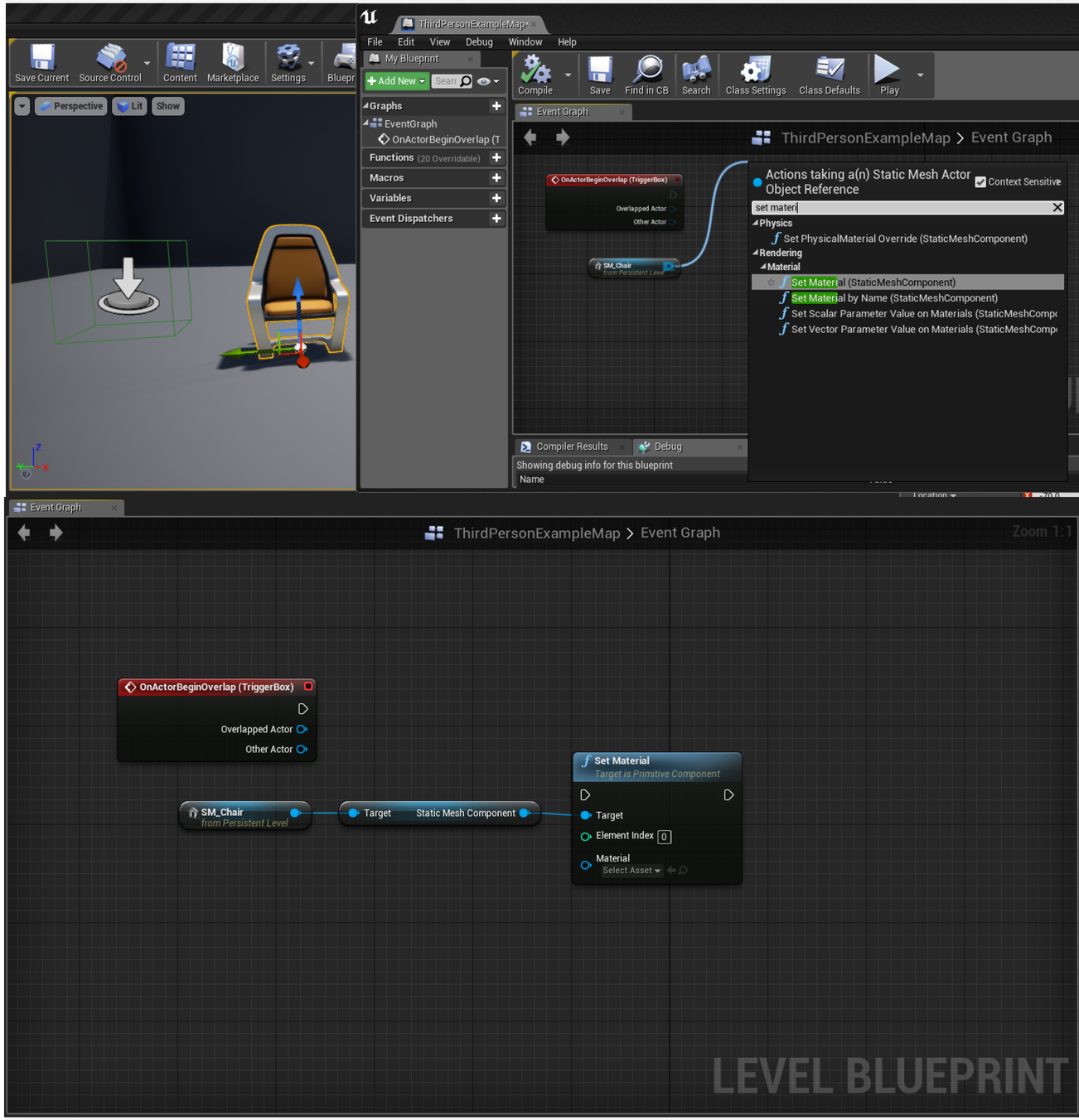
CREATE A REFERENCE TO THE SM_CHAIR ACTOR

Select the SM_Chair Static Mesh Actor in the Level. In the Level Blueprint, right-click in the Event Graph to bring up the Blueprint Context Menu and select Create a Reference to SM_Chair to assign the Actor to a reference variable.



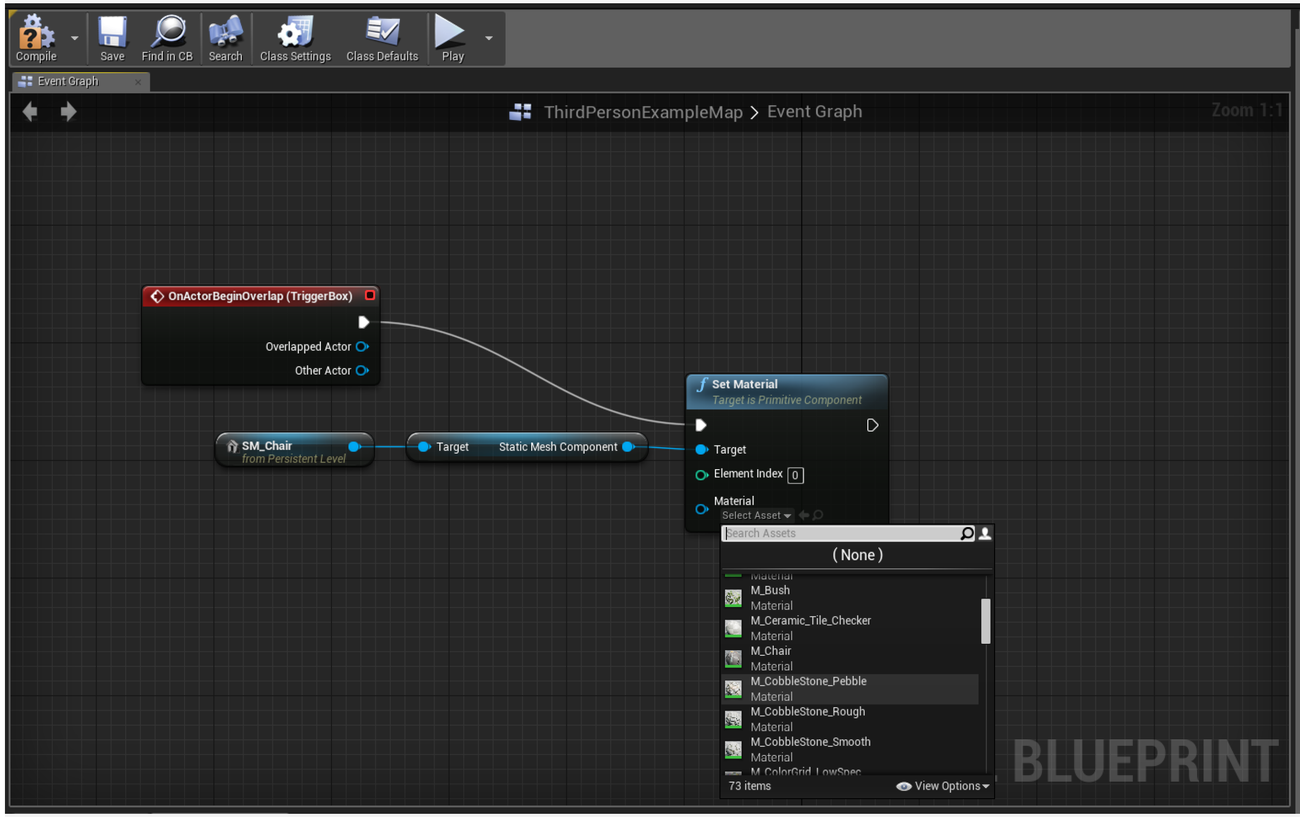
CHANGE THE MATERIAL OF THE SM_CHAIR ACTOR

In the Level Blueprint, drag a wire from the blue data out pin on the Chair Actor reference variable and release it to bring up the Blueprint Context Menu. In the search box, type “set Material” and select Set Material (StaticMeshComponent) to add a Set Material function that targets the mesh component of the Actor.



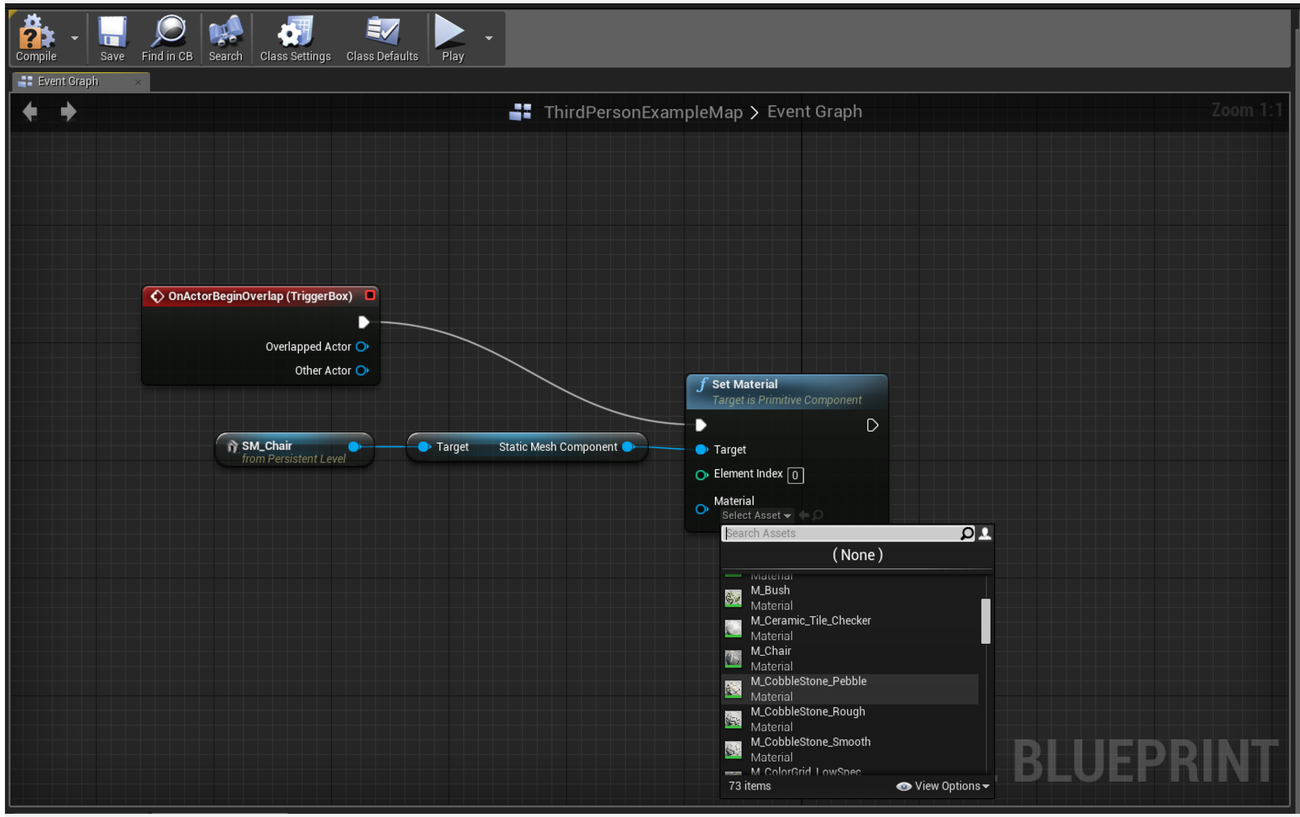
CHANGE THE MATERIAL OF THE SM_CHAIR ACTOR

Drag a wire from the Overlap event’s exec out pin to the Set Material function’s exec in pin to link them together. Then click on the Material property on Set Material and select a new Material from the drop-down list.



CHANGE THE MATERIAL OF THE SM_CHAIR ACTOR

Compile the Blueprint and preview the Level. Move the Character Pawn over the Box Trigger Actor to see the Material on the SM_Chair Actor change.



END OVERLAP EVENT

Now repeat the process, but this time assign the Box Trigger to an End Overlap event and change the Material again.