FoxSpline

Spline Utilities, Movement & NPC Navigation for Blueprints

User Guide

Version 1.0

Alchemy Fox Studio

Supported Engine: UE 5.4, 5.6, 5.7

Table of Contents

Installation

Option A: Via Unreal Engine Tab

1. Open the Epic Games Launcher and go to the Unreal Engine tab.
2. Search for FoxSpline.
3. Click **Install to Engine**, select your Engine version, and click **Install**.
4. Open your project, go to **Edit > Plugins**, enable FoxSpline, then restart the editor.

Option B: Via Fab Library

1. Open the Epic Games Launcher and go to **Fab**.
2. Open **My Library**, search for FoxSpline and click on it.
3. Click **Install Plugin**, select your Engine version, and click **Install**.
4. Open your project, go to **Edit > Plugins**, enable FoxSpline, then restart the editor.

Option C: Manual Installation

1. Copy the FoxSpline/ folder into **YourProject/Plugins/**.
2. Right-click the .uproject file and select **Generate Visual Studio project files**.
3. Open the project, go to **Edit > Plugins**, enable FoxSpline, then restart the editor.

All nodes appear under **FoxSpline | <Category>** when you right-click in any Blueprint graph.

Supported Engine Version: **UE 5.4, 5.6, 5.7**

Quick Start Tutorial

Every FoxSpline node is a static Blueprint function — no setup, no initialization, no subsystem required (unless noted). Below are step-by-step examples showing how to use FoxSpline in real project scenarios.

Example 1: Move a Patrol NPC Along a Spline Route

Goal: Make an NPC walk a looping patrol path defined by a spline in the level.

Place a Spline

In the level, add an Actor with a SplineComponent. Set 4–6 control points around your patrol area. Set "Closed Loop" on the spline so it loops seamlessly.

Register the Path

In your AI Controller BeginPlay, call Register Spline Path with PathName="PatrolA", Spline reference, and bBidirectional=false.

Start NPC on Path

Call Start NPC on Path with NPC reference, PathName="PatrolA", Speed=200, bAlignRotation=true. The NPC begins moving immediately.

React to Junctions

Wire On Junction Reached to a "choose next segment" logic if you have a multi-path network. For a single loop, the NPC wraps automatically without any extra nodes.

Example 2: Distribute Props Along a Road

Goal: Place lamp posts every 400 units along a curved road spline automatically.

Draw Your Road Spline

Add a SplineComponent to your BP_Road actor and draw your road curve in the level editor.

Get Evenly Spaced Transforms

In Construction Script, call Get Points by Spacing with your Spline and Spacing=400. This returns a TArray at exact interval positions with correct tangent rotation.

Spawn Actors at Each Point

Loop over the Transforms array. At each one, SpawnActor BP_LampPost. Set the actor's transform to the array element. All lamps align to the road curve automatically.

Or Use the One-Node Version

Replace the above with Spawn Actors Along Spline — it does the loop internally and returns the SpawnedActors array for further processing.

Example 3: Spline-Based Conveyor Belt

Goal: Move pickup items along a curved conveyor belt at a constant speed.

Set Up the Conveyor Spline

Draw a SplineComponent on your BP_Conveyor actor to define the belt path.

Attach Items on Pickup

When an item is placed on the belt (overlap), call Move Actor Along Spline by Speed with the item actor, your conveyor spline, Speed=120, bAlignRotation=true.

Handle the End

Wire Reached End to a "drop item into bin" logic. Use CurrentDistance to know how far along the belt the item is (for a progress HUD or sorting logic).

Pause for Sorting Gates

Call Pause / Resume Spline Movement to stop an item at a gate, then resume after a scan or processing delay.

Node Reference

Complete reference for all 46 FoxSpline nodes organized by category. Each node includes a description, inputs, outputs, and a use case hint.

1. Distribution (5 Nodes)

5 Nodes

1.1 Get Evenly Spaced Points

Provides 1.1 Get Evenly Spaced Points functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Count	Int	Item count

Output	Type	Description
Return Value	Array of Transform	

Use Case: Spline sampling/placement — get evenly spaced points or place meshes/actors.

1.2 Get Points By Spacing

Provides 1.2 Get Points By Spacing functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Spacing	Float	

Output	Type	Description
OutTransforms	Array of Transform	
OutActualCount	Int	Item count

Use Case: Spline sampling/placement — get evenly spaced points or place meshes/actors.

1.3 Distribute Actors Along Spline

Provides 1.3 Distribute Actors Along Spline functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Actors	Array of Actor Reference	Target actor reference
bAlignRotation	Bool	Boolean flag

(none)

Use Case: Spline sampling/placement — get evenly spaced points or place meshes/actors.

1.4 Spawn Actors Along Spline

Provides 1.4 Spawn Actors Along Spline functionality.

Input	Type	Description
WorldContext	Object Reference	
Spline	Spline Component	Spline component reference
ActorClass	Class Reference	
Count	Int	Item count
bAlignRotation	Bool	Boolean flag

Output	Type	Description
OutSpawnedActors	Array of Actor Reference	Target actor reference

Use Case: Spline sampling/placement — get evenly spaced points or place meshes/actors.

1.5 Place Meshes Along Spline

Provides 1.5 Place Meshes Along Spline functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Mesh	Static Mesh	Mesh reference
SegmentLength	Float	
ForwardAxis	EFoxSplineForwardAxis	

Output	Type	Description
OutMeshComponents	Array of USplineMeshComponent*	Component reference

Use Case: Spline sampling/placement — get evenly spaced points or place meshes/actors.

2. Movement (5 Nodes)

5 Nodes

2.1 Move Actor Along Spline

Provides 2.1 Move Actor Along Spline functionality.

Input	Type	Description
Actor	Actor Reference	Target actor reference
Spline	Spline Component	Spline component reference
Duration	Float	Duration in seconds
bAlignRotation	Bool	Boolean flag
bLoop	Bool	Boolean flag

Output	Type	Description
Return Value	UFoxMoveAlongSplineDurationAction*	

Use Case: Spline movement — latent or instant movement helper.

2.2 Move Actor Along Spline By Speed

Provides 2.2 Move Actor Along Spline By Speed functionality.

Input	Type	Description
Actor	Actor Reference	Target actor reference
Spline	Spline Component	Spline component reference
Speed	Float	Speed value
bAlignRotation	Bool	Boolean flag

Output	Type	Description
Return Value	UFoxMoveAlongSplineBySpeedAction*	

Use Case: Spline movement — latent or instant movement helper.

2.3 Get Progress Along Spline

Provides 2.3 Get Progress Along Spline functionality.

Input	Type	Description
Actor	Actor Reference	Target actor reference
Spline	Spline Component	Spline component reference

Output	Type	Description
OutAlpha	Float	
OutDistance	Float	

Use Case: Spline movement — latent or instant movement helper.

2.4 Pause Resume Spline Movement

Provides 2.4 Pause Resume Spline Movement functionality.

Input	Type	Description
Actor	Actor Reference	Target actor reference
bPause	Bool	Boolean flag

(none)

Use Case: Spline movement — latent or instant movement helper.

2.5 Reverse Spline Movement

Provides 2.5 Reverse Spline Movement functionality.

Input	Type	Description
Actor	Actor Reference	Target actor reference

(none)

Use Case: Spline movement — latent or instant movement helper.

3. Query (5 Nodes)

5 Nodes

3.1 Get Closest Point On Spline

Provides 3.1 Get Closest Point On Spline functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
WorldLocation	Vector	World-space location

Output	Type	Description
OutClosestPoint	Vector	
OutDistance	Float	
OutAlpha	Float	

Use Case: Query — read state for UI binding, save/load, or condition checks.

3.2 Get Distance Along Spline For Actor

Provides 3.2 Get Distance Along Spline For Actor functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Actor	Actor Reference	Target actor reference

Output	Type	Description
OutDistance	Float	
OutAlpha	Float	

Use Case: Query — read state for UI binding, save/load, or condition checks.

3.3 Is Actor Near Spline

Provides 3.3 Is Actor Near Spline functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Actor	Actor Reference	Target actor reference
Radius	Float	Radius in world units (cm)

Output	Type	Description
Return Value	Bool	
OutDistance	Float	

Use Case: Query — read state for UI binding, save/load, or condition checks.

3.4 Get Spline Segment Length

Provides 3.4 Get Spline Segment Length functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
PointIndexA	Int	Zero-based index
PointIndexB	Int	Zero-based index

Output	Type	Description
Return Value	Float	

Use Case: Query — read state for UI binding, save/load, or condition checks.

3.5 Get Transform At Alpha
Provides 3.5 Get Transform At Alpha functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Alpha	Float	

Output	Type	Description
Return Value	Transform	

Use Case: Query — read state for UI binding, save/load, or condition checks.

4. Math (5 Nodes)

5 Nodes

4.1 Sample Spline Curvature
Provides 4.1 Sample Spline Curvature functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Distance	Float	

Output	Type	Description
Return Value	Float	

Use Case: Spline math — sample direction, up-vector, curvature, projection.

4.2 Get Spline Up Vector At Distance
Provides 4.2 Get Spline Up Vector At Distance functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Distance	Float	

Output	Type	Description
Return Value	Vector	

Use Case: Spline math — sample direction, up-vector, curvature, projection.

4.3 Project Point Onto Spline

Provides 4.3 Project Point Onto Spline functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Point	Vector	

Output	Type	Description
OutProjectedPoint	Vector	
OutSplineDistance	Float	

Use Case: Spline math — sample direction, up-vector, curvature, projection.

4.4 Get Spline Direction At Distance

Provides 4.4 Get Spline Direction At Distance functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference
Distance	Float	

Output	Type	Description
Return Value	Vector	

Use Case: Spline math — sample direction, up-vector, curvature, projection.

4.5 Interpolate Between Splines

Provides 4.5 Interpolate Between Splines functionality.

Input	Type	Description
SplineA	Spline Component	Spline component reference
SplineB	Spline Component	Spline component reference
Alpha	Float	
DistanceAlongSpline	Float	

Output	Type	Description
OutLocation	Vector	World-space location
OutRotation	Rotator	World-space rotation

Use Case: Spline math — sample direction, up-vector, curvature, projection.

5. Utility (5 Nodes)

5 Nodes

5.1 Create Spline From Points

Provides 5.1 Create Spline From Points functionality.

Input	Type	Description
Owner	Actor Reference	
Points	Array of Vector	
bClosedLoop	Bool	Boolean flag

Output	Type	Description
Return Value	Spline Component	

Use Case: Utility — supporting function for the toolkit.

5.2 Create Spline From Actors

Provides 5.2 Create Spline From Actors functionality.

Input	Type	Description
Owner	Actor Reference	
Actors	Array of Actor Reference	Target actor reference
bClosedLoop	Bool	Boolean flag

Output	Type	Description
Return Value	Spline Component	

Use Case: Utility — supporting function for the toolkit.

5.3 Get Spline Points As Array

Provides 5.3 Get Spline Points As Array functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference

Output	Type	Description
Return Value	Array of Transform	

Use Case: Utility — supporting function for the toolkit.

5.4 Reverse Spline

Provides 5.4 Reverse Spline functionality.

Input	Type	Description
Spline	Spline Component	Spline component reference

(none)

Use Case: Utility — supporting function for the toolkit.

5.5 Append Spline
Provides 5.5 Append Spline functionality.

Input	Type	Description
Target	Spline Component	
Source	Spline Component	

(none)

Use Case: Utility — supporting function for the toolkit.

6. Lane (5 Nodes)

5 Nodes

6.1 Set NPC Path Offset
Provides 6.1 Set NPC Path Offset functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	
LateralOffset	Float	

(none)

Use Case: Lane configuration — multi-lane NPC paths with offsets and lane switch.

6.2 Set NPC Random Offset
Provides 6.2 Set NPC Random Offset functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	
MinOffset	Float	
MaxOffset	Float	

Output	Type	Description
Return Value	Float	

Use Case: Lane configuration — multi-lane NPC paths with offsets and lane switch.

6.3 Set Path Lane Count

Provides 6.3 Set Path Lane Count functionality.

Input	Type	Description
WorldContext	Object Reference	
PathName	Name	
LaneCount	Int	Item count
LaneWidth	Float	

(none)

Use Case: Lane configuration — multi-lane NPC paths with offsets and lane switch.

6.4 Get NPC Current Lane

Provides 6.4 Get NPC Current Lane functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	

Output	Type	Description
Return Value	Int	

Use Case: Lane configuration — multi-lane NPC paths with offsets and lane switch.

6.5 Switch NPC Lane

Provides 6.5 Switch NPC Lane functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	
TargetLane	Int	
TransitionDuration	Float	Duration in seconds

(none)

Use Case: Lane configuration — multi-lane NPC paths with offsets and lane switch.

7. Nav (16 Nodes)

16 Nodes

7.1 Start NPC On Spline Path

Provides 7.1 Start NPC On Spline Path functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	
Route	Array of Name	
Speed	Float	Speed value
bAlignRotation	Bool	Boolean flag

Output	Type	Description
Return Value	UFoxStartNPCOnPathAction*	

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.2 Register Spline Path

Provides 7.2 Register Spline Path functionality.

Input	Type	Description
WorldContext	Object Reference	
PathName	Name	
Spline	Spline Component	Spline component reference
bBidirectional	Bool	Boolean flag

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.3 Connect Spline Paths

Provides 7.3 Connect Spline Paths functionality.

Input	Type	Description
WorldContext	Object Reference	
PathA	Name	
PathB	Name	

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.4 Disconnect Spline Paths

Provides 7.4 Disconnect Spline Paths functionality.

Input	Type	Description
WorldContext	Object Reference	
PathA	Name	
PathB	Name	

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.5 Find Path Between Points

Provides 7.5 Find Path Between Points functionality.

Input	Type	Description
WorldContext	Object Reference	
StartLocation	Vector	World-space location
EndLocation	Vector	World-space location

Output	Type	Description
Return Value	Bool	
OutRoute	Array of Name	
OutTotalDistance	Float	

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.6 Find Path Between Names

Provides 7.6 Find Path Between Names functionality.

Input	Type	Description
WorldContext	Object Reference	
StartPath	Name	
EndPath	Name	

Output	Type	Description
Return Value	Bool	
OutRoute	Array of Name	
OutTotalDistance	Float	

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.7 Stop NPC On Path

Provides 7.7 Stop NPC On Path functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.8 Resume NPC On Path

Provides 7.8 Resume NPC On Path functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.9 Set NPC Path Speed

Provides 7.9 Set NPC Path Speed functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	
Speed	Float	Speed value

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.10 Redirect NPC To Target

Provides 7.10 Redirect NPC To Target functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	
TargetLocation	Vector	World-space location
Speed	Float	Speed value

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.11 Get NPC Path Progress

Provides 7.11 Get NPC Path Progress functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	

Output	Type	Description
OutCurrentPath	Name	
OutDistanceOnPath	Float	
OutTotalProgress	Float	
OutDestinationPath	Name	

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.12 Is NPC At Destination

Provides 7.12 Is NPC At Destination functionality.

Input	Type	Description
WorldContext	Object Reference	
NPC	Actor Reference	

Output	Type	Description
Return Value	Bool	

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.13 Get Nearest Spline Path

Provides 7.13 Get Nearest Spline Path functionality.

Input	Type	Description
WorldContext	Object Reference	
WorldLocation	Vector	World-space location

Output	Type	Description
OutPathName	Name	
OutEntryPoint	Vector	
OutDistance	Float	

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.14 Set Path Blocked

Provides 7.14 Set Path Blocked functionality.

Input	Type	Description
WorldContext	Object Reference	
PathName	Name	
bBlocked	Bool	Boolean flag

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.15 Start NPC On Path

Provides 7.15 Start NPC On Path functionality.

Input	Type	Description
NPC	Actor Reference	
Route	Array of Name	
Speed	Float	Speed value
bAlignRotation	Bool	Boolean flag

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

7.16 Set Path Lane Config

Provides 7.16 Set Path Lane Config functionality.

Input	Type	Description
PathName	Name	
LaneCount	Int	Item count
LaneWidth	Float	

(none)

Use Case: NPC navigation — register/route/redirect NPCs on the spline graph.

Implementation Notes

- Spline movement via UFoxSplineFollowComponent (TickComponent).
- Lateral offset applied as Right Vector * Offset at each spline position.
- Lane system: LaneCount lanes evenly distributed across LaneWidth. Lane 0 = leftmost.
- Pathfinding: simple Dijkstra on TMap> adjacency graph, weighted by spline length.
- NPC tracking: TMap in subsystem.
- Junction callback via multicast delegate on subsystem.
- Verlet/constraint not used — pure spline interpolation + offset for stability.