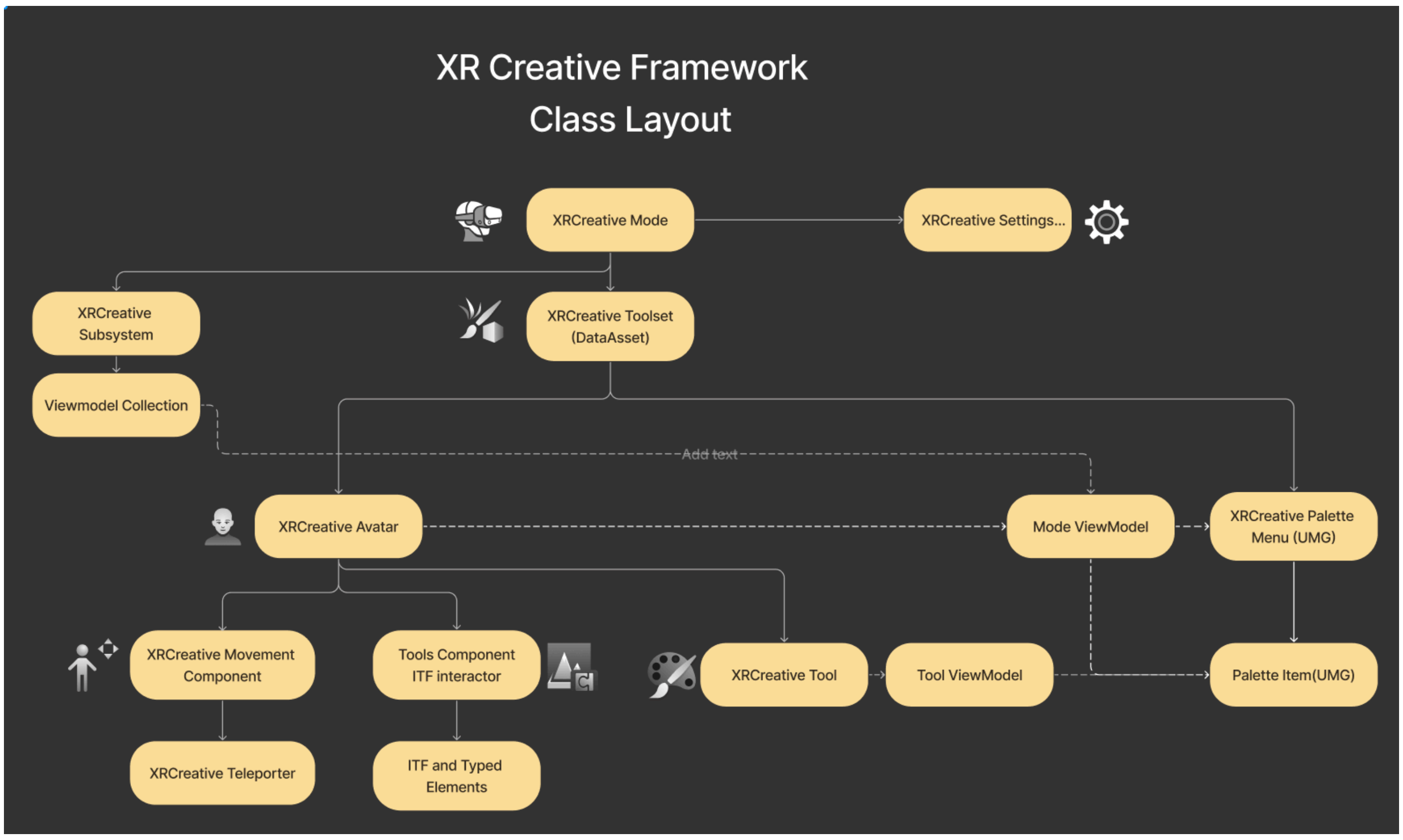
# Customizing Virtual Scouting

Instructions on customizing the Virtual Scouting tools by extending the classes and actors defined by the XR Creative Framework.

With Blueprints, you can customize the Virtual Scouting tools by extending the classes and actors defined by the XR Creative Framework.

The XR Creative Framework is designed to share design patterns with the Unreal Gameplay framework. For more information, see Gameplay Framework.



*XR Creative Framework class diagram*

## Create a New XR Creative Mode and Toolset

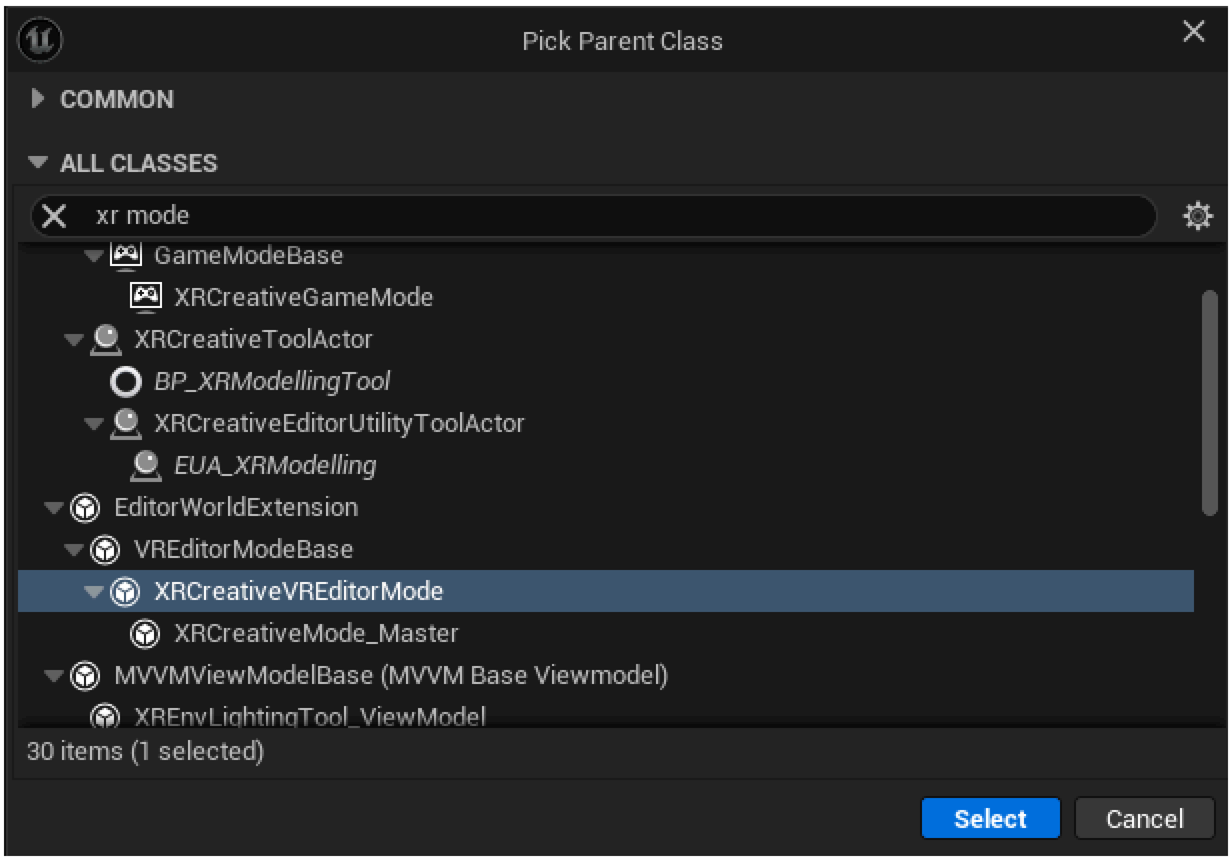
### Create a New XR Creative Mode

The core classes of an XR Creative experience are the `XRCreativeMode` and the `XRCreativeToolset`. `XRCreativeMode` contains a toolset and override events. You can create a custom toolset to add, remove, or reorganize existing tools, and to add new custom tools.

To create a new mode, follow these steps:

1. In the Content Browser, click **Add +** > **New Blueprint**.

2. Search "XR mode" and click **XRCreativeVREditorMode**.

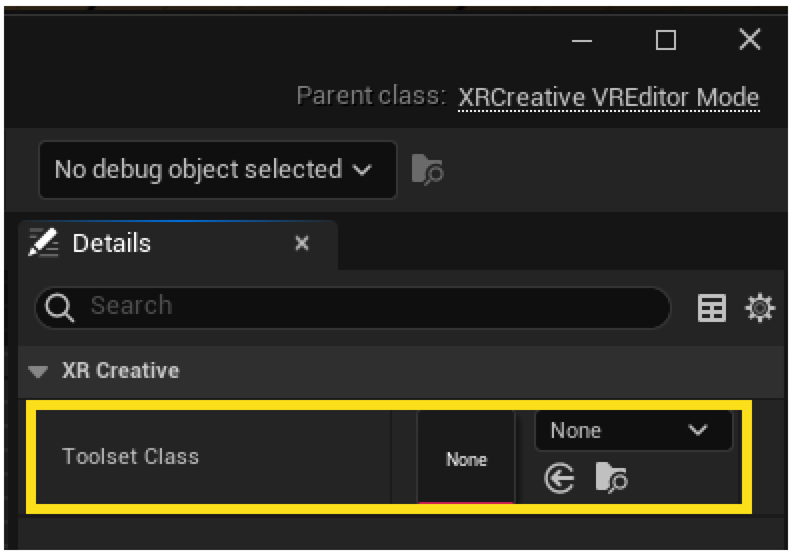


The XR Creative Mode contains the following overridable events:

- `EventOnEnter`
- `EventOnExit`
- `EventTick`

## Create a New XR Creative Toolset

The XR Creative Mode contains the `Toolset Class`. This variable expects a Data Asset of the class `XRCreative Toolset`.



To create a new toolset, follow these steps:

1. In the Content Browser, click **Add +** > **Miscellaneous** > **Data Asset**.
2. Search "XR toolset" and click **XR Creative Toolset**.

The toolset Data Asset contains pointers to the following classes that you have access to in VREditor mode and in your `XRCreativeGameMode`:

- **Avatar**: A pawn of the Class `XRCreativeAvatar`. The Avatar is spawned into the level when VREditor mode is started. It is spawned transiently, so it cannot be saved into a level and is also not visible to other users in the same multi-user session.

- **Right Handed Input Mapping Context**: A Data Asset of input actions for the avatar.
- **Left Handed Input Mapping Context**: A Data Asset of input actions for the avatar when handedness is set to Left.
- An array of `XRBlueprintableToolActor` actors
- **Palette**: An Unreal Motion Graphics UI Designer (UMG) widget of the class `XRCreativePalette`. It contains all of the menu and in-world UI for Virtual Scouting.

Virtual Scouting contains two default toolsets: `Scouting_Default` and `Scouting_Basic`. Both include the Main Menu and the Avatar, but `Scouting_Basic` contains fewer tools.

## Create a New Tool

### Tool object

The tool object is a container for all the other classes that you need to create a tool. It contains fields for the following required properties:

- **Display Name**
- **Tool Actor**
- **Tool Viewmodel**
- **Palette** (the UMG widget for this tool's settings)

## Create a Tool Actor

Tool actors are spawned into the world, provide a set of functionality by operating on other actors in the world, and are then destroyed when you swap to another tool.

To begin making a new tool, follow these steps:

1. In the Content Browser, click **Add +** > **New Blueprint**.
2. Search "tool actor" and click **XRCreativeToolActor**.

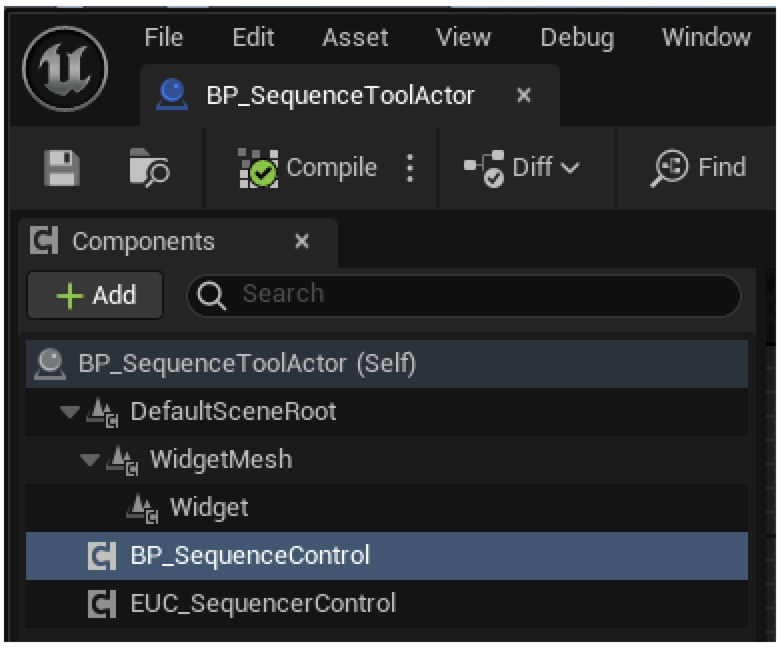
Using **XRCreativeToolActor** provides a tool that works only at runtime. To make a tool that works only in the editor, choose the **XRCreativeEditorUtilityToolActor**.

### Creating Tools For Both Editor and Runtime

Unreal Engine provides two asset factories for Blueprint actors: regular actors, and Editor Utility actors. Editor Utility actors have access to the Editor subsystems that provide editor scripting. Regular actors do not. Editor Utility actors cannot be packaged into a game because they reference editor-only modules that are not available to a packaged game. To learn more, see Scripting the Unreal Editor using Blueprints.

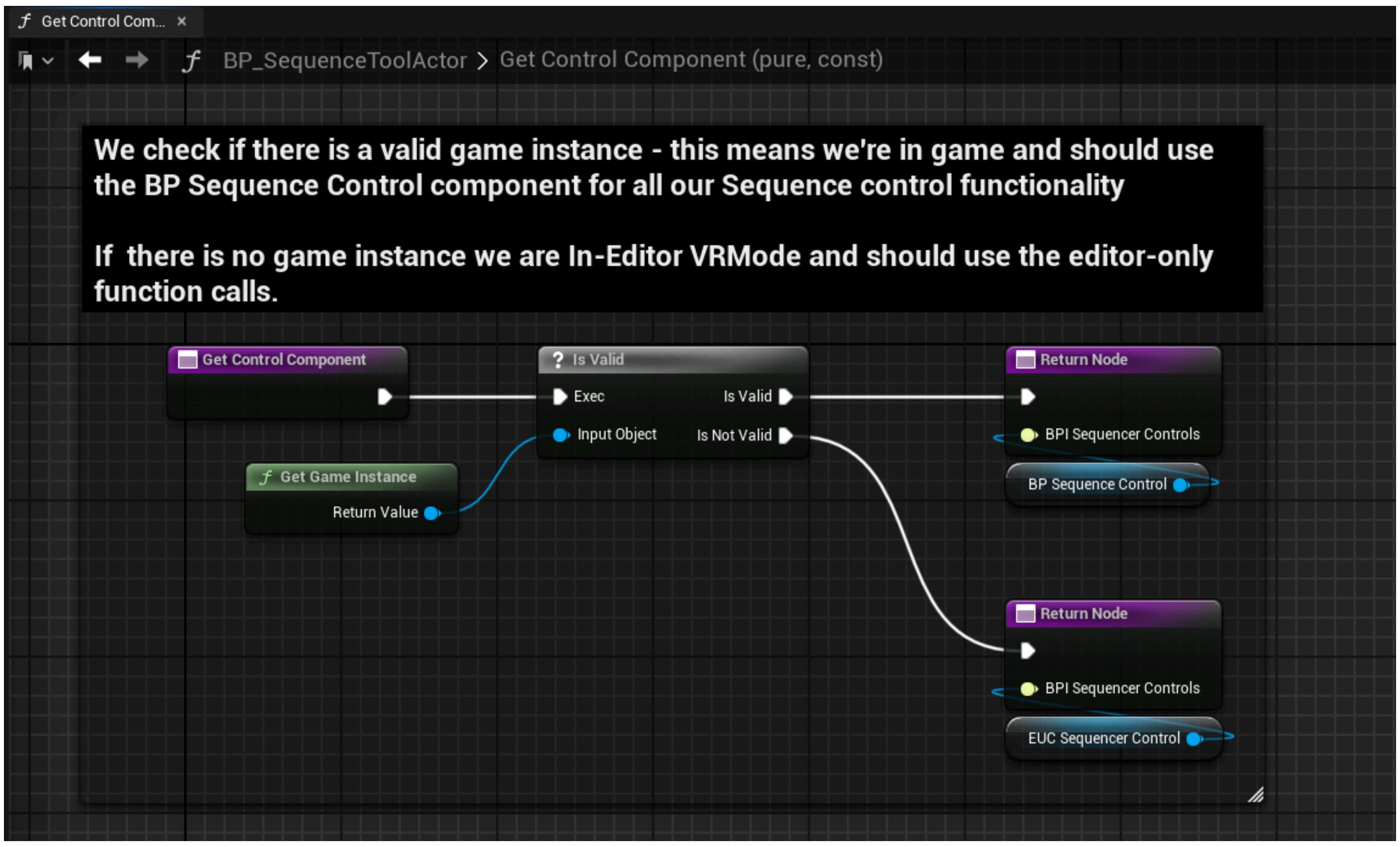
It is possible to create tools for both runtime packaging and in-editor workflows. An example of how to approach this is in the Virtual Scouting Sequencer tool. It includes the following components in the tool actor:

- **BP_SequenceControl** - a regular Blueprint Actor Component
- **EUC_SequenceControl** - an Editor Utility Actor Component



These two components both implement a common interface, `BPI_SequencerControls`.

The tool uses the `GetControlComponent` function to select the component it must use depending on the context the function is called from. If the function detects a valid `GameInstance`, then the regular Blueprint actor is used. If there is no valid `GameInstance`, then the Editor Utility actor is used. A valid `GameInstance` will only be available in PIE, -Game, and packaged games.


We check if there is a valid game instance - this means we're in game and should use the BP Sequence Control component for all our Sequence control functionality

If there is no game instance we are In-Editor VRMode and should use the editor-only function calls.

## Input Actions and Input Mapping Contexts

You can make new input actions and add them to **Input Mapping Contexts** with the input bindings you want. You can add and use `Input_Actions` to your Tool Actors and to your XRCreativeAvatar. Both of these classes are pre-registered for input on creation.

For more information, see Enhanced Input.

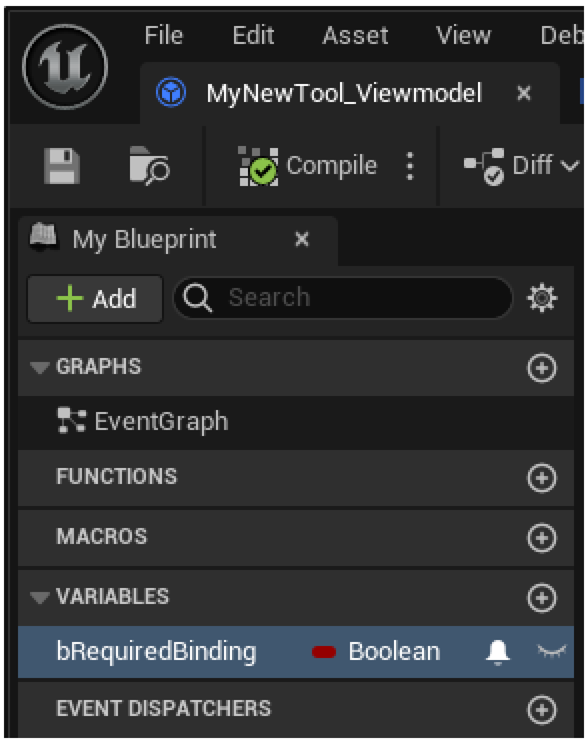
## Create a Tool Viewmodel

XR Creative uses UMG Viewmodels as a means to pass data between in-world objects like tool actors and the UMG palette menu. Viewmodels have the following features:

- A common class for all the variables which define the current state of your tool.
- The field notification system. UMG MVVM has a feature where you can bind (subscribe) to an event that fires each time a variable is updated. This allows you to make variable updates event-based, bindable delegates and avoid casting or interfaces to communicate and share data between the classes that make up your tool.

You can access a collection of viewmodels from XRCreativeSubsystem. In Virtual Scouting, each tool's viewmodel is named after the tool.

If you're creating a tool just for editor use, add a single boolean to the viewmodel called "bRequiredBinding" and set it to field notify. This will be used to ensure that your widgets are bound to the Viewmodel when in VREditor mode. This is not required if you're creating a new tool just for runtime use.

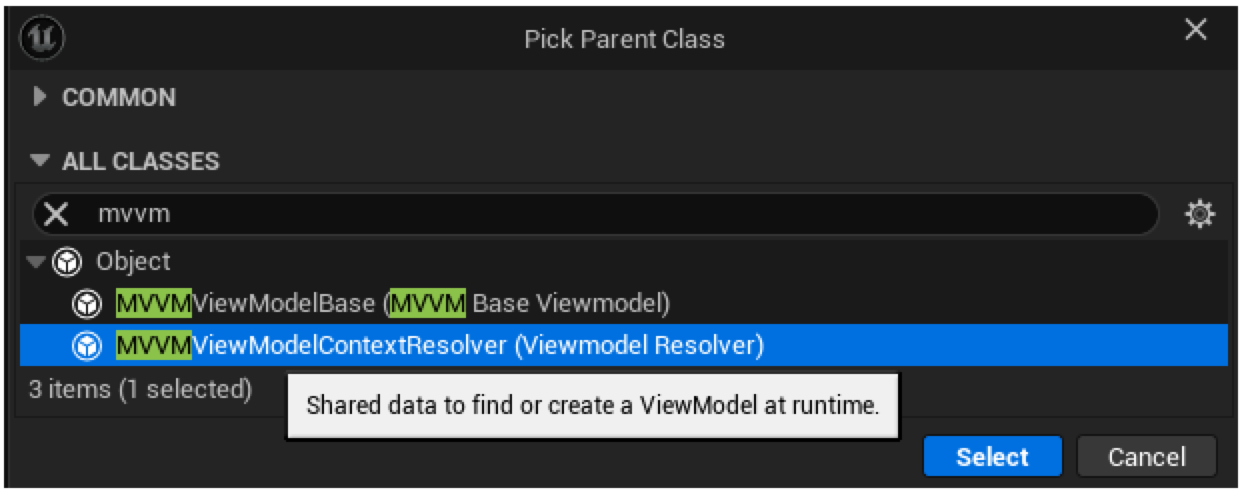


## Create a Viewmodel Resolver

To use a viewmodel with a palette UMG widget in the Editor, you must create a resolver class.

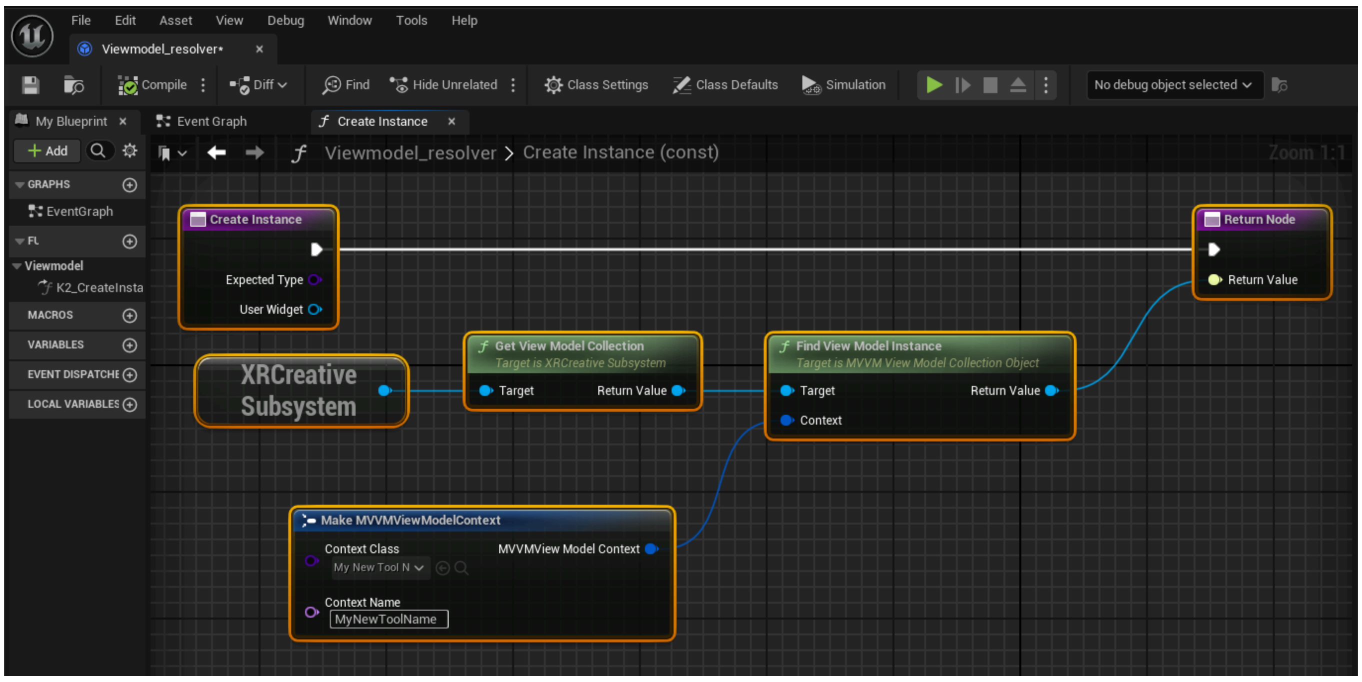
To create a resolver, follow these steps:

1. In the Content Browser, click **Add +** > **New Blueprint**.
2. Search "MVVM" and click **MVVMViewmodelResolver_Base**.


Pick Parent Class
COMMON
ALL CLASSES
mvvm
Object
MVVMViewModelBase (MVVM Base Viewmodel)
MVVMViewModelContextResolver (Viewmodel Resolver)
3 items (1 selected)
Select
Cancel

Shared data to find or create a ViewModel at runtime.

3. In the viewmodel Blueprint, set up the overridable event **Create Instance** as shown in the following screenshot. This code retrieves the viewmodel from the XR Creative Viewmodel Collection.

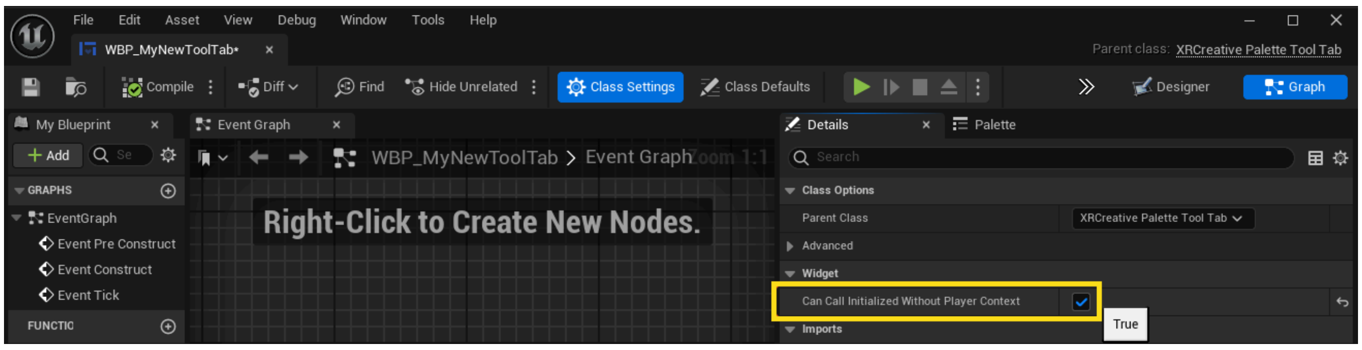


## Create a Palette

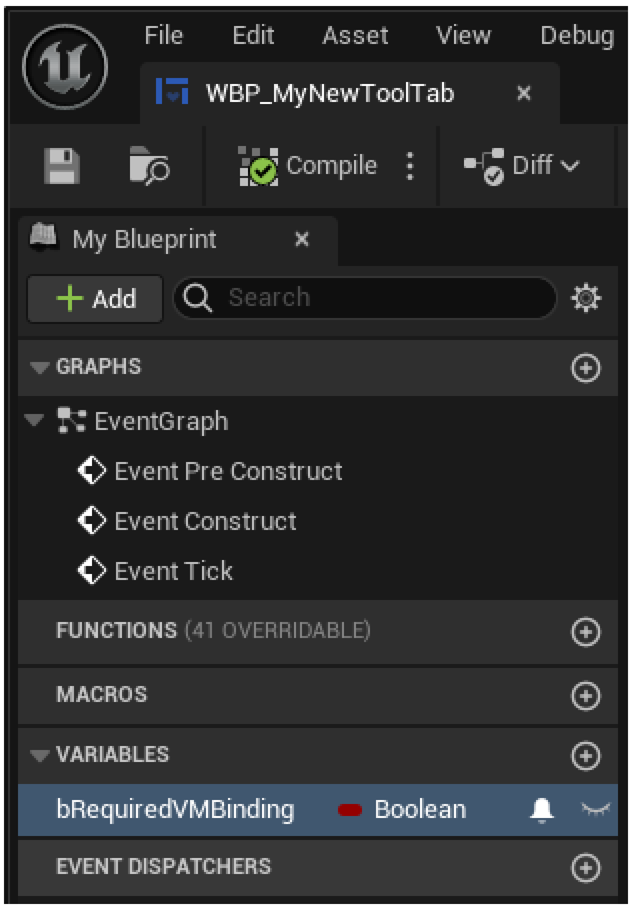
Each tool needs a Palette, which is a UMG Widget that defines the tool's UI in the Main Menu. The viewmodel resolver lets the Palette communicate with the viewmodel and the tool actor.

To create a Palette Widget and bind it to a viewmodel, follow these steps:

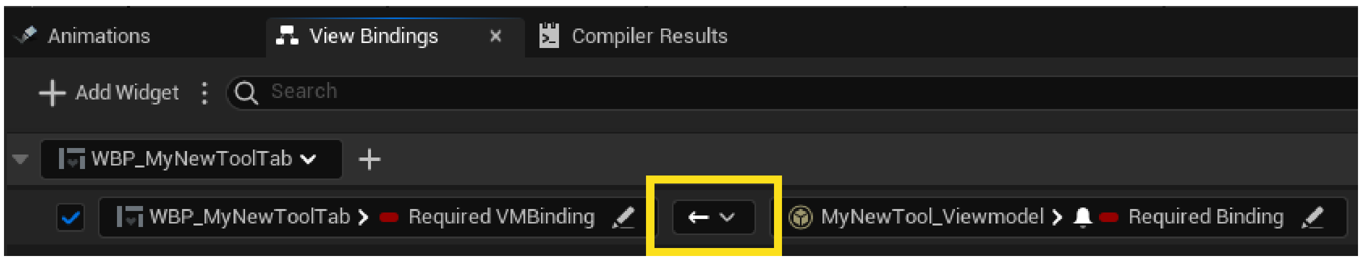
1. In the Content Browser, click **Add +** > **User interface** > **Widget Blueprint**.
2. Search for "XR tab" and click **XRCreativePaletteToolTab**.
3. In the class settings, set `bCanCallInitializedWithoutPlayerContext` to `true`.



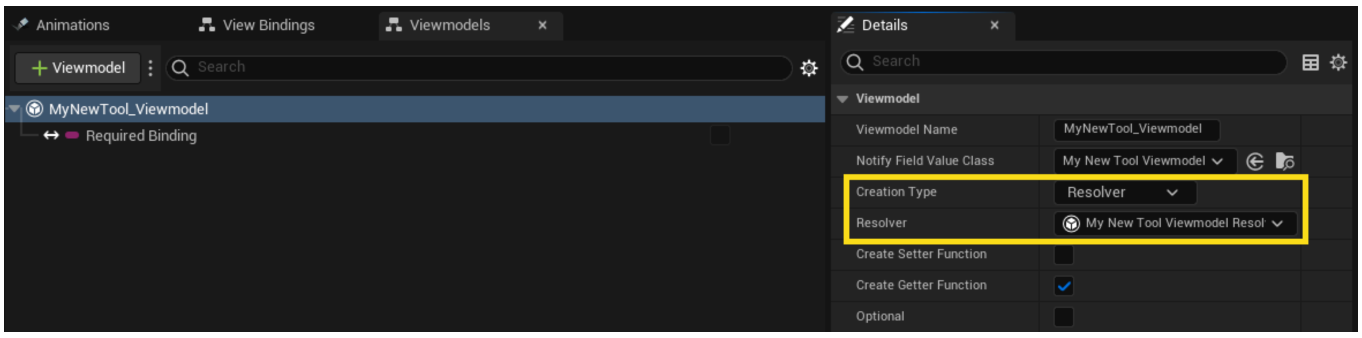
4. Create a single bool variable called `bRequiredVMBinding`.



5. Open the **View Bindings** tab and click the **Add (+)** button next to the widget.
6. Set the new binding between the variable `bRequiredVMBinding` in the widget and the variable `bRequiredVMBinding` in your viewmodel class.
7. Set the binding to be **One Way to Widget**.

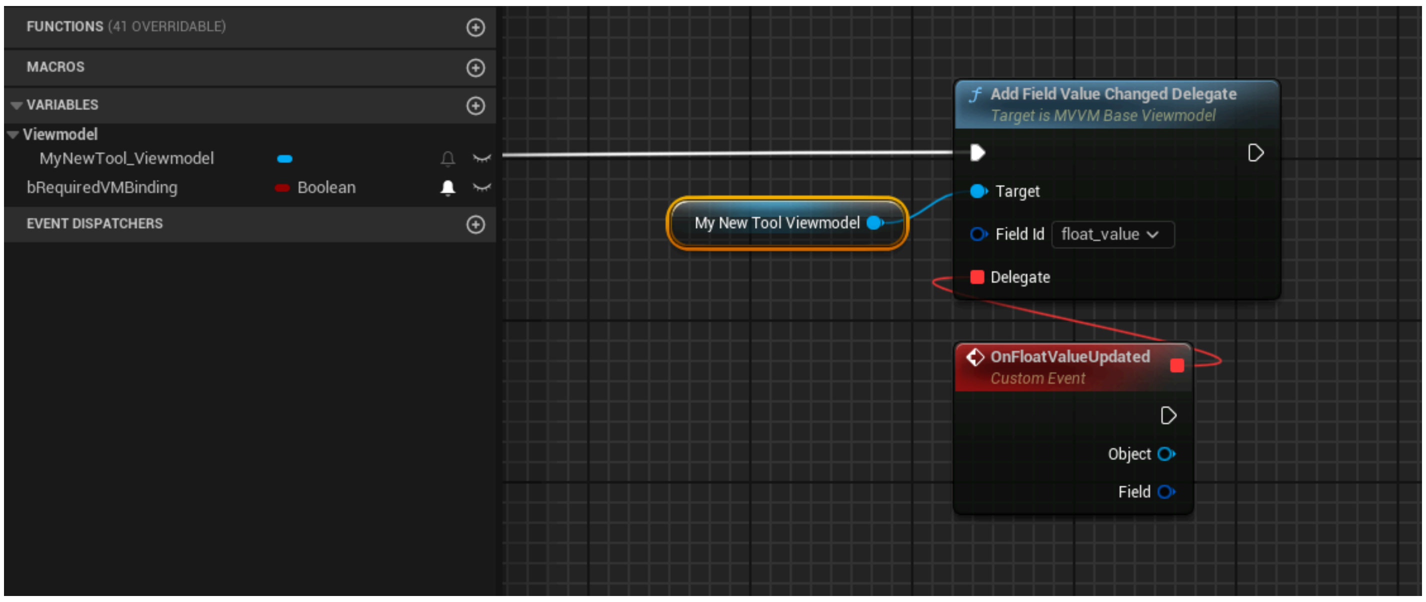

Animations
View Bindings
Compiler Results
Add Widget
Search
WBP_MyNewToolTab
WBP_MyNewToolTab > Required VMBinding
←
MyNewTool_Viewmodel > Required Binding

8. Open the **Viewmodels** tab and click your viewmodel class.
9. In the **Details** panel, set the **Creation Type** to **Resolver**, and set **Resolver** to your viewmodel resolver.



| | |
|---|---|
| Viewmodel Name | MyNewTool_Viewmodel |
| Notify Field Value Class | My New Tool Viewmodel |
| Creation Type | Resolver |
| Resolver | My New Tool Viewmodel Resol |
| Create Setter Function | |
| Create Getter Function | ✓ |
| Optional | |

In your Tool Actor, and in any of your widgets that use a viewmodel, you can bind to field notification delegates as shown in the following diagram.

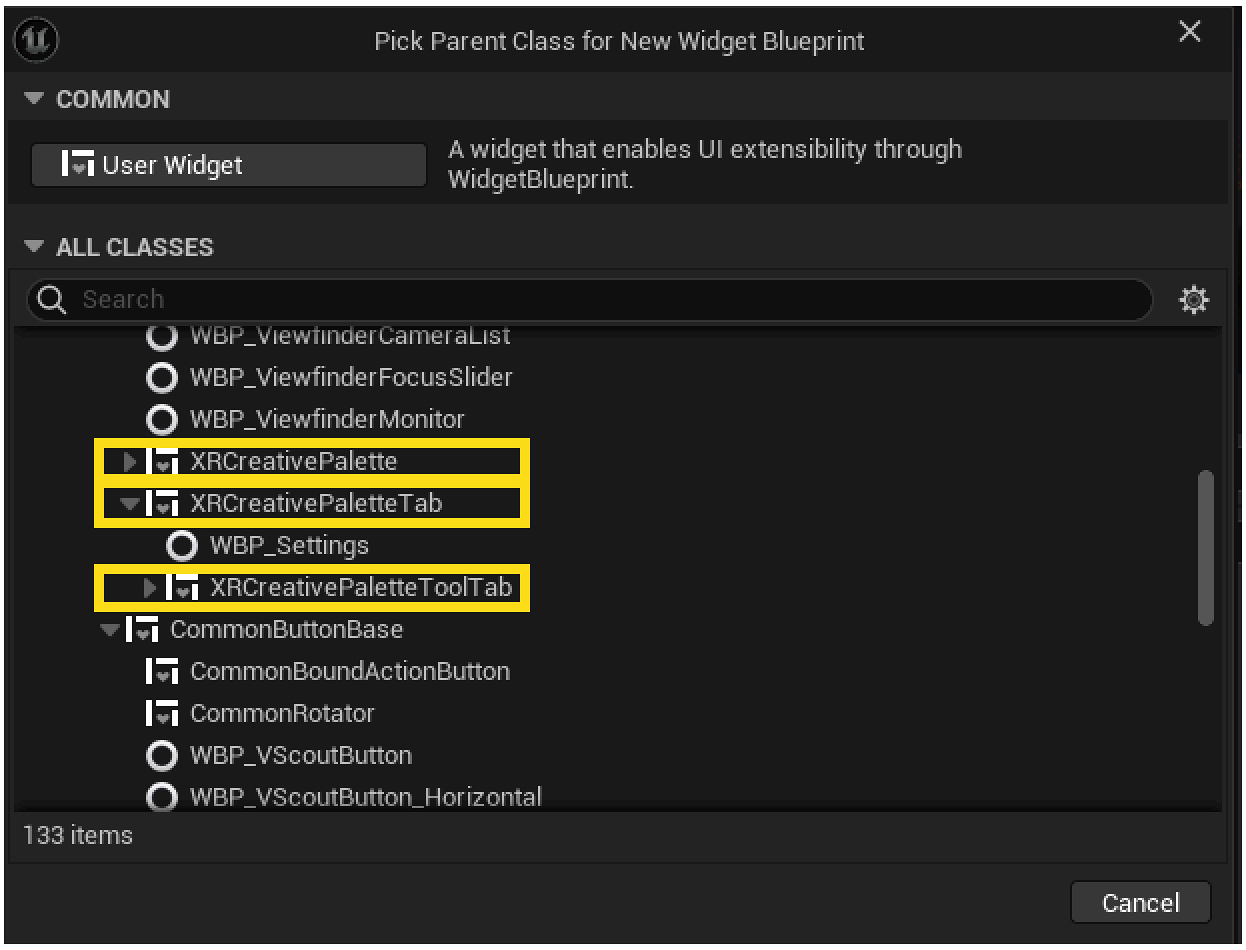


## Advanced Topics

### Creating a new XR Creative Palette system

To create a new XR Creative Palette system, you must create your UI from the following classes:

- `XRCreativePalette`: You should use this class as the main container for all other sub widgets
- `XRCreativePaletteTab`: Any sub-widget you want to create that's associated with a particular tool
- `XRCreativePaletteToolTab`: A subwidget associated with a tool. Your tool object will contain a reference to this class.



A widget that enables UI extensibility through WidgetBlueprint.

Beyond these classes, you can use UMG widgets in your palette and palette tabs. We recommend you use the CommonUI base classes, as these contain much of the boilerplate functionality to build clean, maintainable, and interactive UIs.

## XRCreativeAvatar

The `XRCreativeAvatar` class is blueprintable and provides a starting place for custom avatar development. For an example of how to create a custom avatar, see the `BP_VScoutAvatar` class. The content of the class is divided into the following categories:

- Lifecycle management - setting up the avatar on entering VR and cleaning up when exiting VR
- Input for movement, selection & simulated mouse-clicks
- Tool lifecycle management
- Per-frame updates for pointers and cosmetics
- Dedicated movement component

## Running in VRPie

You can run the Virtual Scouting toolset in VRPreview (VRPie). There are some minor differences and this route has not yet been fully developed. In VRPie you have access to runtime simulation systems like physics and collision.

Instead of using `VRMode Scouting_Default`, when you launch into VRPie you must use `BP_VscoutGameMode`. You can also create your own `GameMode` from the parent class `XRCreativeGameMode`. This class has all the functionality of `GameModeBase` with the added variable of an `XRCreativeToolset` data Asset to define the tools and UI/UX. To build for runtime, use both an `XRCreativeAvatar` and an `XRCreativeGameMode`.

## Packaging a Game

You can package XR Creative experiences into a game using standard VR development processes. The previously mentioned consideration about editor utility actors and regular actors applies when packaging for runtime.