

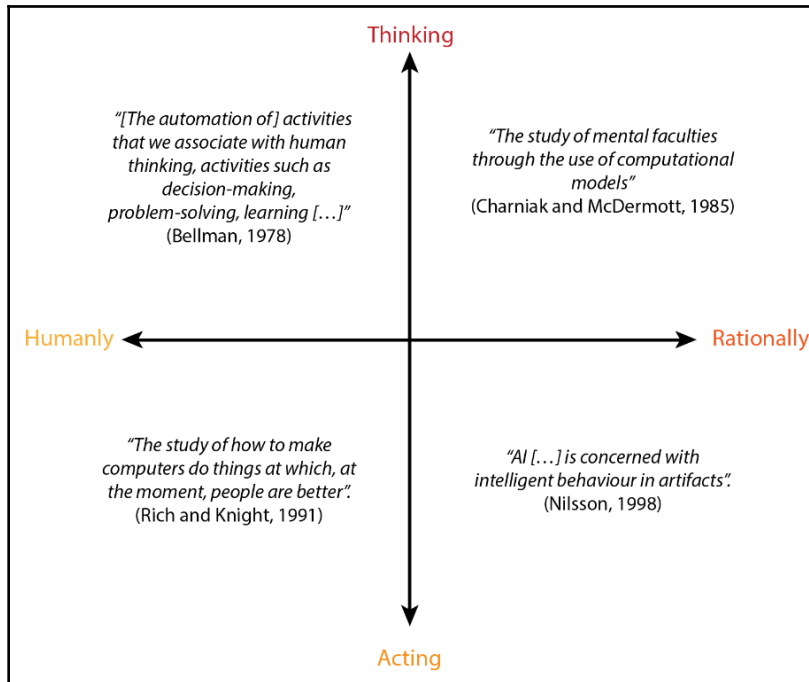


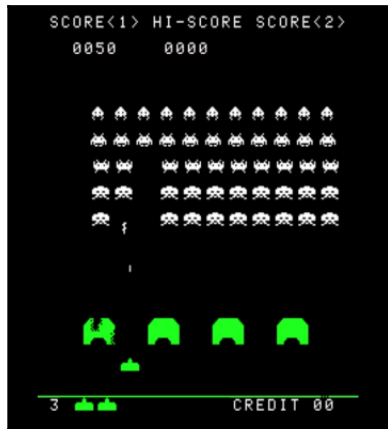
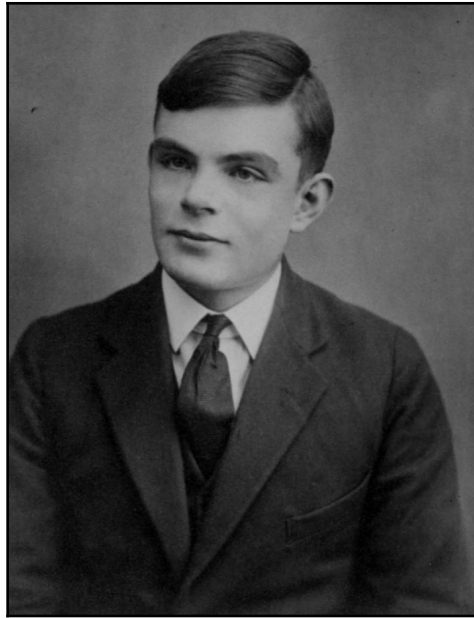
## Unreal Engine 4.22.0 Installation Options ×

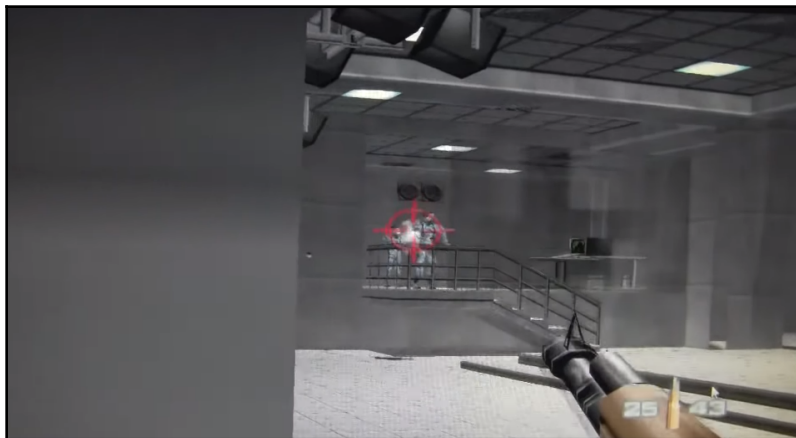
Core Components <small>(Required)</small>	10.89 GB	<input checked="" type="checkbox"/>
Starter Content	867.29 MB	<input checked="" type="checkbox"/>
Templates and Feature Packs	588.64 MB	<input checked="" type="checkbox"/>
Engine Source	140.60 MB	<input checked="" type="checkbox"/>
Editor symbols for debugging	23.92 GB	<input checked="" type="checkbox"/>

Download Size: 0.00 B  
Required Storage Space: 0.00 B

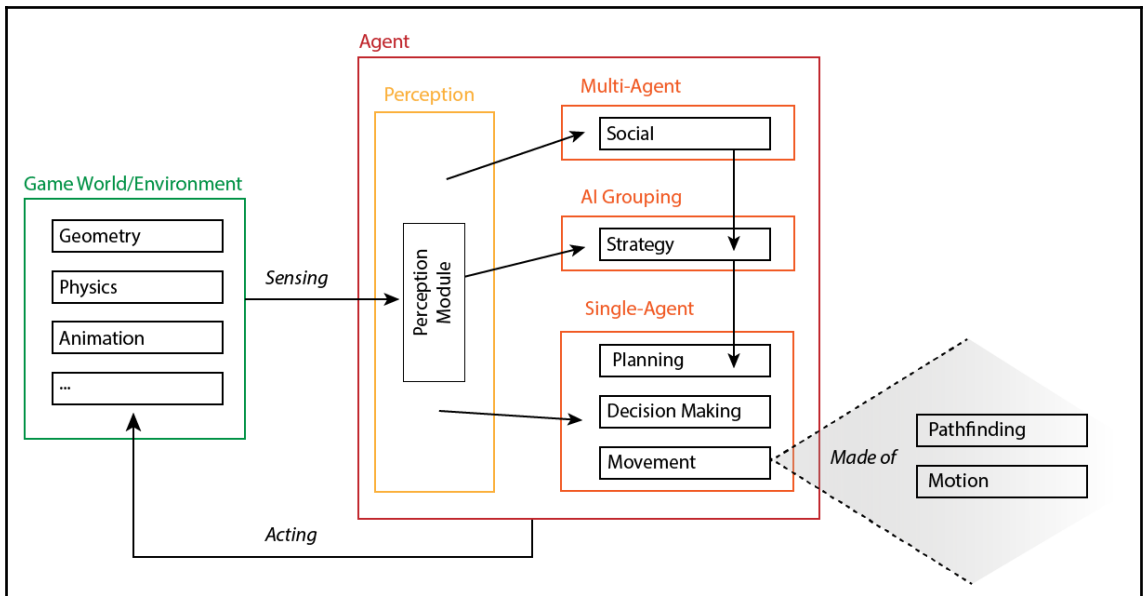
Apply

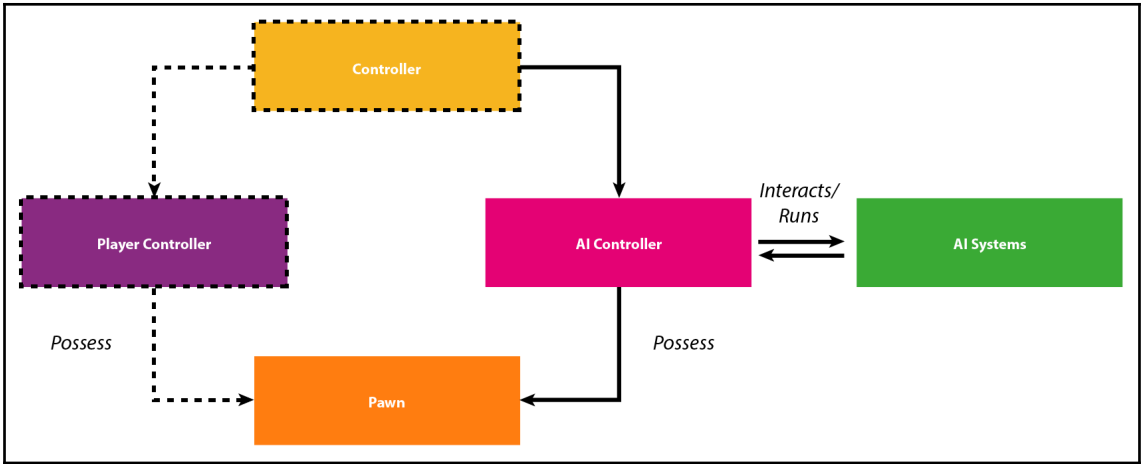




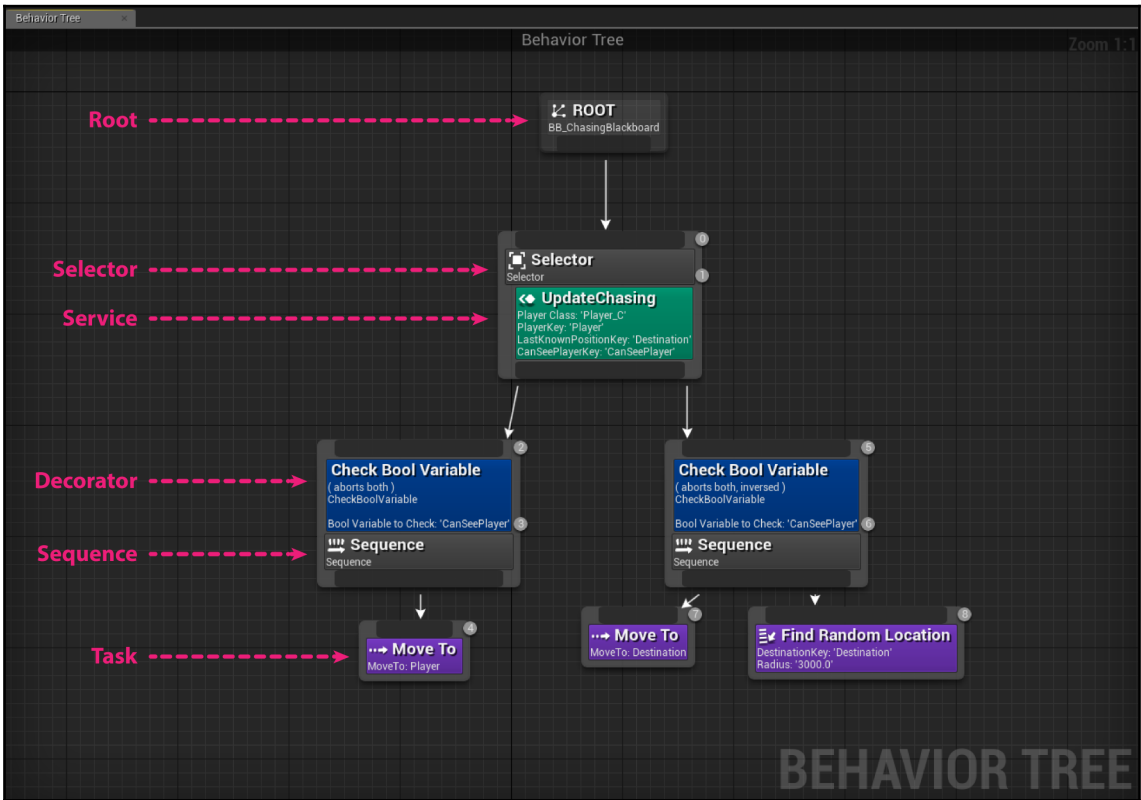
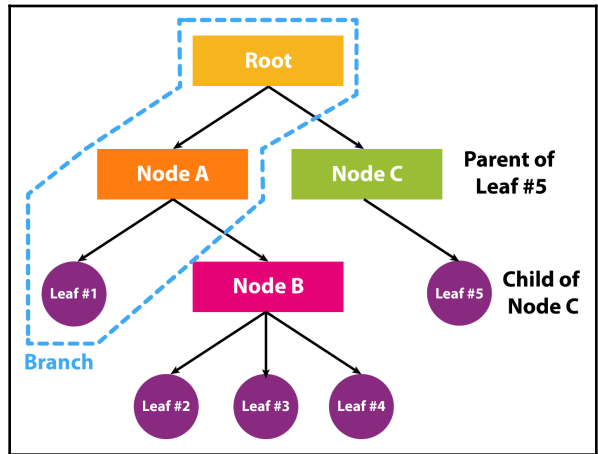




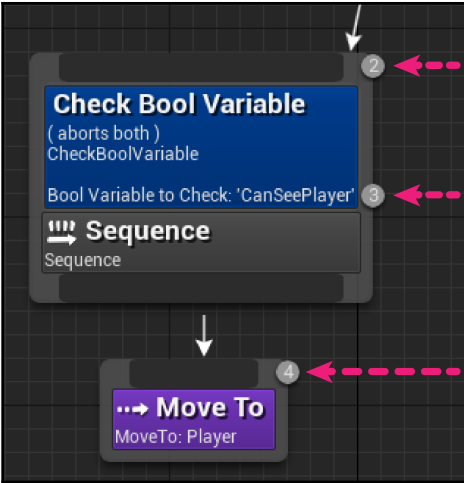


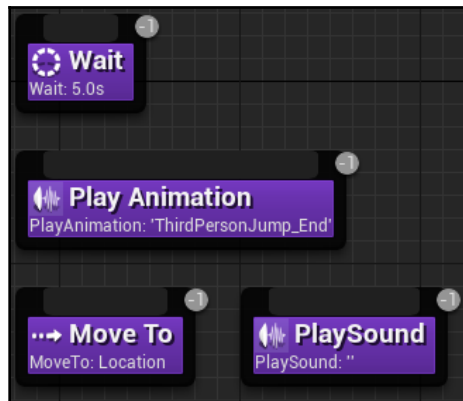
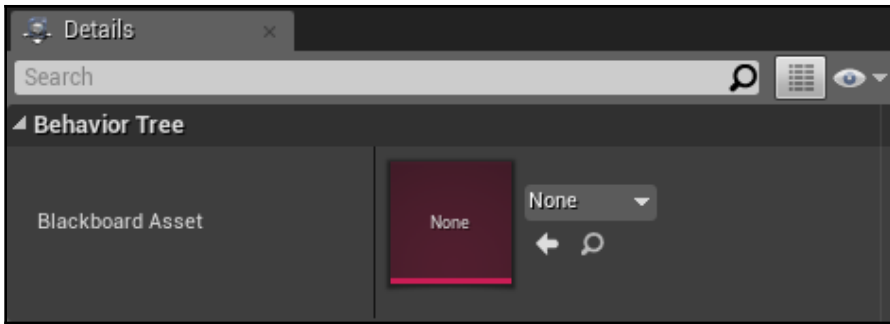


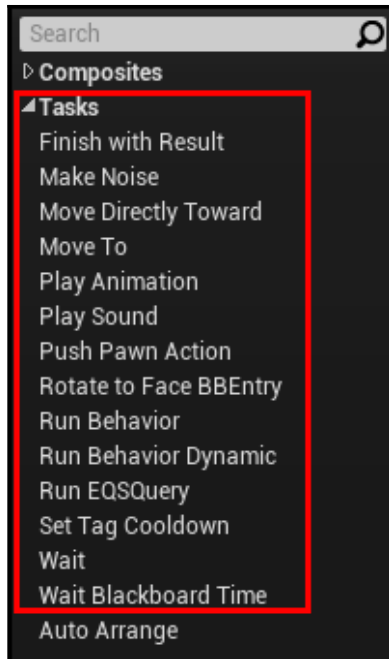
# Chapter 2: Behavior Trees and Blackboards











**⇒ Simple Parallel**  
SimpleParallel: finish with main task  
Local scope for observers

**Force Success**  
ForceSuccess

**Sequence**  
Sequence

**◀ Cone Check**  
ConeCheck: is Location in 90.00 degree Location-Location cone

**Sequence**  
Sequence

**☺ Is At Location**  
IsAtLocation: Location

**Gameplay Tag Condition**  
CheckGameplayTagsOnActor: Has any tags in set: (GameplayTags=)

**? Does path exist**  
DoesPathExist: Find path from SelfActor to Location (mode:HierarchicalQuery)

**↻ Conditional Loop**  
ConditionalLoop: ObjectKey is Is Set

**Sequence**  
Sequence

Breakpoints

Toggle breakpoint F9

Add breakpoint

---

Node Actions

Delete Delete

Cut Ctrl+X

Copy Ctrl+C

Duplicate Ctrl+W

Break Link(s)

Add Decorator... ▶

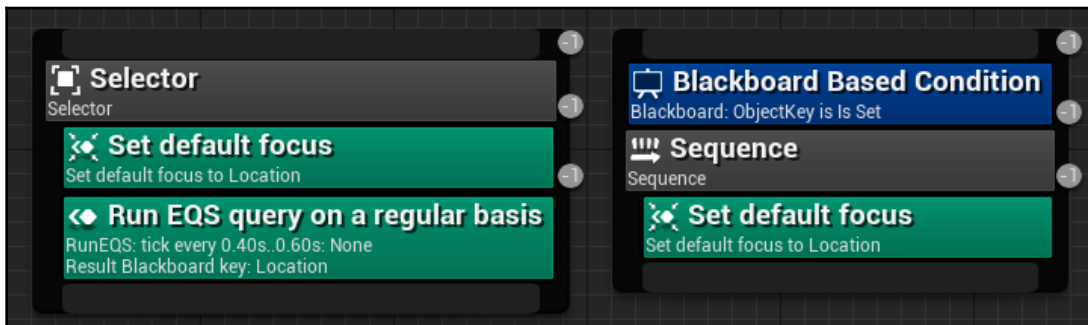
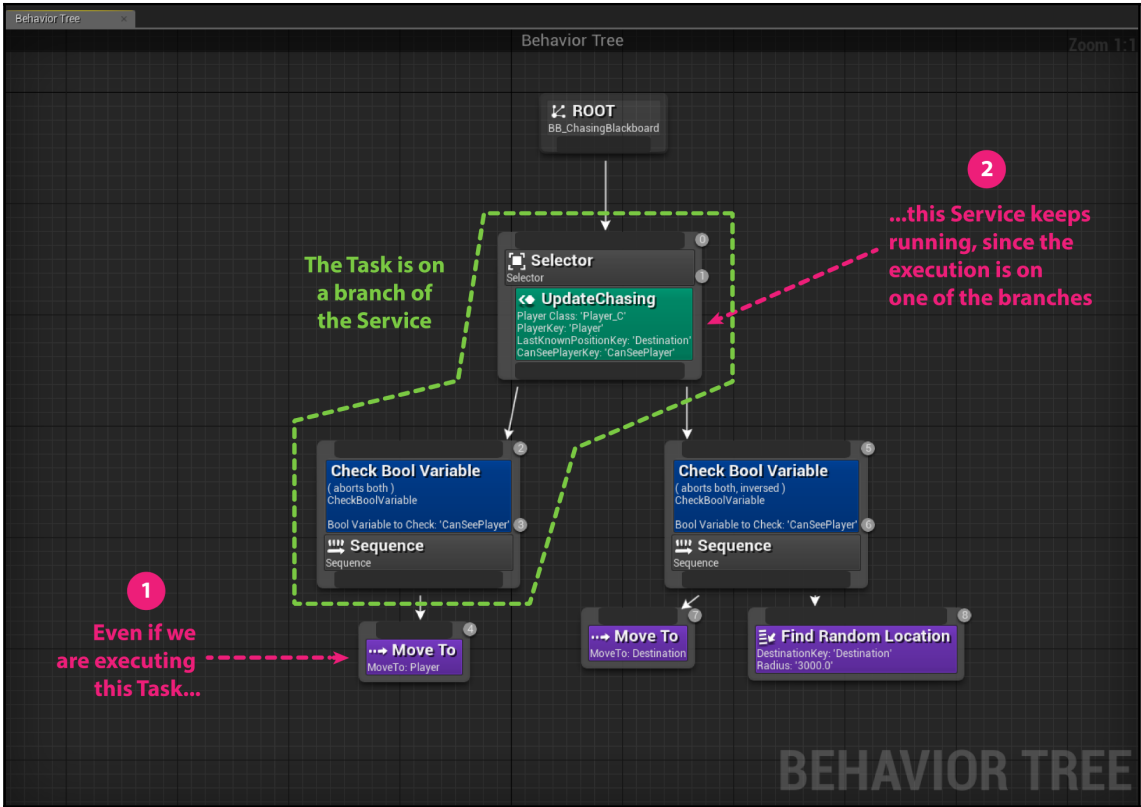
Add Service... ▶

---

Node Comment

Search

- Blackboard
- Check Gameplay Tags on Actor
- Compare BBEntries
- Composite
- Conditional Loop
- Cone Check
- Cooldown
- Does Path Exist
- Force Success
- Is at Location
- Is BBEntry Of Class
- Keep in Cone
- Loop
- Set Tag Cooldown
- Tag Cooldown
- Time Limit



Breakpoints	
Toggle breakpoint	F9
Add breakpoint	
Node Actions	
Delete	Delete
Cut	Ctrl+X
Copy	Ctrl+C
Duplicate	Ctrl+W
Break Link(s)	
Add Decorator... ▶	
<b>Add Service...</b> ▶	
Node Comment	
<input type="text"/>	

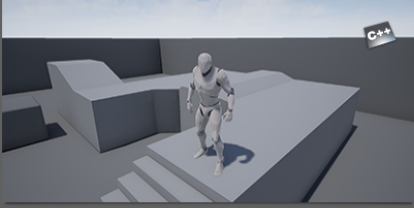
- Default Focus
- Run EQS

Unreal Project Browser
Projects | **New Project**

Choose a **template** to use as a starting point for your new project. Any of these features can be added later by clicking **Add Feature or Content Pack** in **Content Browser**.

Blueprint
C++ C++

Basic Code	First Person	Flying	Puzzle	Rolling	Side Scroller
2D Side Scroller	<b>Third Person</b>	Top Down	Twin Stick Shooter	Vehicle	Vehicle Advanced



**Third Person**

The third person template features a playable character where the camera is

Choose some **settings** for your project. Don't worry, you can change these later in the **Target Hardware** section of **Project Settings**. You can also add the **Starter Content** to your project later using **Content Browser**.

Desktop / Console

Maximum Quality

No Starter Content

Select a **location** for your project to be stored.

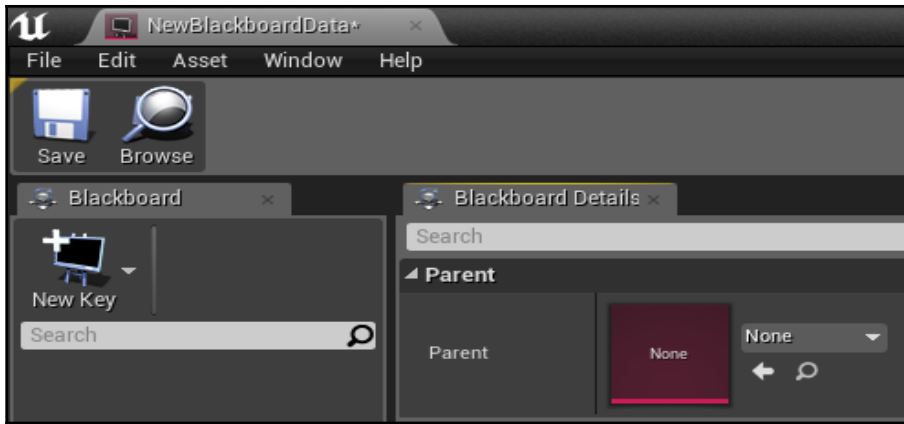
C:\Users\User\Data\Unreal Projects

UnrealAIBook

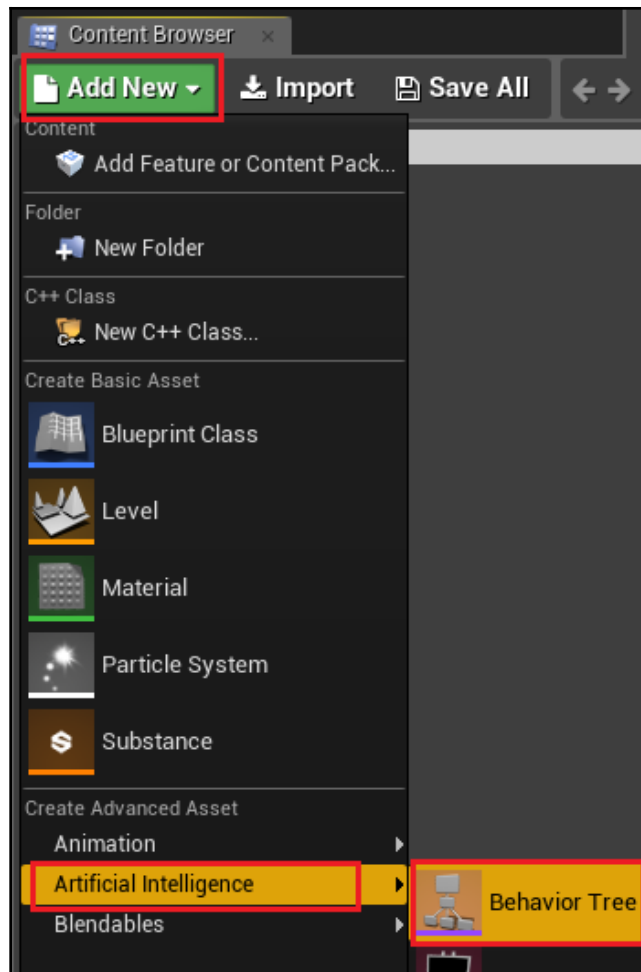
Folder

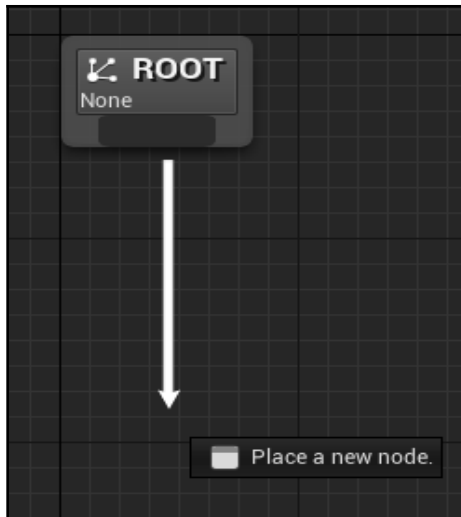
Name

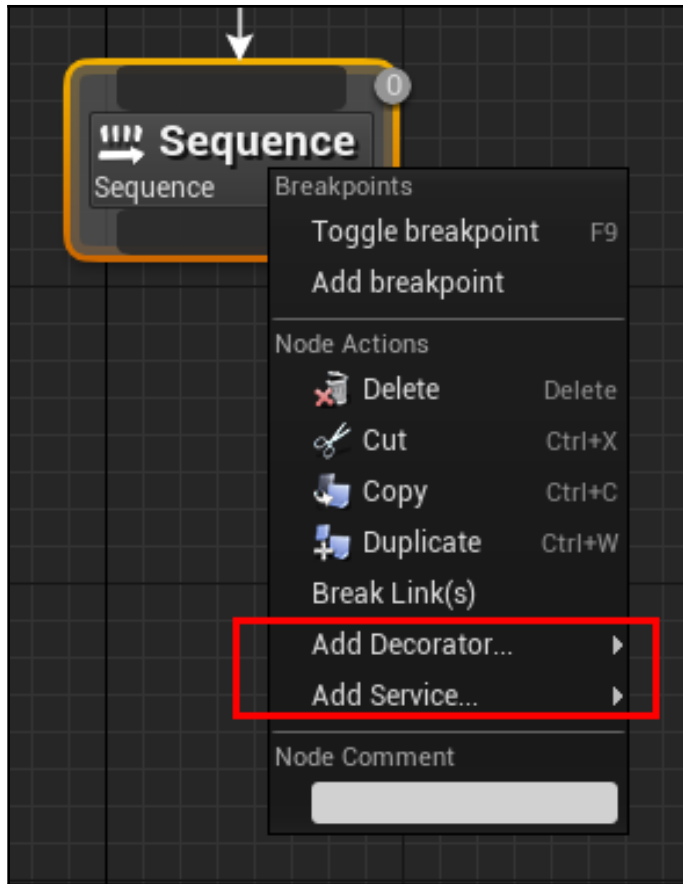
Create Project











Details

Search Details

**Node**

Acceptable Radius	5,0
Filter Class	None
Allow Strafe	<input type="checkbox"/>
Reach Test Includes Agent Radius	<input checked="" type="checkbox"/>
Reach Test Includes Goal Radius	<input checked="" type="checkbox"/>
Stop on Overlap	<input checked="" type="checkbox"/>

**Blackboard**

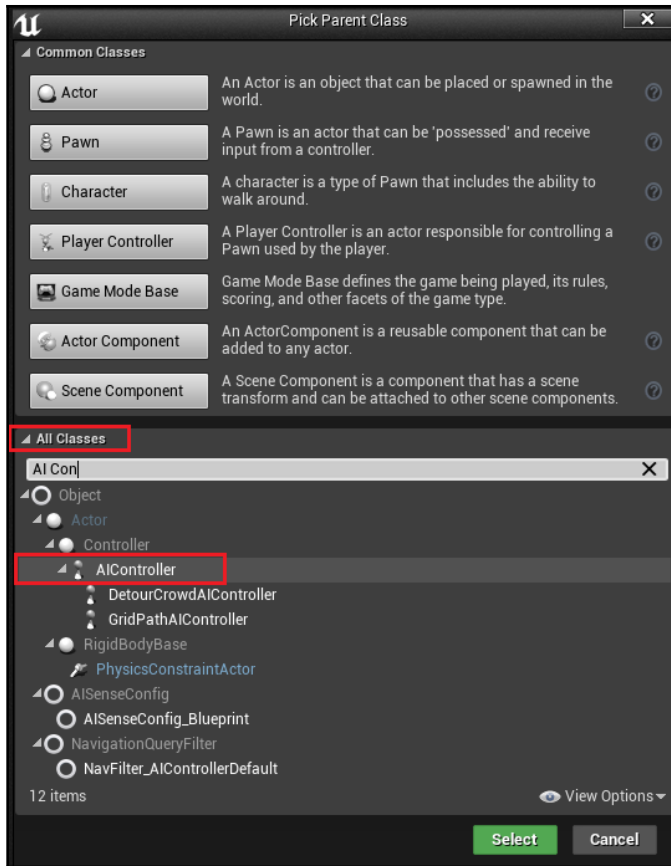
Blackboard Key	Player
----------------	--------

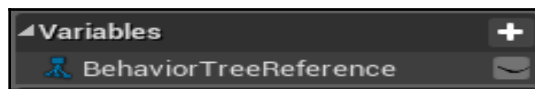
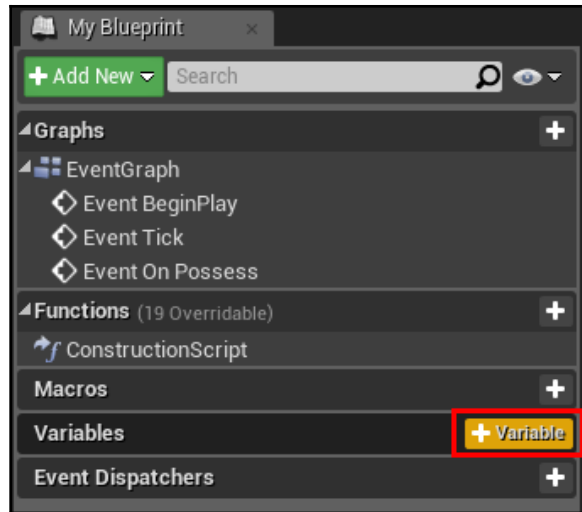
**Task**

Ignore Restart Self	<input type="checkbox"/>
---------------------	--------------------------

**Description**

Node Name	Move To
-----------	---------










Details

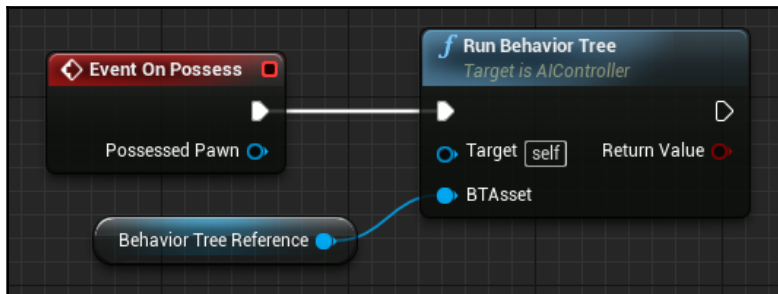
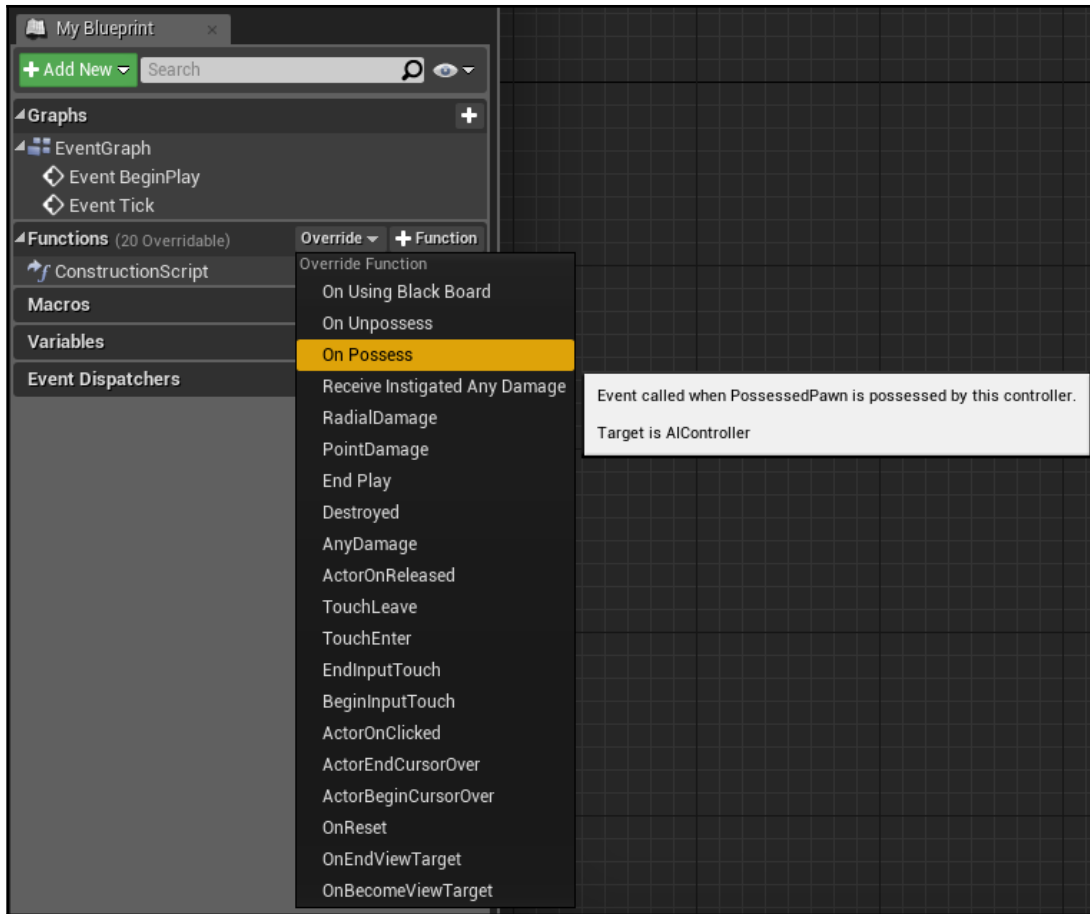
Search Details

### Variable

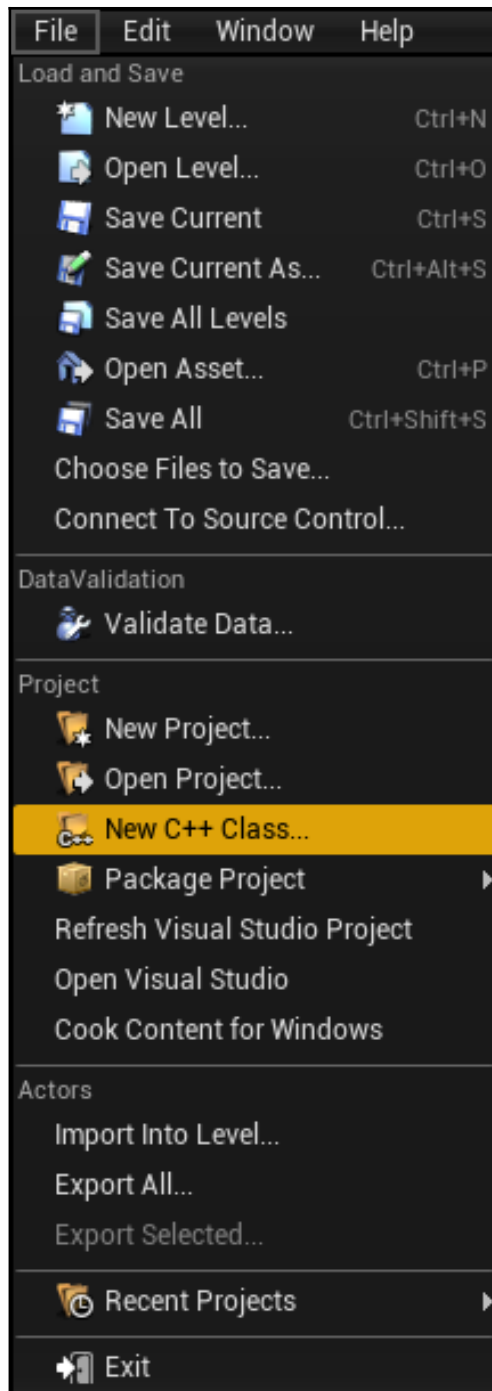
Variable Name	BehaviorTreeReference
Variable Type	 Behavior Tree 
Instance Editable	<input type="checkbox"/>
Blueprint Read Only	<input type="checkbox"/>
Tooltip	
Expose on Spawn	<input type="checkbox"/>
Private	<input type="checkbox"/>
Category	Default
Replication	None
Replication Condition	None

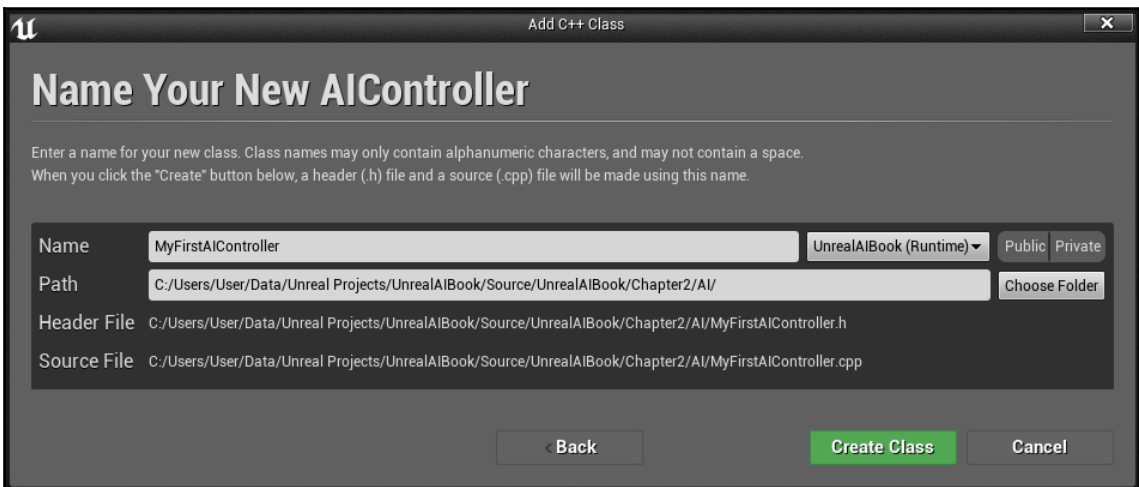
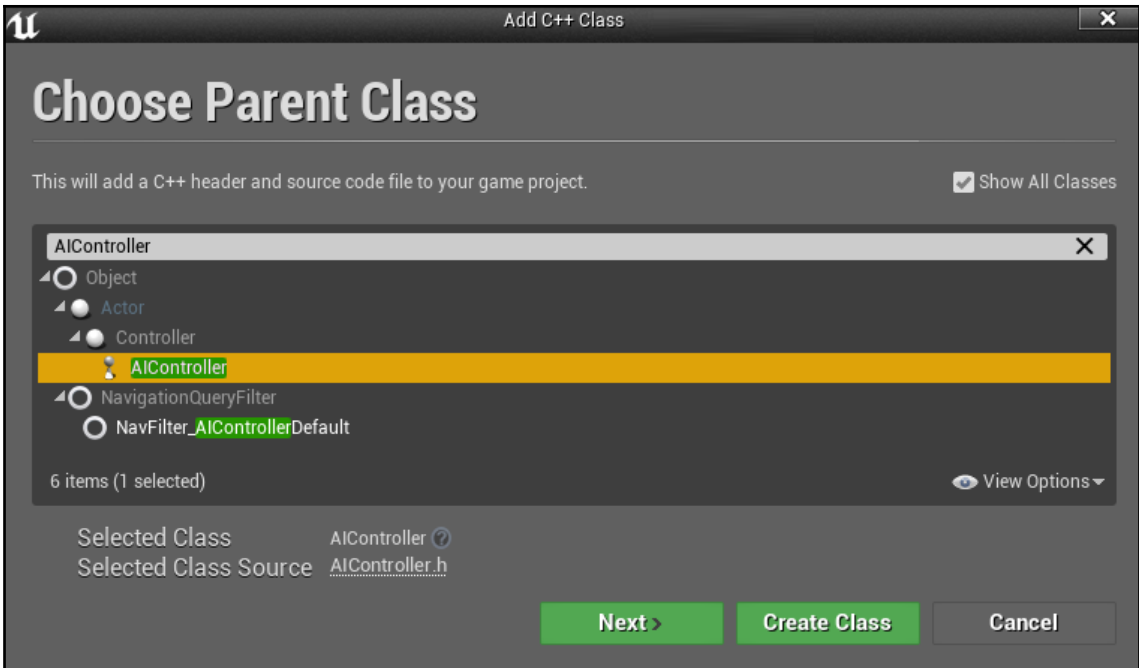
### Default Value

Behavior Tree Reference	 BT_MyFirstBehaviorTree  
-------------------------	--





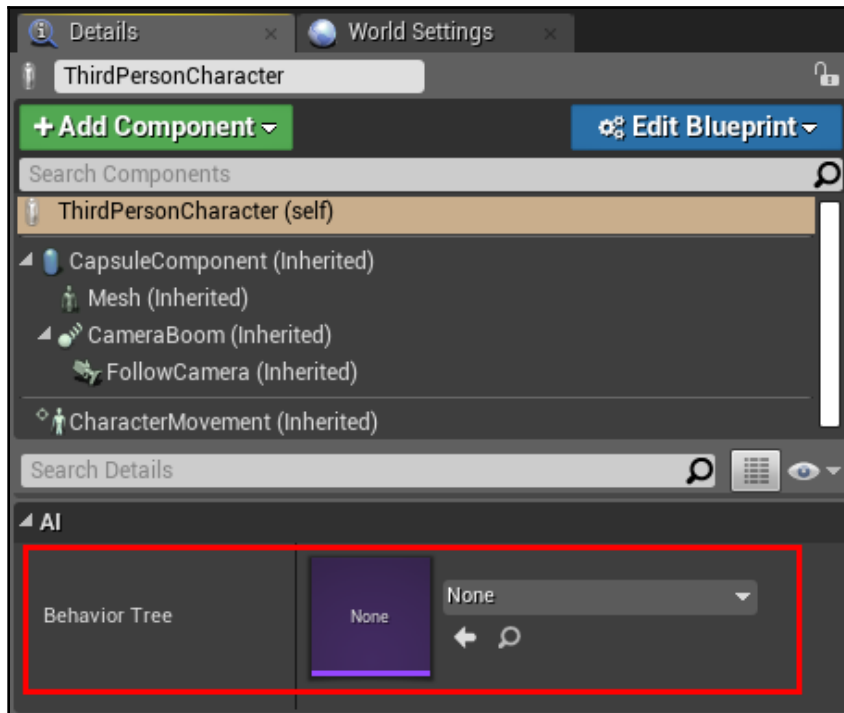


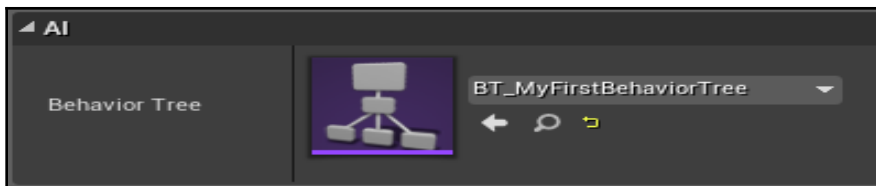


Compiling new C++ code. Please wait...

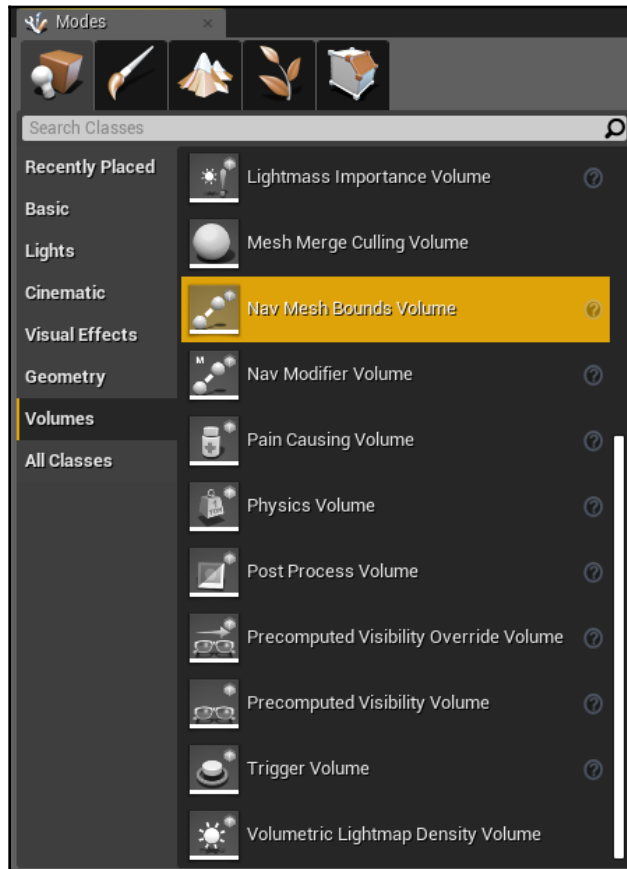
86%

UnrealAIBook: Compiling modules...

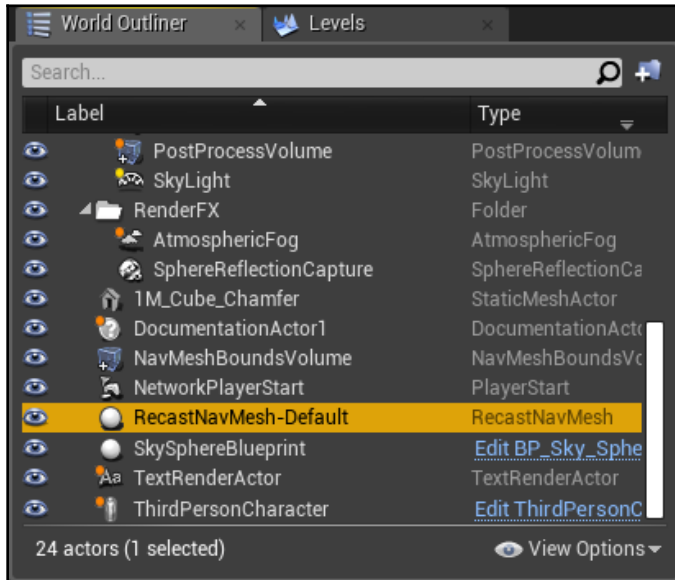
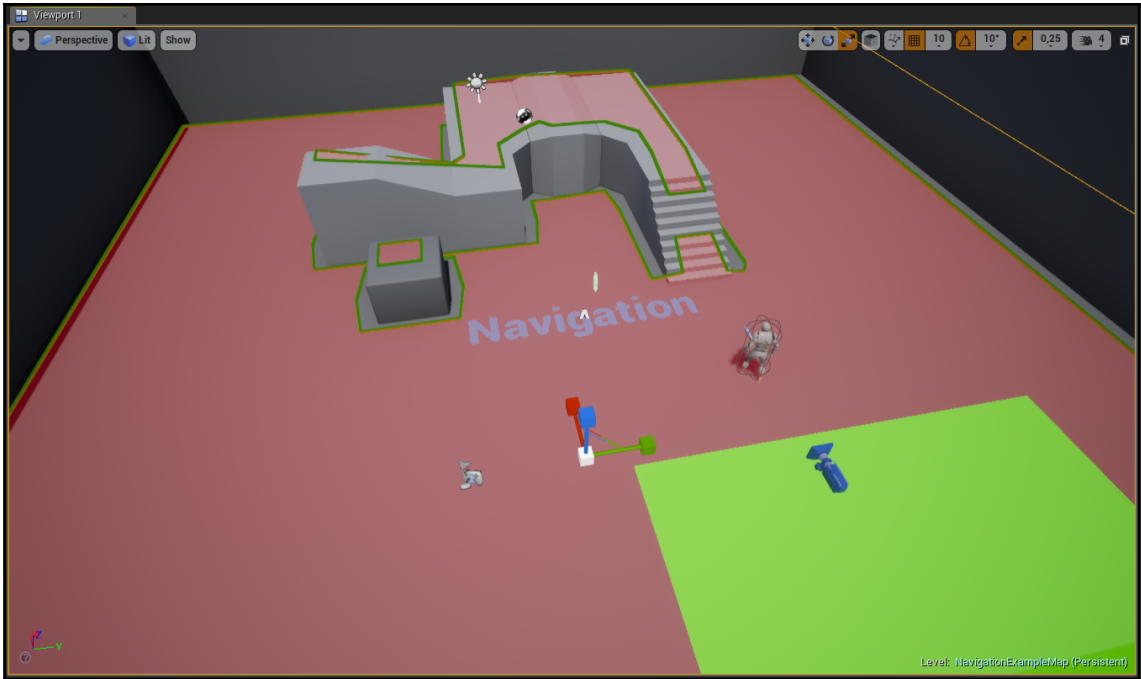





# Chapter 3: Navigation







Display

Draw Triangle Edges	<input type="checkbox"/>
Draw Poly Edges	<input type="checkbox"/>
Draw Filled Polys	<input checked="" type="checkbox"/>
Draw Nav Mesh Edges	<input checked="" type="checkbox"/>
Draw Tile Bounds	<input type="checkbox"/>
Draw Path Colliding Geometry	<input type="checkbox"/>
Draw Tile Labels	<input type="checkbox"/>
Draw Polygon Labels	<input type="checkbox"/>
Draw Default Polygon Cost	<input type="checkbox"/>
Draw Labels on Path Nodes	<input type="checkbox"/>
Draw Nav Links	<input checked="" type="checkbox"/>
Draw Failed Nav Links	<input type="checkbox"/>
Draw Clusters	<input type="checkbox"/>
Draw Octree	<input type="checkbox"/>
Draw Octree Details	<input checked="" type="checkbox"/>
Draw Nav Mesh	<input checked="" type="checkbox"/>
Draw Offset	10,0 <input type="text"/>
Enable Drawing	<input checked="" type="checkbox"/> 



Details x World Settings x

RecastNavMesh-Default

Search Details

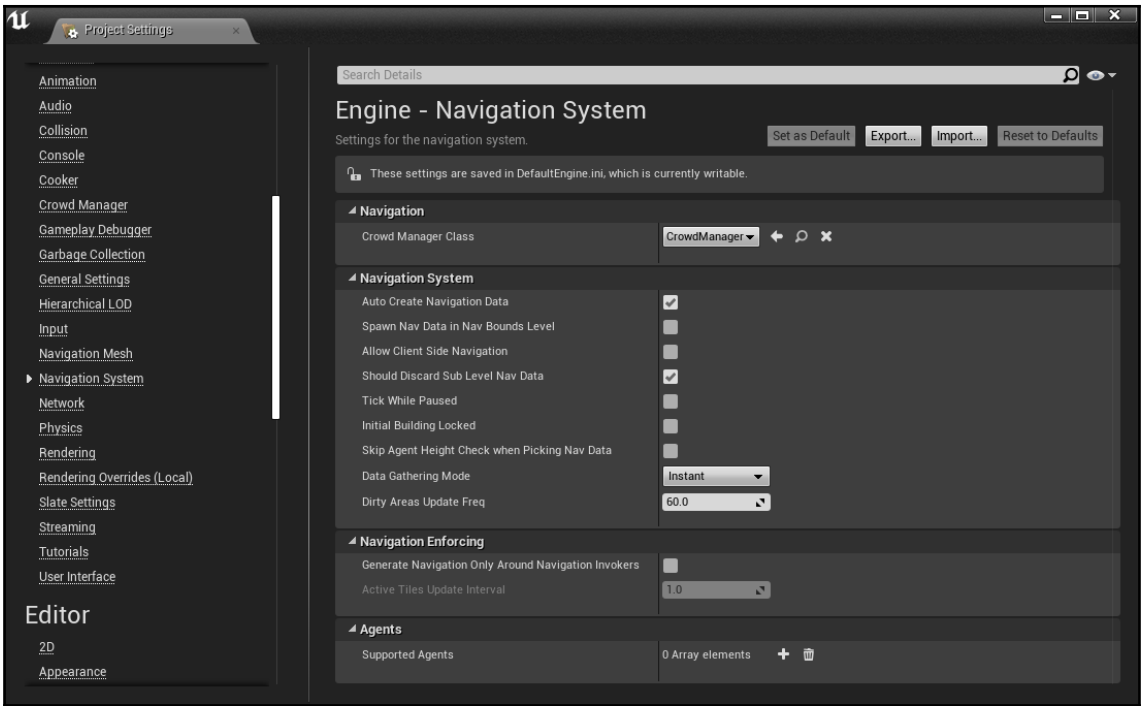
Display

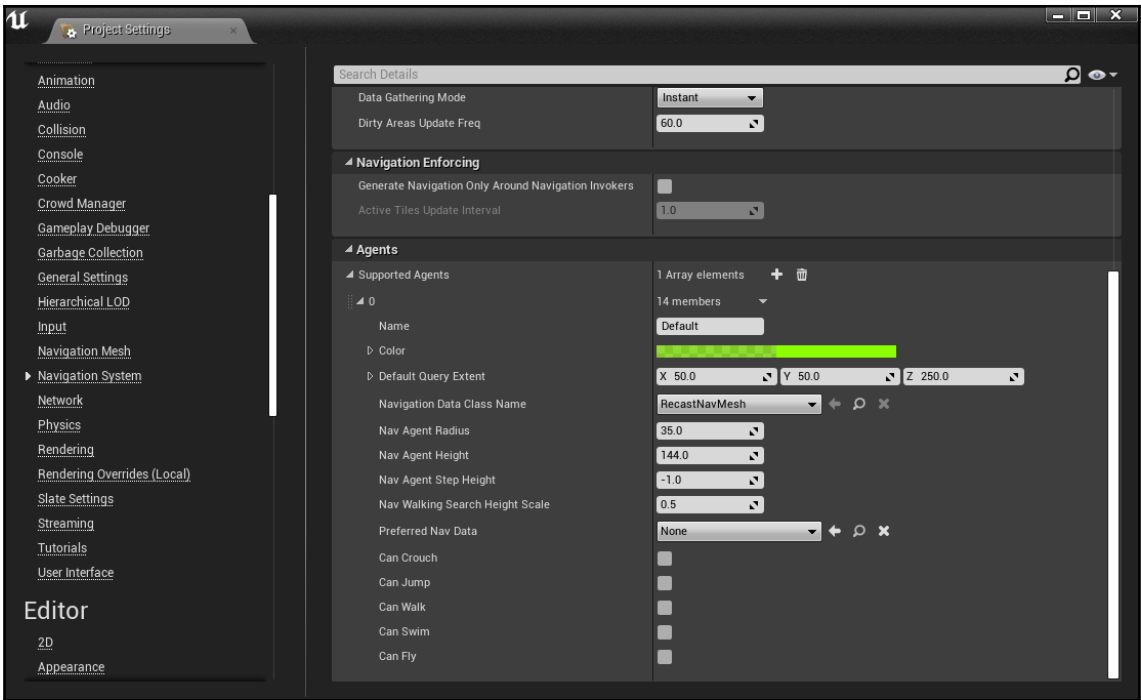
Generation

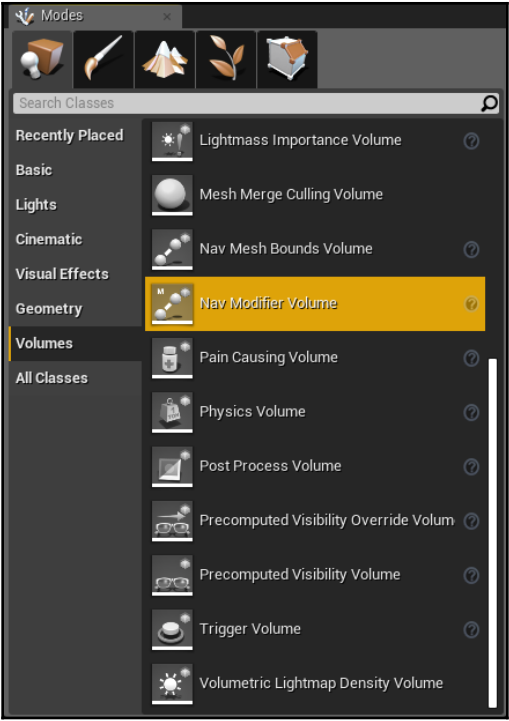
Fixed Tile Pool Size	<input type="checkbox"/>
Tile Pool Size	1024
Tile Size UU	1000.0
Cell Size	19.0
Cell Height	10.0
Agent Radius	35.0
Agent Height	144.0
Agent Max Height	144.0
Agent Max Slope	44.0
Agent Max Step Height	35.0
Min Region Area	0.0
Merge Region Size	400.0
Max Simplification Error	1.3
Sort Navigation Areas by Cost	<input type="checkbox"/>

Max Simultaneous Tile Generation Jobs Count	1024
Tile Number Hard Limit	1048576
Poly Ref Tile Bits	20
Poly Ref Nav Poly Bits	32
Poly Ref Salt Bits	12
Nav Mesh Origin Offset	X 0.0 Y 0.0 Z 0.0
Region Partitioning	Watershed
Layer Partitioning	Watershed
Region Chunk Splits	2
Layer Chunk Splits	2
Perform Voxel Filtering	<input checked="" type="checkbox"/>
Mark Low Height Areas	<input type="checkbox"/>
Filter Low Span Sequences	<input type="checkbox"/>
Filter Low Span from Tile Cache	<input type="checkbox"/>
Do Fully Async Nav Data Gathering	<input type="checkbox"/>









Default

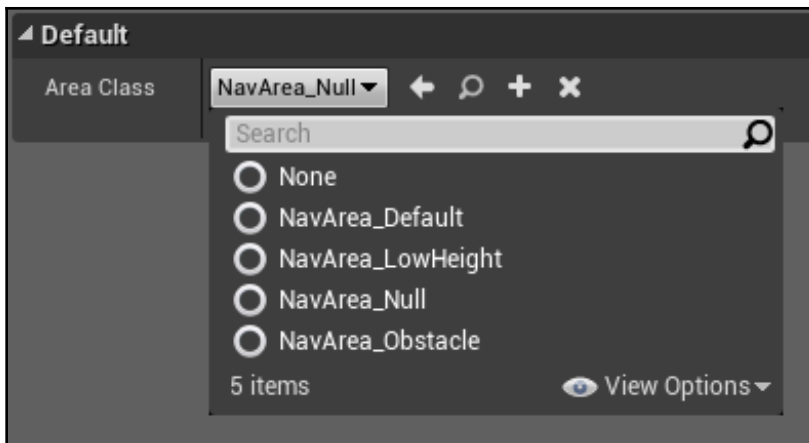
Area Class NavArea\_Null

← 🔍 + ✕

Default

Area Class NavArea\_Null

← 🔍 + ✕



**U** Pick Parent Class ✕

Common Classes

<input type="radio"/> Actor	An Actor is an object that can be placed or spawned in the world.	?
<input type="radio"/> Pawn	A Pawn is an actor that can be 'possessed' and receive input from a controller.	?
<input type="radio"/> Character	A character is a type of Pawn that includes the ability to walk around.	?
<input type="radio"/> Player Controller	A Player Controller is an actor responsible for controlling a Pawn used by the player.	?
<input type="radio"/> Game Mode Base	Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type.	?
<input type="radio"/> Actor Component	An ActorComponent is a reusable component that can be added to any actor.	?
<input type="radio"/> Scene Component	A Scene Component is a component that has a scene transform and can be attached to other scene components.	?

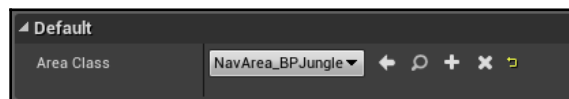
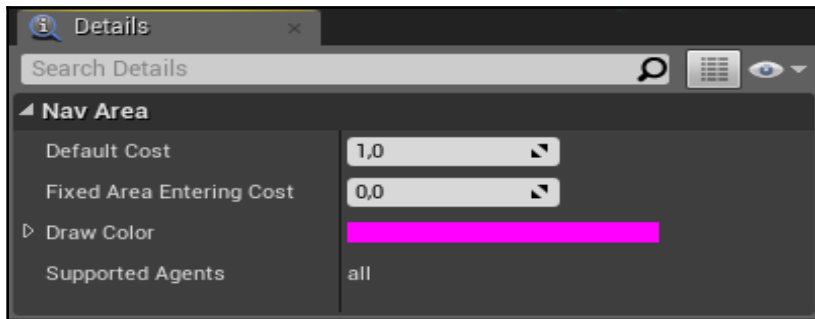
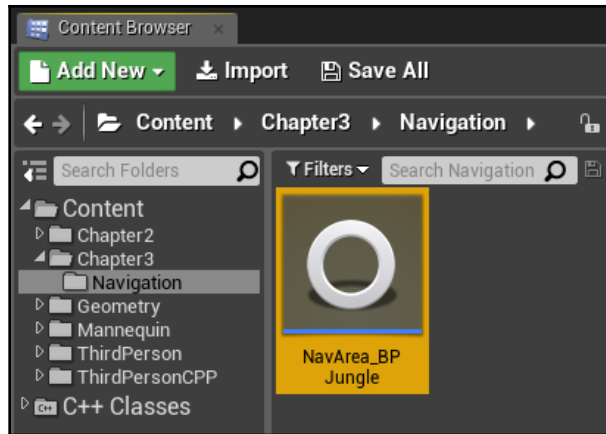
All Classes

NavArea ✕

- Object
  - NavAreaBase
    - NavArea
    - NavArea\_Default
    - NavArea\_LowHeight
    - NavArea\_Null
    - NavArea\_Obstacle
    - NavAreaMeta
      - NavAreaMeta\_SwitchByAgent

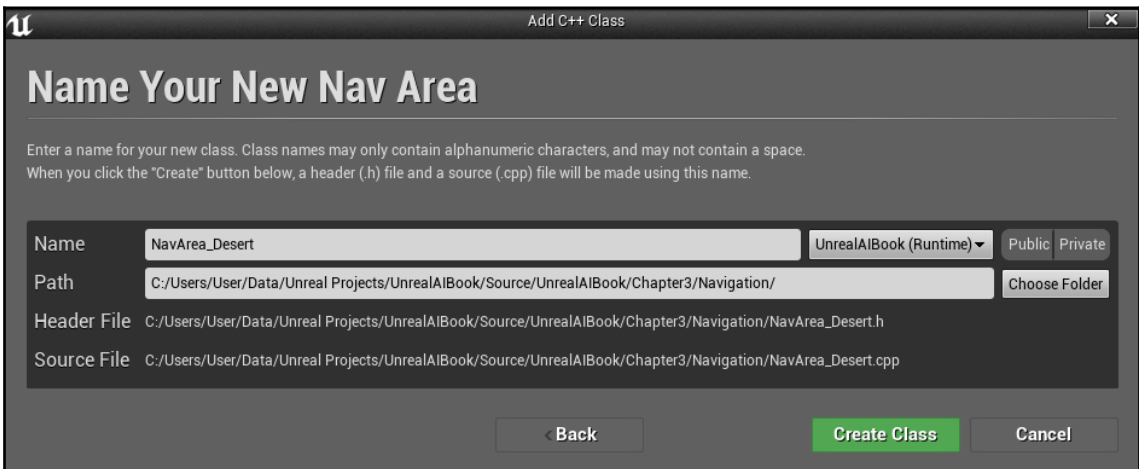
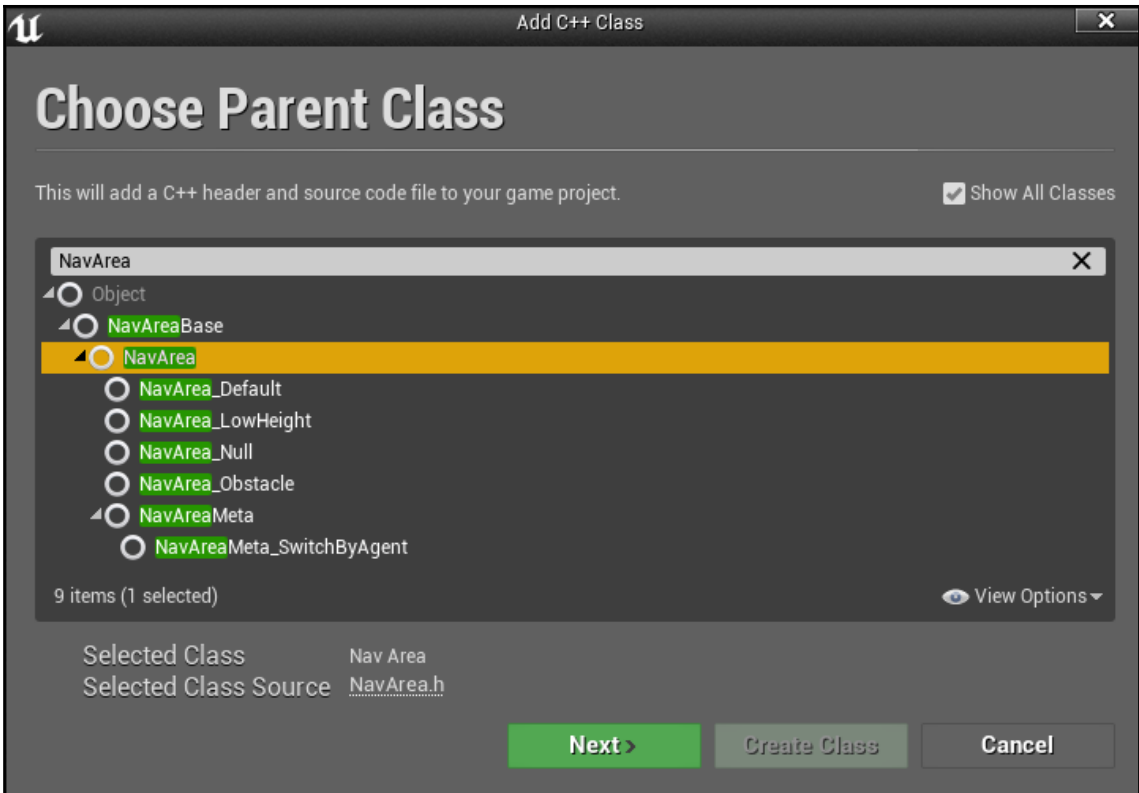
9 items (1 selected) View Options ▾

Select Cancel





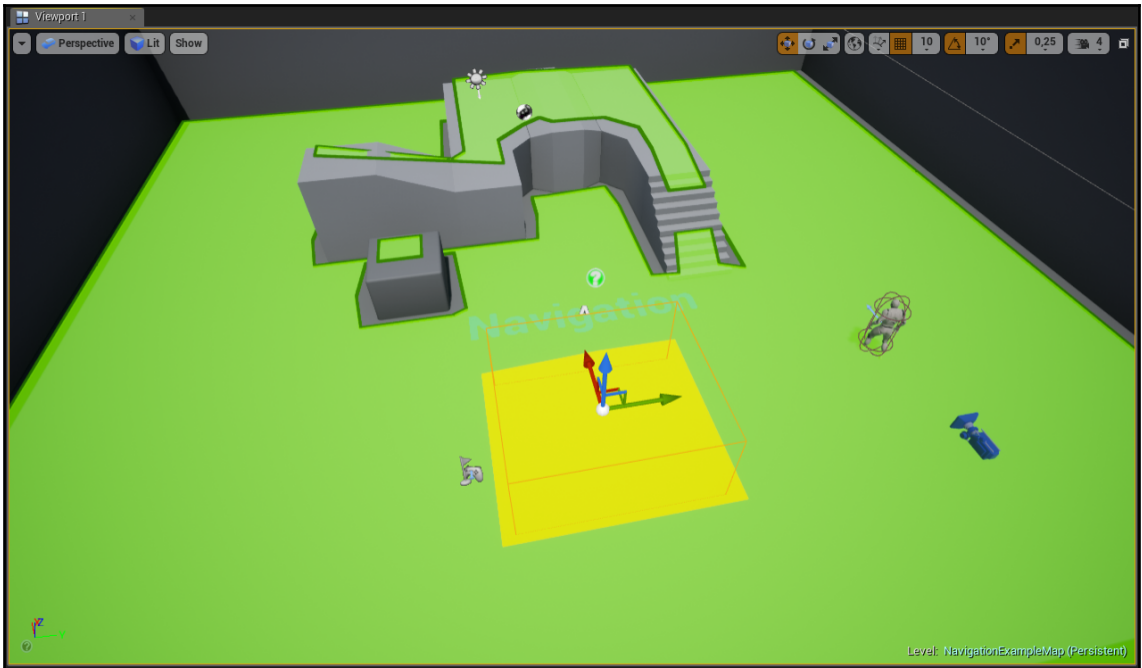


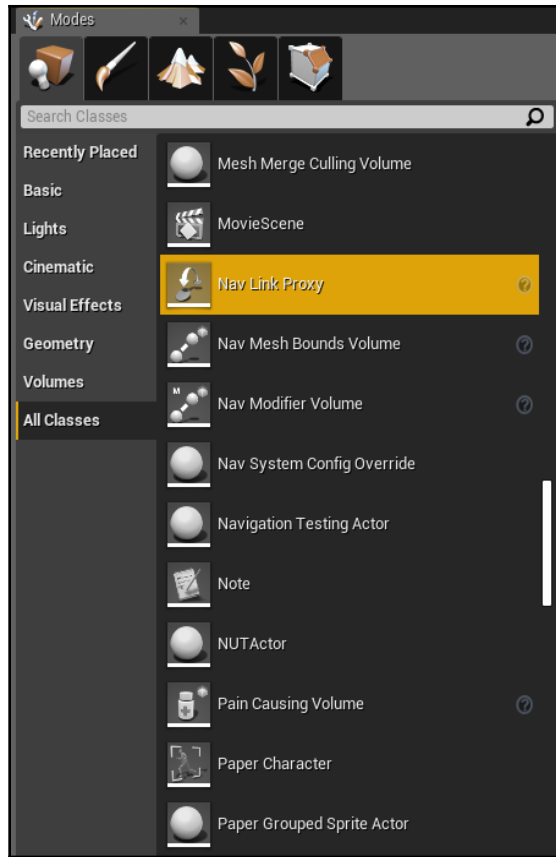


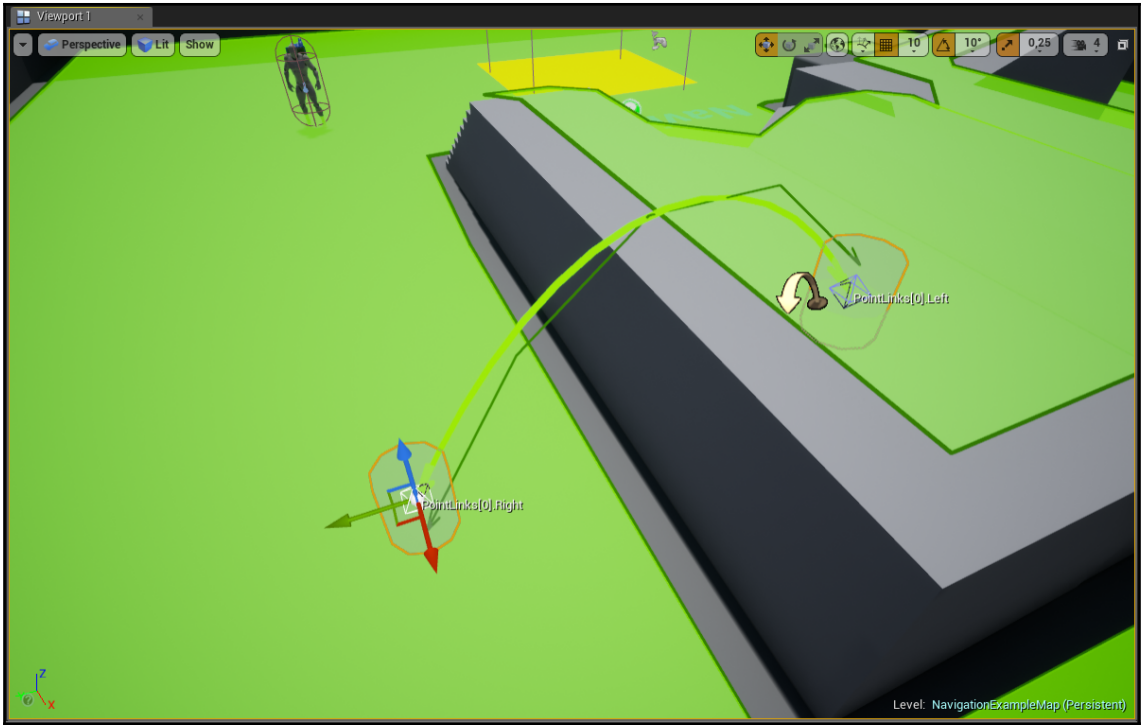
Default

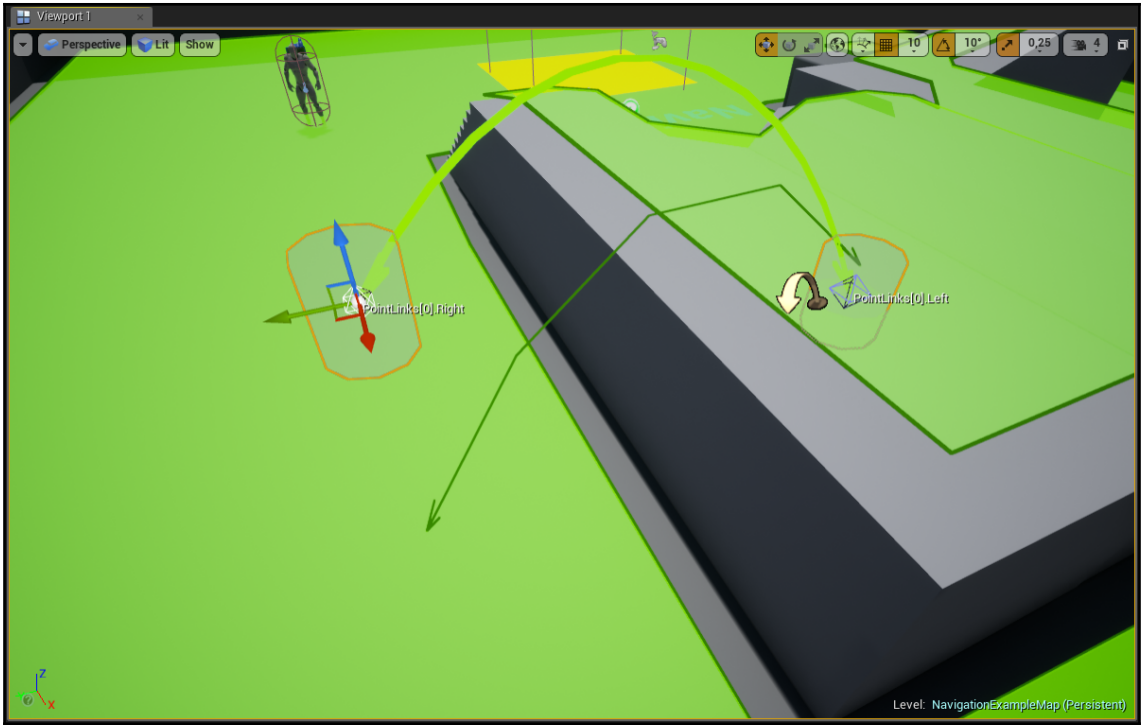
Area Class NavArea\_Desert

← 🔍 + × ↻



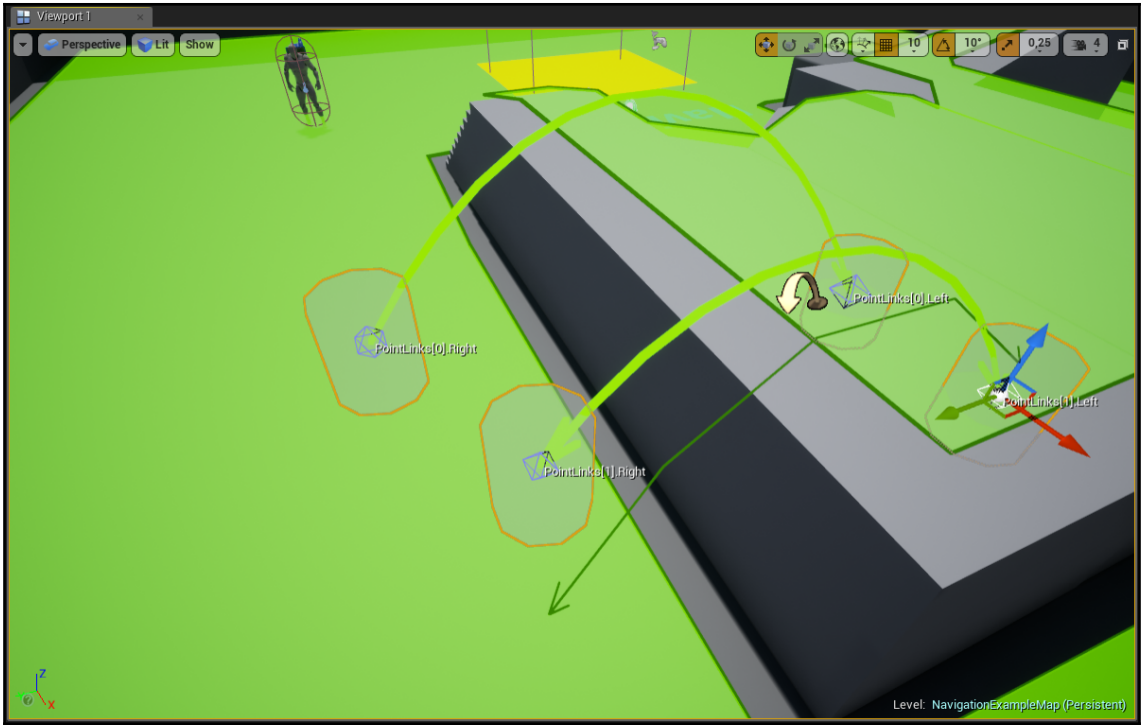






Simple Link

Point Links	2 Array elements	+	🗑️	↶
⋮ ▷ 0		▼	↶	
⋮ ▷ 1		▼	↶	



### Simple Link

Point Links

2 Array elements +

0

Left X 0,0 Y -50,0 Z 0,0

Right X -60,0 Y 310,0 Z -30,0

Left Project Height 0,0

Right Project Height 1000,0

Direction Right to Left

Snap Radius 30,0

Snap Height 50,0

Supported Agents all

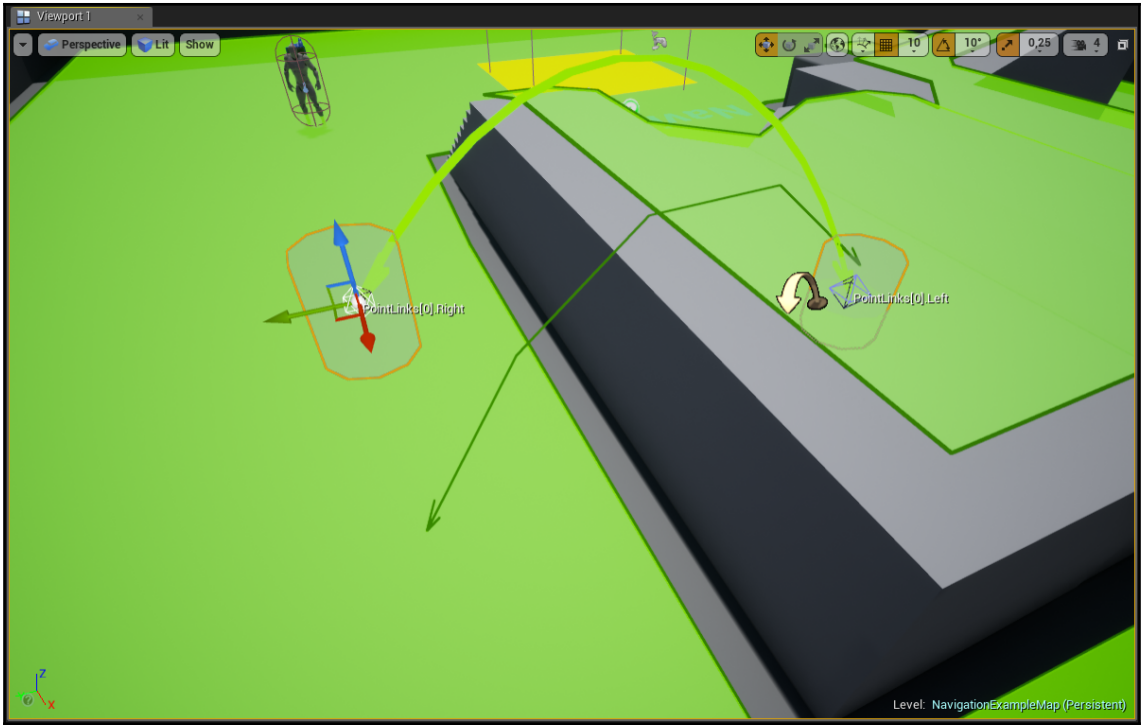
Description

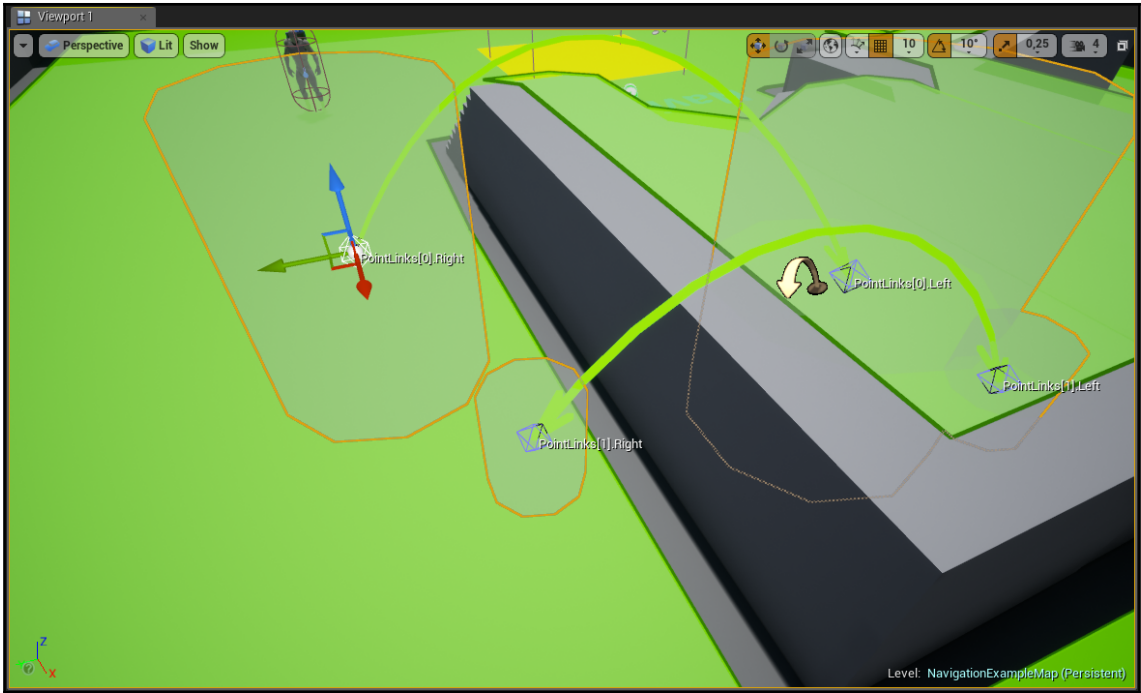
Snap to Cheapest Area

Area Class NavArea\_Default

1







**Smart Link**

Enabled Area Class	NavArea_Default	←	⊙	+	×
Disabled Area Class	NavArea_Null	←	⊙	+	×
Link Relative Start	X 70,0	Y 0,0	Z 0,0		
Link Relative End	X -70,0	Y 0,0	Z 0,0		
Link Direction	Both Ways				
Link Enabled	<input checked="" type="checkbox"/>				
Smart Link Is Relevant	<input type="checkbox"/>				

### Broadcast

Notify when Enabled

Notify when Disabled

Broadcast Radius

Broadcast Interval

Broadcast Channel

### Obstacle

Create Box Obstacle

Obstacle Offset X  Y  Z

Obstacle Extent X  Y  Z

Obstacle Area Class

#### Get Path Length

Path Start  Path Length

Path End  Return Value

Nav Data

Filter Class

#### GetRandomReachablePointInRadius

Origin  Random Location

Radius  Return Value

Nav Data

Filter Class

#### Move to Location

*Target is AIController*

Target  Return Value

Dest

Acceptance Radius

Use Pathfinding

Project Destination to Navigation

Filter Class

#### Move to Actor

*Target is AIController*

Target  Return Value

Goal

Acceptance Radius

Use Pathfinding

Filter Class

Details

Search Details

**Node**

Acceptable Radius	5,0
Filter Class	None
Allow Strafe	<input type="checkbox"/>
Reach Test Includes Agent Radius	<input checked="" type="checkbox"/>
Reach Test Includes Goal Radius	<input checked="" type="checkbox"/>
Stop on Overlap	<input checked="" type="checkbox"/>

**Blackboard**

Blackboard Key	None
----------------	------

**Task**

Ignore Restart Self	<input type="checkbox"/>
---------------------	--------------------------

**Description**

Node Name	Move To
-----------	---------

**U** Pick Parent Class ✕

Common Classes

- Actor An Actor is an object that can be placed or spawned in the world. ?
- Pawn A Pawn is an actor that can be 'possessed' and receive input from a controller. ?
- Character A character is a type of Pawn that includes the ability to walk around. ?
- Player Controller A Player Controller is an actor responsible for controlling a Pawn used by the player. ?
- Game Mode Base Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type.
- Actor Component An ActorComponent is a reusable component that can be added to any actor. ?
- Scene Component A Scene Component is a component that has a scene transform and can be attached to other scene components. ?

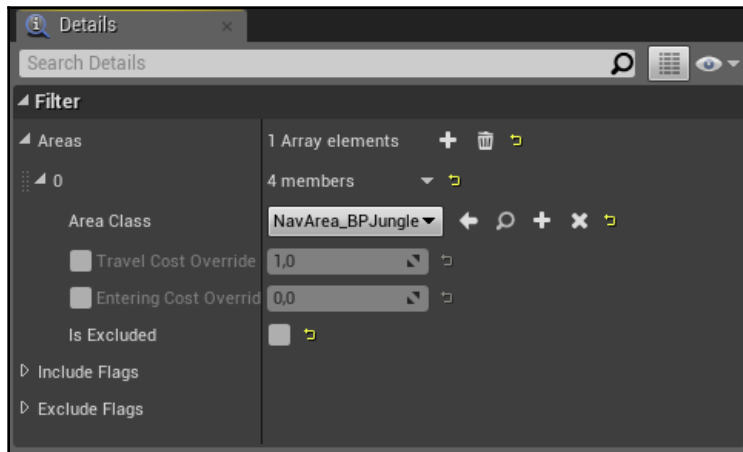
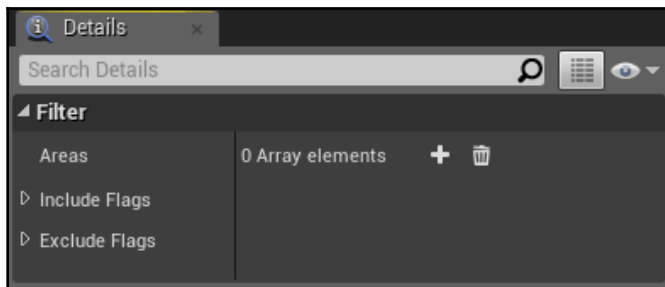
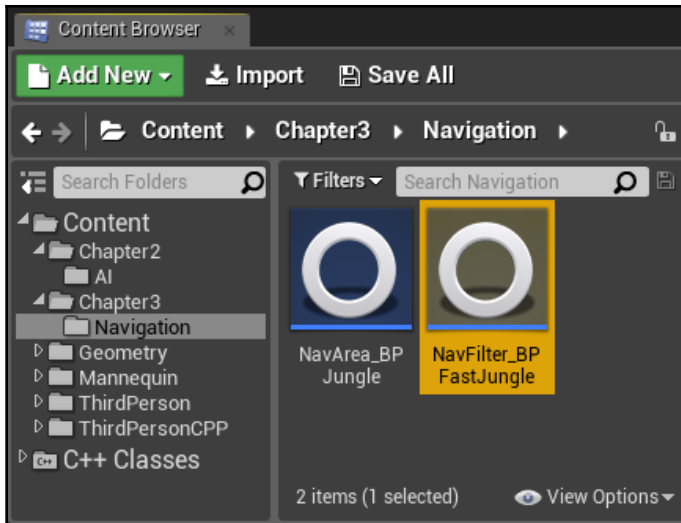
All Classes

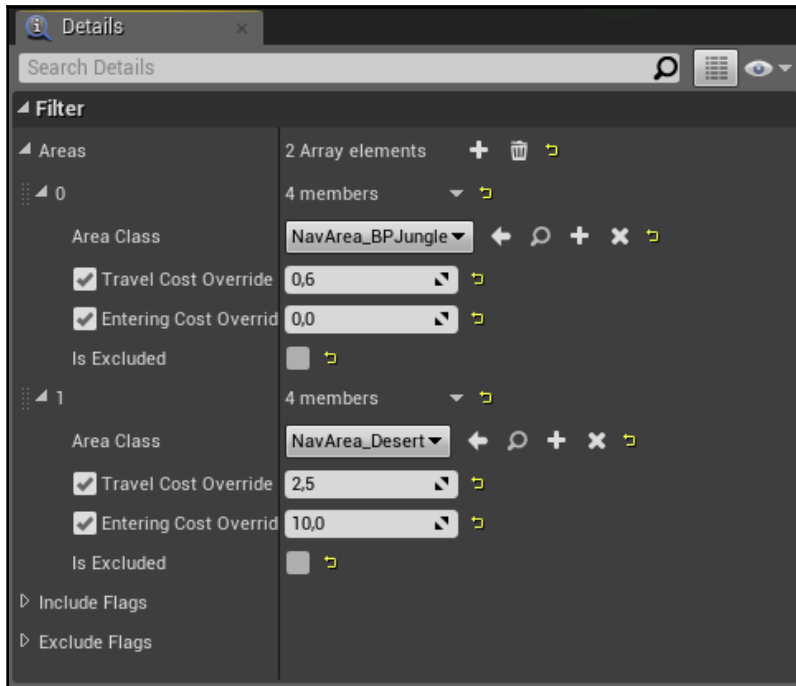
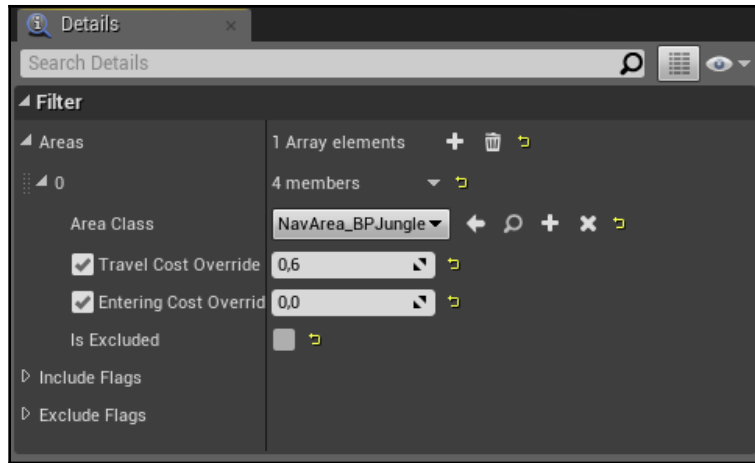
Nav ✕

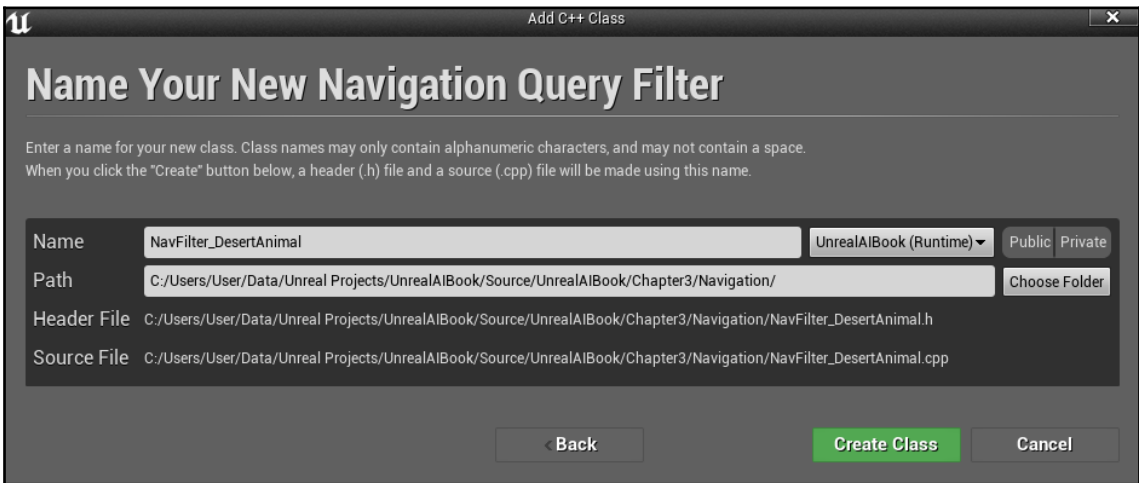
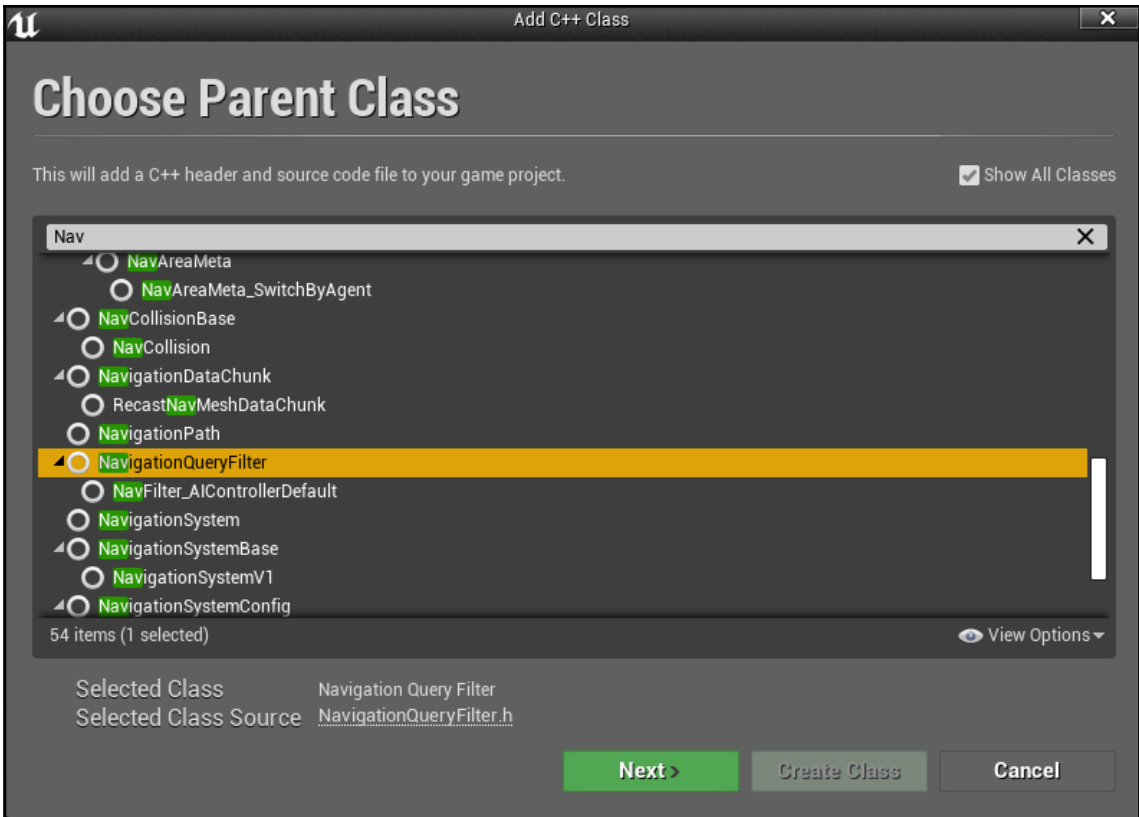
- NavArea
  - NavArea\_BPJungle
  - NavArea\_Default
  - NavArea\_Desert
  - NavArea\_LowHeight
  - NavArea\_Null
  - NavArea\_Obstacle
  - NavAreaMeta
    - NavAreaMeta\_SwitchByAgent
- NavigationQueryFilter
- NavFilter\_AIControllerDefault
- NavLinkDefinition
  - NavLinkTrivial

19 items (1 selected) View Options

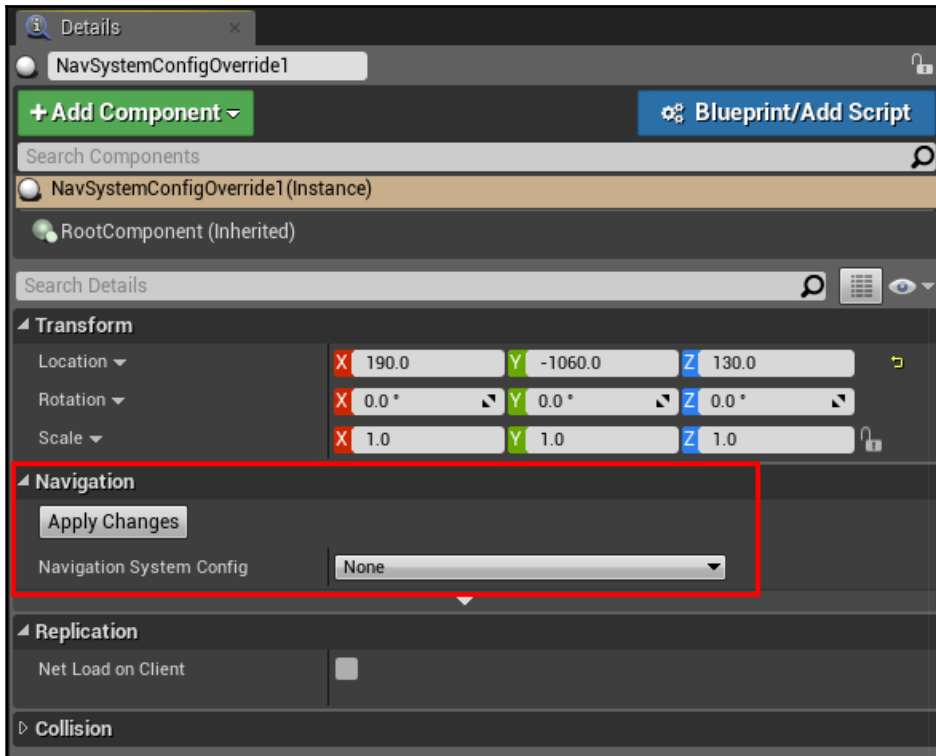
**Select** **Cancel**



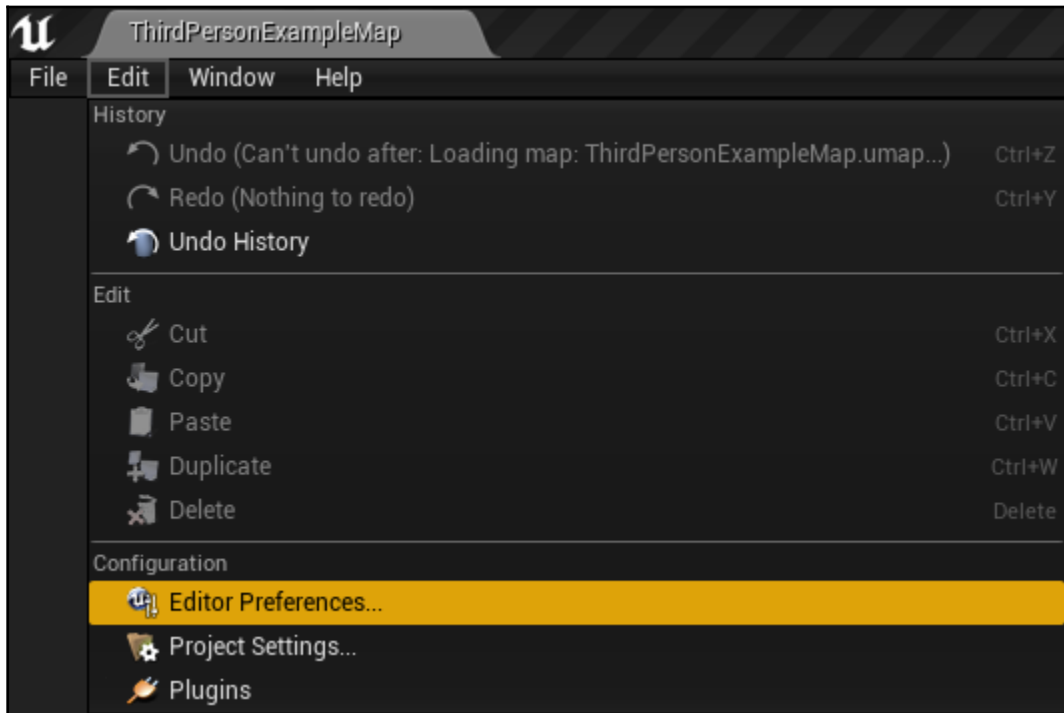


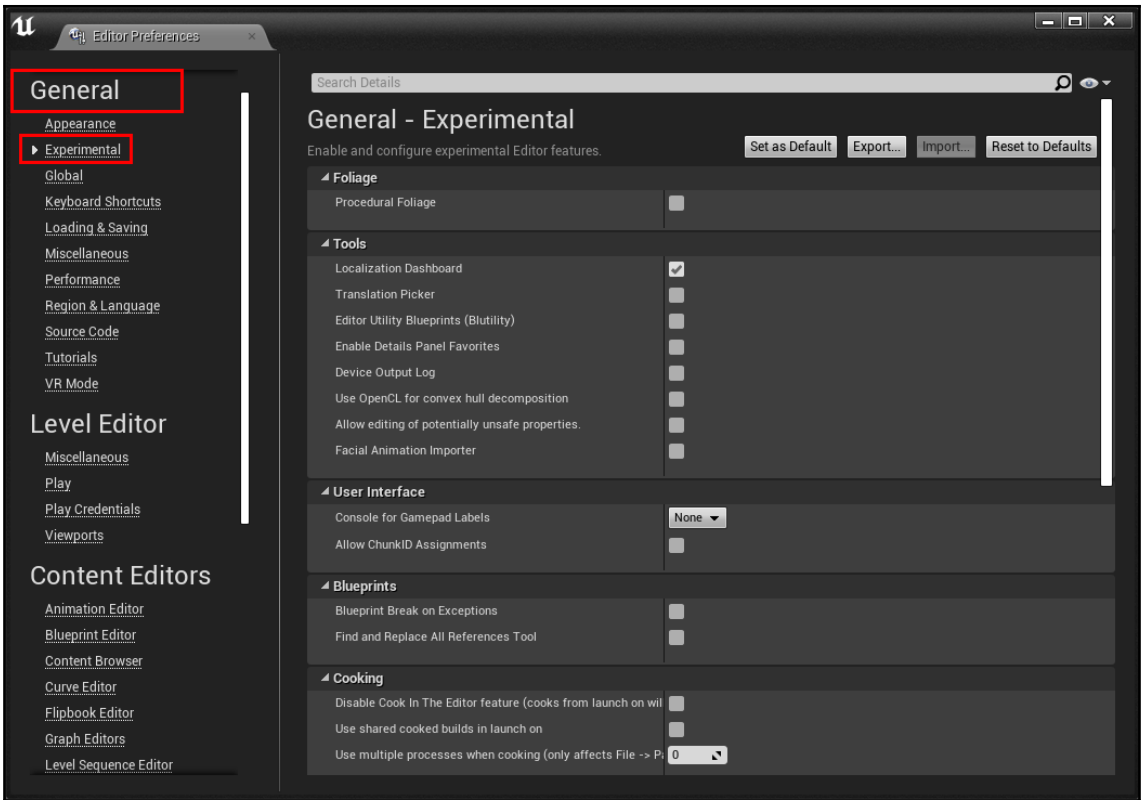


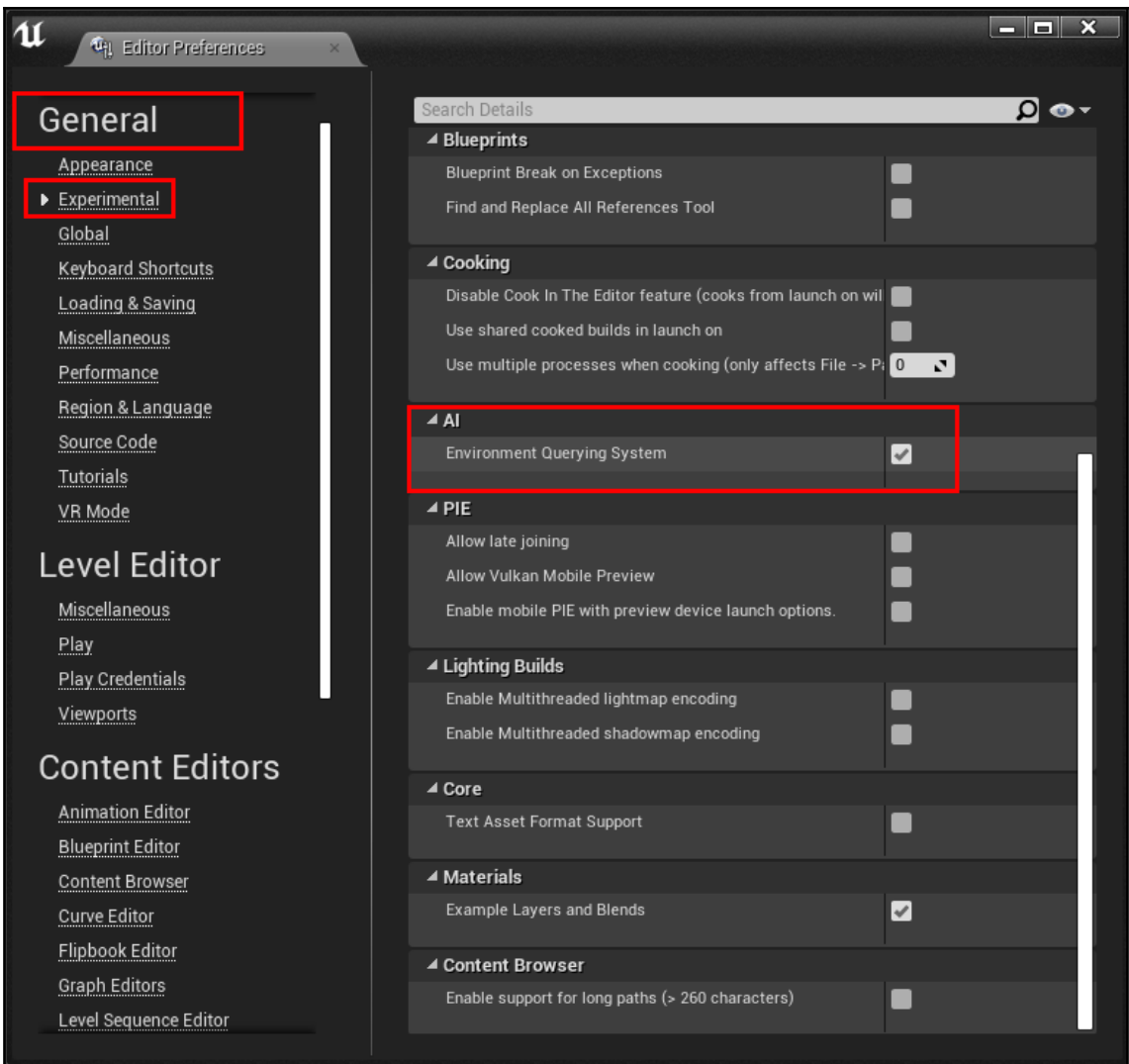


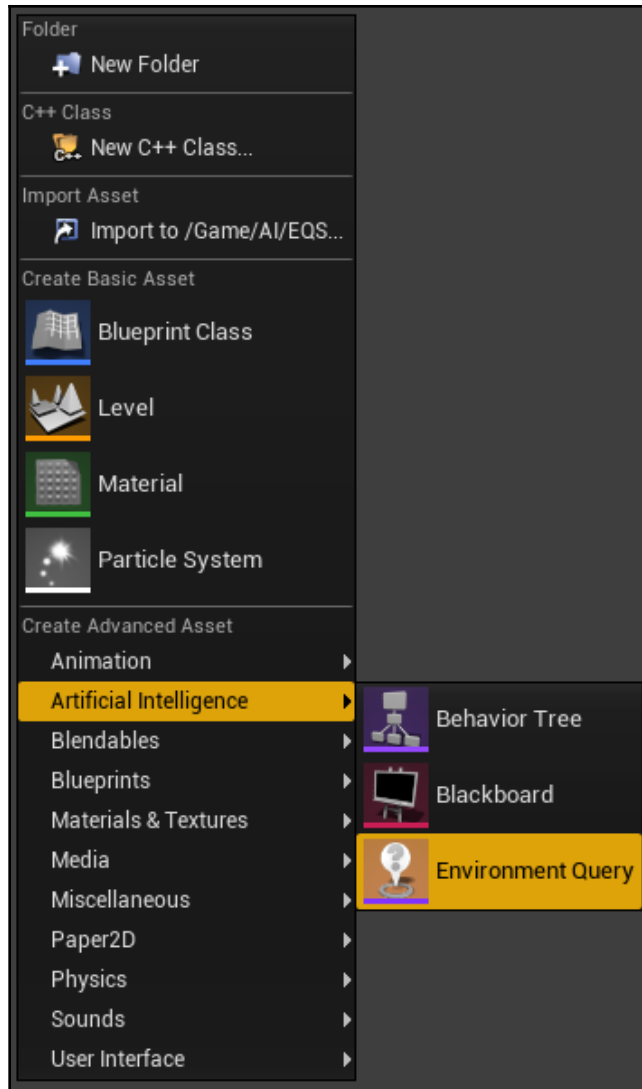


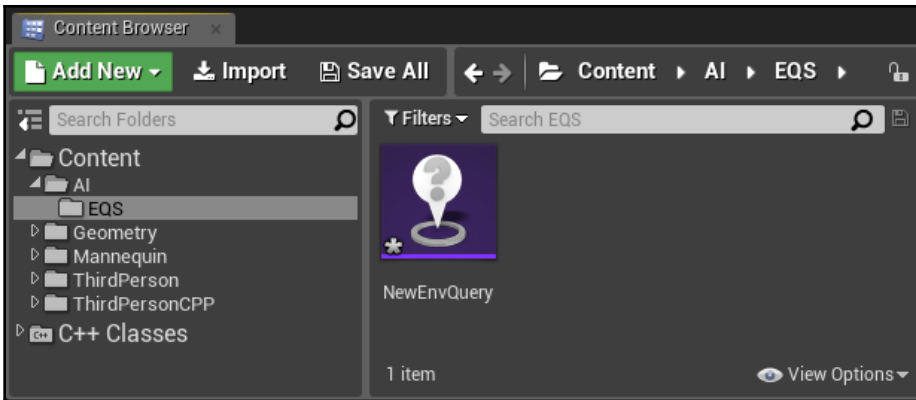
# Chapter 4: Environment Querying System

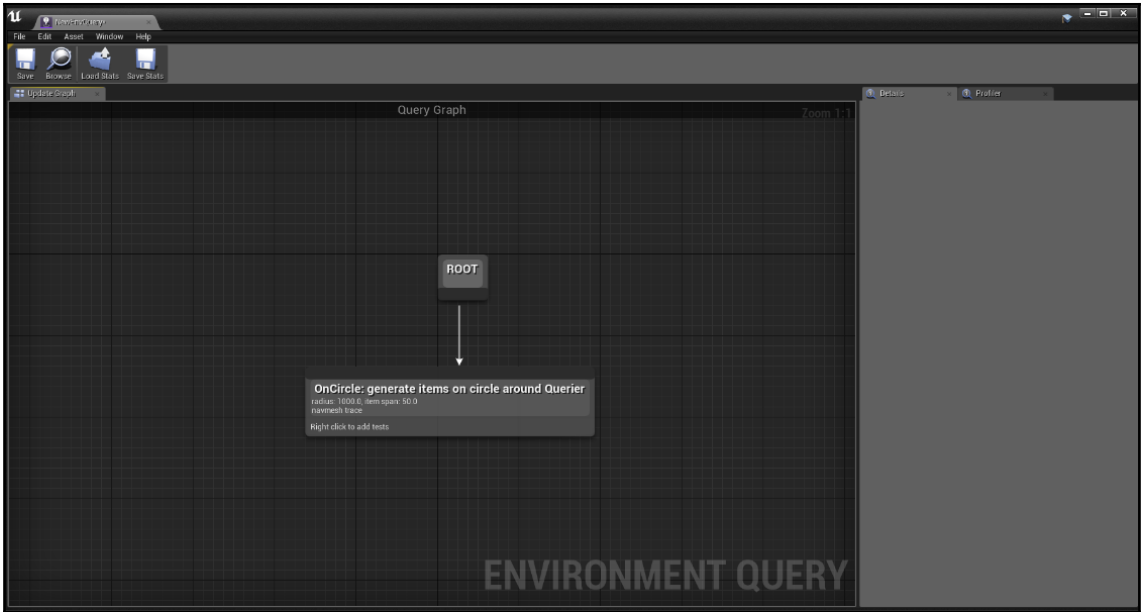












Details Profiler

Search Details

#### Test

Test Purpose: Filter and Score

Test Comment:

#### Distance

Test Mode: Distance 3D

Distance To: EnvQueryContext\_Querier

#### Filter

Filter Type: Range

Float Value Min: 200.0

Float Value Max: 1000.0

#### Score

Clamping:

Scoring Equation: Linear  
Final score = ScoringFactor \* NormalizedItemValue

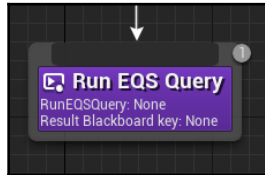
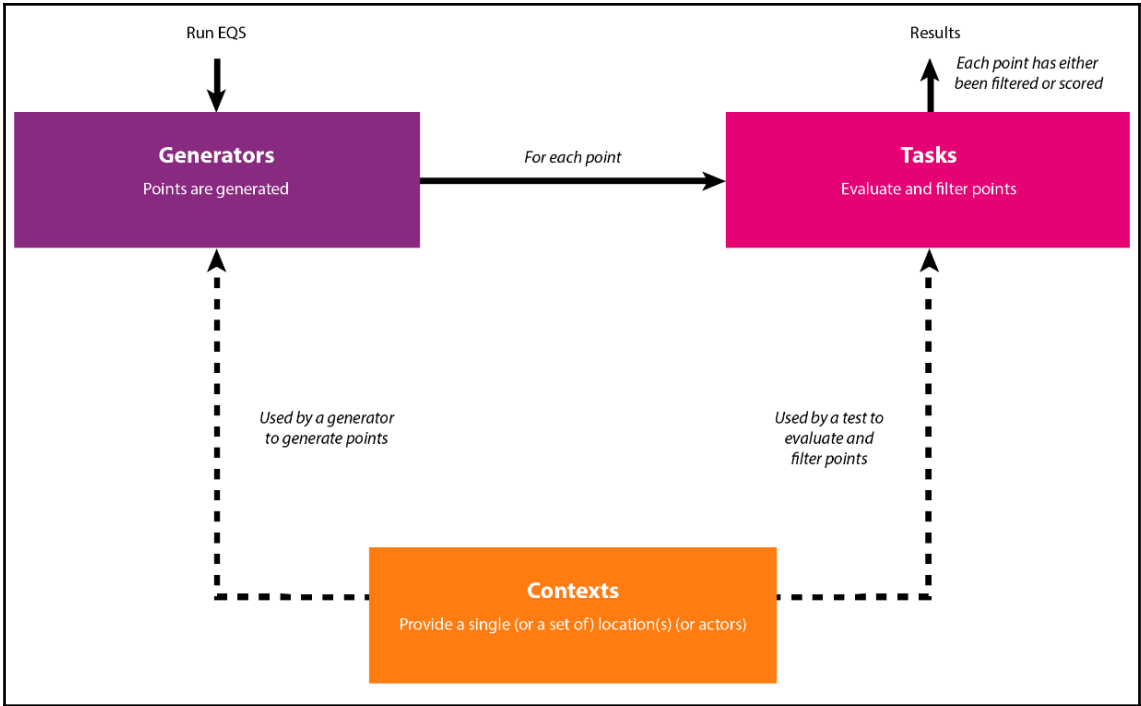
Scoring Factor: 1.0

Normalization Type: Absolute

Reference Value: 0.0

#### Preview





Details

Search Details

### Node

<input checked="" type="checkbox"/> QueryTemplate_DEPRECATED	None
QueryParams_DEPRECATED	0 Array elements
QueryConfig_DEPRECATED	0 Array elements
RunMode_DEPRECATED	Single Best Item

### Blackboard

<input type="checkbox"/> EQSQueryBlackboardKey_DEPRECATED	None
Blackboard Key	None

### EQS

#### EQSRequest

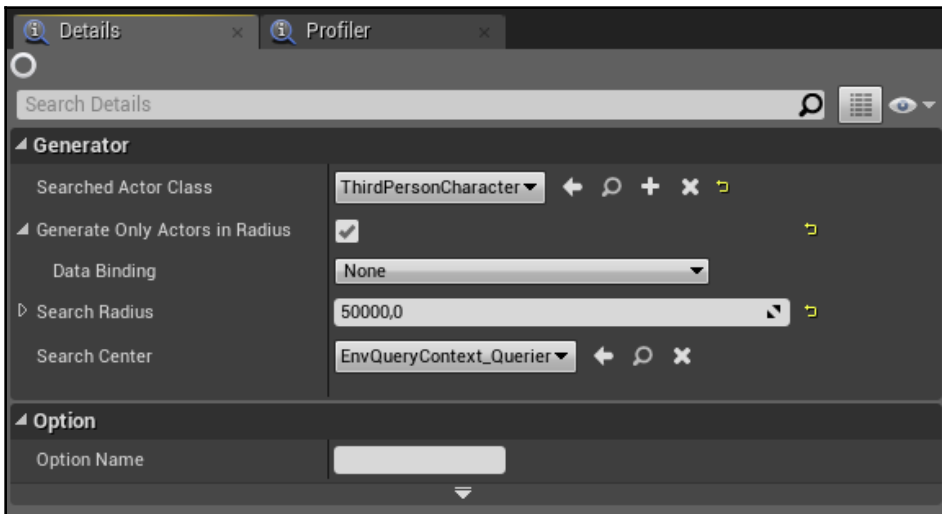
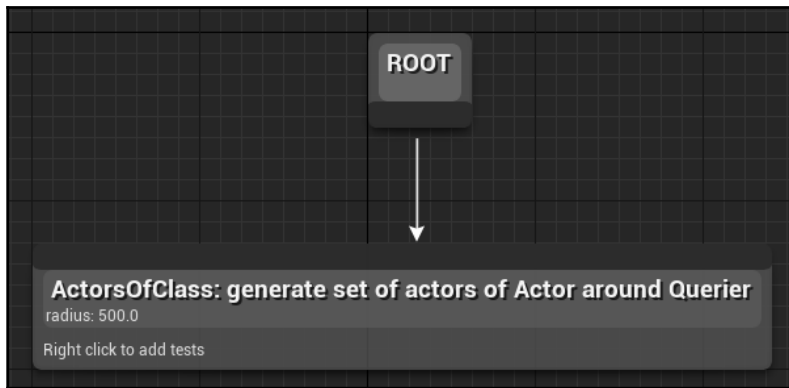
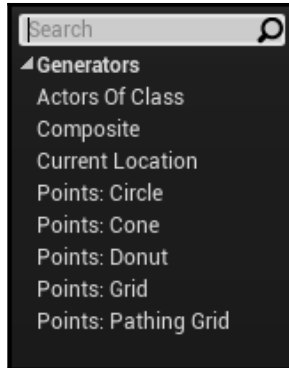
<input checked="" type="checkbox"/> Query Template	None
Query Config	0 Array elements
<input type="checkbox"/> EQSQuery Blackboard Key	None
Run Mode	Single Best Item

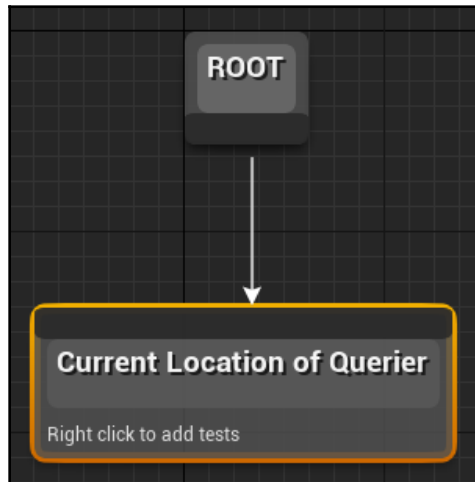
### Task

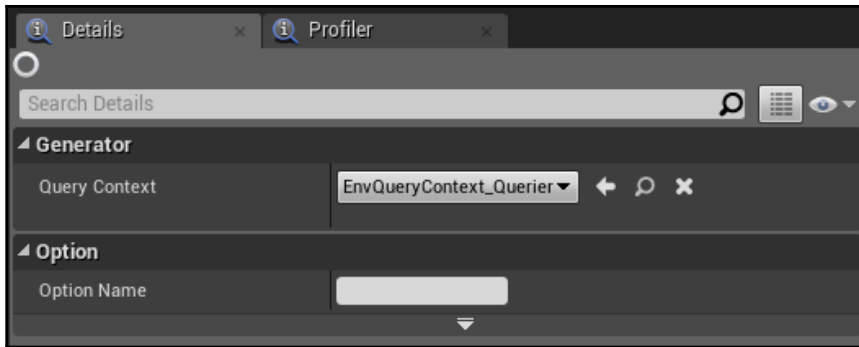
Ignore Restart Self	<input type="checkbox"/>
---------------------	--------------------------

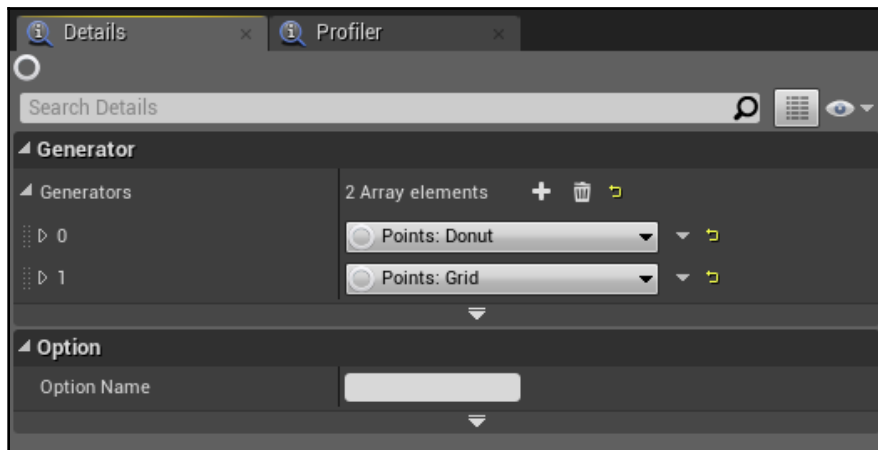
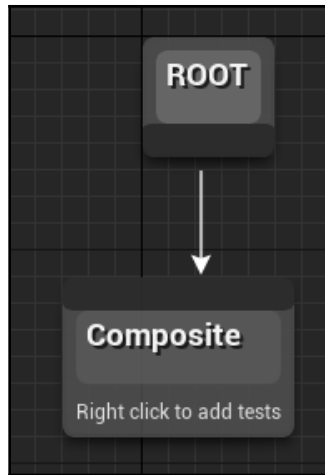
### Description

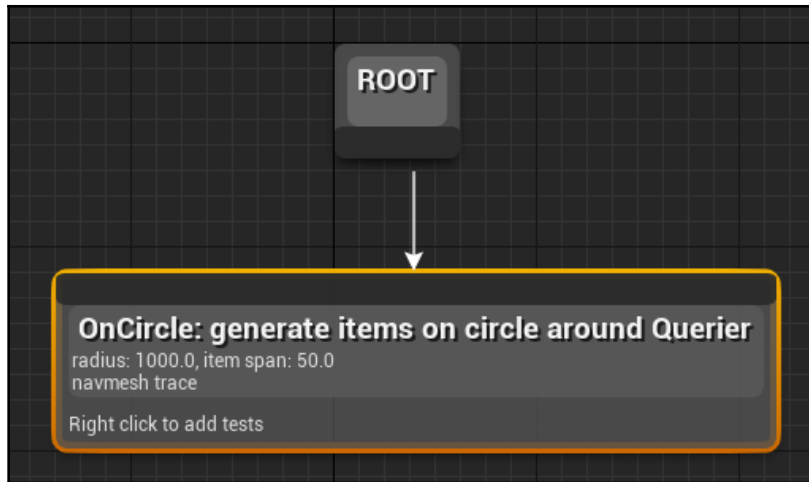
Node Name	Run EQS Query
-----------	---------------











Details Profiler

Search Details

**Generator**

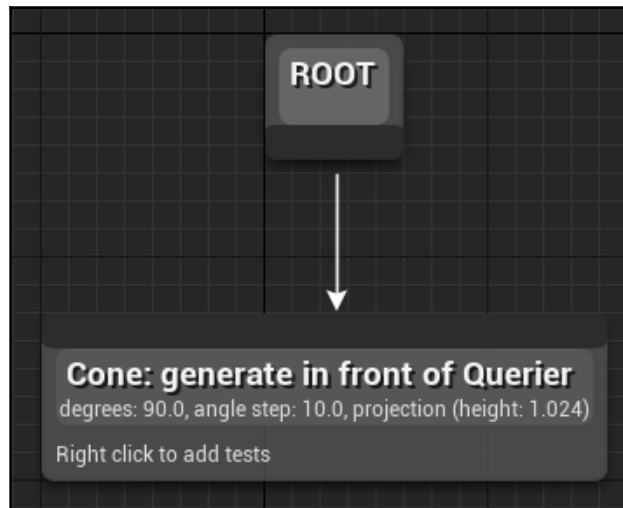
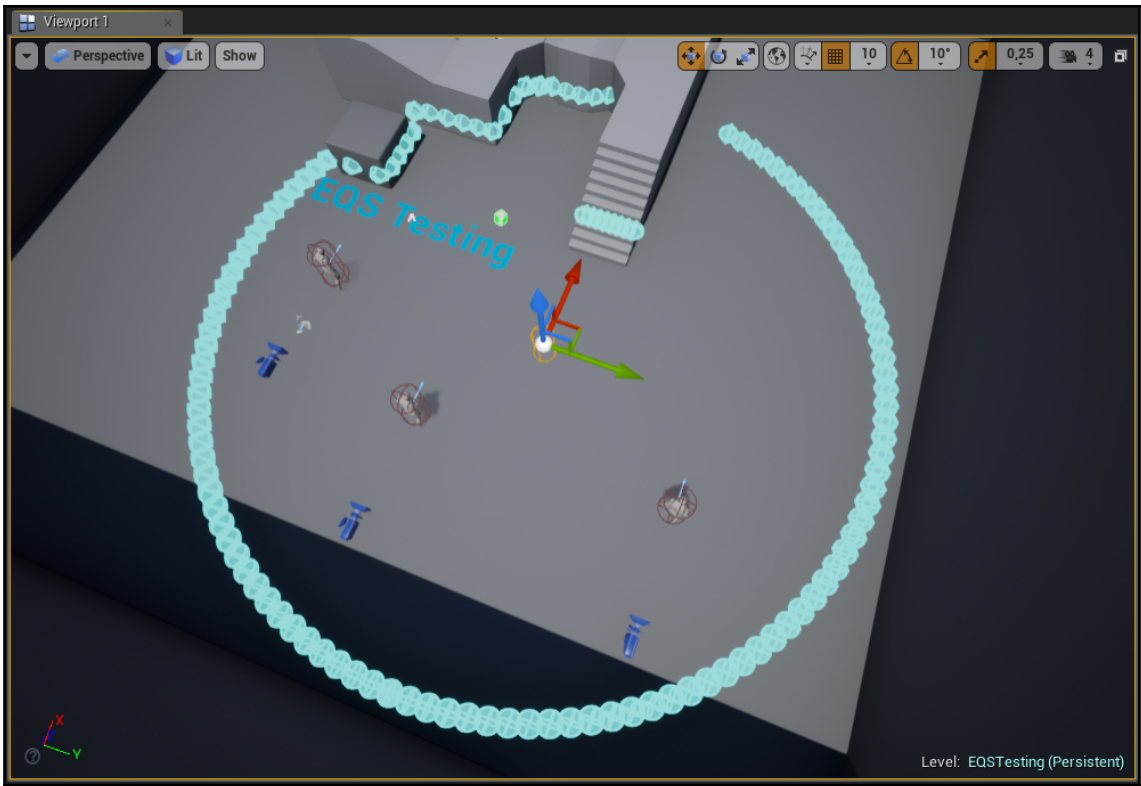
- Circle Radius: 1000,0
- Space Between: 50,0
- Number Of Points: 8
- Point on Circle Spacing Method: By Space Between
- Arc Direction: between two contexts
- Arc Angle: 360,0
- Circle Center: EnvQueryContext\_Querier
- Ignore Any Context Actors when Generating Circle:
- Circle Center ZOffset: 0,0
- Trace Data: navmesh trace
- Projection Data: trace disabled
- Trace Mode: None

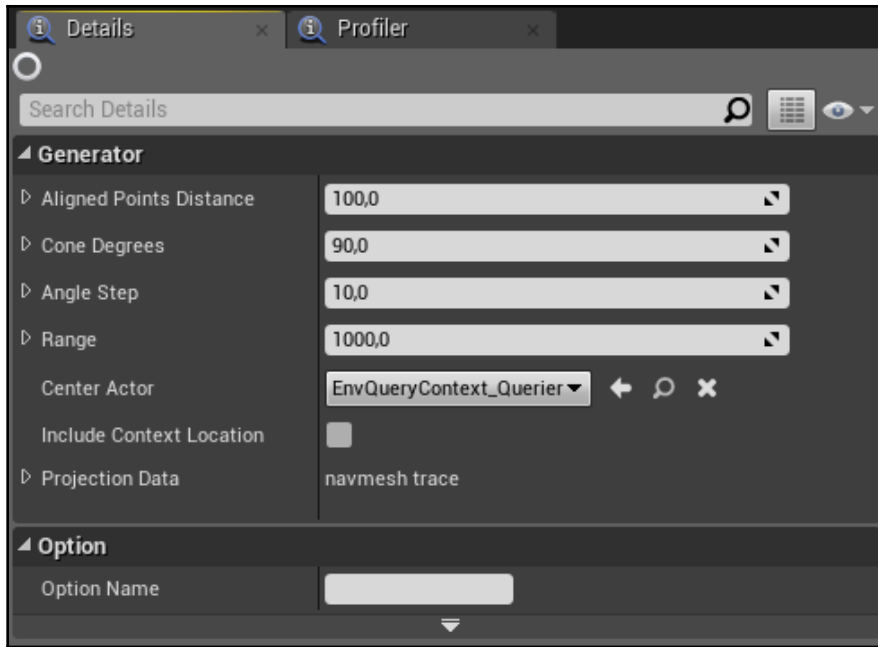
**Option**

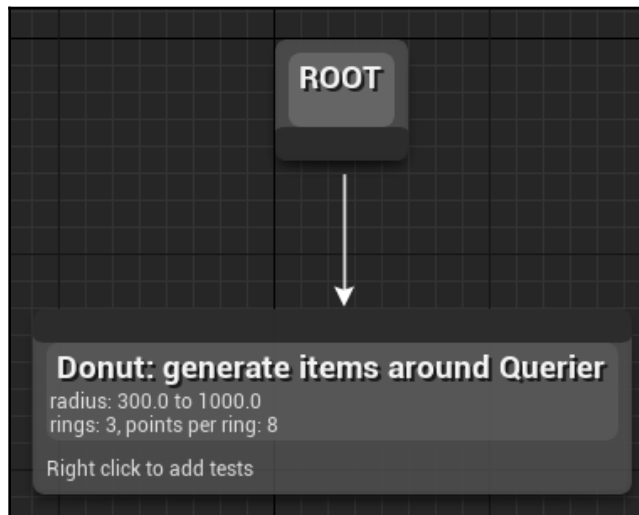
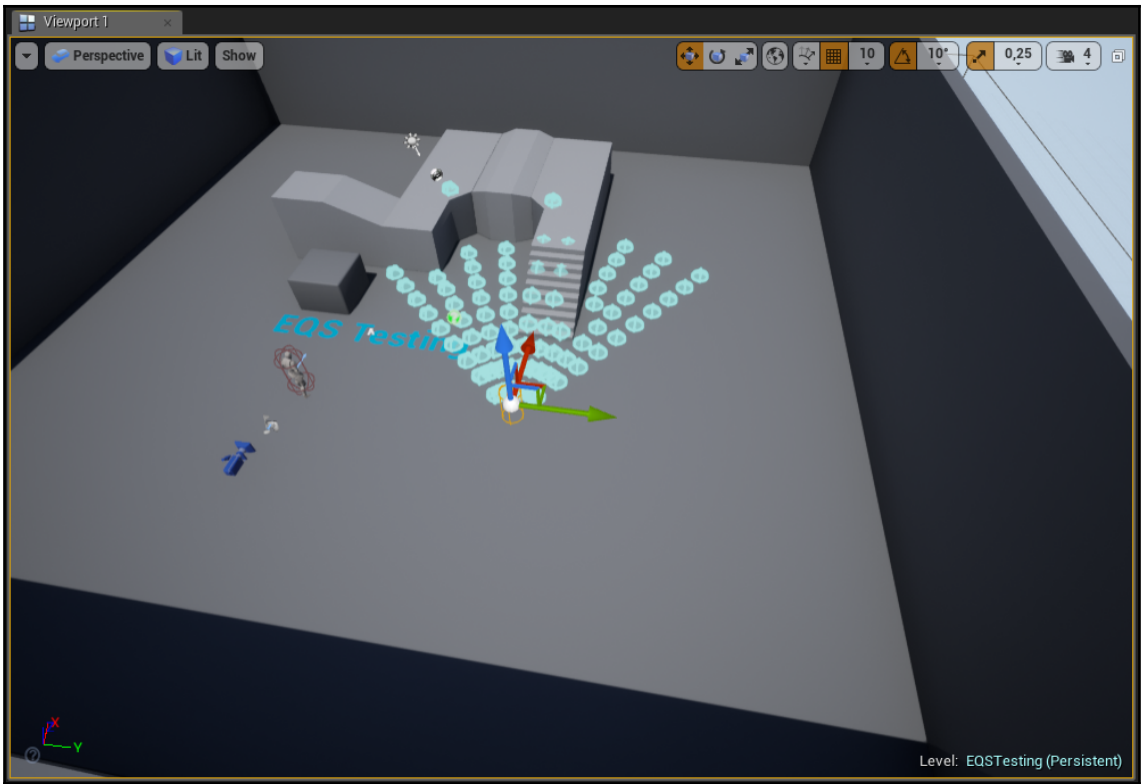
Option Name:

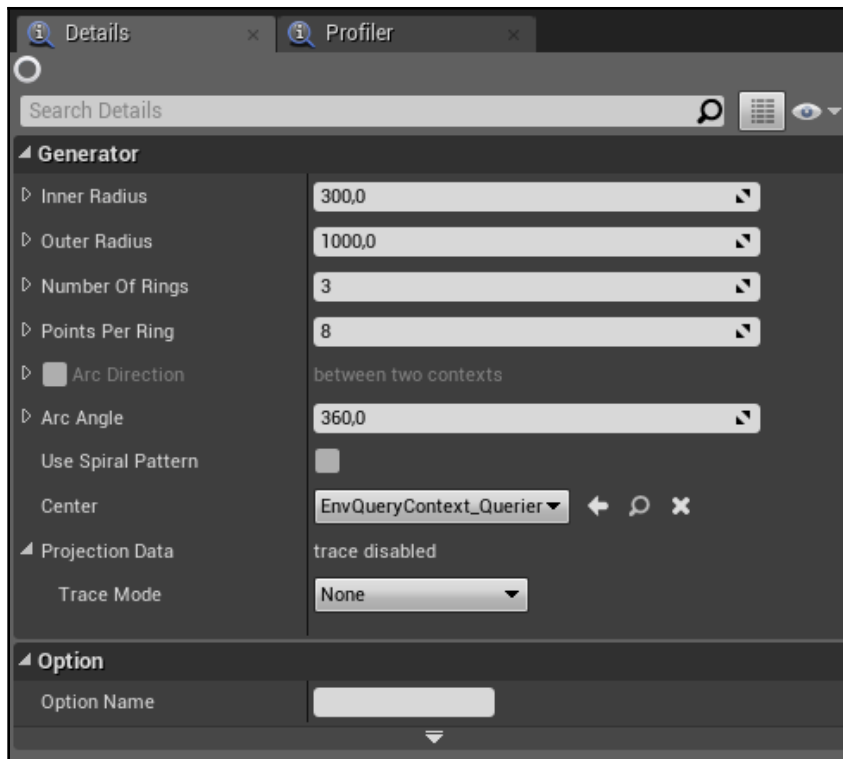


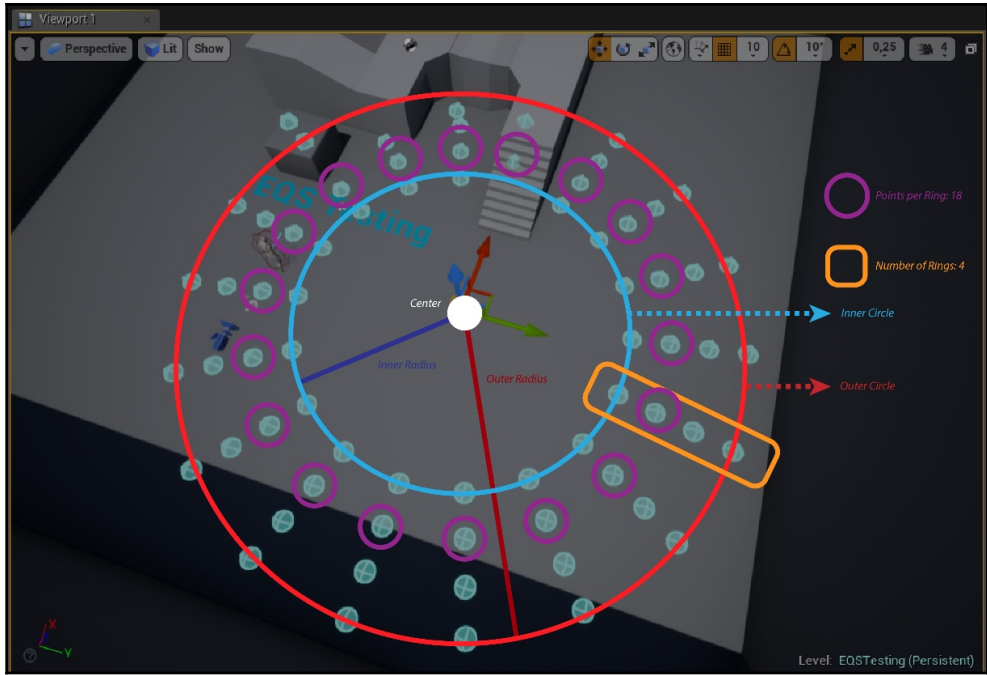


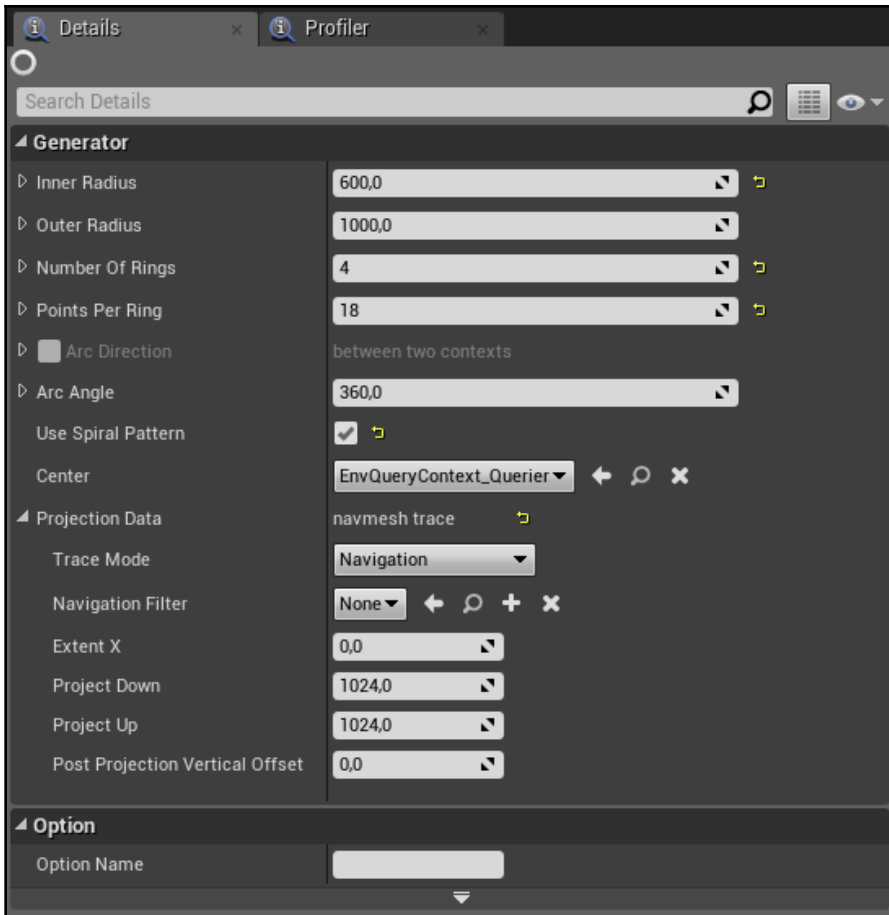


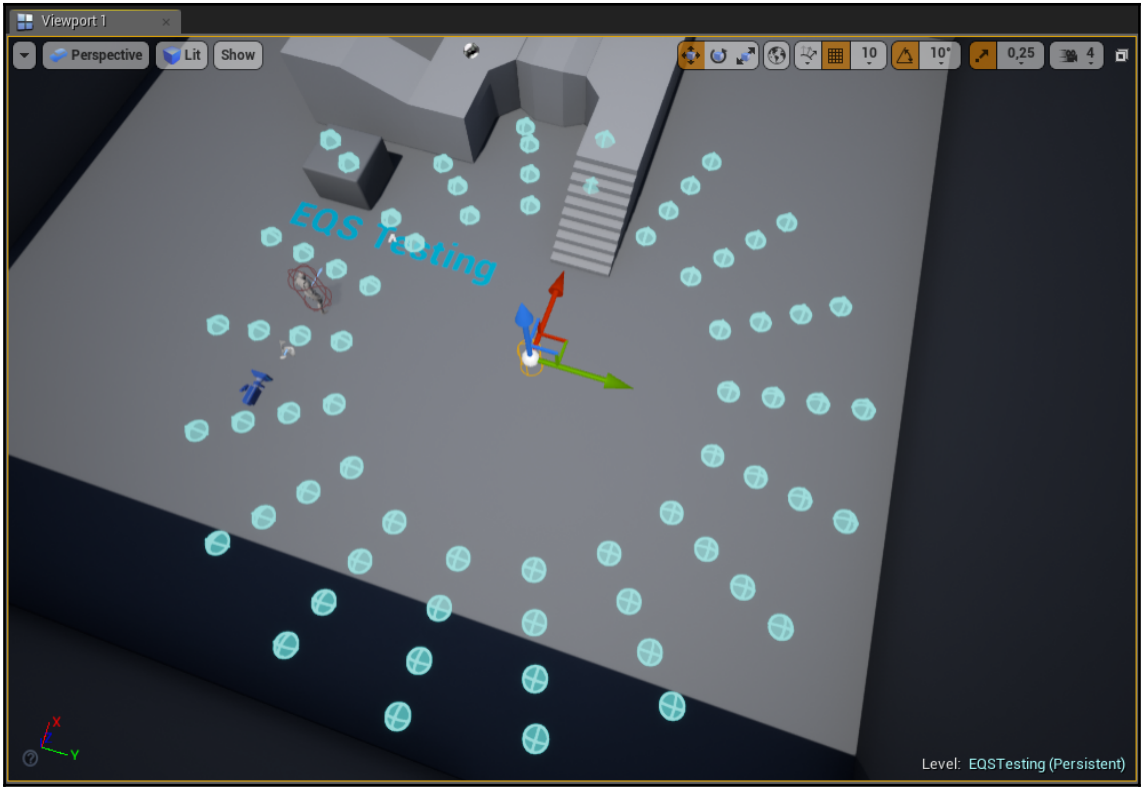


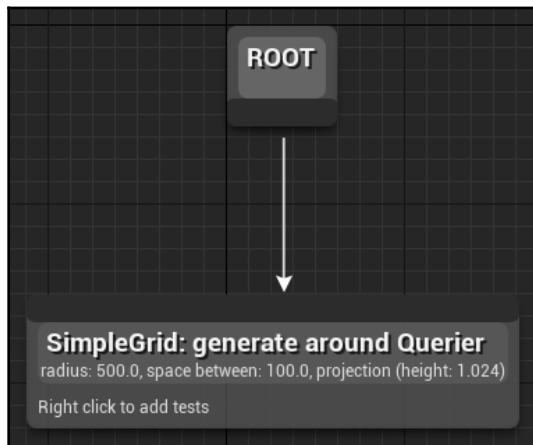
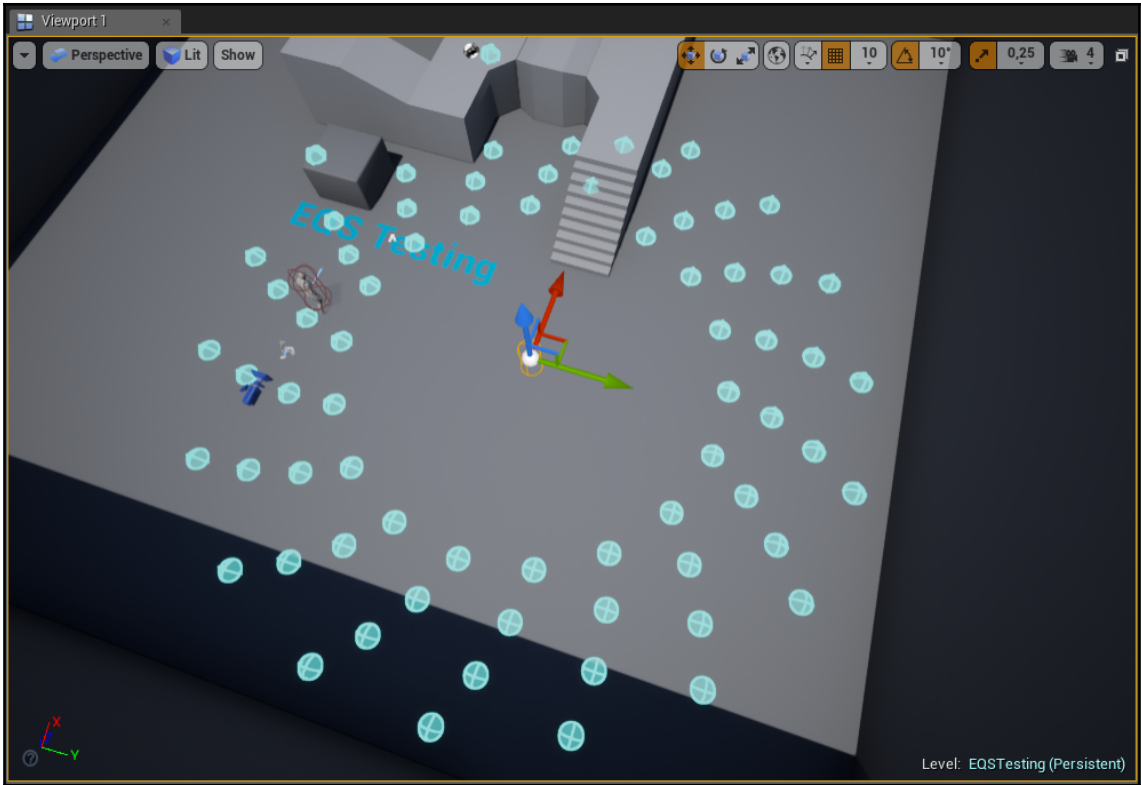




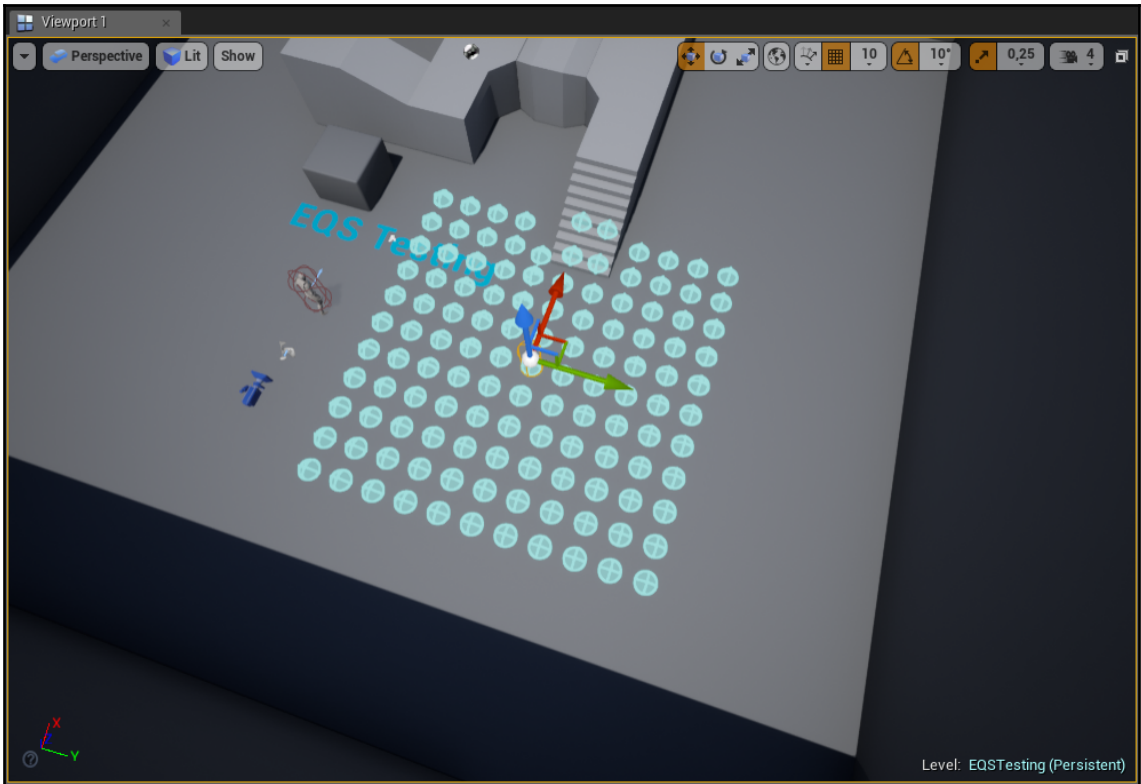
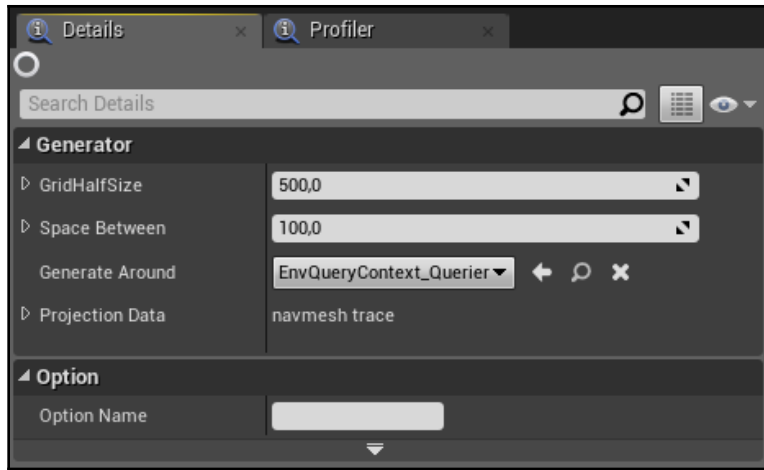


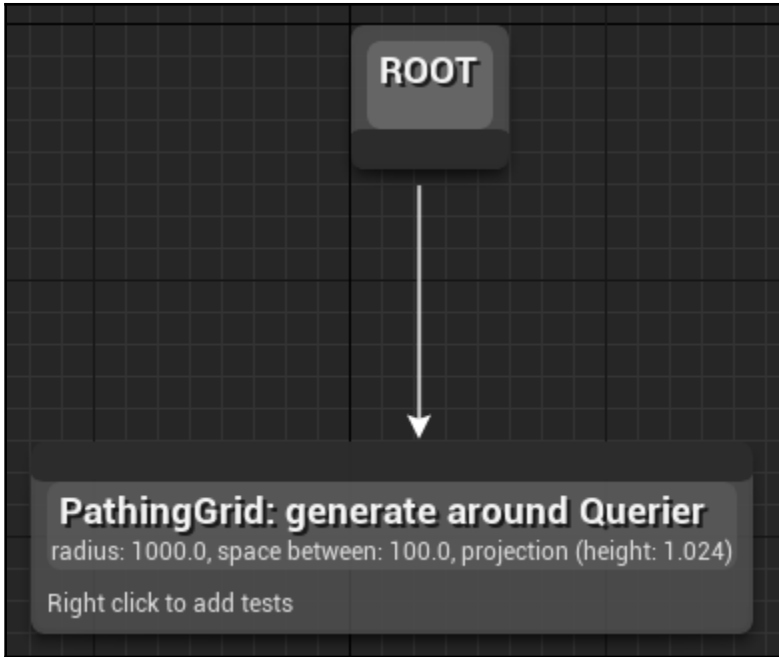


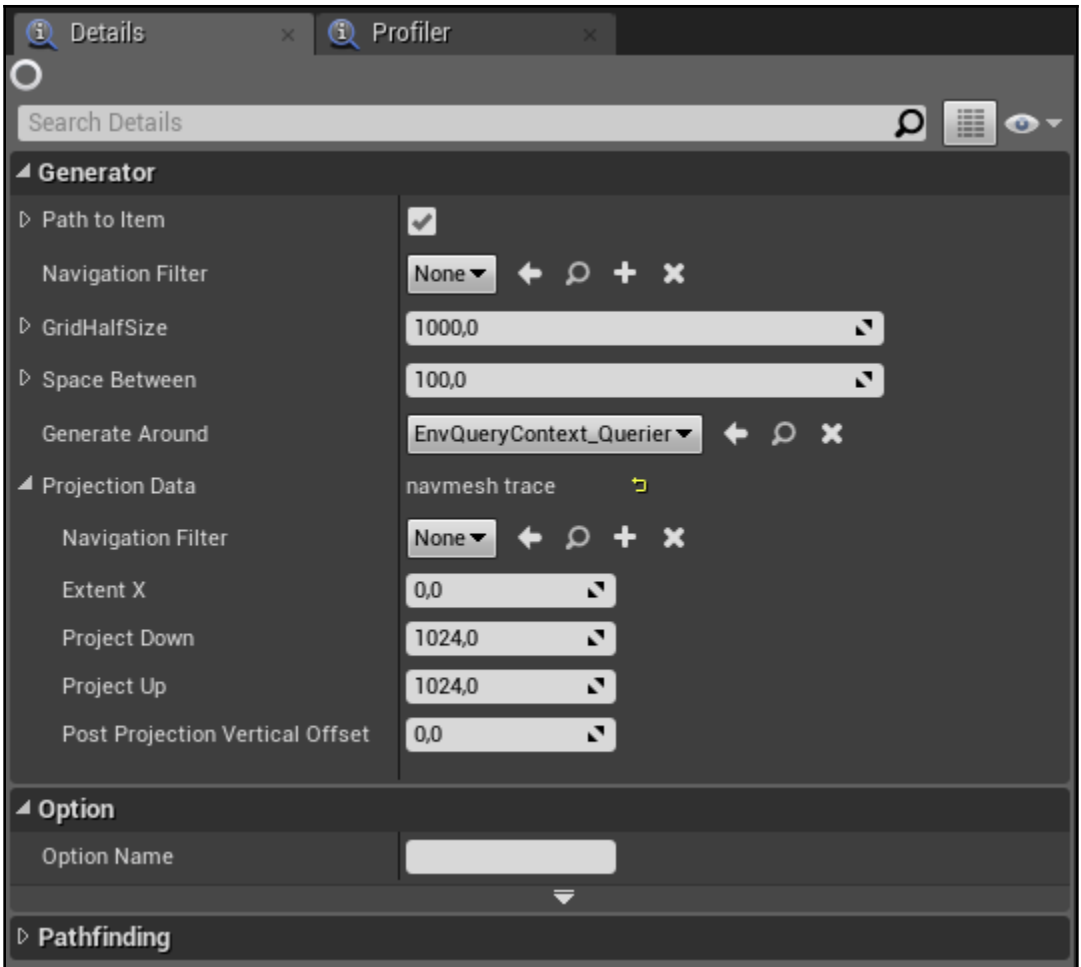


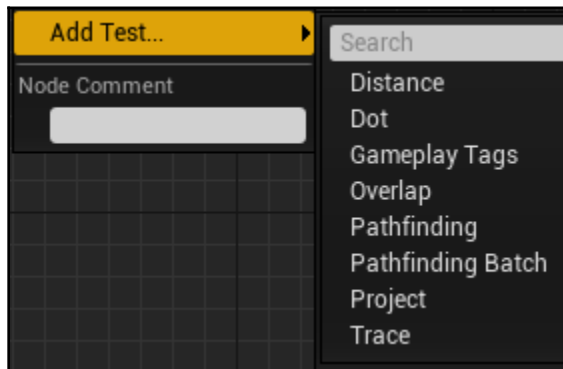


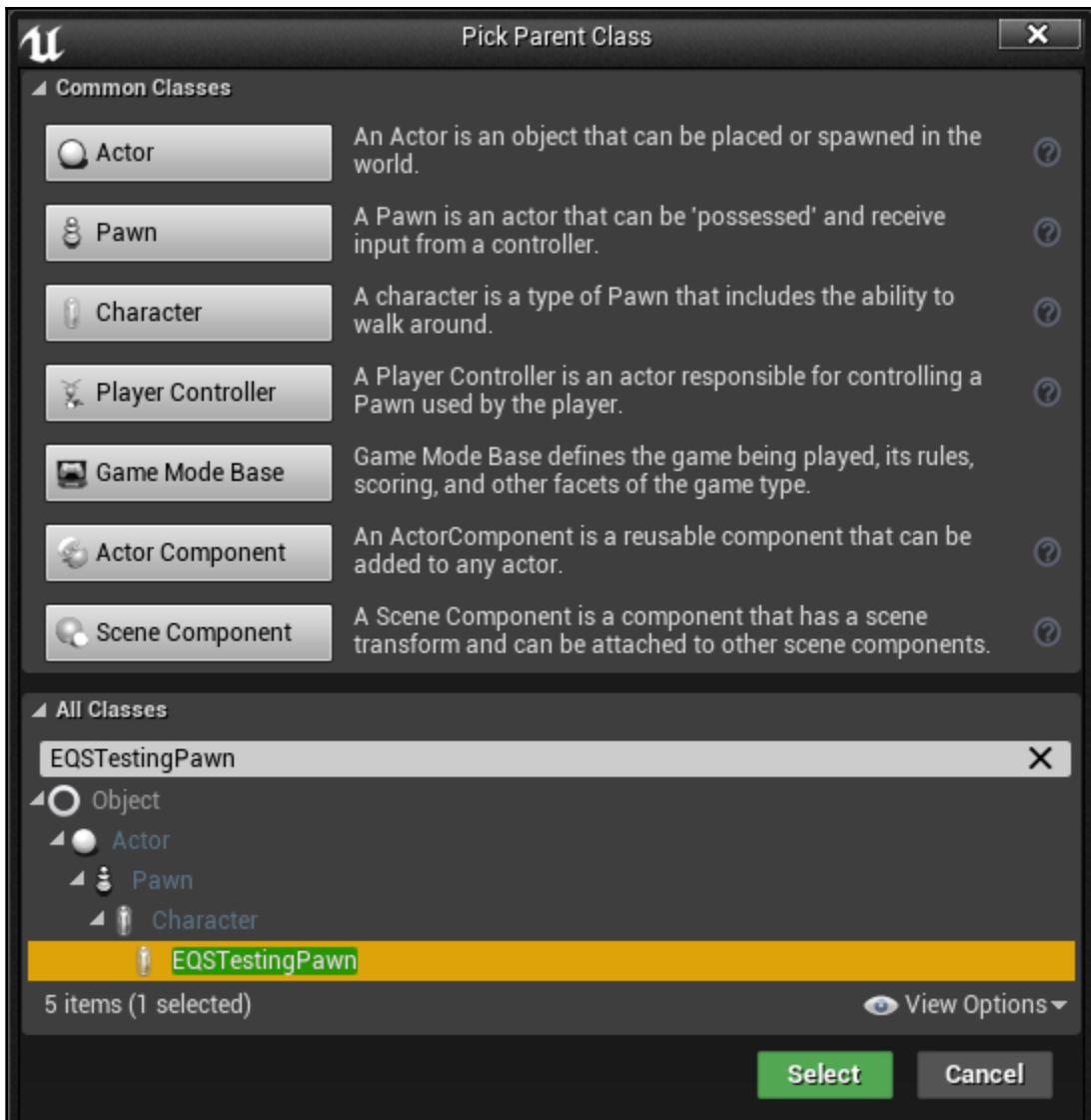






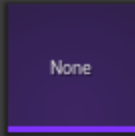






EQS

Query Template



None



QueryParams\_DEPRECATED

0 Array elements



Query Config

0 Array elements



Time Limit Per Step

-1,0

Step to Debug Draw

0

Highlight Mode

All

Draw Labels



Draw Failed Items



Re Run Query Only on Finished Move



Should be Visible in Game



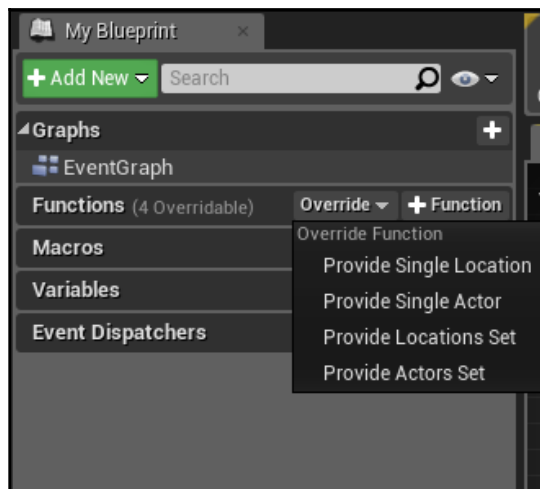
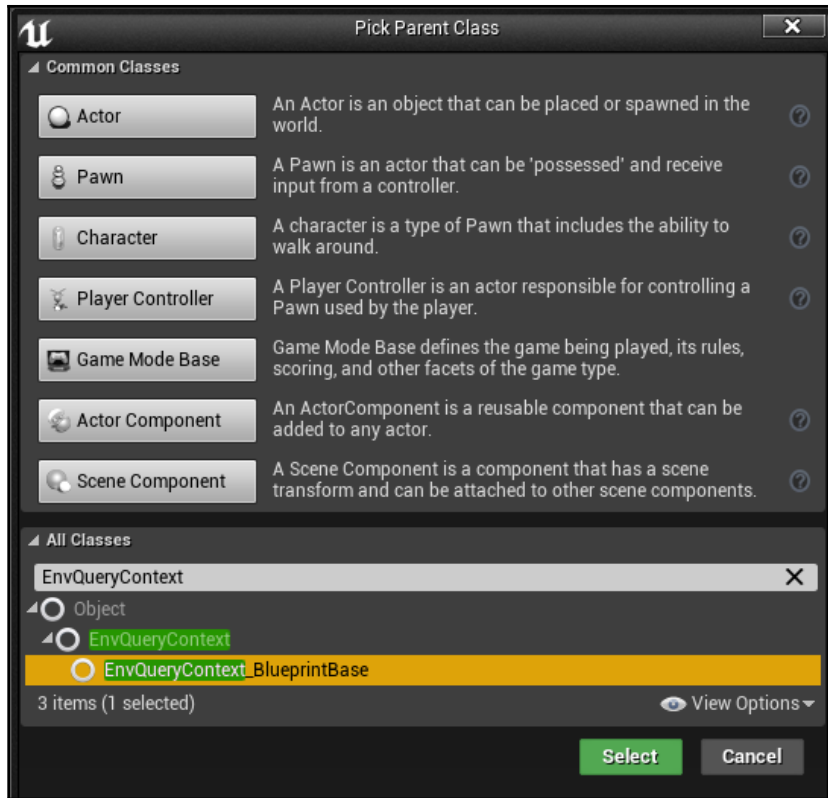
Tick During Game

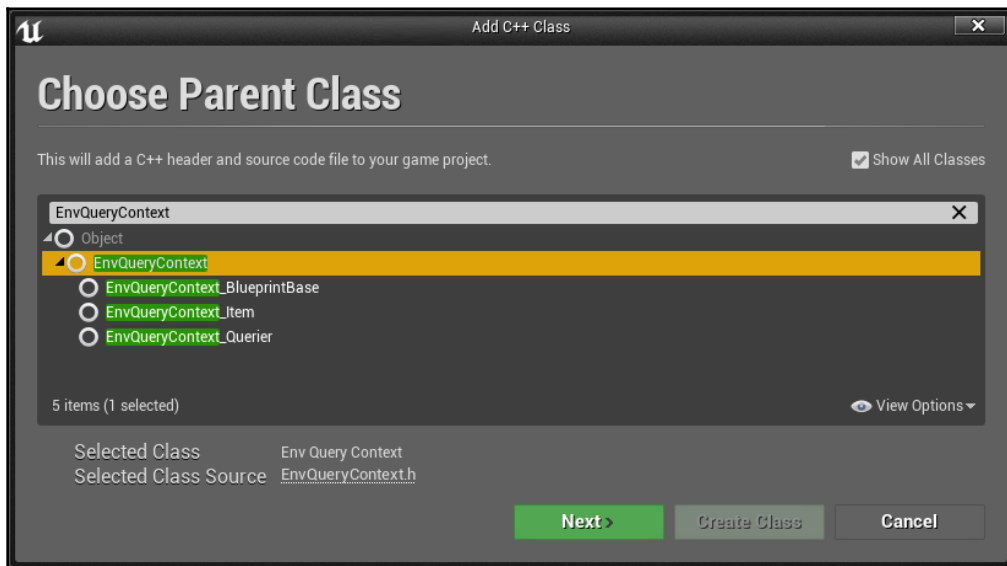
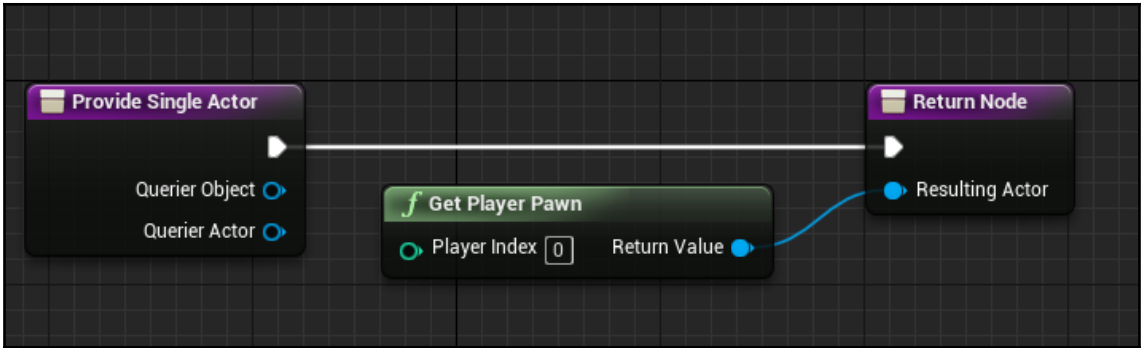


Querying Mode

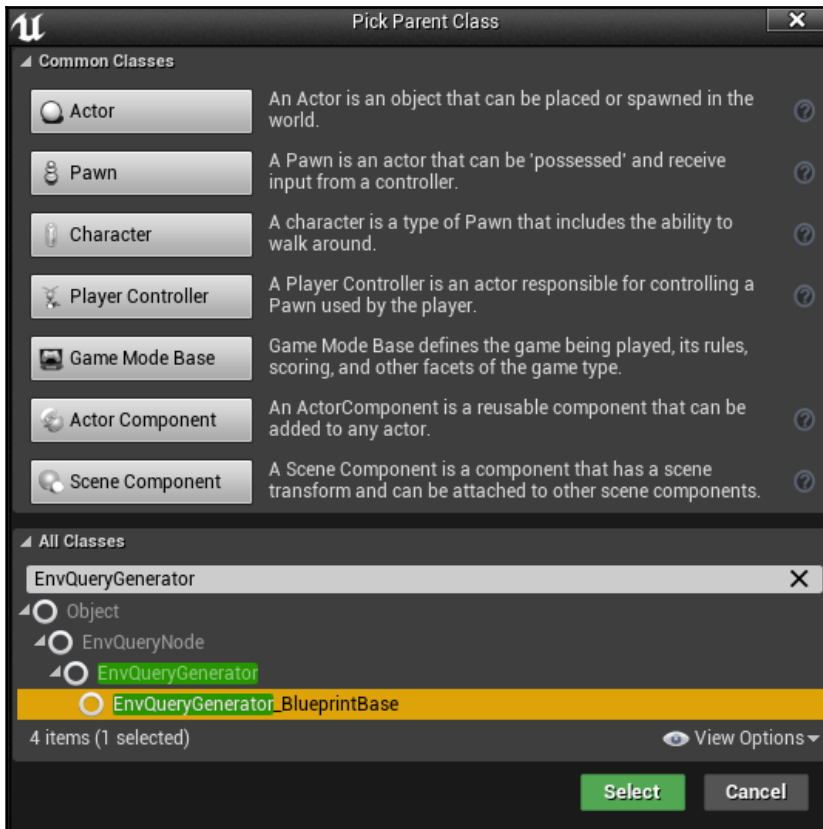
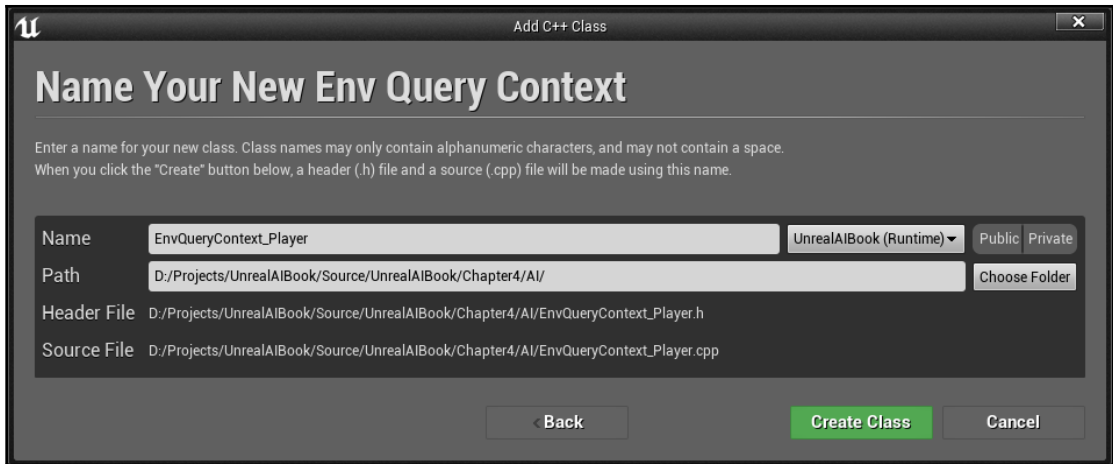
All Matching

Nav Agent Properties









11 Add C++ Class

# Choose Parent Class

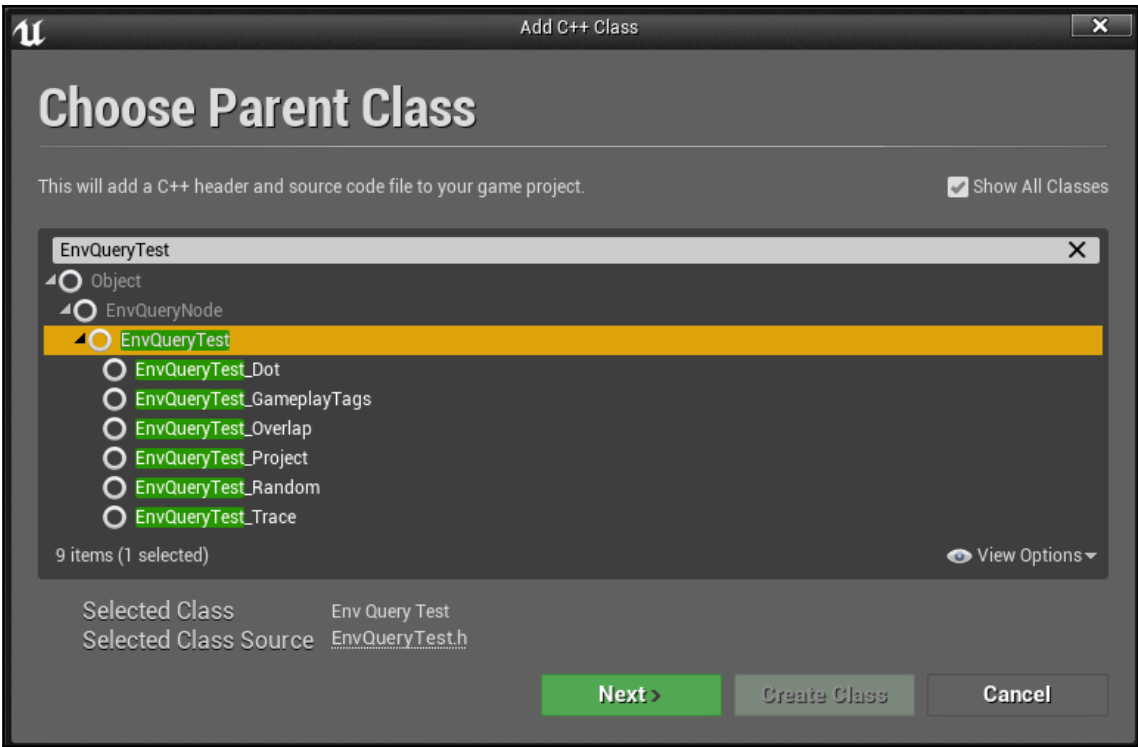
This will add a C++ header and source code file to your game project.  Show All Classes

EnvQueryGenerator

- Object
  - EnvQueryNode
    - EnvQueryGenerator
      - EnvQueryGenerator\_ActorsOfClass
      - EnvQueryGenerator\_BlueprintBase
      - EnvQueryGenerator\_Composite
      - EnvQueryGenerator\_CurrentLocation
      - EnvQueryGenerator\_ProjectedPoints
        - EnvQueryGenerator\_Cone
        - EnvQueryGenerator\_Donut
        - EnvQueryGenerator\_OnCircle
        - EnvQueryGenerator\_SimpleGrid

12 items (1 selected)

Selected Class Env Query Generator  
Selected Class Source EnvQueryGenerator.h

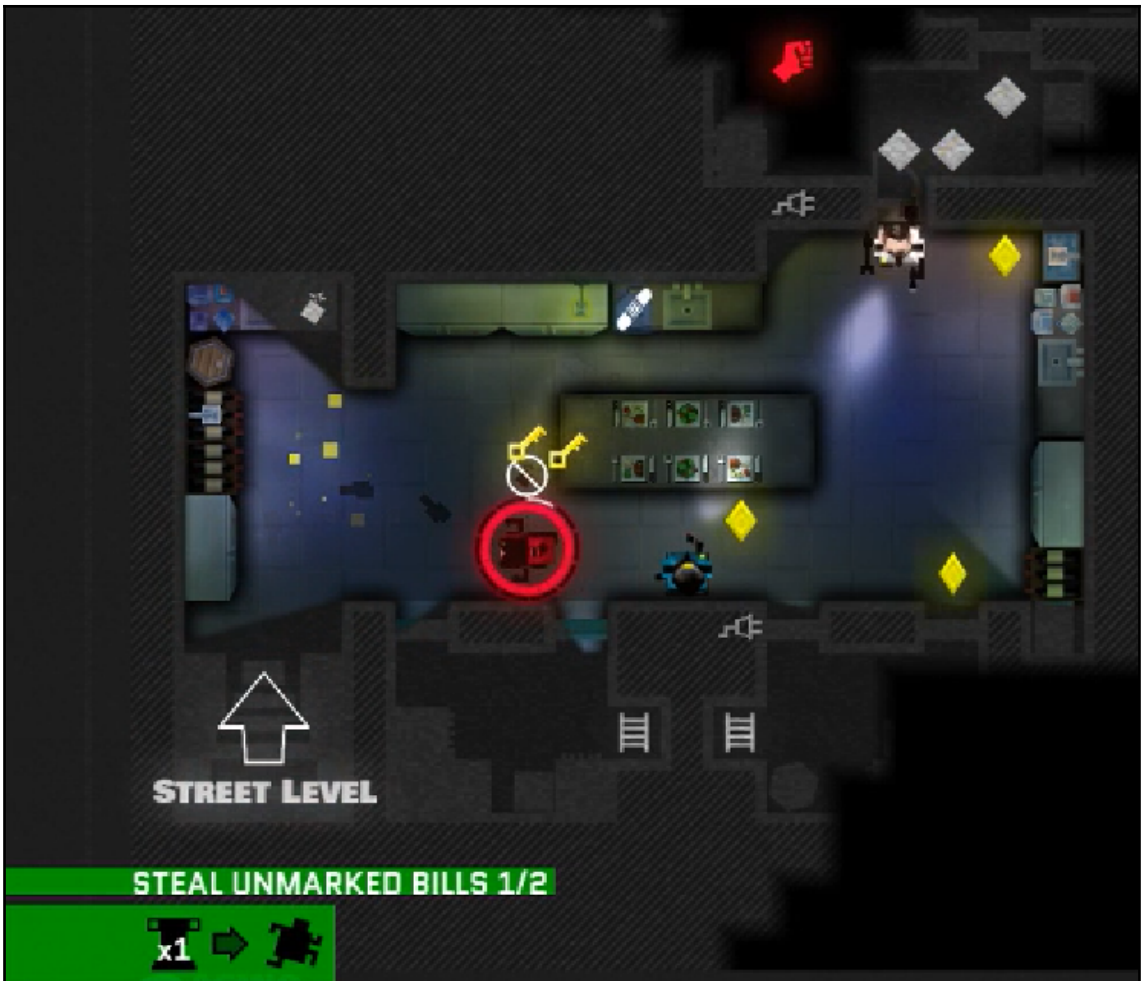


# Chapter 5: Agent Awareness





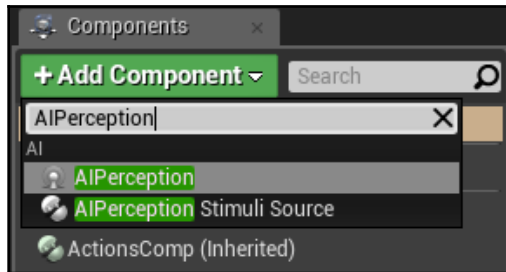




STREET LEVEL

STEAL UNMARKED BILLS 1/2







Details

Search

**Variable**

Variable Name: AIPerception

Tooltip:

Category: Default

Editable when Inherited:

**Sockets**

Parent Socket: None

**AI Perception**

Senses Config: 0 Array elements +

Dominant Sense: None

**Tags**

Component Tags: 0 Array elements +

**Component Replication**

Component Replicates:

**Cooking**

Is Editor Only:

**Events**

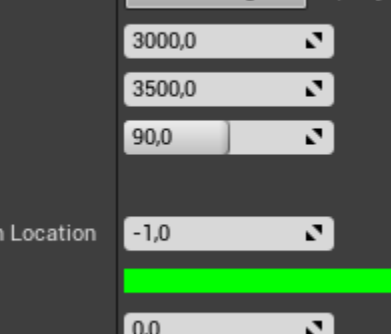
- On Perception Updated
- On Target Perception Updated
- On Component Activated
- On Component Deactivated

AI Perception

Senses Config 1 Array elements + -


0 AI Sight config

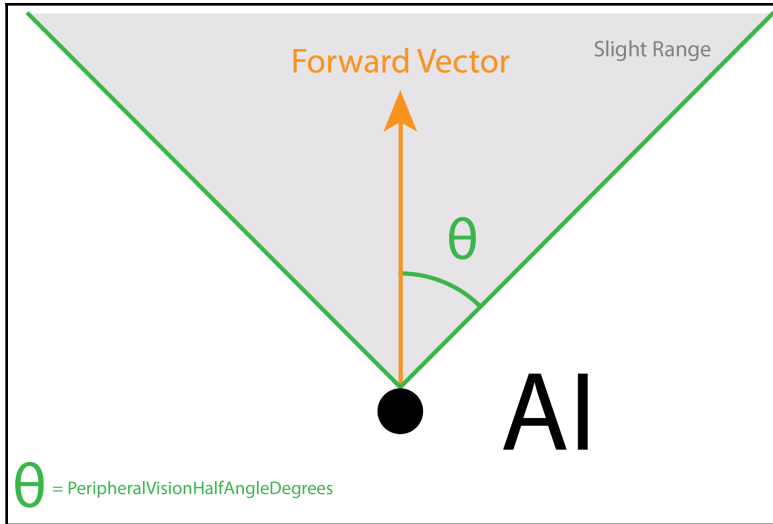
Sense

Implementation	AI Sense_Sight
Sight Radius	3000,0
Lose Sight Radius	3500,0
PeripheralVisionHalfAngleDegrees	90,0
Detection by Affiliation	
Auto Success Range from Last Seen Location	-1,0
Debug Color	
Max Age	0,0
Starts Enabled	<input checked="" type="checkbox"/>

Dominant Sense None

Sense


Implementation	AI Sense_Sight
Sight Radius	3000,0
Lose Sight Radius	3500,0
PeripheralVisionHalfAngleDegrees	90,0
Detection by Affiliation	
Auto Success Range from Last Seen Location	-1,0
Debug Color	
Max Age	0,0
Starts Enabled	<input checked="" type="checkbox"/>

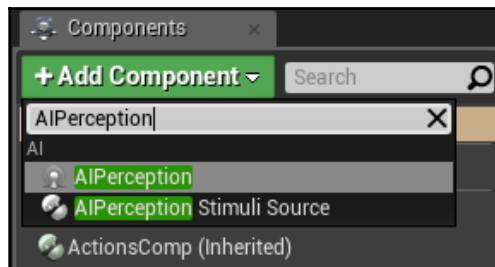
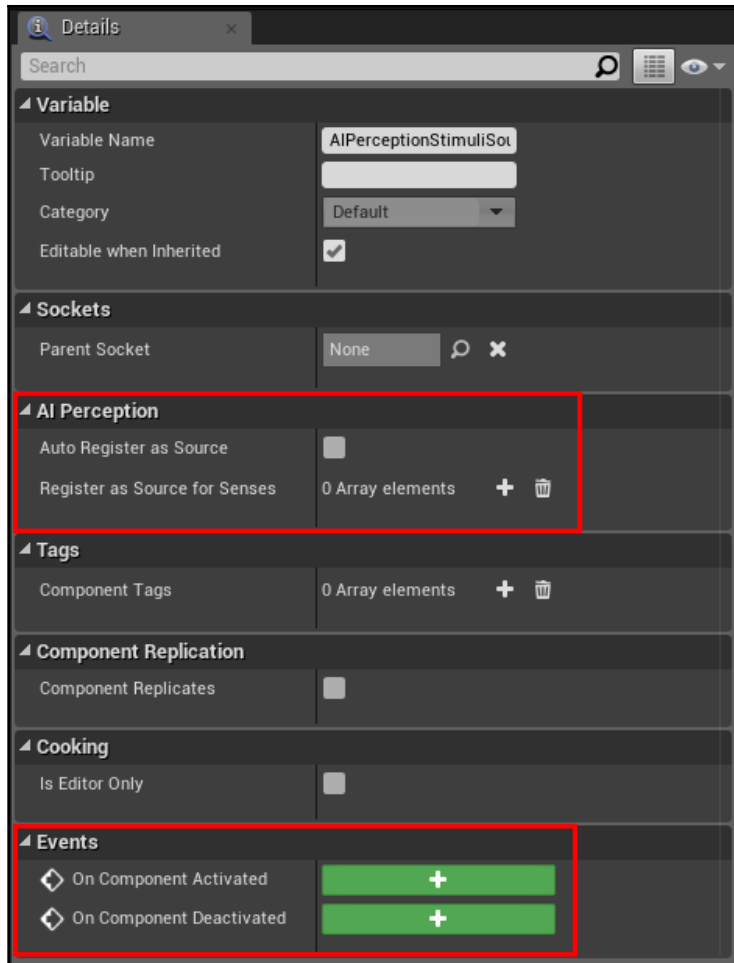


Sense

Implementation	AI_Sense_Hearing
Hearing Range	3000,0
<input type="checkbox"/> Lo SHearing Range	0,0
▷ Detection by Affiliation	
▷ Debug Color	
Max Age	0,0
Starts Enabled	<input checked="" type="checkbox"/>

Sense

Implementation	AI Sense_Sight
Sight Radius	3000,0
Lose Sight Radius	3500,0
PeripheralVisionHalfAngleDegrees	90,0
Detection by Affiliation	
Detect Enemies	<input checked="" type="checkbox"/>
Detect Neutrals	<input type="checkbox"/>
Detect Friendlies	<input type="checkbox"/>
Auto Success Range from Last Seen Location	-1,0
Debug Color	
Max Age	0,0
Starts Enabled	<input checked="" type="checkbox"/>



AI Perception

Senses Config 1 Array elements + 🗑️

0 AI Sight config

Sense

Implementation AISense\_Sight ◀️ 🔍

Sight Radius 600,0

Lose Sight Radius 700,0

PeripheralVisionHalfAngleDeg 90,0

Detection by Affiliation

Auto Success Range from La: -1,0

Debug Color

Max Age 0,0

Starts Enabled

Dominant Sense None ◀️ 🔍 ✕

### AI Perception

Senses Config 1 Array elements + 🗑️

0 AI Sight config ▾

#### Sense

Implementation AISense\_Sight ◀ 🔍

Sight Radius 600,0 ▾

Lose Sight Radius 700,0 ▾

PeripheralVisionHalfAngleDeg 90,0 ▾

#### Detection by Affiliation

Detect Enemies

Detect Neutrals  🗑️

Detect Friendlies  🗑️

Auto Success Range from La: -1,0 ▾

Debug Color

Max Age 0,0 ▾

Starts Enabled

Dominant Sense None ◀ 🔍 ✕

### Events

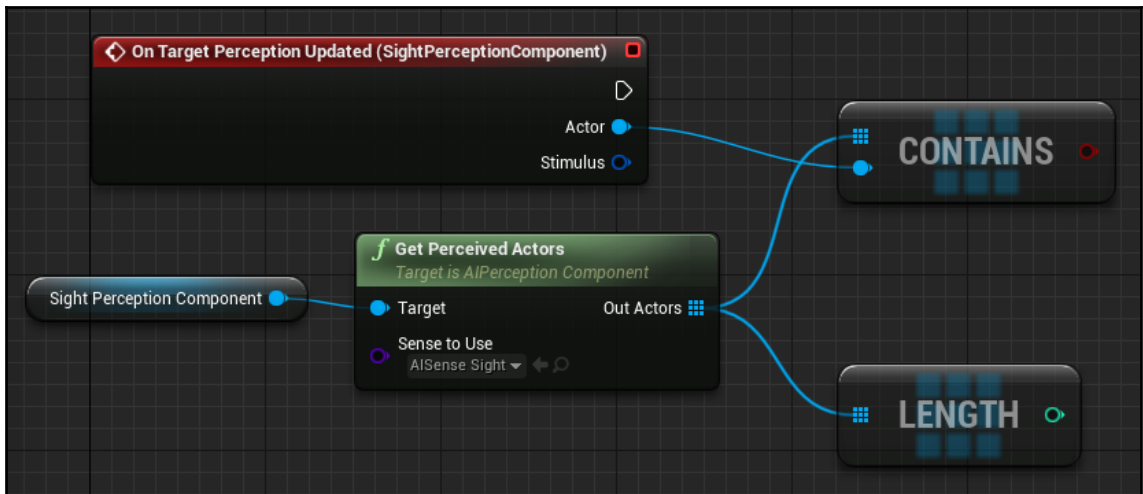
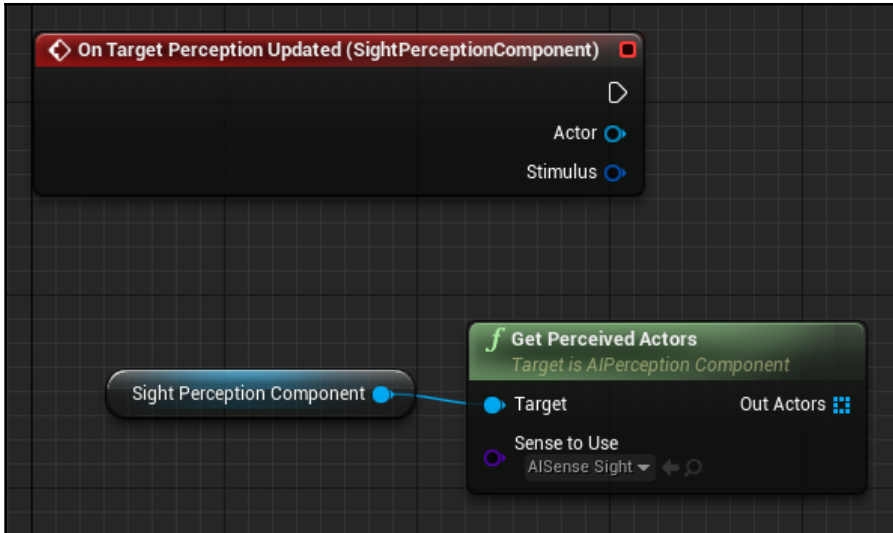
🔗 On Perception Updated	<span style="background-color: #008000; color: white; padding: 2px 10px;">+</span>
🔗 On Target Perception Updated	<span style="background-color: #008000; color: white; padding: 2px 10px;">+</span>
🔗 On Component Activated	<span style="background-color: #008000; color: white; padding: 2px 10px;">+</span>
🔗 On Component Deactivated	<span style="background-color: #008000; color: white; padding: 2px 10px;">+</span>

🔗 On Target Perception Updated (SightPerceptionComponent) ■

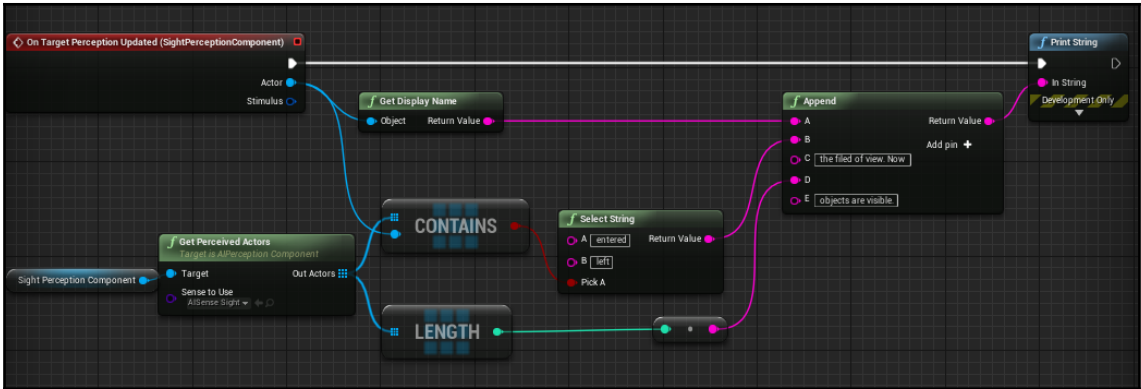
▶

Actor ○

Stimulus ○





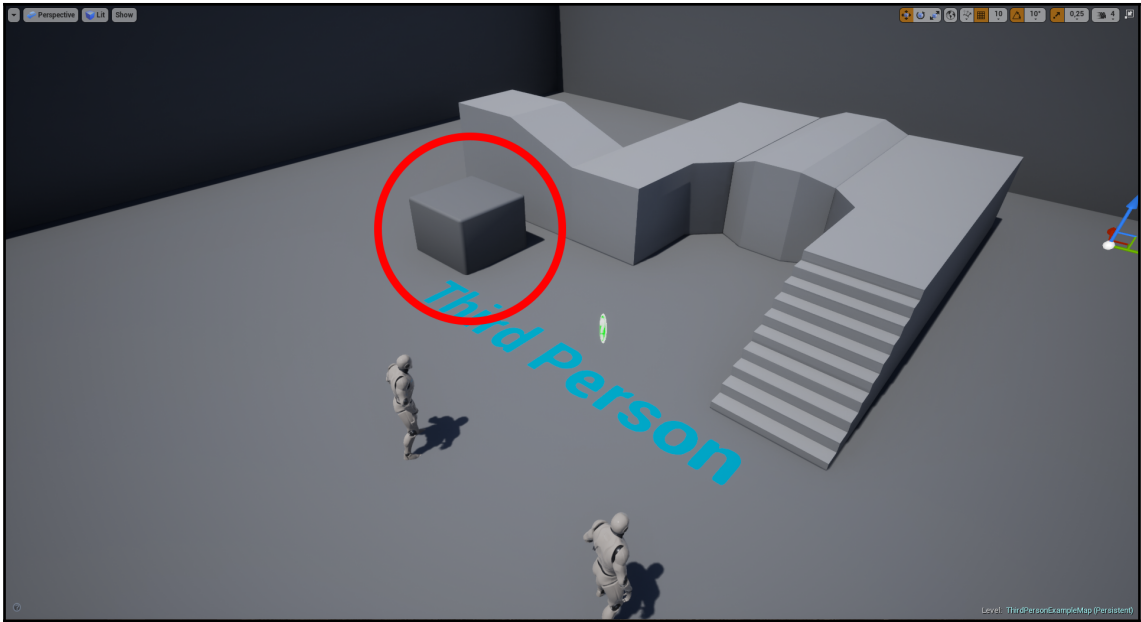


▲ Pawn

Use Controller Rotation Pitch	<input type="checkbox"/>
Use Controller Rotation Yaw	<input type="checkbox"/>
Use Controller Rotation Roll	<input type="checkbox"/>
Can Affect Navigation Generation	<input type="checkbox"/>
Auto Possess Player	Disabled ▾
Auto Possess AI	Placed in World or Spawned ▾ ↗
AI Controller Class	BP_SightAIController ▾ ↶ ↷ ✕ ↘

▲ Pawn

Use Controller Rotation Pitch	<input type="checkbox"/>
Use Controller Rotation Yaw	<input type="checkbox"/>
Use Controller Rotation Roll	<input type="checkbox"/>
Can Affect Navigation Generation	<input type="checkbox"/>
Auto Possess Player	Disabled ▾
Auto Possess AI	Placed in World or Spawned ▾ ↗
AI Controller Class	SightAIController ▾ ↶ ↷ ✕ ↘



### Transform

Location ▾	X -500,0	Y 310,0	Z 190,0	🔒
Rotation ▾	X 0,0 °	Y 0,0 °	Z 0,0 °	🔒
Scale ▾	X 1,0	Y 1,0	Z 0,5	🔒
Mobility	<input type="checkbox"/> Static	<input type="checkbox"/> Stationary	<input checked="" type="checkbox"/> Movable	🔒

**Physics**

Simulate Physics	<input checked="" type="checkbox"/> ↻
<input checked="" type="checkbox"/> MassInKg	100,0
Linear Damping	0,01
Angular Damping	0,0
Enable Gravity	<input checked="" type="checkbox"/>

**Constraints**

Lock Position	X <input type="checkbox"/> Y <input type="checkbox"/> Z <input checked="" type="checkbox"/>
Lock Rotation	X <input checked="" type="checkbox"/> Y <input checked="" type="checkbox"/> Z <input checked="" type="checkbox"/>
Mode	Default
Ignore Radial Impulse	<input type="checkbox"/>
Ignore Radial Force	<input type="checkbox"/>
Apply Impulse on Damage	<input checked="" type="checkbox"/>

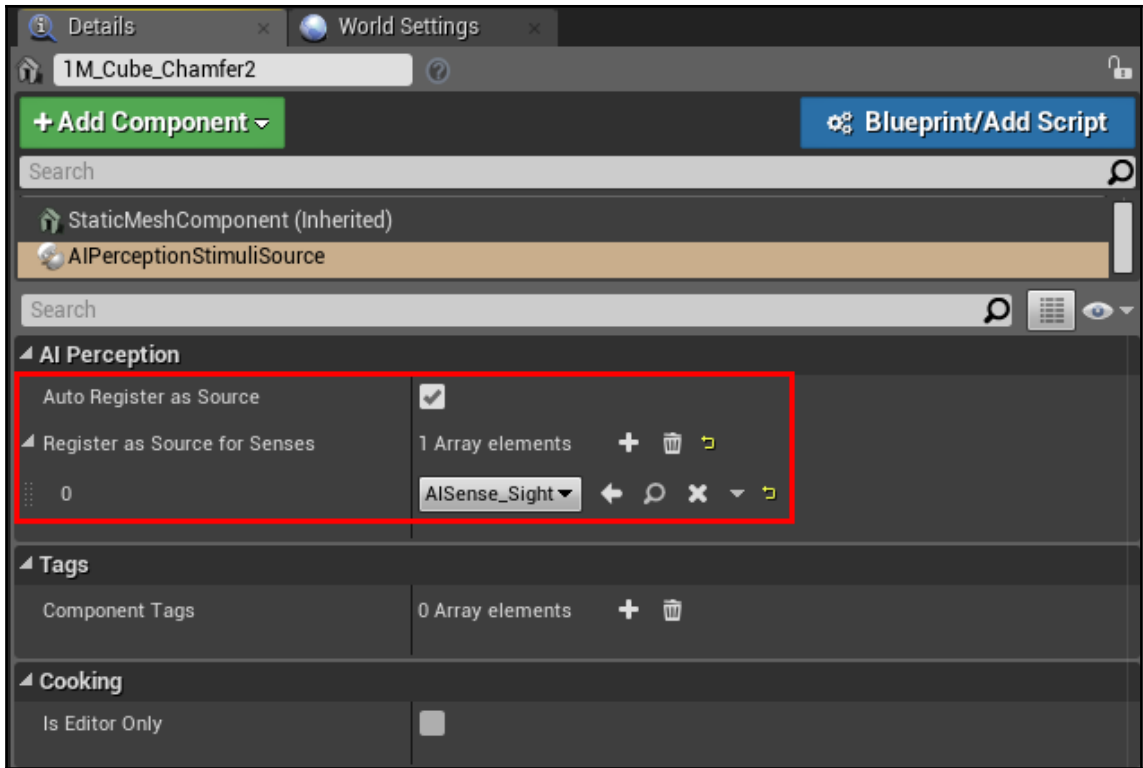
Details | World Settings

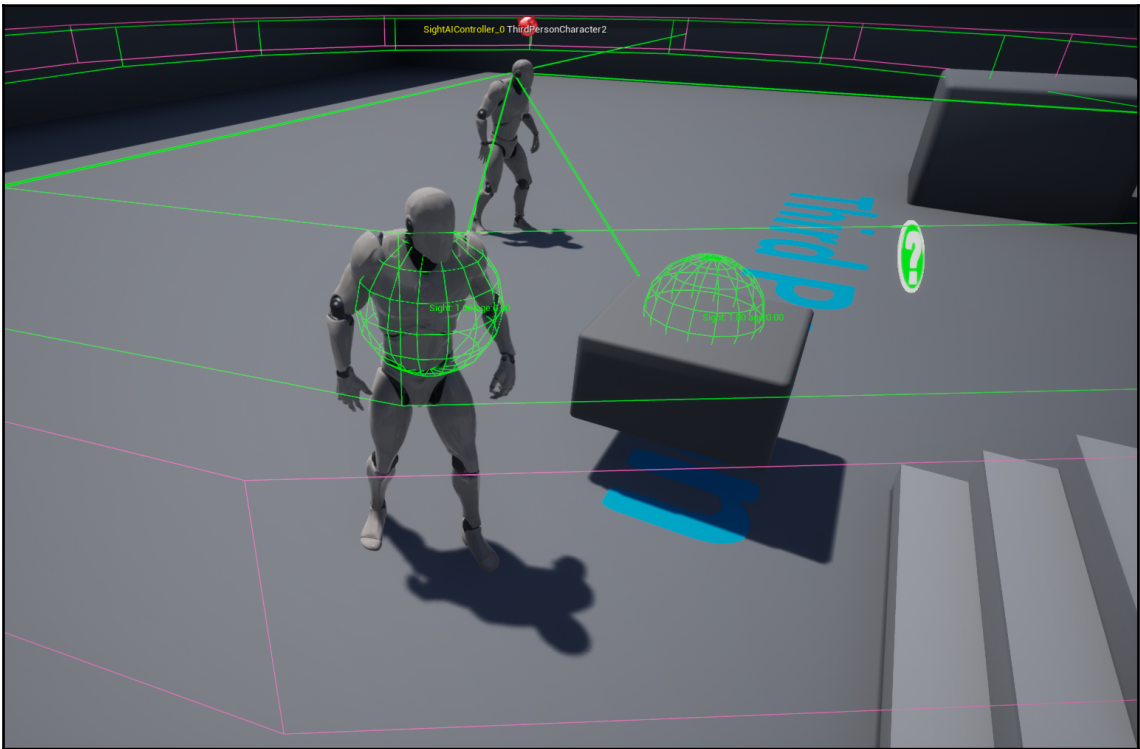
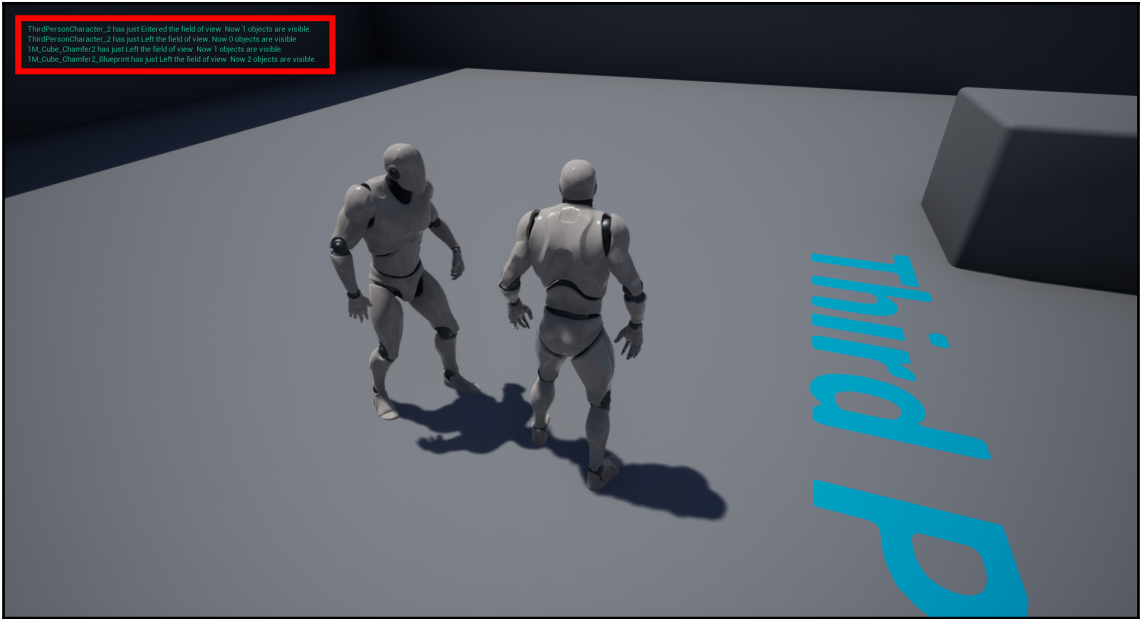
1M\_Cube\_Chamfer2

**+ Add Component**

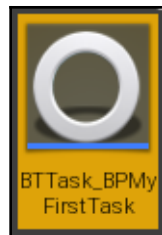
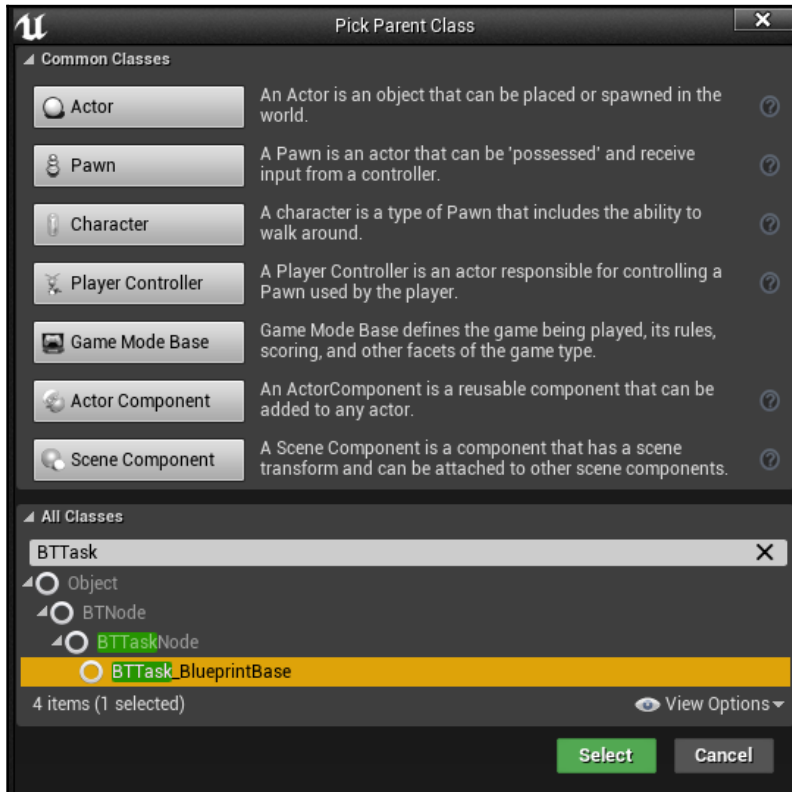
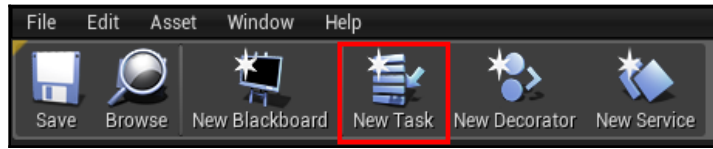
AI Perception

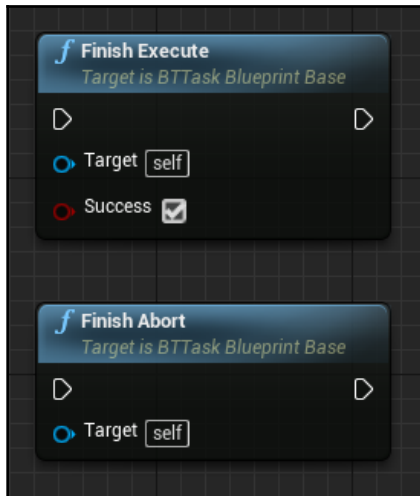
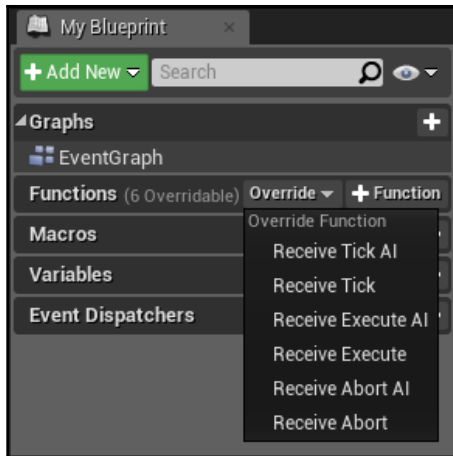
AI Perception Stimuli Source



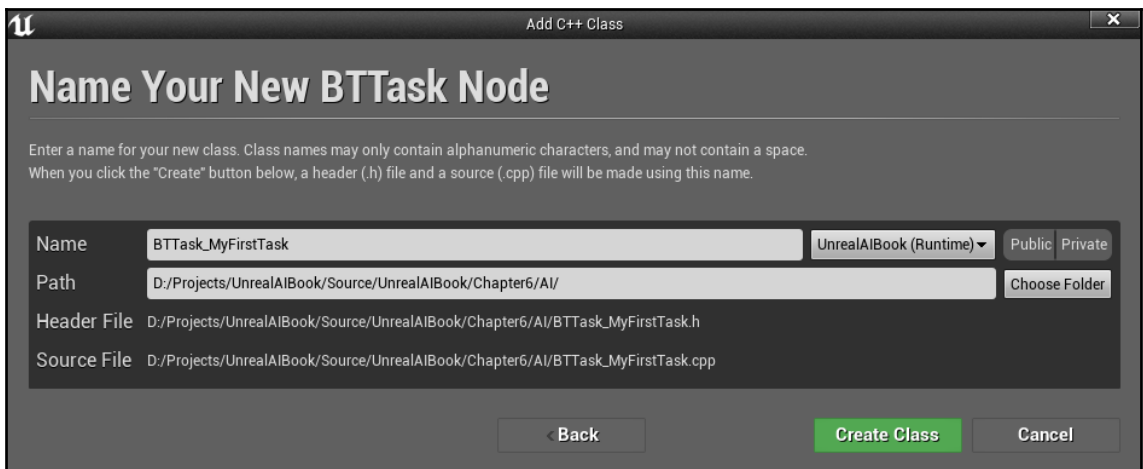
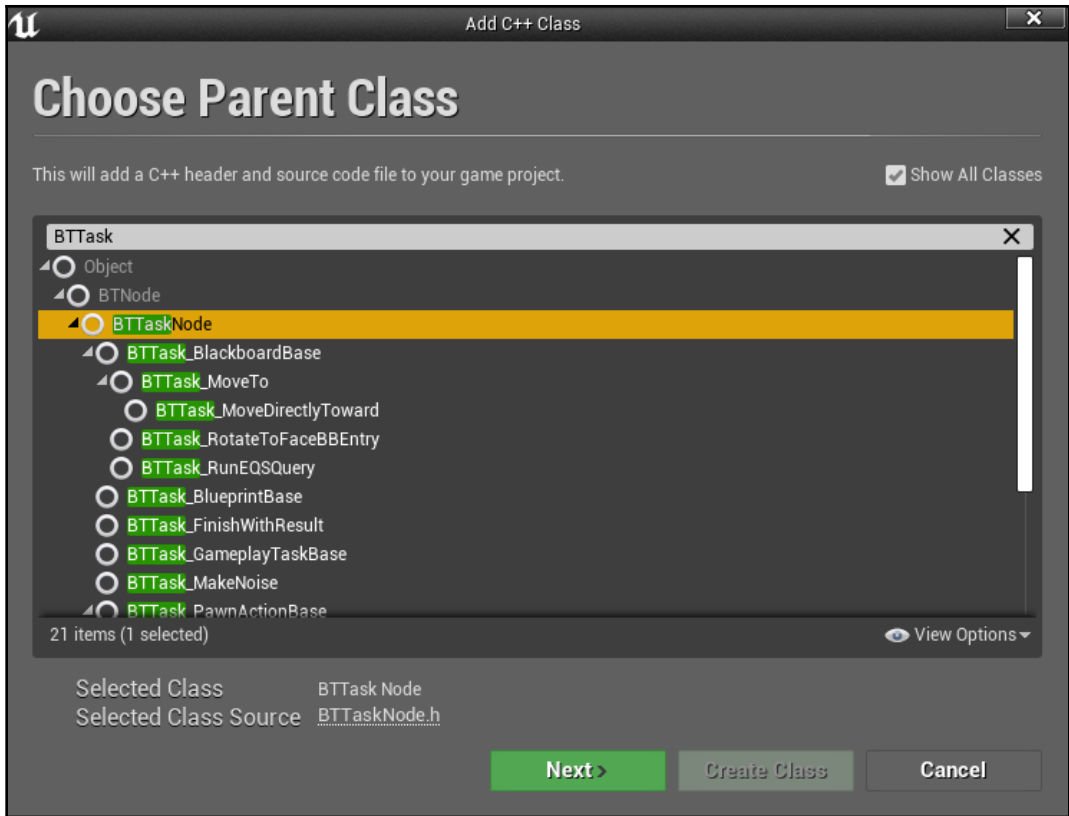


# Chapter 6: Extending Behavior Trees

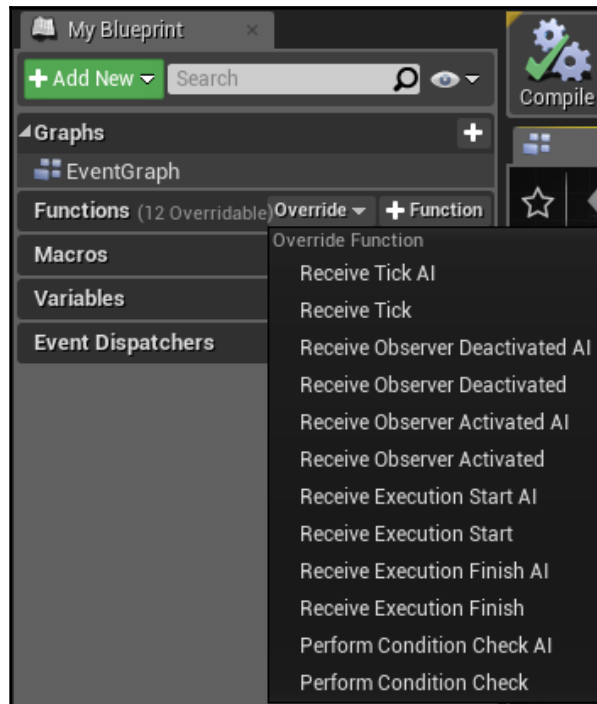


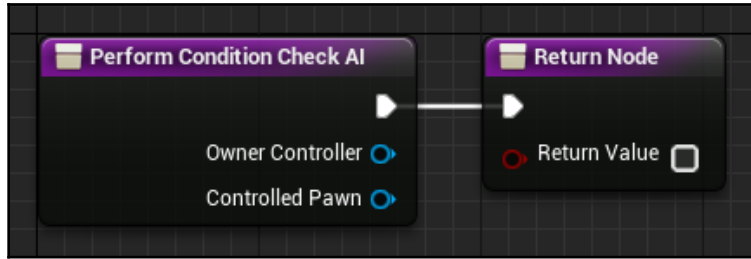












# Choose Parent Class

This will add a C++ header and source code file to your game project.  Show All Classes

- Object
  - BTNode
    - BTAuxiliaryNode
      - BTDecorator**
        - BTDecorator\_BlackboardBase
          - BTDecorator\_Blackboard
            - BTDecorator\_ConditionalLoop
            - BTDecorator\_IsAtLocation
            - BTDecorator\_IsBBEntryOfClass
            - BTDecorator\_BlueprintBase
            - BTDecorator\_CheckGameplayTagsOnActor
            - BTDecorator\_CompareBBEntries
            - BTDecorator\_ConeCheck

22 items (1 selected) View Options

Selected Class: BTDecorator  
Selected Class Source: BTDecorator.h

**Next >** Create Class Cancel

u Add C++ Class

## Name Your New BTDecorator

Enter a name for your new class. Class names may only contain alphanumeric characters, and may not contain a space. When you click the "Create" button below, a header (.h) file and a source (.cpp) file will be made using this name.

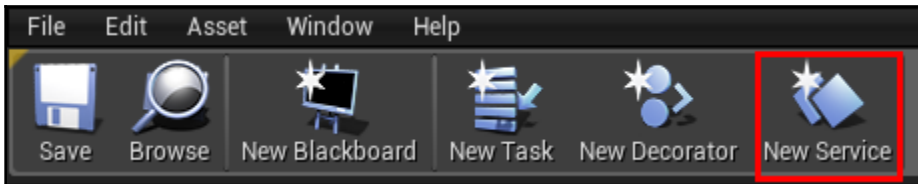
Name  UnrealAIBook (Runtime) Public Private

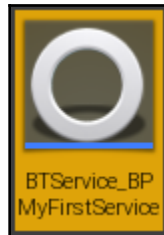
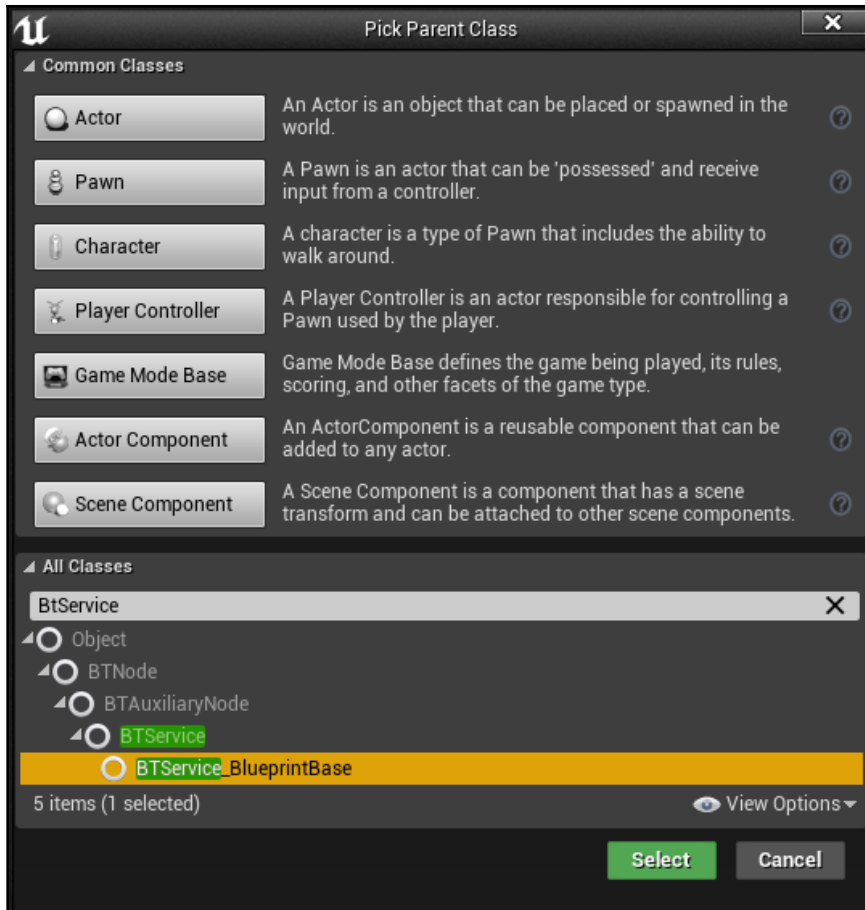
Path  Choose Folder

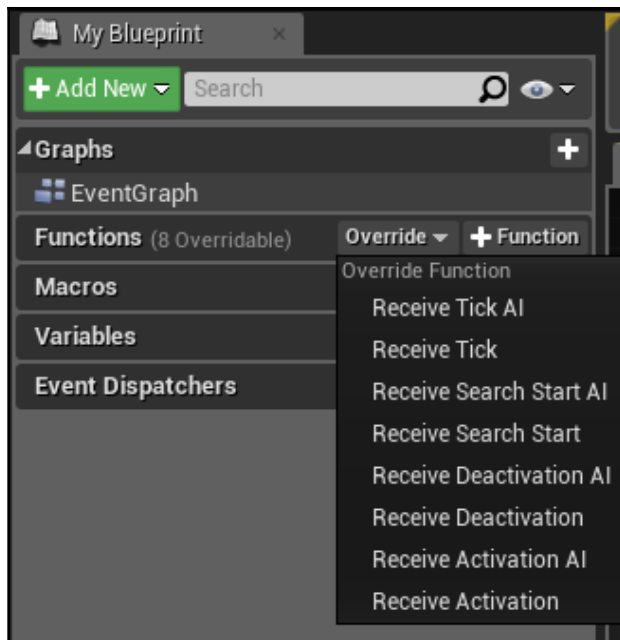
Header File D:/Projects/UnrealAIBook/Source/UnrealAIBook/Chapter6/AI/BTDecorator\_MyFirstDecorator.h

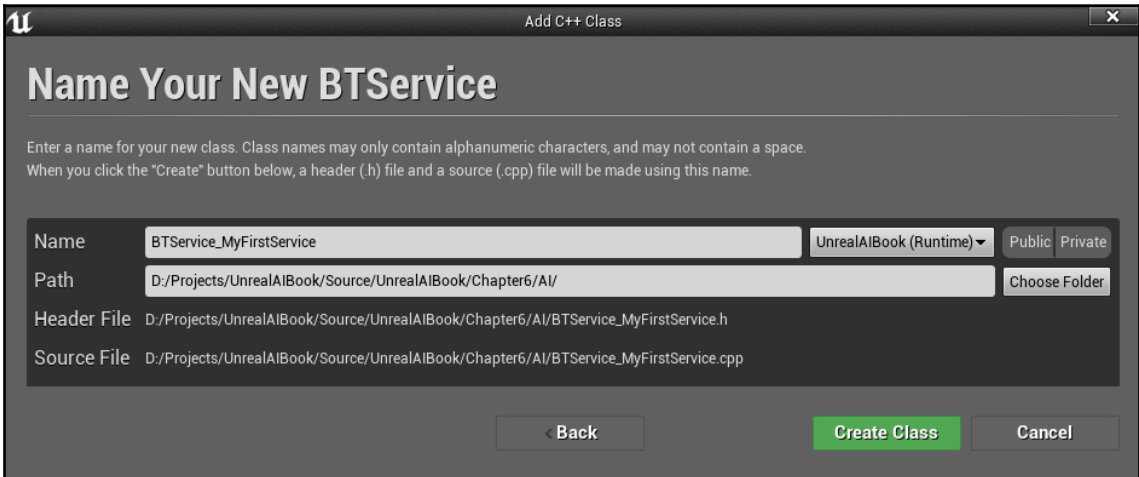
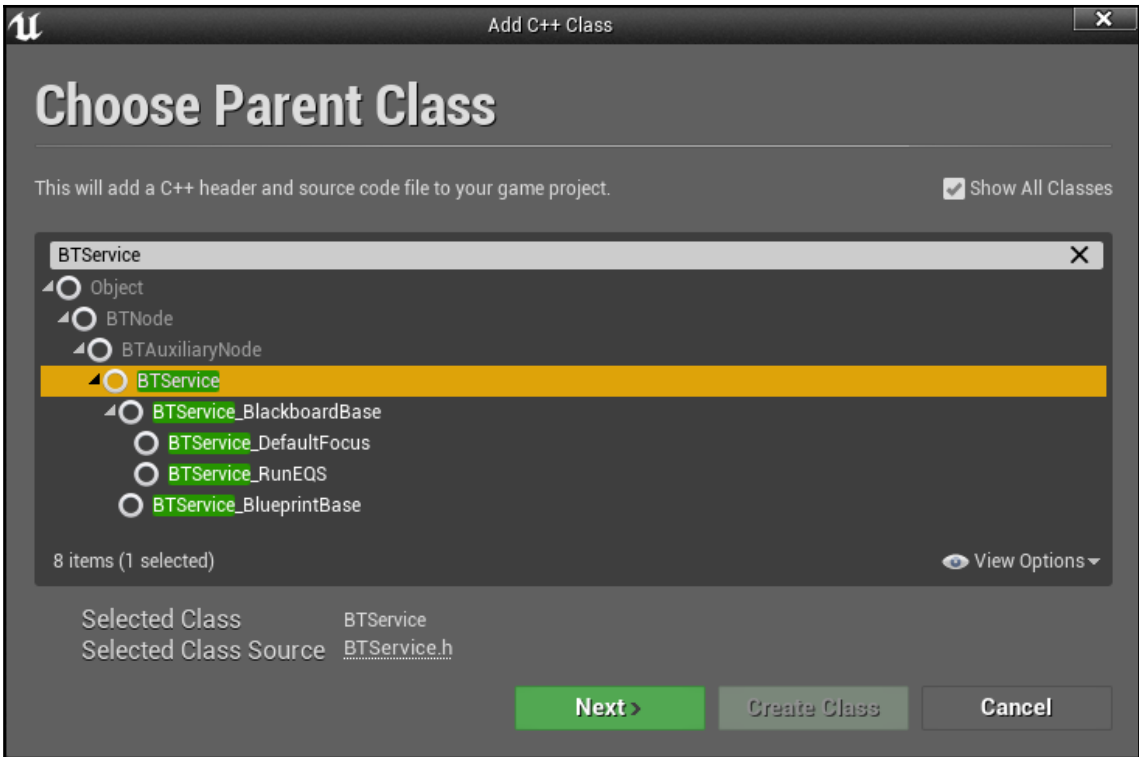
Source File D:/Projects/UnrealAIBook/Source/UnrealAIBook/Chapter6/AI/BTDecorator\_MyFirstDecorator.cpp

< Back Create Class Cancel



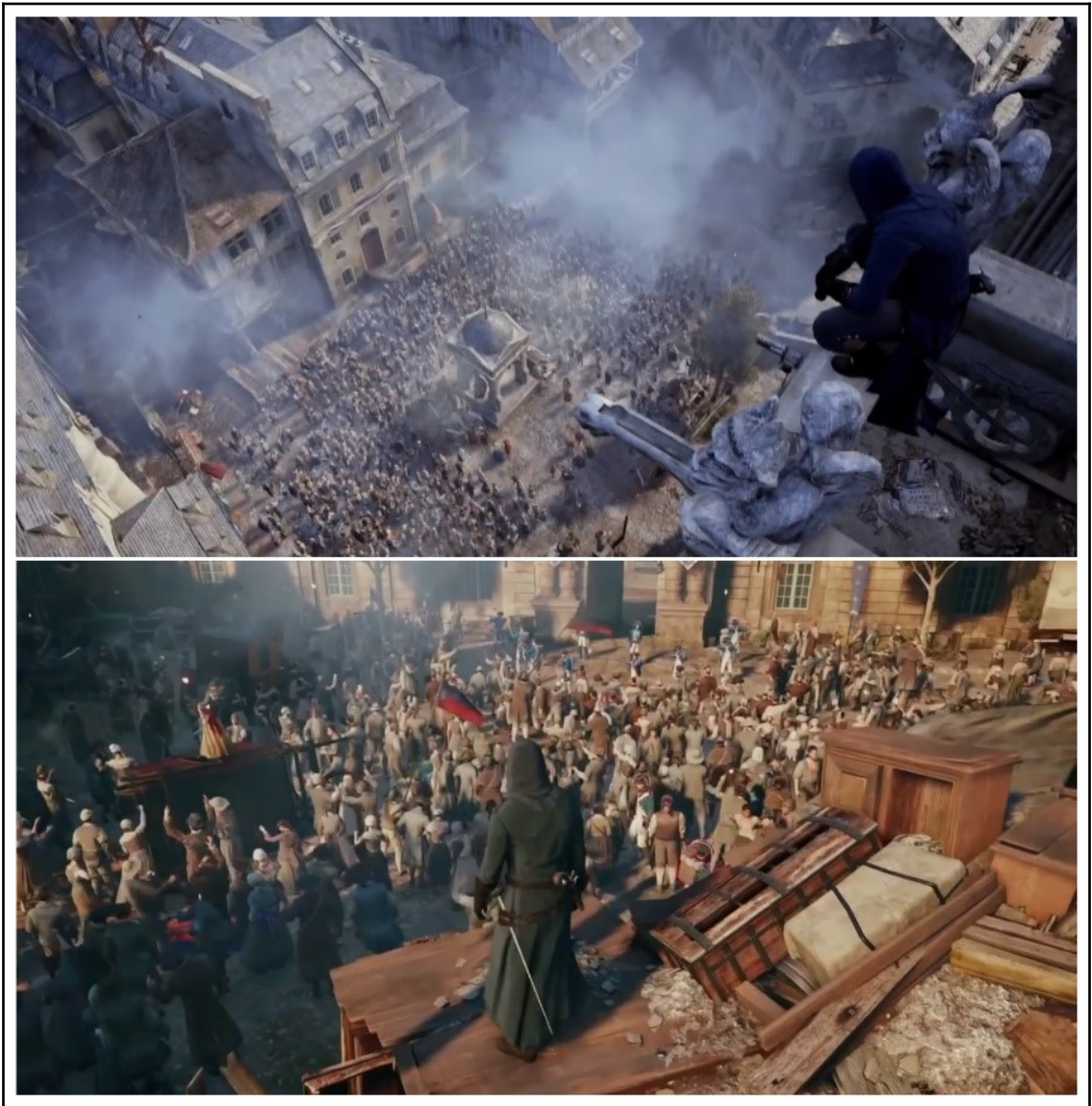








## Chapter 7: Crowds







**Character Movement: Avoidance**

Use RVOAvoidance	<input type="checkbox"/>
Avoidance Consideration Radius	500.0
Avoidance Weight	0.0
Avoidance UID	0
▷ Avoidance Group	
▷ Groups to Avoid	
▷ Groups to Ignore	

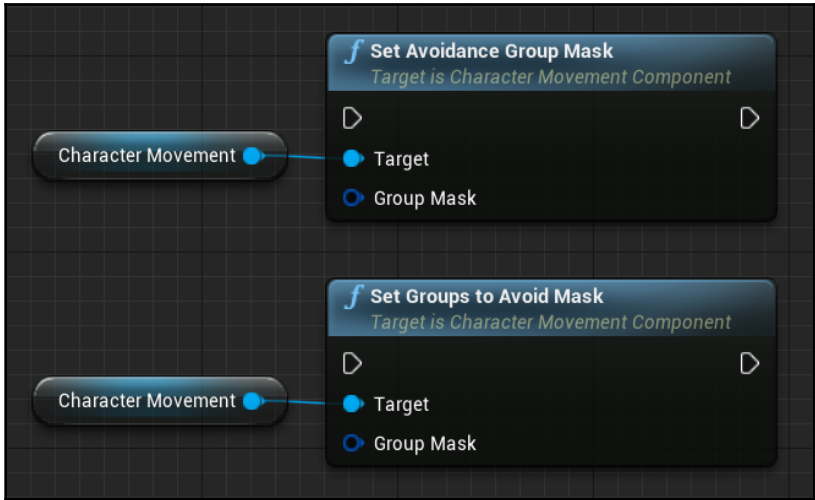
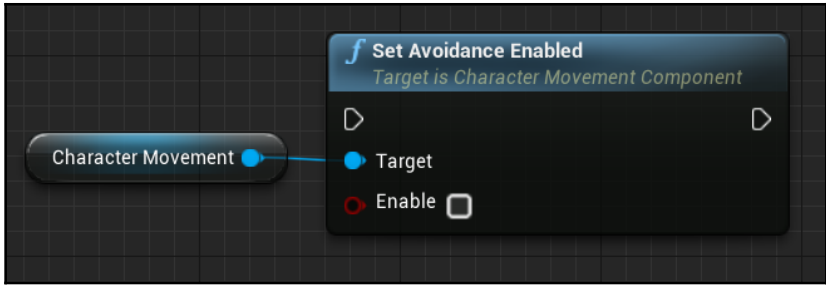
Character Movement

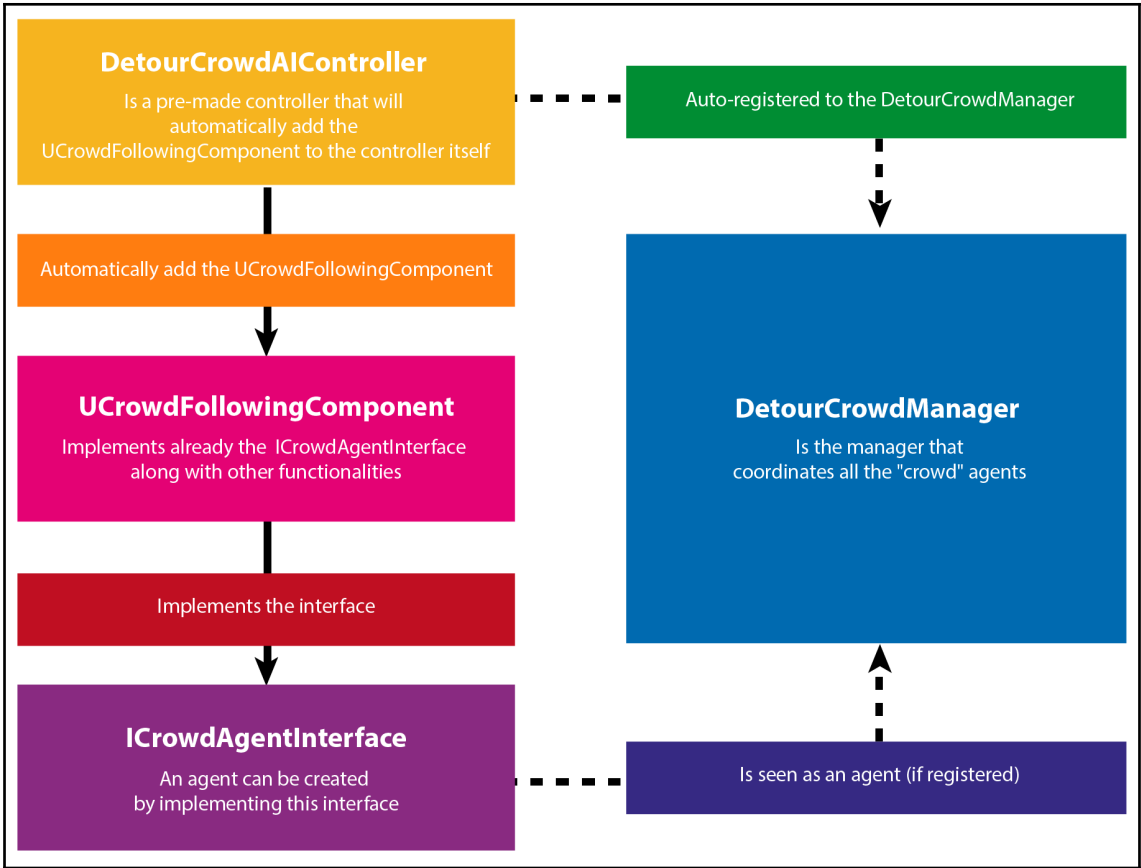
Actions taking a(n) Character Movement Component Object Reference  Context Sensitive


Search

Variables














- ▷ Activation
- ▷ Character Movement
- ▷ Character Movement (General Settings)
- ▷ Character Movement (Networking)
- ▷ Character Movement (Rotation Settings)
- ▷ Character Movement: Avoidance**
  - Get Avoidance Consideration Radius
  - Get Avoidance Group
  - Get Avoidance UID
  - Get Avoidance Weight
  - Get Groups to Avoid
  - Get Groups to Ignore
  - Get Use RVOAvoidance
- ▷ Character Movement: Custom Movement
- ▷ Character Movement: Flying
- ▷ Character Movement: Jumping / Falling





 Pick Parent Class ✕


▲ Common Classes

 Actor	An Actor is an object that can be placed or spawned in the world.	
 Pawn	A Pawn is an actor that can be 'possessed' and receive input from a controller.	
 Character	A character is a type of Pawn that includes the ability to walk around.	
 Player Controller	A Player Controller is an actor responsible for controlling a Pawn used by the player.	
 Game Mode Base	Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type.	
 Actor Component	An ActorComponent is a reusable component that can be added to any actor.	
 Scene Component	A Scene Component is a component that has a scene transform and can be attached to other scene components.	

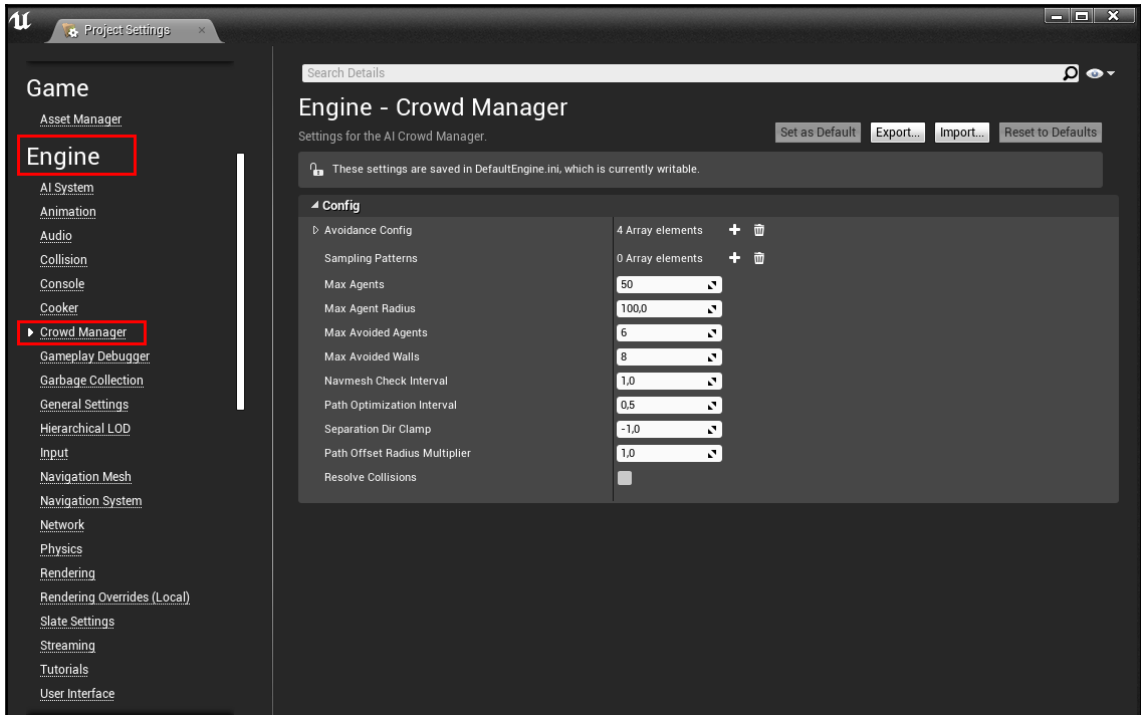
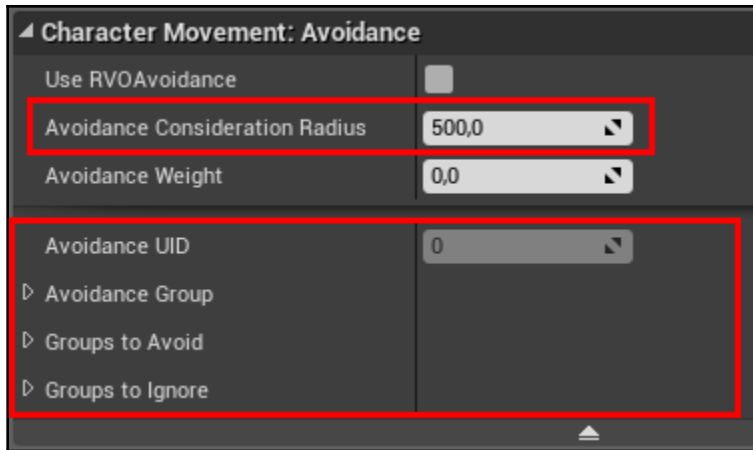
▲ All Classes

DetourCrowdAIController ✕

- Object
  - Actor
    - ▲ Controller
      - AIController
        - DetourCrowdAIController**

5 items (1 selected)  View Options ▾

Select Cancel





Search Details



# Engine - Crowd Manager

Settings for the AI Crowd Manager.

Set as Default

Export...

Import...

Reset to Defaults

🔒 These settings are saved in DefaultEngine.ini, which is currently writable.

## Config

### ▲ Avoidance Config

⋮ ▷ 0	4 Array elements	+	🗑️
⋮ ▷ 1	10 members	▼	
⋮ ▷ 2	10 members	▼	
⋮ ▷ 3	10 members	▼	

### Sampling Patterns

Max Agents

Max Agent Radius

Max Avoided Agents

Max Avoided Walls

Navmesh Check Interval

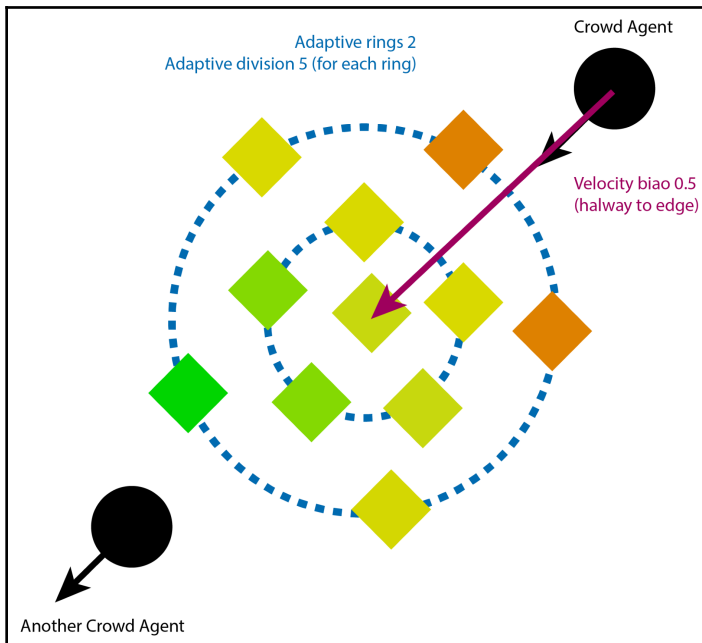
Path Optimization Interval

Separation Dir Clamp

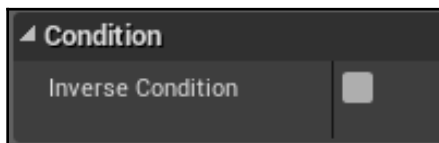
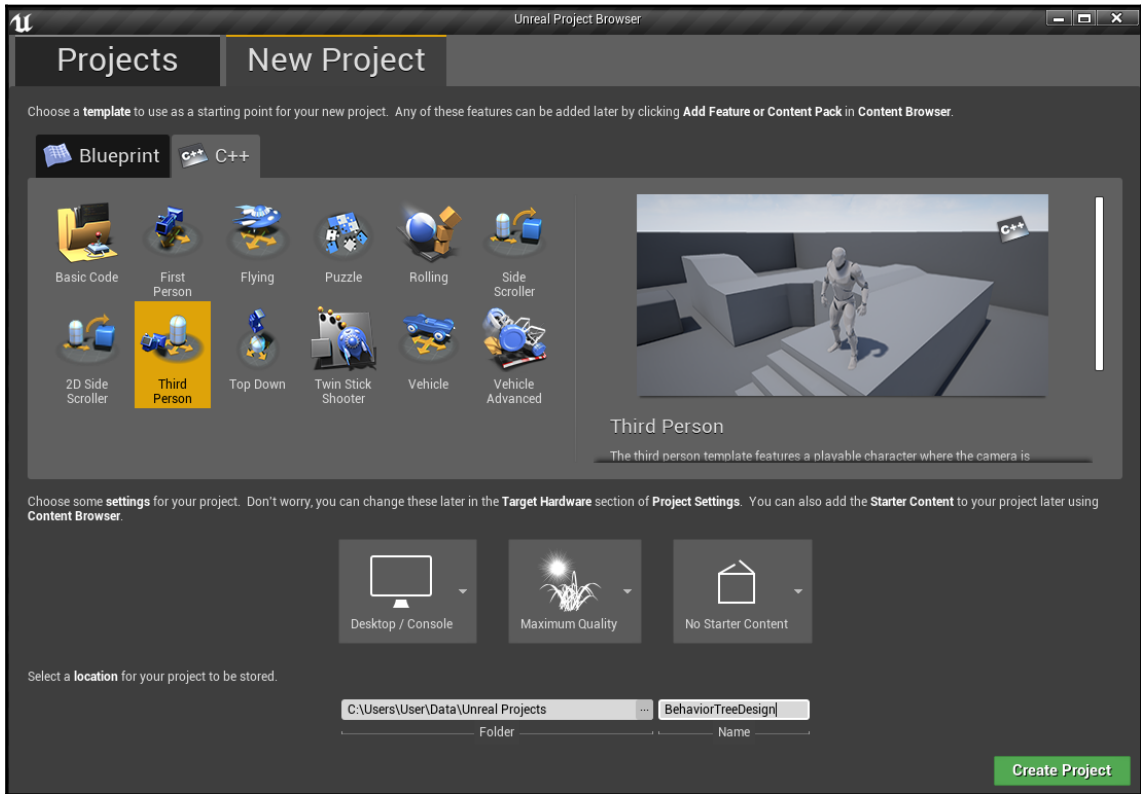
Path Offset Radius Multiplier

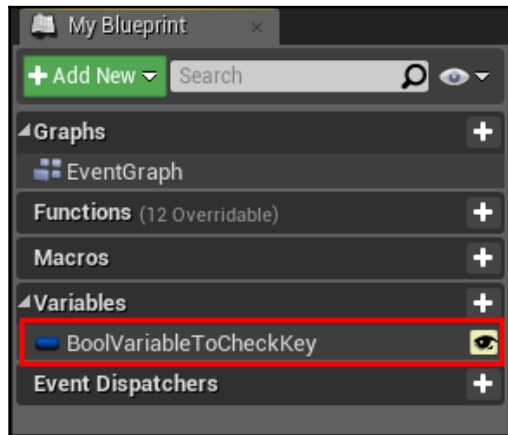
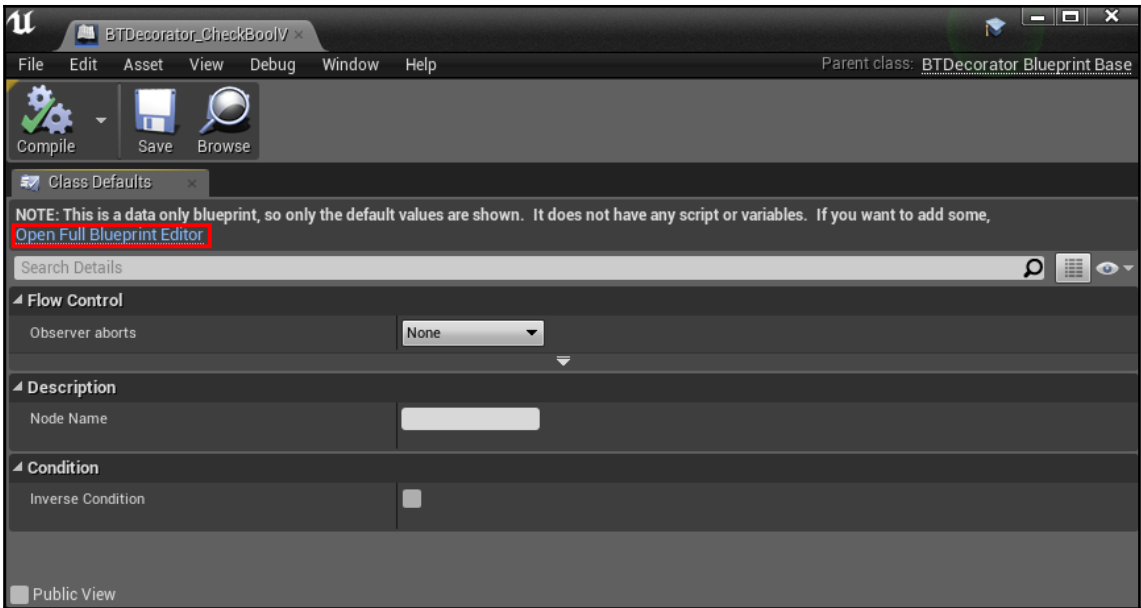
Resolve Collisions

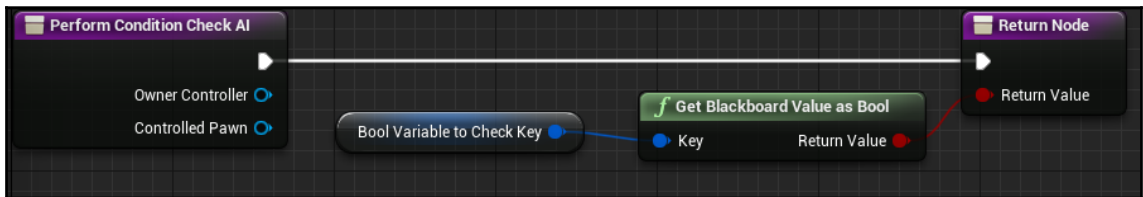
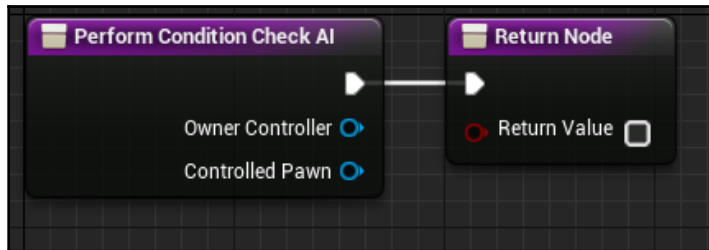
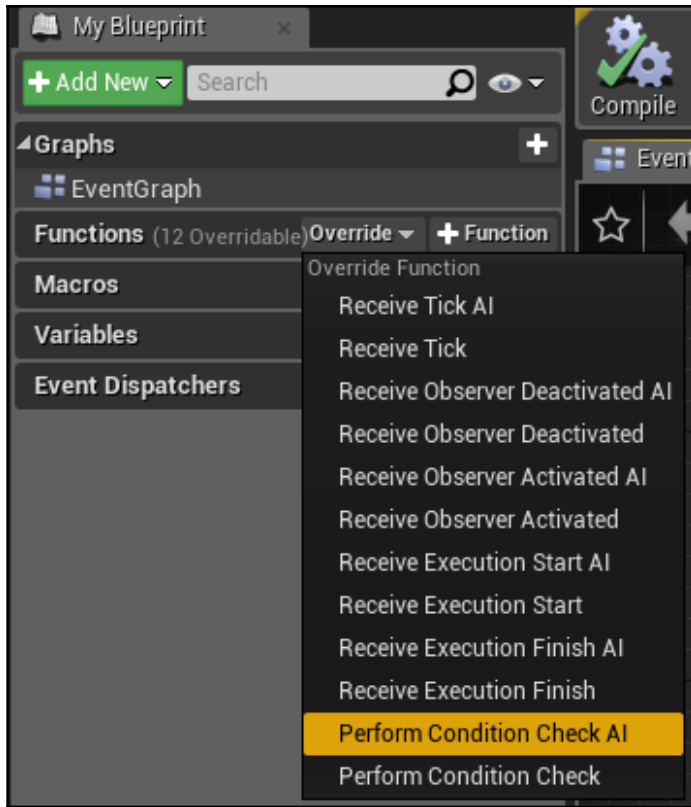
Avoidance Config		4 Array elements +
0	10 members	
Velocity Bias	0,5	
Desired Velocity Weight	2,0	
Current Velocity Weight	0,75	
Side Bias Weight	0,75	
Impact Time Weight	2,5	
Impact Time Range	2,5	
Custom Pattern Idx	255	
Adaptive Divisions	5	
Adaptive Rings	2	
Adaptive Depth	1	
1	10 members	
2	10 members	
3	10 members	

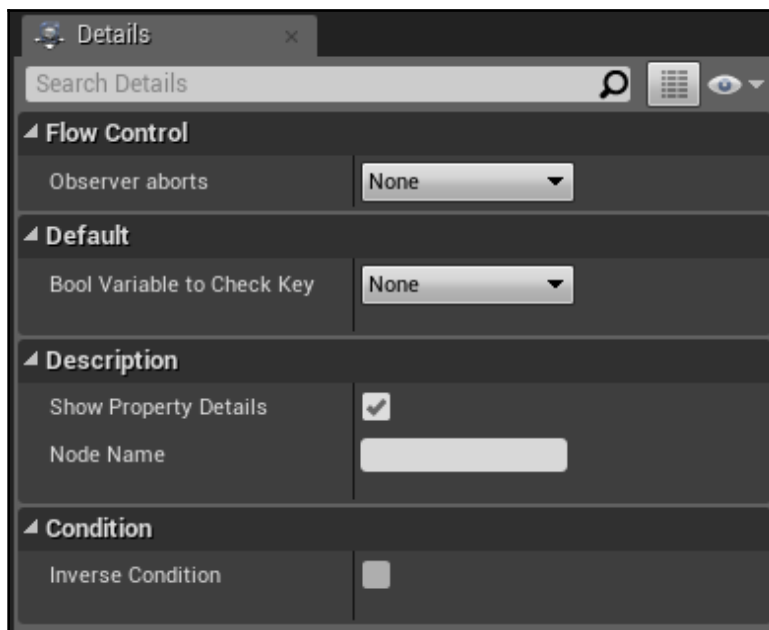
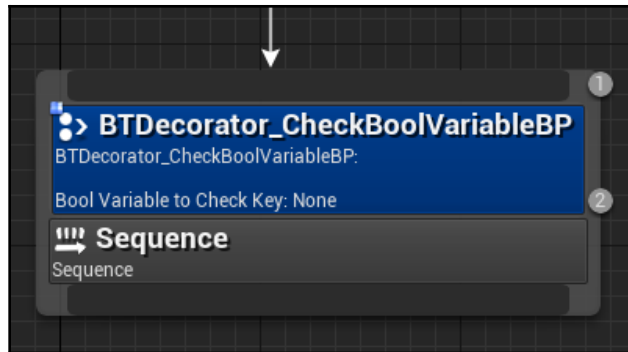


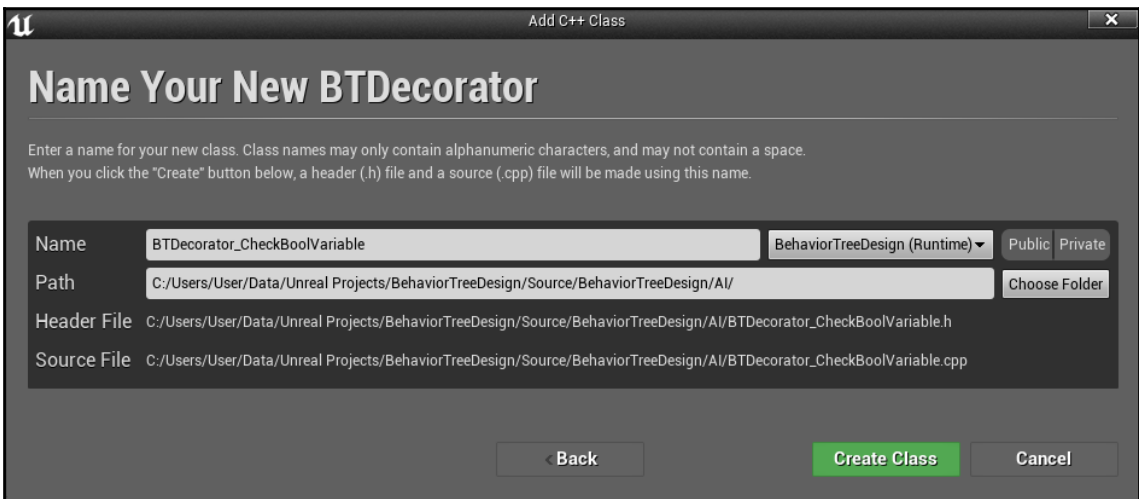
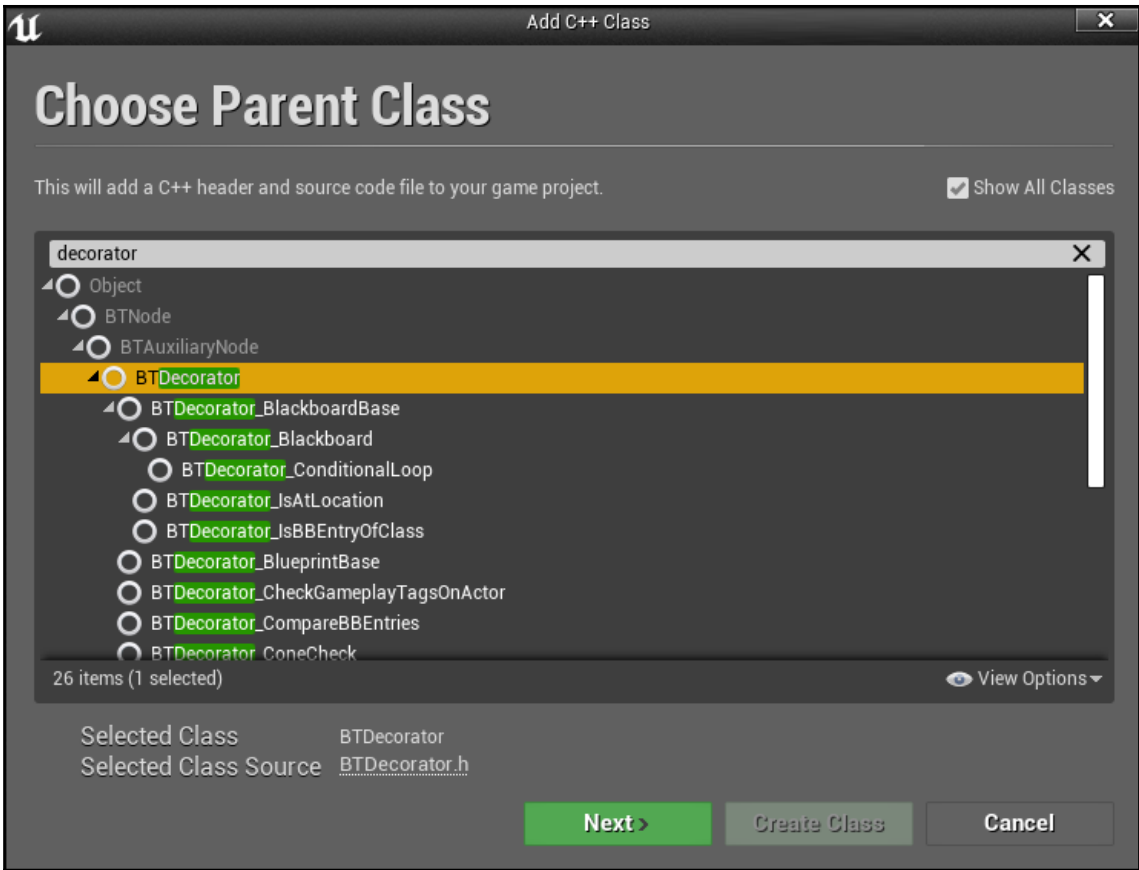
# Chapter 8: Designing Behavior Trees - Part I

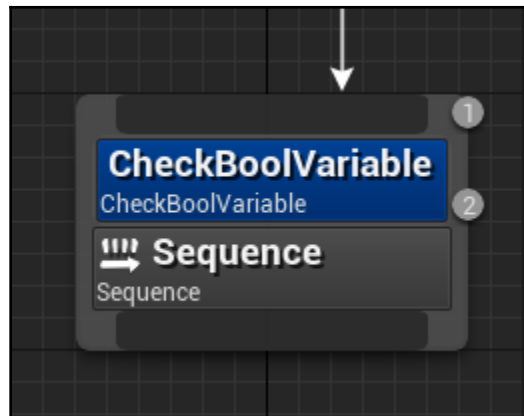
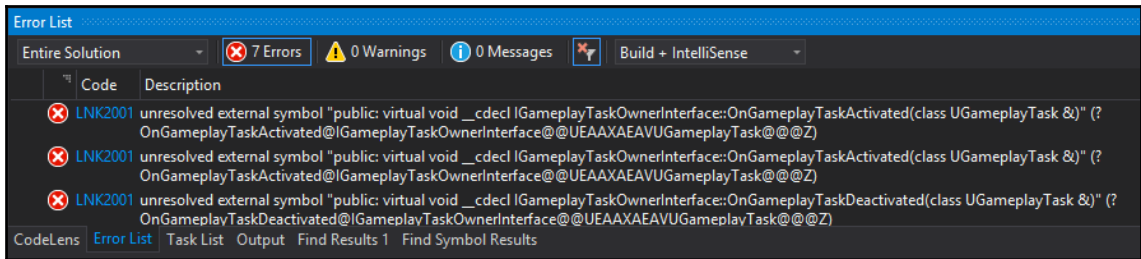
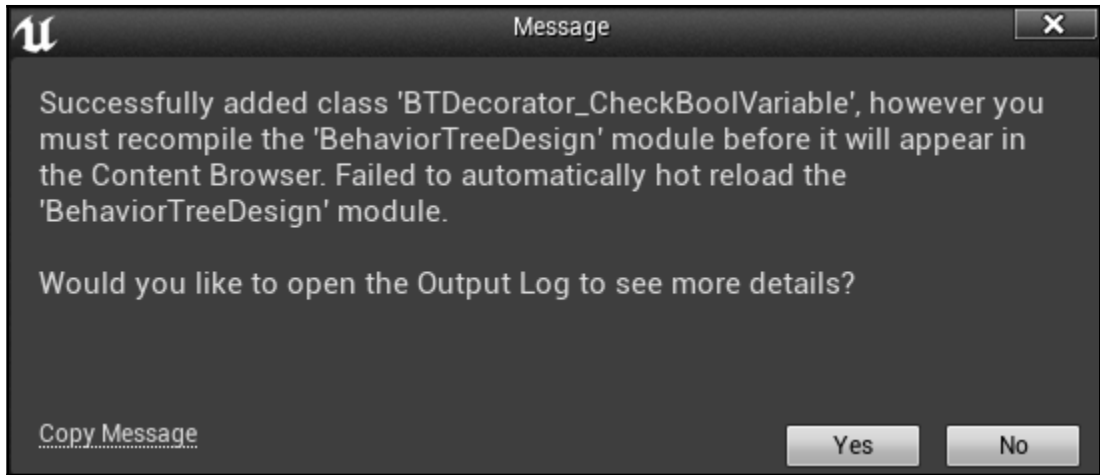




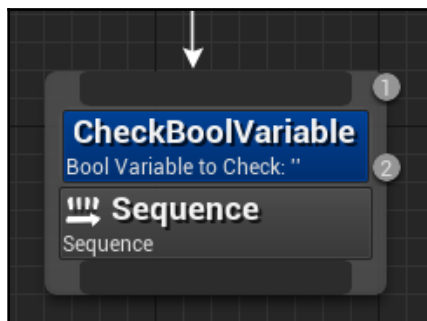
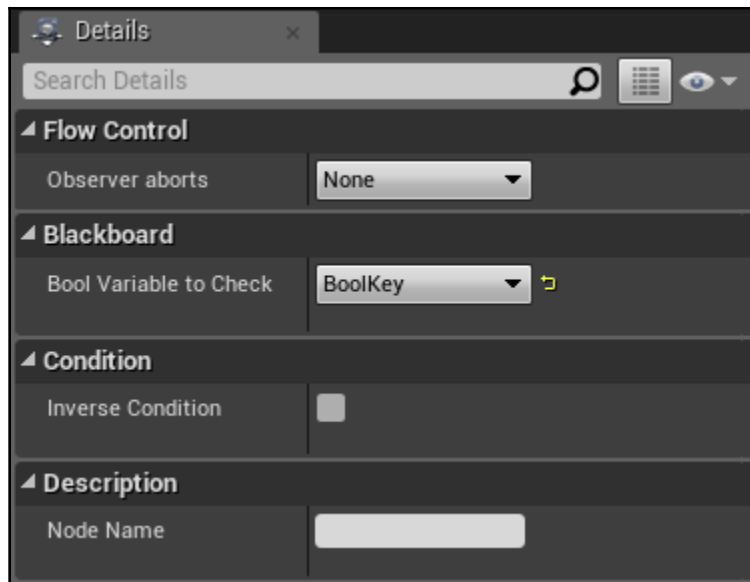


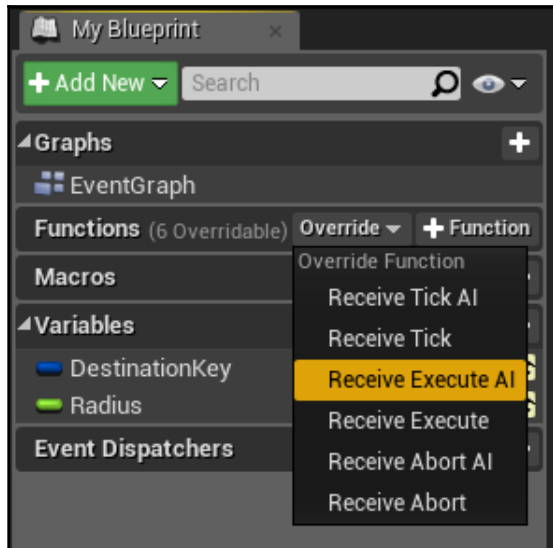
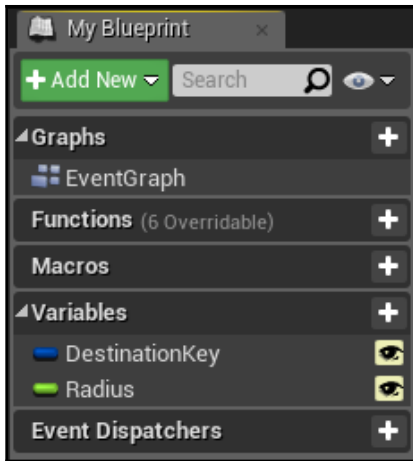








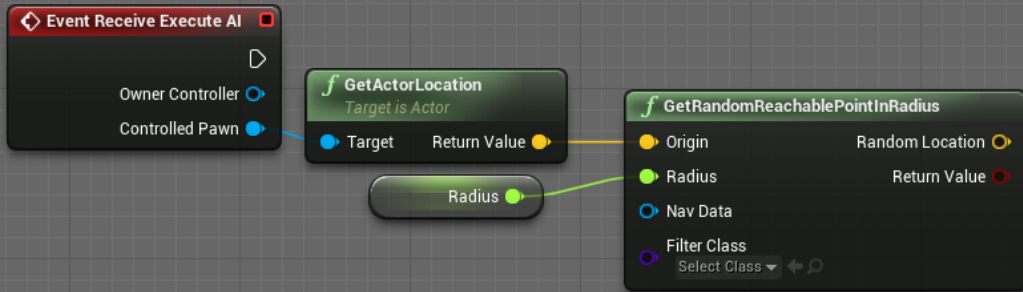




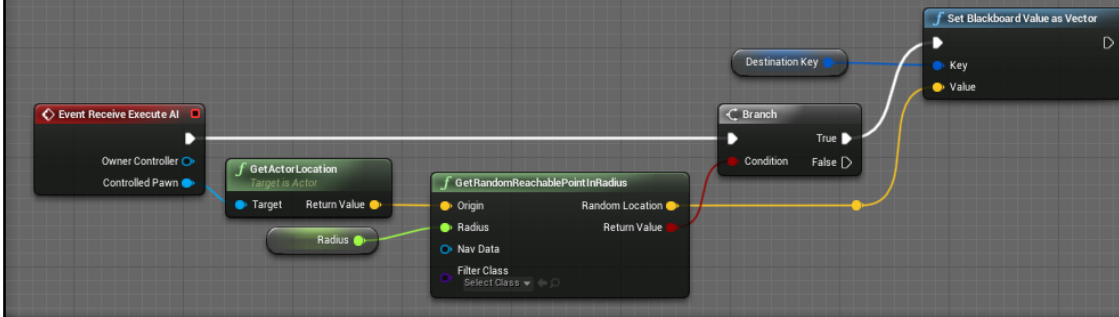
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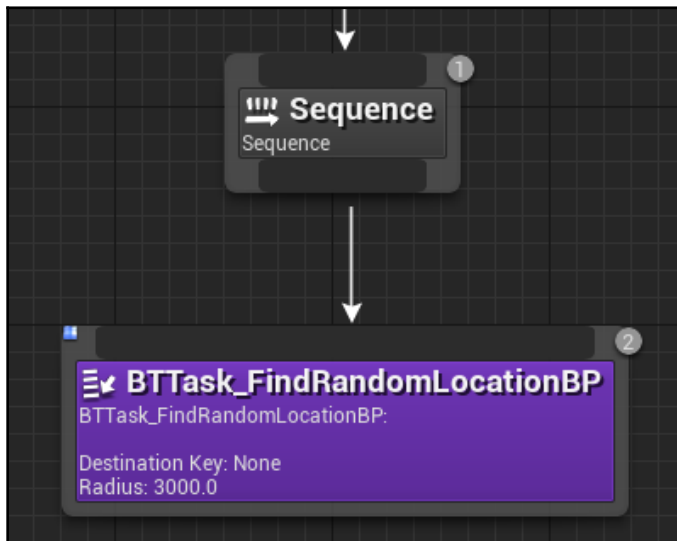
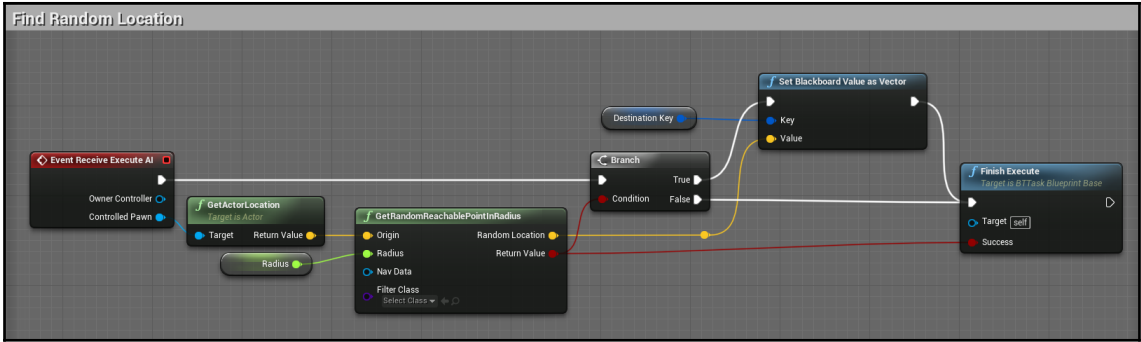


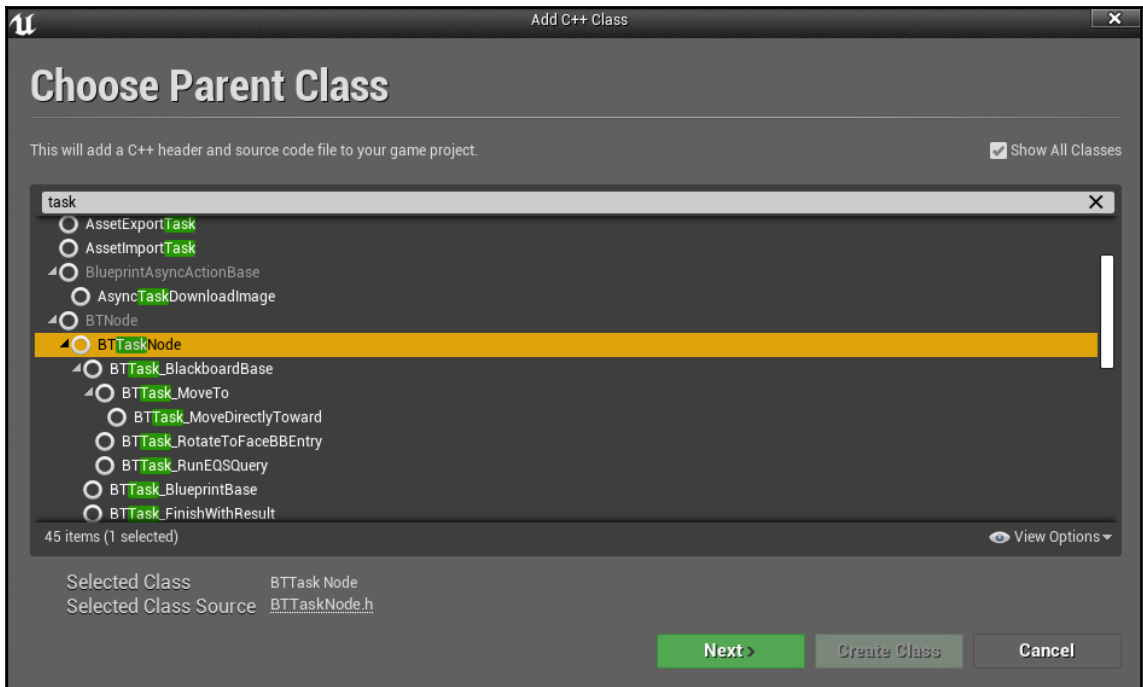
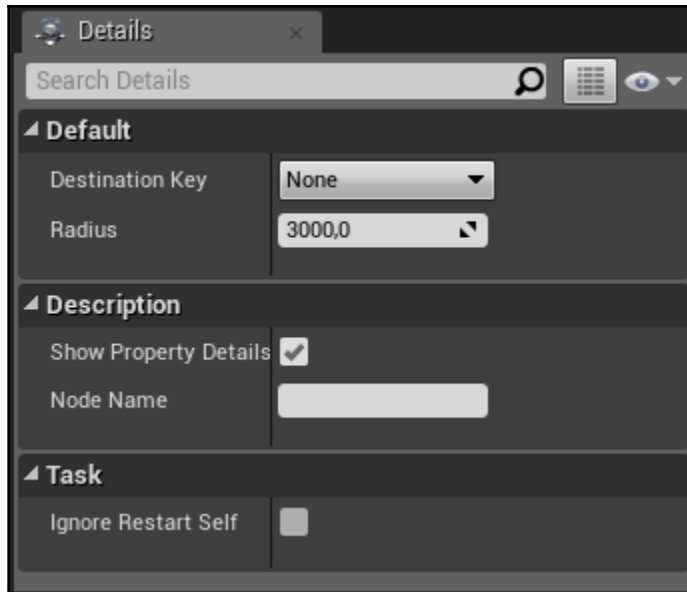
# Find Random Location

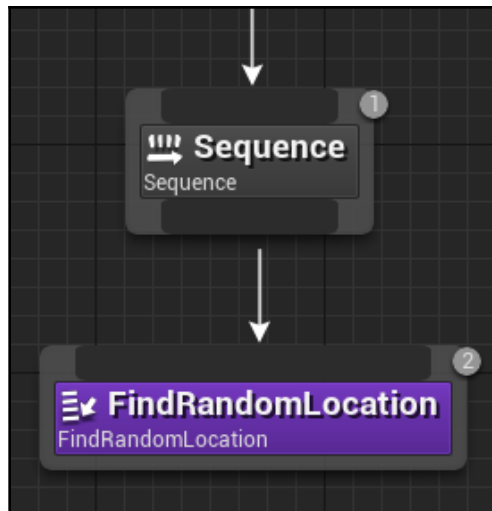
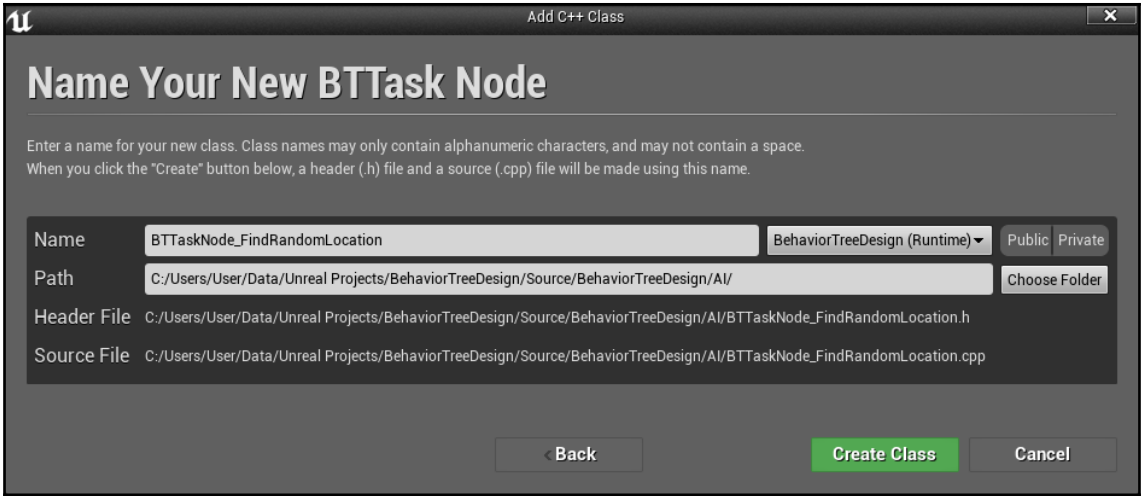


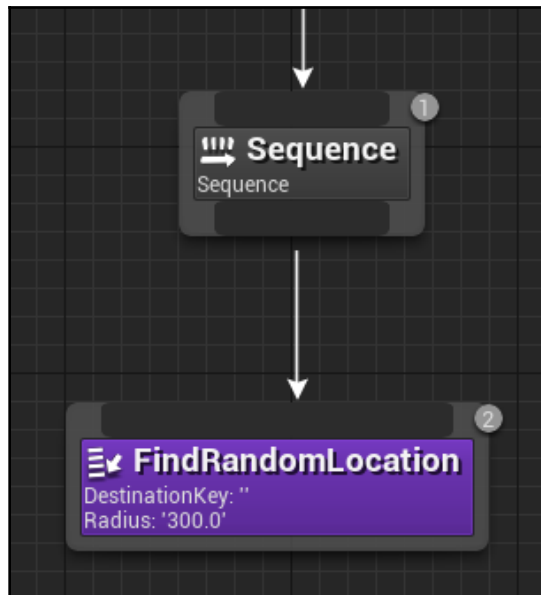
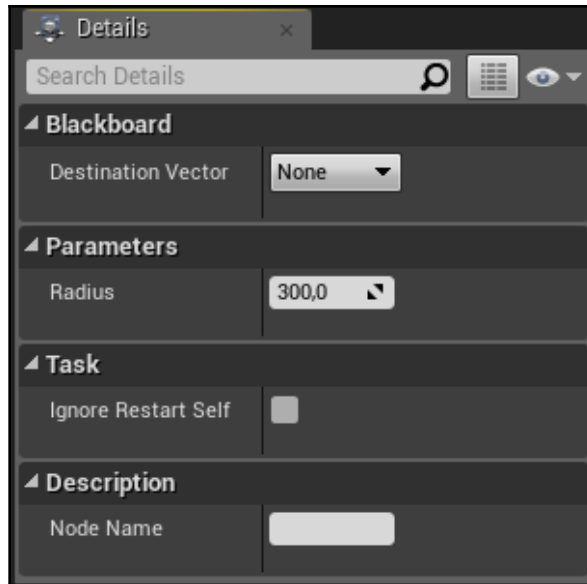
# Find Random Location











**u** Pick Parent Class ✕

▲ Common Classes

<input type="radio"/> Actor	An Actor is an object that can be placed or spawned in the world.	?
<input type="radio"/> Pawn	A Pawn is an actor that can be 'possessed' and receive input from a controller.	?
<input type="radio"/> Character	A character is a type of Pawn that includes the ability to walk around.	?
<input type="radio"/> Player Controller	A Player Controller is an actor responsible for controlling a Pawn used by the player.	?
<input type="radio"/> Game Mode Base	Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type.	
<input type="radio"/> Actor Component	An ActorComponent is a reusable component that can be added to any actor.	?
<input type="radio"/> Scene Component	A Scene Component is a component that has a scene transform and can be attached to other scene components.	?

▲ All Classes

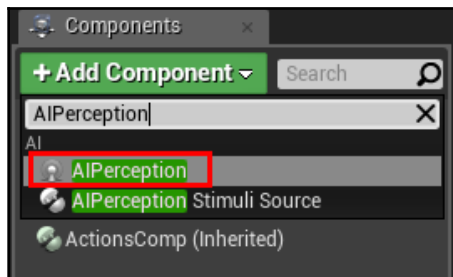
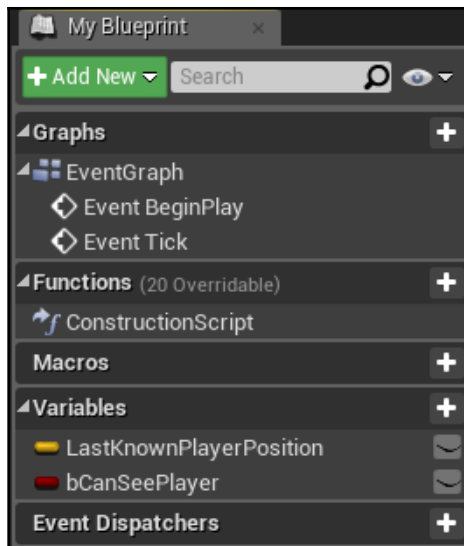
AIController ✕

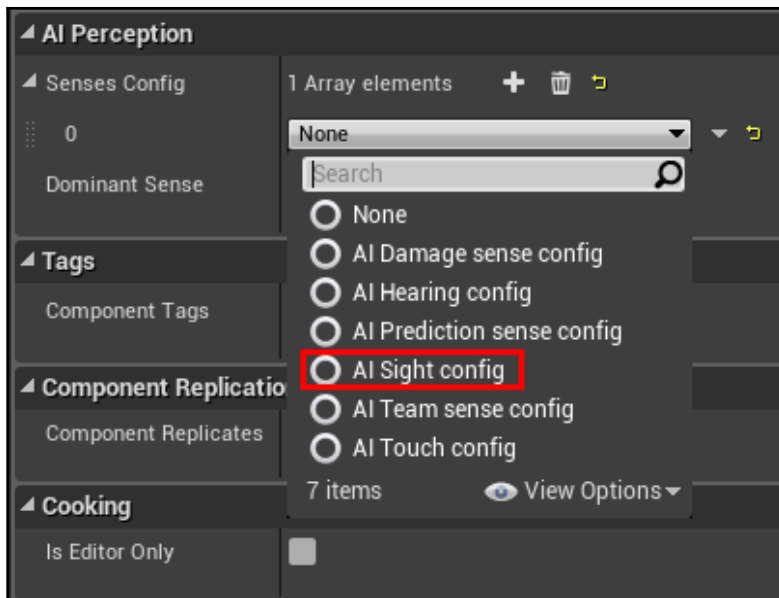
- Object
  - ▲ Actor
    - ▲ Controller
      - ▲ AIController (Selected)
      - ▶ DetourCrowdAIController
      - ▶ GridPathAIController
    - NavigationQueryFilter
    - NavFilter\_AIControllerDefault

8 items (1 selected) View Options ▾

Select Cancel








### AI Perception









Senses Config 1 Array elements + -

0 AI Sight config -

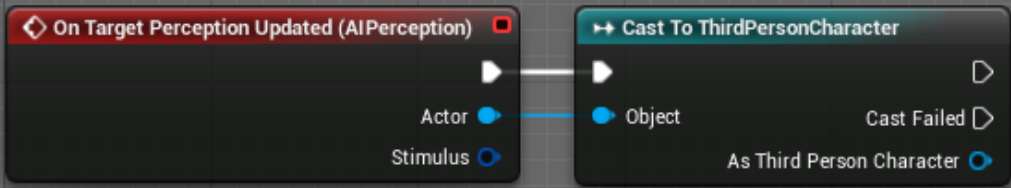
#### Sense

Implementation	AI Sense_Sight
Sight Radius	3000,0
Lose Sight Radius	3500,0
PeripheralVisionHalfAngleDegrees	90,0
<b>Detection by Affiliation</b>	
Detect Enemies	<input checked="" type="checkbox"/>
Detect Neutrals	<input checked="" type="checkbox"/>
Detect Friendlies	<input checked="" type="checkbox"/>
Auto Success Range from Last Seen Location	-1,0
Debug Color	
Max Age	0,0
Starts Enabled	<input checked="" type="checkbox"/>
Dominant Sense	None

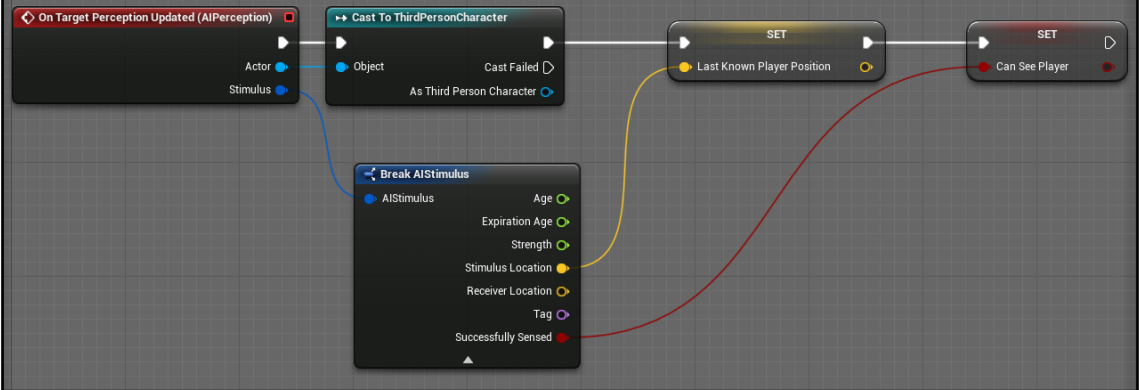
### Events

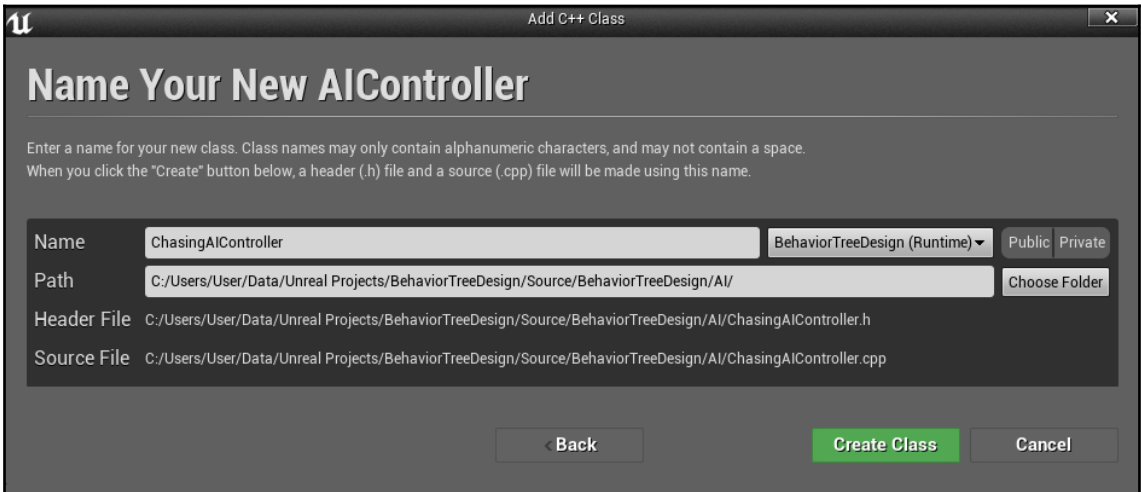
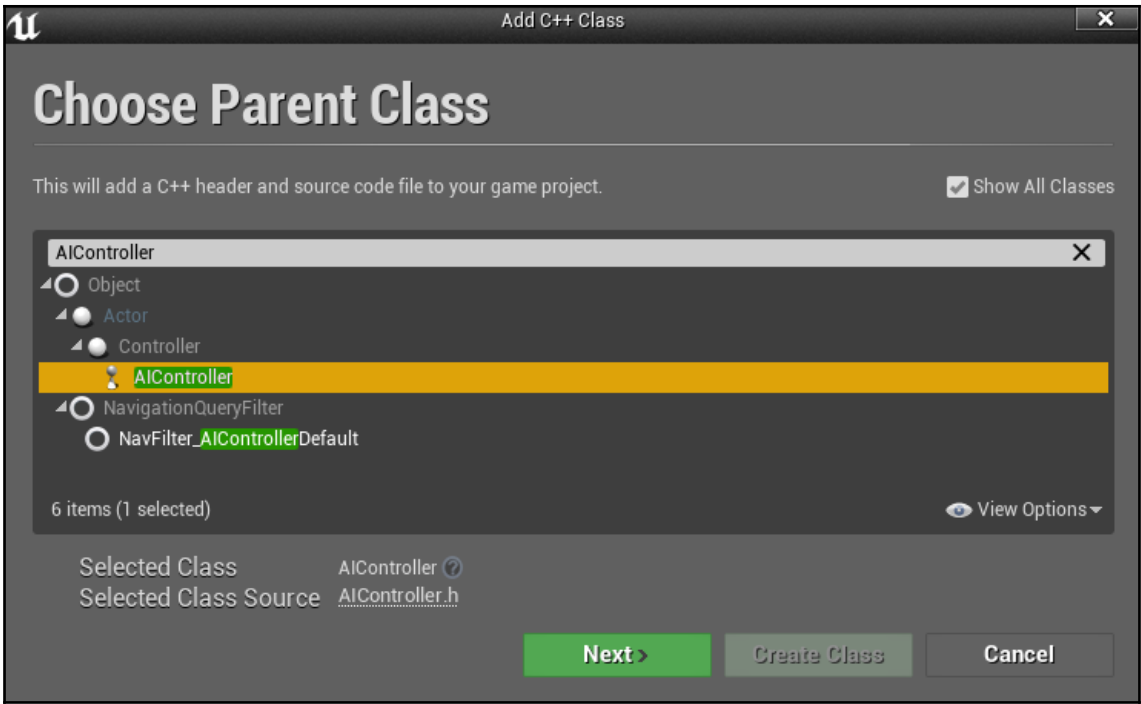
 On Perception Updated	
 On Target Perception Updated	
 On Component Activated	
 On Component Deactivated	

# Update Perception Variables



# Update Perception Variables

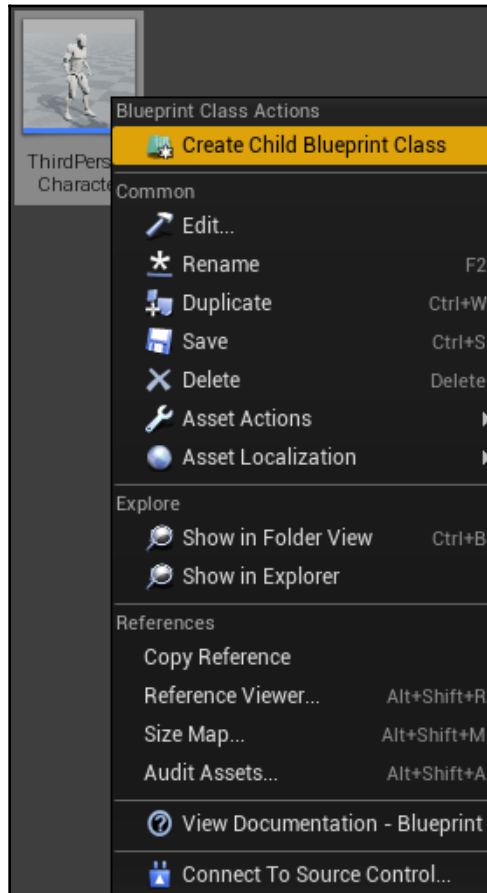


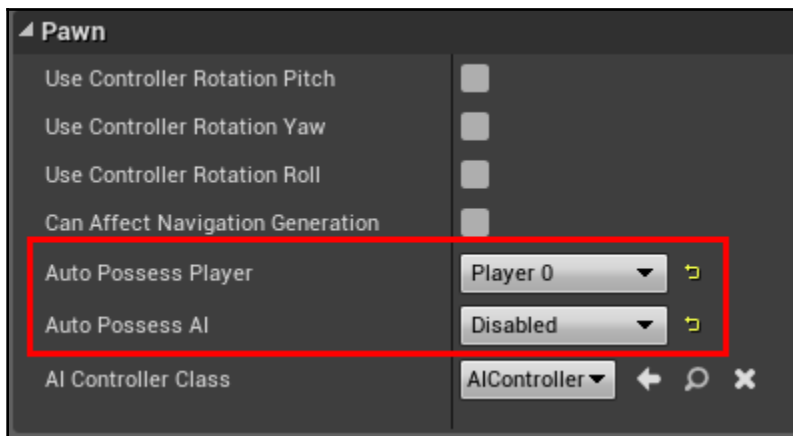
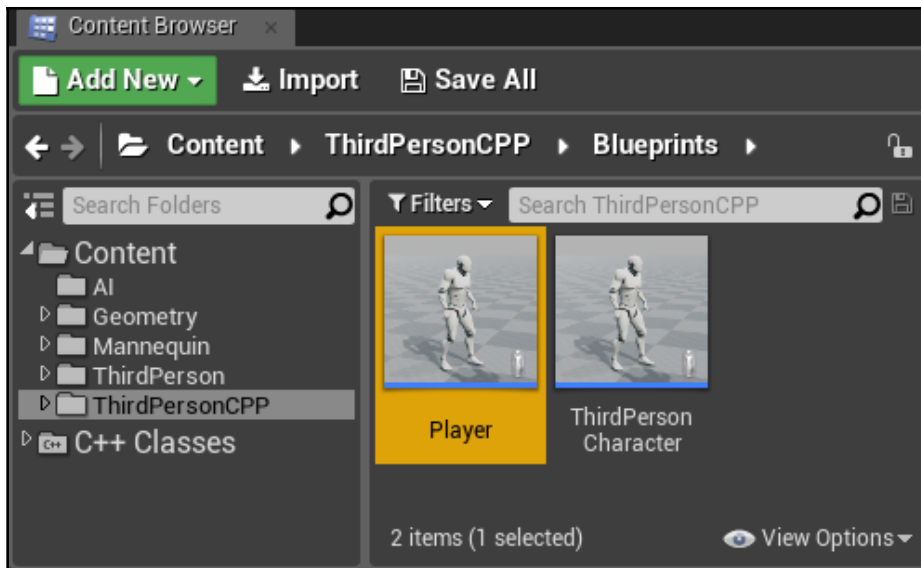


▲ Pawn

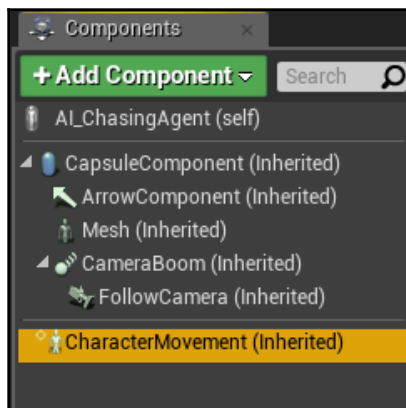
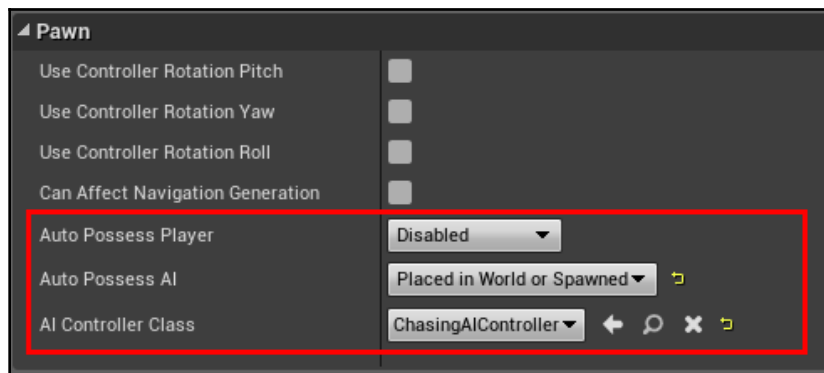
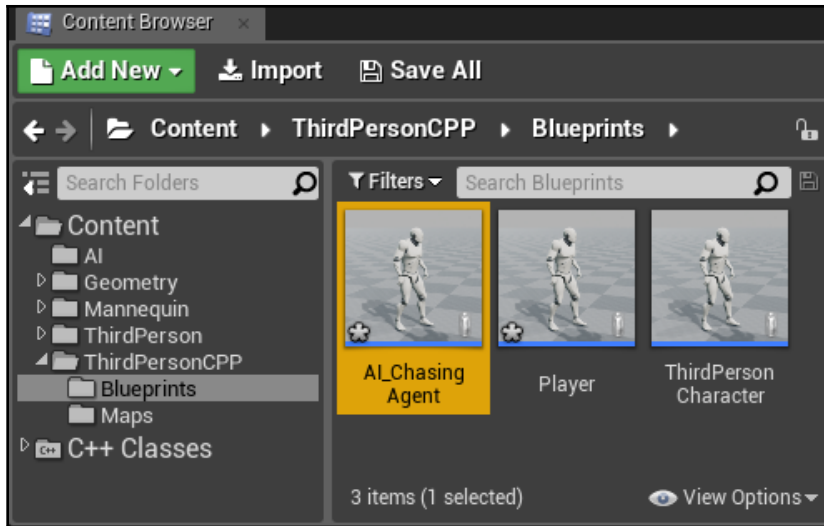
Use Controller Rotation Pitch	<input type="checkbox"/>
Use Controller Rotation Yaw	<input type="checkbox"/>
Use Controller Rotation Roll	<input type="checkbox"/>
Can Affect Navigation Generation	<input type="checkbox"/>
Auto Possess Player	Disabled ▾
Auto Possess AI	Placed in World or Spawned ▾ ↗
AI Controller Class	ChasingAIController ▾ ← ↻ × ↗

# Chapter 9: Designing Behavior Trees - Part II





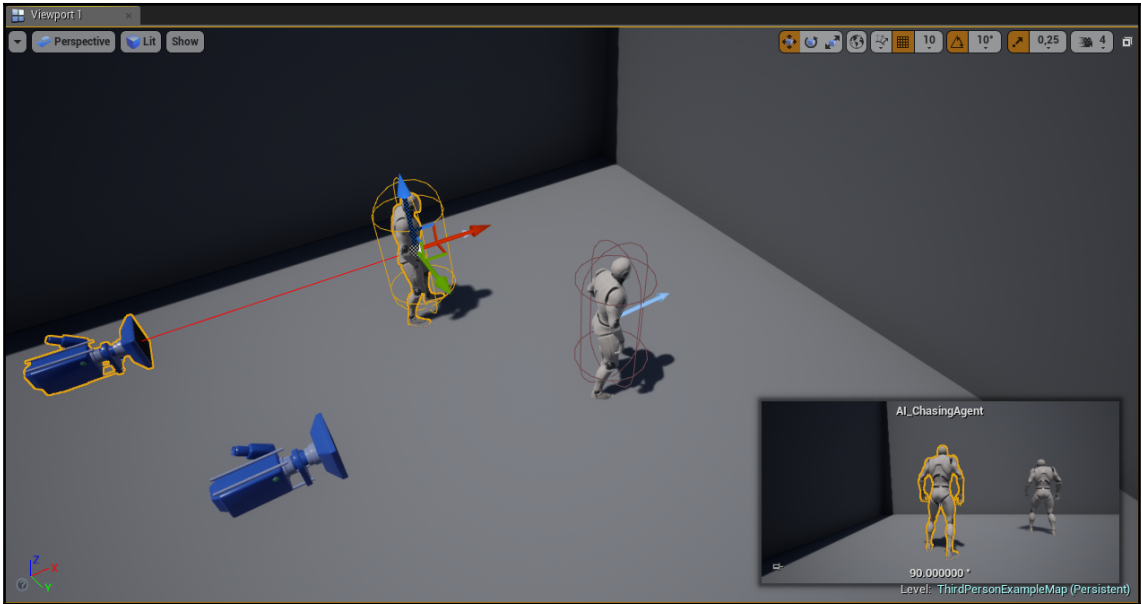


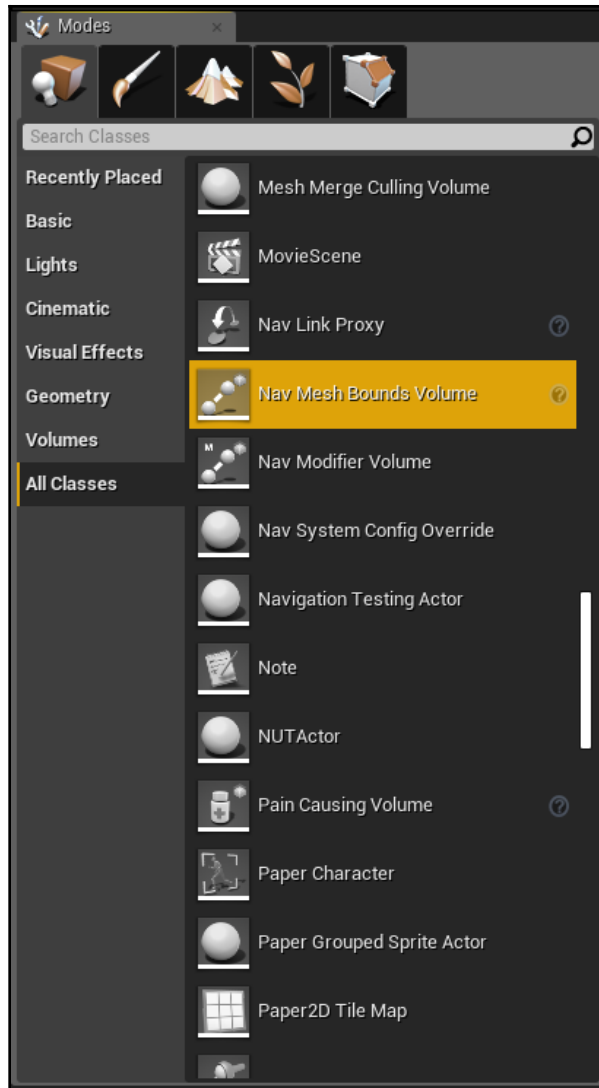


Character Movement: Avoidance

Use RVOAvoidance	<input checked="" type="checkbox"/>	↕
Avoidance Consideration Radius	500,0	↕
Avoidance Weight	0,0	↕









Variables

- CanSeePlayerKey
- PlayerKey
- LastKnownPositionKey
- LastCanSeePlayer

My Blueprint

+ Add New Search

Graphs

EventGraph

Functions (8 Overridable) Override + Function

Macros

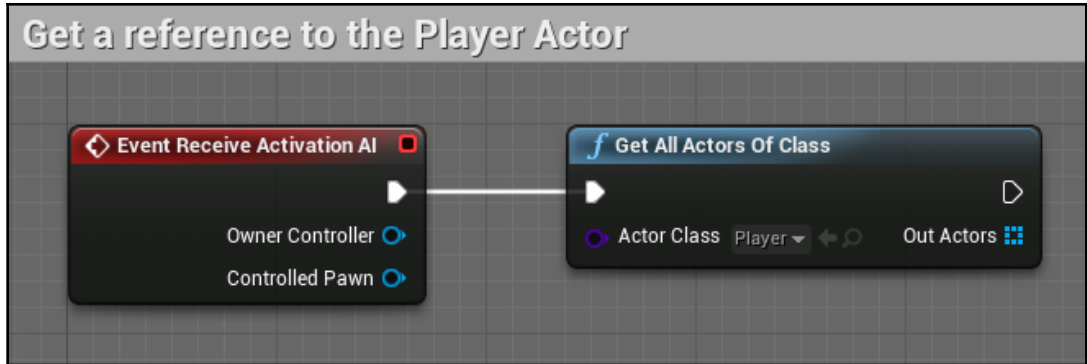
Variables

- CanSeePlayerKey
- PlayerKey
- LastKnownPositionKey
- LastCanSeePlayer

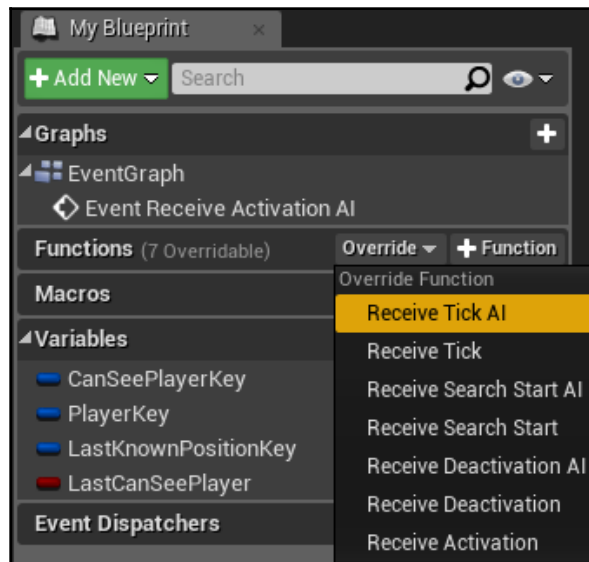
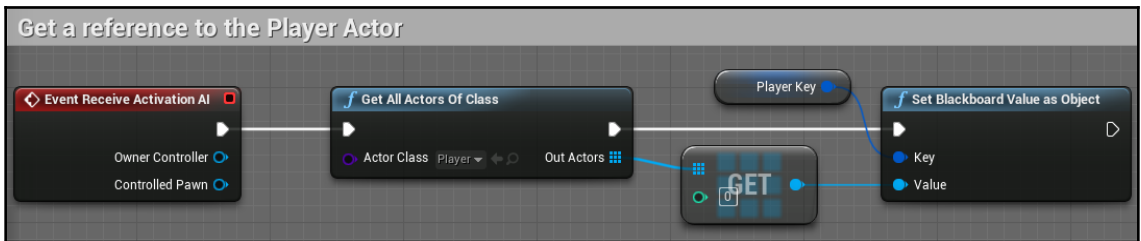
Event Dispatchers

- Receive Activation AI
- Receive Activation

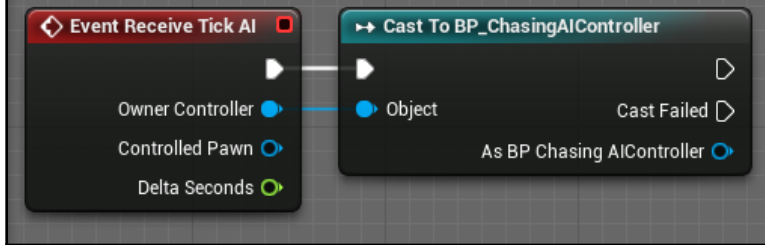
## Get a reference to the Player Actor



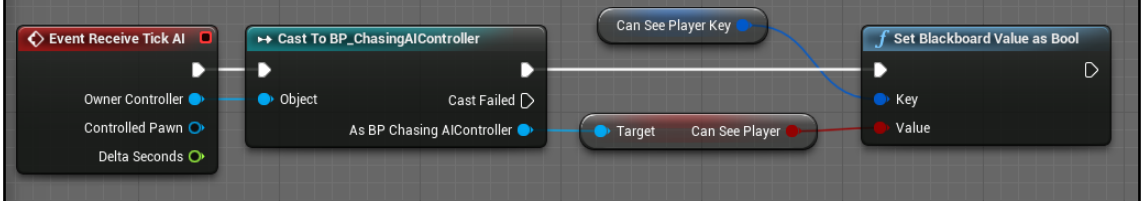
## Get a reference to the Player Actor



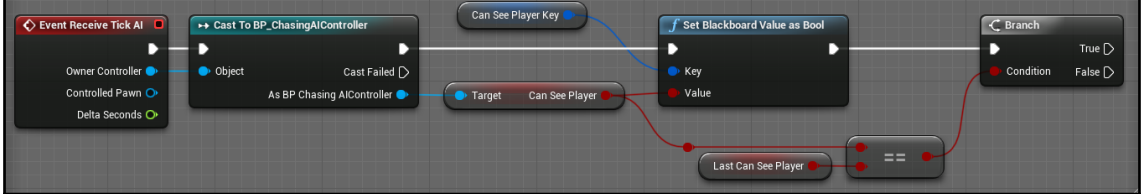
## Update Blackboard Values



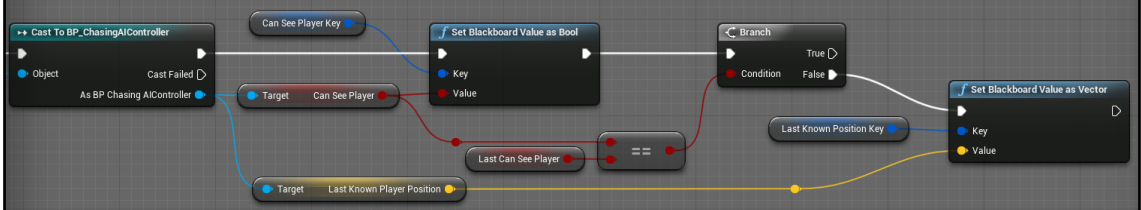
## Update Blackboard Values

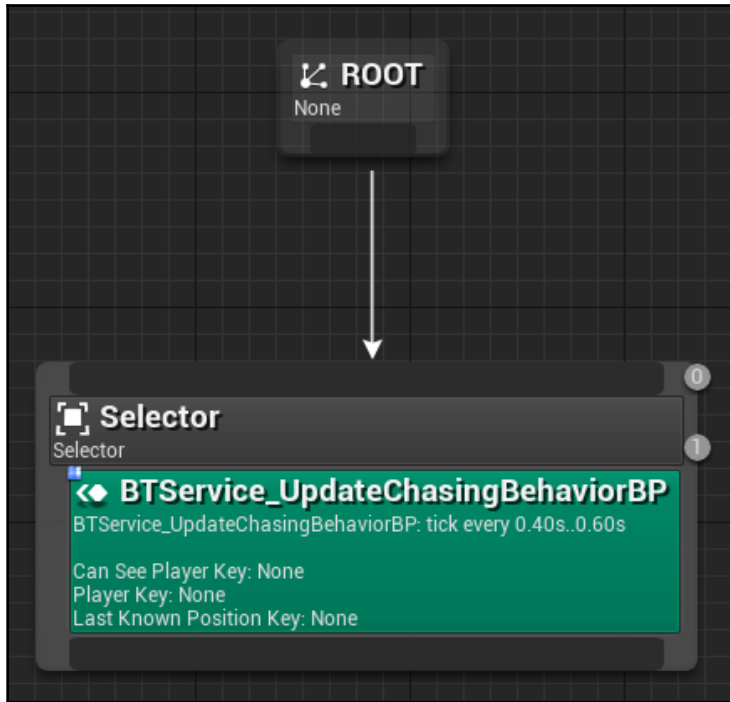
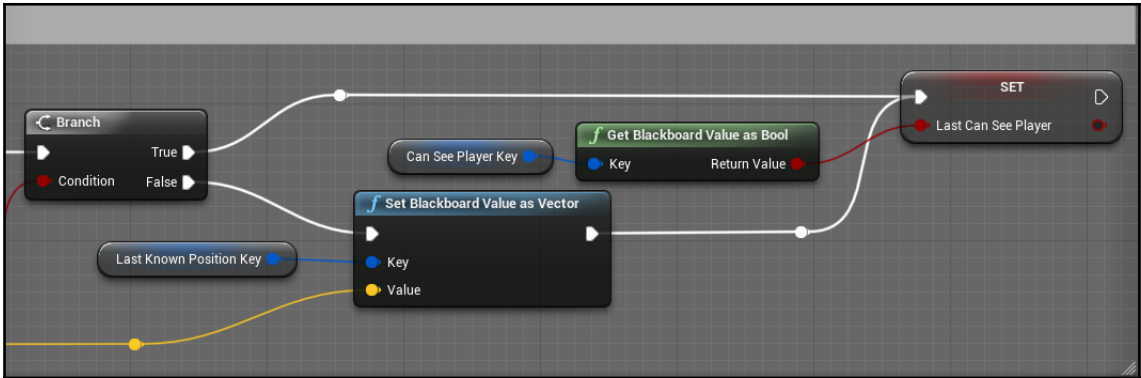


## Update Blackboard Values



## Values







Details x

Search Details 🔍

☰ 👁

### Default

Can See Player Key	None ▼
Player Key	None ▼
Last Known Position	None ▼

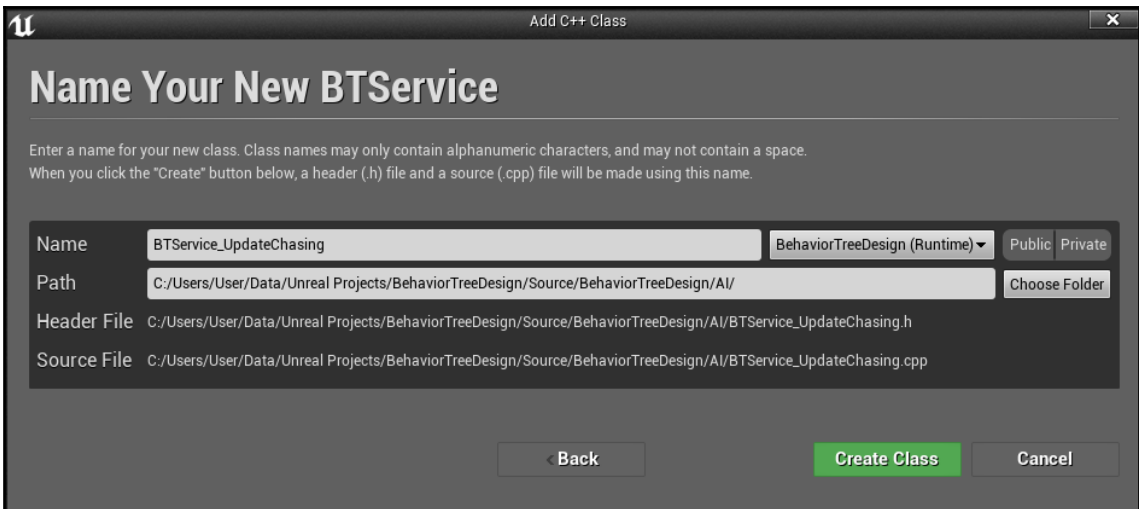
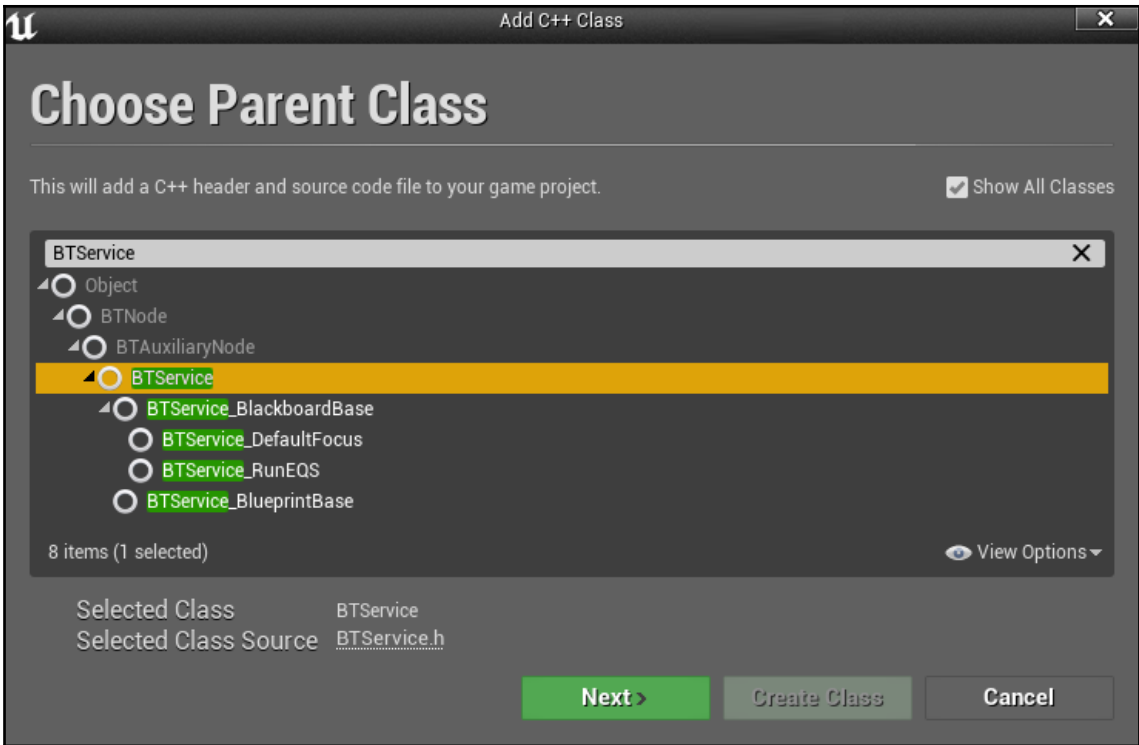
### Description

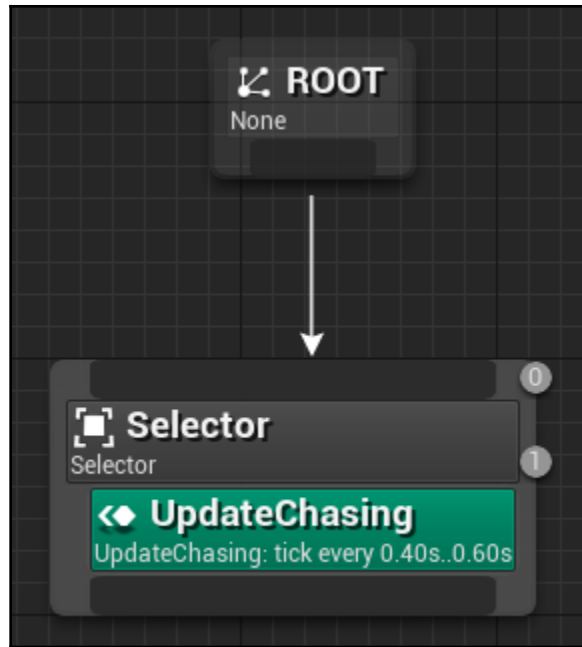
Show Property Details	<input checked="" type="checkbox"/>
Show Event Details	<input type="checkbox"/>
Node Name	<input type="text"/>

### Service

Interval	0,5 ▼
Random Deviation	0,1 ▼

▼





Details

Search Details

Player Class

Player Class  ← 🔍 + × ↶

Blackboard

Can See Player Key  ▼

Player Key  ▼

Last Known Position Key  ▼

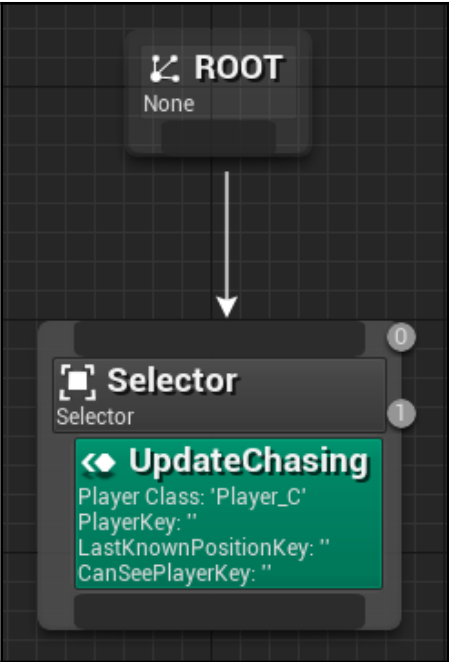
Service

Interval  ▼

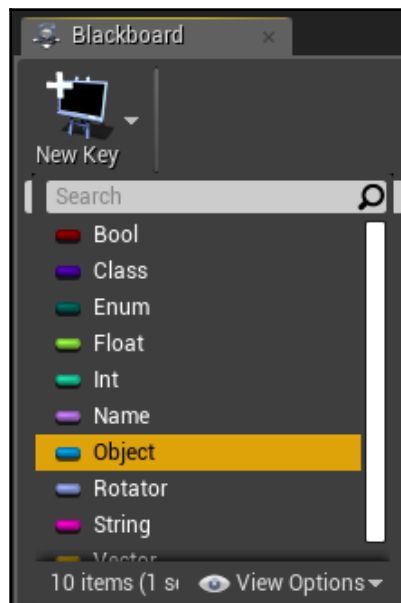
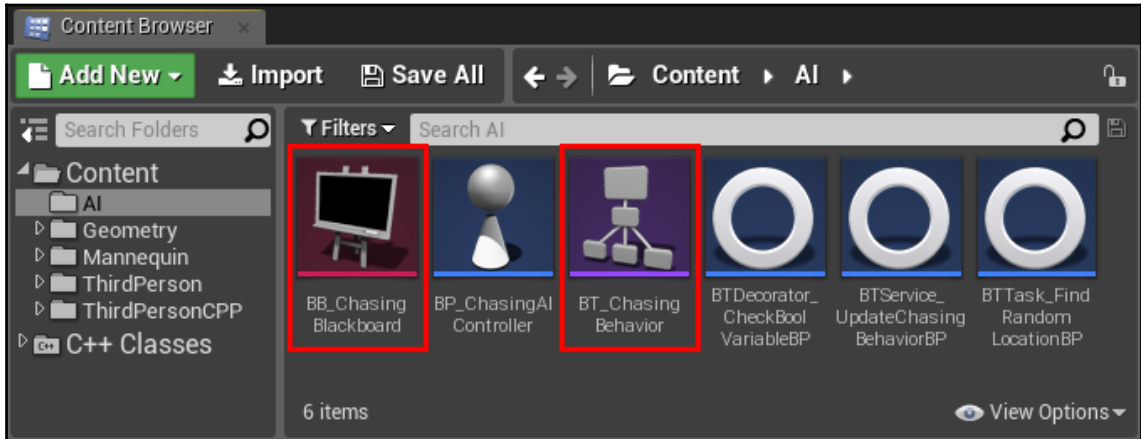
Random Deviation  ▼

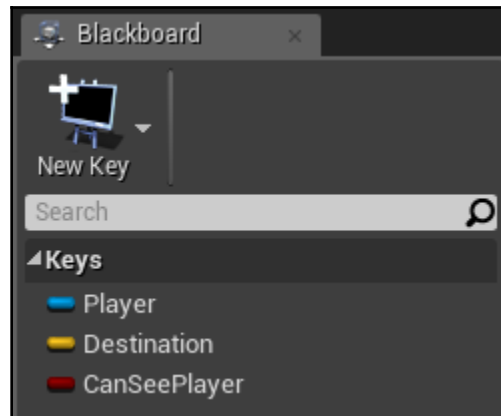
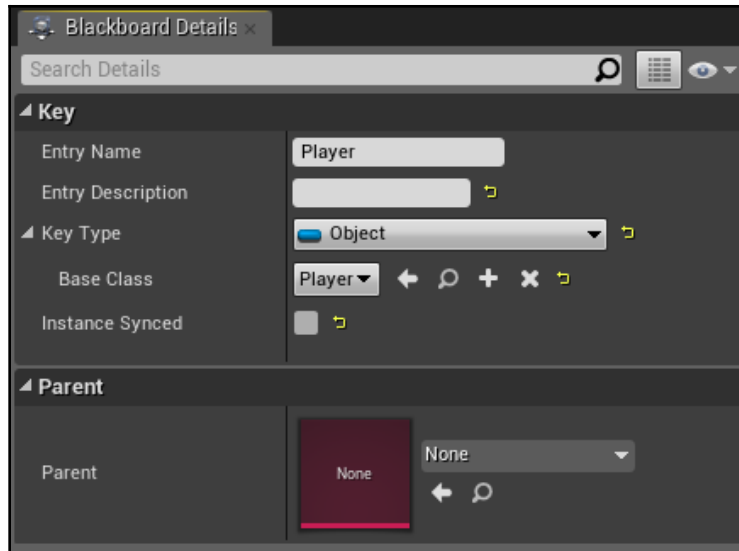
Description

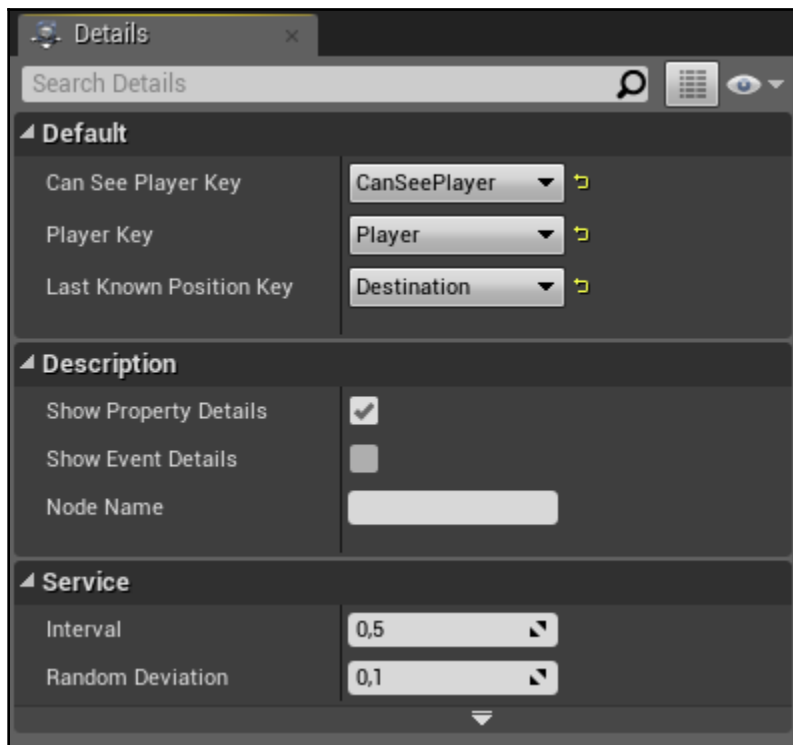
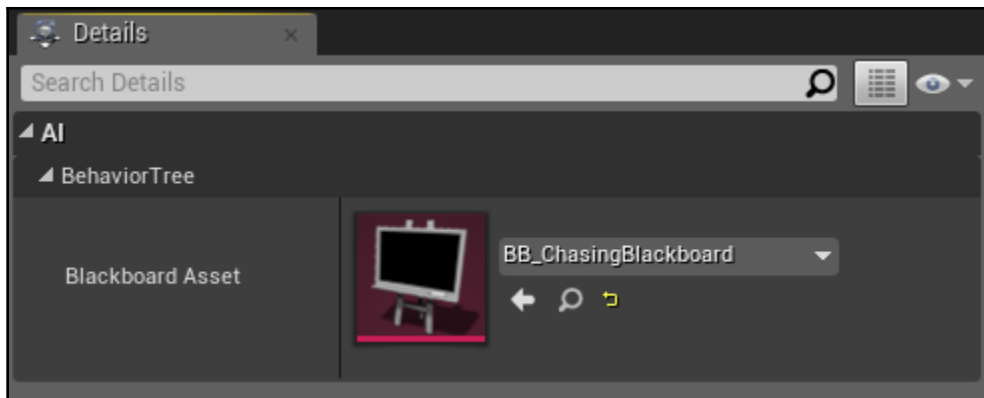
Node Name



# Chapter 10: Designing Behavior Trees - Part III







Details

Search Details

Player Class

Player Class  ← 🔍 + × ↻

Blackboard

Can See Player Key  ↻

Player Key  ↻

Last Known Position Key  ↻

Service

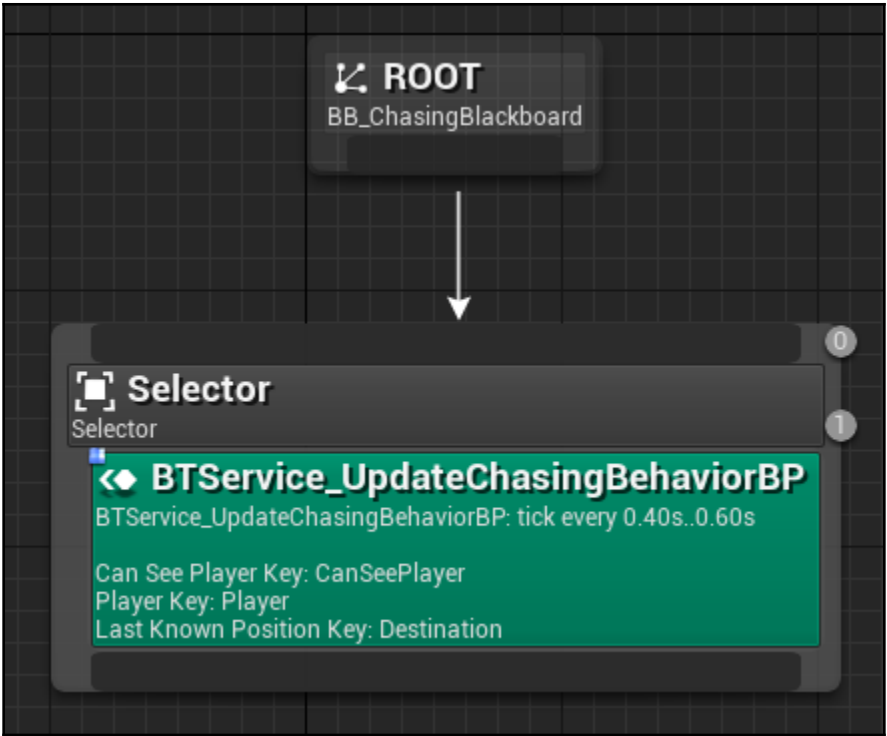
Interval  ↕

Random Deviation  ↕

Description

Node Name





Details

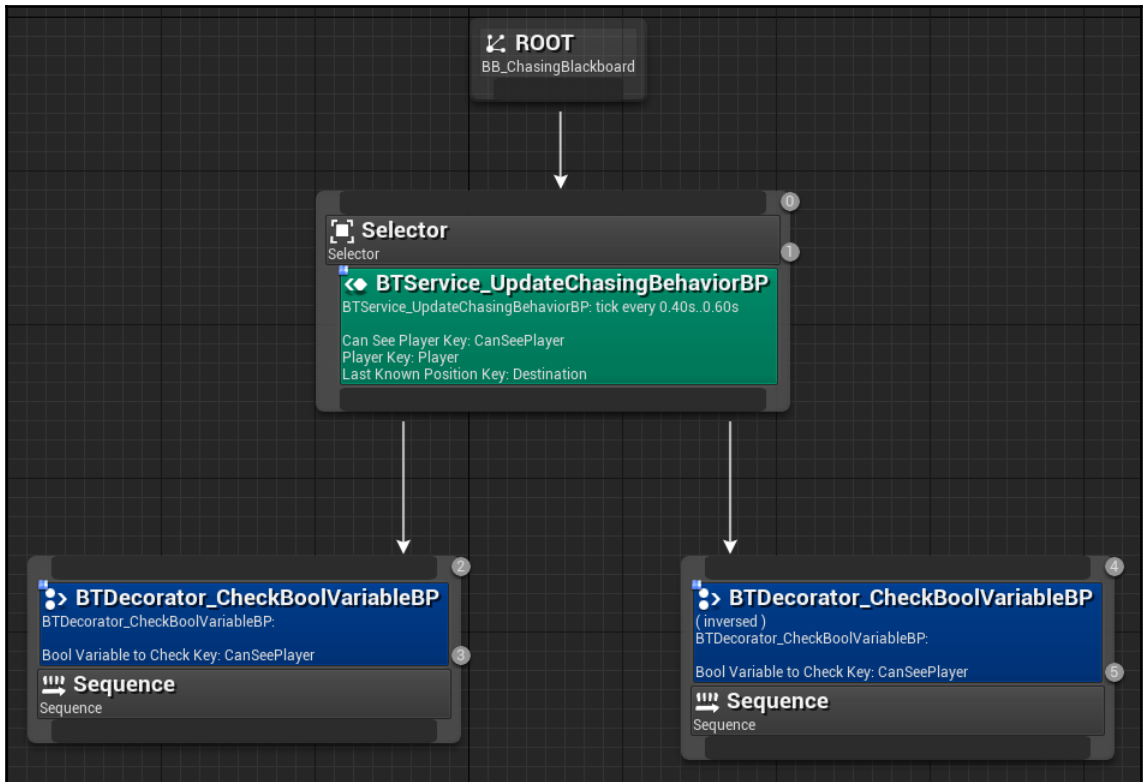
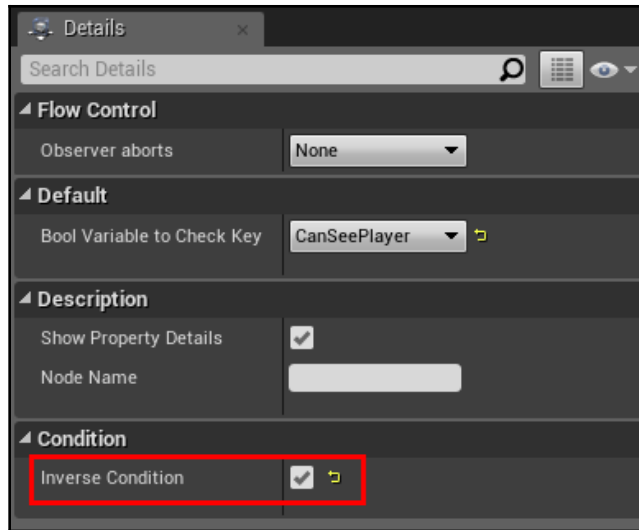
Search Details

**Flow Control**  
Observer aborts: None

**Default**  
Bool Variable to Check Key: CanSeePlayer

**Description**  
Show Property Details:   
Node Name:

**Condition**  
Inverse Condition:



Details

Search Details

### Node

Acceptable Radius	5,0
Filter Class	None
Allow Strafe	<input type="checkbox"/>
Reach Test Includes Agent Radius	<input checked="" type="checkbox"/>
Reach Test Includes Goal Radius	<input checked="" type="checkbox"/>
Stop on Overlap	<input checked="" type="checkbox"/>

### Blackboard

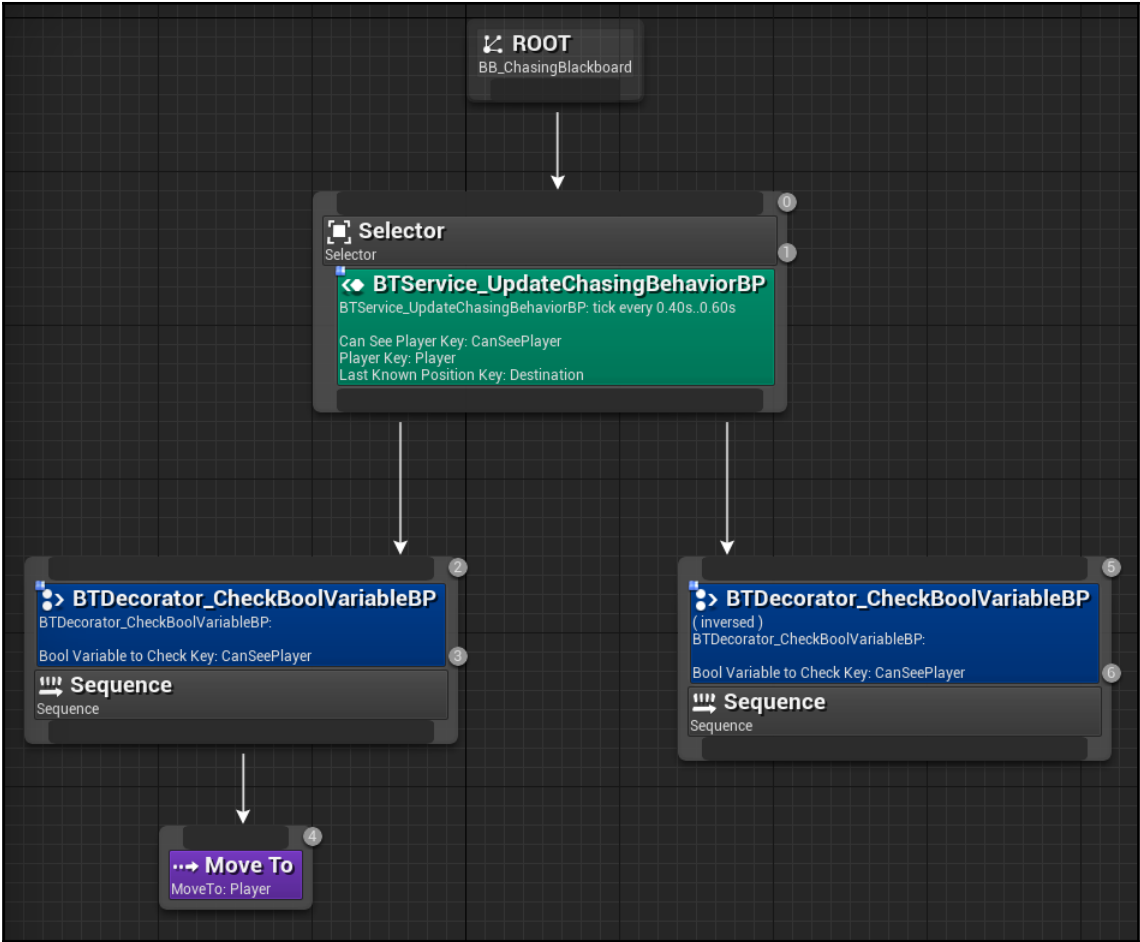
Blackboard Key	Player
----------------	--------

### Task

Ignore Restart Self	<input type="checkbox"/>
---------------------	--------------------------

### Description

Node Name	Move To
-----------	---------



Details

Search Details

### Node

Acceptable Radius	5,0
Filter Class	None
Allow Strafe	<input type="checkbox"/>
Reach Test Includes Agent Radius	<input checked="" type="checkbox"/>
Reach Test Includes Goal Radius	<input checked="" type="checkbox"/>
Stop on Overlap	<input checked="" type="checkbox"/>

### Blackboard

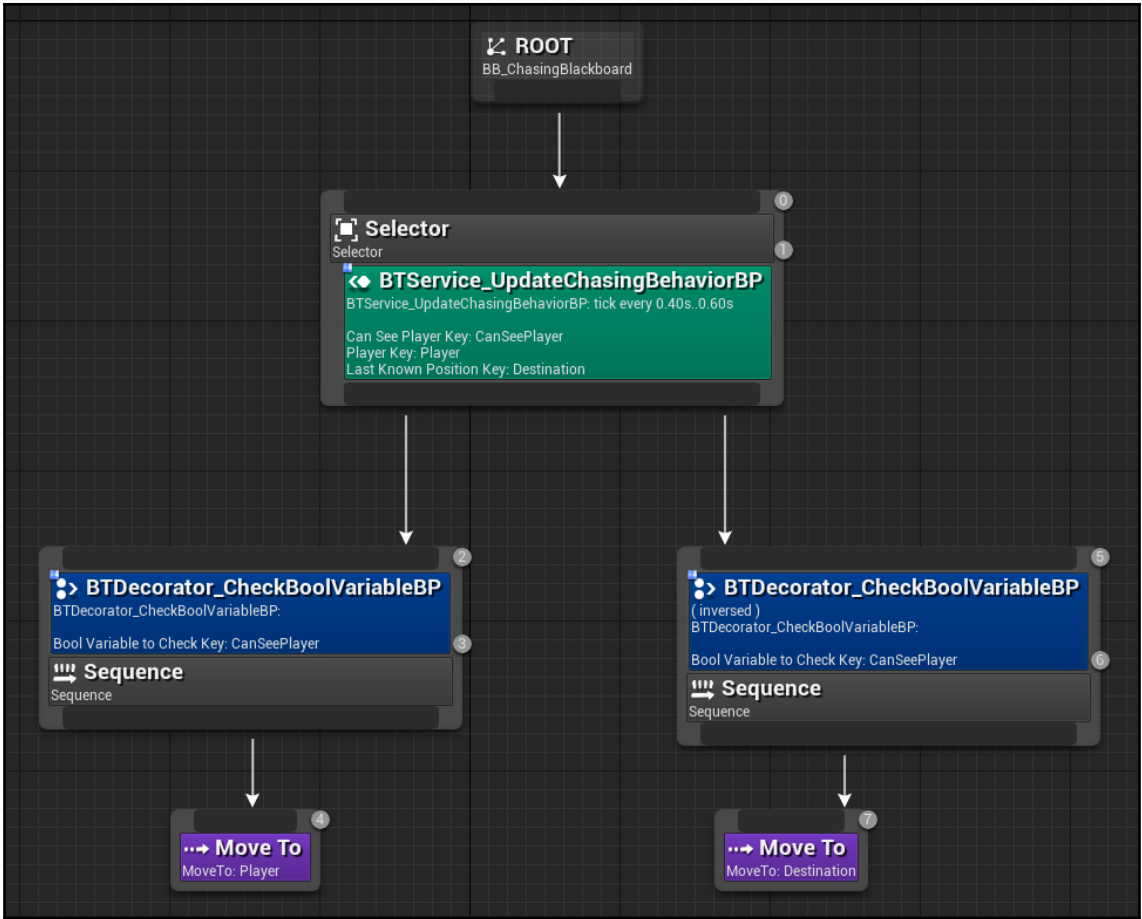
Blackboard Key	Destination
----------------	-------------

### Task

Ignore Restart Self	<input type="checkbox"/>
---------------------	--------------------------

### Description

Node Name	Move To
-----------	---------



Details

Search Details

**Default**

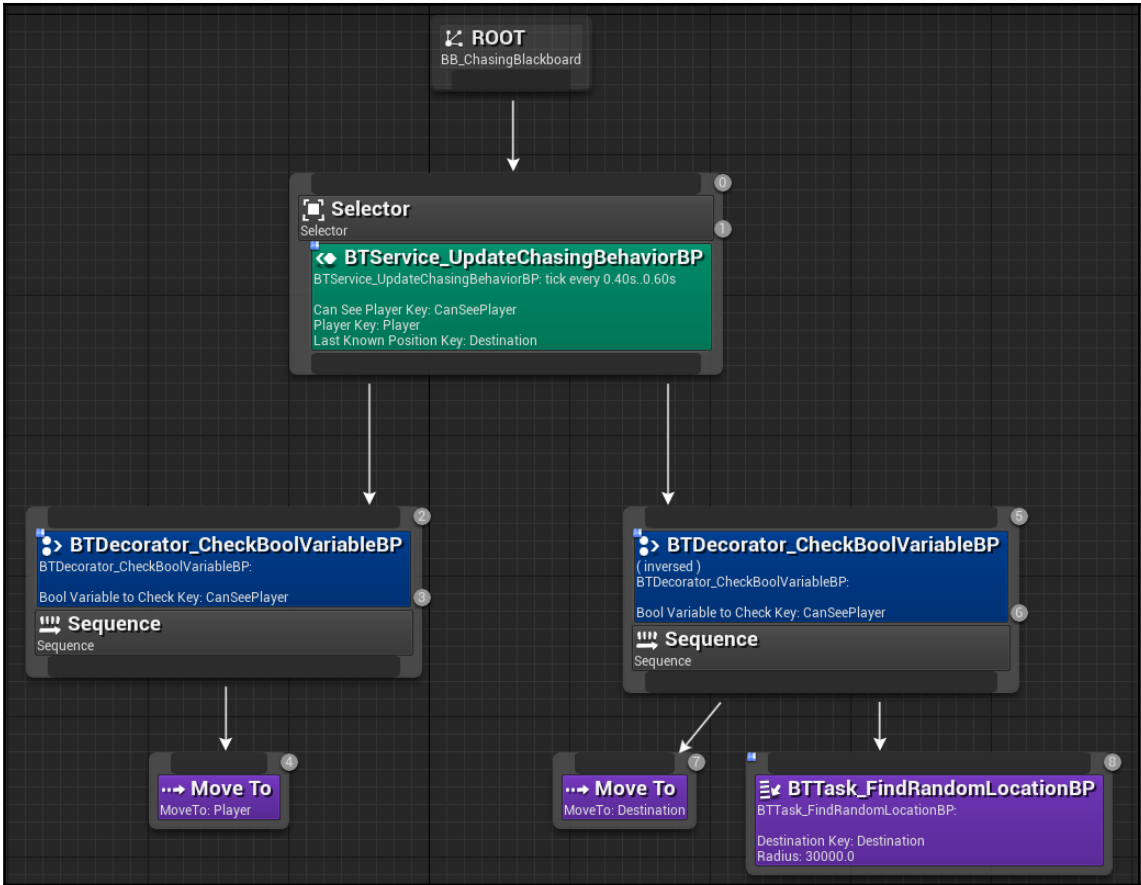
Destination Key	Destination	↕
Radius	30000,0	↕

**Description**

Show Property Details	<input checked="" type="checkbox"/>
Node Name	<input type="text"/>

**Task**

Ignore Restart Self	<input type="checkbox"/>
---------------------	--------------------------





Details

Search Details

▲ **Flow Control**

Observer aborts Self

▲ **Default**

Bool Variable to Check K CanSeePlayer

▲ **Description**

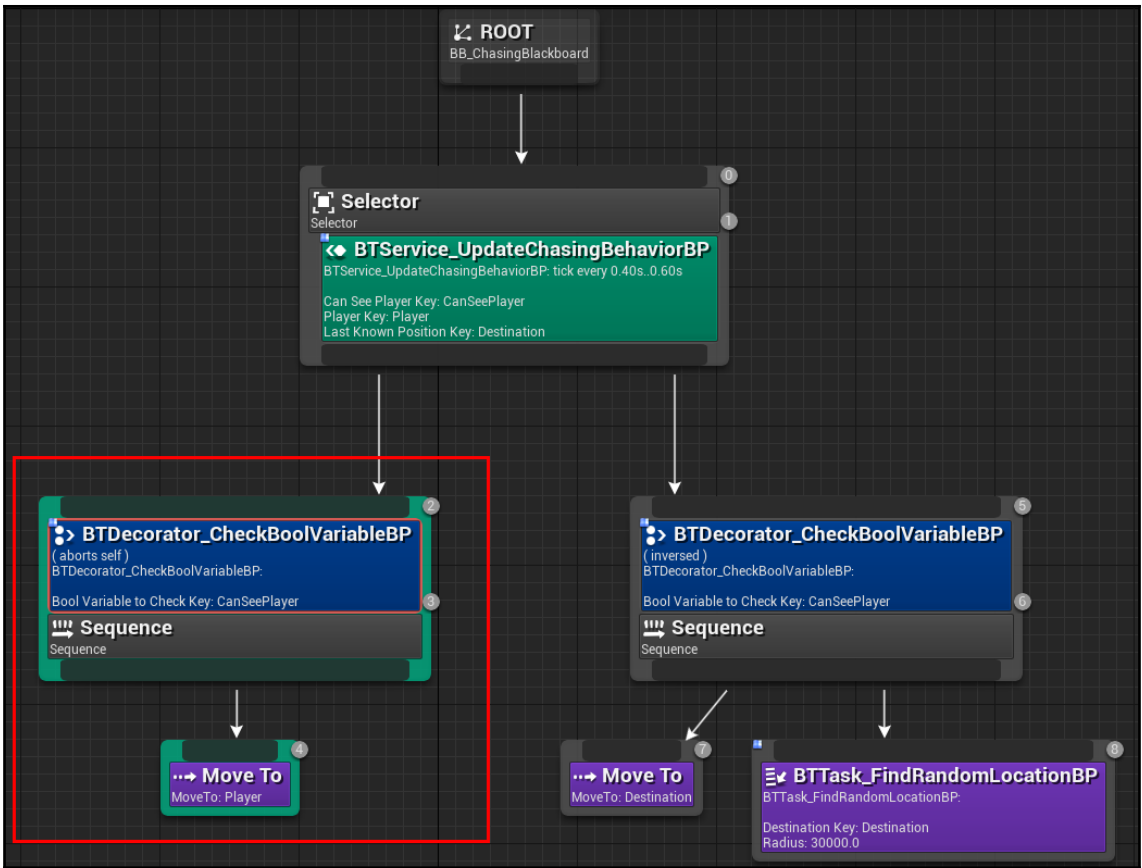
Show Property Details

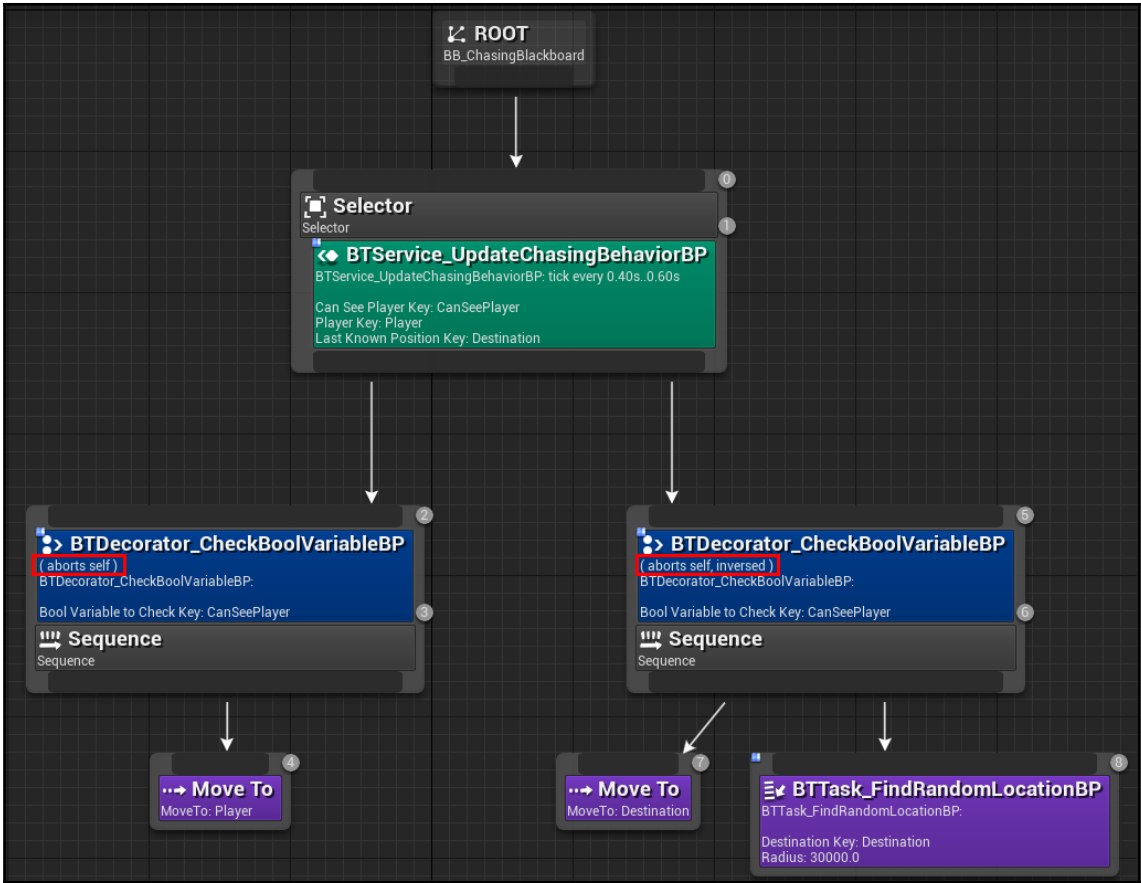
Node Name

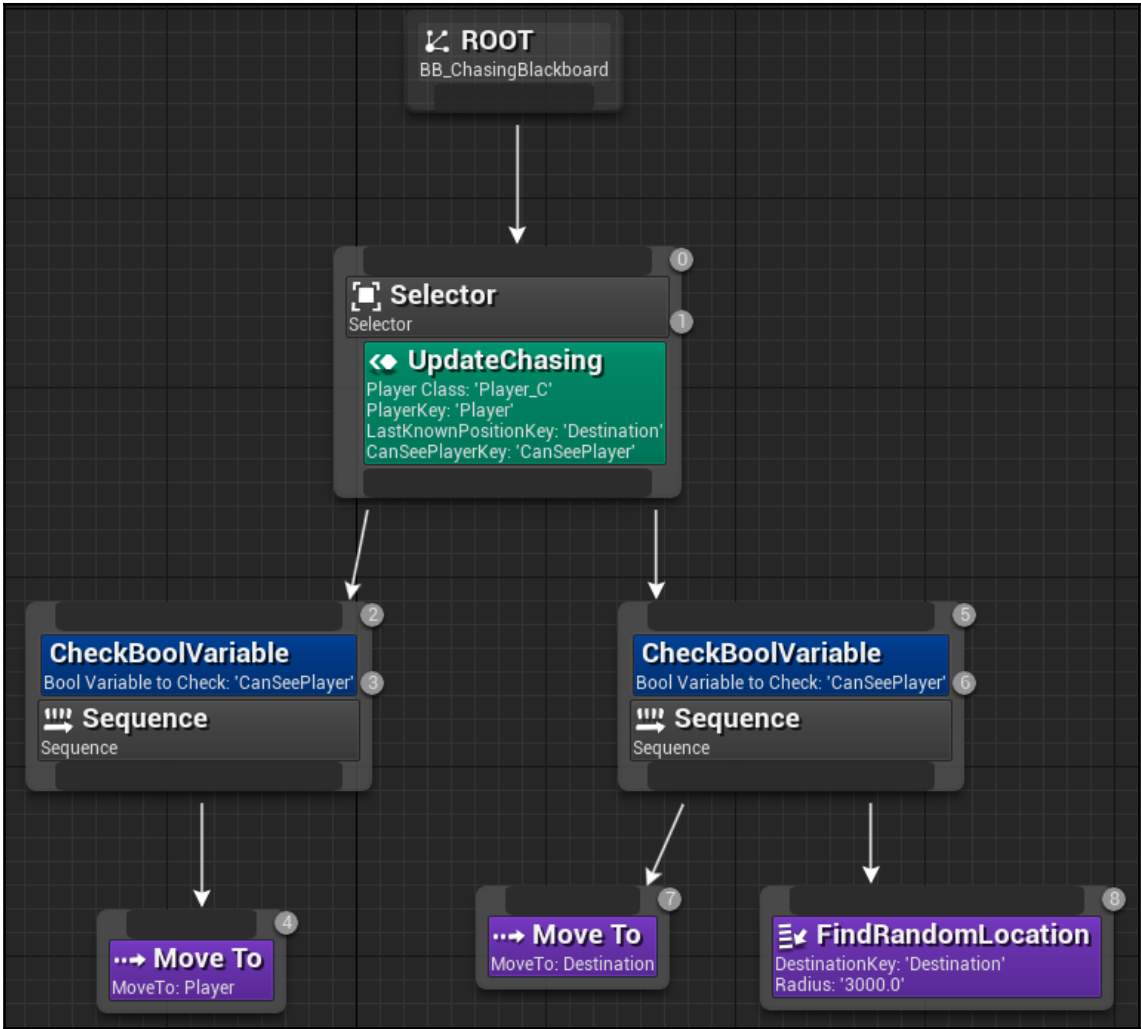
▲ **Condition**

Inverse Condition

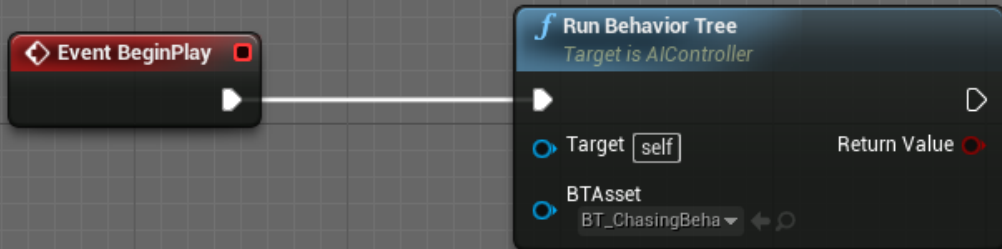
Nodes aborted by mode: Self







## Run Chasing Behavior Tree



ChasingAI Controller

C++ Class Actions

- Create C++ class derived from ChasingAIController
- Create Blueprint class based on ChasingAIController**

Common

- Edit...

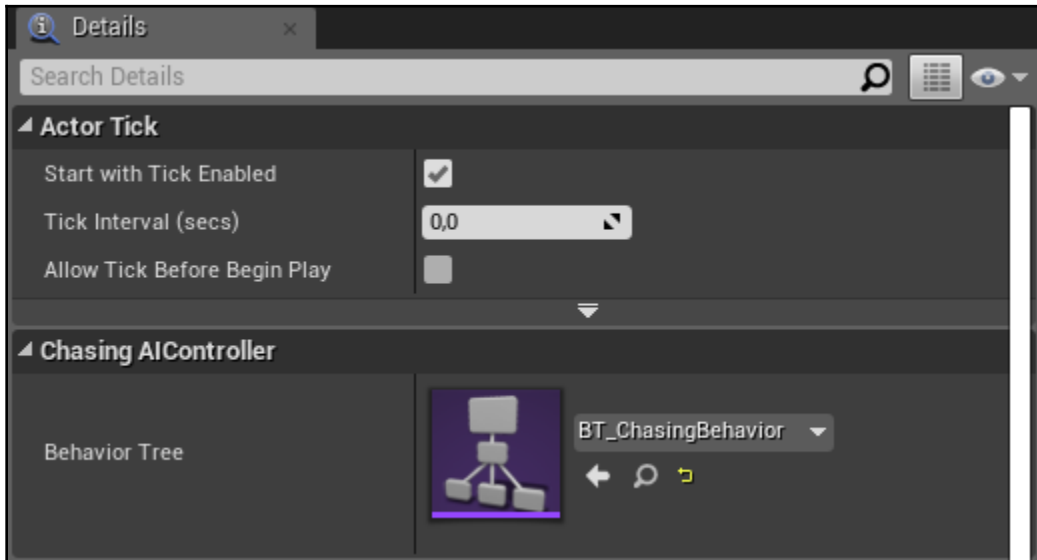
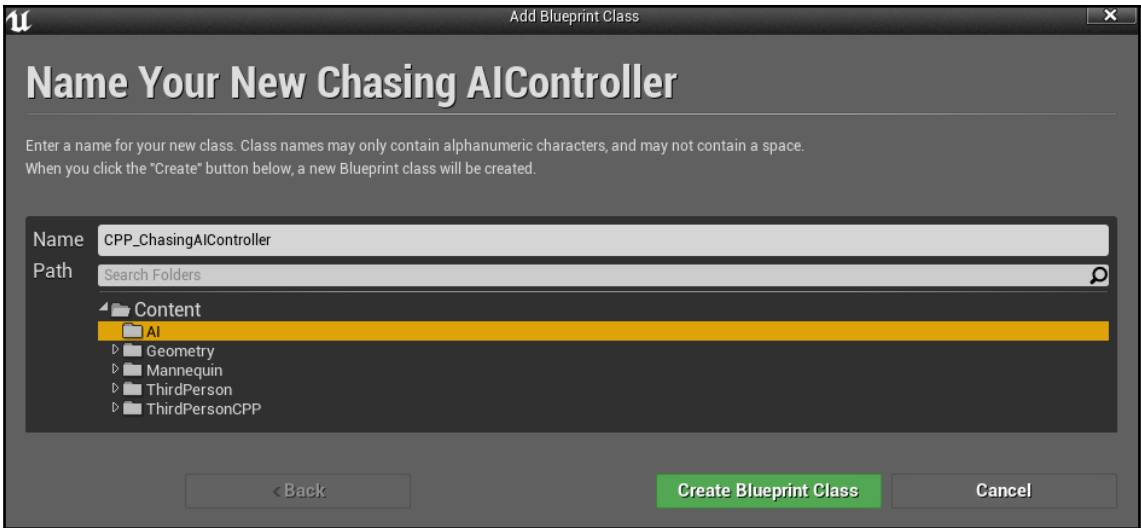
Explore

- Show in Folder View (Ctrl+B)
- Show in Explorer

References

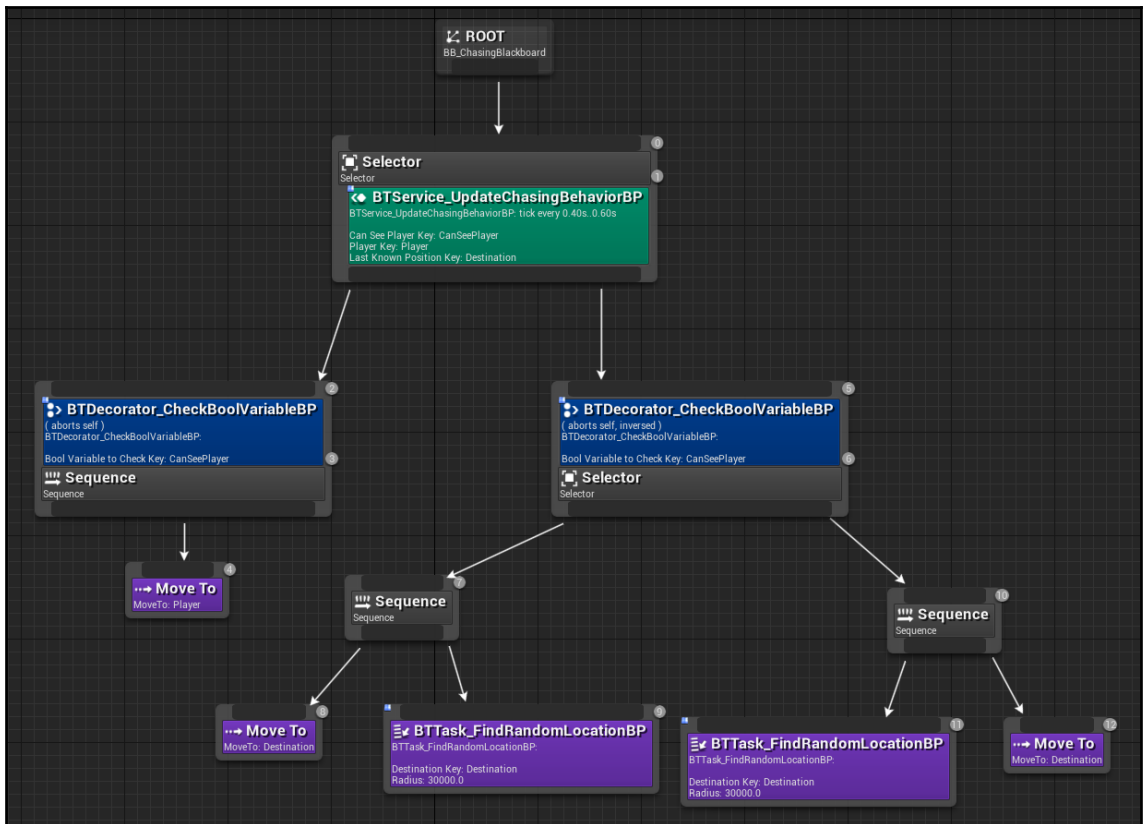
- Copy Reference
- Reference Viewer... (Alt+Shift+R)
- Size Map... (Alt+Shift+M)
- Audit Assets... (Alt+Shift+A)

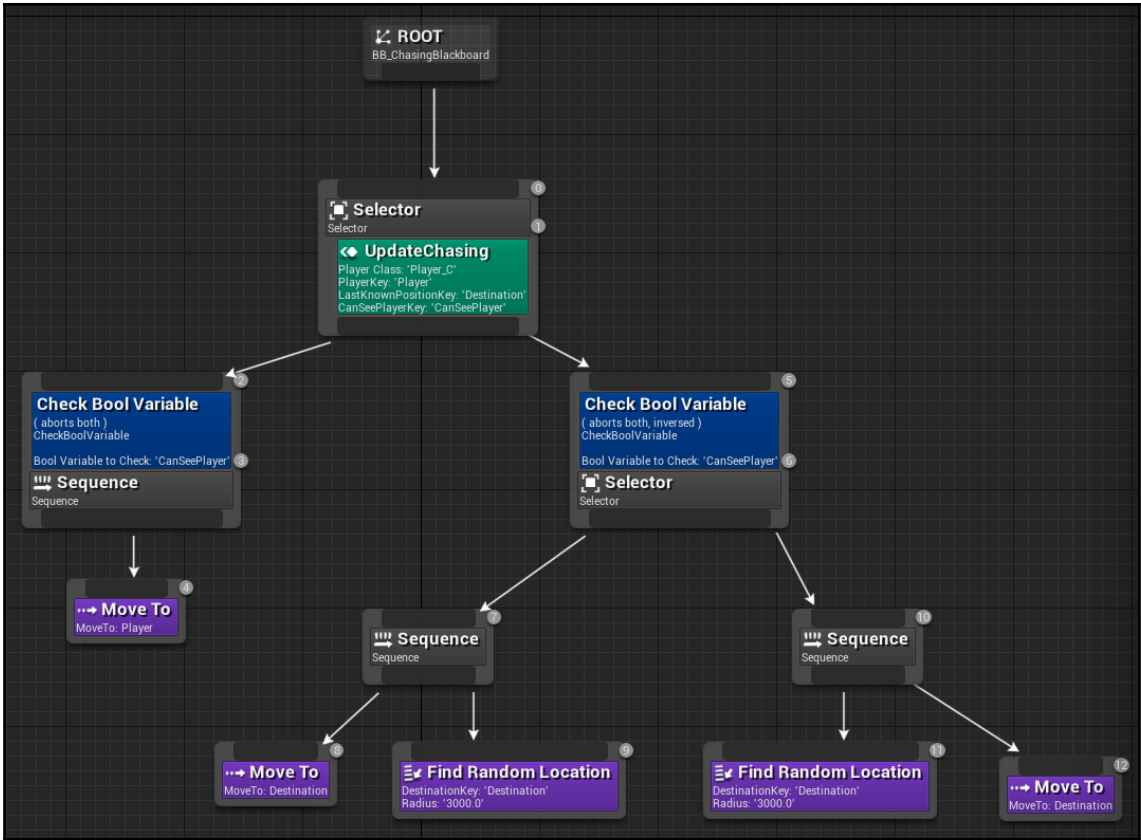
Connect To Source Control...



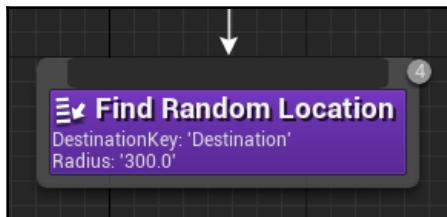
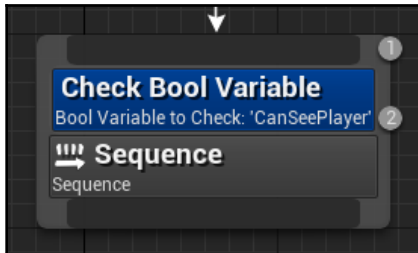
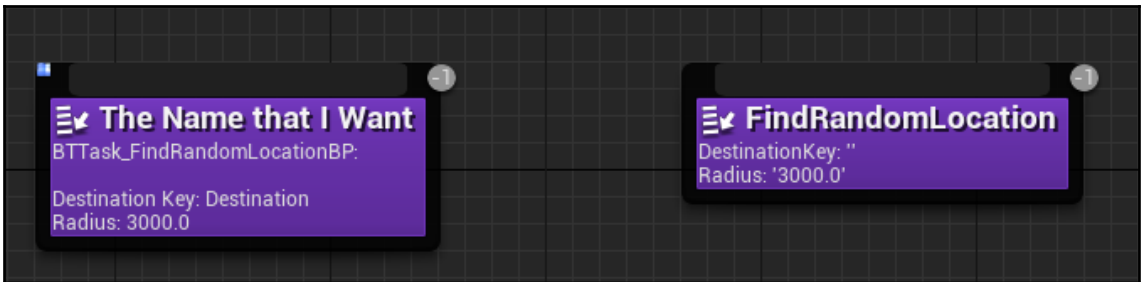
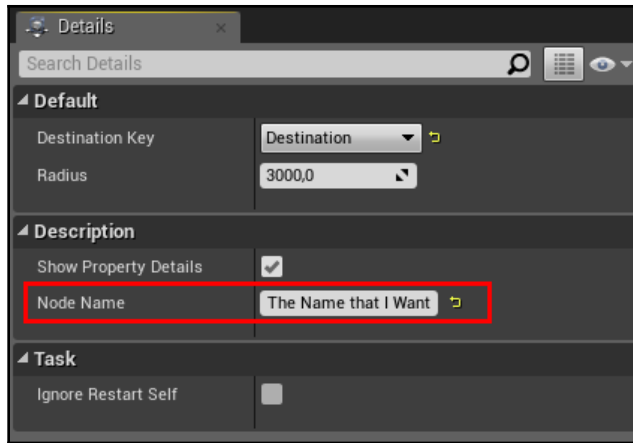
**Pawn**

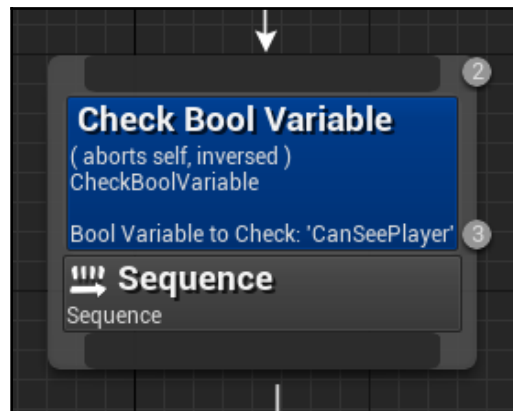
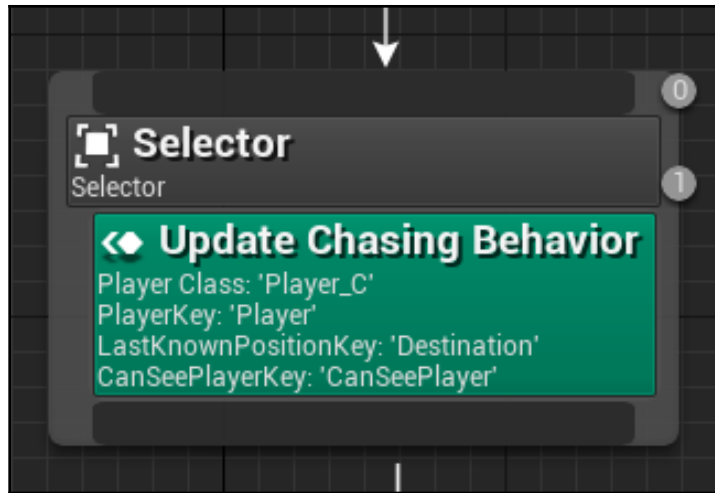
- Use Controller Rotation Pitch
- Use Controller Rotation Yaw
- Use Controller Rotation Roll
- Can Affect Navigation Generation
- Auto Possess Player
- Auto Possess AI
- AI Controller Class

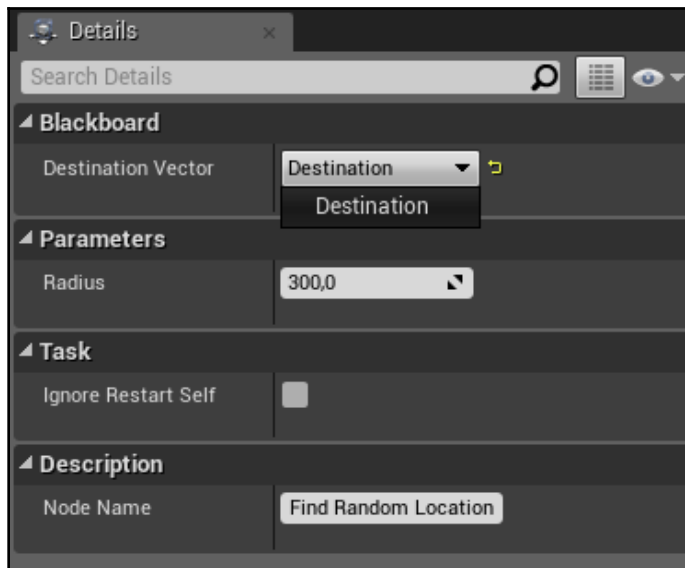
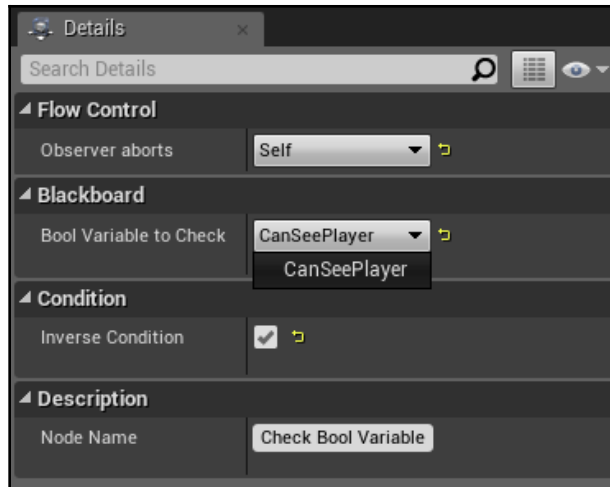












Details

Search Details

### Player Class

Player Class: Player

### Blackboard

Can See Player Key: CanSeePlayer

Player Key: Player

Last Known Position Key: Player, SelfActor

### Service

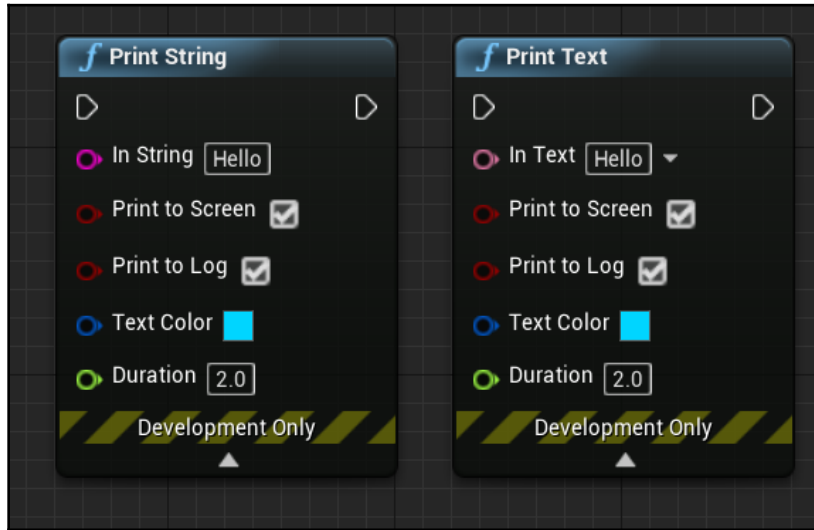
Interval: 0,5

Random Deviation: 0,1

### Description

Node Name: Update Chasing Behavior

# Chapter 11: Debugging Methods for AI - Logging





```
Output Log
Filters Search Log
LogTemp: Repeating last play command: Selected Viewport
LogBlueprintUserMessages: Early PlayInEditor Detection: Level '/Game/Chapter11/LoggingExampleMap'
LoggingExampleMap.LoggingExampleMap:PersistentLevel.LoggingExampleMap'
LogPlayLevel: PlayLevel: No blueprints needed recompiling
PIE: New page: PIE session: LoggingExampleMap (25/mar/2019 04:28:24)
LogPlayLevel: Creating play world package: /Game/Chapter11/UEDPiE_0_LoggingExampleMap
LogPlayLevel: PIE: StaticDuplicateObject took: (0.040138s)
LogAIModule: Creating AISystem for world LoggingExampleMap
LogPlayLevel: PIE: World Init took: (0.002833s)
LogPlayLevel: PIE: Created PIE world by copying editor world from /Game/Chapter11/LoggingExampleMap
LogInit: XAudio2 using '...'
LogInit: FAudioDevice initialized.
LogLoad: Game class is 'UnrealAIBookGameMode'
LogWorld: Bringing World /Game/Chapter11/UEDPiE_0_LoggingExampleMap.LoggingExampleMap up for pl
LogWorld: Bringing up level for play took: 0.005139
LogBlueprintUserMessages: [BP_LoggingActor_2] Hello
PIE: Play in editor start time for /Game/Chapter11/UEDPiE_0_LoggingExampleMap -0.284
LogBlueprintUserMessages: Late PlayInEditor Detection: Level '/Game/Chapter11/LoggingExampleMap
oggingExampleMap.LoggingExampleMap:PersistentLevel.LoggingExampleMap'
Cmd Enter Console Command
```



# Choose Parent Class

This will add a C++ header and source code file to your game project.

Show All Classes

None

An empty C++ class with a default constructor and destructor.

Character

A character is a type of Pawn that includes the ability to walk around.

Pawn

A Pawn is an actor that can be 'possessed' and receive input from a controller.

Actor

An Actor is an object that can be placed or spawned in the world.

Actor Component

Selected Class

Actor

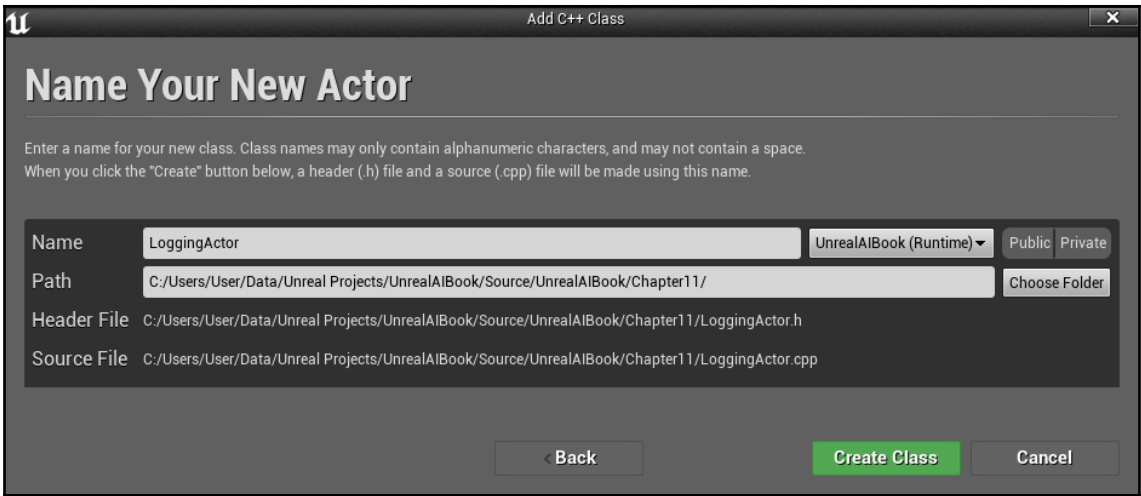
Selected Class Source

Actor.h

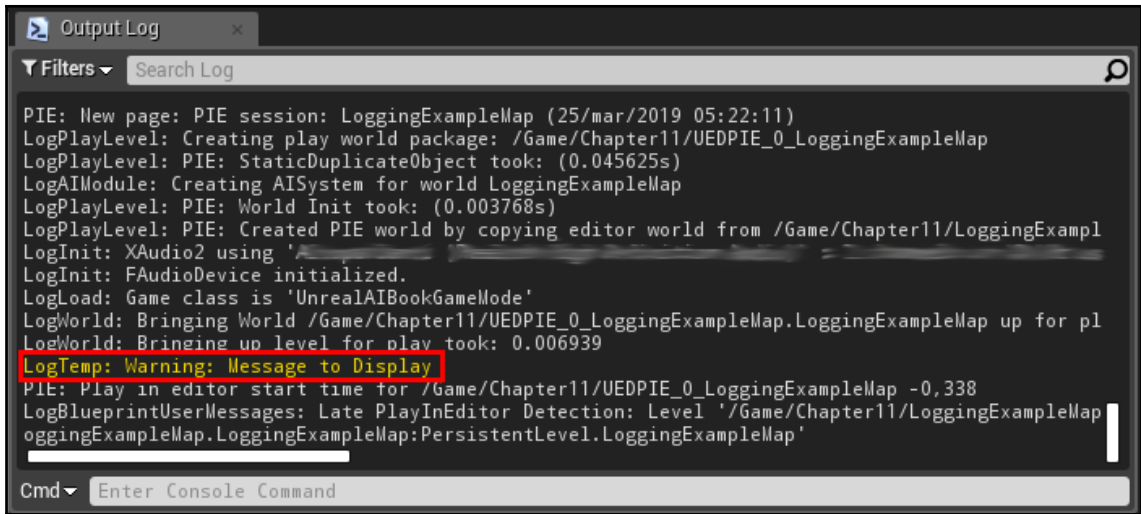
Next >

Create Class

Cancel





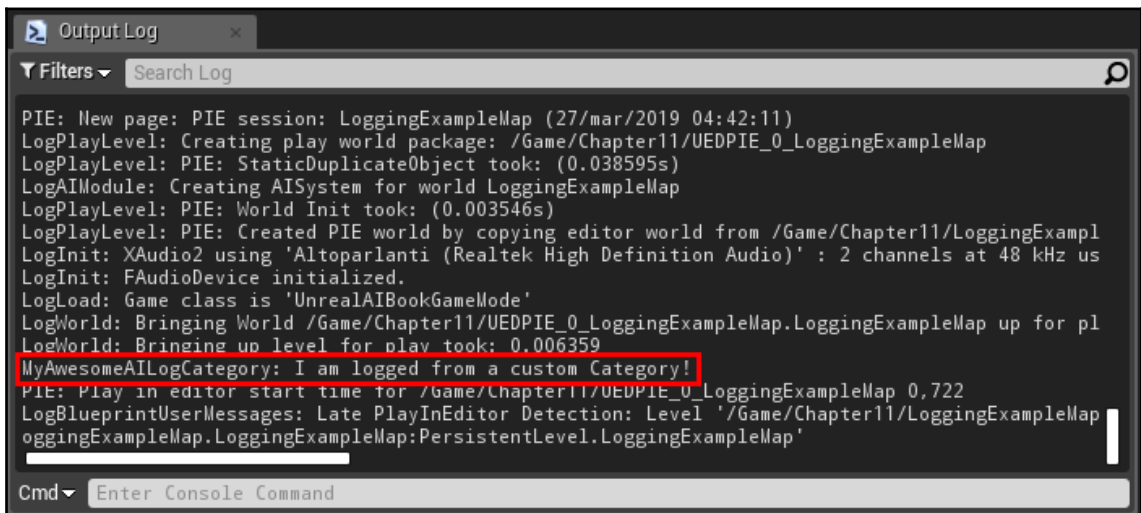


Output Log

Filters Search Log

```
PIE: New page: PIE session: LoggingExampleMap (25/mar/2019 05:22:11)
LogPlayLevel: Creating play world package: /Game/Chapter11/UEDPIE_0_LoggingExampleMap
LogPlayLevel: PIE: StaticDuplicateObject took: (0.045625s)
LogAIModule: Creating AISystem for world LoggingExampleMap
LogPlayLevel: PIE: World Init took: (0.003768s)
LogPlayLevel: PIE: Created PIE world by copying editor world from /Game/Chapter11/LoggingExamp
LogInit: XAudio2 using '
LogInit: FAudioDevice initialized.
LogLoad: Game class is 'UnrealAIBookGameMode'
LogWorld: Bringing World /Game/Chapter11/UEDPIE_0_LoggingExampleMap.LoggingExampleMap up for pl
LogWorld: Bringing up level for play took: 0.006939
LogTemp: Warning: Message to Display
PIE: Play in editor start time for /Game/Chapter11/UEDPIE_0_LoggingExampleMap -0,338
LogBlueprintUserMessages: Late PlayInEditor Detection: Level '/Game/Chapter11/LoggingExampleMap
oggingExampleMap.LoggingExampleMap:PersistentLevel.LoggingExampleMap'
```

Cmd Enter Console Command



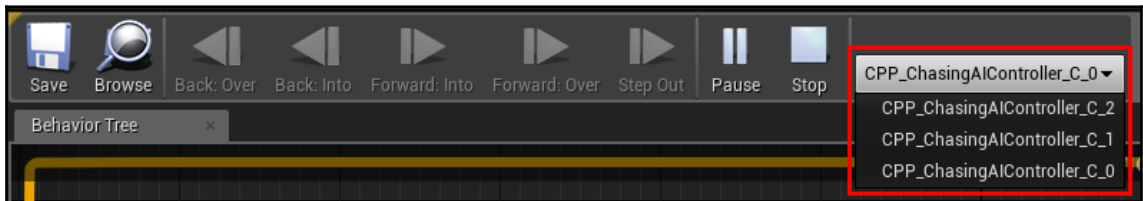
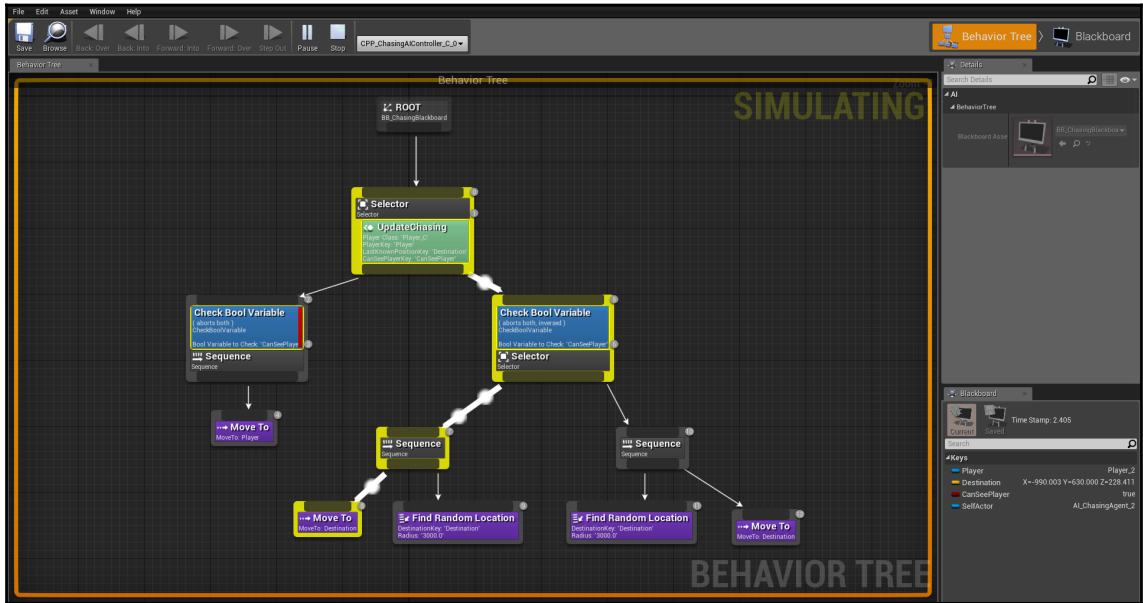
Output Log


Filters Search Log

```
PIE: New page: PIE session: LoggingExampleMap (27/mar/2019 04:42:11)
LogPlayLevel: Creating play world package: /Game/Chapter11/UEDPIE_0_LoggingExampleMap
LogPlayLevel: PIE: StaticDuplicateObject took: (0.038595s)
LogAIModule: Creating AISystem for world LoggingExampleMap
LogPlayLevel: PIE: World Init took: (0.003546s)
LogPlayLevel: PIE: Created PIE world by copying editor world from /Game/Chapter11/LoggingExamp
LogInit: XAudio2 using 'Altoparlanti (Realtek High Definition Audio)' : 2 channels at 48 kHz us
LogInit: FAudioDevice initialized.
LogLoad: Game class is 'UnrealAIBookGameMode'
LogWorld: Bringing World /Game/Chapter11/UEDPIE_0_LoggingExampleMap.LoggingExampleMap up for pl
LogWorld: Bringing up level for play took: 0.006359
MyAwesomeAILogCategory: I am logged from a custom Category!
PIE: Play in editor start time for /Game/Chapter11/UEDPIE_0_LoggingExampleMap 0,722
LogBlueprintUserMessages: Late PlayInEditor Detection: Level '/Game/Chapter11/LoggingExampleMap
oggingExampleMap.LoggingExampleMap:PersistentLevel.LoggingExampleMap'
```














Cmd Enter Console Command

# Chapter 12: Debugging Methods for AI - Navigation, EQS, and Profiling




 Pick Parent Class ✕





▲ Common Classes


 Actor	An Actor is an object that can be placed or spawned in the world.	
 Pawn	A Pawn is an actor that can be 'possessed' and receive input from a controller.	
 Character	A character is a type of Pawn that includes the ability to walk around.	
 Player Controller	A Player Controller is an actor responsible for controlling a Pawn used by the player.	
 Game Mode Base	Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type.	
 Actor Component	An ActorComponent is a reusable component that can be added to any actor.	
 Scene Component	A Scene Component is a component that has a scene transform and can be attached to other scene components.	

▲ All Classes

EQSTestingPawn ✕

▲  Object

- ▲  Actor
  - ▲  Pawn
    - ▲  Character
      -  EQSTestingPawn

5 items (1 selected)  View Options ▾

Select Cancel

EQS

Query Template

None

None

← 🔍

QueryParams\_DEPRECATED

0 Array elements + 🗑️

Query Config

0 Array elements + 🗑️

Time Limit Per Step

-1,0 ▾

Step to Debug Draw

0 ▾

Highlight Mode

All ▾

Draw Labels

Draw Failed Items

Re Run Query Only on Finished Move

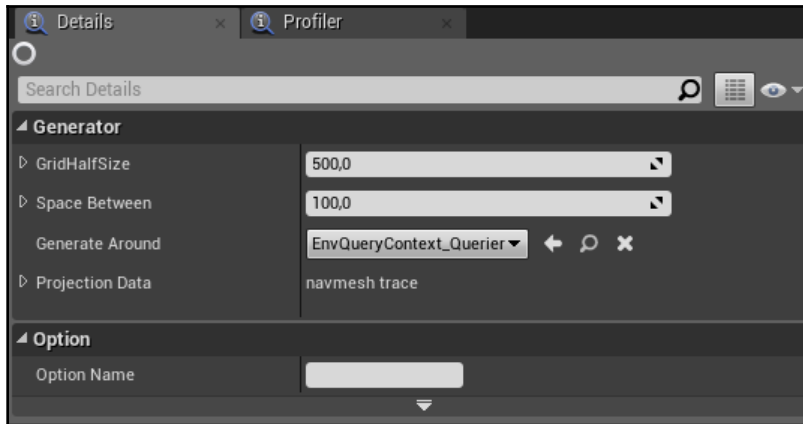
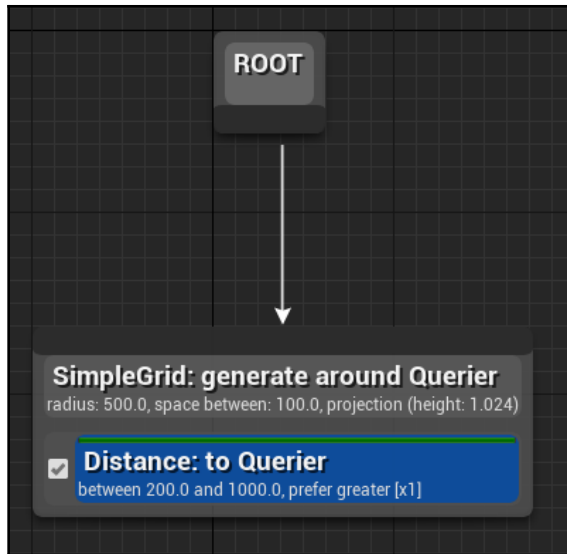
Should be Visible in Game

Tick During Game

Querying Mode

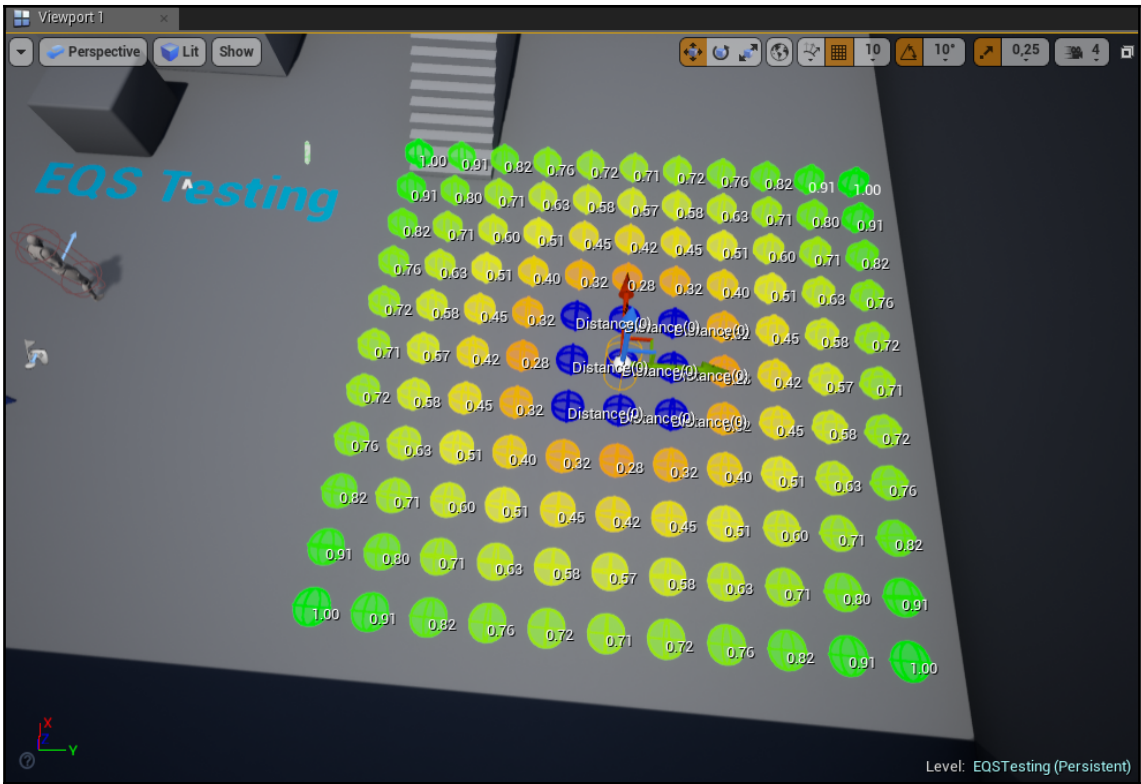
All Matching ▾

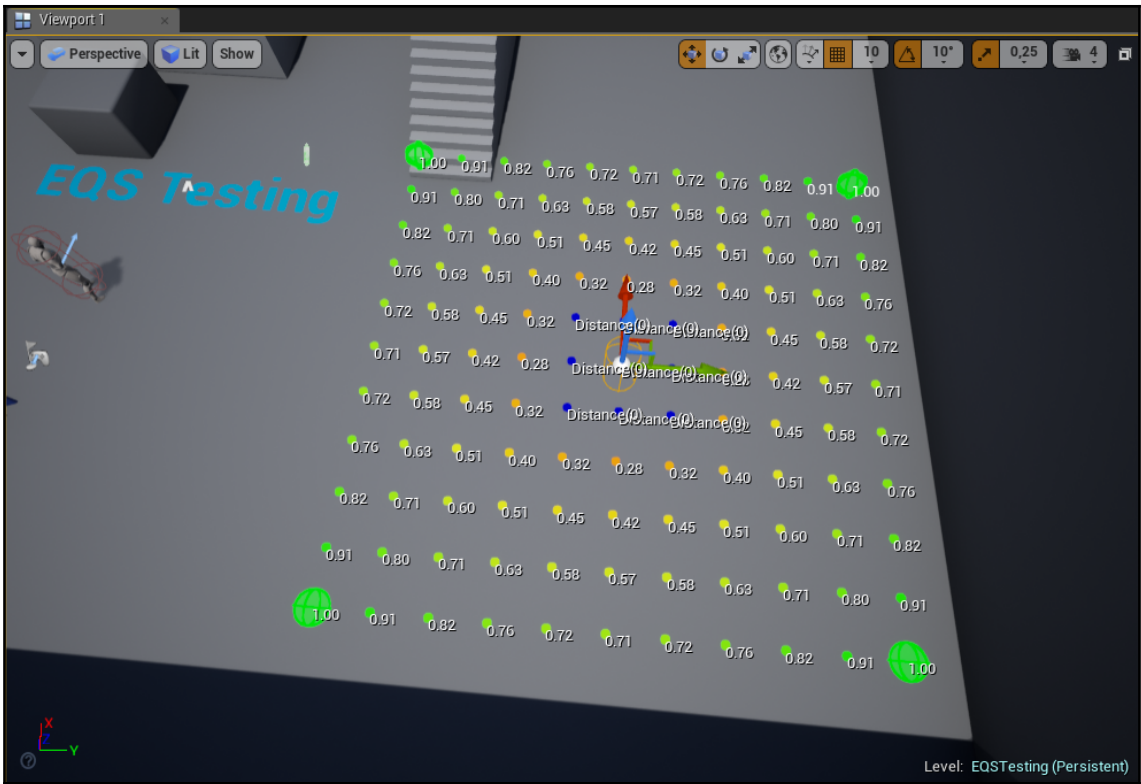
▷ Nav Agent Properties



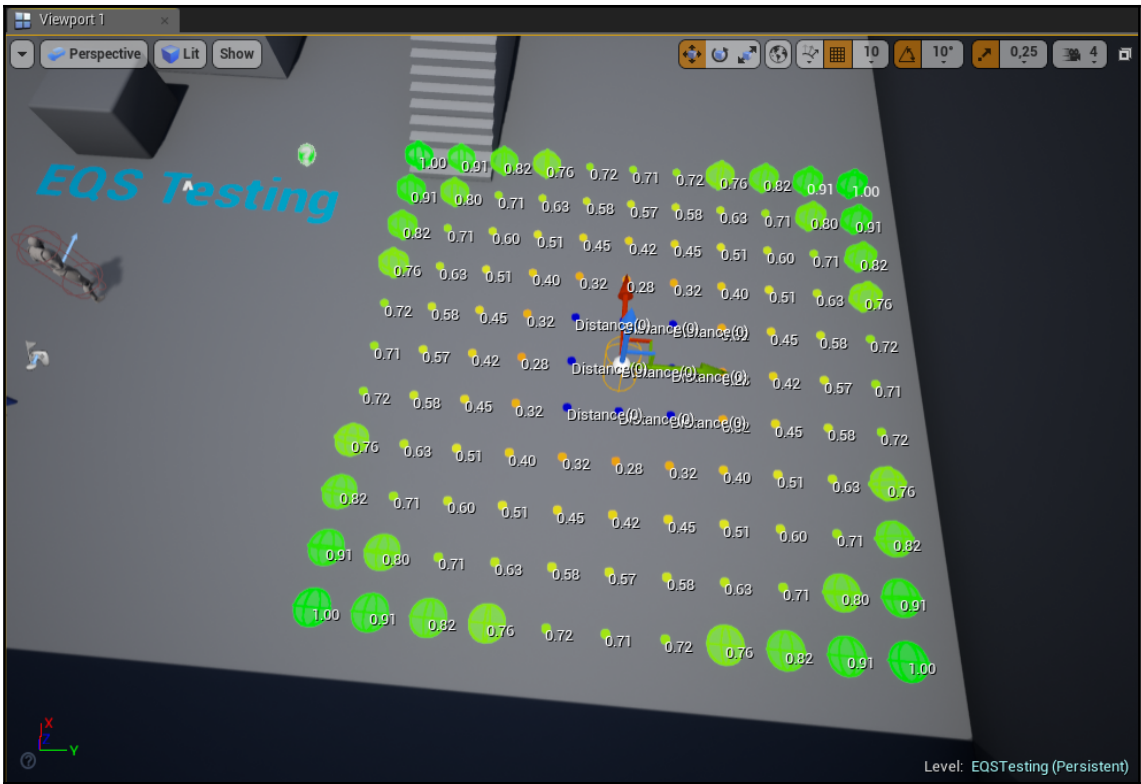
EQS

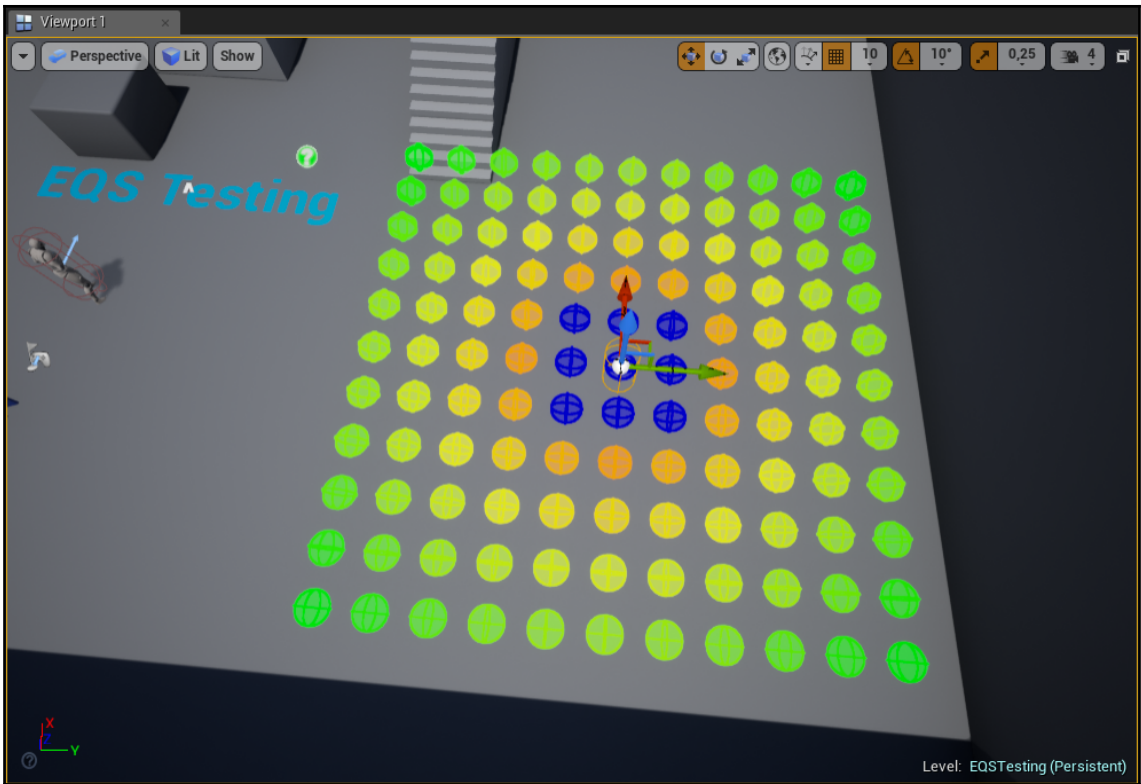
Query Template	<div style="border: 1px solid gray; padding: 2px; display: inline-block;">None</div> <span>None</span> <span>←</span> <span>🔍</span>
QueryParams_DEPRECATED	0 Array elements <span>+</span> <span>🗑️</span>
Query Config	0 Array elements <span>+</span> <span>🗑️</span>
Time Limit Per Step	<input type="text" value="-1,0"/> <span>▾</span>
Step to Debug Draw	<input type="text" value="0"/> <span>▾</span>
Highlight Mode	<input type="text" value="All"/> <span>▾</span>
Draw Labels	<input checked="" type="checkbox"/>
Draw Failed Items	<input checked="" type="checkbox"/>
Re Run Query Only on Finished Move	<input checked="" type="checkbox"/>
Should be Visible in Game	<input type="checkbox"/>
Tick During Game	<input type="checkbox"/>
Querying Mode	<input type="text" value="All Matching"/> <span>▾</span>
▷ Nav Agent Properties	

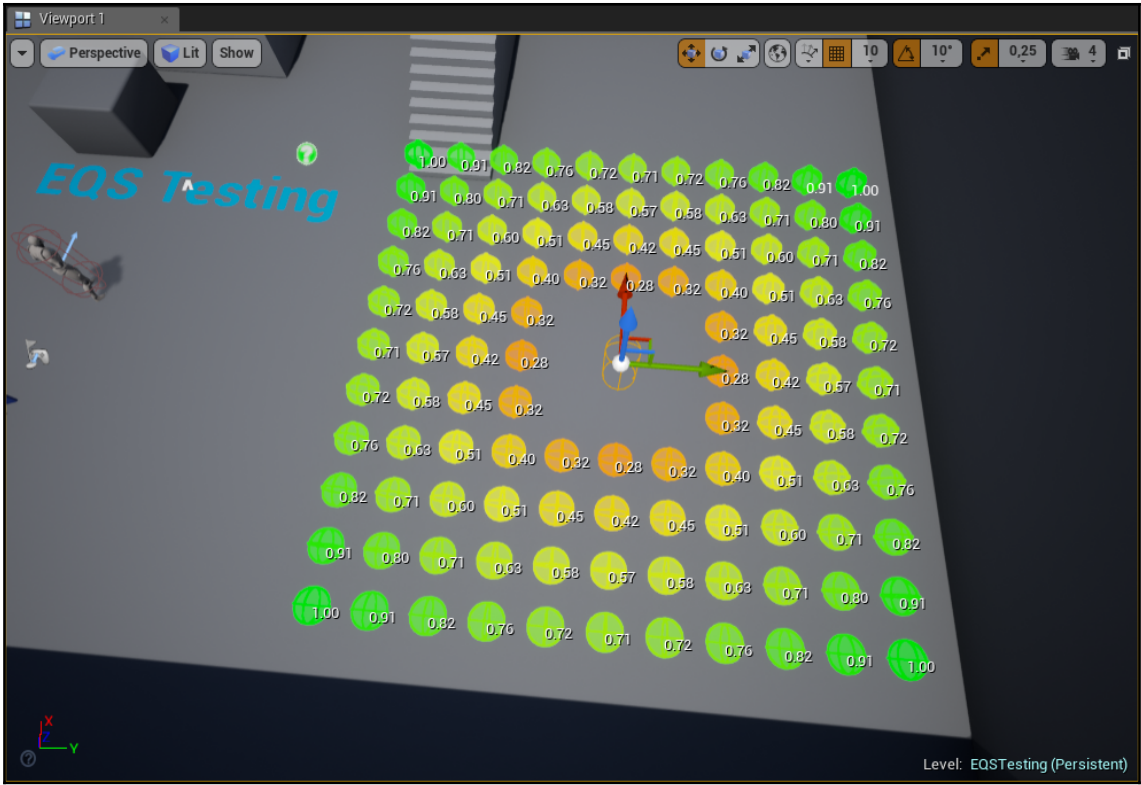


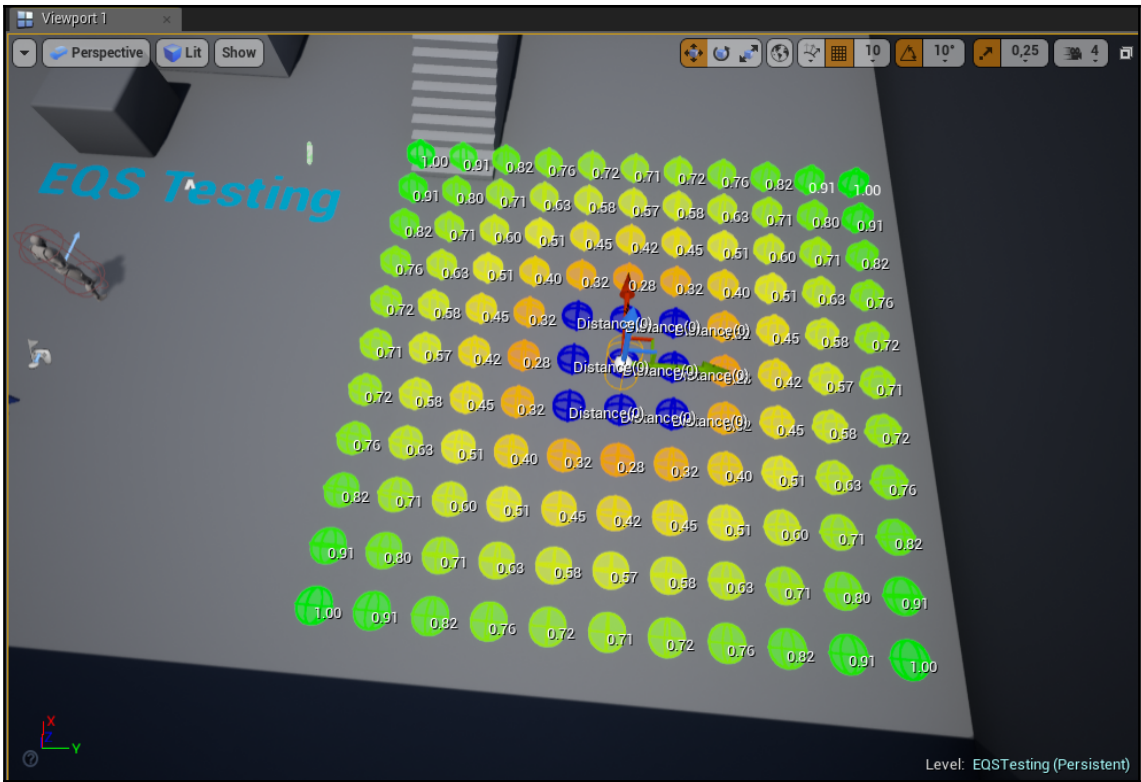


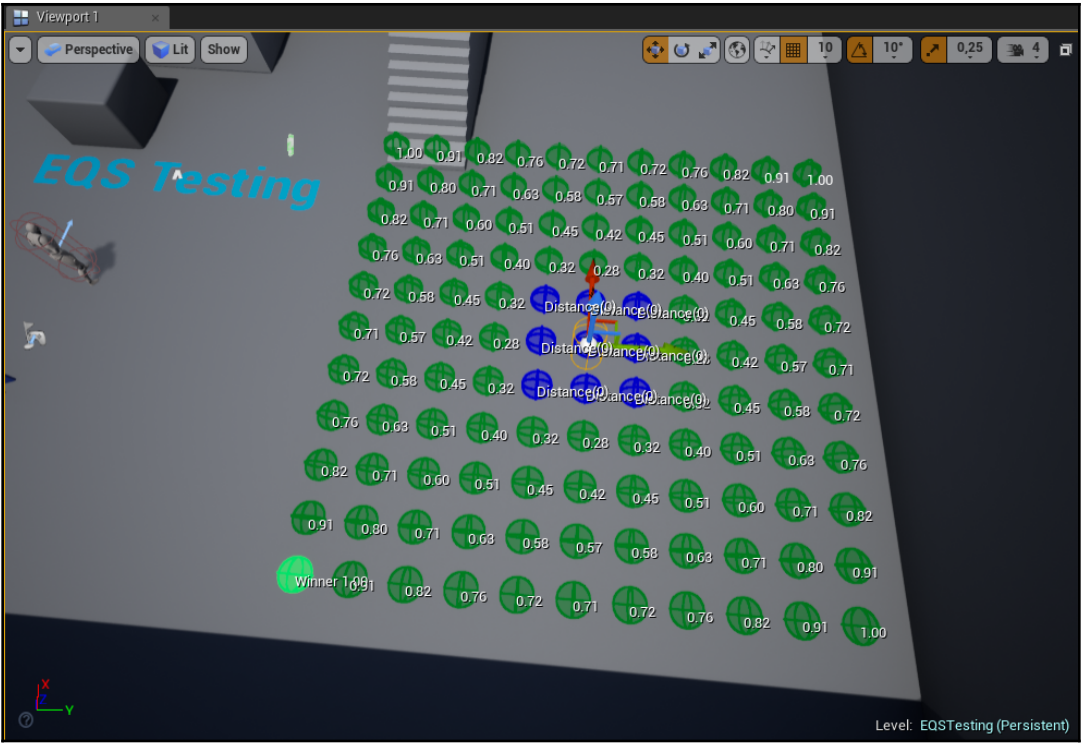




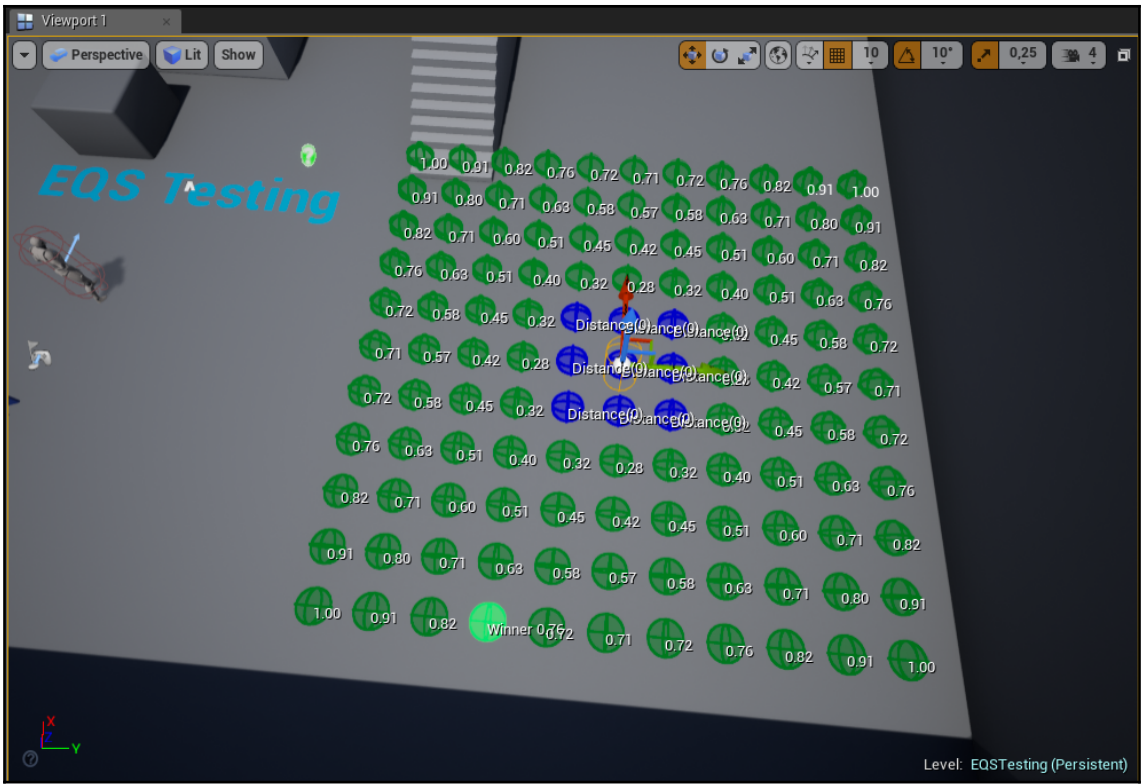






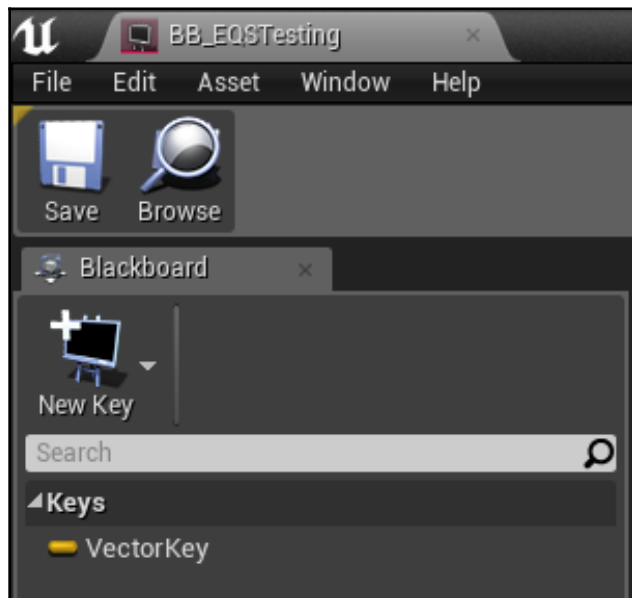
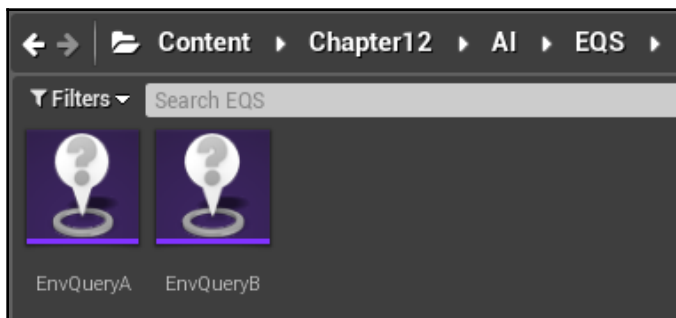
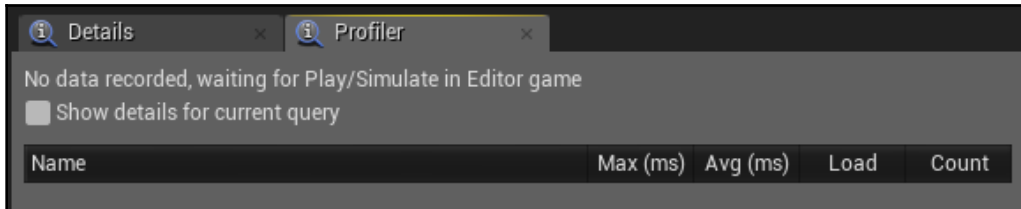
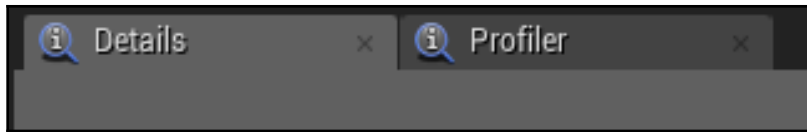




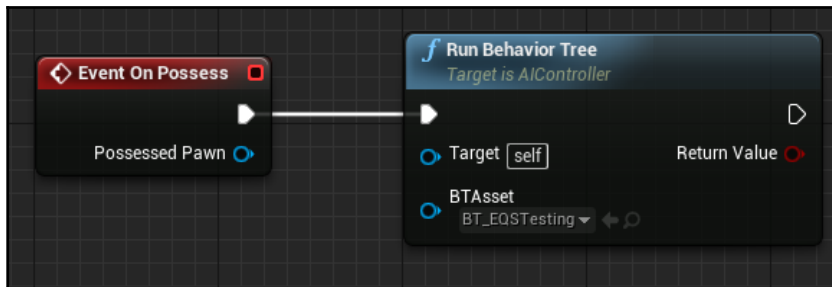
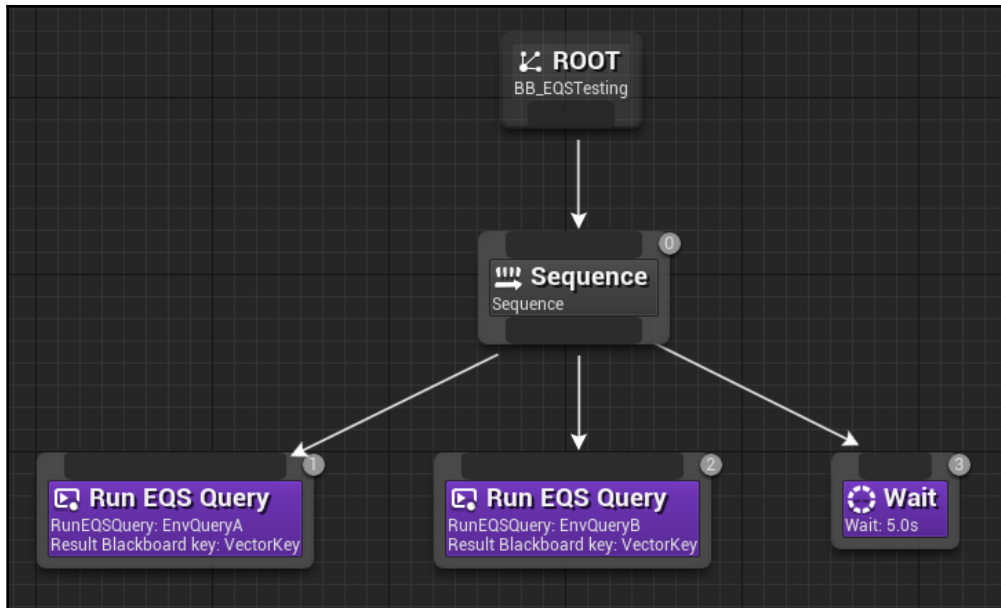


Nav Agent Properties

Nav Agent Radius	-1,0
Nav Agent Height	-1,0
Nav Agent Step Height	-1,0
Nav Walking Search Height Scale	0,5
Preferred Nav Data	None
Can Crouch	<input type="checkbox"/>
Can Jump	<input type="checkbox"/>
Can Walk	<input type="checkbox"/>
Can Swim	<input type="checkbox"/>
Can Fly	<input type="checkbox"/>

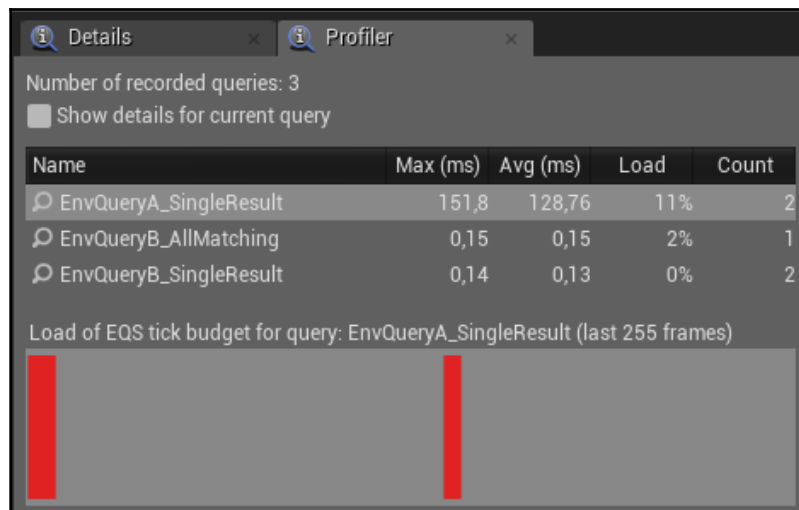
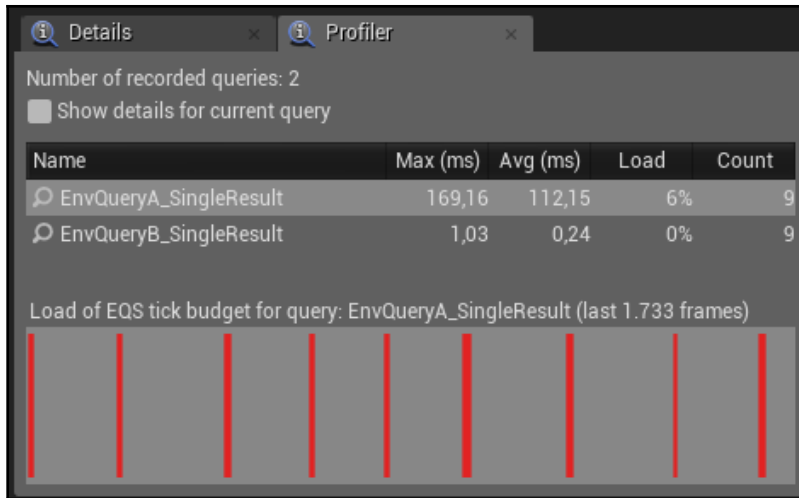


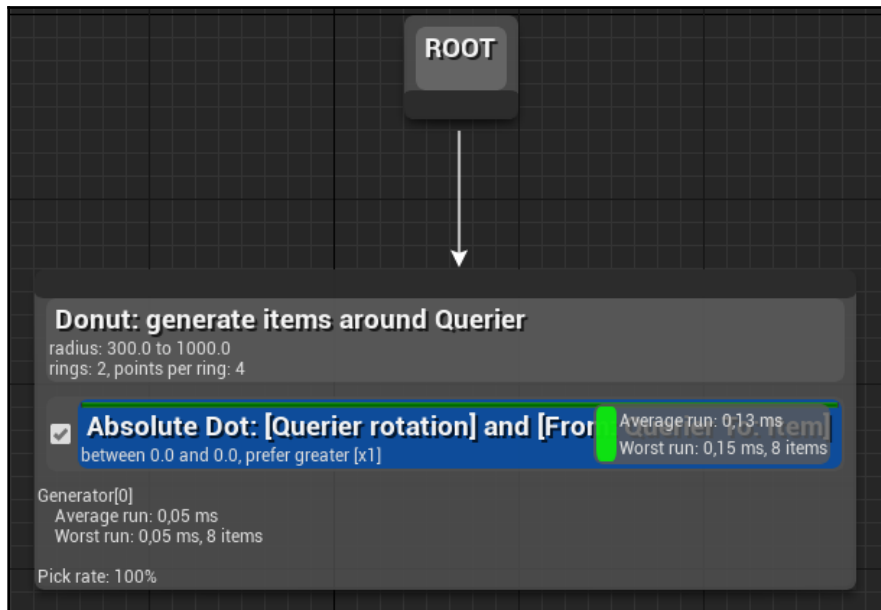
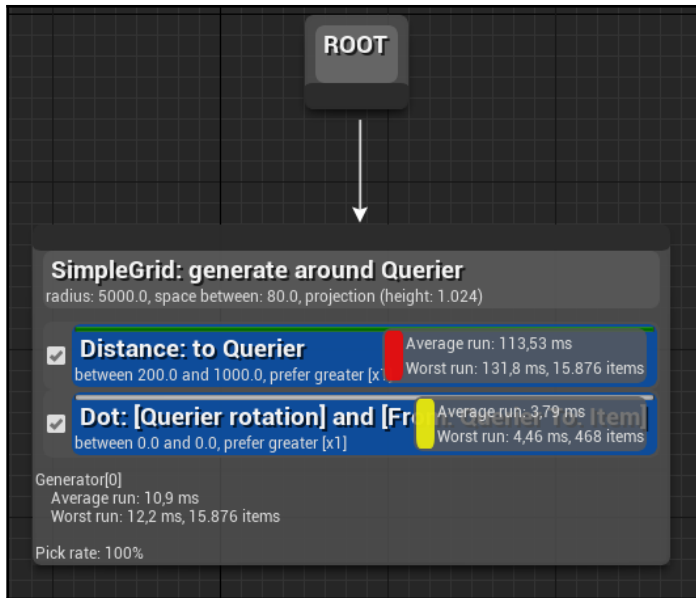


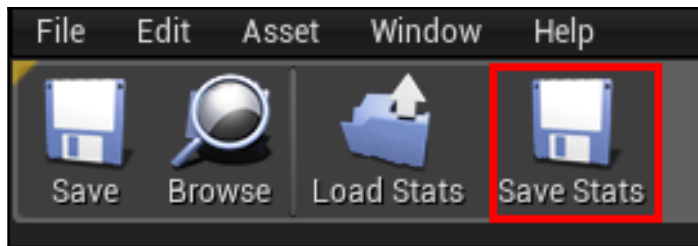


**Pawn**

- Use Controller Rotation Pitch
- Use Controller Rotation Yaw
- Use Controller Rotation Roll
- Can Affect Navigation Generation
- Auto Possess Player
- Auto Possess AI
- AI Controller Class

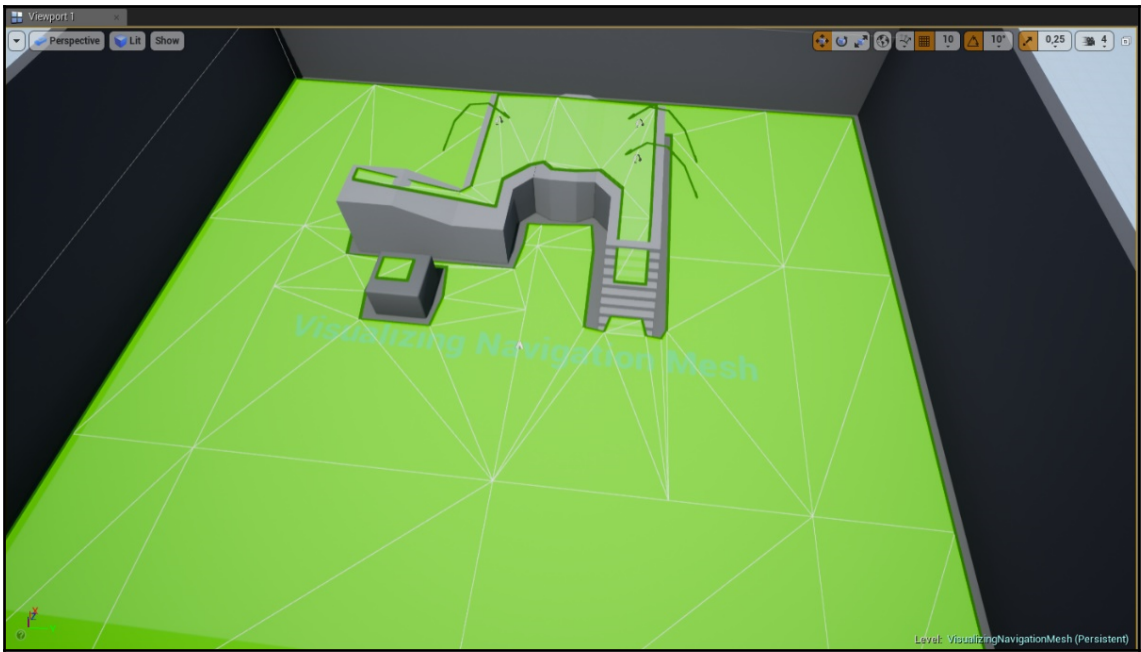
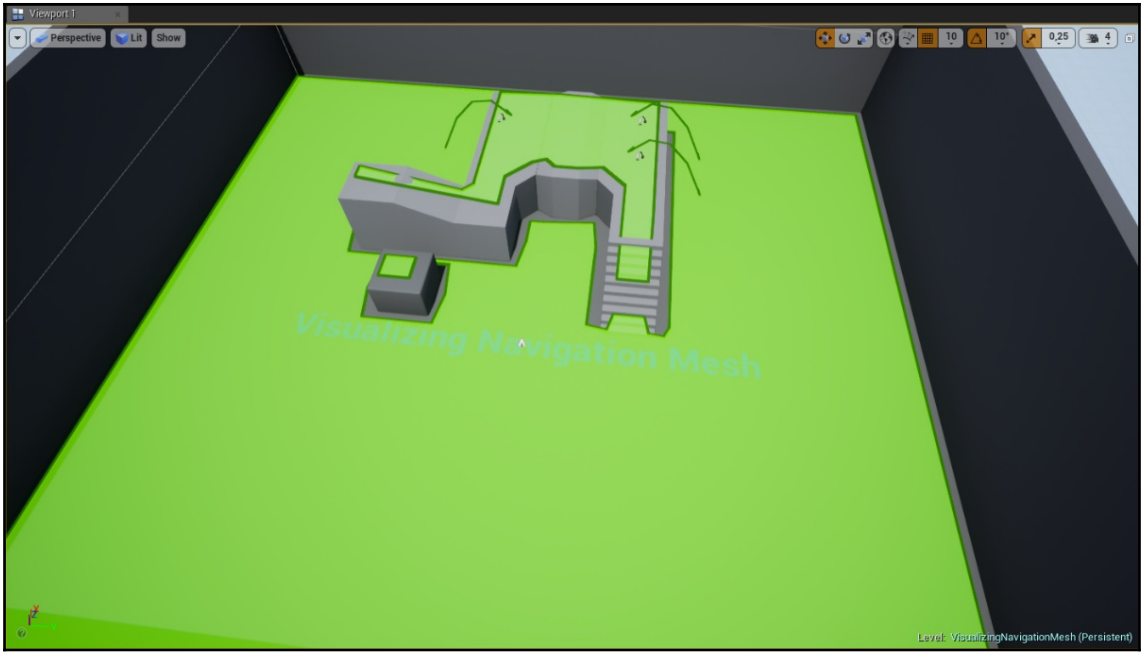


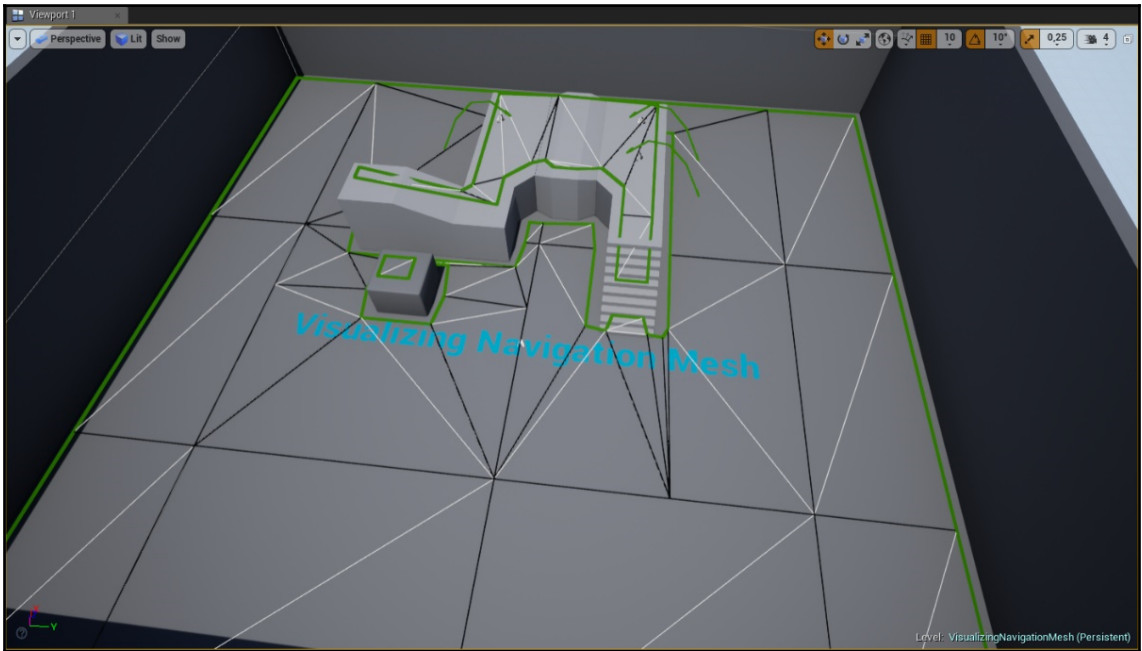
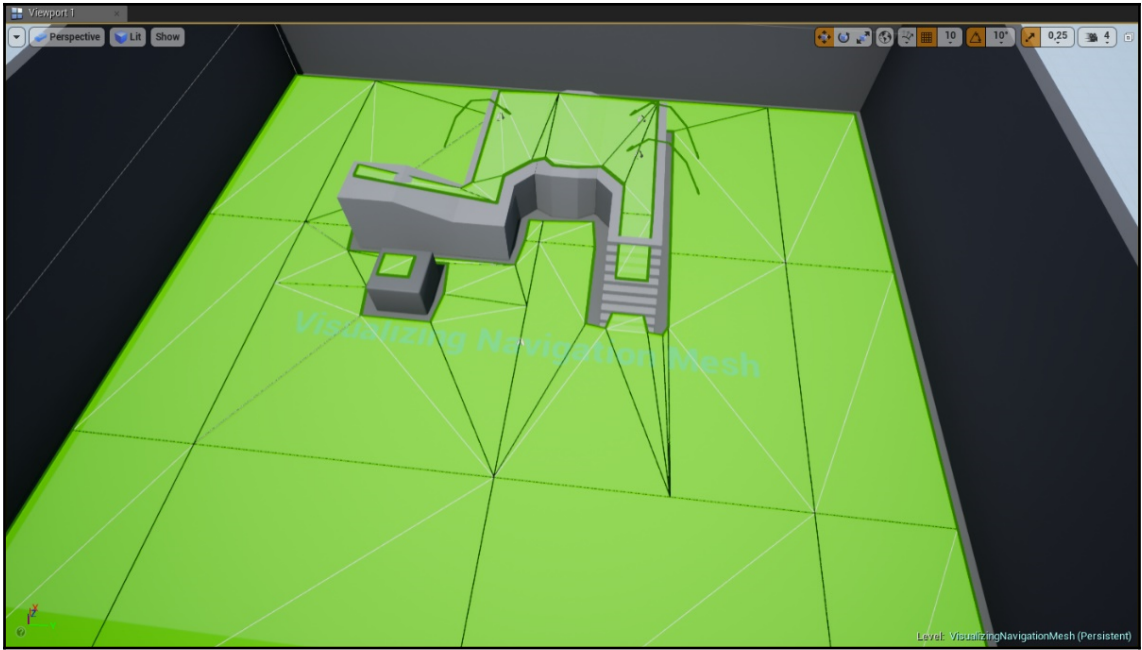


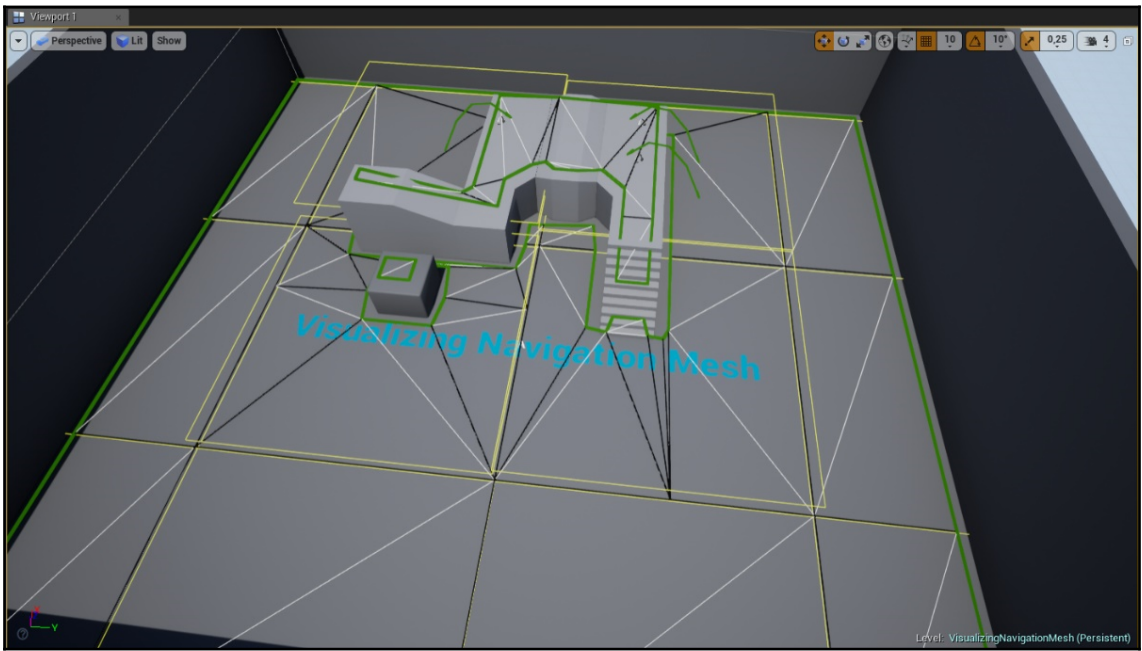
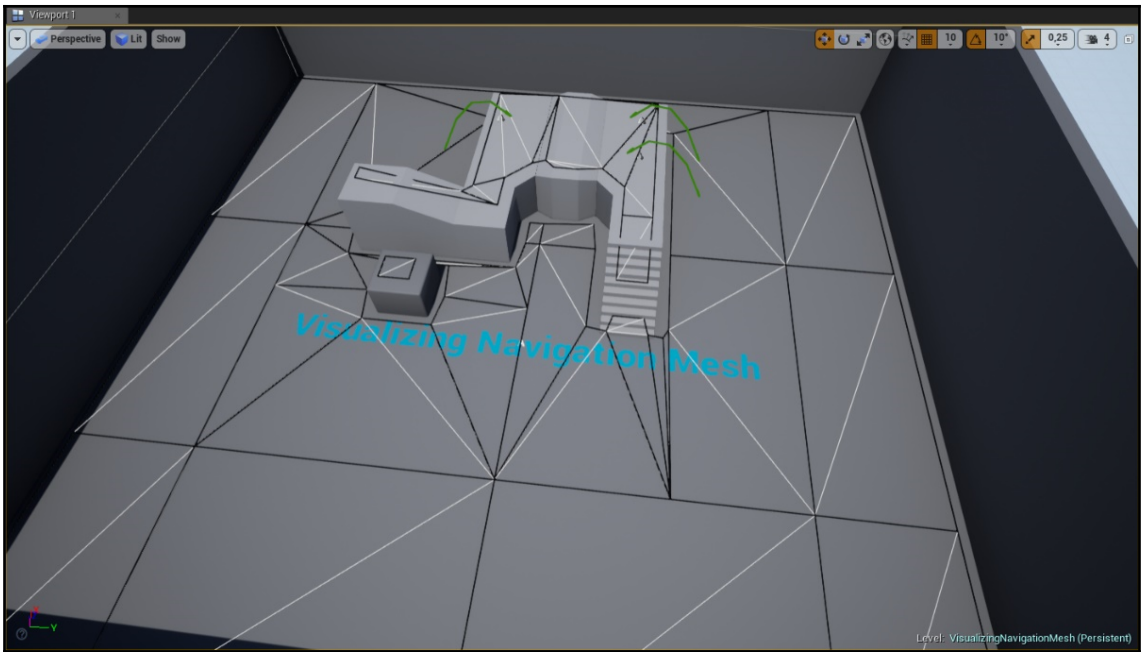


## Display

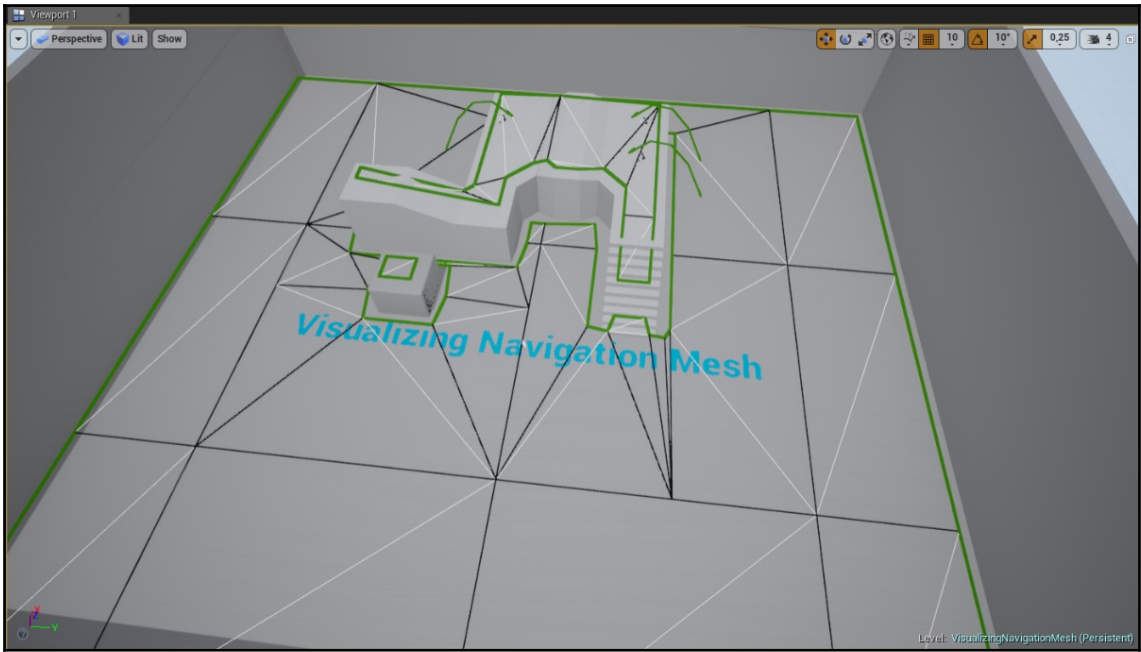
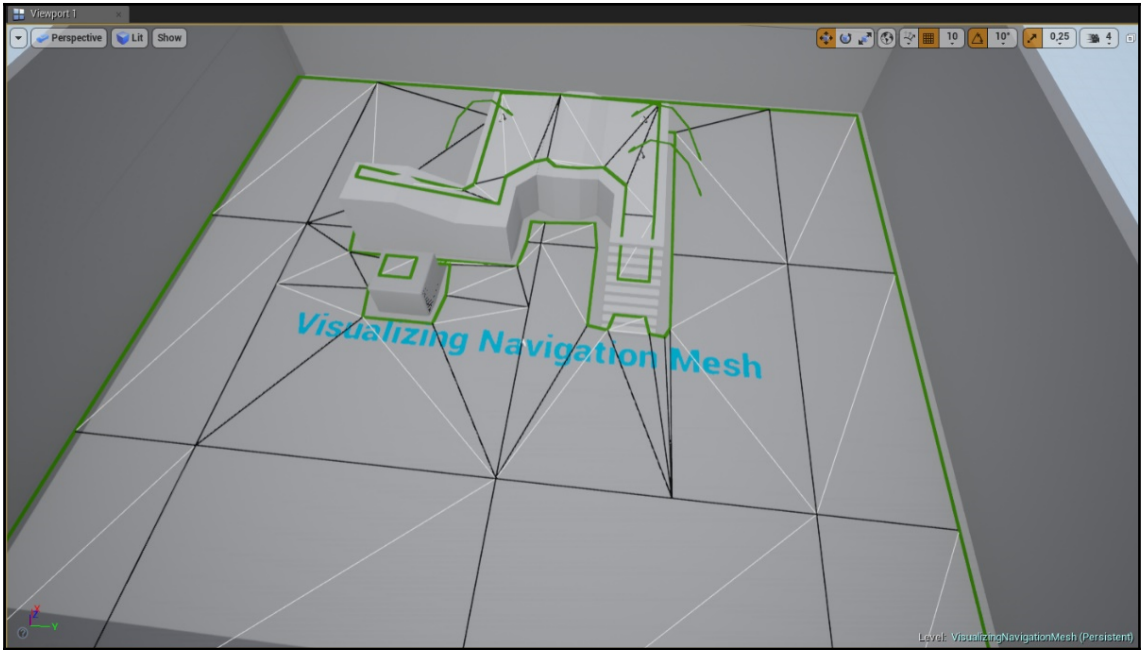
- |                              |                                       |
|------------------------------|---------------------------------------|
| Draw Triangle Edges          | <input type="checkbox"/>              |
| Draw Poly Edges              | <input type="checkbox"/>              |
| Draw Filled Polys            | <input checked="" type="checkbox"/>   |
| Draw Nav Mesh Edges          | <input checked="" type="checkbox"/>   |
| Draw Tile Bounds             | <input type="checkbox"/>              |
| Draw Path Colliding Geometry | <input type="checkbox"/>              |
| Draw Tile Labels             | <input type="checkbox"/>              |
| Draw Polygon Labels          | <input type="checkbox"/>              |
| Draw Default Polygon Cost    | <input type="checkbox"/>              |
| Draw Labels on Path Nodes    | <input type="checkbox"/>              |
| Draw Nav Links               | <input checked="" type="checkbox"/>   |
| Draw Failed Nav Links        | <input type="checkbox"/>              |
| Draw Clusters                | <input type="checkbox"/>              |
| Draw Octree                  | <input type="checkbox"/>              |
| Draw Octree Details          | <input checked="" type="checkbox"/>   |
| Draw Nav Mesh                | <input checked="" type="checkbox"/>   |
| Draw Offset                  | <input type="text" value="10,0"/>     |
| Enable Drawing               | <input checked="" type="checkbox"/> ↻ |

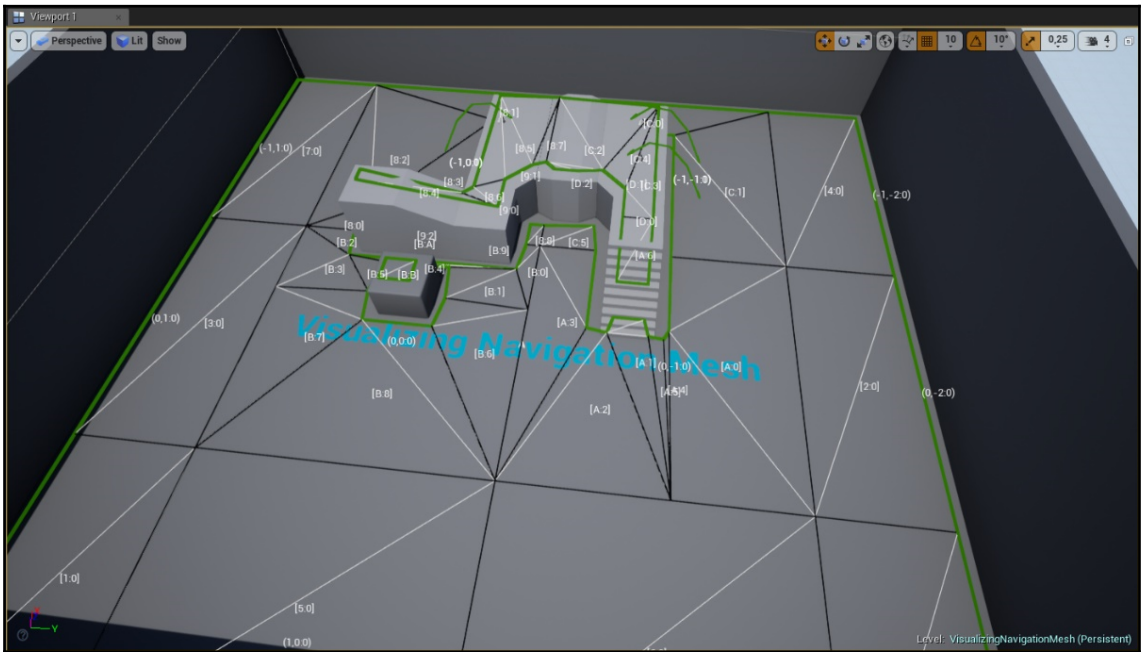
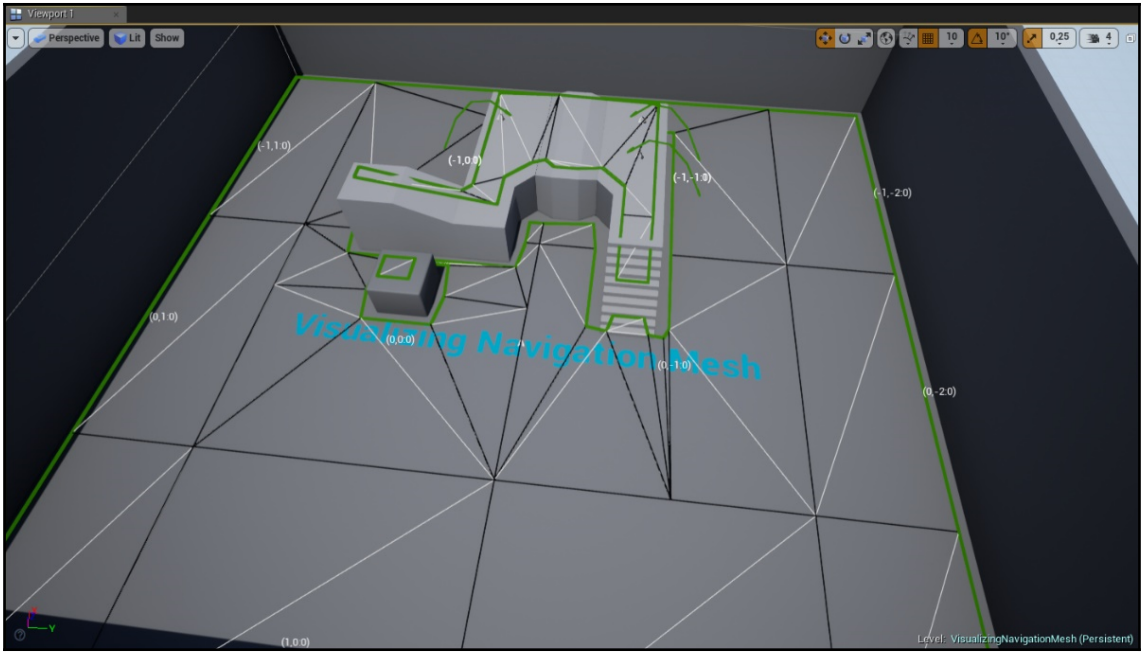


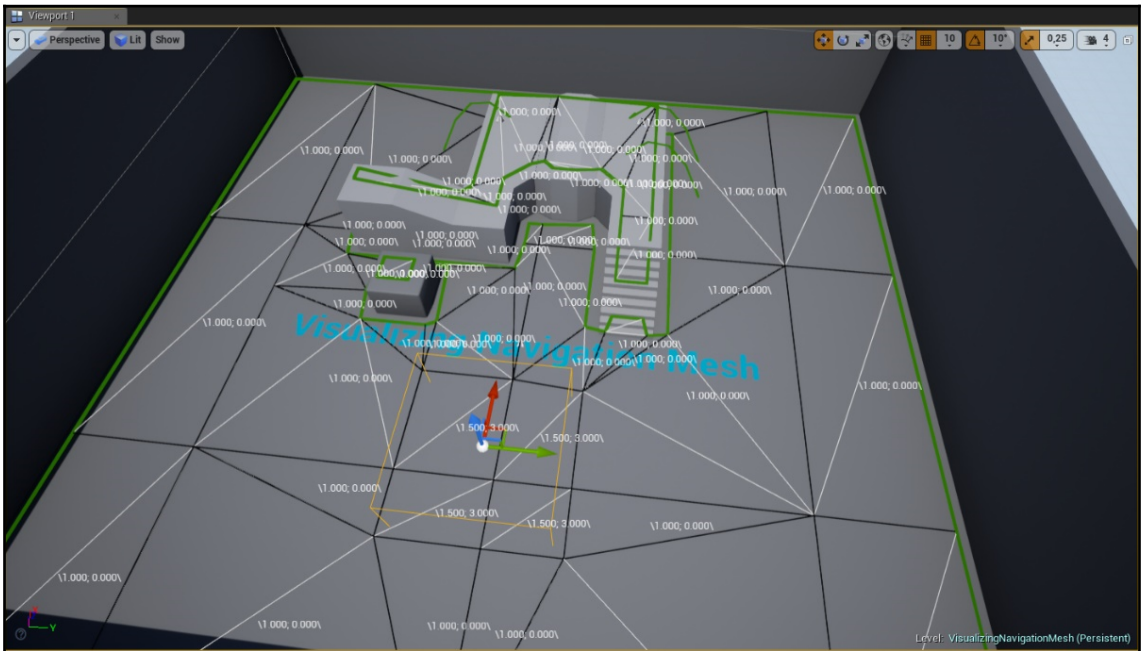
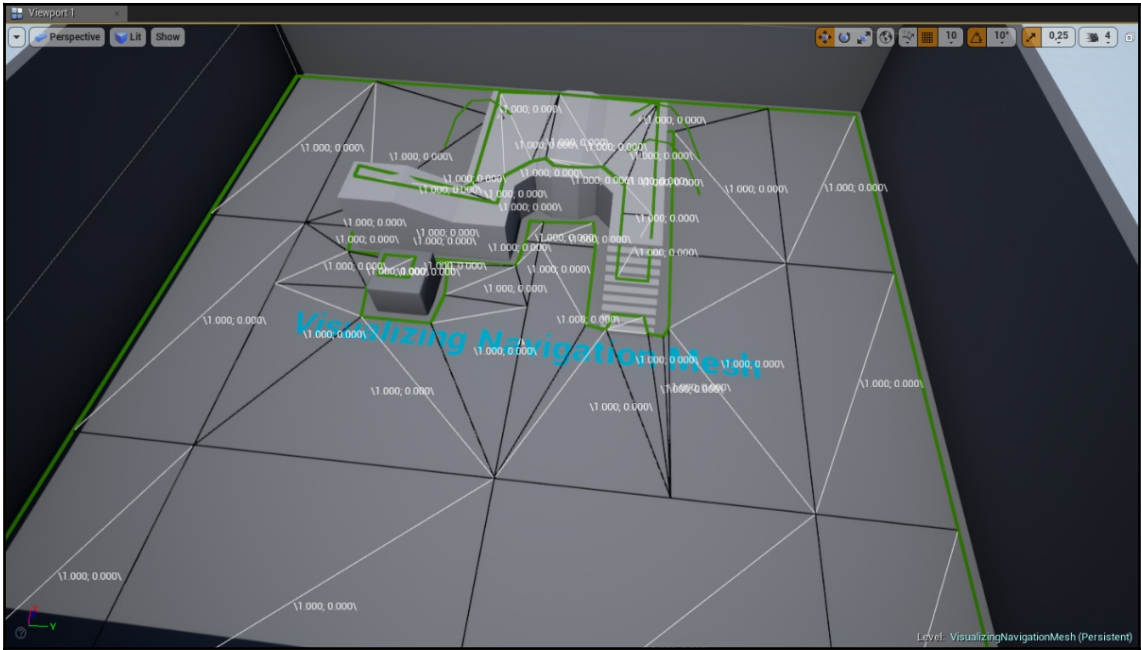


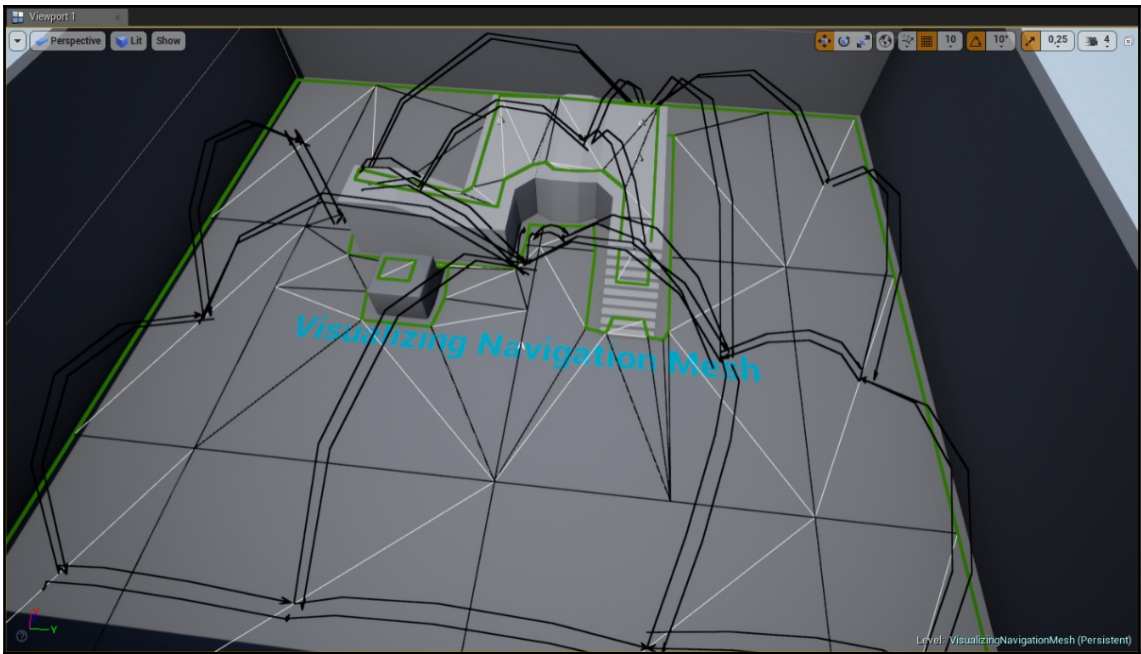
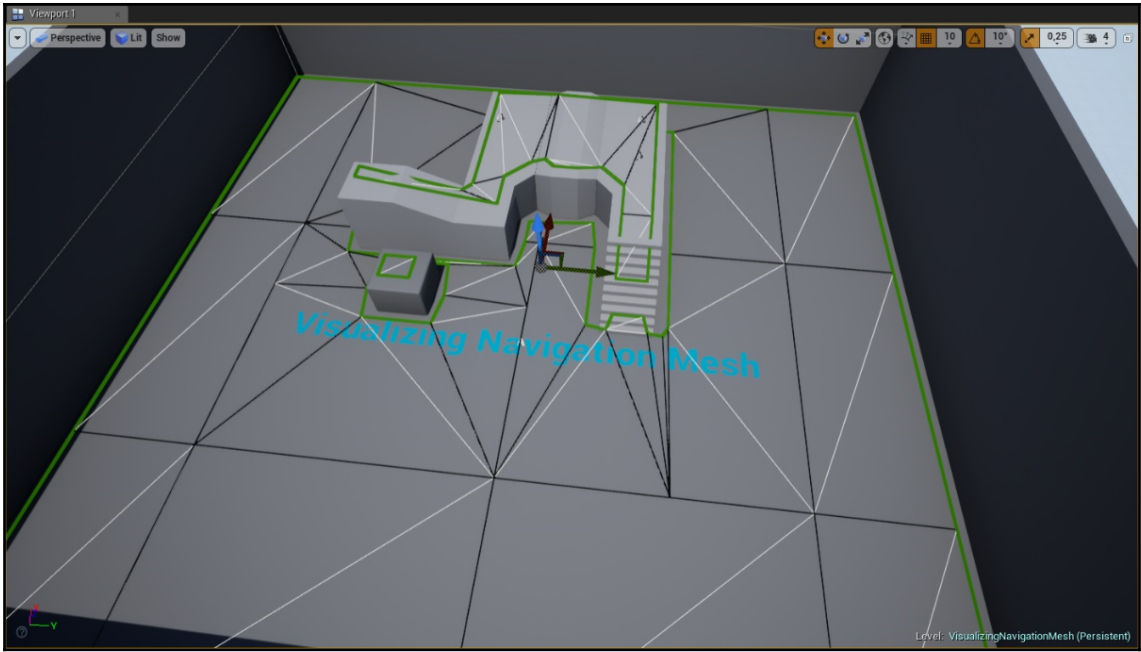


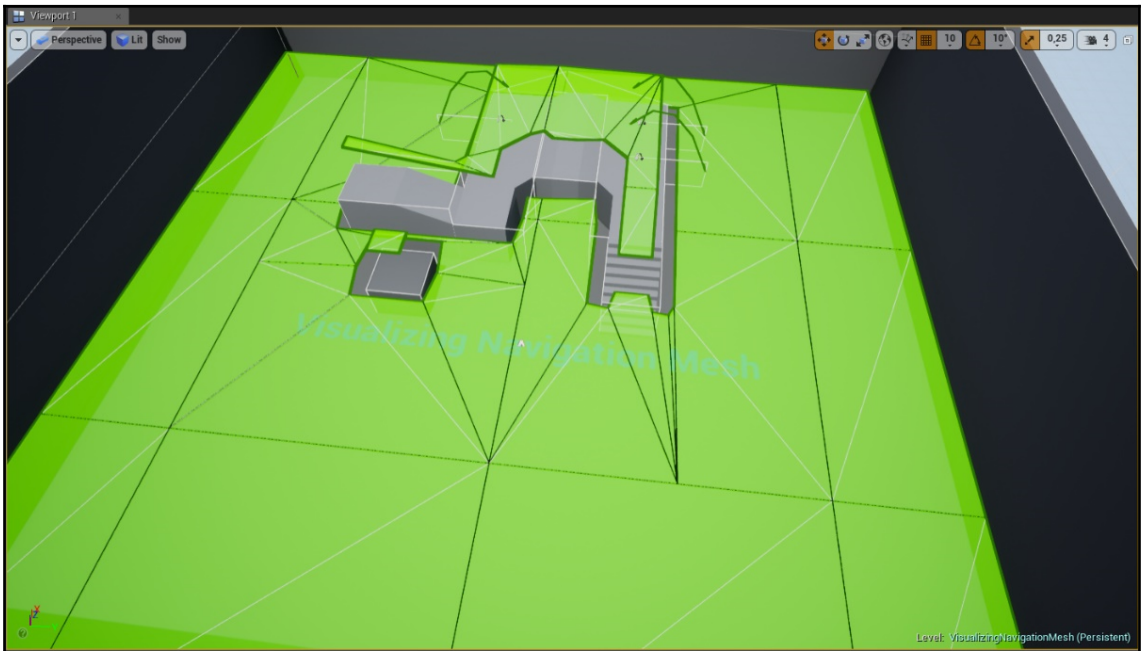
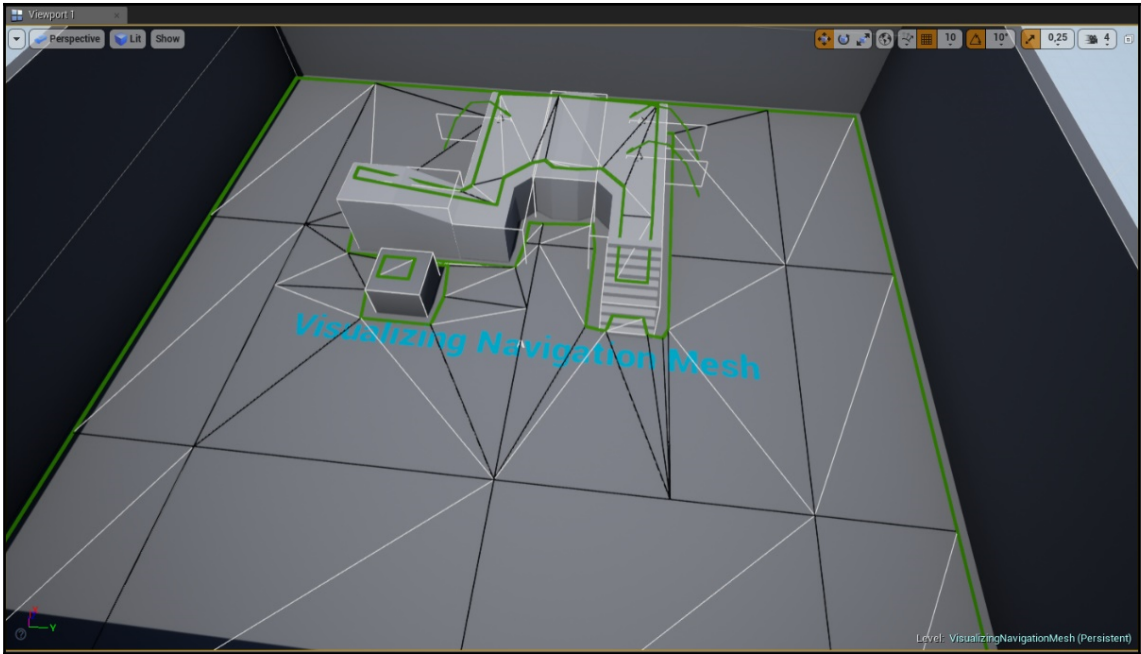


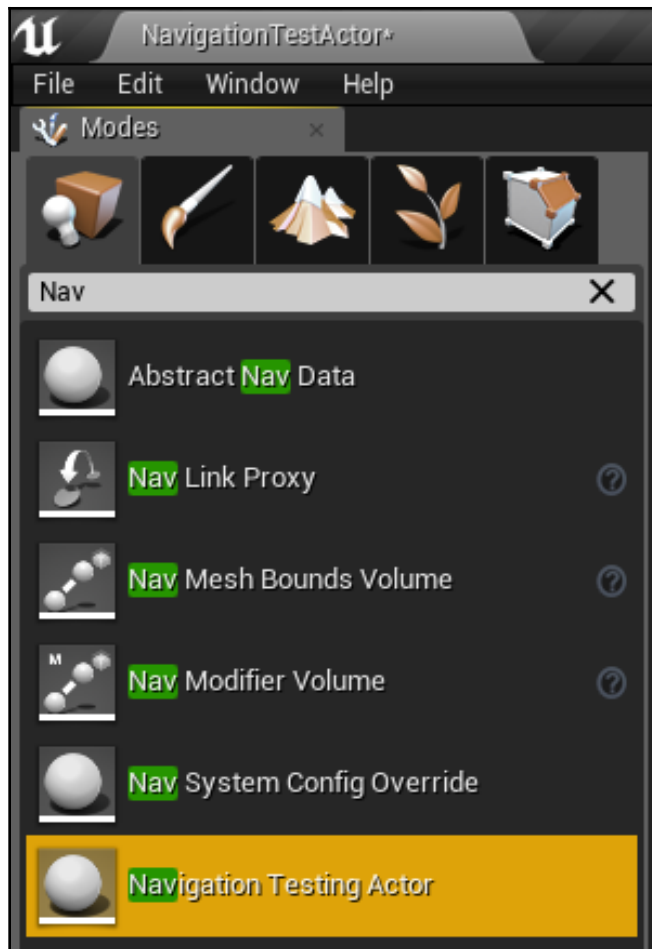


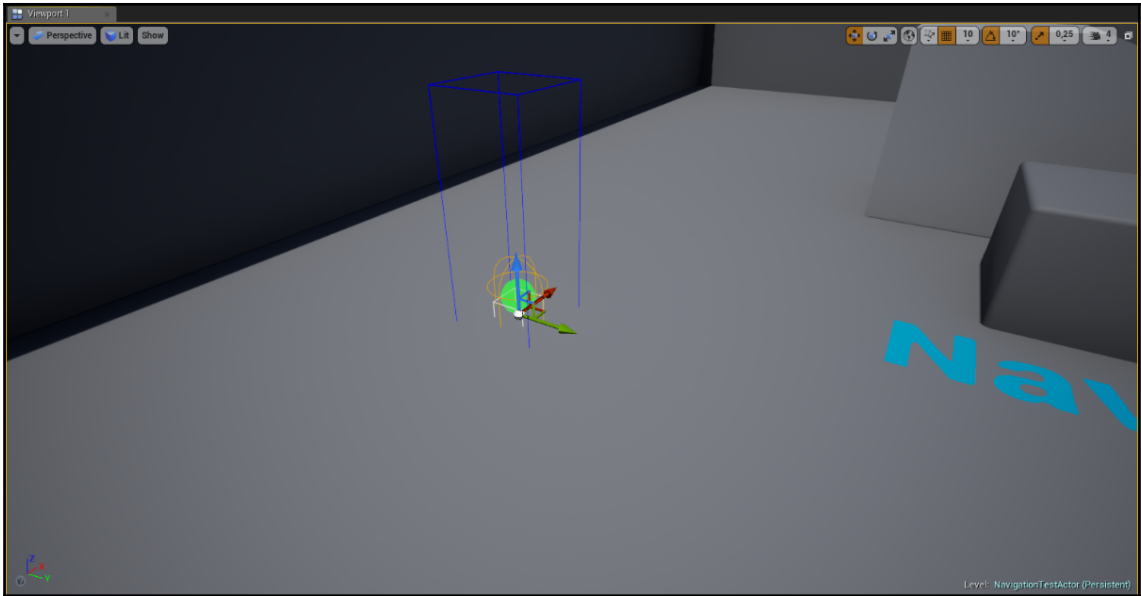






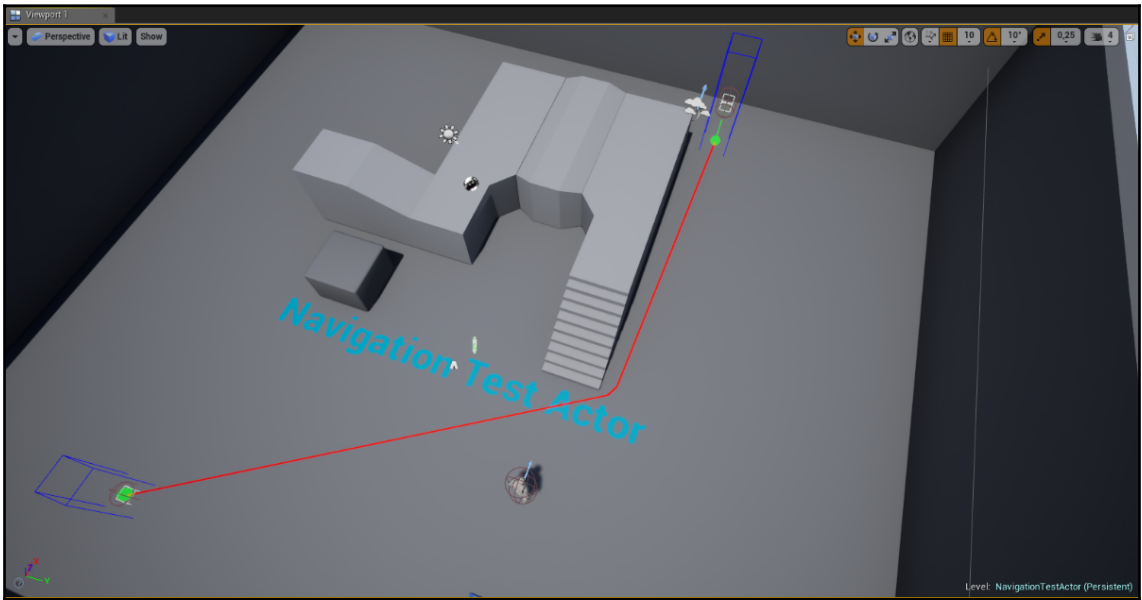




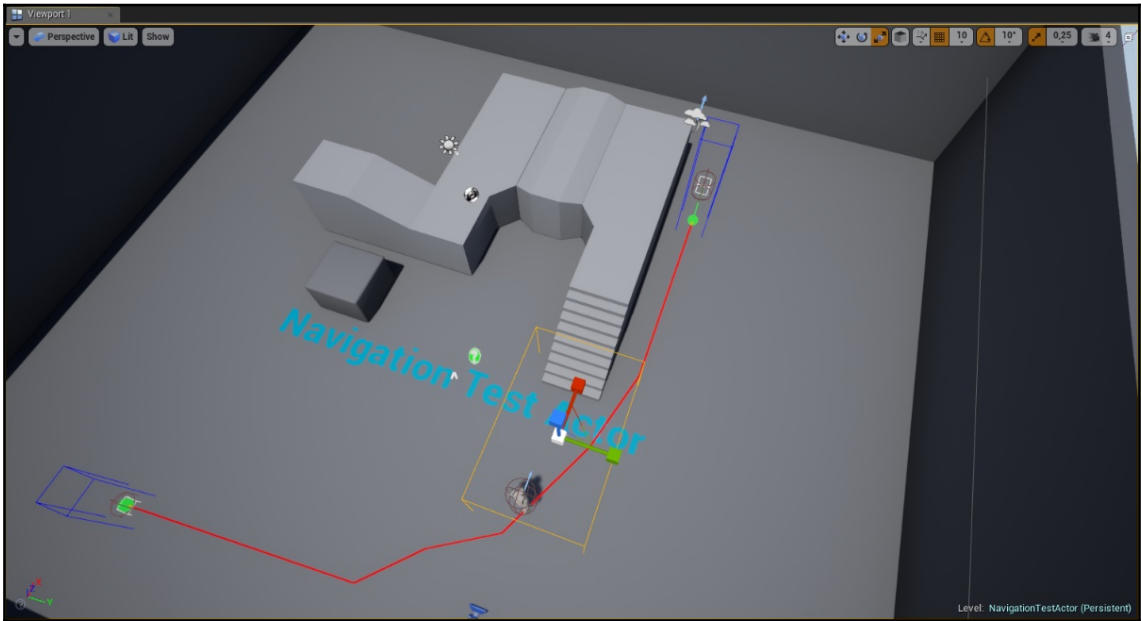
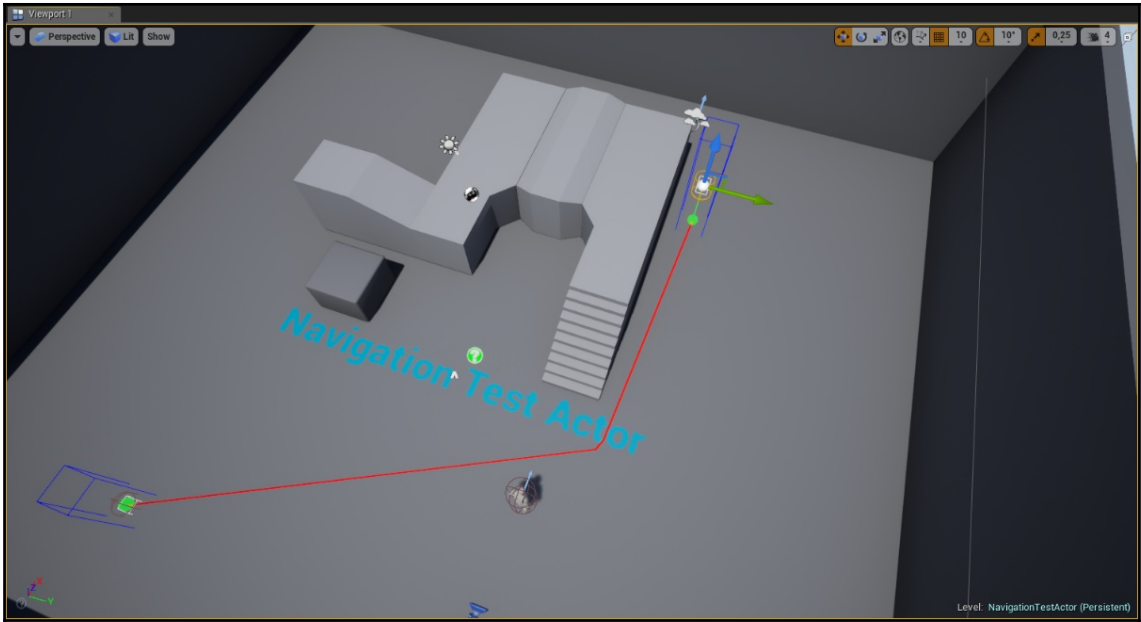


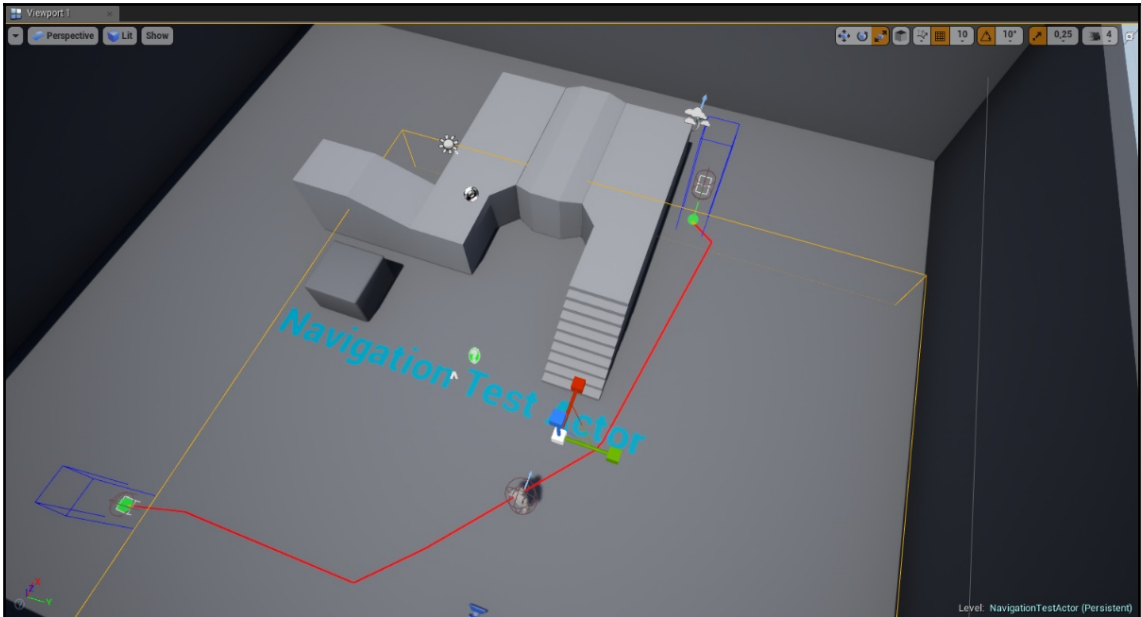
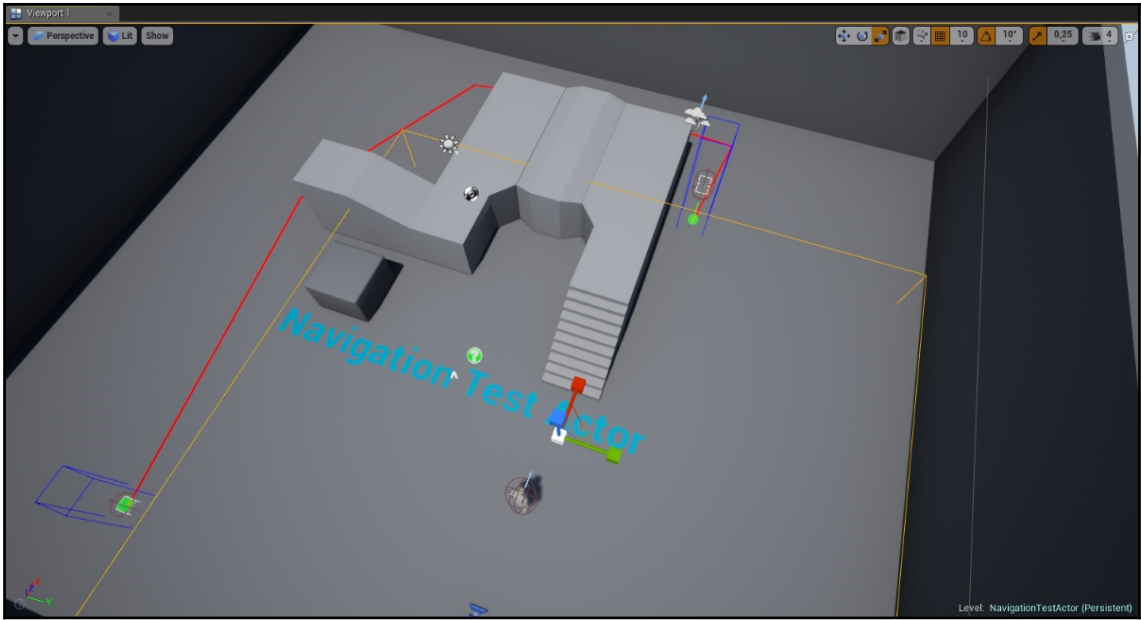
### Pathfinding

Search Start	<input checked="" type="checkbox"/> ↻
Use Hierarchical Pathfinding	<input type="checkbox"/>
Gather Detailed Info	<input checked="" type="checkbox"/>
Other Actor	NavigationTestingActor1 🔍 ↻
Filter Class	None ◀ 🔍 + ✕
Offset from Corners Distance	0,0 ↵









## Stat GameplayTags

Stat Game

Displays game performance stats

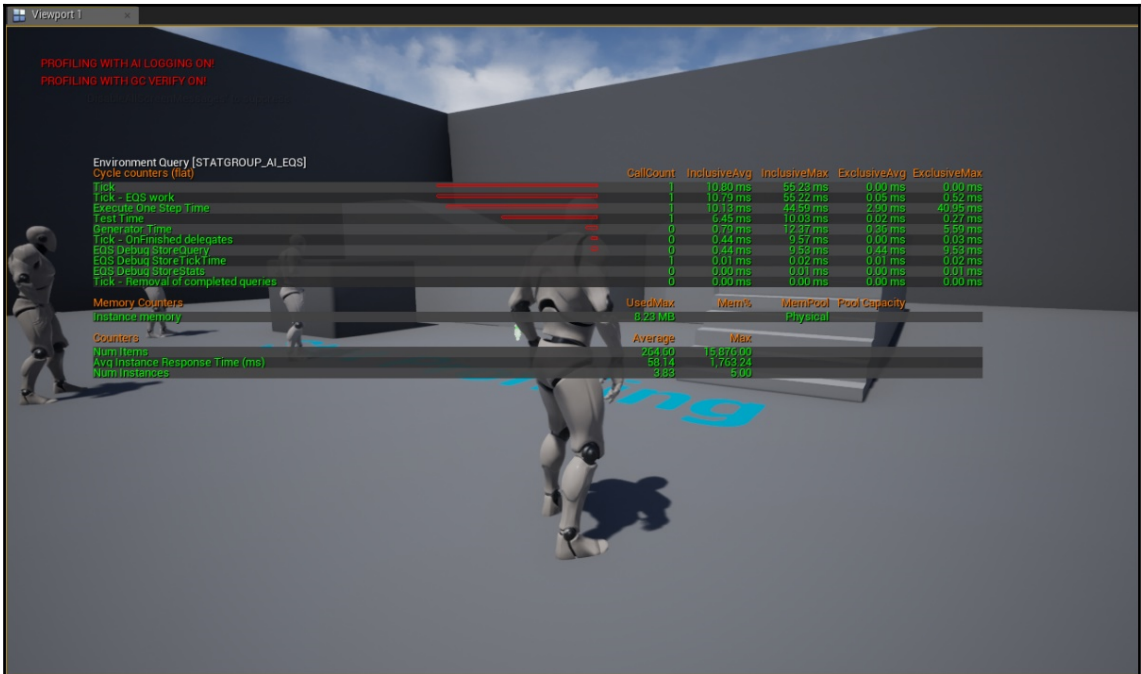
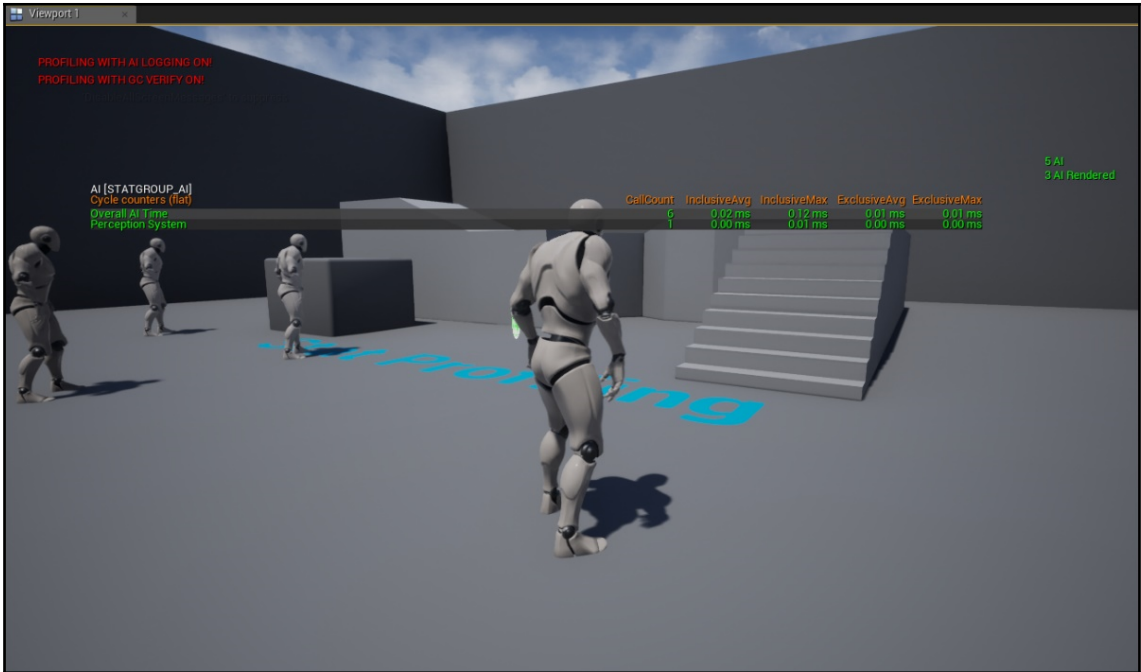
> Stat Game\_

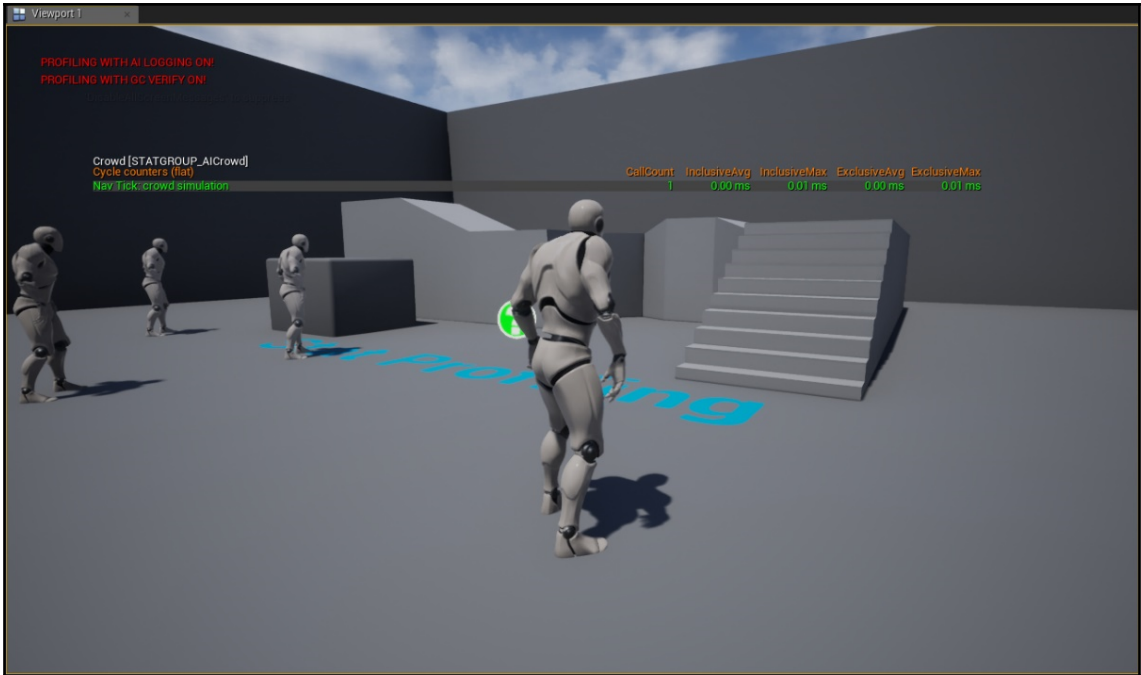
Viewport 1

**PROFILING WITH AI LOGGING ON!**  
**PROFILING WITH GC VERIFY ON!**  
DisableInScreenMessages To suppress

Game (STATGROUP_Game)	Callcount	InclusiveAvg	InclusiveMax	ExclusiveAvg	ExclusiveMax
Cycle counters (Hit)					
World Tick Time	2	7.99 ms	66.07 ms	0.09 ms	0.21 ms
TickableGameObjects Time	9	5.55 ms	62.23 ms	0.04 ms	0.07 ms
DT Tickable Time	2	5.55 ms	62.23 ms	0.04 ms	0.07 ms
Tick Time	6	2.16 ms	3.71 ms	0.01 ms	0.01 ms
Char Movement Total	6	0.84 ms	0.92 ms	0.09 ms	0.01 ms
Blueprint Time	23	0.19 ms	0.31 ms	0.01 ms	0.02 ms
Post Tick Component Update	7	0.13 ms	0.21 ms	0.01 ms	0.01 ms
Transform of Render Data	32	0.08 ms	0.12 ms	0.02 ms	0.04 ms
PlayerController Tick	1	0.05 ms	0.13 ms	0.00 ms	0.00 ms
Queue Tasks	2	0.07 ms	0.12 ms	0.07 ms	0.12 ms
Update Camera Time	2	0.07 ms	0.11 ms	0.05 ms	0.09 ms
Blueprint Latent Actions	19	0.01 ms	0.01 ms	0.01 ms	0.01 ms
Nav Tick Time	2	0.01 ms	0.01 ms	0.01 ms	0.01 ms
Camera ProcessViewRotation	1	0.00 ms	0.01 ms	0.00 ms	0.01 ms
GC Sweep Time	1	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Teleport To Time	1	0.00 ms	0.01 ms	0.00 ms	0.01 ms
EndPose/MovementUpdate Time	6	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Reset Async Trace Time	1	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Finish Async Trace Time	1	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Net Tick Time	2	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Net Broadcast Tick Time	2	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Cooldown Dequeueing	2	0.00 ms	0.00 ms	0.00 ms	0.00 ms
Schedule cooldowns					
Counters		Average	Max		
Ticks Requested		48.00	48.00		
TimerManager Heap Size		8.00	8.00		







Viewport 1

PROFILING WITH AI LOGGING ON!  
 PROFILING WITH OC VERIFY ON!

Click to suppress

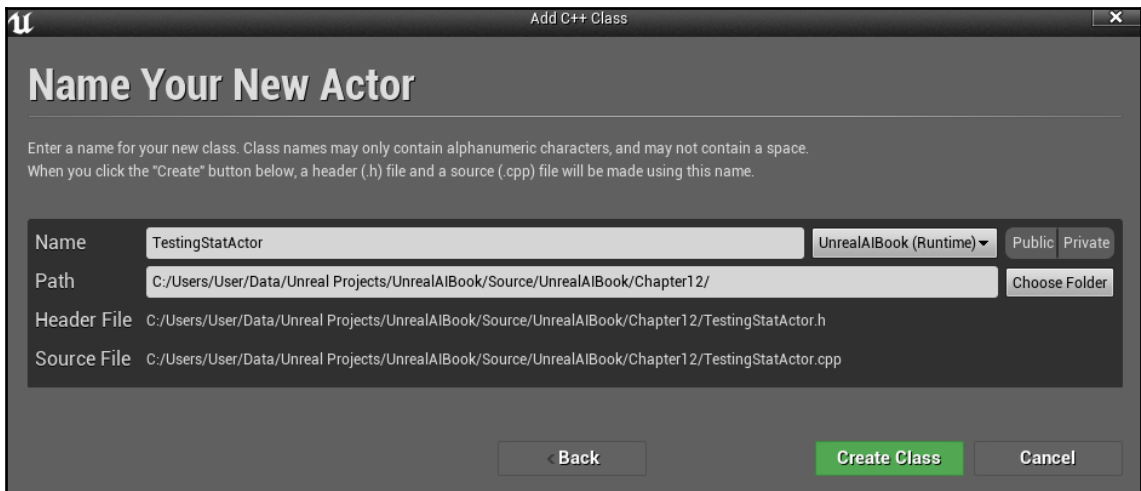
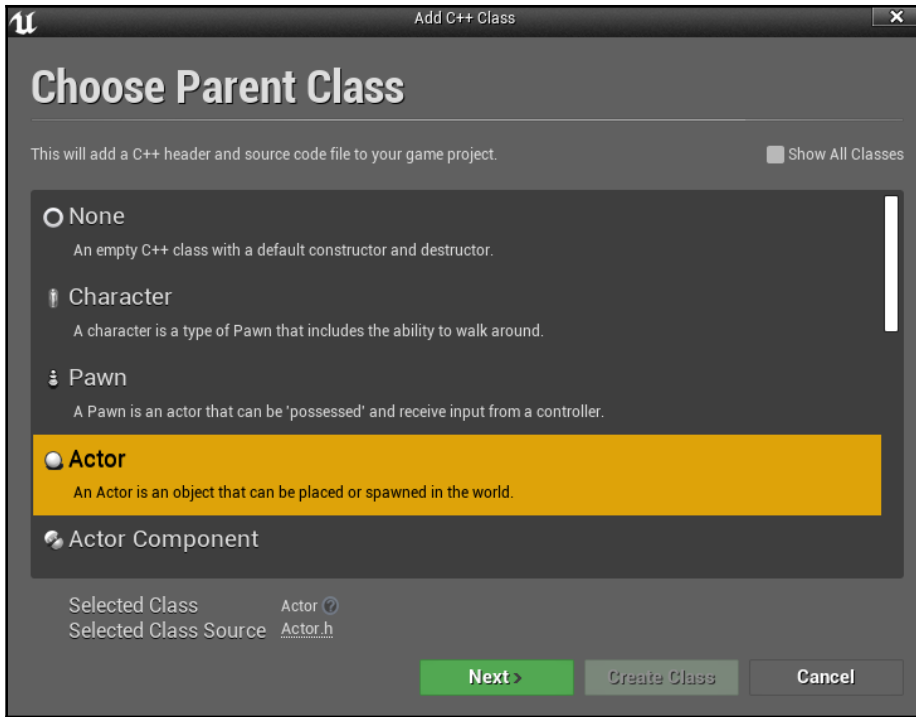
5 AI  
1 AI Rendered

Crowd [STATGROUP_AICrowd]	CallCount	InclusiveAvg	InclusiveMax	ExclusiveAvg	ExclusiveMax
Cycle counters (flat)					
Nav Task: crowd simulation	1	0.00 ms	0.00 ms	0.00 ms	0.00 ms

AI [STATGROUP_AI]	CallCount	InclusiveAvg	InclusiveMax	ExclusiveAvg	ExclusiveMax
Cycle counters (flat)					
Overall AI Time	6	0.02 ms	0.07 ms	0.01 ms	0.01 ms
Perception system	1	0.00 ms	0.01 ms	0.00 ms	0.00 ms

Behavior Tree [STATGROUP_AIBehaviorTree]	CallCount	InclusiveAvg	InclusiveMax	ExclusiveAvg	ExclusiveMax
Cycle counters (flat)					
Task	5	0.01 ms	0.06 ms	0.01 ms	0.01 ms
Execution Time	0	0.00 ms	0.04 ms	0.00 ms	0.00 ms
Search Time	0	0.00 ms	0.02 ms	0.00 ms	0.02 ms

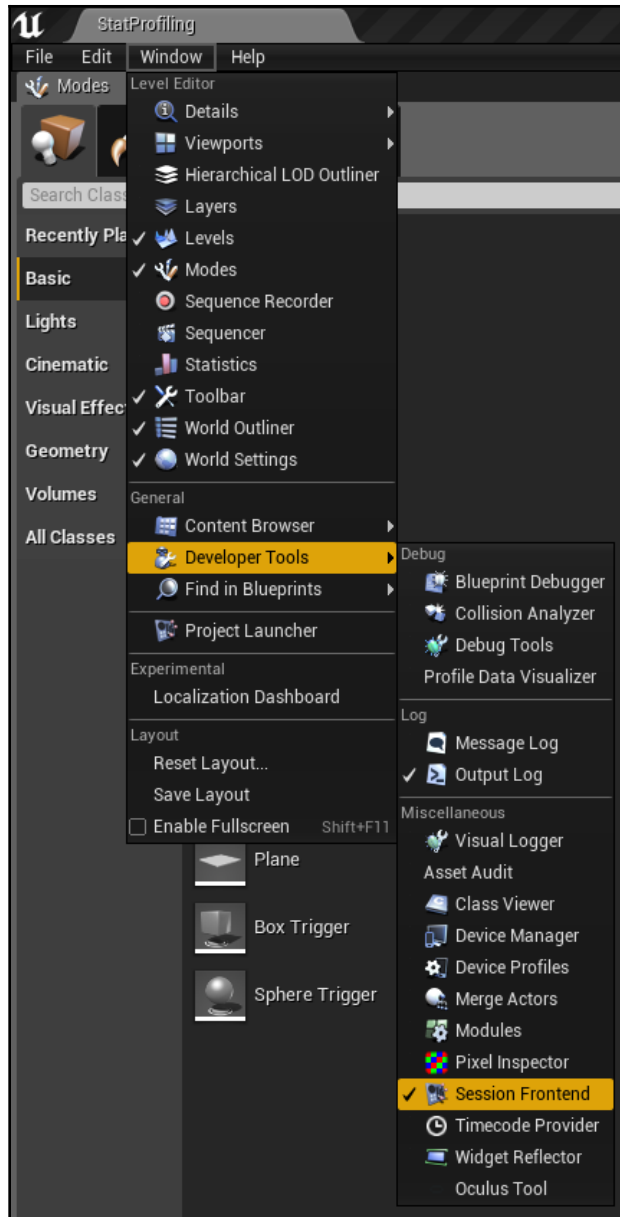
Memory Counters	Used/Max	Mem%	MemPool	Pool Capacity
Instance memory	0.00 MB		Physical	

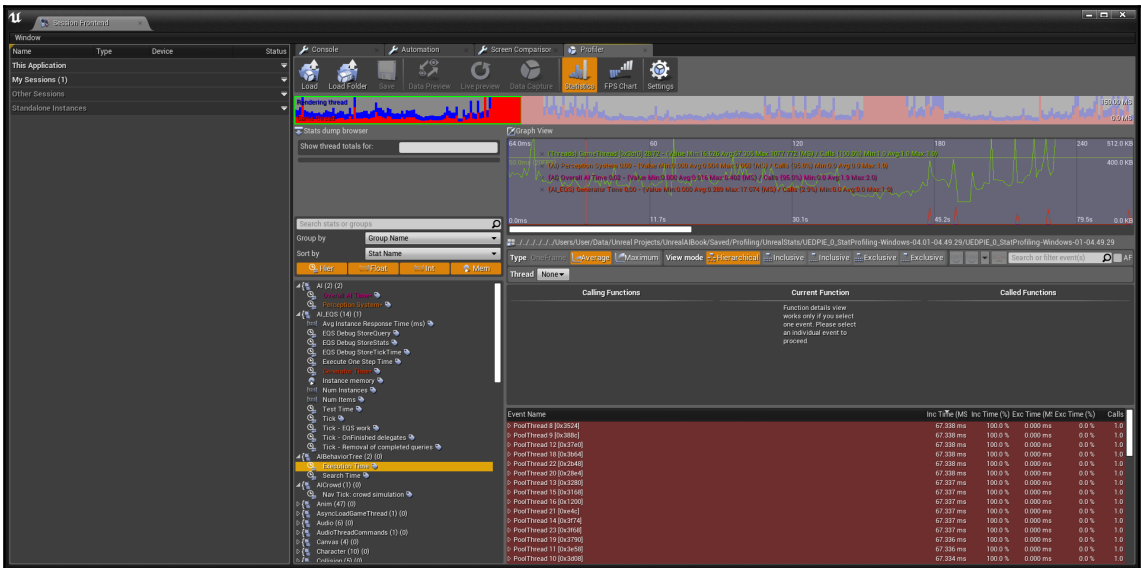
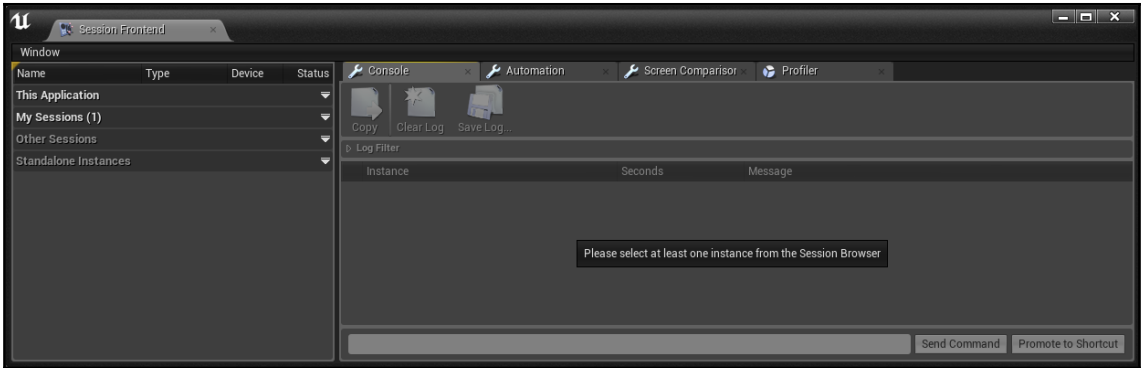




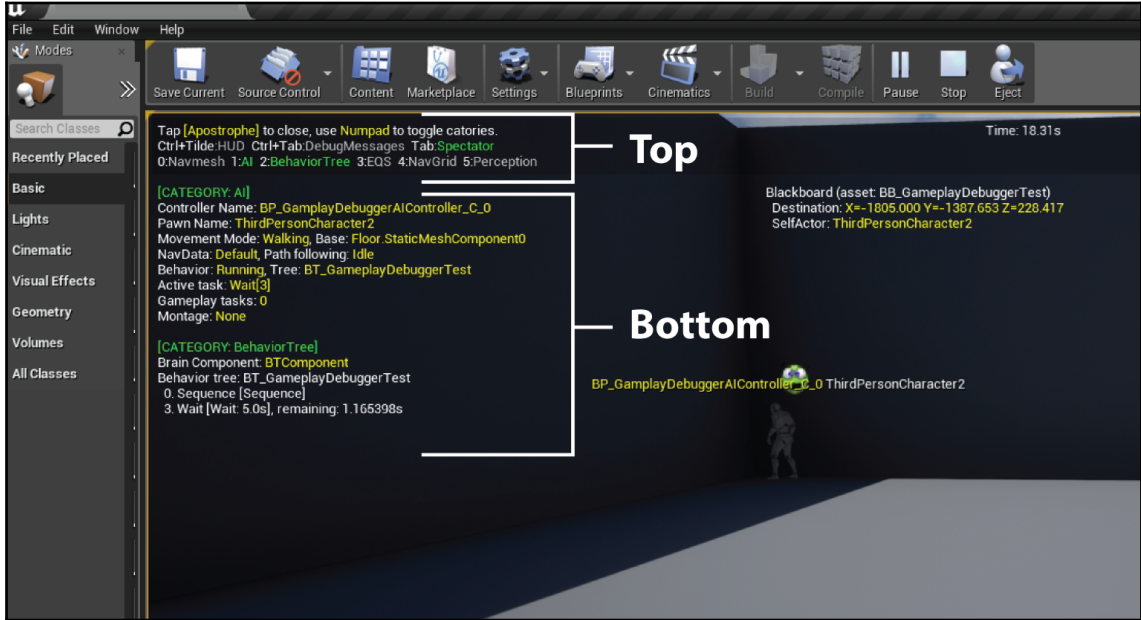
```
Stat AICrowd
Stat AIBehaviorTree
Stat AI_MyCustomGroup
Stat AI_EQS
Stat AI
> Stat AI_
```







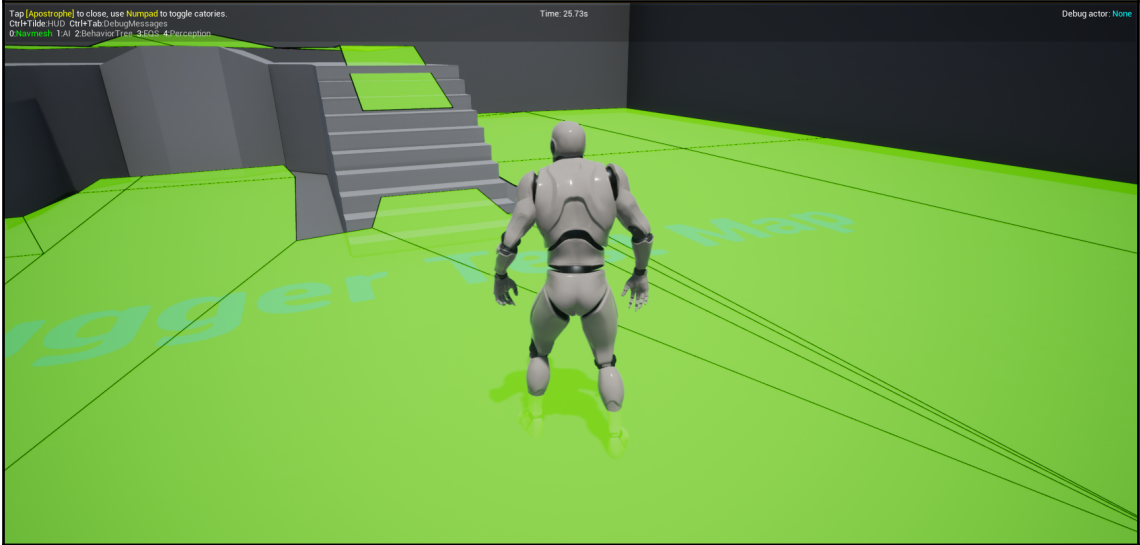
# Chapter 13: Debugging Methods for AI - The Gameplay Debugger



```
Tap [Apostrophe] to close, use Numpad to toggle categories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages Tab:Spectator  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:NavGrid 5:Perception
```

```
[CATEGORY: AI]  
Controller Name: BP_GamplayDebuggerAIController_C_0  
Pawn Name: ThirdPersonCharacter2  
Movement Mode: Walking, Base: Floor.StaticMeshComponent0  
NavData: Default, Path following: Idle  
Behavior: Running, Tree: BT_GameplayDebuggerTest  
Active task: Wait[3]  
Gameplay tasks: 0  
Montage: None  
  
[CATEGORY: BehaviorTree]  
Brain Component: BTComponent  
Behavior tree: BT_GameplayDebuggerTest  
0. Sequence [Sequence]  
3. Wait [Wait: 5.0s], remaining: 1.165398s
```

Tap [Apostrophe] to close, use Numpad to toggle categories.  
**Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages Tab:Spectator**  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:NavGrid 5:Perception

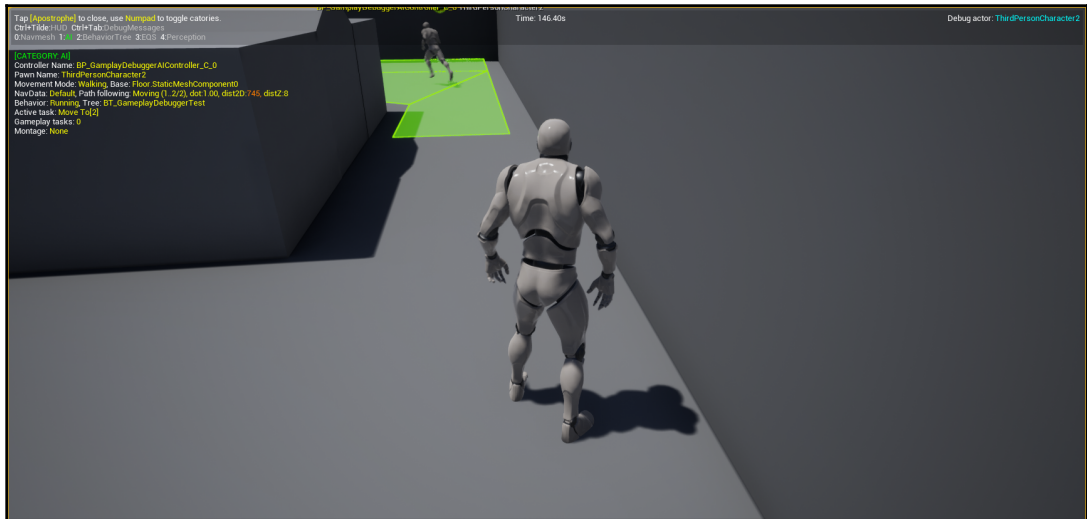


Tap [Apostrophe] to close, use Numpad to toggle categories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:Perception

[CATEGORY: AI]  
Controller Name: BP\_GameplayDebuggerAIController\_C\_0  
Pawn Name: ThirdPersonCharacter2  
Movement Mode: Walking, Base: Floor.StaticMeshComponent0  
NavData: Default, Path following: Idle  
Behavior: Running, Tree: BT\_GameplayDebuggerTest  
Active task: Wait[3]  
Gameplay tasks: 0  
Montage: None

Tap [Apostrophe] to close, use Numpad to toggle categories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:Perception

[CATEGORY: AI]  
Controller Name: BP\_GameplayDebuggerAIController\_C\_0  
Pawn Name: ThirdPersonCharacter2  
Movement Mode: Walking, Base: Floor.StaticMeshComponent0  
NavData: Default, Path following: Moving (1..2/2), dot:1.00, dist2D:745, distZ:8  
Behavior: Running, Tree: BT\_GameplayDebuggerTest  
Active task: Move To[2]  
Gameplay tasks: 0  
Montage: None





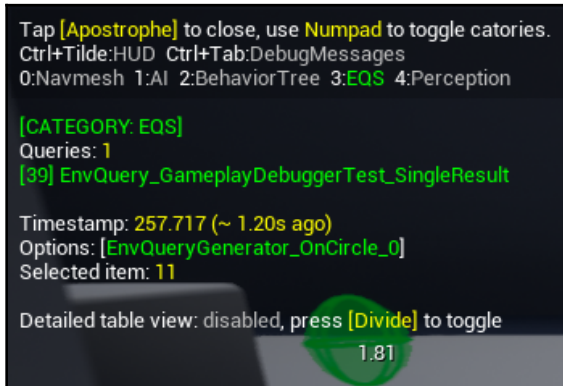
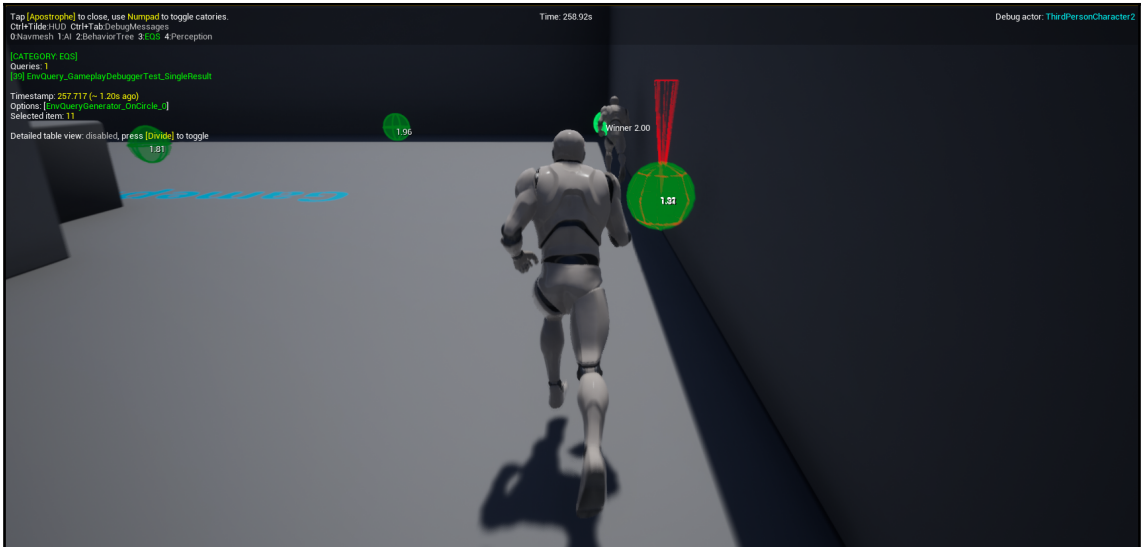
Tap [Apostrophe] to close, use Numpad to toggle catories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:Perception

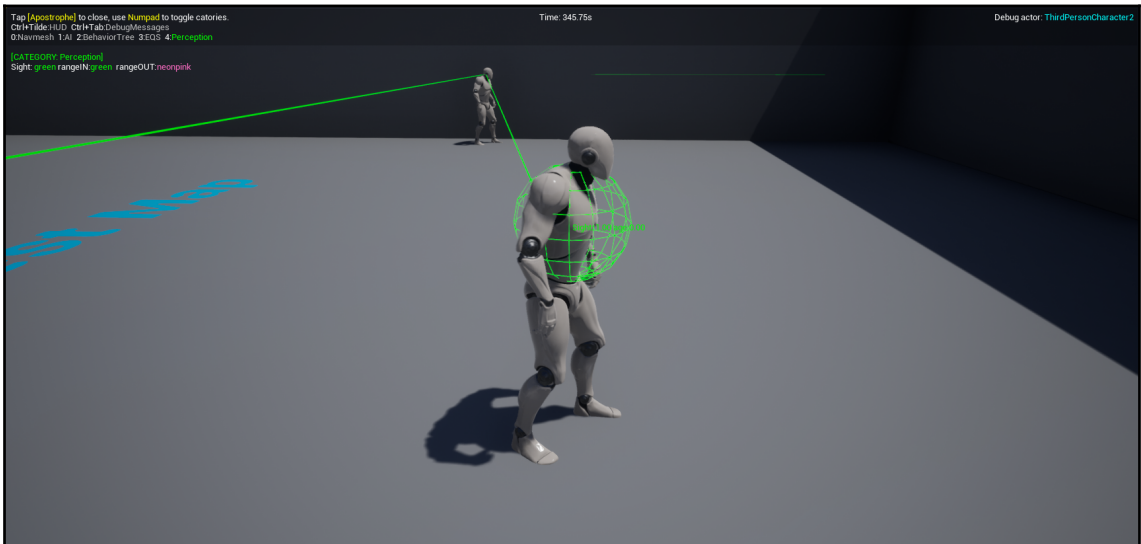
[CATEGORY: BehaviorTree]  
Brain Component: BTComponent  
Behavior tree: BT\_GameplayDebuggerTest  
0. Sequence [Sequence]  
3. Wait [Wait: 5.0s], remaining: 1.785686s

Blackboard (asset: BB\_GameplayDebuggerTest)  
Destination: X=-1763.001 Y=-368.344 Z=228.417  
SelfActor: ThirdPersonCharacter2



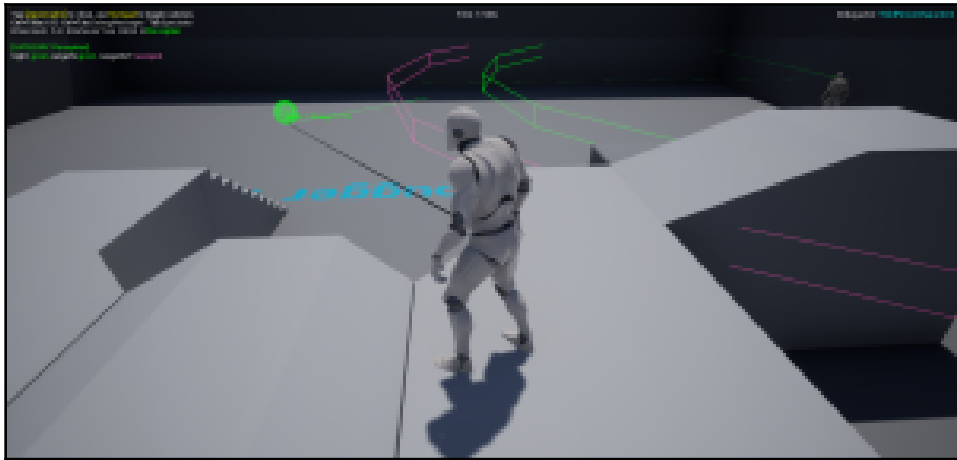
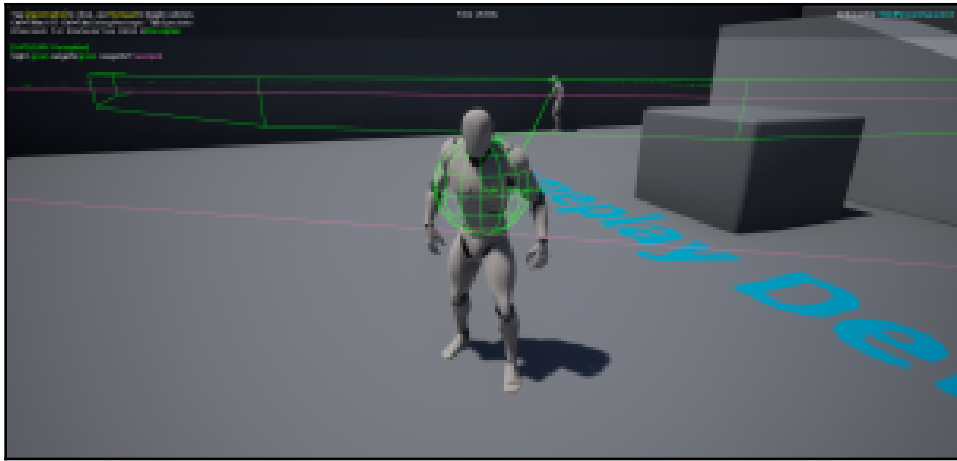


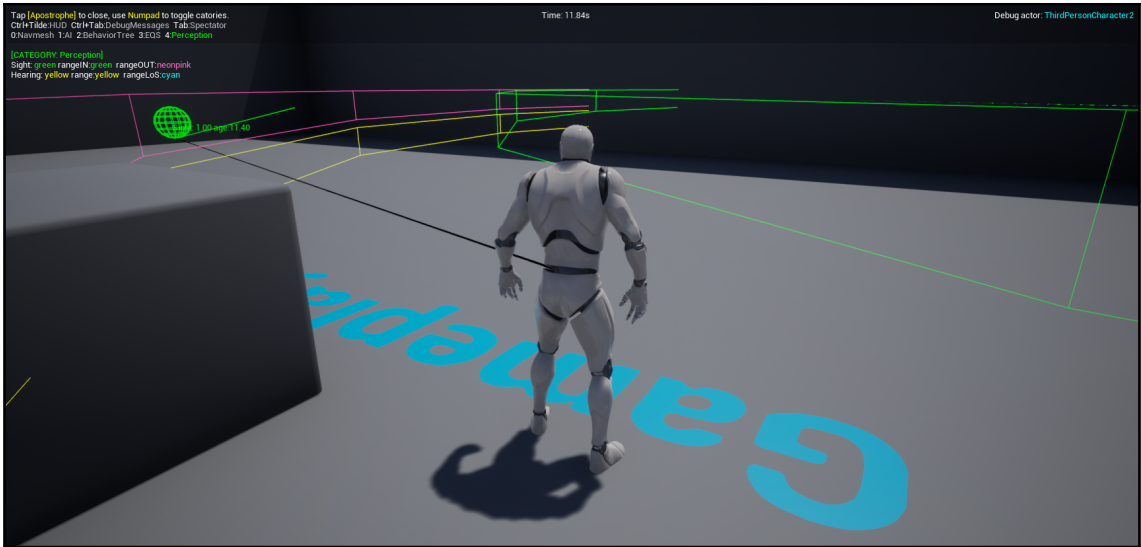




Tap [Apostrophe] to close, use Numpad to toggle catories.  
 Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
 0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:Perception

[CATEGORY: Perception]  
 Sight: green rangeIN:green rangeOUT:neonpink





Tap [Apostrophe] to close, use Numpad to toggle catories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:Perception

[CATEGORY: Perception]  
Sight: green rangeIN:green rangeOUT:neonpink  
Hearing: yellow range:yellow rangeLoS:cyan

Tap [Apostrophe] to close, use Numpad to toggle catories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:NavGrid 5:Perception

[CATEGORY: NavGrid]  
Num sources: 0



#### Input

Activation Key	Apostrophe
Category Row Next Key	Num +
Category Row Prev Key	Num -
Category Slot 0	Num 0
Category Slot 1	Num 1
Category Slot 2	Num 2
Category Slot 3	Num 3
Category Slot 4	Num 4
Category Slot 5	Num 5
Category Slot 6	Num 6
Category Slot 7	Num 7
Category Slot 8	Num 8
Category Slot 9	Num 9

#### Display

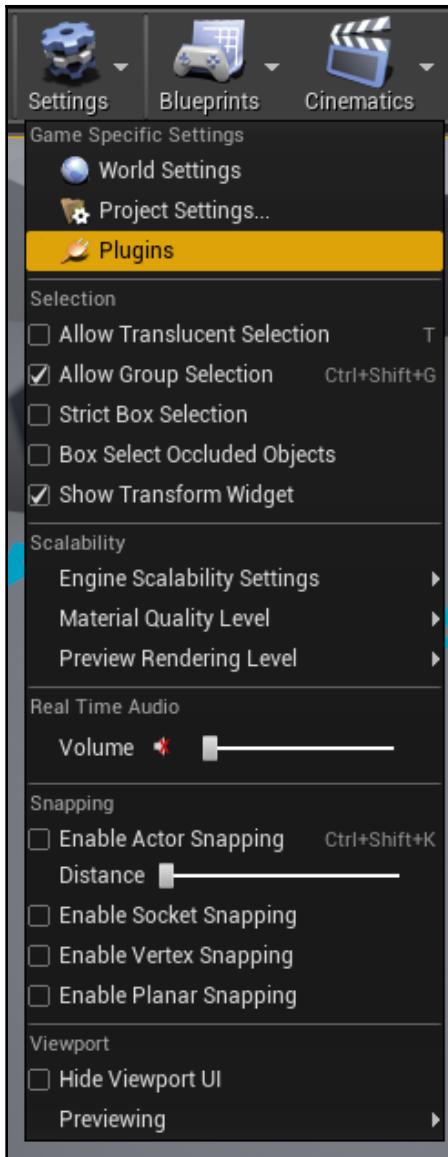
Debug Canvas Padding Left	10,0
Debug Canvas Padding Right	10,0
Debug Canvas Padding Top	10,0
Debug Canvas Padding Bottom	10,0

Add Ons	
Categories	6 Array elements
▷ 0	[1]:AI
▷ 1	[2]:BehaviorTree
▷ 2	[-]:EQS
▷ 3	[0]:Navmesh
▷ 4	[-]:Perception
▷ 5	[-]:NavGrid
Extensions	2 Array elements
▷ 0	GameHUD
▷ 1	Spectator


[CATEGORY: Locator]

If a DebugActor is selected, this is its position:

Location: X=908.544 Y=515.342 Z=228.417





 **New Plugin** [Close]

Choose a template and then specify a name to create a new plugin.

**Blank**  
Create a blank plugin with a minimal amount of code.

Choose this if you want to set everything up from scratch or are making a non-visual plugin.  
A plugin created with this template will appear in the Editor's plugin list but will not register any buttons or menu entries.

**Content Only**  
Create a blank plugin that can only contain content.

**Blueprint Library**  
Create a plugin that will contain Blueprint Function Library.

Choose this if you want to create static blueprint nodes.

**Editor Toolbar Button**

Folder Name

**Descriptor Data**

Author

Description

11 New Plugin

Choose a template and then specify a name to create a new plugin.

### Blank

Create a blank plugin with a minimal amount of code.

Choose this if you want to set everything up from scratch or are making a non-visual plugin.  
A plugin created with this template will appear in the Editor's plugin list but will not register any buttons or menu entries.

### Content Only

Create a blank plugin that can only contain content.

### Blueprint Library

Create a plugin that will contain Blueprint Function Library.

Choose this if you want to create static blueprint nodes.

C:\Users\User\Data\Unreal Projects\Unreal AIBook\Plugins\ ... GameplayDebugger\_Locator

Folder Name

4 Descriptor Data

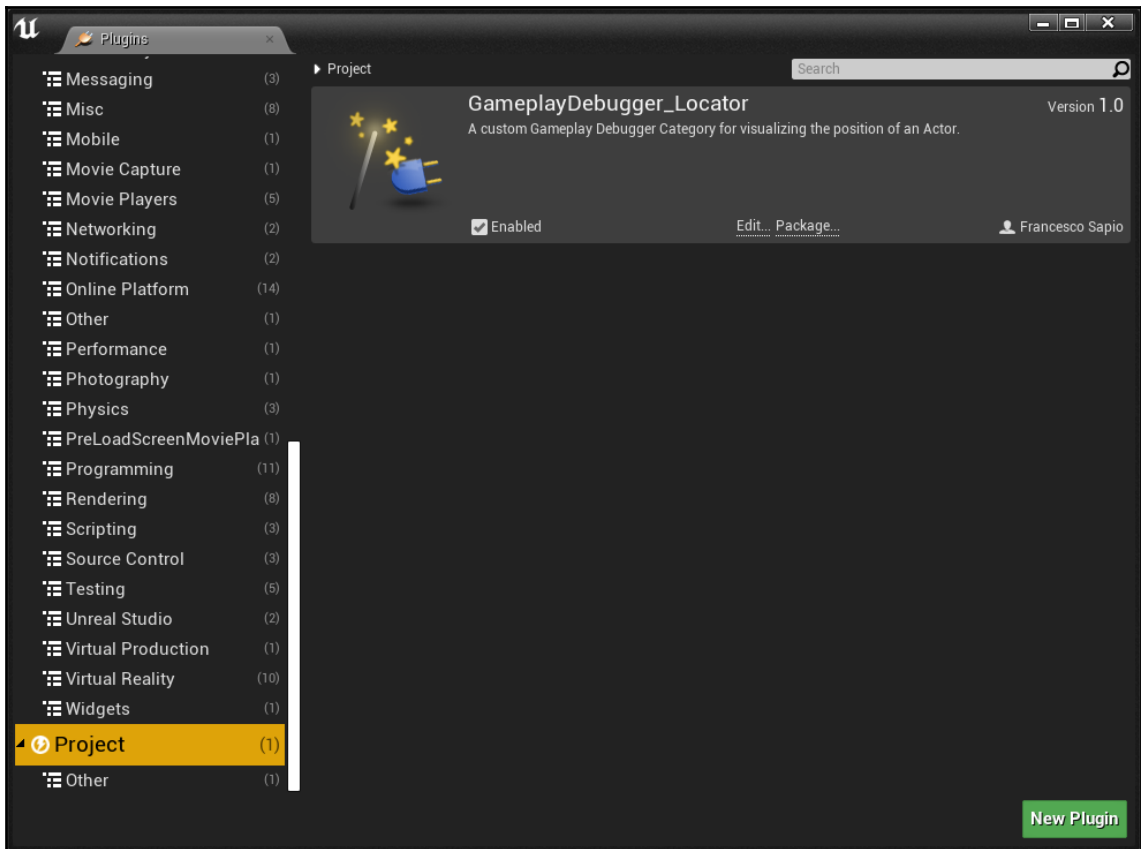
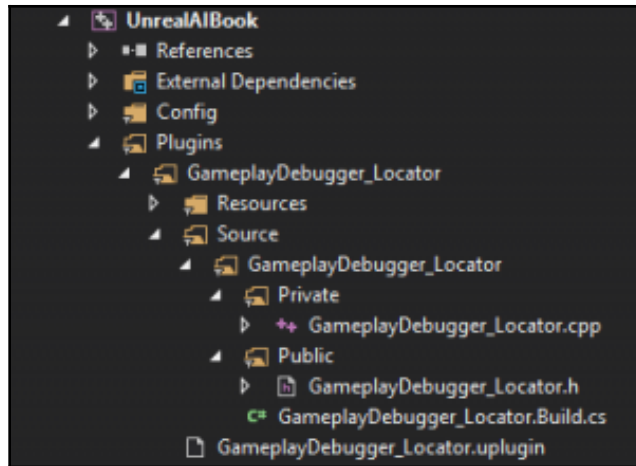
Author Francesco Sapio

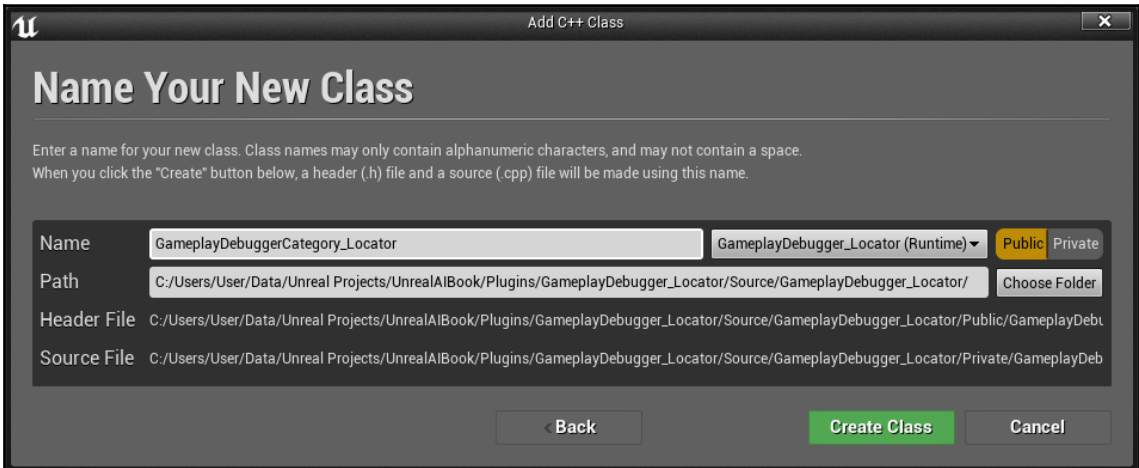
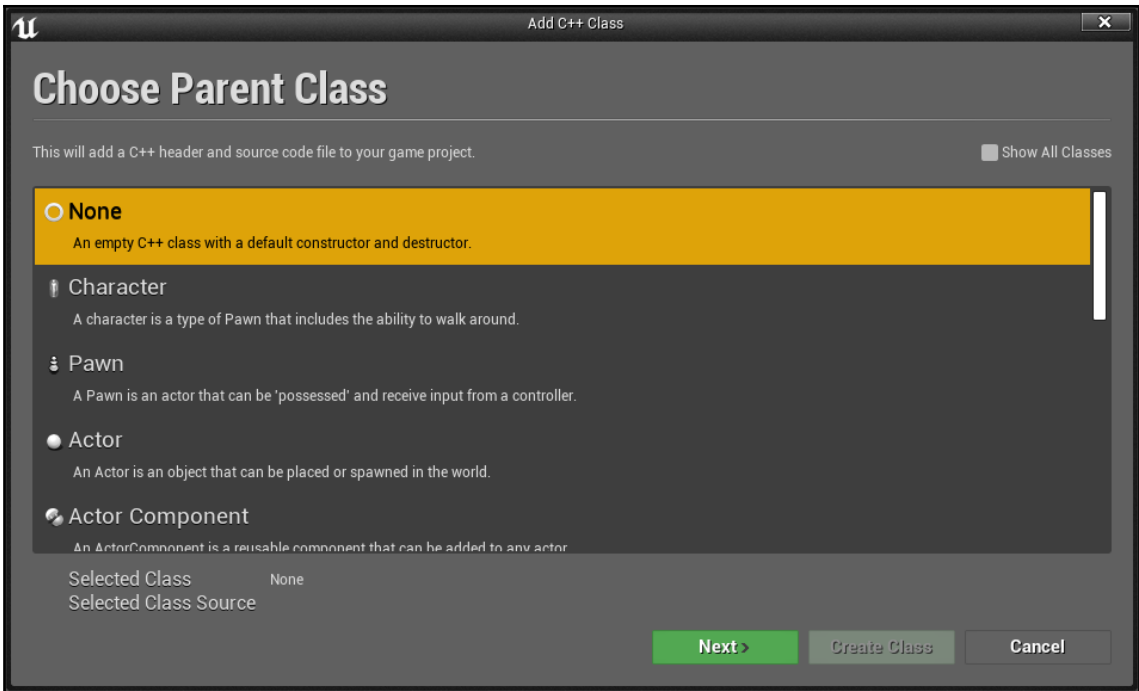
Description A custom Gameplay Debugger Category for visualizing the position of an Actor.

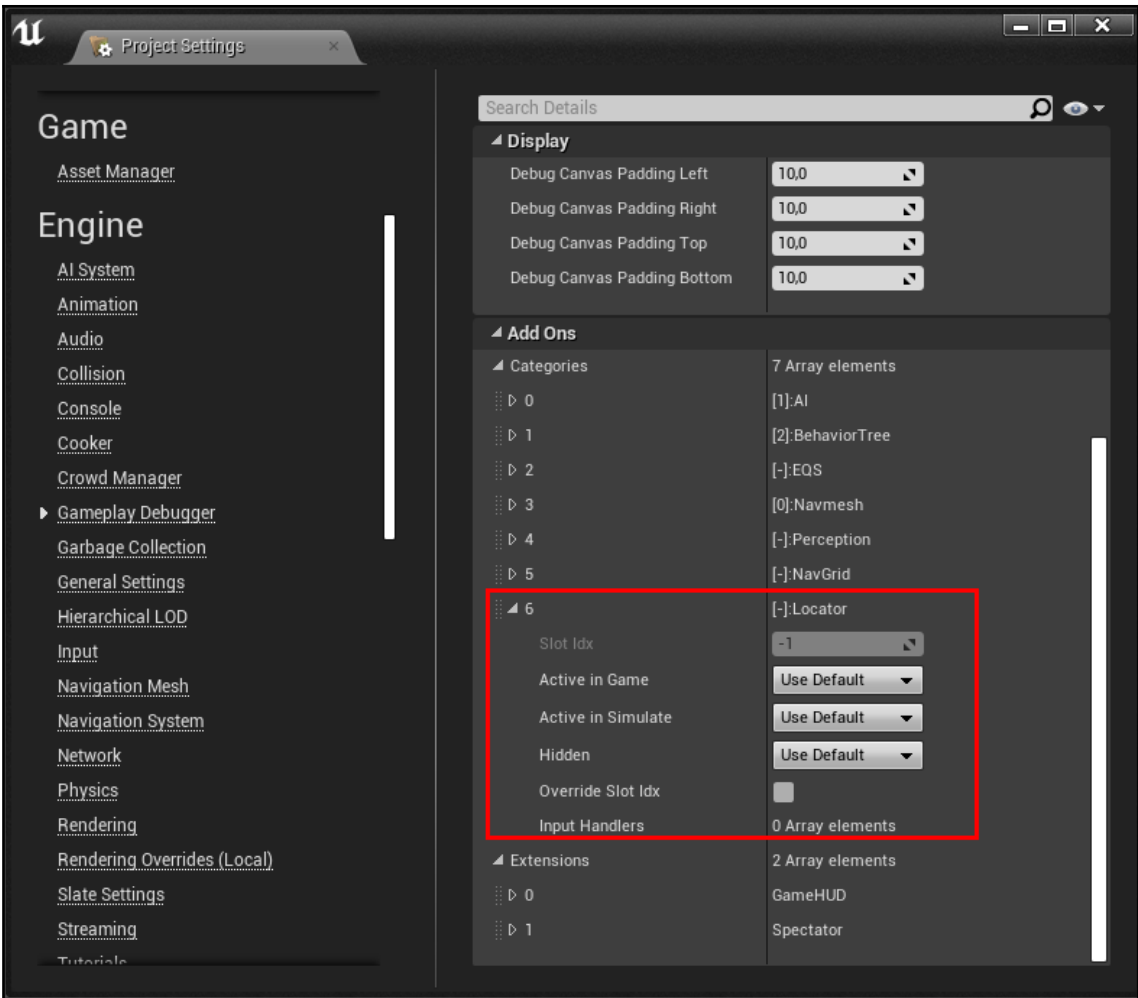
Show Content Directory

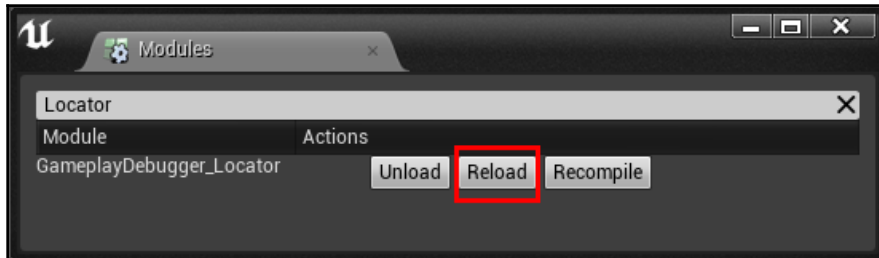
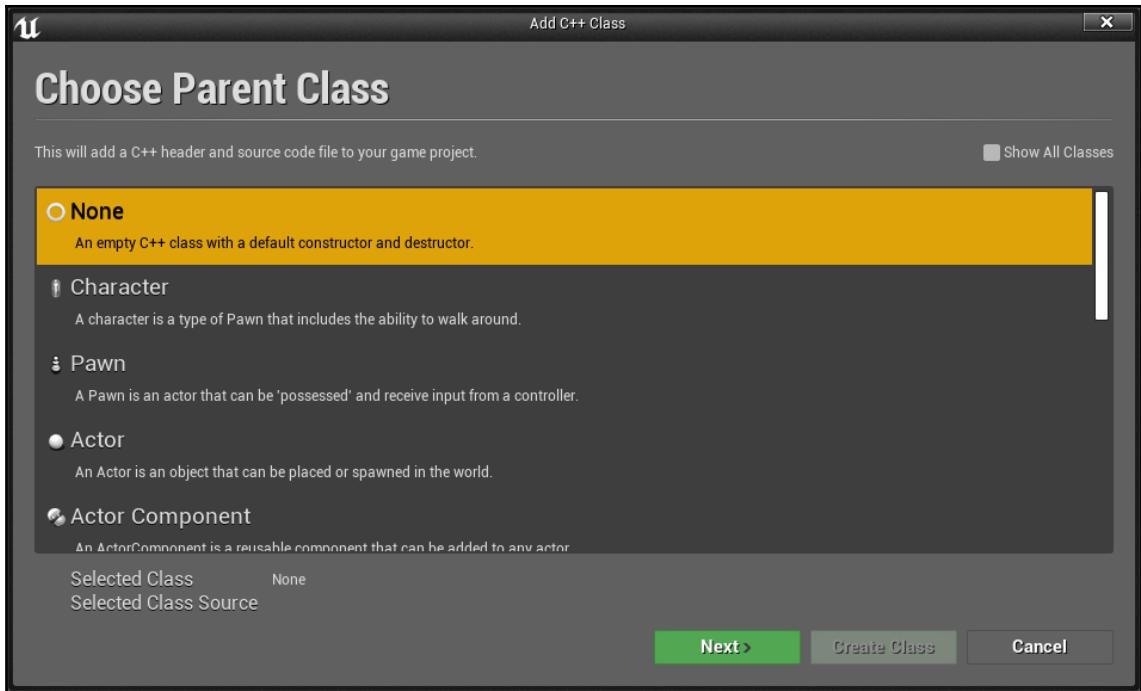
Create Plugin









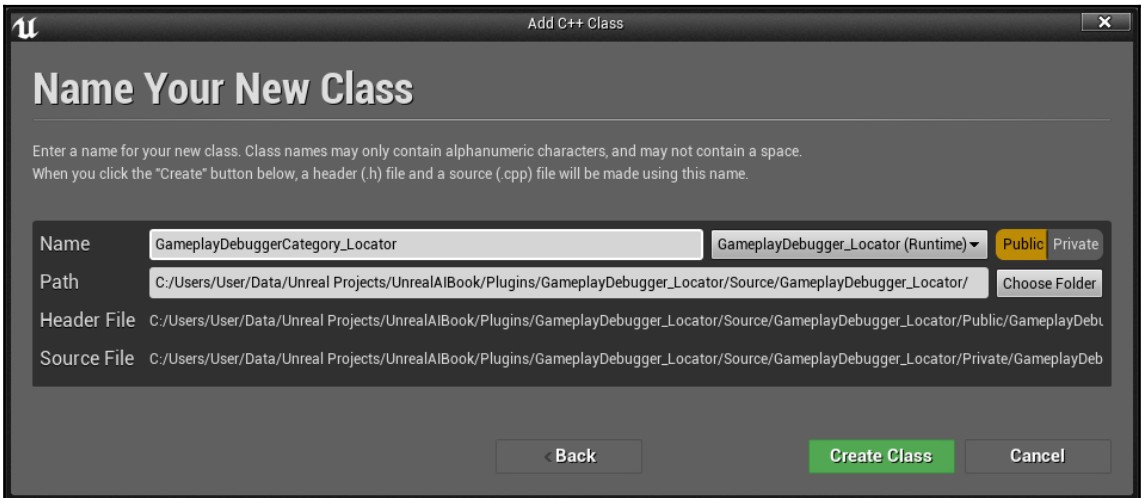


Tap [Apostrophe] to close, use Numpad to toggle categories.  
Ctrl+Tilde:HUD Ctrl+Tab:DebugMessages  
0:Navmesh 1:AI 2:BehaviorTree 3:EQS 4:Locator 5:NavGrid 6:Perception

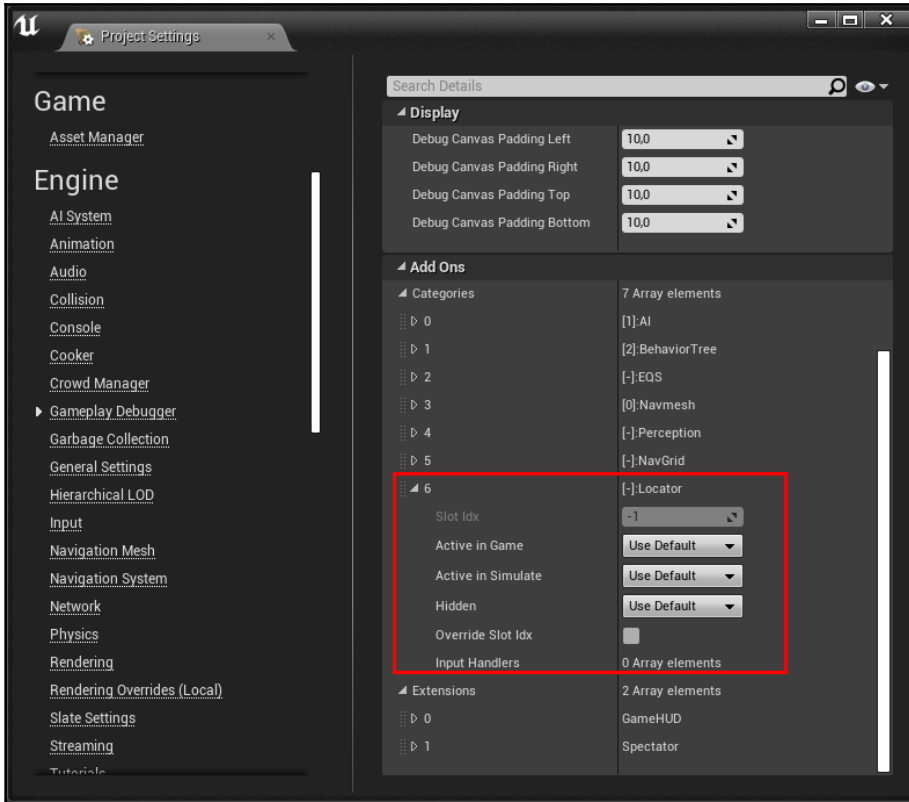
[CATEGORY: AI]  
[CATEGORY: Locator]  
If a DebugActor is selected, here below is its location:  
Location:

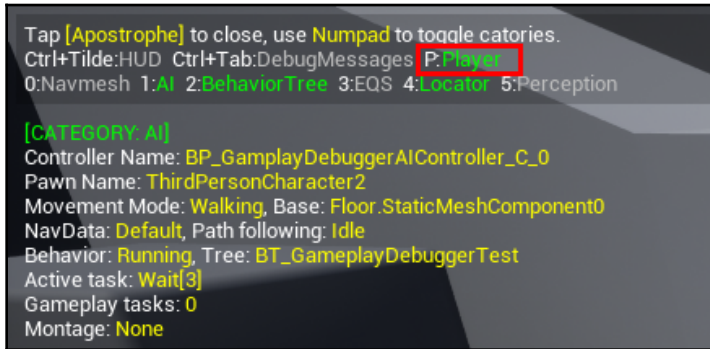


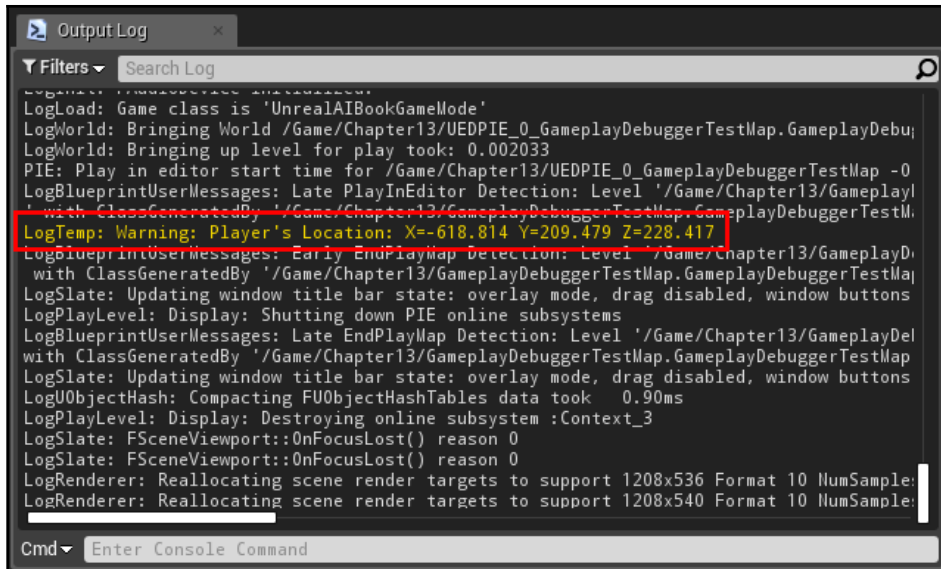
[CATEGORY: Locator]  
If a DebugActor is selected, this is its position:  
Location: X=908.544 Y=515.342 Z=228.417











The screenshot shows the 'Output Log' window in Unreal Engine. The window title is 'Output Log'. At the top, there is a 'Filters' dropdown and a 'Search Log' input field. The log content is as follows:

```
LogLoad: Game class is 'UnrealATBookGameMode'  
LogWorld: Bringing World /Game/Chapter13/UEDPIE_0_GameplayDebuggerTestMap.GameplayDebu  
LogWorld: Bringing up level for play took: 0.002033  
PIE: Play in editor start time for /Game/Chapter13/UEDPIE_0_GameplayDebuggerTestMap -0  
LogBlueprintUserMessages: Late PlayInEditor Detection: Level '/Game/Chapter13/Gameplay  
with ClassGeneratedBy '/Game/Chapter13/GameplayDebuggerTestMap.GameplayDebuggerTestM  
LogTemp: Warning: Player's Location: X=-618.814 Y=209.479 Z=228.417  
LogBlueprintUserMessages: Early EndPlayMap Detection: Level '/Game/Chapter13/GameplayD  
with ClassGeneratedBy '/Game/Chapter13/GameplayDebuggerTestMap.GameplayDebuggerTestMa  
LogSlate: Updating window title bar state: overlay mode, drag disabled, window buttons  
LogPlayLevel: Display: Shutting down PIE online subsystems  
LogBlueprintUserMessages: Late EndPlayMap Detection: Level '/Game/Chapter13/GameplayDel  
with ClassGeneratedBy '/Game/Chapter13/GameplayDebuggerTestMap.GameplayDebuggerTestMap  
LogSlate: Updating window title bar state: overlay mode, drag disabled, window buttons  
LogUObjectHash: Compacting FUObjectHashTables data took 0.90ms  
LogPlayLevel: Display: Destroying online subsystem :Context_3  
LogSlate: FSceneViewport::OnFocusLost() reason 0  
LogSlate: FSceneViewport::OnFocusLost() reason 0  
LogRenderer: Reallocating scene render targets to support 1208x536 Format 10 NumSample:  
LogRenderer: Reallocating scene render targets to support 1208x540 Format 10 NumSample:
```

At the bottom of the window, there is a 'Cmd' dropdown and an 'Enter Console Command' input field.

# Going Beyond

